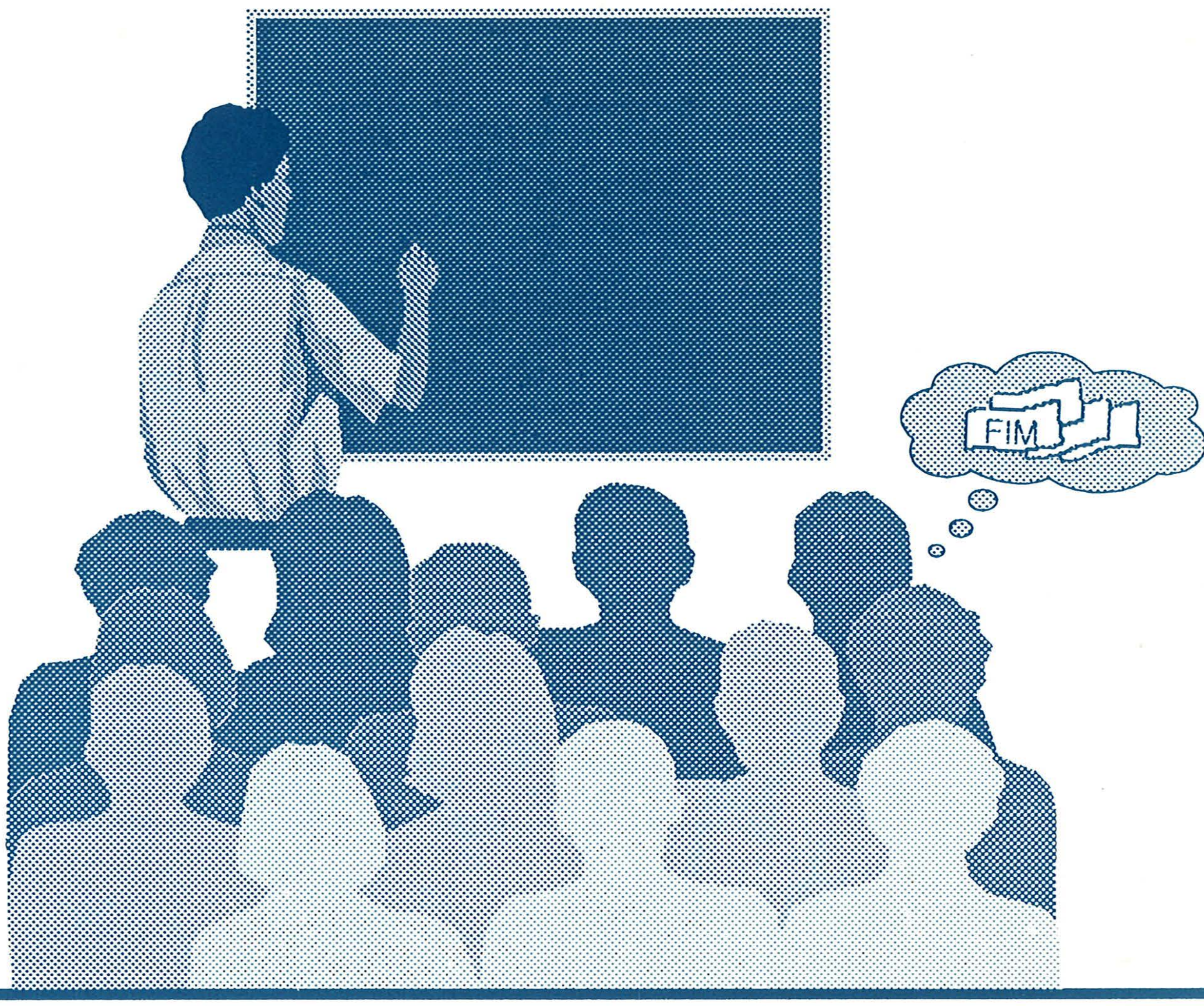
ETLA The Research Institute of the Finnish Economy

Rita Asplund

ESSAYS ON HUMAN CAPITAL AND EARNINGS IN FINLAND



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ABSTRACT: This study analyses, within the human capital framework, individual earnings differentials in the Finnish labour market and the impact and importance of investment in human capital in explaining the observed earnings dispersion. In particular, because the working history as well as the occupational and industry structures of men and women are known to differ substantially, differences in the earnings effects of human capital across genders are strongly at issue throughout the study. Apart from the gender aspect, special attention is also paid to problems of selectivity, i.e. of non-randomness in the allocation of individuals, in the estimation of earnings equations from individual data. These aspects are analysed from different points of view in four empirical essays of the study (Chapters III-VI). The cross-sectional micro-data used come from the Finnish Labour Force Survey for 1987 conducted by Statistics Finland. The data are analysed in detail in Chapter VI of the study.

In sum, the findings of the study suggest the following. First, the incentives to invest in further education and training after completed formal education are, on average, fairly weak. Second, because of the comparatively high returns on investment in human capital paid in the public sector, the sector has succeeded in attracting high-educated individuals to its large, and until recent years, rapidly growing number of both upper- and lower-level non-manual jobs. Third, there exists some degree of wage rigidity caused in part by the strong earnings effects of formal education mediated by the employee's position in the occupational hierarchy and in part by the employee's industry affiliation.

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TIIVISTELMÄ: Tutkimuksessa tarkastellaan henkilöiden välisiä palkkaeroja Suomen työmarkkinoilla pääpainon ollessa inhimillisen pääoman eli koulutuksen ja työkokemuksen merkityksessä näiden erojen selittäjänä. Koska työhistorian ja ammatti- ja toimialarakenteiden tiedetään vaihtelevan merkittävästi naisten ja miesten välillä, erot inhimillisen pääoman palkkavaikutuksissa ovat tutkimuksessa vahvasti esillä. Erityistä huomiota kiinnitetään niinikään palkkayhtälöiden estimointiin liittyviin ns. valikoituvuusongelmiin eli siihen, että yksilöiden sijoittuminen työmarkkinoiden eri ryhmiin ei ole välttämättä satunnaista. Näitä aiheita tarkastellaan eri näkökulmilta tutkimuksen neljässä empiirisessä luvussa (luvut III-VI). Tutkimuksessa käytetään Tilastokeskuksen vuoden 1987 työvoimatutkimuksen vuosiaineistoa. Aineistoa tarkastellaan yksityiskohtaisesti luvussa VII.

Tiivistäen tutkimustulokset viittaavat seuraavaan. Insentiivit investoida tietoihin ja taitoihin henkilön siirryttyä koulusta työelämään ovat Suomessa keskimäärin varsin heikkoja. Koska julkinen sektori näyttää palkitsevan inhimillistä pääomaa suhteellisen hyvin, se on onnistunut palkkaamaan hyvin koulutettuja henkilöitä aivan viime vuosiin saakka nopeasti kasvaneisiin ylemmän ja alemman toimihenkilön virkoihin. Lopuksi tutkimustulokset osoittavat, että Suomen työmarkkinoiden palkkarakenteessa esiintyy jäykkyyttä, mikä selittyy osaksi ammattiaseman ja osaksi toimialan suhteellisen voimakkaalla vaikutuksella yksilöiden palkkatasoon.

PREFACE

This dissertation was never meant to be written. Several circumstances and persons, in particular, spurred me to undertake this study and fostered its eventual completion.

When moving to my current employer, ETLA The Research Institute of the Finnish Economy, in January 1989 I was given the opportunity to carry out a longstanding idea of the institute, namely to investigate the economic effects of human capital. This turned out to be quite a challenging task, because of the complexity of the topic in itself and the fact that it was a totally unknown research field for me. Today I am, nevertheless, grateful to ETLA and, especially, to Mikael Ingberg for opening my eyes to this most interesting and rapidly expanding field of economics.

The research work that were to result in this dissertation was started in Autumn 1990 with the helpful guidance and support of Pekka Ilmakunnas, who was my research advisor at the institute at that time. I wish to thank Pekka also for his valuable assistance during the various phases of this work.

The most fundamental prerequisite for carrying out this study, however, has been provided by my employer, ETLA. I am much indebted to the management of the institute for all its support. My very special gratitude I wish to express to Pentti Vartia for giving me the opportunity to work on my thesis full-time during several years and for his continuous encouragement.

In the course of conducting this study, I have received support and assistance from a large number of colleagues and friends, both in Finland and abroad. Their valuable comments and suggestions on preliminary drafts of different chapters are gratefully acknowledged.

I owe my warmest thanks also to my official examiners Reija Lilja and Tor Eriksson for their constructive suggestions on the manuscript. I wish to express my deepest gratitude to Tor also for his patience, encouragement and guidance throughout the work on this dissertation. Tor also arranged for me to participate in the project "The Nordic Labour Market in the 1990s", which was carried out in the years 1989-93. My dissertation has much benefited from this joint Nordic project.

I have also benefited from the friendly assistance provided by the ADP and administrative staff at the institute. Especially I want to thank John Rogers for checking the language and making suggestions for improving my English, and Tuula Ratapalo for her excellent work in preparing the final layout of this study for publication.

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Helsinki, October 1993

Rita Asplund

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CHAPTER I

INTRODUCTION

There has been very little empirical analysis of earnings determination for Finland based on individual data. In particular, the importance of interpersonal education and training differences as determinants of earnings dispersion is still a more or less unexplored research field. This is hardly satisfactory in view of the enormous resources that are annually spent on improving the quality of the Finnish labour force.

Moreover, there is a growing body of international literature pointing to the important role of education in explaining trends in earnings dispersion. In *Employment Outlook 1993*, the OECD reports an increase in earnings dispersion in the 1980s for a majority of investigated member countries. This contrasts sharply with the decreasing or stable inequality experienced in the 1970s. Furthermore, the changes in the differences between earnings of employees of different educational level were mostly as pronounced as for the overall dispersion. In particular, the 1970s saw a marked fall in educational differentials while the 1980s saw increasing differentials.

Attempts have also been made to explain these changes in educational differentials. Thus the decline in differentials in the 1970s is largely attributed to the increase in the relative supply of well educated employees. However, in the 1980s, the growth in the proportion of the workforce with higher levels of education continued but there was a widespread increase in the relative earnings of the highly educated employees. In other words, the simple supply model does not hold for the 1980s. The explanation now offered emphasizes the slower rate of growth of the highly educated in the 1980s as compared to the 1970s, which is seen to have resulted in a situation where the supply of highly educated employees has fallen short of the steadily growing demand for highly skilled labour within practically all sectors of the economy. (A comprehensive review of the topic is found in the aforementioned OECD Employment Outlook for 1993.)

Empirical evidence suggests that the return on formal education and labour market training is fairly low in the Nordic countries as compared to other industrialized countries. Suppose that individuals in the Finnish labour market feel that they do not receive a satisfying return on their investments in education and training. One consequence could then be that their incentives to take part in further education and on-the-job training diminish. This, in turn, might have severe effects for the country's future possibilities of regaining or catching up with the productivity growth of the industrialized world and thus of competing in increasingly specialized and integrated international markets.

However, low returns on post-school investments in education and training, i.e. on investments undertaken in working life, may also be indicative of insufficient possibilities of labour market training and/or other productivity improving measures. All in all, then, empirical evidence on the return to investment in human capital can provide important signals about potential policy parameters to improve the functioning of the labour market and thereby also the competitiveness of the country.

The past few decades have produced a vast body of theoretical and empirical literature on interpersonal earnings differences. Indeed, the issue that has clearly dominated the human capital literature is that of earnings differentials vis-à-vis age and education. The original stimulus for this development was provided by Mincer, who in 1974 launched an empirical specification of the earnings function which is now widely referred to as the standard human capital earnings function. This basic human capital model of earnings determination postulates a simple linear relation between the natural logarithm of individual earnings and the human capital productivity proxies of years of schooling and years of work experience. With the increasing availability of large micro-level databases, the Mincer model has, in recent years, commonly been completed with a broad set of variables capturing differences across individuals in other personal and job-related characteristics, as well.

This widely-used conventional human capital approach to cross-sectional earnings functions is adopted also in the present study. The approach has without doubt its shortcomings, one of which is the assumption that the individuals act in a labour market characterized by perfect competition. But if, as in the present study, the main purpose is to examine the influence of investment in human capital on earnings determination and interpersonal earnings differentials and not to explain overall earnings variance, then the human capital theory of earnings determination can be seen to offer a most suitable framework.

Specifically, this study analyses, within the human capital framework, individual earnings differentials in the Finnish labour market and the impact and importance of investment in human capital in explaining the observed earnings dispersion. In other words, ***the human capital aspect will receive the most emphasis in the analysis***, although attention will also be paid to other personal and job characteristics that can be expected to contribute to the explanation of earnings variability across individuals.

Since the analysis concerns both male and female employees and because the working history as well as the occupational and industry structures of men and women are known to differ substantially, differences in the earnings effects of human capital across genders will be strongly at issue throughout the study. The analysis of individual earnings and, especially, of female earnings also diverts attention to questions of self-selection, i.e. of non-randomness in the allocation of individuals, not least when it comes to labour force participation and occupational and sectoral status while working. The potential presence of selectivity bias arising from this type of decisions may seriously distort the estimated earnings effects of the personal and job characteristics under study if not properly accounted for in the estimations. Apart from the gender aspect, special attention will therefore be paid also to problems of selectivity bias in the estimation of earnings equations from individual data.

These aspects are analysed from different points of view in four empirical essays of the study. The cross-sectional micro-data used come from the Finnish Labour Force Survey for 1987 conducted by Statistics Finland. The year 1987 is chosen because it is the first and, until recently, only year for which the labour force surveys have been supplemented with income data from the tax rolls. The corresponding data for 1989 became available to the author only in August 1992. Although the labour force survey database does not provide longitudinal data, it is preferred to Population Census data mainly because it comprises additional information of vital importance in human capital earnings analysis not available in Finnish census data. As will become evident, the existing empirical evidence on interpersonal earnings differentials in Finland relies heavily on census data.

The next chapter gives a schematic presentation of the human capital earnings function and the major assumptions underlying the theory. Because of the vast literature on the Mincer earnings model, the theoretical framework employed in the study is presented in a concice way.

Chapter III analyses the impact of human capital as well as of other personal and job characteristics on the observed earnings dispersion among all employees in the Finnish labour market and separately for male and female employees. As emphasized above, the focus is on the magnitudes and significance levels of the estimated earnings effects of various proxy measures of human capital, primarily formal education, general and specific work experience, and participation in formal on-the-job training programmes.

Chapters IV and V deepen the analysis of Chapter III in the sense that much the same analysis is undertaken for different occupational social status categories, on the one hand, and for the private and public sectors, on the other. In particular, Chapter IV examines the importance of occupational status in explaining the observed earnings dispersion in Finland, with emphasis on displaying the role of interaction effects between human capital and occupation. The crucial question then is to what extent the estimated coefficients of the included occupation indicator variables reflect, in effect, an indirect earnings effect of formal schooling arising from the influence of especially vocational education and training on the individuals' occupational attainment. Hence, these interaction effects are of interest because they might provide useful insights about the functioning of the Finnish labour market and, especially, about the role in earnings determination of the individuals' positions in the occupational hierarchy.

Chapter V focuses on similarities and dissimilarities in the earnings structure of the private and public sectors in Finland. The private/public-sector earnings structures have, in recent years, received much attention in the international literature mainly because of the rapid increase both in employment and in relative earnings in the public sector during the past few decades. Moreover, the question has been raised whether this development has resulted in a situation where the public sector has come to compete with the private sector for educated labour for, especially, non-manual jobs by paying equally high or even higher returns on investments in human capital.

The empirical analysis presented in Chapter VI concerning human capital and industry wage differentials in Finland complements the analysis in Chapter III to the extent that the relative weight of the individuals' industry affiliation in explaining earnings differentials is examined in more detail. A high/low explanatory power of the individuals' industry affiliation relative to that of differences in the personal and job characteristics of the labour force in different industries would point to a more/less rigid earnings structure in Finland than in many other countries.

Chapters III-VII are each written as independent parts of the study. In other words, the reader need not follow the structure of the study but can jump straight to the chapter that seems to be of most interest to him or her. However, the inevitable disadvantage of this preferred approach is that the text suffers from some degree of repetition, mainly when it comes to data and model specifications.

Chapter VII examines in detail the cross-sectional micro-level data underlying the empirical analyses reported in Chapters III-VI. It also offers complementary as well as comparative empirical evidence on earnings determination in support of the definitions of variables used in the estimations and of the sorting and construction of the final estimating data. Thus the chapter will provide an answer to many of the questions concerning the underlying data that may arise while assessing the empirical evidence reported in the preceeding chapters.

Chapter VIII, finally, summarizes the empirical results reported in Chapters III-VI with emphasis on findings that hopefully will inspire further research in Finland on the important topic of human capital and earnings.

CHAPTER II

HUMAN CAPITAL EARNINGS FUNCTIONS:

A THEORETICAL FRAMEWORK

ABSTRACT:

In early studies of the marginal rate of return to education, the functional form of the statistical earnings function was commonly allowed to be dictated by available data. Using the pioneering theories of investment in education and on-the-job training postulated in the early 1960s, Mincer in 1974 launched an empirical specification of the earnings function which is now widely referred to as the standard human capital earnings function. Since there is a vast body of literature on the Mincer earnings model, this chapter gives only a schematic presentation of the function and the major assumptions underlying the theory. The organization and contents of the chapter reflect its primary purpose, namely to serve as a brief theoretical background for the empirical estimations of human capital earnings functions on Finnish Labour Force Survey data reported and discussed in Chapters III-VII of this study.

1. INTRODUCTION

The issue that has clearly dominated the human capital literature is that of earnings differentials by age and education. In fact, the prime application of the earnings function is to the study of the effects of investment in schooling and on-the-job training on the level, pattern, and interpersonal distribution of life cycle earnings originating in the pioneering work on human capital by Becker (1964,1967,1975), Becker & Chiswick (1966), Ben-Porath (1967), and, especially, by Mincer (1958,1962,1974).[1]

The basic assumption underlying the human capital methodology is that any increase in educational attainment, i.e. accumulation of human capital[2], creates human capabilities and therefore causes an increase in labour productivity. In particular, education and training are described as investment or production processes that turn unskilled into skilled labour.[3] And with greater knowledge individuals are assumed to be able to act more efficiently in different circumstances including those at work, that is they will be more productive.

This accumulation of human capital is thought to be fully reflected in the market wage received by the worker, which is assumed always to equal the value of the worker's current marginal productivity. The belief underlying the human capital view thus is that the labour market for educated workers operates in accord with the precepts of competitive economic analysis. Accordingly, persons with identical human resources are assumed to be equally paid. Likewise, the allocation of labour is assumed to be determined by the market wages of the different educational categories, and the adjustments on the labour market are supposed to take place solely through changes in wage levels. A further implication is that the individuals make all their decisions - including their educational choices -under full information. In other words, education does not provide individuals with more information, it merely improves their human capabilities.

But the human capital view has also been subject to a variety of criticisms. The sceptics most frequently argue that earnings differentials overstate the relative productivity of workers who differ in education. Indeed, the rather extreme screening or filter hypothesis completely disregards the productive value of education. Instead it is argued that the main (only) role of education is to provide information about the individuals' innate abilities by distilling the talented upwards in the society and to award them a quality label, the diploma. This information is, in turn, used by employers in their hiring policies.

Less extreme in its critique is the sorting hypothesis, the essense of which is that the effect of education on earnings consists of both productivity and signalling components. Hence, according to the sorting argument education both provides information about workers' abilities and affects these abilities. In other words, since individuals are assumed not to have perfect knowledge of their ability, education informs not only the employers but also the individuals themselves about their actual capabilities.[4]

There is, however, a profound difference between the human capital and sorting theories in the view of the productivity fostering role of education. More precisely, the sorting theory states that the marginal productivity of a worker is linked to the occupation and not to the worker as in the human capital theory; that is, the skill structure of the work force has to be adjusted to fit the (given) job structure, and not vice versa as in the human capital theory. As a consequence, earnings differentials between individuals with identical capabilities may arise from differences in occupational status, leading to differences in productivity and, therefore, in pay.

A further implication of the assumption that productivity and earnings levels are linked to the occupation and not to the worker is that educational categories are ranked differently for different occupations; i.e., a high level of education is no self-evident key to any occupation as in the human capital theory. This ranking may change, however, if the relative supply of educational categories changes. And since workers compete for jobs mainly with their relative productive characteristics and not with the wage level as in the human capital theory, they have reason to improve their capabilities continually through on-the-job training.

In other words, the sorting theory posits that formal schooling and various background variables are the spring-board to employment, and that productive qualifications necessary for a continued career can be achieved only in the labour market through experience and training. This interpretation of on-the-job training is to be compared with the human capital view, according to which on-the-job training gives rise to both general and specific human capital. General human capital is thereby thought to be identical with the homogeneous human capital accumulated by investing in formal education, i.e. it increases the overall productivity of the employee. Specific human capital, on the other hand, is seen to be productive only in that particular firm in which it is created and is therefore lost when moving to another firm.[5]

Ideally, the direction of causation between investment in human capital and worker productivity would be determined by empirical tests. Given the experimental data, the determination of which model is correct is perfectly straightforward. Such data are not available, however. The consequent difficulty in developing clearcut tests of signalling/screening versus human capital interpretations of human investment therefore partly explains why the empirical literature on this issue is neither extensive nor very convincing. Willis (1986), for instance, argues that so far the main empirical tactic of any promise in this field rests on an attempt to classify occupations in terms of an a priori view about the degree to which individual-level productivity in those occupations is observable.

The general conclusion that can be drawn is that neither the studies focusing on the direct productivity nor those focusing on signalling/screening have yielded definitive empirical results. Education does have a positive impact on productivity but it is less obvious whether its impact is close to the wage differential between workers who differ in education. Nor can the existence of screening effects be ruled out. On the contrary, in a recent Swedish study it is concluded that although there is no obvious way to differentiate empirically between the different hypotheses, some degree of screening is undoubtedly present especially in higher education (Bornmalm-Jardelöw, 1988).

Nevertheless Freeman (1986), for example, concludes that since no empirical study has found the signalling/screening effects to be a major factor in the demand for education, the findings can be seen to support the human capital view. Similar thoughts are expressed by Willis (1986), who doubts "that the signalling hypothesis will receive a convincing test against the conventional human capital theory because of the inherent identification problem" (p. 598).

The rest of this chapter focuses almost entirely on the human capital theory of wage determination. The standard human capital earnings function is outlined in Section 2. However, since there is an extensive body of literature on the Mincer earnings model, the derviation of the function is presented only schematically and only some major assumptions underlying the theory are pointed to. In Section 3, the earnings function is extended to include investment in specific human capital as measured by seniority (tenure). Alternative theoretical explanations of the earnings-seniority relation are also briefly discussed. The organization and contents of the chapter reflect its primary purpose, namely to serve as a theoretical background for the estimations of human capital earnings functions on Finnish Labour Force Survey data for 1987 reported in Chapters III-VII of this study.

2. THE STANDARD HUMAN CAPITAL EARNINGS FUNCTION [6]

In early studies of the marginal internal rate of return to education, the functional form of the statistical earnings function was commonly allowed to be unrestrictedly dictated by available data. In fact, when micro-level data were used, the regression specification chosen was simply that which best fitted the data.

Using the theories of investment in education and on-the-job training pioneered by Becker (1964) and Mincer (1958,1962) in an attempt to restrict the functional form of the human capital earnings function, Mincer in 1974 launched an empirical specification of the earnings function which was also intended as an approximation to the mostly unknown, precise functional form for the life cycle earnings path implied by optimal human capital investment models initiated by Ben-Porath (1967).[7] The Mincer earnings model is based, however, on rather strong assumptions, the most decisive of which are briefly commented upon in the following derivation of the now standard specification of human capital earnings functions.[8]

To begin with, Mincer makes the simplifying theoretical assumption that the employees acquire solely homogeneous human capital through their investments in education and on-the-job training. In other words, an employee having acquired a given amount of skills is assumed to be equally productive as any employee holding the same stock of human capital, i.e., their stocks of accumulated human capital consist of an equal number of homogeneous efficiency units of labour.[9] All employees can consistently be regarded as perfect substitutes in production at rates proportional to their endowment of efficiency units. The assumption implies that the acquired human capital as well as any increase in it will influence the employee's productivity by the same amount irrespective of the type of work done or the employer for whom it is done.

Following Becker's (1962,1964) pioneering distinction between general and firm-specific skills[10], this assumption abstracting from occupational skills has two interdependent implications when, as in the human capital theory, the labour market is assumed to be characterized by perfect competition. First, the employee will have to pay all the costs of his/her training. If the firm is to finance the training, the employee has to accept that his/her wage is reduced below his/her marginal product during the training period. The firm thus implicitly charges the employee for the costs of the training, and the employee is willing to pay that price, because the increase in his/her stock of human capital following from the investment will increase his/her productivity and therefore also future earnings. Secondly, the competitive labour market guarantees that the employee alone receives the returns from his/her accumulated investment in training. If the firm tried to capture some of the returns from the employee's training investment, there is always another firm willing to hire the employee at a wage which reflects the full value of his/her stock of homogeneous human capital.

For simplicity Mincer further treats the rate of return to investment in human capital as a constant for the individual, implying that a change in the individual's investments does not affect his/her marginal and thus also not his/her average rate of return. Put differently, any additional investment in human capital is seen to have the same proportional effect on the individual's earnings at all experience levels. Graphically, the profiles of log earnings against experience are taken to be approximately vertically parallel for all schooling groups. This assumed independence between schooling and experience allows the human capital earnings function to be written in the weakly separable form.[11]

Mincer then combines this key assumption of a constant individual-specific rate of return with an assumption about the time path of human capital investment over the individual's life cycle similar to that in models of optimal human capital accumulation. These optimization models commonly assume, however, that faced with a given market rate of interest, the individual will choose to invest in schooling and post-school training so as to maximize the present value of lifetime earnings. Mincer, on the other hand, treats the individual's investment in human capital as determined exogenously, an approach which Willis (1986) argues to be definitely inconsistent with the above-mentioned maximization hypothesis.[12]

Specifically, Mincer assumes that the individual begins with an exogenously given stock of human capital at the age of school entry.[13] Let HC(0) denote the initial human capital embodied in the individual when entering school. Schooling is regarded as a full-time activity - i.e., the individual devotes all of his/her time and capacity to investment in education, the reasoning being that, because of the high rate of return and the long payoff period, it pays for the individual to specialize completely in accumulating human capital. For each year of schooling the individual reaps a constant rate of return (r).[14] When this i^{th} individual leaves school after S years of schooling, his/her earnings capacity will amount to[15]

(1) $$HC(S) = HC(0)\, e^{rS}$$

assuming that potential earnings forgone are the only costs (i.e. the assumed value) of education to the individual.[16] This simplifying assumption, commonly dictated by a lack of data on individual schooling costs, goes in fact back to the early studies of the internal rate of return to education in the 1960s.

Given that the individual makes no further investment in human capital after leaving school, his/her earnings capacity will equal actual (net) earnings, i.e. HC(S) = EARN(S). In other words, disregarding the potential presence of human capital depreciation and the possibility of costless learning, the individual's life cycle earnings profile will be horizontal at a value of EARN(S). Taking natural logarithms of eq. (1) gives the log-linear schooling-earnings relationship often referred to as the Mincer schooling model

(2) $$lnEARN(S) = lnHC(0) + rS\ .$$

A definitely more realistic assumption about the individual's post-school investment behaviour, however, would be to presume that the individual continues to invest in human capital after having completed school. In other words, when entering the labour force the individual will most probably allocate his/her earnings capacity between further investment in human capital, i.e. on-the-job training, and earning. Suppose that in the first year of work experience, the individual devotes a fraction of I(0) of his/her earnings capacity to training investment, leaving only 1 - I(0) for work. Assuming for the moment that the rate of return to post-school investment is the same as that to schooling, the immediate growth in the individual's earnings capacity due to this investment would be rI(0). With equal amounts of on-the-job investment in each year, the individual's potential earnings after EXP years of work experience since the completion of school would amount to

$$(3) \qquad HC(EXP) = HC(S) + \sum_{t=1}^{EXP} rI(t)$$

and, when translated into continuous time, to

$$(4) \qquad HC(EXP) = HC(S)\, e^{\int_0^{EXP} rI(t)dt} .$$

It seems unlikely, though, that the individual continues to invest the same fraction of his/her earnings capacity in human capital throughout the working lifetime, the main reason being that human capital investments undertaken later in life have a shorter payoff period. Hence, if the individual can be assumed to choose to invest in human capital so as to maximize the present value of lifetime earnings, then there is most certainly a tendency for the amount of investment to decline over time. Indeed, the wealth maximization hypothesis posits that the use of work time for human capital accumulation towards the end of working life cannot be regarded as an investment but is rather showing that the employee enjoys studying, i.e. treats education as a consumption good.

In particular, Mincer assumes that the amount invested in post-school training tends to decline linearly over the individual's working life from the initial value of I(0) at the beginning of the work career to a value of zero at the end of the career[17], i.e. at retirement. Accordingly, instead of treating the time path of post-school investment as a constant as in eqs. (3) and (4), it is written in the linear form

(5) $$I(EXP) = I(0) - \frac{I(0)}{y} EXP ,$$

where y is the length of the individual's working lifetime. For simplicity, y is not related to the individual's years of education. The shrinking fraction of earnings capacity invested in human capital is reflected in a slower growth in the individual's human capital stock and thereby also in a slower rate of growth of potential earnings. Specifically, rewriting eq. (4) using eq. (5) yields

(6) $$HC(EXP) = HC(S)\, e^{r\int_0^{EXP} [I(0) - (\frac{I(0)}{y})\, t] dt} ,$$

which after integration gives

(7) $$HC(EXP) = HC(S)\, e^{rI(0)EXP - \frac{rI(0)}{2y} EXP^2} .$$

Subtracting the costs of human investment, i.e. the fraction of potential earnings forgone, C(EXP) = I(EXP)HC(EXP), from the individual's earnings capacity as defined in eq. (7) gives his/her actual disposable earnings after a total of EXP years of labour force experience

(8) $$EARN(EXP) = HC(EXP) - C(EXP) = [1 - I(EXP)]HC(EXP) .$$

Inserting eqs. (1) and (7) into eq. (8) and taking natural logarithms yields

(9) $$lnEARN(EXP) = ln[1 - I(EXP)] + lnHC(0) + rS$$
$$+ rI(0)EXP - \frac{rI(0)}{2y} EXP^2 .$$

Alternatively, if the individual's rate of return parameter on schooling investments, r_S, is allowed to differ from the corresponding parameter on post-school investments, r_{EXP}, then eq. (9) may be written in the form

(9') $$lnEARN(EXP) = ln[1 - I(EXP)] + lnHC(0) + r_s S$$

$$+ r_{EXP}I(0)EXP - \frac{r_{EXP}I(0)}{2y} EXP^2 .$$

When the first term on the right-hand side of eq. (9) is further approximated by a second-order Taylor expansion, i.e. by

$$(10) \qquad ln[1 - I(EXP)] \approx -I(EXP) - \frac{I(EXP)^2}{2}$$

the earnings function, with the indicies referring to the i^{th} individual still suppressed, may be written as

$$(11) \qquad lnEARN(EXP) = lnHC(0) + rS - I(0) - \frac{I(0)^2}{2}$$

$$+ [rI(0) + \delta + I(0)\delta]EXP - \frac{(r\delta + \delta^2)}{2} EXP^2 ,$$

where $\delta = I(0)/y$, that is, the rate at which the post-school investment ratio is supposed to decline over the individual's working career.[18]

Also in eq. (11), a distinction between the rate of return to schooling and the rate of return with respect to on-the-job training similar to that in eq. (9') above can be undertaken. This will not, however, provide a direct estimate of r_{EXP}. Instead, if some kind of estimate of the average rate of return to a year of work experience is to be obtained using that approach, specific assumptions need to be made about the time path of post-school investment in eq. (5).[19] The estimate of r_{EXP} obtained in this manner may, as a consequence, be incorrect. But the estimate is to be interpreted with caution not only because it can be criticized for being based on more or less uncertain assumptions. More important, as pointed out earlier, the standard human capital earnings function disregards the possibility of a relationship between schooling and the amount and rate of return vis-à-vis on-the-job training. Below a less restrictive approach to estimating the rate of return to post-school investment is briefly discussed.

The widely-used econometric approximation of the life cycle earnings profile of the i^{th} individual portrayed in eq. (11) implies the following relationship between the natural logarithm of earnings and the human capital productivity proxies of years of schooling and years of labour force experience:[20]

$$(12) \qquad lnEARN_i = \alpha_0 + \alpha_1 S_i + \alpha_2 EXP_i + \alpha_3 EXP_i^2 + \varepsilon_i \qquad i = 1,\ldots,N$$

where the schooling coefficient (α_1) provides a direct estimate of the average level of the internal rate of return to education in a population of N individuals. In this particular regression specification, the marginal rate of return to schooling is assumed to be constant: each additional year of schooling is assumed to yield the same pecuniary return. The quadratic experience term is included to capture the concavity of observed experience-earnings profiles, implying that a priori $\alpha_2 > 0$ and $\alpha_3 < 0$.

Lack of data on the actual work experience of each employee forced Mincer, however, to use a proxy for experience calculated by transforming the employees' age into the potential length of their total work experience ($EXP^{pot.}$):

$$(13) \qquad EXP_i \approx EXP_i^{pot.} = AGE_i - S_i - PRES\ ,$$

where the years of schooling are assumed to begin at the age when school starts, PRES (typically at age 6, in Finland at age 7). The proxy in eq. (13) is based on the assumption that the individual enters the labour force immediately after having completed schooling (at age S + PRES) and is continuously employed. Hence, if either condition is not fulfilled, the transformation formulae will overestimate the individual's true labour market experience.

The Mincer earnings function has been used in a vast number of studies of educational wage differentials and the life cycle pattern of earnings. The strength of the function is reflected, inter alia, by the fact that virtually all these studies reveal important empirical regularities in educational earnings differentials and the life cycle pattern of earnings despite the considerable differences between the societies investigated and the various time periods concerned. But simultaneously it is quite remarkable that the Mincer earnings function works so well, considering the rather strong assumptions on which the theoretical framework is based.

Furthermore, comparison of eqs. (11) and (12) reveals an important shortcoming of the empirical model specification: it treats the rate of return to human capital, r, the individual's initial earnings capacity, HC(0), the fraction of capacity invested in post-school human capital, I(0), and thus also δ as unobservable individual-specific constants. Put differently, the earnings function in eq. (12) is written as if everyone had the same values of these parameters. Hence, to the extent that the parameters differ across individuals because of differences in ability or family background (or any other unobservable variable affecting human capital investment behaviour), the effects are captured by the error term, ε.

The omission of interpersonal ability differences thus indicates a possibility that the standard human capital earnings function does not measure correctly the opportunity set faced by the individual. If ability differences are likely to influence the marginal internal rate of return to human investment, then also the choice of schooling will vary across individuals; individuals with high ability will on average choose higher levels of schooling because of their larger capacity to translate investments in human capital into higher productivity compared with low-ability individuals. In that case, the residual (ε) will be positively correlated with the schooling variable (S), and the estimated rate of return to education will, as a consequence, be upward biased. Put differently, the estimated earnings function will be subject to an ability bias caused by self-selection, which overstates the incremental earnings an individual of certain ability would gain through additional investment in schooling.[21]

Also family background factors have frequently been regarded as important determinants of the distribution of investments in education across individuals. But it has also been hypothesized that where there is widespread public subsidisation of education evening up the educational opportunities of children from different home environments, family background should not have much impact on educational decisions. The logic then is that with equal educational opportunities, observed differences in education are due only to differences in the demand for education, which may in turn be explained by varying ability.[22] All in all, adjustment for this potential selectivity bias problem requires that the individuals' educational choices can be determined endogenously, that is, on the basis of expected income and other relevant explanatory factors (e.g. Maddala, 1983). Because of a lack of appropriate data, this approach is fairly rare in empirical work.[23]

But in contrast to what would be expected from the theoretical arguments given above, empirical evidence clearly indicates that simple human capital earnings functions allowing only for exogenously given investment in human capital, thus omitting ability and family background factors and the consequent selectivity bias problem, do contribute to the explanation of interpersonal earnings variance. Indeed, average rates of return to education adjusted for ability, either by including explicit measures of ability in the earnings function or by estimating the return to schooling from data on twins or siblings, have been found to largely fall within the same range (some 5 to 10 per cent) as unadjusted rates of return. In fact, it has been argued that allowance for ability can be expected to reduce the rate of return by at most 50 per cent.[24] Based on this evidence, Siebert (1990) concludes that "the main role of ability is in determining the acquisition of education, not in influencing the rate of return to education once it has been acquired" (p. 35).

In a newer approach, attempts are made to create instruments for schooling that are uncorrelated with ability. Studies using this approach report no omitted-ability bias in the estimated return to schooling, or a downward rather than an upward bias in the estimates (e.g. Angrist & Krueger (1991,1992) and Angrist & Newey (1991)). These mixed results have prompted a reexamination of evidence, which emphasizes the potential bias arising from measurement error in schooling. Thus Ashenfelter & Krueger (1992) find, when adjusting for both omitted-ability bias and measurement error in schooling, that the OLS return to schooling is actually biased downward, rather than upward. In contrast, Blackburn & Neumark (1993), when considering the same sources of bias, conclude that "our results show that one can address issues of omitted-ability bias, measurement-error bias, and endogeneity bias, and still conclude that OLS estimation ignoring unobserved ability overstates the economic return to schooling" (p. 23). The controversy of this debate on omitted-ability bias may finally be illustrated by a recent statement made by Rosen (1992): "As an empirical matter, 'ability bias' is small" (p. 160).

Likewise, home environment has also not been found to have a decisive influence on individuals' earnings after school (see e.g. Siebert, 1990). Results reported by Bishop (1991) point in the same direction. His findings indicate that the genetic inheritance approximated by various family background variables has no direct effect on earnings.

A further question closely related to ability is whether it is reasonable to assume, as in the Mincer earnings function, that the rate of return to post-school investment is independent of the rate of return to schooling. Suppose that individuals with more education gain more from post-school investment than less educated individuals, i.e. they have a higher rate of return on their on-the-job investments. This would occur if ability were positively correlated with education so that individuals on a higher educational attainment level learned more quickly also on the job. In fact, empirical evidence does seem to indicate that post-school returns tend to increase with schooling (e.g. Psacharopoulos & Layard, 1979).

In that case, forcing the regression to have exactly the same profile with respect to post-school investment for all schooling groups, except for a vertical shift, would give an incorrect estimate of the returns to on-the-job investment and an overestimation of the returns to schooling. One simple way of approaching this problem would be to allow post-school investment to depend on schooling by supplementing the standard human capital earnings function with an interaction term, $S \cdot EXP$.

Psacharopoulos & Layard (1979), for example, augment the Mincer earnings function with a whole set of interaction terms: $S \cdot EXP$, $S^2 \cdot EXP$, $S \cdot EXP^2$, $S^2 \cdot EXP^2$. Using this framework they were able to compute the average rate of return to training investment and simultaneously check if the rate of return to education does equal the rate of return to post-school investment. McNabb & Richardson (1989), however, criticize this approach for imposing an arbitrary structure on the nature of the interaction between levels of schooling and rates of return to experience, and for making the interpretation of the estimated returns to schooling and experience difficult. A superior approach, they argue, would be to estimate the earnings effects of experience for different schooling groups, on the one hand, and the returns to schooling for different levels of experience, on the other.

The human capital theory further disregards any risk associated with investment in human capital. In reality, however, uncertainty arises for a variety of reasons, such as uncertainty about the length of life, the market conditions that will prevail and the actual returns that will be received during the individual's lifetime. Low & Ormiston (1990), for example, show using U.S. data that failure to account for risk consideration produces biased estimates of the rate of return to education. In particular, they find that "when both risk and risk aversion are taken into account, the rate of return to schooling is up to 90 percent lower than traditional estimates" (p. 1125).[25] This research approach is, however, only in its infancy, for which reason existing empirical evidence should be interpreted with great caution.

Before turning to the next section it might be appropriate to point to some further aspects not yet discussed, which may also give rise to difficulties when interpreting estimated rates of return to schooling. First, the above analysis is made only in pecuniary terms, thereby omitting the eventual impact of the non-pecuniary benefits and disbenefits associated with different jobs. This may bias the obtained estimates of the rate of return to education. Specifically, the average returns will be underestimated if there are compensatory payments for working conditions but no allowance made in the regression for such compensating differentials. Although the available data rarely allow such aspects to be taken into account, there is convincing evidence on the existence of differentials both as regards physical working conditions and with respect to fringe benefits.[26]

In addition to this, there is the question of the difference between the rate of return to investment in education reaped by the individual and the rate of return received by the society from that very same investment. Social returns will differ from private returns if there are differences between the private and social costs of schooling due to public subsidisation of education and/or between the private and social benefits of schooling because of the taxation of earnings. Generally when calculating the private rate of return, earnings are net of taxes and, because of public subsidies of direct schooling costs, forgone earnings are the only costs of education individuals are seen to incur.[27] In contrast, social rates of return include all direct costs of schooling and use before-tax earnings.

But in comparing estimated private and social rates of return to education for different countries, Psacharopoulus (1981) found that the impact of the tax system is generally more or less negligible; the estimated tax rates tend to be approximately proportional. Instead, most of the difference between the two rates of return could be ascribed to the direct costs of schooling. This implies that by computing social rates of return to education the analysis can be extended to issues raised by public subsidisation of education in general and to the correct amount and composition of the subsidy in particular.

Only by making the simplifying assumptions that (1) forgone earnings are the only costs of schooling, (2) the individual enters the labour force immediately after completing school at age PRES + S, and (3) the individual's years of schooling do not influence his/her working life of y years, can the obtained estimates be taken to reflect both the private and the social rates of return to schooling. As indicated above, these assumptions, among others, play a crucial role in deriving the standard human capital earnings function. Moreover, the use of these conventional assumptions is still today commonly dictated by the limitations set by available micro-level databases.

Finally, it may be noted that since the human capital model treats the costs of forgone earnings as an investment, the estimates of the private rate of return to education can be broadly compared with the rates of return on comparably risky physical investments (as well as with the market interest rate). But in comparing rates of return to schooling with returns on equally risky physical capital due allowance should be made for the fact that, as pointed out earlier, the estimated returns to formal education may be subject to various biases.[28] Therefore, estimates slightly exceeding or falling short of this comparison standard are generally to be regarded as being of a plausible order of magnitude and thus to corroborate the model. If, on the other hand, the estimated rates turn out to be much lower than the returns on physical capital, there is likely to be a tendency to overinvest in education. This may be due in part to consumption aspects and in part to screening effects involved in the individuals' educational decisions.

3. THE SEGMENTED HUMAN CAPITAL EARNINGS FUNCTION

As pointed out earlier, one of the key assumptions underlying the Mincer human capital earnings function is the employees' acquisition of solely general human capital. And since any general capital will by definition raise the potential productivity of workers to the same extent in all firms, including the firm providing it, the acquired skills will be fully transferable across jobs. In a labour market characterized by perfect competition, the workers will, as a consequence, both pay the costs and reap the returns from the investment. A further implication is that there is no reason for the workers to change their investment behaviour when moving to another job.

In contrast, specific human capital raises the worker's potential productivity only within the firm providing the training. Hence, in contrast to the general human capital approach, the individual's decisions on post-school investment and thus his/her life cycle earnings will be influenced also by the conditions within the given firm. This joint dependency of the productivity of specific capital on both the worker and the firm implies that the two agents should agree on sharing costs as well as returns so that each would suffer a loss if the employment relationship ended. However, as pointed out by Willis (1986), "Becker was unable to provide a theory of the factors that determine the worker's and the firm's shares...[and thus]...to derive the implications for the life cycle pattern of worker earnings" (p. 594).

Therefore, a widely-used approach within the general human capital framework for empirically assessing the influence on earnings growth of investment in specific capital has been to simply introduce into the standard human capital earnings function the employee's length of employment with the current employer, i.e. his/her seniority (tenure). In other words, the years of experience with the same employer are assumed to reflect the specific human capital acquired by the employee.

This simple way of extending the standard human capital earnings function to include also specific capital tells little, however, about the work history of the individual. In particular, Holmlund (1984), among others, emphasizes that since firm-specific training is by definition non-transferable, it may be expected that the returns to on-the-job training outside the current job are lower than to human investment undertaken at the current job. Discontinuities in the employee's life cycle earnings due to job switches are therefore most likely to occur.

Moreover, it has been suggested that, because of individual optimizing decisions, the amount the individual is willing to invest in (specific) human capital at each job will depend on the expected duration of the job (Borjas, 1981). Specifically, given that the job offers suitable training opportunities, the individual will carry out his/her investment plans only when the job is considered to be of a certain duration. Even older employees could therefore be expected to invest in human capital if they have recently changed jobs. Hence, the individual's investment activities need not necessarily decline monotonically over the life cycle, as assumed in the Mincer earnings function. Instead, the typical employee's human investment path can be assumed to have a saw-tooth pattern; the individual's accumulation of specific capital declines as the expected remaining time at the job approaches zero, but moves upwards when the individual takes on a new job. The amount of the jump is, in turn, most likely related to the expected duration of the new job. With increasing age, however, job shifts tend to become less frequent and the expected remaining time at the job shorter. Siebert (1990) therefore argues that the investment behaviour of the employee may nonetheless have a declining age profile.

In the following, the standard human capital earnings function is modified to take account of these kinds of arguments. More exactly, both specific training and job mobility effects are introduced into the earnings function by incorporating the work history of the individual into the equation. But instead of supposing that the individual's career comprises a total of j jobs, the earnings function that is to be derived makes a distinction between two segments only: one corresponding to current job experience and the other to all previous job experience. The restriction of the model to two segments only is dictated by the labour force survey data employed in the subsequent empirical analyses; the data set merely provides information on total years of work experience and years of experience with the current employer.

Following Holmlund (1984), the expression for the individual's earnings capacity in eq. (4) above may now be written

$$(14) \qquad HC(EXP) = HC(S)\; e^{r_C \int_0^{SEN} I_C(t)dt + r_P \int_0^{PREEXP} I_P(t)dt},$$

where I_C and I_P reflect the fractions of the employee's earnings capacity invested in human capital in the current job (SEN) and prior to the current job (PREEXP = EXP - SEN), respectively. The rates of return corresponding to these investment ratios are given by r_C and r_P.

Eq. (14) thus offers a possibility to determine to what extent the individual's earnings capacity depends on the amount of and the returns to human capital accumulated within the current job, on the one hand, and prior to the current job, on the other. As before, it is assumed that there is a tendency of the initial amount of post-school investment, I(0), to decline linearly over time.

This assumption is thought to hold not only over the life cycle but also within jobs. Specifically, this means that

$$(15)\qquad I_P = I_P(0) - \frac{I_P(0)}{y} PREEXP = I_P(0) - \delta_P PREEXP$$

$$(16)\qquad I_C = I_C(0) - \frac{I_C(0)}{y} SEN = I_C(0) - \delta_C SEN\,,$$

where the initial post-school investment ratio at the current job, $I_C(0)$, is seen to be a decreasing function of work experience acquired prior to this job, i.e.

$$(17)\qquad I_C(0) = \sigma - \varphi PREEXP\,.$$

The definition of $I_C(0)$ in terms of previous work experience implies an investment behaviour consistent with optimal human capital models. In particular, eq. (17) indicates that for persons with continuous labour market participation, initial human investment ratios are lower for jobs started at higher ages. Moreover, by using the definition in eq. (17) no assumptions are needed about the actual investment opportunities associated with each job. If investment opportunities vary across jobs, the employee can still obtain the desired initial investment ratio by simply choosing that job which offers the most suitable training characteristics.

Inserting eqs. (15)-(17) into eq. (14) gives

$$(18)\qquad HC(EXP) = HC(S)\, e^{r_C \int_0^{SEN} (\sigma - \varphi PREEXP - \delta_C t)dt \,+\, r_P \int_0^{PREEXP} (I_P(0) - \delta_P t)dt}\,,$$

which after integration takes the form

$$(19)\qquad HC(EXP) =$$

$$HC(S)\, e^{r_C \sigma SEN - r_C \varphi PREEXP \cdot SEN - \frac{r_C \delta_C}{2} SEN^2 + r_P I_P(0) PREEXP - \frac{r_P \delta_P}{2} PREEXP^2}\,.$$

The employee's actual earnings are obtained after subtracting the costs of post-school investments at the current job, i.e.

$$(20) \qquad EARN(EXP) = (1 - I_C)HC(EXP)\,.$$

Inserting eqs. (1) and (19) into eq. (20) and taking natural logarithms yields

$$(21) \qquad lnEARN(EXP) = ln(1 - I_C) + lnHC(0) + rS + r_C\sigma SEN$$

$$- \frac{r_C\delta_C}{2} SEN^2 + r_P I_P(0)PREEXP$$

$$- \frac{r_P\delta_P}{2} PREEXP^2 + r_C\varphi PREEXP \cdot SEN\,.$$

When further using a second-order Taylor expansion to approximate $\ln(1 - I_C)$[29], we arrive at

$$(22) \qquad lnEARN = lnHC(0) + rS - \sigma - \frac{\sigma^2}{2} + (r_C\sigma + \delta_{cC+}\,\sigma\delta_C)SEN$$

$$- \frac{(r_C\delta_C + \delta_C^2)}{2} SEN^2 + (r_P I_P(0) + \varphi + \sigma\varphi)PREEXP$$

$$- \frac{(r_P\delta_P + \varphi^2)}{2} PREEXP^2 - (r_C\varphi + \varphi\delta_C)PREEXP \cdot SEN\,.$$

It is evident from eq. (22) that estimates of this segmented human capital earnings function will not allow the rates of return and investment ratios with respect to the individual's work history to be readily identifiable. Some interesting tests may nevertheless be undertaken. Thus, in deriving eq. (22) it was assumed, inter alia, that the initial investment ratio at the current job is a decreasing function of experience acquired via previous jobs. If such a relationship does not exist, i.e. $\varphi = 0$, then the coefficient of the interaction term, PREEXP·SEN, will not be significantly different from zero.

Holmlund (1984) also points to the possibility of testing whether the rate of return to human investment as regards the current job really exceeds the rate of return received in previous jobs. However, in order to test this hypothesis it has to be further assumed that job mobility does not influence the individual's investment behaviour. In other words, we are forced to reintroduce the simplifying assumption of eq. (7) used in deriving the standard human capital earnings function.[30] In that case, eq. (22) is modified to the form

$$(23) \qquad lnEARN(EXP) = lnHC(0) + rS - I(0) - \frac{I(0)^2}{2}$$

$$+ (r_C I(0) + \delta + I(0)\delta)SEN - \frac{(r_C\delta + \delta^2)}{2} SEN^2$$

$$+ (r_P I(0) + \delta + I(0)\delta)PREEXP - \frac{(r_P\delta + \delta^2)}{2} PREEXP^2$$

$$- (r_C\delta + \delta^2)PREEXP \cdot SEN \,.$$

From eq. (23) it is obvious that the hypothesis $r_C > r_P$ is supported if the coefficient on seniority exceeds the coefficient on previous work experience and if the absolute value of the coefficient on seniority squared exceeds the absolute value of the coefficient on previous experience squared.

Thus, in analysing earnings differentials not only total work experience but also seniority and, when possible, the number of job moves should be incorporated in the regression function. From the above it is apparent that the omission of specific human investments may bias the estimates of the return to general post-school investment. The direction of this bias may, however, differ between younger and older workers (Siebert, 1990). In particular, for old workers longer seniority is likely to imply more accumulated human capital and higher earnings for given levels of experience as compared to job movers of the same age. This would result in an overestimation of the return to experience for old workers. Among young workers, on the other hand, the more able tend to shift jobs more frequently (job shopping) than their less able counterparts. Given such ability effects, the return to experience would be downward biased.

If some kind of information on job moves is available, the effect of labour turnover can be captured by simply adding a job mobility variable to eq. (23). In the two segment case, for example, the occurrence of labour mobility could be approximated by means of a dummy variable taking a value of one if the total years in the labour market exceed the years with the present employer (EXP > SEN), and a value of zero otherwise.

A strong, positive effect of job seniority accumulation on earnings growth has been reported in empirical studies by, among others, Bartel & Borjas (1981), Borjas (1981), Mincer & Jovanovic (1981), Mincer (1986, 1988, 1989), and Mincer & Higuchi (1988). Moreover, these empirical results are seen to clearly support the human capital interpretation that a longer spell of employment at the same employer or firm results in more accumulated specific skills and thus in higher productivity and earnings.

There are, however, also more recent, competing theories of compensation and productivity offering alternative explanations for the strong, positive link between job seniority and earnings growth observed in empirical analyses based on survey data. A common feature of these theories is that firms use a strong seniority-earnings profile to affect the behaviour of workers.[31] But it has also been argued that the estimated effect of seniority on earnings and labour turnover is the result of inconsistent estimates produced by unobserved heterogeneity across individuals and job matches. More precisely, since job duration is a strong negative function of past quits and layoffs, longer tenure is likely to be positively correlated with characteristics of individuals and jobs which explain fewer quits and layoffs. These same characteristics are taken to be positively associated with employee productivity and thus with earnings.

Hence, long spells of job seniority and high earnings levels may be associated with one another even if earnings do not increase with time employed at the same employer; higher productivity and earnings are simply the result of a good job match.[32] In that case, omission of individual and job heterogeneity in the empirical estimation of earnings functions will produce a disturbance term which partly reflects job-match quality and therefore is positively correlated with seniority. The estimated earnings effect of seniority will, as a consequence, be positive but upward-biased.

Recently, several studies have been concerned with consistent estimation of the effect of seniority (tenure) on earnings in the presence of job matching. Topel (1986), Abraham & Farber (1987), Altonji & Shakotko (1987), Marshall & Zarkin (1987), Mortensen (1988), and Ruhm (1990), among others, all find a strong inverse relationship between earnings and job turnover rates and, consequently, a small earnings effect as regards job seniority. In other words, most of the acquired skills are interpreted as general and thus fully transferable across jobs, implying low turnover and unemployment costs for employees. If this evidence is correct, it will without doubt have far-reaching implications for the theoretical work in the employment relationship literature as well as for labour market policies.

But recent empirical studies, even when based on the same data set, also provide strong evidence in support of the hypothesis that specific capital accumulation is an important ingredient of employment relationships. In particular, the findings of Garen (1989) imply correlation between seniority and the disturbance term consistent with the job-matching model. But contrary to the job-match hypothesis, the estimates obtained by Garen indicate that the earnings effect of seniority is understated if the heterogeneity bias problem is overlooked in the estimations. Garen consistently concludes that the observed inverse correlation between the residual term and seniority is evidently not explained by the matching model. Instead, the results are seen to be more supportive of models suggested by Lazear (1986) and Topel (1986). Similar conclusions are drawn for West Germany by Schmidt & Zimmermann (1991).

A substantial earnings effect of seniority not explained by either heterogeneity across individuals or across jobs is also reported by Topel (1991). He argues that by disregarding job quality, the estimated effects of seniority will be understated and not overstated as is commonly assumed in the basic theory of job search and matching. According to Topel "the overestimation argument ignores the fact that persons who change jobs gain, on average, from their move, and they are included in the data at low job tenures" (p. 151). These largely diverging findings on the effects of specific capital imply that the importance of productivity versus other factors in explaining earnings growth will remain at issue.

Footnotes:

1. In a somewhat different vein are the studies by Habrison & Meyers (1964), which initiated cross-country comparisons of education and economic well-being, and Krueger (1968).

2. The term "human capital" has come to refer to the knowledge, skills, and other physical and mental capabilities contributing to productivity that individuals have acquired by investing in education, training, health, and so on. Specifically, human resource development involves investment principally in education and training, with secondary contributions from health and labour mobility.

3. Following Miyagiwa (1989), the educational process can be represented by a production function where the total output of skills emerges from the input of the number of students and the units of educational input. Cf. also Aulin-Ahmavaara (1987,1989, 1990), who has developed a complete dynamic input- output model that along with the production of goods and services also includes the production of human capital and of different kinds of labour.

4. For a brief survey of the screening and sorting theories, see e.g. Asplund (1991) and the literature cited therein.

5. The notion of general and specific skills was introduced by Becker (1962,1964). General skills were thought to be acquired in school and could be transferred from one job to another; i.e. were useful to several firms or in several industrial sectors. Specific skills, on the other hand, were developed through on-the-job training and lost when the employee moved. To this may, however, be added that Eliasson (1988), for example, emphasizes that Becker's distinction is not consistent with the prevailing situation in modern highly specialized industrial societies. Today, the formal educational system teaches a variety of skills with extremely limited applications, whereas the job world is full of specialized skills acquired at work that can be transferred to many jobs.

6. The chapter is based mainly on the surveys of the standard human capital earnings function in Holmlund (1984), Willis (1986), and Siebert (1990).

7. In the Ben-Porath (1967) model of optimal human capital accumulation, the individual is assumed to allocate his or her time between work and education/training so as to maximize the present value of lifetime income. But the model has also been generalized to include leisure as a third activity to which time can be allocated, whereby utility rather than income is maximized (Heckman, 1976). Siebert (1990), though, argues that the two models do not, in the last resort, yield very different conclusions. For a comprehensive survey of optimal human capital investment models, see e.g. Weiss (1986).

8. For criticisms of the assumptions underlying the human capital theory, see e.g. Blaug (1976).

9. The concept of efficiency units of labour is widely used in the growth accounting framework. See e.g. the review in Asplund (1991).

10. See footnote 5 above.

11. It is, however, worth pointing out that parallel log earnings-experience profiles are a necessary but not a sufficient condition for there to be no relationship between education and post-school investments. Hence, the fact that the profiles of log earnings with respect to experience, when drawn from real-world data for different schooling groups, often turn out to be approximately parallel does not imply per se that the coefficient on schooling is an unbiased estimator of the rate of return to education (cf. Psacharopoulos & Layard, 1979).
In this context it may further be noted that for the sake that the assumption of all individuals having the same human capital investment profile would not hold, Mincer (1974) offered an alternative approach to estimating the return to education, viz. the so-called "short-cut" approximate method. In brief, the method involves the use of the conventionally-estimated rate of return to education in order to identify for each schooling group the so-called overtaking level of experience, i.e. the year when actual earnings catch up with potential earnings had no (employee-financed) training investments been undertaken. The average log earnings corresponding to the overtaking experience level are calculated, and the rate of return to each level of schooling is evaluated by simply comparing the earnings levels for consecutive schooling groups. The problem, however, is that the overtaking experience year for each schooling group cannot be computed unless also the rate of return to training investments is known. It is, therefore, assumed that the rate of return to training is the same as that to schooling. If this is not so, then the method is clearly incorrect. This is also the reason why Psacharopoulos & Layard (1979) argue that Mincer's short-cut method should be discarded.

12. Willis (1986) further argues that much of the difficulty that arises when trying to interpret the Mincer earnings function within the wealth maximization context can, in effect, be traced to one of the key assumptions underlying the model, i.e. that of homogeneous human capital. He therefore reinterprets the earnings function in terms of heterogeneous human capital, whereby the Mincer-type earnings function emerges as a special case. Drawing on the work of Willis, de Beyer & Knight (1989) derive and test a theory of occupation-specific productivity and earnings which is seen to be consistent with the competitive framework of the human capital theory. Empirical evidence on the importance of occupational status in explaining earnings dispersion in Finland are reported in Chapter IV of this study.

13. According to Leibowitz (1974,1977), the individual's initial human capital can be seen to be determined by genetic factors and nuturing.

14. In measuring schooling in years it is implicitly assumed that each year is homogeneous. Not only are interpersonal ability differences omitted, as will be discussed below. All variation in schooling quality is ignored as well. Nevertheless, empirical evidence indicates a positive correlation between education quality and earnings resulting from the fact that those with more years of schooling also tend to have high-quality years of schooling. Hence, ignoring the quality aspect will result in an overstatement of the estimated average rate of return to an additional year of education. But apparently individuals also tend to compensate less satisfactory quality of their schooling with a larger quantity of schooling, which will weaken the observed positive correlation between the quantity and quality of schooling. Indeed, this is seen to be one of the reasons why, in practice, omitting schooling quality from the estimated earnings function has been found to have a negligible effect on the estimated rate of return to schooling. See further e.g. Siebert (1990).
Rivera-Batiz (1990), however, argues that since persons with an equal number of years of education may have widely diverging skills due, for example, to differences in schooling

quality, some kind of measure of the individuals' literacy skills should be incorporated in the regression in addition to the years of schooling variable. He therefore supplements the earnings function with a literacy skills variable constructed from test-based reading proficiency scores. The coefficient on the literacy skills variable is found to clearly indicate that, given the level of education, an improvement in literacy skills would have a notable effect on earnings not least for persons on lower readings levels. This inclines Rivera-Batiz to conclude that education and reading proficiency are correlated but imperfect proxies for each other. But on the other hand, the statistical significance of his skills variable may be largely due to the investigated sample, which comprises solely adults in their early twenties.

15. For ease of exposition, the index referring to the earnings, education and work experience of the i^{th} individual considered is suppressed in the subsequent theoretical presentation of human capital earnings functions. Alternatively, the earnings function may be thought of as derived for a "representative" individual.

16. Specifically, the private internal rate of return to one year's education is assumed to be

$$r = \frac{HC(S) - H(S-1)}{HC(S-1)}$$

while the true rate of return is

$$r = \frac{[HC(S) - HC(S-1)](1-m)}{HC(S-1)(1-t) + FC - Y},$$

where m is the marginal income tax rate, t is the average income tax rate, FC is possible private direct costs of education such as tuition fees, and Y is, for instance, scholarship or part-time earnings of students. It is evident that the use of pre-tax or post-tax earnings does not affect the rate of return to education, provided that the tax system is proportional and that there are no fixed costs of schooling to the individual (these are covered by public subsidies and/or paid out of scholarship or part-time earnings). The reason why the rate of return to education will be totally unaffected by the proportional tax system is that the reduction in the opportunity cost of schooling caused by a tax increase will be offset by a simultaneous reduction in the benefits from schooling. Cf. Psacharopoulos & Layard (1979) and Willis (1986).
In sum, for the coefficient on the schooling variable to be an unbiased estimator of the average private rate of return to a year's education three assumptions would have to be fulfilled: (1) the individual faces no private direct costs of schooling, (2) there is no relationship between education and work experience, and (3) the age-experience profiles are flat. Cf. Psacharopoulos (1982).

17. Mincer (1974) also suggested other possible assumptions about the time path of employees' investments in human capital after leaving school. The alternative functional forms of the earnings function corresponding to these assumptions have, however, not been found to be preferable to the quadratic function of the standard human capital earnings function.

18. Following Mincer (1974), the expression for the individual's actual earnings in eq. (8) may alternatively be approximated by

$$(8') \qquad EARN(EXP) = HC(EXP)\,[1 - I(EXP)] \approx HC(EXP)\, e^{-I(EXP)},$$

which yields a somewhat simpler expression than that in eq. (11), viz.

$$(11') \qquad lnEARN(EXP) = lnHC(0) + rS - I(0) + \left[rI(0) + \delta + \frac{r\delta}{2}\right] EXP - \frac{r\delta}{2} EXP^2 .$$

The fundamental idea is nevertheless maintained: in both cases, the coefficients are estimated by regressing log earnings on years of schooling, experience and experience squared.

19. Siebert (1990) makes a rough estimation of the rate of return to post-school investment, r_{EXP}, by using the expression for the coefficient on EXP in eq. (11') in footnote 18. He assumes that I(0) is approximately 50 per cent (the overtaking year approximation suggested by Mincer) and that $\delta = -0.013$ (I(0) is thereby assumed to be close to zero after a working career of 40 years). The estimated coefficient on EXP is given the value 0.1, which he finds to be a reasonable average of estimates obtained in various studies. From these assumptions, Siebert calculates r_{EXP} to be about 0.23 on average, which is considerably higher than the estimated rate of return to education. To this may be added that the corresponding, slightly different expression for EXP in eq. (11) in the text yields a value of r_{EXP} equal to 0.24.

20. It may be noted that Mincer (1974) estimated and reported results also for two other specifications of the earnings function, viz.

$$(12') \qquad lnEARN_i = \alpha_0 + \alpha_2 S_i + \varepsilon_i \qquad \textit{("the schooling model")}$$

$$(12'') \qquad lnEARN_i = \alpha_0 + \alpha_1 S_i + \alpha_2 S_i^2 + \alpha_3 EXP_i + \alpha_4 EXP_i^2 + \alpha_5 S_i \cdot EXP_i + \varepsilon_i .$$

Also see e.g. Blinder (1976) for possible specifications of the human capital earnings function.

21. For a comprehensive review of the extensive literature addressing the presence of ability bias in estimating the returns to schooling, see e.g. Griliches (1977). It has also been suggested, however, that some individuals can be thought of as possessing "mechanical ability" as opposed to the "academic ability" possessed by other individuals. This mechanical ability is seen to partly explain why some individuals choose to finish their formal education early. Their earnings will, as a consequence, overstate the earnings forgone by those who continue their studies. The implication is that the estimated rate of return to schooling will be downward biased thereby counteracting the upward bias following from the omission of ability differences. Siebert (1990) notes, though, that "this is probably rather a minor point" (p. 11).

22. It may, nevertheless, be of interest to note that empirical schooling functions for the UK and US imply that parental schooling has the strongest effect on children's schooling decisions. The strong family background effect estimated for these two countries in combination with the considerable contribution of schooling to the observed earnings dispersion has resulted in much concern about so-called intergenerational transmission of inequality. See e.g. Siebert (1990) and the literature referred to.

Simple correlation tests based on Finnish Population Census data for 1985 suggest that the relation between parental and children's schooling is notable also in Finland (Kivinen & Rinne, 1991). But so far, no empirical evidence on the order of magnitude of this relationship compared with other influencing factors has been reported. Empirical results for Sweden (Björklund, 1992) based on Level of Living Survey data suggest that there is weak support for the comparative advantage hypothesis, which predicts a higher marginal rate of return to education for individuals with high-schooling family background. But the estimation results also point to a slightly lower marginal rate for those with a highly educated father, which is interpreted as supportive of the financing hypothesis.

23. A few attempts to deal with the endogeneity of education have, nevertheless, been made. In a recent study of education and earnings in the Netherlands, Oosterbeek (1990) replicates two models which treat education as an endogenously determined variable, i.e., take account of the fact that individuals do choose their optimal amount of education. In particular, Oosterbeek estimates, using Dutch data, an endogenous switching regression model applied earlier by Willis & Rosen (1979) and a selectivity model developed and estimated by Garen (1984) in which the choice variable is continuous. Oosterbeek finds no support in his data set for the earlier findings of comparative advantage in choosing to attend college (Willis & Rosen, 1979) or in choosing the amount of education (Garen, 1984). In other words, the biases from self-selectivity seem to be negligible in the Netherlands, a result which contrasts sharply with the findings for the U.S.
Apart from these two approaches, the educational choice process has also been described in terms of a Tobit model (Kenny et al., 1979) as well as a series of sequential dichotomous choices (Hartog et al., 1989). Oosterbeek argues, though, that from a theoretical point of view, the dichotomous choice model of Willis & Rosen (1979) is most attractive.

24. For more details on measured effects of ability, see e.g. the survey in Siebert (1990).

25. For a review and a further extension of the theory of human capital under uncertainty, see e.g. Snow & Warren (1990).

26. Lucas (1977), for instance, has estimated the understatement due to equalizing differences, i.e. due to not allowing for non-pecuniary effects, to amount to some 15-30 per cent of the measured rate of return to schooling. For a comprehensive survey on this issue, see Rosen (1986).
A further consequence of performing the analysis in pecuniary terms may also be noted in this context, although its relevance is disregarded in the investment-based human capital approach. Suppose that education is regarded not only as an investment but is also seen to comprise consumption aspects. In that case, pecuniary costs will overstate true investment costs. Similarly, if higher education also brings "status", pecuniary returns will most likely understate true returns to schooling investment. It is argued that the combined effect of these two aspects tends to push the measured rate of return below the true rate. (Cf. e.g. Siebert, 1990.)

27. Cf. footnote 16 above.

28. In making this comparison, it should be remembered that the estimated rate of return to education is an average rate. If the dispersion in rates of return to education can be assumed to be wide, then the estimated average rate of return may not give a correct picture. Apart from individual preferences and available funds, also occupational licensing restric-

tions will contribute to this dispersion. Hence, as pointed out by Siebert (1990), by analysing the dispersion of returns also the fundamental assumption of competitive labour markets underlying the human capital theory may be evaluated. Available empirical results do not, however, seem to reject the use of the theory.

29. The second-order Taylor expansion is of the form

$$(10') \qquad ln(1 - I_C) \approx -I_C - \frac{I_C^2}{2} = -\sigma - \frac{\sigma^2}{2} + (\varphi + \sigma\varphi) PREEXP - \frac{\varphi^2}{2} PREEXP^2$$

$$+ (\delta_C + \sigma\delta_C) SEN - \frac{\delta_C^2}{2} SEN^2 - \varphi\delta_C \, PREEXP \cdot SEN$$

after inserting eqs. (16) and (17) given in the text.

30. Specifically, eqs. (15) and (16) now take the form

$$(15') \qquad I_P = I(0) - \delta \, PREEXP$$

$$(16') \qquad I_C = I(0) - \delta \, PREEXP - \delta \, SEN,$$

i.e. it is assumed that $\sigma = I_P(0) = I(0)$ and that $\varphi = \delta_C = \delta_P = \delta$.

31. See the surveys in e.g. Parson (1986), Carmichael (1989), and Hutchens (1989) for an overview of the theory of specific human capital as well as of the multitude of competing theories explaining within-firm earnings growth without appealing to contemporaneous productivity growth, such as adverse selection, agency and other implicit contract models. Efficiency wage models, which represent a slightly different vein of theories, are discussed in some detail in Chapter VI of this study.

32. The formal development of the model of job matching under imperfect information goes back to Jovanovic (1979).

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CHAPTER III

EDUCATION, EXPERIENCE AND EARNINGS IN FINLAND

Empirical evidence from a cross section of individuals

ABSTRACT:

The primary purpose of the present chapter is to test empirically the impact of human capital on the observed earnings dispersion in Finland. This is done by regressing extended human capital earnings functions on Labour Force Survey data for 1987. The strength of the database is that it comprises a multitude of information on an individual basis and therefore allows earnings differences in Finland to be analysed to an extent that has not been possible before. The estimation results point to comparatively high marginal rates of return to formal schooling and to fairly modest earnings effects for both general experience and seniority. Furthermore, the estimation results reveal a strong, positive relation between earnings and formal on-the-job training. These findings are clearly supportive of the human capital interpretation of earnings determination.

1. INTRODUCTION

The past few decades have produced a vast amount of theoretical and empirical literature on interpersonal earnings differences (see the surveys in e.g. Willis (1986) and Siebert (1990)). The original stimulus for this development was provided by Mincer, who in 1974 launched an empirical specification of the earnings function which is now widely referred to as the standard human capital earnings function. This basic human capital model of earnings determination postulates a simple linear relation between the natural logarithm of earnings and the human capital productivity proxies of years of schooling and years of work experience. No attempts are made to explain existing individual differences in education and post-school investment levels. Instead, the observed stocks of accumulated human capital are assumed to be exogenously determined. This conventional human capital approach to cross-sectional earnings functions is also adopted in the present study.[1]

Specifically, extended versions of the standard human capital earnings function are estimated using cross-sectional micro-level data from the Finnish Labour Force Survey for 1987. The strength of the database is that it allows earnings differences in Finland to be analysed to an extent that has not been possible before. The actual estimating data are restricted to employed wage and salary earners aged 16 to 64, leaving a total of 3895 observations. The gender aspect is accounted for in two different ways: with gender appearing as an explanatory variable, on the one hand, and with separate estimations for each gender, on the other. All regressions are estimated using sample selection procedures to allow for the possibility of a selectivity bias problem influencing the estimation results due to analysing wage and salary earners employed at a particular period of time.

There is, so far, very little empirical evidence on earnings determination for Finland based on individual data. In particular, the importance of interpersonal education and training differences as determinants of earnings dispersion is still a more or less unexplored research field. The human capital aspect will, as a consequence, receive the prime emphasis in the estimations, although attention is also paid to other personal and job-related characteristics that can be expected to contribute to the explanation of observed earnings differentials.

The rest of the chapter is organized as follows. The underlying earnings model and data are presented in Section 2, while the estimation results are discussed in detail in Section 3. In Section 4 the estimated returns to human capital are compared with previously published empirical evidence for Finland. Some concluding remarks are given in Section 5.

2. MODEL SPECIFICATION AND DATA

The starting point of the empirical analysis is an extended version of the quadratic[2] human capital earnings function developed by Mincer (1974). In particular, the natural logarithm of individual earnings ($\ln EARN_i$) is regressed on a vector (X_i) of explanatory variables that captures the impact of the human capital productivity proxies of formal schooling and labour market experience as well as of other potential personal and job-related characteristics. The log earnings of the i^{th} individual are then given by

$$(1) \qquad lnEARN_i = X_i\alpha + \varepsilon_i\,, \qquad \varepsilon_i \sim N(0, \sigma_\varepsilon^{2)} \qquad i = 1,\ldots, N$$

where α is a vector of parameters to be estimated and ε_i is a disturbance term.

Under the usual least squares assumptions, the disturbance term in the earnings model in (1) is randomly distributed among the population, with an expected value equal to zero. However, in the labour force survey data used in the subsequent empirical analysis, the sample individuals recorded as being employed are not randomly selected from the entire population. Instead they represent persons who were employed during the week of the questionnaire, excluding all individuals who, because of self-selected or forced choice, were not employed at that particular time. Given that this produces a non-negligible sample selectivity bias, estimation of earnings equations for employees using ordinary least squares techniques results in inconsistent parameter estimates (e.g. Maddala, 1983).

Adjustment for potential sample selectivity bias influencing the estimation results is done by estimating the earnings function in (1) in combination with a selection function of the probit type explaining the probability of the i^{th} sample individual being employed.[3] The selection function in this two-equation model, classified as a "Type 2" Tobit model by Amemiya (1984), may be written in the general form

$$(2) \qquad W_i^* = Y_i\beta + \mu_i \, ,$$

where Y_i is a vector of explanatory variables, β is a vector of unknown parameters, and μ_i is a disturbance term that in the case of selectivity bias is correlated with the disturbance term (ε_i) in the earnings function. The dependent variable (W_i^*) in the selection equation is unobservable, but it has a dichotomous observable realization W_i (employed or not), which is related to W_i^* as follows:

$$W_i = 1 \quad \textit{iff} \quad W_i^* > 0$$

$$W_i = 0 \quad \textit{otherwise} \, .$$

Hence, the dependent variable ($\ln EARN_i$) in the earnings regression is not observed unless $W_i^* > 0$, implying that the observed sample of EARN is censored. The conditional expectation of the earnings equation may then be written as

$$(3) \qquad E(lnEARN_i \mid W_i = 1) = X_i\alpha + E(\varepsilon_i \mid W_i = 1)$$

$$= X_i\alpha + E(\varepsilon_i \mid \mu_i > -Y_i\beta) \, .$$

By assuming that ε_i and μ_i follow a bivariate normal distribution $N(0,0,\sigma_\varepsilon^2,1,\rho_{\varepsilon\mu})$ with zero means, σ_ε^2 respective unit variance, and correlation coefficient $\rho_{\varepsilon\mu}$, a standard sample selection bias correction of the earnings equation can be made

$$(4) \qquad E(lnEARN_i \mid W_i = 1) = X_i\alpha + \rho_{\varepsilon\mu}\sigma_\varepsilon \frac{\varphi(Y_i\beta)}{\Phi(Y_i\beta)} = X_i\alpha + \rho_{\varepsilon\mu}\sigma_\varepsilon\lambda \, ,$$

where σ_ε is the standard error of the disturbance term in the earnings equation and $\varphi(\cdot)$ and $\Phi(\cdot)$ are, respectively, the density function and the distribution function of the standard normal distribution. The earnings equation in (4) is estimated with the LIMDEP program using maximum likelihood estimation of the procedure discussed in Heckman (1979) and Greene (1981). More exactly, in order to obtain both consistent and efficient estimates, the equations in (1) and (2) are re-estimated jointly, whereby the final values from the Heckman two-stage procedure are used as starting-values for the maximum likelihood method of estimating α, β, σ_ε, and $\rho_{\varepsilon\mu}$.

The probability of being employed is explained in terms of a set of personal characteristics containing age and indicators for gender, educational level, marital status, family size, and location of residence. In line with the theory of human capital, the observed earnings variance is assumed to reflect differences in the employees' formal education and labour market experience. It may, however, be questioned whether it is appropriate to have schooling appear in the earnings function in a linear form, which forces the returns to varying years of schooling to be the same.

Apart from this possible mis-specification of the schooling variable, there is also another potential source of error involved. Specifically, the employed data merely comprise information on the highest single education completed by each sample individual. Thus a stereotype key would have to be used in order to turn this information into years of full-time schooling. There is strong reason to believe that this transformation method influences the estimates obtained. An alternative approach is therefore adopted in the following. More exactly, the continuous schooling variable is replaced by a separate indicator for each level of education completed, whereby the coefficient on each degree dummy provides an approximate estimate of the percentage change in earnings, ceteris paribus, from having acquired the degree.

In addition to human capital-related variables, the earnings equation is also supplemented with a set of personal and job characteristics, some of which may be expected to correlate with the working history of the individual. In part, this represents a simple way of trying to control for possible measurement errors in the respondent's self-reported total years of work experience. Thus if, for example, periods of unemployment, layoffs or temporary withdrawal from the labour market are not properly accounted for, the estimated return to experience will presumedly be biased downward. In view of this, the empirical earnings equation is completed with indicator variables reflecting the marital status, family size, location of residence, employment status, working conditions, union membership, and industry affiliation of the sample individuals. The role of occupational status in explaining earnings dispersion in Finland is analysed in detail in Chapter IV of this study and is therefore ignored here.

The earnings model is estimated with gender appearing as an explanatory variable, on the one hand, and separately for each gender, on the other. The inclusion of a simple indicator for gender captures the effect on the overall structure of earnings of the i^{th} individual being a woman but restricts the earnings effects of all the other explanatory variables to be the same across male and female employees. Instead, often a clear distinction between genders is seen to be needed, dictated mainly by issues of discrimination and the usually segmented work experience profile of women.

The econometric specifications of the human capital earnings model in (1) are estimated using cross-sectional micro-level data from the Labour Force Survey for 1987 conducted by Statistics Finland. The data set is unique in the sense that 1987 is the first and, until recently, only year for which Finnish labour force survey data have been supplemented with income data from the tax rolls. Moreover, the survey comprises information of vital importance in human capital earnings analysis not available in, for instance, Finnish Population Census data. The database does not, however, provide the type of panel data needed in studies of the present kind; the survey sample varies from one year to another.

The labour force survey covers a sample of some 9000 individuals, representing the entire population aged 15-64 years as stratified according to sex, age and region. When the data are restricted to employed wage and salary earners aged 16 to 64 and sorted out with respect to missing and incomplete information on crucial variables, the sample of employees retained in the actual estimating data shrinks to covering a total of 3895 individuals.

Because of data limitations and shortcomings, the specification of the earnings variable and the relevant human capital variables represents a rather critical step of the empirical analysis. The dependent variable is chosen to be average annual before-tax hourly earnings in order to allow for interpersonal differences in weekly working hours and in months worked. This approach also makes the earnings of full-time and part-time employees comparable. The earnings data used comprise most types of compensation, including overtime and vacation pay. Fringe benefits are omitted in this context but are included in the empirical analysis reported in Chapters IV to VI of this study. It may, however, be noted already in this context that the estimation results obtained when including fringe benefits in the earnings data do not differ significantly from the results obtained when fringe benefits are not accounted for.

Ideally, earnings differentials should be related to the actual schooling differences which generate them. The employed data set does not allow this, however; as noted earlier, the available register data on formal schooling merely show the single highest level of education completed by each individual. There is a total of eight levels of education, which are represented by six schooling indicators in the estimations.

A notable advantage of the data set is that it provides self-reported information on the person's total years of work experience as well as on his or her years with the current employer, i.e. seniority (tenure). The reported years of work experience have been checked against the person's age and transformed years of formal schooling plus 7 (the age that school starts in Finland). Any inconsistencies between reported total work experience and seniority have also been eliminated, since people generally remember their years with the present employer better than their total years in the labour force. The estimation results thus refer to the individuals' "actual" and not to their potential labour market experience, which makes a huge difference especially for women (cf. Tables 8 and 9 in Chapter VII of this study).

A summary of definitions of the variables employed in the subsequent empirical analysis is given in Table A of the Appendix. The male and female employees in the estimating data are described in terms of these variables in Table B of the Appendix. A detailed description of the construction of the final estimating data, definitions of variables used and estimation results for alternative definitions of key variables is given in Chapter VII.

3. ESTIMATION RESULTS

3.1. Earnings effects of education and experience

The regression results obtained from estimating the extended human capital model specification outlined in the preceding section on labour force survey data using maximum likelihood techniques are displayed in Table 1. The table also reports the corresponding gender-specific estimation results.[4] The probit estimates, which are given in Table C of the Appendix, succeed in correctly predicting employment for close to 90 per cent of the sample employees.

The parameter estimates of the educational indicator variables suggest that the effect of education on earnings is on average increasing with the level of education. But the estimated growth rate of earnings is by no means smooth; first, it varies quite substantially depending on the level of education concerned and secondly, it differs markedly between the two genders. Moreover, the gender gap in educational returns seems to be largest at the lower end of the educational scale, i.e. at levels where a majority of the labour force is situated. These trends, which stand out more clearly in Figure 1, point to highly varying economic incentives to continue in formal education. Accordingly, the widely-used linear schooling variable would be a less appropriate proxy to use in the estimations.

For women, a most conspicuous disincentive seems to occur immediately at the beginning of their educational "career". Specifically, the statistically insignificant difference between the estimated return to completed basic education and graduation from the LOWER VOCATIONAL and professional level of education suggests that women with lower vocational training tend to have no relative income advantage over women with just a basic education.[5] Compared to this, graduation from the UPPER VOCATIONAL and professional level of education has a substantial marginal product: acquiring a degree at this level, with other things held constant, would raise the earnings of women by one fifth on average. Acquisition of higher education degrees would also have a positive but more moderate effect on female earnings. The female estimates thus show a clear pattern of decreasing marginal rates of return to education. This pattern is further strengthened when account is taken of the highly varying length of education behind each degree.

Table 1. Estimation results for the extended human capital earnings equation estimated jointly and by gender.[1] The dependent variable is log hourly earnings.

Variable	All obs.	Women	Men
CONSTANT	3.4359^{**} (.0403)	3.3014^{**} (.0678)	3.3457^{**} (.0540)
BASIC EDUCATION	0	0	0
LOWER VOCATIONAL	0.0615^{**} (.0150)	0.0076 (.0227)	0.1057^{**} (.0202)
UPPER VOCATIONAL	0.2294^{**} (.0164)	0.1764^{**} (.0248)	0.2666^{**} (.0227)
SHORT NON-UNIV	0.4297^{**} (.0239)	0.3644^{**} (.0354)	0.4817^{**} (.0341)
UNDERGRADUATE	0.5160^{**} (.0377)	0.5167^{**} (.0477)	0.4584^{**} (.0661)
GRADUATE	0.6188^{**} (.0256)	0.6004^{**} (.0430)	0.6270^{**} (.0367)
EXP	0.0155^{**} (.0023)	0.0131^{**} (.0036)	0.0194^{**} (.0032)
$EXP^2/1000$	-0.1981^{**} (.0584)	-0.1696^{*} (.0924)	-0.2938^{**} (.0827)
WOM	-0.1896^{**} (.0128)		
MARRIED	0.0185 (.0144)	-0.0198 (.0196)	0.0560^{**} (.0227)
$CHILD^{0-6}$	0.0134 (.0135)	0.0294 (.0183)	-0.0100 (.0207)
$CHILD^{7-17}$	0.0276^{*} (.0129)	0.0009 (.0189)	0.0533^{**} (.0184)
CAPITAL	0.1065^{**} (.0127)	0.0880^{**} (.0194)	0.1248^{**} (.0168)
TEMPEMPL	0.0194^{*} (.0152)	0.0640^{**} (.0205)	-0.0680^{**} (.0244)
PART-TIME	0.2725^{**} (.0169)	0.2744^{**} (.0206)	0.2052^{**} (.0382)
PIECE-RATE	0.0591^{**} (.0193)	0.0134 (.0344)	0.0887^{**} (.0243)
NODAYWORK	0.0779^{**} (.0127)	0.1331^{**} (.0175)	0.0184 (.0198)
UNEMPL	-0.0565^{**} (.0157)	-0.0282^{*} (.0224)	-0.0712^{**} (.0225)
UNION	-0.0143 (.0120)	-0.0279 (.0187)	-0.0026 (.0162)

Table 1. (cont.)

Variable	All obs.	Women	Men
Industry sector indicators:			
INDU11 (agriculture)	-0.0961** (.0403)	0.0374 (.0969)	-0.1374** (.0426)
INDU31 (food manuf.)	-0.0477 (.0357)	-0.0248 (.0639)	-0.0283 (.0424)
INDU32 (textile)	-0.0845* (.0418)	-0.0488 (.0586)	0.0327 (.1006)
INDU33 (wood prod.)	-0.0992* (.0457)	-0.0120 (.0938)	-0.1190** (.0503)
INDU34 (paper prod.)	0.1737** (.0316)	0.1598** (.0655)	0.2109** (.0346)
INDU35 (chemicals)	0.0631 (.0384)	0.0283 (.1016)	0.0984** (.0418)
INDU36 (non-metallic)	-0.0221 (.0536)	-0.0353 (.2204)	-0.0082 (.0523)
INDU37*** (basic metal)	0.1554 (.1019)		0.1702* (.0932)
INDU38 (metal products)	0	0	0
INDU20/39**** (oth. manuf.)	0.1291 (.0932)	0.2378 (.1737)	0.1144 (.0979)
INDU40 (electricity)	0.0845 (.0629)	0.0292 (.2283)	0.0922 (.0612)
INDU50 (construction)	0.0163 (.0289)	0.0175 (.0896)	0.0266 (.0308)
INDU61 (wholesale trade)	0.0404 (.0326)	0.0714 (.0669)	0.0236 (.0353)
INDU62 (retail trade)	-0.0849** (.0274)	-0.0565 (.0499)	-0.0908** (.0335)
INDU63 (restaurants)	-0.0128 (.0412)	0.0109 (.0569)	-0.0336 (.1021)
INDU71 (transport)	-0.0129 (.0319)	0.0956* (.0576)	-0.0168 (.0387)
INDU72 (communication)	0.0257 (.0472)	0.1033 (.0824)	0.0123 (.0571)
INDU81 (financing)	0.1376** (.0342)	0.1725** (.0529)	0.2209** (.0602)
INDU82 (insurance)	0.1119 (.0784)	0.1362 (.0956)	0.1536 (.2027)
INDU83 (real estate)	0.0042 (.0326)	0.0308 (.0553)	0.0183 (.0445)

Table 1. (cont.)

Variable	All obs.	Women	Men
INDU91 (public adm.)	0.0069 (.0334)	0.0675 (.0609)	-0.0066 (.0384)
INDU92 (sanitary services)	-0.1312** (.0438)	-0.0542 (.0653)	-0.2005** (.0749)
INDU93 (social services)	-0.0130 (.0253)	0.0281 (.0468)	-0.0336 (.0349)
INDU94 (cultural services)	0.0697* (.0352)	0.1036* (.0564)	0.0325 (.0567)
INDU95 (personal services)	-0.1157* (.0697)	-0.0413 (.1016)	-0.1601* (.0930)
SIGMA(ε)	0.3016** (.0021)	0.3029** (.0032)	0.2898** (.0034)
RHO(ε,μ)	-0.0368 (.0746)	-0.0834 (.1020)	0.1040 (.1310)
Log-Likelihood Number of obs.	-3627.2 3895	-2031.8 1987	-1466.9 1908

1 Standard errors are given in parentheses below the estimates. Maximum likelihood estimates are corrected for selectivity bias, where SIGMA(ε) is the standard error of the disturbance term in the earnings equation and RHO(ε,μ) measures the correlation between the error term (ε) in the earnings equation and the error term (μ) in the probit (selection) equation. The probit estimates are reported in Table C of the Appendix. A simple Chow test based on estimation results obtained using the Heckman procedure suggests that the hypothesis of the parameter estimates being equal for male and female employees can be rejected at a 0.1 % level.

* Denotes significant estimate at a 5 % level.

** Denotes significant estimate at a 1 % level.

*** The four observations on females in basic metal industries are included in the reference category INDU38.

**** Includes employment in mining and quarrying.

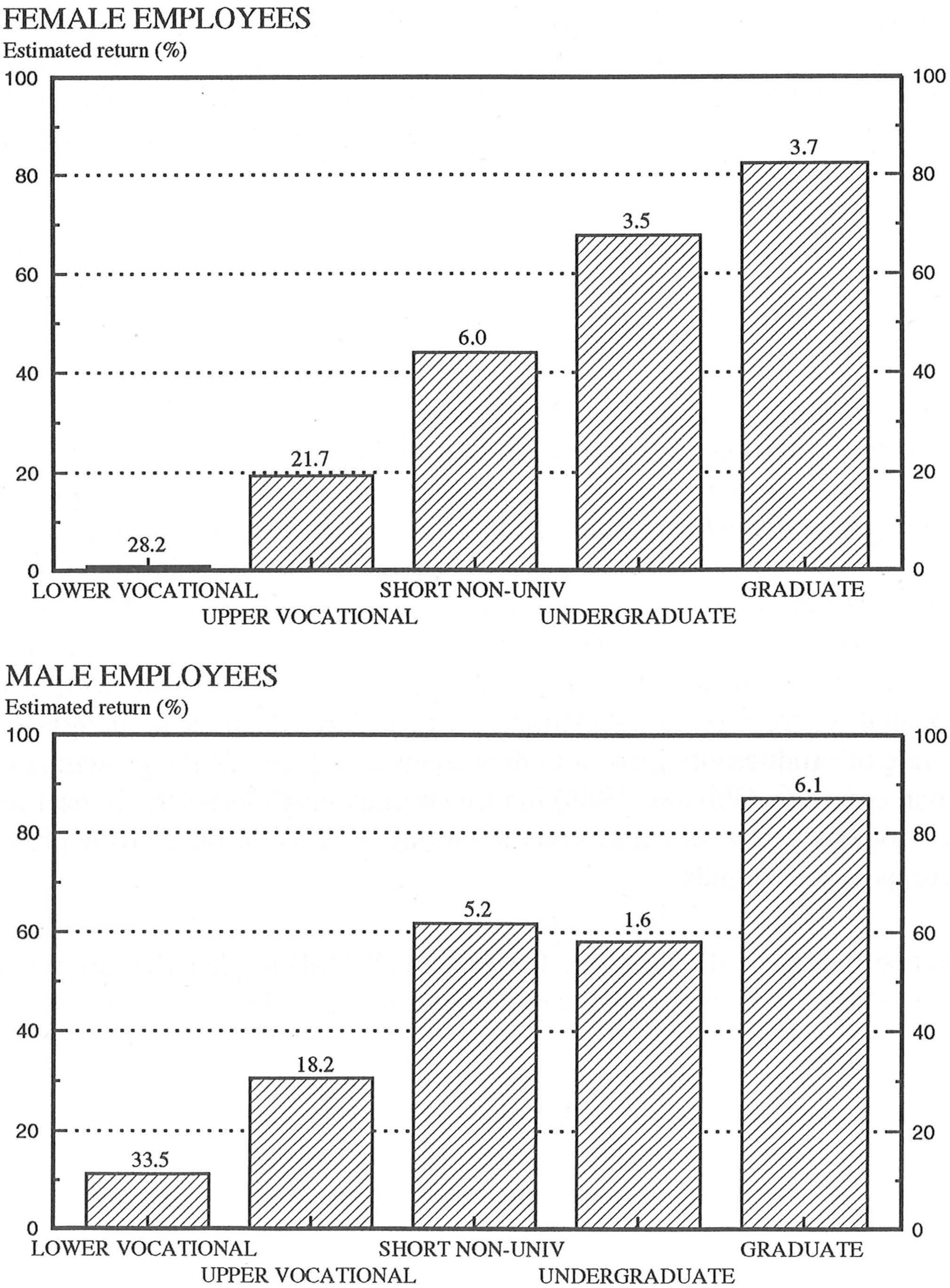
For men, on the other hand, the steadily growing trend in the marginal rate of return to education is dramatically interrupted by a negligible effect on earnings from acquiring an UNDERGRADUATE university degree instead of a non-university higher education degree (SHORT NON-UNIV). A plausible explanation for this outcome is the past years' favourable labour market situation of ADP-personnel and engineers, whose degrees are ranged under the lowest level of higher education (cf. CSO, 1991).

It is also worth noting that the two university degree levels (UNDERGRADUATE, GRADUATE) stand out as the only educational levels at which the estimated return for men does not differ significantly from that for women. However, because of the small relative share of persons with a university degree (cf. Figure 1), this finding does not affect to any notable extent the average rate of return to schooling estimated for the two genders. Instead, the statistically insignificant return to the acquisition of lower vocational and professional education for women obviously offers a major explanation of the overall lower return to education estimated for women.[6]

Unfortunately the small number of observations in the data on persons with a postgraduate degree (2 females, 7 males) makes drawing a distinction in the estimations between persons with a graduate and a postgraduate degree questionable. The postgraduate coefficients obtained when such a division is made support this conclusion; the parameter estimate on the postgraduate variable, the reference level being the basic (compulsory) level of education, is insignificant for women and points to a relative income advantage of some 61 per cent for men. These postgraduate returns are to be compared with the estimated return to a graduate degree which amounts to over 80 per cent for both genders when related to the average return on completed primary education.

The parameter estimates on the experience variables are mostly highly significant and have the a priori expected signs, thereby pointing to an upward-sloping concave experience-earnings profile for both genders. Assuming that the cross-sectional coefficients for experience capture the dynamics of changes in earnings over the individual's life cycle, the magnitudes of the estimates indicate that earnings growth starts at the beginning of working life from some 1.9 per cent for the typical male employee and from roughly 1.4 per cent for the typical female employee, implying a minor but nonetheless significant difference in the average growth rate in earnings between men and women entering the labour market. Earnings growth decreases thereafter continuously, albeit fairly slowly; when evaluated at the sample mean level of experience, the average annual growth in hourly earnings amounts to some 1.2 per cent for men and to about 0.9 per cent for women, and reaches zero only after more than three decades in the labour market, turning thereafter negative until retirement.

Figure 1. Estimated return to different levels of education compared with the return to basic education



Note. The figure on the top of each pile gives the percentage sample share of the educational level in question.

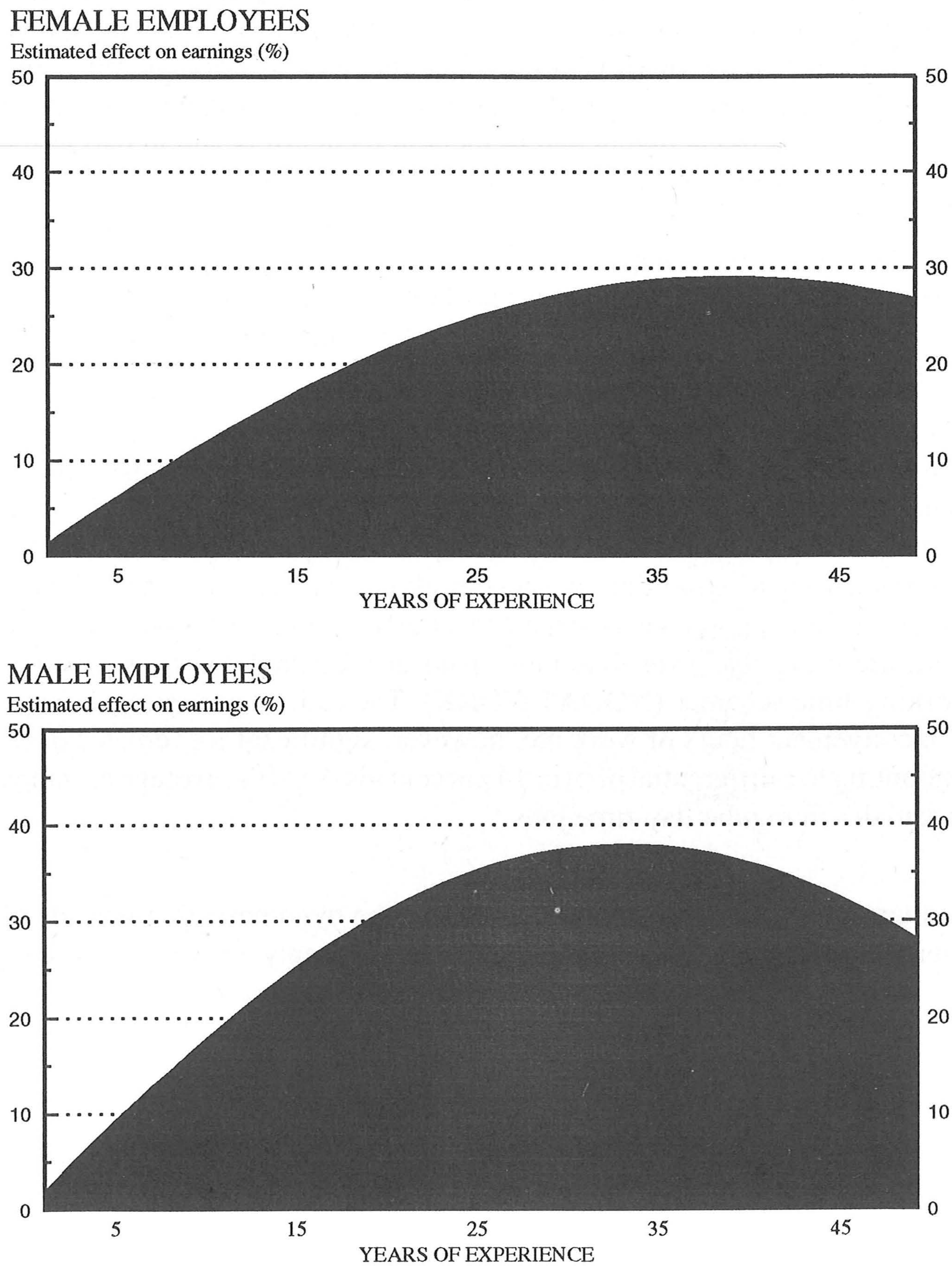
Source: Antilogs of the schooling coefficients in Table 1.

More exactly, a maximum of roughly 38 per cent cumulative growth[7] in male hourly earnings is reached after 33 years of work experience, while the cumulative growth in female hourly earnings peaks at some 29 per cent after 39 years in the labour market. Generally speaking, the crucial difference in the experience-earnings profiles of the two genders thus lies in a substantially flatter profile for women, resulting in a notably smaller total influence of experience on female earnings (Figure 2). It seems unlikely that this difference could be totally explained by the slightly shorter average labour force experience observed for female employees (16 years compared with 17 years for male employees). Possibly part of the gender gap is attributable to different amounts of on-the-job training and different promotional patterns, or simply to unobservable interruptions in the career.

All in all, then, an employee with the average number of years of schooling would reach a maximum in hourly earnings in his early fifties. However, this late peak does not exclude the possibility of an earlier peak in annual earnings if there is a tendency for annual hours worked to fall off well before the peak in hourly earnings. But it should also be kept in mind that the results are based on cross-section micro-level data for one year only. Willis (1986), for example, points out that the actual experience-imputed earnings growth of a cohort of new labour force entrants may be quite different from that indicated by cross-sectional estimates if there have been clear changes in the rate of productivity growth in the economy and thus in the growth rate of real earnings. Ohlsson (1986) in turn strongly emphasizes the impact of variations in the size of cohorts on the earnings effects estimated from cross sections of individuals.

The coefficient on the indicator for women (WOM) implies that the standardized hourly earnings differential between men and women amounted to over 20 per cent in 1987. Furthermore, MARRIED men have on average nearly 6 per cent higher hourly earnings than unmarried men, whereas for women, marriage turns out to have no statistically significant earnings effect.[8] Also family size (CHILD) seems to have a small positive effect on male earnings only (some 5 per cent).[9] Not surprisingly, the average earnings level tends to be substantially higher within the Helsinki area (CAPITAL). The differential impact of location of residence amounts to some 9 per cent for female employees and to over 13 per cent for male employees.

Figure 2. Average cumulative growth (%) in hourly earnings attributable to different number of years of work experience since labour market entrance



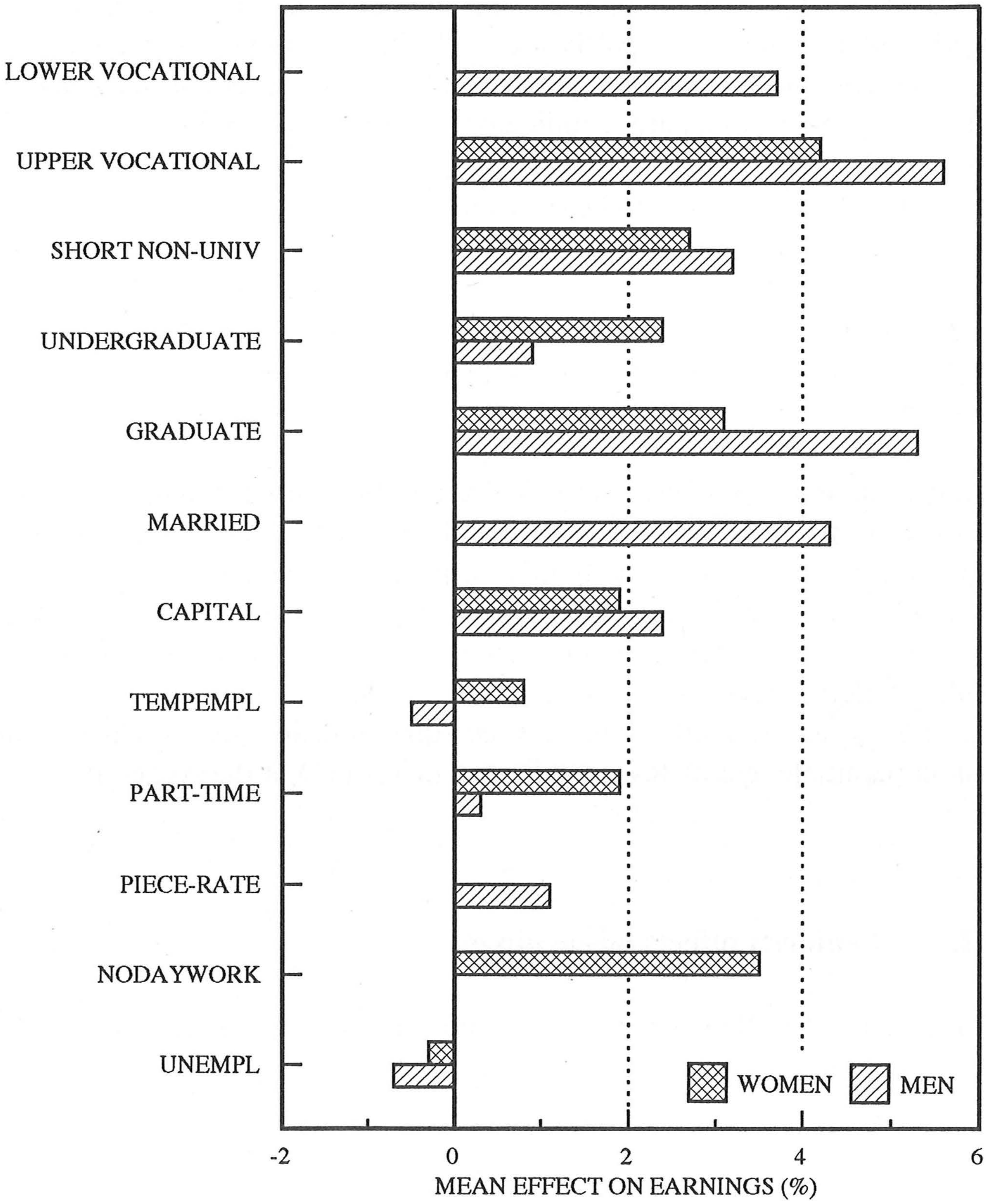
Source: Calculations based on the experience coefficients reported in Table 1 using the formulae in footnote 7.

The estimation results further suggest that women in temporary employment (TEMPEMPL) tend to have about 6 per cent higher hourly earnings than women with a permanent job. For men, on the other hand, temporary employment implies an income disadvantage of approximately the same magnitude. Table 1 also points to a considerable income advantage of part-time employees (PART-TIME). The remarkable wage premium obtained for temporarily employed females as well as for part-time employed persons is most likely due in part to measurement errors and in part to the distinct distribution of these two employee categories across critical personal and job characteristics, which may in turn be indicative of some degree of self-selection (cf. Chapters V and VII of this study). Furthermore, the small share of the two categories in the whole sample of employees indicates that the coefficients for the temporary and part-time employment variables are to be interpreted with some caution.

The estimation results also point to significantly higher hourly earnings of male employees covered by some other compensation system than wages/salaries paid on a monthly, weekly or hourly basis (PIECE-RATE). For women, such extraordinary compensation systems imply a small, if any, income advantage. As is to be expected, hourly earnings in regular day-time work are typically lower than those paid in jobs implementing irregular working-time schemes (NODAYWORK). The estimated earnings effects of inconvenient hours of work are, however, significant for females only, amounting to a differential of over 14 per cent vis-à-vis the average earnings of females in regular day-time jobs.

Furthermore, the regression results support the hypothesis that periods of unemployment or layoffs (UNEMPL) generally imply a negative earnings effect. In particular, male employees who had been unemployed or temporarily laid off during the previous twelve months had, on average, significantly lower hourly earnings compared with males who had been fully employed during the same time period. The data do not tell, however, whether this can be ascribed to a higher probability of unemployment in less-paid jobs or, alternatively, to a tendency of ending up in lower-paid jobs when re-employed. It is noteworthy that a weaker effect is observed among female employees.

Figure 3. Estimated earnings effects of selected personal and job characteristics evaluated at their sample mean level



Note. The earnings effect is displayed only if it is estimated to be significantly different from zero at conventional levels.

Source: Calculated from the regression coefficients in Table 1 and the sample means in Table B of the Appendix.

The insignificant influence on earnings of union membership (UNION) is obviously mainly due to the practically 100 per cent coverage of centralized wage agreements in Finland. Moreover, the occasionally fairly strong correlation between union membership and the included job characteristics implies that the term may partly reflect differences in working conditions. To conclude, the actual earnings effects of union membership seem hard to capture by means of a simple indicator for unionized employees.

The addition of two-digit industry sector controls has an almost negligible impact on the estimated coefficients of the other explanatory variables accounted for in the estimations. The crucial question of inter-industry earnings differentials and the relative importance of the individuals' industry affiliation in explaining these differences is addressed in more detail in Chapter VI of this study.

Finally, there seems to be no statistically significant correlation between the error term (μ) in the probit equation and the error term (ε) in the earnings equation. In other words, the hourly earnings observed among employees do not exceed significantly the population mean that would be observed should non-participant individuals enter the labour market. This holds for both genders. Accordingly, estimation of the extended human capital earnings equation using ordinary least squares techniques produces consistent parameter estimates, as indicated in Table D of the Appendix.

3.2. Seniority effects on earnings

The relationship between seniority and earnings has in recent decades received much attention in theoretical and empirical analyses of earnings determination and job mobility. A strong, positive effect of job seniority accumulation on earnings growth has been reported in empirical studies by, among others, Bartel & Borjas (1981), Borjas (1981), Mincer & Jovanovic (1981), and Mincer (1986,1988,1989).

The most prominent explanation of this important link between seniority and earnings is offered by the theory of specific human capital, according to which earnings growth with job seniority is attributable to the employee's acquisition of more specific skills and higher productivity.[10] The years of experience with the same employer are then assumed to reflect the specific human capital acquired by the employee. Hence, a widely-used approach within the human capital framework to assessing empirically the influence on earnings growth of investment in specific capital is to simply introduce into the standard human capital earnings function the employee's length of employment with the current employer, i.e. his or her seniority (tenure). As in the case of general experience, the positive association between earnings and seniority is expected to diminish as seniority increases. The seniority effect added to the earnings function is therefore commonly given a quadratic specification.

When incorporating both total work experience and seniority in the human capital earnings function, the coefficient on experience is to be interpreted as an estimate of the growth in market earnings due to the individual's investment in general human capital, while the coefficient on seniority provides an estimate of earnings growth due to the individual's investment in specific human capital. Accordingly, summing up the coefficients on experience and seniority yields a proxy for the earnings effect of total work experience (cf. Hashimoto & Raisian, 1985).

The regression results obtained from estimating the extended human capital earnings specification augmented with a seniority variable and its square (SEN, SEN^2) are displayed in Table 2. Comparison of Tables 1 and 2 reveals that the introduction of variables capturing possible earnings effects of investment in specific capital reduces the absolute size of the linear general experience term from 1.5 to 1.2 per cent for the full sample, from 1.3 to 0.9 per cent for women, and from 1.9 to 1.6 per cent for men. Because of the strong, positive correlation between experience and seniority, this is also the expected direction of the effect.

The coefficient of the linear seniority variable turns out to be significant only in the full sample and the female earnings regression, whereas the coefficient on seniority squared is statistically insignificant throughout. Thus the earnings effect of seniority does not seem to have an upward-sloping concave profile; for both genders, the hourly earnings per year of employment with the same employer tend to grow at a constant but moderate rate.[11] The period of recovery from an initial earnings loss may, as a consequence, be fairly long.

Table 2. Estimation results for the seniority earnings model estimated jointly and by gender.[1] The dependent variable is log hourly earnings.

Variable	All obs.	Women	Men
CONSTANT	3.4418** (.0406)	3.3128** (.0677)	3.3644** (.0557)
BASIC EDUCATION	0	0	0
LOWER VOCATIONAL	0.0602** (.0153)	0.0089 (.0227)	0.1027** (.0208)
UPPER VOCATIONAL	0.2243** (.0165)	0.1731** (.0248)	0.2589** (.0231)
SHORT NON-UNIV	0.4257** (.0240)	0.3622** (.0355)	0.4732** (.0345)
UNDERGRADUATE	0.5150** (.0377)	0.5194** (.0478)	0.4480** (.0660)
GRADUATE	0.6171** (.0257)	0.6063** (.0431)	0.6173** (.0370)
EXP	0.0123** (.0024)	0.0090** (.0038)	0.0160** (.0035)
$EXP^2/1000$	-0.1820** (.0606)	-0.1428 (.0990)	-0.2558** (.0883)
SEN	0.0055** (.0023)	0.0067* (.0036)	0.0042 (.0030)
$SEN^2/1000$	-0.0094 (.0851)	0.0007 (.1433)	-0.0112 (.1057)
WOM	-0.1892** (.0128)		
MARRIED	0.0193 (.0145)	-0.0192 (.0196)	0.0548** (.0232)
$CHILD^{0-6}$	0.0133 (.0137)	0.0298 (.0185)	-0.0146 (.0209)
$CHILD^{7-17}$	0.0298* (.0130)	0.0050 (.0190)	0.0544** (.0187)
CAPITAL	0.1124** (.0127)	0.0944** (.0195)	0.1319** (.0172)
TEMPEMPL	0.0311* (.0154)	0.0811** (.0207)	-0.0568* (.0247)
PART-TIME	0.2784** (.0169)	0.2841** (.0205)	0.2100** (.0382)
PIECE-RATE	0.0619** (.0193)	0.0124 (.0338)	0.0921** (.0250)
NODAYWORK	0.0799** (.0130)	0.1367** (.0176)	0.0171 (.0209)

Table 2. (cont.)

Variable	All obs.	Women	Men
UNEMPL	-0.0393** (.0162)	-0.0118 (.0229)	-0.0573** (.0234)
UNION	-0.0244* (.0125)	-0.0367* (.0194)	-0.0084 (.0168)
SIGMA(ε)	0.3005** (.0021)	0.3004** (.0034)	0.2892** (.0032)
RHO(ε,μ)	-0.0541 (.0739)	-0.1069 (.1013)	0.0292 (.1296)
Log-Likelihood	-3585.0	-2004.3	-1449.9
Number of obs.	3847	1974	1873

1 For notes, see Table 1. The estimations also include 24 industry sector controls, whereby employment in manufacturing of metal products (INDU38) is used as the reference category.

* Denotes significant estimate at a 5 % level.

** Denotes significant estimate at a 1 % level.

But despite an overall weak earnings effect, earnings growth due to seniority differs quite markedly between genders. Specifically, the coefficients suggest that, ceteris paribus, the first 10 years of current seniority are associated with an increase in earnings of about 7 per cent for the typical female employee, but of only some 4 per cent, if any, for the typical male employee. These "lower bound" estimates indicate that, on average, female employees would lose much more because of forgone specific capital than their male counterparts if their employment relationship were to terminate for exogenous reasons.

The stronger impact of seniority on female earnings is also reflected by the fact that seniority accounts for nearly a half of the initial earnings effect of total work experience. The importance of seniority for the determination of male earnings is much smaller; it accounts for, at most, one fifth of the initial earnings effect of total work experience. Giving the earnings effects of general experience and seniority a conventional human capital interpretation, female employees would thus tend to acquire a considerable amount of specific skills, while male employees seem to acquire mainly general skills, i.e. skills which are by definition transferable between employers.

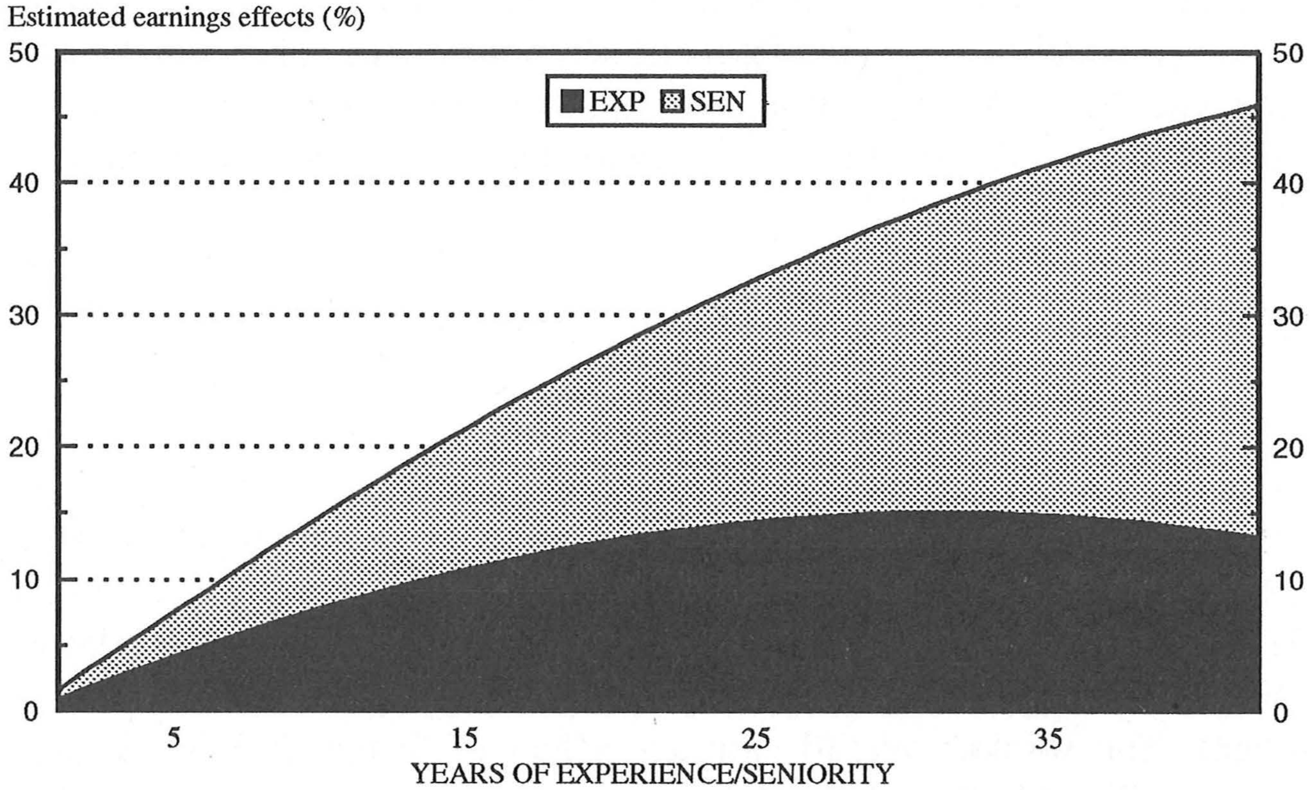
In order to further illuminate the simultaneous earnings effects of seniority and general experience, earnings profiles of men and women are calculated from the estimates in Table 2. These profiles are portrayed in Figure 4. The two fields showing the estimated earnings growth attributable to general experience and seniority give, when taken together, a proxy of the earnings effect of total work experience for a hypothetical individual staying with the same employer up to 42 years (sample maximum of seniority).

The human capital interpretation of longer length of employment at the same employer as resulting in more accumulated specific capital and thus in higher productivity and earnings indicates, however, that a positive return to seniority may, in effect, capture either a return to specific training or job duration, or both. In other words, there is a possibility that the coefficient on the seniority variable reflects some combined effect of competing theories on compensation and productivity (see e.g. Parson, 1986). But it has also been argued that the estimated effect of seniority is simply the result of inconsistent estimates produced by unobserved heterogeneity across individuals and job matches.[12]

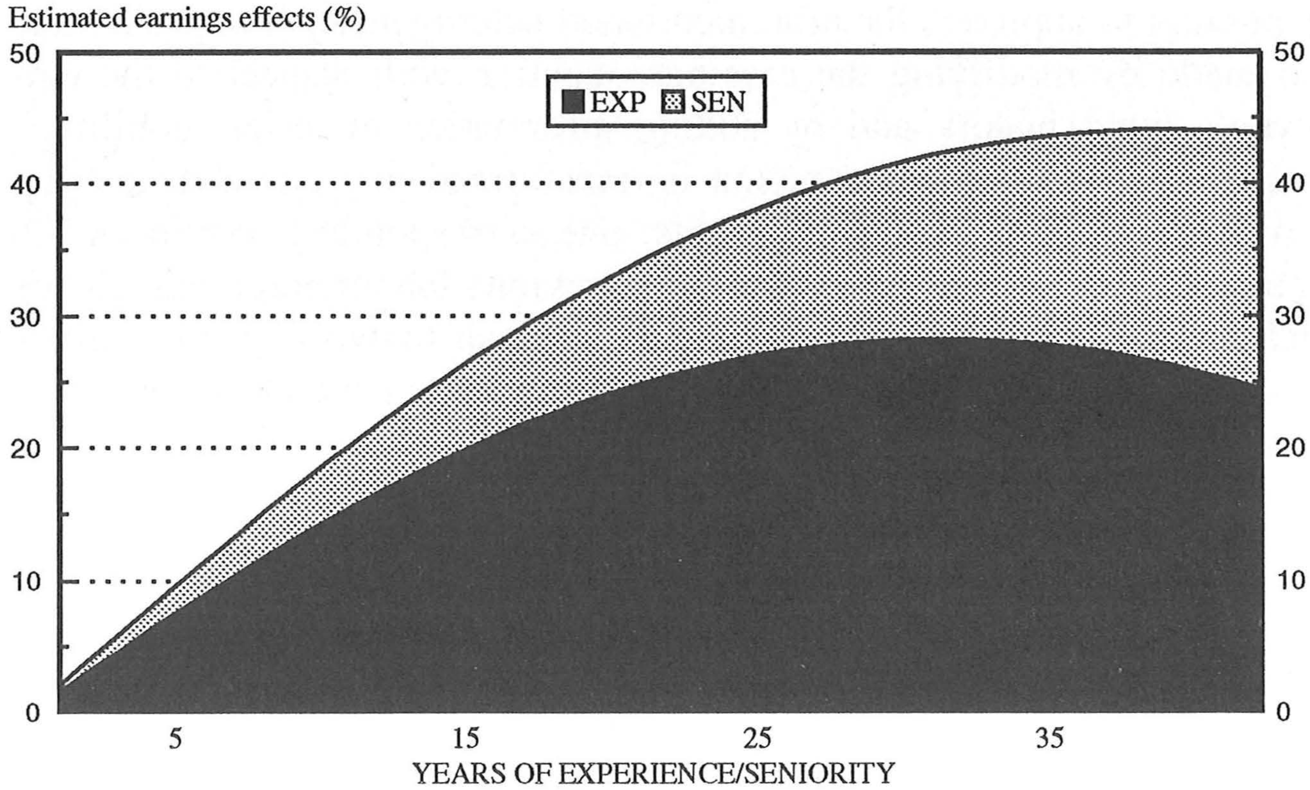
Unfortunately, the data used in the present study do not allow a distinction between the theoretical explanations of the effect of seniority on earnings growth. Instead, following e.g. Brown (1989) and Mincer (1988,1989), an attempt is made to capture at least part of the correlation between specific training and employment duration by supplementing the seniority earnings model with survey information on the occurrence of formal on-the-job training. This is done in two different ways: first, by introducing an indicator (OJT) for employees who have attended formal on-the-job training courses during the twelve months preceding the time of the questionnaire, and second, by adding a variable capturing the earnings effect of days in training during that same time period (OJTDAYS). The gender-specific regression results corresponding to these two specifications of the on-the-job training variable are displayed in columns 2-3 of Tables 3 and 4. For ease of exposition, the tables only report the estimated coefficients for the human capital variables. The estimates of the other explanatory variables are very close to their counterparts in Table 2.

Figure 4. Earnings profiles for general experience and seniority

FEMALE EMPLOYEES



MALE EMPLOYEES



Source: Calculated from the general and specific experience estimates reported in Table 2 using the formulae in footnote 7.

The inclusion of formal OJT in the earnings model indicates that the seniority variable can now be taken to reflect earnings growth attributable to informal OJT and/or to factors that may cause earnings to increase independent of productivity growth. As can be seen from Tables 3 and 4, however, the estimated main effects of seniority differ only trivially. But on the other hand, the small drop in the estimates due to the introduction of formal OJT is hardly surprising in view of the overall moderate seniority effect on earnings growth.

The tables further display a strong, positive relation between earnings growth and formal training, suggesting that productivity growth is important in shaping earnings profiles, as indicated by human capital theory. Moreover, the effect on earnings of formal OJT is found to be much stronger for male employees than for female employees. Male employees having attended formal training courses had on average some 10 per cent higher hourly earnings than those having received no formal training. The relative earnings advantage of formally trained female employees was less than 4 per cent. The weaker overall earnings effect of formal training among women is also reflected by the estimated coefficients for the training days variable.

An attempt to approach the aforementioned heterogeneity bias problem is also made by modifying the earnings equation with respect to the employee's work history and by adding information on prior mobility.[13] Specifically, the earnings function is transformed to make a distinction between two labour market segments: one corresponding to current job experience (SEN) and the other to all previous labour force experience (PREEXP). The reason for restricting the analysis to two segments only is the data set employed, which provides information merely on the employee's total work experience and length of employment with the current employer. Past mobility, in turn, is simply defined as a change in the employer at least once since labour force entry; i.e., the dummy proxy for mobility (MOVE) takes a value of one if the employee's total number of years in the labour market exceeds the years with the present employer, and a value of zero otherwise. The gender-specific estimates corresponding to the segmented human capital earnings equation are reported in column 4 of Tables 3 and 4.

Table 3. Estimation results for various specifications of the seniority earnings equation estimated for men.[1] The dependent variable is log hourly earnings.

Variable	(1)	(2)	(3)	(4)
LOWER VOCATIONAL	0.1027** (.0208)	0.0942** (.0206)	0.0970** (.0206)	0.0929** (.0206)
UPPER VOCATIONAL	0.2589** (.0231)	0.2248** (.0232)	0.2322** (.0231)	0.2267** (.0232)
SHORT NON-UNIV	0.4732** (.0345)	0.4321** (.0343)	0.4392** (.0341)	0.4349** (.0342)
UNDER-GRADUATE	0.4480** (.0660)	0.4086** (.0631)	0.4038** (.0653)	0.4089** (.0631)
GRADUATE	0.6173** (.0370)	0.5702** (.0375)	0.5752** (.0371)	0.5712** (.0374)
EXP	0.0160** (.0035)	0.0152** (.0035)	0.0158** (.0035)	
EXP^2 /1000	-0.2558** (.0883)	-0.2348** (.0876)	-0.2478** (.0876)	
PREEXP				0.0166** (.0039)
$PREEXP^2$ /1000				-0.2566* (.1049)
SEN	0.0042 (.0030)	0.0036 (.0030)	0.0036 (.0030)	0.0187** (.0041)
SEN^2 /1000	-0.0112 (.1057)	-0.0049 (.1055)	0.0025 (.1057)	-0.2362* (.1236)
PREEXP•SEN/1000				-0.4778** (.1950)
OJT		0.1013** (.0172)		0.1023** (.0172)
OJTDAYS			0.0119** (.0019)	
$OJTDAYS^2$ /1000			-0.1509** (.0231)	
MOVE				-0.0437* (.0262)
Log-Likelihood	-1449.9	-1429.0	-1431.1	-1427.2

1 For notes, see Table 1. The estimates of the other explanatory variables are close to their counterparts in Table 2 and are therefore not reported in the table. The estimations also include 24 industry sector controls, whereby employment in manufacturing of metal products (INDU38) is used as the reference category.

* Denotes significant estimate at a 5 % level.

** Denotes significant estimate at a 1 % level.

Table 4. Estimation results for various specifications of the seniority earnings equation estimated for women.[1] The dependent variable is log hourly earnings.

Variable	(1)	(2)	(3)	(4)
LOWER VOCATIONAL	0.0089 (.0227)	0.0076 (.0227)	0.0076 (.0226)	0.0109 (.0227)
UPPER VOCATIONAL	0.1731** (.0248)	0.1678** (.0249)	0.1651** (.0248)	0.1701** (.0250)
SHORT NON-UNIV	0.3622** (.0355)	0.3519** (.0357)	0.3481** (.0352)	0.3560** (.0357)
UNDER-GRADUATE	0.5194** (.0478)	0.5091** (.0481)	0.5003** (.0486)	0.5148** (.0480)
GRADUATE	0.6063** (.0431)	0.5951** (.0432)	0.5852** (.0430)	0.6016** (.0432)
EXP	0.0090** (.0038)	0.0087* (.0038)	0.0085* (.0038)	
$EXP^2/1000$	-0.1428 (.0990)	-0.1388 (.0990)	-0.1331 (.0988)	
PREEXP				0.0111** (.0043)
$PREEXP^2/1000$				-0.1893 (.1305)
SEN	0.0067* (.0036)	0.0066* (.0036)	0.0066* (.0036)	0.0155** (.0046)
$SEN^2/1000$	0.0007 (.1433)	0.0043 (.1439)	0.0054 (.1455)	-0.1437 (.1528)
PREEXP•SEN/1000				-0.2862 (.2277)
OJT		0.0328* (.0194)		0.0323* (.0194)
OJTDAYS			0.0087* (.0042)	
$OJTDAYS^2/1000$			-0.1299 (.1868)	
MOVE				-0.0539** (.0250)
Log-Likelihood	-2004.3	-2002.1	-1997.6	-1999.4

1 For notes, see Table 1. The estimates of the other explanatory variables are close to their counterparts in Table 2 and are therefore not reported in the table. The estimations also include 24 industry sector controls with manufacturing of metal products (INDU38) used as the reference category.

* Denotes significant estimate at a 5 % level.

** Denotes significant estimate at a 1 % level.

As shown in the tables, the coefficient on the interaction term, PREEXP•SEN, has a negative sign throughout but is significantly different from zero for male employees only, indicating that their initial investment ratio at the current employer is on average a decreasing function of the experience acquired from previous jobs. The strong, negative relation between previous experience and initial training investments in the current job observed for male employees simultaneously supports the hypothesis that jobs started at higher ages involve less training mainly because of the shorter remaining payoff period. No such association seems to exist for female employees.

There is also a possibility to test whether the rate of return to human investments undertaken at the current job exceeds the rate of return to training received in previous jobs, as would be expected if the training is specific and therefore non-transferable across jobs. Following Holmlund (1984), such specificity of accumulated human capital requires two conditions to be fulfilled. First, the coefficient of the seniority variable has to exceed the coefficient for previous experience. Based on the absolute size of the parameter estimate, this seems to roughly hold for both genders.

Secondly, the absolute value of the coefficient on seniority squared has to exceed the absolute value of the coefficient on previous experience squared. The estimates obtained on the squared terms do not seem to fulfil this condition. Hence, if we are inclined to accept the simplifying assumption that job mobility does not affect to any large extent the individual's investment behaviour over the life cycle, the estimates on the experience variables suggest that the rate of return differential between training inside and outside the current job is small or negligible for both genders. Put differently, skills acquired on the job generally seem to be highly transferable, indicating that job changes do not tend to reduce significantly the value of the experience acquired at work.

Finally, the coefficient on the turnover variable (MOVE) suggests that for both genders, mobility on the labour market tends to shift the earnings profile downwards by some 4 to 5 per cent on average. This finding may also be linked to the question of the specificity of skills acquired through formal OJT. Unfortunately, the survey data comprise no information on that issue. But in view of the fact that the reported training refers to "any professional or trade union training provided within the the framework of a structured course that is partly or wholly sponsored by the employer", it is definitely not to be characterized as entirely employer- or firm-specific. Instead, comparison of the absolute magnitudes of the coefficients for the MOVE and OJT variables suggests that part of the training can be classified as industry-specific and/or occupation-specific and is consequently lost only when the employee moves to another industrial sector or changes occupations.

It may, though, be questioned whether it is appropriate to treat participation in formal OJT programmes as an exogenous variable, that is to assume that the trainees are selected in a random manner. Suppose that those who went through these programmes would, had they not received OJT, nonetheless have had higher earnings than their non-participating counterparts. In that case, an exogenous OJT variable would give an upward-biased estimate of the actual earnings effect of formal OJT.[14] There is, however, also a possibility that the estimated on-the-job training coefficients understate the actual earnings effect. This would occur if the full return to training is not received during the training (survey) year, but is spread out over several years.

4. COMPARISON WITH PREVIOUS EVIDENCE FOR FINLAND

Evidence on the role of human capital in explaining observed earnings differentials in Finland has been documented mainly in the following studies, all using the human capital approach: Lilja & Vartia (1980), Ingberg (1987), Nygård (1989a,1989b), Brunila (1990), Eriksson (1992), and Vainiomäki & Laaksonen (1992). This section briefly presents the basic findings of these contributions to capturing earnings effects of human capital investment. Because of fundamental differences, however, in the data sets used and in the definitions of key variables, direct comparisons with the results reported in the present chapter cannot be undertaken.

The study by Lilja & Vartia (1980) focuses on examining the impact of schooling on income differences across households using Finnish Household Survey data for 1971. The dependent variable is the annual disposable income of a sample of 1000 households, while the schooling variable reflects the years in formal education of the head of the household. The empirical earnings equation is gradually supplemented with other characteristics of the head of the household (potential work experience, gender, industry affiliation) and of the household as a whole (state of activity, socioeconomic status, location of residence). The estimated schooling coefficient suggests that an additional year's schooling for the head of the household, ceteris paribus, increases the annual disposable income of the household by roughly 9 per cent when controlling for all the aforementioned background factors. The estimated earnings effect of potential work experience amounts to only 0.3 per cent a year. It is also noteworthy that the indicator for gender points to a relative income disadvantage of households headed by females of some 16 per cent. However, this effect is largely reduced when the size of the household is accounted for in the estimations.

Nygård (1989a) adopts a dynamic approach to illustrate how a number of background factors, including schooling, have influenced the income position of Finnish households. The data set is constructed by pooling micro-level data from the Finnish Household Surveys for 1971, 1976, and 1981. This gives a total of over 18900 households. The dependent variable is the relative pre-tax income of the household. The regression results suggest that households with the head of the household having completed primary or secondary education have improved their relative income position from 1971 to 1981 at the expense of households headed by a person with graduation from higher (tertiary) education. The coefficients of the age variable, in turn, imply a shift of the relative income peak towards higher ages; the estimated income peak in 1971 corresponds to an age of about 44 years and in 1981 to some 49 years. Nygård also finds that the relative income differences between households headed by females and males have declined significantly during the 10-year period under study.

The data set used by Ingberg (1987) comprises some 6300 labour force participants drawn from a database created through merging Labour Force Survey data for 1980 and income and labour force status variables from the Housing and Population Census of the same year. The dependent variable is annual taxable earnings, including income from farming and entrepreneurial income. The schooling variable measures years of formal education and is constructed by assigning a certain number of years of schooling to the different levels of education completed by each sample individual. The regression results obtained from estimating the simple Mincerian schooling model for different subsamples of the data as well as for different overtaking sets point to an average rate of return on schooling in the interval of 9 to 12 per cent.

In a second study, Nygård (1989b) illustrates life-cycle aspects and the implications of income mobility by looking at a "representative" income recipient and his lifetime income streams from alternative careers. In brief, the adopted framework focuses on the lifetime incomes of an 18-year-old man, who after having completed secondary school considers whether to enter the labour market or to invest in further education in order to qualify for a higher-paying job. His decision set is restricted to three alternative income careers as a Finnish civil servant, and his final choice of appointment is taken to be definitive. The lifetime payoffs of the optional career choices are calculated based on the situation of 1985, which is, moreover, assumed to remain in effect throughout the person's lifetime. Based on these desk calculations, Nygård shows that "although schooling is expected to pay off by generating higher salaries, the lifetime payoff crucially depends on the spell of further education, with the associated low (zero) income, and on the anticipated discount rate" (p. 63).

Brunila (1990), Eriksson (1992) and Vainiomäki & Laaksonen (1992), finally, all use samples from the Finnish Population Censuses. In particular, Brunila (1990) estimates full sample as well as gender-specific earnings functions from census data for 1975 and 1985 in an attempt to explain the observed dispersion in annual before-tax earnings of some 11000 employees having worked full time during the whole year. Eriksson (1992) estimates earnings equations using a longitudinal data set which is constructed by following a representative sample of the Finnish population aged 16 to 50 (in 1970) over the years 1971, 1975, 1980, and 1985. The final estimating data consist of 1754 individuals, and the dependent variable is monthly earnings. Vainiomäki & Laaksonen (1992) estimate both wage-level and first-differenced equations for a sample of private-sector employees using census data for 1975, 1980, and 1985. Their cross-sectional analysis focuses on the monthly earnings of over 17000 individuals in each sample year.

In all three studies, as in the present study, the schooling variable refers to the single highest level of education completed by each sample individual. A common finding is that there has been a clear decline in educational returns in the 1980s as compared to the 1970s and that, as a consequence, also the earnings differentials across educational levels have narrowed. The overall impression is that the average returns to educational levels reported in this chapter are well in conformity with the evidence for 1985 reported in these three studies.

Brunila (1990) finds for both genders an earnings effect vis-à-vis age of 0.6 per cent a year in 1975 and 0.8 per cent a year in 1985. The coefficients on the potential work experience variables reported by Eriksson (1992) point to a clear shift of the peak in monthly earnings; the estimated peak in 1971 was obtained after some 22 years in the labour market and in 1985 only after about 36 year in the labour force. Since Vainiomäki & Laaksonen (1992) use indicators for age groups, their estimates are not commented on. Obviously the different definitions of experience variables explain a major part of the highly varying earnings effects of experience estimated for the Finnish labour market.

Finally, all three studies report a decline in the gender effect on earnings from some 45 per cent in the early 1970s to roughly 30 per cent by 1985. The much lower estimate reported in the present chapter is evidently mainly explained by the broader set of control variables used in the estimations, and the use of hourly earnings instead of annual, monthly or weekly earnings as the dependent variable.

5. CONCLUDING REMARKS

Generally speaking, the Finnish estimates on human capital variables point, when compared with estimates obtained for other industrialized countries, to an "average-level" direct rate of return to formal schooling and to a fairly low increase in earnings per year of total work experience and of employment with the same employer, i.e. seniority. However, comparisons should be made with great caution not least because of fundamental differences in the populations underlying the survey samples as well as in definitions of variables. In particular, the estimated earnings effects reported in this chapter are gross-of-taxes and do not account for the costs of schooling and interpersonal ability differences.

But the returns to education estimated for Finland may, nevertheless, be regarded as remarkably high in view of the fairly low rate of return to education that has generally been found to characterize the Nordic countries. In fact, also when a Nordic classification of education is used instead of the Finnish one, the estimated overall return to education is still significantly higher in Finland than in the other Nordic countries (Asplund et al., 1993). Possible explanations of this finding are a stronger productivity-fostering effect of education in Finland and/or more severe shortages of skilled manpower caused by a slower flow of educated persons into the Finnish labour market. But at the same time, the average increase in earnings per year of work experience turns out to be relatively low in Finland also in a Nordic perspective. This, in turn, may be interpreted as indicative of insufficient possibilities of labour market training and/or other productivity improving measures. This important aspect certainly requires further research.

There also seem to be noteworthy differences in the rate of return to human capital between the two genders. Both the return to schooling and the increase in earnings from each year of general labour market experience are clearly lower for female employees. Another notable difference between genders is the moderate but still more important role of seniority in the determination of female earnings. But the estimation results also seem to suggest that the earnings effect of seniority for women is due mainly to a good employee-employer relationship and not to the accumulation of specific skills. For male employees, on the other hand, growth in productivity with general experience tends to be the dominant explanation for the overall effect of experience on earnings, accompanied with a strong, positive effect of participation in formal training programmes. This lends clear support to the human capital theory.

But in assessing the reported estimation results, due allowance should be made for the fact that the estimations are based on cross-sectional data for one year only. In other words, the estimated coefficients are to be interpreted as short-term estimates. As pointed out by Willis (1986), the actual earnings growth of members of cohorts of new labour force entrants may be quite different from that indicated by cross-sectional estimates if there have been clear changes in the rate of productivity growth or in the earnings structure by age and education.

Unfortunately, the stability of the reported estimates cannot be examined because the labour force survey data available for the years prior to 1987 do not comprise income data. Previously published evidence for Finland reviewed in Section 4 above suggests, however, that the return to formal education has been remarkably stable during the 1980s, after a clear decline in the 1970s. Moreover, empirical results reported in Asplund et al. (1993) point to a similar development in the other Nordic countries.

Footnotes:

1. The human capital theory of wage determination is reviewed in Chapter II of this study.

2. It has occasionally been argued that the widely used quadratic specification of the human capital earnings function tends to underestimate earnings growth for young employees (Welch, 1979). In his review, Rosen (1992), in turn, notes that "there are recent signs that higher order polynomials in experience are necessary to fit the 1980s data" (p. 162). Following Murphy & Welch (1990), also a quartic specification for the experience-earnings profile was tried, but this approach did not yield reasonable estimation results.

3. As pointed out by Maddala (1983), it would be important not only to test for the existence of sample selection bias but to also analyse the actual earnings effects of self-selection, i.e. the effects for the alternative, unobserved choice. The stumbling-block, however, is that the data rarely allow this.

4. It is to be noted that in interpreting the coefficients of included explanatory variables, continuous variables provide directly the log earnings effect of, say, an additional year of human capital accumulation, whereas dummy estimates indicate the differential effect of being in a particular group as compared with the reference group. Moreover, only if the percentage change is small enough will the estimated coefficient measure the actual percentage change in earnings from having/acquiring the characteristic for which the variable stands, other things being unchanged. In the case of larger percentage changes, the actual earnings effect is given by the antilog of the given parameter estimate, i.e. $(e^{\alpha} - 1)*100$. In fact, Halvorsen & Palmquist (1980) suggest that the percentage differential for indicator variables is calculated in this way for semilogarithmic equations. This approach is also adopted in the present study.

5. Although there seem to be no pecuniary advantages in acquiring a lower vocational degree, completion of that degree may nonetheless stand out as a good in itself or lead to a job with greater job satisfaction.

6. The average rate of return to an additional year of schooling beyond the completed basic education - other relevant factors being held unchanged - is estimated at some 9 per cent for men and at slightly more than 8 per cent for women, giving an average of close to 9 per cent for all employees. Hence, the marginal return to above-primary education is on average nearly 1 percentage point lower for women than for men (significant difference at a 5 % level). Because of the fairly high estimated returns to education, attempts were made to capture, by means of the single cross-section of individuals available, possible age-related differences in the returns due not least to variation in the supply of educated labour over the past decades. The schooling coefficients estimated for different cohorts revealed, however, no significant differences between the point estimates relative to the standard errors.

7. The cumulative earnings effect of work experience measures total percentage additions to earnings due to experience from zero experience to given years of experience, and is calculated as the antilog of $(\alpha_1 EXP - \alpha_2 EXP^2)$.

8. The marriage premium estimated in earnings equations is often interpreted as representing unobserved human capital (see e.g. Becker (1981,1985), Kenny (1983), Nakosteen

& Zimmer (1987), and Korenman & Neumark (1991)). Another interpretation (see Becker) is assortative matching (of spouses).

9. For a more detailed discussion of the effects of children on male and female earnings, see e.g. Löfström (1992).

10. There are, however, also more recent, competing theories of compensation and productivity offering alternative explanations for the empirically observed positive earnings effect of seniority. See the survey in e.g. Parson (1986).

11. The full sample linear seniority variable has a coefficient of 0.0052 with a standard error of 0.0009 when seniority squared is excluded. The corresponding female coefficient amounts to 0.0068 with a standard error of 0.0016, whereas the corresponding male coefficient is 0.0039 with a standard error of 0.0012. Attempts were also made to capture early-seniority effects on earnings by adding to the seniority earnings equation a dummy variable to indicate the employee's first year with the current employer. For male employees, this term has a coefficient of 0.0476 with a standard error of 0.0243. For female employees, the corresponding coefficient is 0.1385 with a standard error of 0.0245. However, the interpretation of the estimates is unclear because they are based on annual earnings data that may combine earnings associated with the current employment relationship with earnings from employment with previous employers during that same year. Hence, the estimates evidently reflect some combination of mobility or labour market entry effects and seniority effects. According to Brown (1989), they might also capture non-quadratic earnings effects that do not fit into a quadratic specification of seniority.

12. For a brief review of recent empirical evidence, see e.g. Chapter II of this study and the literature referred to therein.

13. The theoretical framework underlying this approach is outlined in Section 3 of Chapter II of this study.

14. If the data of the present study were used in order to treat OJT as endogenous, the training effect would not be identified; the same set of explanatory variables evidently affects both the participation in training programmes and the earnings equation.

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APPENDIX

Table A. Summary of definitions of included variables

Variable	Definition
EARN	Average hourly earnings (in FIM) calculated from the before-tax annual wage and salary income recorded in the tax rolls and an estimated amount of annual normal working hours.
ln EARN	Natural logarithm of EARN.
BASIC	Indicator for persons with basic education only (about 9 years or less).
LOWER VOCATIONAL	Indicator for persons with completed lower-level of upper secondary education (about 10-11 years).
UPPER VOCATIONAL	Indicator for persons with completed upper-level of upper secondary education (about 12 years).
SHORT NON-UNIV	Indicator for persons with completed lowest level of higher education (about 13-14 years).
UNDERGRADUATE	Indicator for persons with completed undergraduate university education (about 15 years).
GRADUATE	Indicator for persons with completed graduate university education (more than 16 years).
EXP	Self-reported total years of labour market experience.
SEN	Seniority, i.e. self-reported years with the present employer.
PREEXP	Years of experience with previous employers calculated as PREEXP = EXP - SEN.
OJT	Indicator for persons who self-reportedly have received employer-sponsored formal on-the-job-training during the previous twelve months.
OJTDAYS	Self-reported total number of days in formal on-the-job training during the previous twelve months.
MOVE	Indicator for job mobility proxied by MOVE = 1 if EXP > SEN.
WOM, MALE	Indicators for gender.
AGE	Physical age of the individual.
MARRIED	Indicator for married persons and singles living together.
$\text{CHILD}^{0\text{-}17}$	Indicator for children aged 0 to 17 living at home.
$\text{CHILD}^{0\text{-}6}$	Indicator for children aged 0 to 6 living at home.
$\text{CHILD}^{7\text{-}17}$	Indicator for children aged 7 to 17 living at home.
SOUTH	Indicator for residence in the southern parts of Finland (Uudenmaan province, Turun- ja Porin province, Ahvenanmaa, Hämeen province, and Kymen province).
CAPITAL	Indicator for residence within the capital region (the Helsinki area).

TEMPEMPL	Indicator for persons who self-reportedly are in temporary employment.
PART-TIME	Indicator for persons who self-reportedly are in part-time employment.
PIECE-RATE	Indicator for persons who are not being paid on an hourly, weekly, or monthly basis.
NODAYWORK	Indicator for persons who are not in regular day-time work.
UNEMPL	Indicator for persons who have been unemployed or temporarily laid off during the previous twelve months.
UNION	Indicator for unionized employees.
INDU11-13	Indicator for employment in agriculture, forestry or fishing.
INDU31	Indicator for employment in food manufacturing.
INDU32	Indicator for employment in textile industries.
INDU33	Indicator for employment in manufacturing of wood products.
INDU34	Indicator for employment in manufacturing of paper products.
INDU35	Indicator for employment in manufacturing of chemicals.
INDU36	Indicator for employment in manufacturing of non-metallic products.
INDU37	Indicator for employment in basic metal industries.
INDU38	Indicator for employment in manufacturing of metal products.
INDU20/39	Indicator for employment in other manufacturing, including mining.
INDU40	Indicator for employment in electricity.
INDU50	Indicator for employment in construction.
INDU61	Indicator for employment in wholesale trade.
INDU62	Indicator for employment in retail trade.
INDU63	Indicator for employment in restaurants.
INDU71	Indicator for employment in transport.
INDU72	Indicator for employment in communication.
INDU81	Indicator for employment in financing.
INDU82	Indicator for employment in insurance.
INDU83	Indicator for employment in real estate.
INDU91	Indicator for employment in public administration.
INDU92	Indicator for employment in sanitary services.
INDU93	Indicator for employment in social services.
INDU94	Indicator for employment in recreational and cultural services.
INDU95	Indicator for employment in personal and household services.

Table B. Sample mean characteristics of all employees retained in the actual estimating data and separately for male and female employees

Variable	All obs. Mean	Women Mean	Men Mean
EARN	44.82	40.80	49.00
ln EARN	3.72	3.63	3.81
BASIC (1,0)	0.3605	0.3674	0.3532
LOWER VOCATIONAL (1,0)	0.3083	0.2823	0.3354
UPPER VOCATIONAL (1,0)	0.2000	0.2174	0.1819
SHORT NON-UNIV (1,0)	0.0565	0.0604	0.0524
UNDERGRADUATE (1,0)	0.0257	0.0352	0.0157
GRADUATE (1,0)	0.0490	0.0372	0.0613
EXP	16.78	16.14	17.46
EXP^2	388.85	356.83	422.19
SEN	8.92	8.60	9.26
SEN^2	149.11	139.40	159.34
PREEXP	7.85	7.51	8.21
$PREEXP^2$	123.09	110.99	135.84
OJT (1,0)	0.3671	0.3770	0.3569
OJTDAYS*	6.60	5.72	7.57
MOVE (1,0)	0.8614	0.8556	0.8676
AGE	37.17	37.72	36.60
WOM (1,0)	0.5101	-	-
MARRIED (1,0)	0.7366	0.7313	0.7421
$CHILD^{0-17}$ (1,0)	0.4875	0.4947	0.4801
$CHILD^{0-6}$ (1,0)	0.2334	0.2094	0.2584
$CHILD^{7-17}$ (1,0)	0.3499	0.3694	0.3297
SOUTH (1,0)	0.6644	0.6784	0.6499
CAPITAL (1,0)	0.1946	0.2074	0.1813
TEMPEMPL (1,0)	0.0973	0.1188	0.0749
PART-TIME (1,0)	0.0370	0.0609	0.0121
PIECE-RATE (1,0)	0.0901	0.0649	0.1164
NODAYWORK (1,0)	0.2401	0.2486	0.2311
UNEMPL (1,0)	0.1027	0.0981	0.1074
UNION (1,0)	0.7633	0.7957	0.7296
INDU11-13 (1,0)	0.0221	0.0096	0.0351
INDU31 (1,0)	0.0329	0.0357	0.0299
INDU32 (1,0)	0.0272	0.0433	0.0105
INDU33 (1,0)	0.0249	0.0161	0.0341
INDU34 (1,0)	0.0508	0.0367	0.0655
INDU35 (1,0)	0.0200	0.0116	0.0288
INDU36 (1,0)	0.0100	0.0035	0.0168
INDU37 (1,0)	0.0072	0.0020	0.0131
INDU38 (1,0)	0.0798	0.0393	0.1221
INDU20/39 (1,0)	0.0038	0.0025	0.0052
INDU40 (1,0)	0.0131	0.0055	0.0210
INDU50 (1,0)	0.0780	0.0146	0.1441
INDU61 (1,0)	0.0367	0.0287	0.0451
INDU62 (1,0)	0.0765	0.0946	0.0576
INDU63 (1,0)	0.0246	0.0393	0.0094
INDU71 (1,0)	0.0539	0.0272	0.0818
INDU72 (1,0)	0.0270	0.0226	0.0314
INDU81 (1,0)	0.0362	0.0589	0.0126
INDU82 (1,0)	0.0082	0.0086	0.0079
INDU83 (1,0)	0.0413	0.0398	0.0430
INDU91 (1,0)	0.0639	0.0694	0.0582
INDU92 (1,0)	0.0103	0.0121	0.0084
INDU93 (1,0)	0.2210	0.3468	0.0901
INDU94 (1,0)	0.0177	0.0242	0.0110
INDU95 (1,0)	0.0126	0.0080	0.0173
Number of obs.	3895	1987	1908

* Average number of days in formal on-the-job training courses for those who received training during the previous twelve months.

Table C. Maximum likelihood estimates of the selection (probit) equation explaining the probability of being in employment[1]

Variable	All obs.	Women	Men
CONSTANT	-5.9355^{**} (.5488)	-5.4558^{**} (.7620)	-6.7155^{**} (.8298)
AGE	0.3779^{**} (.0471)	0.3368^{**} (.0651)	0.4733^{**} (.0721)
AGE^2	-0.0058^{**} (.0012)	-0.0044^{**} (.0017)	-0.0086^{**} (.0019)
AGE^3 /1000	0.0127 (.0104)	0.0006 (.0143)	0.0378^{*} (.0163)
MARRIED	0.2880^{**} (.0489)	0.0838 (.0652)	0.5640^{**} (.0795)
$CHILD^{0\text{-}17}$	0.0097 (.0544)	-0.1839^{**} (.0686)	0.3419^{**} (.0930)
SOUTH	0.3834^{**} (.0393)	0.3983^{**} (.0526)	0.3532^{**} (.0611)
BASIC EDUCATION	-0.3140^{**} (.0423)	-0.3266^{**} (.0574)	-0.2931^{**} (.0649)
MALE	0.2345^{**} (.0410)	-	-
No. of obs.	6018	3193	2825
Prob(W=1), %***	89.5	88.5	89.2

1 Standard errors are given in parentheses below the estimates.
* Denotes significant estimate at a 5 % level.
** Denotes significant estimate at a 1 % level.
*** Percentage share of correctly predicted (probit) employment.

Table D. Regression results for the extended human capital earnings equation estimated jointly and by gender using OLS techniques.[1] The dependent variable is log hourly earnings.

Variable	All obs.	Women	Men
CONSTANT	3.4250** (.0292)	3.2767** (.0492)	3.3753** (.0342)
BASIC EDUCATION	0	0	0
LOWER VOCATIONAL	0.0632** (.0126)	0.0122 (.0184)	0.1026** (.0171)
UPPER VOCATIONAL	0.2315** (.0166)	0.1821** (.0241)	0.2626** (.0228)
SHORT NON-UNIV	0.4313** (.0239)	0.3686** (.0324)	0.4782** (.0353)
UNDERGRADUATE	0.5186** (.0297)	0.5234** (.0357)	0.4541** (.0543)
GRADUATE	0.6211** (.0274)	0.6079** (.0404)	0.6234** (.0359)
EXP	0.0161** (.0021)	0.0146** (.0030)	0.0176** (.0030)
$EXP^2/1000$	-0.2150** (.0496)	-0.2091** (.0676)	-0.2442** (.0695)
WOM	-0.1908** (.0113)		
MARRIED	0.0202* (.0120)	-0.0179 (.0157)	0.0478** (.0189)
$CHILD^{0-6}$	0.0138 (.0126)	0.0294 (.0207)	-0.0117 (.0156)
$CHILD^{7-17}$	0.0282** (.0105)	0.0021 (.0136)	0.0521** (.0162)
CAPITAL	0.1074** (.0144)	0.0906** (.0187)	0.1233** (.0223)
TEMPEMPL	0.0193 (.0246)	0.0638* (.0316)	-0.0680* (.0372)
PART-TIME	0.2711** (.0474)	0.2718** (.0496)	0.2119 (.1312)
PIECE-RATE	0.0594** (.0181)	0.0141 (.0327)	0.0878** (.0209)
NODAYWORK	0.0779** (.0128)	0.1327** (.0188)	0.0183 (.0173)
UNEMPL	-0.0566** (.0212)	-0.0280 (.0311)	-0.0705** (.0276)
UNION	-0.0141 (.0145)	-0.0269 (.0225)	-0.0029 (.0188)

Table D. (cont.)

Variable	All obs.	Women	Men
Industry sector indicators:			
INDU11 (agriculture)	-0.0963** (.0348)	0.0377 (.0635)	-0.1363** (.0409)
INDU31 (food manuf.)	-0.0475 (.0295)	-0.0240 (.0392)	-0.0281 (.0462)
INDU32 (textile)	-0.0847** (.0299)	-0.0496 (.0417)	0.0314 (.0474)
INDU33 (wood prod.)	-0.0992** (.0274)	-0.0109 (.0442)	-0.1181** (.0338)
INDU34 (paper prod.)	0.1739** (.0255)	0.1610** (.0387)	0.2110** (.0336)
INDU35 (chemicals)	0.0631 (.0410)	0.0281 (.0522)	0.0984* (.0511)
INDU36 (non-metallic)	-0.0220 (.0504)	-0.0369 (.0672)	-0.0093 (.0618)
INDU37*** (basic metal)	0.1553** (.0362)		0.1703** (.0419)
INDU38 (metal products)	0	0	0
INDU20/39**** (oth. manuf.)	0.1283* (.0692)	0.2330* (.1172)	0.1144 (.0904)
INDU40 (electricity)	0.0845** (.0338)	0.0264 (.0479)	0.0916* (.0408)
INDU50 (construction)	0.0162 (.0220)	0.0182 (.0498)	0.0271 (.0242)
INDU61 (wholesale trade)	0.0406 (.0312)	0.0720 (.0458)	0.0227 (.0427)
INDU62 (retail trade)	-0.0851** (.0258)	-0.0567 (.0389)	-0.0900** (.0378)
INDU63 (restaurants)	-0.0132 (.0331)	0.0104 (.0449)	-0.0329 (.0518)
INDU71 (transport)	-0.0127 (.0244)	0.0958* (.0555)	-0.0170 (.0264)
INDU72 (communication)	0.0250 (.0257)	0.1013** (.0412)	0.0138 (.0326)
INDU81 (financing)	0.1373** (.0306)	0.1715** (.0401)	0.2218** (.0683)
INDU82 (insurance)	0.1119** (.0416)	0.1364* (.0713)	0.1532** (.0356)
INDU83 (real estate)	0.0042 (.0286)	0.0304 (.0470)	0.0185 (.0345)

Table D. (cont.)

Variable	All obs.	Women	Men
INDU91 (public adm.)	0.0066 (.0216)	0.0671* (.0328)	-0.0058 (.0327)
INDU92 (sanitary services)	-0.1310* (.0656)	-0.0541 (.0900)	-0.2029** (.0784)
INDU93 (social services)	-0.0133 (.0202)	0.0275 (.0318)	-0.0323 (.0325)
INDU94 (cultural services)	0.0691 (.0567)	0.1018 (.0721)	0.0323 (.0823)
INDU95 (personal services)	-0.1157** (.0316)	-0.0396 (.0695)	-0.1599** (.0327)
R^2 adj. SEE	0.3672 0.3032	0.3019 0.3056	0.3846 0.2925
F-statistic Number of obs.	54.79 3895	22.48 1987	30.07 1908

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1 Standard errors are given in parentheses below the estimates and are adjusted for heteroscedasticity according to White (1980). A simple Chow test suggests that the hypothesis of the parameter estimates being equal for male and female employees can be rejected at a 0.1 % level.

* Denotes significant estimate at a 5 % level.

** Denotes significant estimate at a 1 % level.

*** The four observations on females in basic metal industries are included in the reference category INDU38.

**** Includes employment in mining and quarrying.

CHAPTER IV

OCCUPATIONAL EARNINGS DIFFERENTIALS IN FINLAND

Empirical evidence from a cross section of individuals

ABSTRACT:

The primary purpose of the present chapter is to analyse the importance of occupational status in explaining earnings dispersion in Finland. This is done in two steps. First, human capital earnings functions supplemented with occupation controls are estimated in order to exhibit the effect of occupation on the general level of earnings and the interaction between human capital and occupation. The aim then is to see to what extent the coefficients estimated for the occupation indicator variables reflect an indirect earnings effect of formal schooling arising from the influence of vocationally differentiated education on the individuals' occupational attainment. In the second step, this question is addressed by estimating occupation-specific earnings functions, whereby correction for the potential effects of selection bias arising from occupational choice is made by adding information obtained from estimating occupational attainment functions of the multinomial logit form.

The empirical findings suggest that the effect of formal education on earnings is not necessarily weakened by the role that occupation plays. Instead, a notable part of the earnings effect of education seems to be mediated by the employee's position in the occupational hierarchy. The strong indirect earnings effect of schooling points, in turn, to a fairly rigid occupational earnings structure, especially among male employees. A cautious generalization of the results implies that the inclusion of both educational and occupational controls in the earnings equation might provide useful insights about the functioning of the Finnish labour market.

1. INTRODUCTION*

The usual approach within the human capital framework mostly overlooks the potential role of occupations in explaining observed interpersonal earnings differentials; the pay in an occupation is thought to be determined primarily by the investment in human capital that an individual has to make to enter it. Drawing on the work of Willis (1986), de Beyer & Knight (1989) derive and test a theory of occupation-specific productivity and earnings consistent with the competitive framework of the human capital theory. In particular, their theoretical model interprets occupational attainment as the outcome of a nexus of relationships among occupation, ability, education, training and productivity. These interactions are shown to generate a positive hierarchial sorting of individuals into jobs even under the assumption of perfectly competitive factor markets.

However, the inclusion of a set of occupation controls into the earnings function treats the occupational status of an individual as given or, using the terminology of Brown et al. (1980), as in some sense justified. If the allocation of employees to different occupational categories can be expected to be the outcome of a selection process rather than a random drawing, then the omission of any potential factors influencing the individual's choice of or access to a given occupation may give rise to problems of selectivity bias in the estimations.

One way of approaching the obvious endogeneity of occupational attachment would be to drop the occupation controls and consider a reduced form earnings equation which combines determinants of occupational attainment and of earnings. More information is, however, gained if the two processes are kept separate, i.e. if the estimation of occupation-specific earnings equations is combined with the estimation of occupational attainment equations in order to correct for the potential presence of selectivity bias arising from occupational choice. This latter approach, which has recently been used by Reilly (1991), is preferred also in the present study. The selection

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bias problem is addressed by implementing a general technique for the estimation of multivariate choice models proposed by Lee (1983) and first applied by Trost & Lee (1984).

The adopted approach can, however, be criticized for overlooking the fact that the relation between occupational choice and earnings determination is necessarily simultaneous; the choice of occupation affects lifetime earnings and expected future earnings influence occupational choice (e.g. Dolton et al., 1989). Because the available data only comprise information on a single cross section of individuals, the obvious simultaneity of decisions cannot be accounted for in the analysis.

Nevertheless, the estimation results obtained from estimating both occupational attachment and earnings equations offer a possibility to examine in more detail the role of occupation in the determination of earnings. Following de Beyer & Knight (1989), an exercise is undertaken where the direct and indirect (through occupational attainment) earnings effects of education are calculated and compared with the earnings effects estimated for schooling in earnings equations omitting occupation.

The chapter is organized as follows. Section 2 presents the empirical specifications of the estimated earnings functions, the estimation methods employed and the data used. Section 3 reports the estimated effects of occupation on the overall level of male and female earnings, while Section 4 analyses the influence of human capital on earnings within occupational categories and the interaction between formal education and occupational status. Concluding remarks are given in Section 5. A simple attempt to measure the extent of occupational segregation in the Finnish labour market using the obtained estimation results is reported in Appendix I.

2. MODEL SPECIFICATIONS AND DATA

The empirical analysis is based on an extended version of the conventional human capital earnings function postulated by Mincer (1974). In particular, the natural logarithm of earnings of the i^{th} individual ($\ln EARN_i$) is explained in terms of a vector (X_i) comprising human capital-related as well as other relevant personal and job characteristics:

$$(1) \qquad lnEARN_i = X_i\alpha + \varepsilon_i , \qquad \varepsilon_i \sim N(0, \sigma^2_\varepsilon) \quad i = 1,..., N$$

where α is a vector of parameters to be estimated and ε_i is a disturbance term.

Under the usual least squares assumptions, the disturbance term in the earnings model in equation (1) is randomly distributed among the population, with an expected value equal to zero. However, in the survey data used in the present study, the sample individuals recorded as being employed are not randomly selected from the entire population. Instead they represent persons who were employed during the week of the questionnaire, excluding all individuals who, for one reason or the other, were not employed at that particular time. Given that this produces a non-negligible sample selection bias, estimation of earnings equations for employees using ordinary least squares techniques results in inconsistent parameter estimates (e.g. Maddala, 1983).

Adjustment for potential sample selectivity bias influencing the estimation results is made by estimating the earnings function in equation (1) in combination with a selection function of the probit type explaining the probability of the i^{th} sample individual being employed. The selection criterion in the resulting two-equation model, classified as a "Type 2" Tobit model by Amemiya (1984), has the following general form

$$(2) \qquad W_i^* = Y_i\beta + \mu_i$$

where Y_i is a vector of explanatory variables, β is a vector of unknown parameters, and μ_i is a disturbance term that in the case of selectivity bias correlates with the residual (ε_i) in the earnings equation. The dependent variable (W_i^*) in the selection equation is unobservable, but it has a dichotomous observable realization W_i (employed or not) which is related to W_i^* as follows:

$$W_i = 1 \qquad iff \quad W_i^* > 0$$

$$W_i = 0 \qquad otherwise .$$

Accordingly, the dependent variable (lnEARN_i) in the earnings regression is not observed unless $W_i^* > 0$, implying that the observed sample of EARN is censored. The conditional expectation of the earnings equation may then be written as

$$(3) \qquad E(lnEARN_i \mid W_i = 1) = X_i\alpha + E(\varepsilon_i \mid W_i = 1)$$

$$= X_i\alpha + E(\varepsilon_i \mid \mu_i > -Y_i\beta)\ .$$

By assuming that ε_i and μ_i follow a bivariate normal distribution $N(0,0,\sigma_\varepsilon^2,1,\rho_{\varepsilon\mu})$ with zero means, σ_ε^2 respective unit variance, and correlation coefficient $\rho_{\varepsilon\mu}$, a standard sample selectivity bias correction of the earnings equation can be performed in the following manner

$$(4) \qquad E(lnEARN_i \mid W_i = 1) = X_i\alpha + \rho_{\varepsilon\mu}\sigma_\varepsilon \frac{\varphi(Y_i\beta)}{\Phi(Y_i\beta)} = X_i\alpha + \rho_{\varepsilon\mu}\sigma_\varepsilon\lambda\ ,$$

where σ_ε is the standard deviation of the disturbance term in the earnings equation and $\varphi(\cdot)$ and $\Phi(\cdot)$ are, respectively, the density function and the distribution function of the standard normal. Various empirical specifications of the earnings model in equation (4) are estimated with the LIMDEP program using maximum likelihood estimation of the procedure discussed in Heckman (1979) and Greene (1981). More exactly, in order to obtain both consistent and efficient estimates, equations (1) and (2) are estimated jointly, whereby the final values from the two-stage Heckman procedure are used as starting-values for the maximum likelihood method of estimating α, β, σ_ε and $\rho_{\varepsilon\mu}$.

The probability of being employed is explained in terms of a set of personal characteristics encompassing age and indicators for educational level, marital status, family size, and location of residence. The observed earnings variance among male and female employees, in turn, is assumed to be dependent on the employees' formal education, years of labour market experience, marital status, family size, location of residence, employment status, working conditions, union membership, and industry affiliation. Apart from these explanatory variables, the earnings model is further supplemented with a set of occupation indicators in order to examine the interaction effects of the individuals' position in the occupational structure.

It may be questioned, though, whether it is appropriate to treat the occupational status of an individual as exogenously given, i.e. to ignore any potential factors that may influence the individual's choice of or access to a given occupation.[1] One way of approaching this endogeneity problem would be to drop the occupation controls and consider a reduced form earnings equation which combines determinants of occupational attachment and of earnings or, more formally, replaces the occupation controls by their determinants in occupational attainment equations.

This approach disregards, however, the fact that occupational differences may occur not only in the level of earnings but also in the returns to human capital as well as to other individual characteristics. More information is thus gained by keeping the two processes separate; that is, earnings functions are estimated for relevant occupational categories, whereby the potential presence of selection bias arising from occupational choice is addressed by supplementing the occupation-specific earnings functions with the estimation of occupational attainment functions.

Following Lee (1983), this alternative approach, involving multiple choice and censored dependent variables, can be formulated in terms of a polychotomous choice model with J mutually exclusive occupational categories and J earnings equations:

$$(5) \qquad lnEARN_{ij} = Z_{ij}\gamma_j + \zeta_{ij}\,, \qquad \zeta_{ij} \sim N(0, \sigma_j^2)$$

$$(6) \qquad OCC^*_{ij} = V_i\theta_j + \eta_{ij}\,, \qquad i = 1,...,N \qquad j = 1,...,J$$

where Z_{ij} and V_i are vectors of explanatory variables, γ_j and θ_j are vectors of unknown parameters, and ζ_{ij} and η_{ij} are disturbance terms. The occupational earnings function in equation (5) will be affected by selectivity bias if the disturbances in equations (5) and (6) are correlated.

The dependent variable ($lnEARN_{ij}$) in the occupation-specific earnings equation is observed only if occupational category j is chosen. This choice is assumed to be the outcome of an optimization process where the individual compares the maximum utility attainable given each occupational alternative and selects that alternative which provides the highest present value of net benefits. The utility maximization process is thought to be captured by the occupational indicator function

$$(7) \qquad OCC_i = j \qquad \textit{iff} \;\; OCC^*_{ij} > \max OCC^*_{ik}\,, \qquad k = 1,\ldots,J \qquad k \neq j$$

Following Lee (1983), the choice of the j[th] alternative in equation (7) can be reformulated as a binary decision, i.e.

$$(8) \qquad OCC_i = j \qquad \textit{iff} \;\; V_i\theta_j > \psi_{ij}\,,$$

where ψ_{ij} is the residual for each individual and occupational category and is defined as

$$(9) \qquad \psi_{ij} = \max \;\; OCC^*_{ik} - \eta_{ij}\,, \qquad k = 1,\ldots,J \qquad k \neq j$$

Assuming that the residuals (η_{ij}) of the utility function in equation (6) are independently and identically distributed with the Type 1 extreme value distribution[2], the probability that occupational category j will be chosen can be represented by a multinomial logit model[3]

$$(10) \qquad Prob(\psi_{ij} < V_i\theta_j) = Prob(OCC_i = j) = \frac{\exp\,(V_i\theta_j)}{1 + \sum_{k=1}^{J} \exp\,(V_i\theta_k)}\,.$$

Only the parameters of the J-1 investigated occupational categories can be identified, which requires a normalization $\Sigma\theta_J=0$ to be imposed in the estimations.[4] The earnings equation conditional on category j being chosen may then be written as

$$(11) \qquad E(lnEARN_{ij} \mid OCC_i = j) = Z_{ij}\gamma_j + E(\zeta_{ij} \mid OCC_i = j)$$

$$= Z_{ij}\gamma_j + E(\zeta_{ij} \mid \psi_{ij} < V_i\theta_j)\,.$$

Given that ζ_{ij} and ψ_{ij} follow a bivariate normal distribution, a two-step estimation procedure similar to that postulated by Heckman (1979) can be used in order to correct the occupation-specific earnings functions for the potential effects of selectivity bias arising from occupational choice. Following Lee (1983), the ψ_{ij} residuals are transformed into standard normal random variables and a modified earnings equation conditional on occupation category j being chosen is derived

$$(12) \qquad E(lnEARN_{ij} \mid OCC_i = j) = Z_{ij}\gamma_j - \rho_j\sigma_j \frac{\varphi[F_j(V_i\theta_j)]}{\Phi[F_j(V_i\theta_j)]} = Z_{ij}\gamma_j - \rho_j\sigma_j\lambda_j ,$$

where F(·) denotes the probability distribution function and the other terms are defined in line with their counterparts in equation (4) above. Various empirical specifications of the occupational earnings model in equation (12) are estimated with the LIMDEP program using the multinomial logit-OLS two-stage estimator of Lee (1983). More exactly, the multinomial probability function in equation (10) is estimated by maximum likelihood and the obtained information is used to compute λ_j, i.e. the term controlling for the potential effects of selectivity bias. Consistent estimates of γ_j and $\Omega_j = \rho_j\sigma_j$ are then obtained by ordinary least squares regression of $\ln EARN_{ij}$ on Z_{ij} and $\hat{\lambda}_j$:

$$(13) \qquad lnEARN_{ij} = Z_{ij}\gamma_j + \Omega_j\hat{\lambda}_j + \tau_{ij} ,$$

where $E(\tau_{ij} \mid OCC_i{=}j) = 0$ and $E(\tau_{ij}^2 \mid OCC_i{=}j) \neq$ constant (see e.g. Trost & Lee, 1984). The standard errors are corrected using the heteroscedasticity-consistent estimator suggested by White (1980).

The probability of a person adopting a given occupation is taken to depend on the individual's accumulated human capital, family responsibilities, employment and working condition preferences as well as on regional variations in occupational structures. Following Gyourko & Tracy (1988), age is not included as an explanatory variable, the underlying assumption being that there are no systematic shifts of employees between occupational social status categories as they grow older. A lack of data, in turn, does not enable the inclusion of social background variables, which have generally been found also to affect the individual's choice of occupation (e.g. Gabriel et al., 1990). The earnings within each occupational social status category are explained in terms of the same broad set of variables used in explaining overall earnings variance.

The earnings models outlined above are estimated using cross-sectional micro-level data from the Labour Force Survey for 1987 conducted by Statistics Finland. A strong advantage of the data set is that it comprises information of vital importance in human capital earnings analysis. Less satisfactory is that it does not provide the type of panel data needed in studies of the present kind, as the survey sample varies from one year to another. The labour force survey covers a random sample of some 9000 persons, representing the entire population aged 15-64 years as stratified according to sex, age and region. When the data are restricted to employed wage and salary earners aged 16-64 and sorted out with respect to missing or incomplete information on crucial variables, the sample of employees retained in the actual estimating data shrinks to covering a total of 3895 individuals.

The dependent variable is chosen to be average before-tax hourly earnings in order to allow for interpersonal differences in months and weekly hours worked and to make the earnings of full-time and part-time employees comparable. The earnings data used comprise most types of compensation, including overtime and vacation pay and fringe benefits. Yet, a simple t-test[5] indicates that the estimation results obtained when including fringe benefits in the earnings data do not differ significantly from the results obtained when fringe benefits are omitted (cf. the results reported in Chapter III of this study).[6]

Ideally, earnings differentials should be related to the actual schooling differences which generate them. The employed data set does not allow this, however; the available register data on formal schooling merely show the single highest level of education completed by each individual. There are a total of eight levels of education, which are represented in the estimations by both linear and non-linear schooling variables. A noteworthy advantage of the database is that it comprises self-reported information on the person's total years of work experience and his or her years with the current employer, i.e. seniority (tenure). Thus the estimation results are based on the sample individuals' "actual" and not on their potential labour market experience.

The occupational classification of individuals is carried out according to the standard Finnish Classification of Socio-economic Groups of 1983 (CSO, 1983). In brief, individuals in paid-employment are classified into three broad social status categories: upper-level salaried employees, lower-level salaried employees, and manual workers. Each of the two non-manual categories is further divided into four subgroups depending on, inter alia, the level of responsibility and independency associated with the working tasks performed. The category of manual workers is also divided into four subgroups, but primarily according to occupational group and industrial sector.

A summary of definitions of the variables employed in the subsequent empirical analysis is given in Table A of Appendix II. The male and female employees in the estimating data are described in terms of these variables in Tables B and C of Appendix II. A detailed description of the construction of the underlying data and of the definition of crucial variables is given in Chapter VII of this study.

3. EARNINGS EFFECTS OF OCCUPATIONAL SOCIAL STATUS

The regression results obtained from estimating gender-specific human capital earnings functions exclusive and inclusive of occupational social status controls are displayed in Table 1. The corresponding probit estimates are reported in Table D of Appendix II. The earnings effects estimated for the various explanatory variables included in the analysis are discussed at length in Chapter III of this study and are therefore commented on only briefly below.

The parameter estimates[7] of the education level indicators suggest that the effect of education on earnings is on average increasing with the level of education. But the growth rate of earnings varies quite substantially depending on the level of education concerned. Moreover, it differs markedly between the two genders at the lower end of the educational scale where a major part of the labour force is situated. These overall trends largely persist when controlling for the occupational social status of employees (columns 2 and 4 in Table 1); although the inclusion of occupation indicators reduces significantly the absolute size of the schooling coefficients (see further section 4), the estimates still point to highly varying economic incentives to continue in formal education.

Further, despite a considerable narrowing of the differences in educational returns across genders[8], the estimated returns to completion of the LOWER VOCATIONAL level stand out as an important exception. Specifically, women with a lower vocational education tend to have no relative income advantage over women with only a basic education. For men, graduation from this particular educational level has a marginal product amounting to some 10-11 per cent on average. All in all, then, the estimation results suggest that differences in the jobs and occupations which men and women

Table 1. Regression results for extended human capital earnings equations estimated by gender[1]. The dependent variable is log hourly earnings inclusive of fringe benefits.
(Occupation controls are included in columns 2 and 4.)

Variable	Female employees (1)	Female employees (2)	Male employees (3)	Male employees (4)
CONSTANT	3.3114** (.0681)	3.3816** (.0804)	3.3539** (.0549)	3.4083** (.0679)
BASIC EDUCATION	0	0	0	0
LOWER VOCATIONAL	0.0073 (.0227)	-0.0022 (.0222)	0.1055** (.0204)	0.0915** (.0197)
UPPER VOCATIONAL	0.1758** (.0248)	0.1160** (.0244)	0.2728** (.0227)	0.1569** (.0239)
SHORT NON-UNIV	0.3670** (.0353)	0.2188** (.0370)	0.4875** (.0339)	0.2619** (.0382)
UNDER-GRADUATE	0.5168** (.0478)	0.2830** (.0532)	0.4714** (.0667)	0.2135** (.0685)
GRADUATE	0.6038** (.0430)	0.3643** (.0466)	0.6416** (.0370)	0.3991** (.0370)
EXP	0.0129** (.0036)	0.0097** (.0036)	0.0193** (.0033)	0.0142** (.0034)
$EXP^2/1000$	-0.1654* (.0926)	-0.1094 (.0935)	-0.2898** (.0845)	-0.1999* (.0873)
MARRIED	-0.0182 (.0196)	-0.0209 (.0195)	0.0590** (.0230)	0.0397* (.0222)
$CHILD^{0-6}$	0.0299 (.0183)	0.0248 (.0185)	-0.0109 (.0207)	-0.0105 (.0196)
$CHILD^{7-17}$	0.0014 (.0189)	0.0080 (.0190)	0.0546** (.0185)	0.0464** (.0179)
CAPITAL	0.0873** (.0194)	0.0854** (.0192)	0.1304** (.0170)	0.1218** (.0167)
TEMPEMPL	0.0625** (.0205)	0.0380* (.0202)	-0.0709** (.0248)	-0.0774** (.0228)
PART-TIME	0.2812** (.0206)	0.2889** (.0207)	0.1977** (.0389)	0.1818** (.0367)
PIECE-RATE	0.0120 (.0346)	0.0362 (.0328)	0.0909** (.0242)	0.1017** (.0235)
NODAYWORK	0.1306** (.0176)	0.1598** (.0180)	0.0179 (.0203)	0.0533** (.0190)
UNEMPL	-0.0268 (.0226)	-0.0068 (.0226)	-0.0722** (.0229)	-0.0563** (.0212)
UNION	-0.0335* (.0188)	-0.0159 (.0189)	-0.0112 (.0163)	0.0154 (.0161)

Table 1. (cont.)

Variable	Female employees (1)	(2)	Male employees (3)	(4)
Industry sector indicators:				
INDU11-13 (agriculture)	0.0372 (.0989)	0.0501 (.1185)	-0.1315** (.0430)	-0.0874 (.0765)
INDU31 (food manuf.)	-0.0233 (.0644)	-0.0057 (.0660)	-0.0257 (.0429)	0.0047 (.0411)
INDU32 (textile)	-0.0468 (.0591)	-0.0289 (.0562)	0.0405 (.1022)	0.0425 (.0910)
INDU33 (wood prod.)	-0.0124 (.0948)	-0.0207 (.0886)	-0.1190** (.0501)	-0.1143* (.0491)
INDU34 (paper prod.)	0.1627** (.0656)	0.1395* (.0701)	0.2106** (.0347)	0.2116** (.0346)
INDU35 (chemicals)	0.0328 (.1008)	0.0201 (.1021)	0.1036** (.0429)	0.1067** (.0413)
INDU36 (non-metallic)	-0.0322 (.2251)	-0.0108 (.2487)	-0.0093 (.0535)	0.0122 (.0505)
INDU37*** (basic metal)			0.1678* (.0948)	0.1926* (.0939)
INDU38 (metal products)	0	0	0	0
INDU20/39**** (oth. manuf.)	0.2372 (.1734)	0.0996 (.2167)	0.1094 (.1005)	0.0759 (.1014)
INDU40 (electricity)	0.0324 (.2337)	-0.0126 (.3247)	0.0893 (.0620)	0.0959 (.0610)
INDU50 (construction)	0.0301 (.0873)	0.0178 (.0938)	0.0282 (.0309)	0.0518* (.0292)
INDU61 (wholesale)	0.0796 (.0660)	0.0271 (.0764)	0.0531 (.0346)	0.0265 (.0371)
INDU62 (retail trade)	-0.0551 (.0503)	-0.1413* (.0630)	-0.0873** (.0334)	-0.0294 (.0388)
INDU63 (restaurants)	0.0134 (.0575)	0.0094 (.0695)	-0.0347 (.1059)	-0.0143 (.0861)
INDU71 (transport)	0.1046* (.0590)	0.0623 (.0692)	-0.0191 (.0389)	0.0499 (.0432)
INDU72 (communication)	0.1041 (.0835)	0.0751 (.0935)	0.0091 (.0582)	0.0897 (.0590)
INDU81 (financing)	0.2015** (.0535)	0.1530* (.0670)	0.2525** (.0607)	0.2064** (.0561)
INDU82 (insurance)	0.1537 (.0957)	0.1028 (.0981)	0.1576 (.2184)	0.2101 (.1456)

Table 1. (cont.)

Variable	Female employees (1)	(2)	Male employees (3)	(4)
INDU83 (real estate)	0.0378 (.0556)	-0.0075 (.0674)	0.0331 (.0446)	0.0199 (.0455)
INDU91 (public adm.)	0.0711 (.0613)	0.0373 (.0719)	-0.0137 (.0389)	0.0158 (.0410)
INDU92 (sanitary services)	-0.0477 (.0660)	-0.0149 (.0777)	-0.2019** (.0748)	-0.1678** (.0714)
INDU93 (social services)	0.0310 (.0472)	-0.0141 (.0618)	-0.0350 (.0351)	-0.0185 (.0414)
INDU94 (cultural services)	0.1030* (.0570)	0.0583 (.0682)	0.0286 (.0580)	-0.0148 (.0622)
INDU95 (personal services)	-0.0440 (.1022)	-0.0239 (.1152)	-0.1647* (.0947)	-0.0781 (.0857)
Occupational status indicators:				
OCC31 (management)		0.3616** (.0854)		0.3926** (.0452)
OCC32 (research)		0.0982 (.0663)		0.2190** (.0521)
OCC33 (education)		0.3482** (.0449)		0.2608** (.0517)
OCC34 (oth. seniors)		0.1678** (.0375)		0.1560** (.0465)
OCC41 (supervisors)		0.0852* (.0498)		0.0892* (.0483)
OCC42 (indep. clericals)		0.0439 (.0303)		-0.0556 (.0499)
OCC43 (routine clericals)		0.0490 (.0382)		-0.0063 (.0690)
OCC44 (oth. lower-level non-manual workers)		0		0
OCC51 (workers, agriculture)		-0.1522 (.1193)		-0.0493 (.0874)
OCC52 (workers, manufacturing)		-0.1030* (.0563)		-0.0219 (.0465)
OCC53 (workers, oth. prod.)		-0.1198** (.0420)		-0.0971* (.0485)
OCC54 (workers, service)		-0.1037** (.0270)		-0.1082* (.0470)

Table 1. (cont.)

Variable	Female employees (1)	(2)	Male employees (3)	(4)
SIGMA(ε)	0.3042**	0.2927**	0.2929**	0.2758**
	(.0033)	(.0028)	(.0034)	(.0030)
RHO(ε,μ)	-0.0877	-0.0574	0.0925	0.0429
	(.1011)	(.1076)	(.1324)	(.1400)
Log-Likelihood	-2039.8	-1965.8	-1488.0	-1375.3
Number of obs.	1987	1987	1908	1908

1 Standard errors are given in parentheses below the estimates. Maximum likelihood estimates corrected for sample selectivity bias, where SIGMA(ε) is the standard error of the disturbance term in the earnings equation and RHO(ε,μ) measures the correlation between the error term (ε) in the earnings equation and the error term (μ) in the selection (probit) equation. The probit estimates are reported in Table D of Appendix II.
A simple Chow test based on estimation results obtained using the Heckman estimator suggests that the hypothesis of the parameter estimates being equal for males and females can be rejected at a 0.1 % level.

* Denotes significant estimate at a 5 % level.

** Denotes significant estimate at a 1 % level.

*** The four observations on females employed in basic metal industries are included in the reference category INDU38.

**** Includes employment in mining and quarrying.

typically hold offer only part of an explanation for the different rates of return to education between genders. Accordingly other explanations such as wage discrimination cannot be ruled out.

The parameter estimates on the experience variables are mostly highly significant and have the a priori expected signs, thereby pointing to an upward-sloping concave experience-earnings profile for both genders. Assuming that the cross-sectional coefficients for experience capture the dynamics of changes in earnings over the individual's life cycle, the magnitudes of the estimates indicate that upon entering the labour market earnings start to climb at a pace of some 1.9 per cent for the typical male employee and roughly 1.3 per cent for the typical female employee. The rate of increase declines thereafter continuously, reaches zero only after more than three decades in the labour market, and turns thereafter negative until retirement.

More exactly, a maximum of about 38 per cent cumulative growth[9] in male hourly earnings is reached after some 33 years of work experience, while the cumulative growth in female hourly earnings peaks at roughly 29 per cent after 39 years in the labour market. The addition of occupation controls results in a negligible drop in the absolute value of the experience coefficients. This outcome is evidently due in part to the overall weak earnings effect estimated for labour market experience.

A large majority of the parameter estimates on the various personal and job-related variables are significant and of the expected signs. Moreover, controlling for the employees' occupational social status leaves the estimated coefficients of these indicator variables roughly unchanged. From this it may be concluded that the distribution of employees with respect to the observed personal and job characteristics is fairly similar in the 12 occupational categories considered.

Thus the estimation results suggest that family responsibilities (MARRIED, CHILD) generally have a positive effect on male earnings. Not surprisingly, residence within the Helsinki area (CAPITAL) implies a higher hourly earnings level for both genders. The results also point to a notable income advantage of male employees in jobs covered by some other compensation system than wages/salaries paid on a monthly, weekly or hourly basis (PIECE-RATE) as well as of female employees in jobs that entail inconvenient hours of work (NODAYWORK). Furthermore, periods of unemployment or temporary layoffs (UNEMPL) typically implied a negative earnings effect for males only. In other words, male employees who had been unemployed or temporarily laid off during the time period covered by the survey had lower hourly earnings than male employees who had been constantly in full employment.

The almost negligible influence on earnings of union membership (UNION) is evidently mainly due to the broad coverage of centralized wage agreements in Finland. A most plausible explanation for the strong relative income advantage obtained for part-time employees (PART-TIME) and females in temporary employment (TEMPEMPL) is the distinct distribution of these two employee categories across occupations and industries (see Chapter VII of this study). Finally, the addition of two-digit industry sector controls has an almost negligible impact on the estimated coefficients of the other explanatory variables accounted for in the estimations. The important question of inter-industry earnings differentials and the relative weight of the individuals' industry affiliation in explaining these differences is addressed in more detail in Chapter VI of this study.

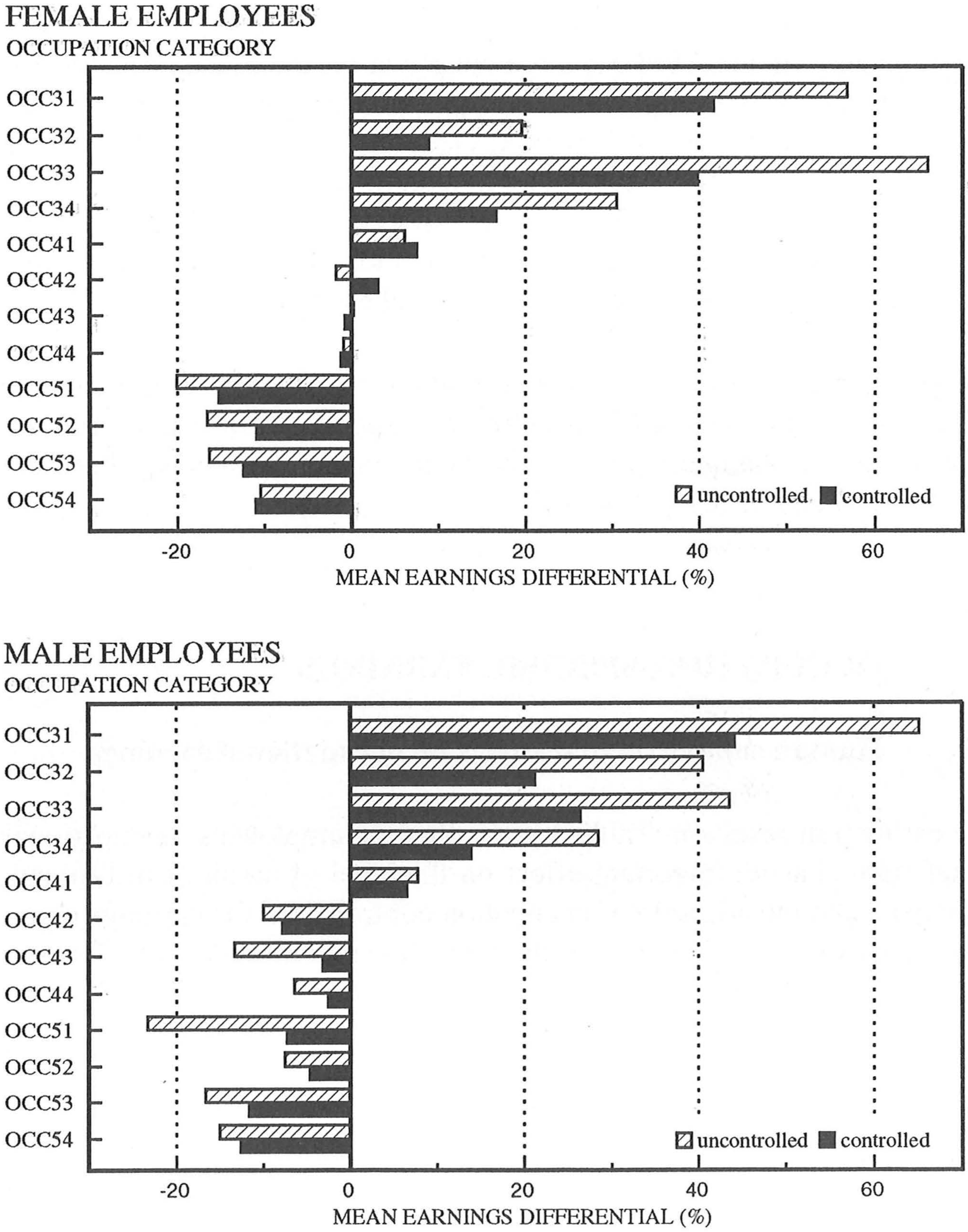
Taken together the occupational indicator variables play a significant role in explaining earnings variance among both male and female employees.[10] A closer analysis of the magnitudes and significance levels of the estimated parameters on the occupational indicator variables reveals certain interesting patterns of earnings variability across occupational social status categories and genders. In particular, the results in Table 1 indicate that there are small or negligible earnings differentials between lower-level salaried employees (OCC41-44). The only notable exception is the category of supervisors (OCC41), who in 1987 had, on average, some 9 per cent higher hourly earnings compared with other lower-level employees.

As is also to be expected, the average hourly earnings level is typically higher for upper-level salaried employees and lower for manual workers as compared to the average earnings of lower-level salaried employees. But there are distinct exceptions to this general pattern, as well. For male upper-level non-manual categories, shifts into higher-level occupational positions, other things unchanged, tend to be associated with a fairly moderate growth in hourly earnings up to the second highest social status category (OCC32), followed by a striking jump upwards in the average earnings level resulting from the substantially higher hourly earnings received by senior officials and upper management (OCC31).

The general trend in the average earnings of females in the upper-level non-manual categories, on the other hand, is dominated by a very strong earnings position of female senior officials and employees in education and training (OCC33), and a fairly weak earnings standard of female senior officials and employees in research and planning (OCC32) not only when compared with that of other female upper-level salaried employees but also when related to the earnings position of their male counterparts. This latter finding is explained mainly by the fact that women generally work in lower-paid research and planning occupations (e.g. as research assistants).

Finally, the parameter estimates on the occupational indicators for the four manual worker categories point to almost negligible variation in average hourly earnings both across genders and within each gender. The most

Figure 1. Employment-weighted mean differentials in hourly earnings levels inclusive of fringe benefits between 12 occupational social status categories before and after having controlled for crucial background factors



Source: Calculations based on the gender-specific occupation coefficients reported in Table 1 and the sample shares in Tables B and C of Appendix II.

conspicuous exception is the insignificant earnings differential between male employees in manufacturing (OCC52) and in lower-level non-manual occupations. Compared with the other manual worker categories, the average earnings level of male manufacturing workers was some 10-13 per cent higher in 1987.

These general trends stand out more clearly in Figure 1, which shows the mean percentage deviation of each occupational category from the employment-weighted average hourly earnings level for all categories after having controlled for various background factors (dark areas).[11] As also illustrated in the figure, the controlled mean differentials in hourly earnings between occupational social status categories differ notably from the commonly used uncontrolled earnings differentials (crosshatched areas).

The estimated coefficients for the selectivity variable (RHO) point to no significant sample selection bias in the estimations. Accordingly, ordinary least squares techniques give consistent parameter estimates. These are reported in Table E of Appendix II.

4. OCCUPATION-SPECIFIC EARNINGS

4.1. Human capital-related effects on occupational earnings

The estimation results in Table 1 show that the employees' occupational social status has an important effect on the level of earnings in Finland. Moreover, the introduction of occupation controls into the earnings equation reduces the absolute size of the educational coefficients by almost a half or more, except for graduation from the lower vocational level.

There are several hypothetical explanations for this significant drop in the direct earnings effect of schooling (e.g. de Beyer & Knight, 1989). First, the effect of education may be weakened by the role that occupation plays - that is, the occupational structure defines a hierarchy of positions existing independently of the persons filling the positions. Second, a major part of the earnings effects captured by occupation controls may reflect an indirect effect of schooling arising from the influence of a vocationally differentiated education in particular on the individuals' occupational attainment.

Third, occupation may simply act as a proxy for unmeasured ability, implying that it has no independent role in the determination of earnings. Finally, depending on the standard of the available occupational data in general and the definition of occupational categories in particular, the education and occupation indicators may reflect much the same effects. The data used in the present study do reveal some but, so it seems, no serious degree of collinearity between educational level and occupational social status (cf. Table F of Appendix II).

In order to address the question of the role of occupation, occupation-specific earnings equations are estimated for each gender. The earnings equations are corrected for potential selection bias arising from occupational choice as outlined in Section 2. Since the estimation results displayed in Table 1 suggest that the sample selection bias associated with the person being recorded as an employee is negligible, no correction in the estimations is made in that respect.[12]

In the previous section, a distinction was made between a total of 12 occupational social status categories. Below a less disaggregated classification is adopted, dictated in part by the occupation estimates reported in Table 1, and in part by the need to have a sufficient number of employees in each of the categories to be considered. More exactly, in terms of the dependent polychotomous occupation variable (OCC_{ij}) four fairly broad categories are distinguished: upper-level salaried employees (OCC31-34), lower-level salaried employees (OCC41-44), manufacturing workers (OCC52), and other production, distribution and service workers (OCC53-54).[13] A finer classification of non-manual workers is prevented by insufficient numbers of females or males in some of the non-manual categories. Sample means for the four categories are given in Tables B and C of Appendix II.

The regression results obtained for female and male employees using a heteroscedasticity-consistent estimator of the occupation-specific earnings model in equation (13) are reported for selected variables in Tables 2 and 3. A full tabulation of the estimation results is given in Tables G and H of Appendix II. The gender-specific maximum likelihood estimates for the multinomial logit model in equation (10) are displayed in Tables I and J of Appendix II.

Table 2. Female occupational earnings equations corrected for selectivity bias (eq. (13)).[1] The dependent variable is log hourly earnings inclusive of fringe benefits. (The estimation results are fully reported in Table G of Appendix II.)

Variable	All female employees	Upper-level non-manual workers	Lower-level non-manual workers	Manu-facturing workers	Other manual workers
CONSTANT	3.3369**	3.6359**	3.2742**	3.2410**	2.9305**
	(.0759)	(.2316)	(.0585)	(.1164)	(.1724)
S	0.0426**	0.0639*	0.0449**	-0.0003	-0.0128
	(.0054)	(.0290)	(.0078)	(.0204)	(.0184)
EXP	0.0061*	0.0096	0.0077*	0.0161**	0.0036
	(.0037)	(.0073)	(.0043)	(.0067)	(.0064)
EXP^2 /1000	-0.0755	-0.1265	-0.1786*	-0.1991	-0.0368
	(.0964)	(.1911)	(.0971)	(.1593)	(.1227)
SEN	0.0057**	0.0067*	0.0093**	-0.0035	0.0038*
	(.0017)	(.0033)	(.0012)	(.0033)	(.0019)
OJT	0.0233	-0.0096	0.0194	0.1794**	-0.0158
	(.0196)	(.0361)	(.0179)	(.0487)	(.0311)
UNION	-0.0218	0.0051	-0.0137	-0.1536**	-0.0323
	(.0196)	(.0526)	(.0285)	(.0488)	(.0515)
LAMBDA	-[1]	0.0153	0.0778	0.0769	0.3097**
		(.0848)	(.0554)	(.0685)	(.1019)
R^2 adj.	-[1]	0.2257	0.2145	0.1560	0.1998
No. of obs.	1974	269	1106	210	374

1 Standard errors are in parentheses below the estimates and are adjusted for heteroscedasticity according to White (1980) in the occupation-specific earnings equations (columns 2-5). The corresponding multinomial logit estimates are reported in Table I of Appendix II. The earnings equation for all female employees (column 1) comprises the same control variables as the earnings equations estimated in Section 3 and is adjusted for sample selectivity bias using ML-estimation. RHO(ε,μ) = -0.0425 with a standard error of 0.1012. Log-Likelihood = -1958.8.

* Denotes significant estimate at a 5 % level.

** Denotes significant estimate at a 1 % level.

Table 3. Male occupational earnings equations corrected for selectivity bias (eq. (13)).[1] The dependent variable is log hourly earnings inclusive of fringe benefits. (The estimation results are fully reported in Table H of Appendix II.)

Variable	All male employees	Upper-level non-manual workers	Lower-level non-manual workers	Manu-facturing workers	Other manual workers
CONSTANT	3.3985** (.0625)	3.5948** (.1752)	3.2828** (.0949)	3.4358** (.0531)	3.3973** (.0718)
S	0.0468** (.0050)	0.0710** (.0197)	0.0634** (.0142)	0.0391** (.0112)	0.0194 (.0136)
EXP	0.0117** (.0033)	0.0185* (.0082)	0.0241** (.0052)	0.0136** (.0040)	0.0062 (.0049)
EXP^2 /1000	-0.1758* (.0863)	-0.1002 (.2055)	-0.3778** (.1104)	-0.2655** (.0901)	-0.0926 (.0989)
SEN	0.0030** (.0012)	-0.0031 (.0031)	0.0011 (.0025)	0.0041* (.0019)	0.0057** (.0017)
OJT	0.0809** (.0174)	0.1003** (.0352)	0.0824** (.0282)	0.0450* (.0218)	0.0838** (.0264)
UNION	0.0007 (.0164)	-0.0843* (.0408)	0.0034 (.0345)	0.0412 (.0341)	-0.0059 (.0376)
LAMBDA	-[1]	0.0491 (.0661)	0.0356 (.0446)	-0.1215** (.0426)	-0.0122 (.0402)
R^2 adj.	-[1]	0.2510	0.3541	0.2581	0.1502
No. of obs.	1873	376	400	600	447

1 Standard errors are in parentheses below the estimates and are adjusted for heteroscedasticity according to White (1980) in the occupation-specific earnings equations (columns 2-5). The corresponding multinomial logit estimates are reported in Table J of Appendix II. The earnings equation for all male employees (column 1) comprises the same control variables as the earnings equations estimated in Section 3 and is adjusted for sample selectivity bias using ML-estimation. RHO(ε,μ) = -0.0265 with a standard error of 0.1337. Log-Likelihood = -1348.0.

* Denotes significant estimate at a 5 % level.

** Denotes significant estimate at a 1 % level.

With a few exceptions, the estimated coefficients of the human capital variables for separate occupational categories show the same general pattern as the estimates obtained for all female and male employees. In particular, the return to an additional year in above-primary education (S) decreases, less for men than for women, when moving down the occupational social status scale. Indeed, the estimated coefficients indicate that, except for males in manufacturing jobs, the returns to postcompulsory schooling for manual workers are not statistically different from zero. This outcome does not simply seem to be the result of small variation in completed formal education in these categories (cf. Tables B and C of Appendix II).

Generally speaking, the schooling coefficients point to small, if any, differences in the estimated rates of return to above-primary education among the broad categories of non-manual and manual workers but to significant differences between these two employee groups. This holds for both genders. Conspicuous gender gaps in estimated educational returns within occupational categories occur for the female-dominated category of lower-level non-manual workers and the male-dominated category of manufacturing workers.

This pattern of occupation-specific educational returns within and across genders is largely reproduced by the estimated earnings effects of general experience (EXP). Thus male employees in non-manual and manufacturing jobs tend to receive a significantly higher increase in occupational earnings not only for each year of above-primary schooling but also for their general labour market experience. For the category of other male manual workers, the estimated earnings effects of these two human capital variables are not significantly different from zero. Instead a major part of the increase in earnings of non-manufacturing male workers seems to originate in the length of the present employer-employee relationship, i.e. seniority (SEN).[14] Possibly this outcome is explained by the large number of public sector employees situated in this particular occupational category. However, le Grand (1991), who reports a similar finding for Swedish non-manual and manual workers, explains the stronger seniority effect for manual workers as being a result of their fairly low educational attainment level and their consequently lower probability of shifting to another employer.

Among female employees, on the other hand, the estimated earnings effects of both general experience and seniority reveal almost negligible differences across the occupational social status categories considered. The only noteworthy exception is females in manufacturing jobs for whom the experience-imputed earnings effects resemble those of male employees rather than those of their female colleagues in other occupations (i.e. a much stronger effect for general experience than for seniority).

Comparison of occupational earnings effects of work experience across genders suggests that the return to general experience is significantly higher for male employees among lower-level non-manual workers only. Yet, even similar percentage increases in earnings may result in substantial absolute differences if earnings levels differ. Another notable difference between genders is the moderate but still more important role of seniority in the determination of female earnings in non-manual jobs.

The estimation results further point to a notable variability in the impact of formal on-the-job training courses (OJT) on both female and male earnings. Among female employees, all occupational categories under study display a small, if any, relative income advantage from OJT, except for females in manufacturing jobs. For male employees, on the other hand, growth in productivity with general experience tends to be the dominant explanation for the overall effect of experience on earnings, accompanied with a strong, positive effect of participation in formal training programmes.

Again union membership (UNION) is found to have no significant effect on earnings. There are two notable exceptions, though. Somewhat confusing is the wage premium obtained for non-union females in manufacturing jobs. A closer analysis of these non-unionized females reveals that they are on average younger and, as a consequence, have less work experience than their unionized counterparts. Furthermore, almost three fourths of them work in food manufacturing or textile industries, and mostly in fairly skill-intensive occupations. Obviously this also explains their slightly higher average hourly earnings level (FIM 36.05 compared with FIM 32.72 for unionized sample females in manufacturing jobs). Nonetheless, because of their relatively small share in the category, the estimate should be interpreted with caution.

Less surprising is the finding that unionized males in upper-level non-manual occupations earn some 9 per cent less than their non-union counterparts. A most plausible explanation for this is the much lower rate of unionization among highly-paid officials. Most likely a major reason why the same result is not obtained for the corresponding category of female employees is the combined effect of a higher unionization rate among female upper-level non-manual workers and fewer females in highly-paid non-manual positions.

Finally, the selectivity bias terms do provide evidence on some degree of nonrandomness in the allocation of employees across occupational social status categories. Among female employees, a strong selectivity effect is obtained for the occupational category of other manual workers. Evaluated at the mean value of LAMBDA, the selection coefficient indicates that females entering this particular occupational category earn on average some 45 per cent less than an individual with identical observable characteristics drawn at random from the labour force would be expected to earn in that category. Reilly (1991), for example, argues that such selection effects on earnings may reflect a situation where especially young employees share the costs of their training with the employer, as suggested by human capital theory. But the poor position of females in other manual works may also be explained by relatively low starting wages in typical female jobs in the distribution and service sectors. This, in turn, could possibly be taken to reflect some kind of a crowding-in effect, implying that the category comprises proportionally more jobs to which access is relatively easy especially for less-skilled females.

For male employees, a strong selectivity effect is recorded for manufacturing jobs. In particular, the selection coefficient suggests that, on average, males in this occupational category have about 10 per cent higher hourly earnings than a randomly selected male with average characteristics would earn in a manufacturing job. This finding seems reasonable in view of the expansion years in the late 1980s and the wage bidding evoked by increasing shortages of skilled manpower, such as engineers and ADP-personnel, in the manufacturing sector (cf. Asplund, 1991).

4.2. The role of occupation in earnings determination

What then do the regression results for the earnings equations and the occupational attachment equations indicate about the role of occupation in the determination of earnings in Finland? At the one extreme is the hypothesis that the occupational structure has an independent effect on earnings. If, however, a full explanation is to be provided in terms of the existing hierarchy of positions, then it would also have to account for the largely differing returns to human capital acquisition among occupational social status categories displayed in Tables 2 and 3. At the other extreme is the hypothesis that occupation has no independent effect on earnings; it merely acts as a proxy for unmeasured ability. But for this to hold, the estimated occupation coefficients and the occupation-specific relationships between earnings and human capital proxies would have to be given a plausible explanation in terms of ability only.

Although no conclusive tests can be undertaken, the estimation results clearly indicate that these extreme hypotheses can provide no more than part of the explanation. The strong influence of formal education on both occupational attainment (indirect effect) and the earnings received within an occupation (direct effect) rather points to a notable interaction between education and occupational status. In an earnings equation omitting the occupation, the schooling variable measures these combined effects. The question then arises of how much of the observed drop in the schooling coefficients caused by the inclusion of occupation controls is attributable to the indirect earnings effect of schooling.

Following de Beyer & Knight (1989), an attempt is made to decompose the estimated earnings effects of an upper vocational education into a direct and an indirect effect on potential earnings. The direct effect is given by the coefficient on this particular educational level in the overall earnings equation comprising occupation indicators. The indirect effect, in turn, results from the impact of an upper vocational education on occupational chances.

The estimation results in Table 1 (columns 1 and 3) suggest that completion of an upper vocational level, other things unchanged, raises the average hourly earnings of both male and female employees by some 18 per cent, the reference group being a lower vocational education. When occupation controls are added to the gender-specific earnings equations (columns 2 and 4 in Table 1), the direct pecuniary gain from acquiring an upper rather than a lower vocational degree declines to some 12 per cent for women and to about 7 per cent for men.

Table 4. Decomposition of the earnings effect of an upper vocational education

Probability of being in occupational social status category j, Prob(OCC=j)

	Female with lower vocational educ.		Female with upper vocational educ.		Male with lower vocational educ.		Male with upper vocational educ.	
	Actual	Predicted	Actual	Predicted	Actual	Predicted	Actual	Predicted
Upper-level non-manual workers	0.055	0.054	0.324	0.228	0.047	0.036	0.322	0.290
Lower-level non-manual workers	0.268	0.536	0.461	0.683	0.214	0.199	0.537	0.559
Manufacturing workers	0.323	0.194	0.082	0.030	0.408	0.459	0.052	0.068
Other manual workers	0.353	0.216	0.133	0.060	0.331	0.306	0.089	0.082

	Earnings effect for females		Earnings effect for males	
	Change in lnEARN	% change[1]	Change in lnEARN	% change[1]
Coefficient				
- without OCC-terms	0.1685	18.4	0.1673	18.2
- with OCC-terms (direct effect)	0.1182	12.5	0.0654	6.8
Effect through occupational attainment (indirect effect)	0.0755	7.8	0.1182	12.5
Combined direct and indirect effect	0.1937	21.4	0.1836	20.2

1 The percentage change in earnings is given by the antilog of the parameter estimate.

The indirect earnings effects are estimated from the multinomial logit estimates (Tables I and J of Appendix II) in the following way. For a representative female/male employee having the mean values of the explanatory variables (other than education) for all sample female/male employees, the probability of being in occupation j is predicted given that the employee has a lower vocational degree, Prob(OCC^L=j), or, alternatively, an upper vocational degree, Prob(OCC^U=j). The gender-specific earnings equations in Table 1 are re-estimated in order to obtain occupation coefficients (α_j) for the four occupational social status categories distinguished in the occupation-specific analysis. The sum of these occupation estimates weighted by the predicted probabilities of lower vocational graduates of being in the different occupational categories is then subtracted from the sum of coefficients weighted by the corresponding predicted probabilities for upper vocational graduates: $\Sigma\alpha_j Prob(OCC^U=j)$ - $\Sigma\alpha_j Prob(OCC^L=j)$. This net term indicates the growth in expected earnings resulting from the acquisition of an upper vocational degree and the consequent improvement of occupational chances.

Table 4 shows that for both genders, the indirect effect arising through occupational attainment roughly makes up for the reduction in the coefficient of upper vocational education caused by the introduction of occupation controls in the estimations.[15] A cautious generalization of the results would thus imply that occupational social status does not necessarily weaken the earnings effect of formal education. Instead, a major part of the earnings effects captured by occupational controls seems to reflect the impact of education on occupational choices and thereby also on earnings. Another noteworthy finding is that this indirect earnings effect of schooling is roughly half the direct effect for females but almost twice the direct effect for males, which points to a more rigid occupational structure for male earnings.

5. CONCLUDING REMARKS

This chapter reports an attempt to exhibit the importance of occupational social status in explaining earnings dispersion in Finland, with special attention being paid to the interactions between occupation and formal education. The results for the overall earnings equations estimated by gender point to notable occupational differences in mean earnings levels. The varying returns to human capital among occupational categories indicate, in turn, that occupation has a notable influence also on the sensitivity of the employee's earnings to changes in crucial personal characteristics.

The addition of occupational controls to the overall earnings equations results in a substantial reduction in the estimated return to formal education, while the parameter estimates of the other explanatory variables remain roughly unchanged. Simultaneously the results obtained from estimating occupational attainment equations imply that formal schooling has a strong indirect impact on earnings through the improvement of occupational chances. In fact, calculations for upper-level vocational and professional graduates suggest that the earnings effect of formal education is not necessarily weakened by the role that occupation plays. Instead, the greater part of that effect seems to arise from the influence that education has on occupational attainment. This is also to be expected for countries where formal education contains a large amount of occupation-specific skills and the possession of a given educational degree is a prerequisite for certain occupations.

Of special interest is the finding that the earnings effects of formal education mediated by the employee's position in the occupational hierarchy tend to be much larger for males than for females. This points to a more rigid occupational structure of male earnings. Because of these varying interactions between education and occupational status, educational expansion can be expected to affect very differently the labour market situation for men and women in general and the returns to education in particular. Therefore, re-estimation of the earnings functions for some other year might provide useful insight about the functioning of the Finnish labour market.

Footnotes:

1. The possible endogeneity of some of the other explanatory variables included in the earnings model, especially educational attainment, participation in formal on-the-job training courses, part-time employment and union membership, is of necessity ignored in this context; the available data simply do not allow consistent estimation in these respects.

2. Alternative names for the Type 1 distribution are exponential or Gumbel extreme value distributions (Johnson & Kotz, 1970).

3. The multinomial logit model is preferred to the unordered multinomial probit model because it is less difficult to estimate and it is preferred to the ordered probit model because it does not require a sequential ranking of occupations which may involve arbitrary judgements. Moreover, the ordered probit model has been found to predict less well than the multinomial logit model (cf. de Beyer & Knight (1989) and Reilly (1991)).

4. Specifically, the probability of employment in occupation j, Prob(OCC_i=j), is estimated in relation to the occupation, say, k chosen for the purpose of normalization. This implies estimation of J-1 functions of the form

$$\text{(i)} \qquad \ln\left[\frac{Prob(OCC_i = j)}{Prob(OCC_i = k)}\right] = \delta_j + \theta_j V_i + \eta_{ij}, \qquad j = 1,\ldots,J \quad j \neq k$$

where Prob(OCC_i=j)/Prob(OCC_i=k) is the ratio of the probability of being in occupation j to that of being in occupation k, and δ is a constant term. A comparison of any occupations j and m can then be derived as

$$\text{(ii)} \qquad \ln\left[\frac{Prob(OCC_i = j)}{Prob(OCC_i = m)}\right] = \ln\left[\frac{Prob(OCC_i = j)}{Prob(OCC_i = k)}\right] - \ln\left[\frac{Prob(OCC_i = m)}{Prob(OCC_i = k)}\right]$$

$$= (\delta_j - \delta_m) + (\theta_j - \theta_m)V_i + (\eta_{ij} - \eta_{im}) .$$

5. Conditional that the null hypothesis of equal variances of two normal distributions (j = 1,2), i.e. the hypothesis H_0 that $\sigma_1^2 = \sigma_2^2$, is not rejected at conventional levels, the following t-test for comparing single parameter estimates can be performed:

$$t = \frac{\hat{\beta}_{i1} - \hat{\beta}_{i2}}{\sqrt{\frac{(n_1 - k_1)}{(n_1 - n_2 - k_1 - k_2)} Var(\hat{\beta}_{i1}) + \frac{(n_2 - k_2)}{(n_1 - n_2 - k_1 - k_2)} Var(\hat{\beta}_{i2})}}$$

where the $\hat{\beta}_{ij}$s are the (uncorrelated) estimates to be compared, the n_js are the sample sizes, and the k_js give the number of parameters in the estimations. No weighing terms in the denominator are, of course, needed when $n_1 = n_2$ and $k_1 = k_2$. This t-test is analogous to the t-test for comparing the means of two normal distributions derived by DeGroot (1975). I am indebted to Pekka Ilmakunnas for providing me with this insight.

6. This does not necessarily imply that fringe benefits play a minor role in Finland. Obviously the outcome is partly due to the fact that the tax rolls merely provide information on the taxable value of fringe benefits, which in 1987 was, on average, some 80 per cent of their market value. The impact of tax-exempt fringe benefits being totally disregarded is probably small since virtually all fringe benefits are subject to taxation, the most important exceptions being reasonable health and recreational benefits financed by the employer.

7. Only if the percentage change is small enough will the estimated coefficient measure the actual percentage change in earnings from having/acquiring the characteristic for which the variable stands, other things being unchanged. In the case of a larger percentage change, the actual earnings effect is given by the antilog of the parameter estimate, i.e. by $(e^{\alpha} - 1)*100$. Moreover, Halvorsen & Palmquist (1980) suggest that the percentage differential for indicator variables is calculated as the antilog of the given coefficient for semilogarithmic equations. In the present paper, the estimated log effects on earnings are throughout re-interpreted in this way.

8. The inclusion of occupation controls reduces the average rate of return to an additional year of schooling beyond completed basic education from 9 to 5 per cent for men and from 8 to 4 per cent for women. A simple t-test (see footnote 5 above) indicates that the gender gap in the average return to above-primary education remains significant (at a 5 % level) also after controlling for differences in occupational social status.

9. The cumulative earnings effect of labour market experience (EXP) measures total percentage additions to earnings due to experience from zero experience to given years of experience and is calculated as the antilog of $(\alpha_1 EXP - \alpha_2 EXP^2)$.

10. $Chi^2(12) \approx 2(\text{Log-Likelihood}_U - \text{Log-Likelihood}_R)$ amounts to 148.0 for female employees and 225.4 for male employees, with the subscripts U and R referring to the unrestricted and the restricted earnings model, respectively.

11. The wage premium ($PREMIUM_{OCC}$) received in occupational category OCC (OCC = 31,32,33,34,41,42,43,44,51,52,53,54) is calculated as the antilog of

$$PREMIUM_{OCC} = \hat{\beta}_{OCC} - \sum_{OCC=31}^{54} e_{OCC}\hat{\beta}_{OCC},$$

where $\hat{\beta}_{OCC}$ is the estimated coefficient for occupational category OCC and e_{OCC} is its employment share in the sample. A value of zero is assigned to the omitted occupational category (= OCC44, that is other lower-level employees with administrative and clerical occupations).

12. A tractable model specification maintaining the labour force participation decision for the sample individuals is obtained if the multinomial logit model is supplemented with the probit (participation) criterion in eq. (2) in the text, and if it is further assumed that the error terms in the two selection equations are independent. Cf. Dolton et al. (1989) and the econometric model outlined in eqs. (1)-(9) in Chapter IV of this study.

13. The category of manual workers in agriculture, forestry and commercial fishing

(OCC51) is omitted because of the small number of observations and the difficulty of integrating them with some of the other manual worker categories.

14. The estimated coefficients of the quadratic seniority term were throughout insignificant, and the variable was therefore abandoned in the regressions.

15. As noted by de Beyer & Knight (1989), the slight overestimation of the total earnings effect of education using the direct-indirect method is most likely explained by some degree of collinearity between the educational indicators and the other explanatory variables included in the occupational attainment equations.

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APPENDIX I

OCCUPATIONAL SEGREGATION

Brown et al. (1980) argue that also when calculating male-female earnings differentials account should be made for the endogeneity of occupational status by estimating occupational attainment equations and occupation-specific earnings equations separately. Using these estimation results, the overall mean gender earnings differential can be decomposed into intra- and inter-occupational earnings differentials, and these further into their explained and unexplained parts. The inter-occupational terms are then thought to measure the earnings effects of female occupational segregation.

In the following, the regression results obtained from estimating occupational attachment equations and occupation-specific earnings equations for male and female employees in the Finnish labour market are used to decompose the mean gender earnings differential into its explained and unexplained intra- and inter-occupational parts in line with the modified index number approach suggested by Brown et al. (1980). Using the notations in equation (5) in the text, the unconditional[1] mean earnings differential between genders may be written as

$$\text{(I1)} \qquad \Delta\,\overline{(lnEARN)} = \overline{lnEARN^m} - \overline{lnEARN^f}$$

$$= \sum_{j=1}^{J} \left[\bar{p}_j^m \, \overline{lnEARN_j^m} - \bar{p}_j^f \, \overline{lnEARN_j^f} \right],$$

where p^m and p^f denote the sample proportions of, respectively, male (m) and female (f) employees in each of the occupational categories considered. The terms in equation (I1) can be decomposed into four parts:

$$\text{(I2)} \qquad \Delta\,\overline{(lnEARN)} = \sum_{j=1}^{J} \bar{p}_j^f \hat{\gamma}_j^m \Delta\bar{Z}_j + \sum_{j=1}^{J} \bar{p}_j^f \bar{Z}_j^f \Delta\hat{\gamma}_j$$

$$+ \sum_{j=1}^{J} \overline{lnEARN_j^m} \, (\bar{p}_j^m - \bar{p}_j^*) + \sum_{j=1}^{J} \overline{lnEARN_j^m} \, (\bar{p}_j^* - \bar{p}_j^f)\,,$$

where $\Delta\hat{\gamma}_j = \hat{\gamma}_j^m - \hat{\gamma}_j^f$, with $\hat{\gamma}_j^m$ and $\hat{\gamma}_j^f$ standing for the estimated coefficients of the gender-specific occupational earnings equations, $\overline{p}_j^*$ is the proportion of sample female employees that would be in the j^th occupation if the distribution of occupational opportunities were the same as for their male counterparts, and $\Delta\overline{Z}_j = \overline{Z}_j^m - \overline{Z}_j^f$. The first two terms on the right-hand side of equation (I2) above give the explained and the unexplained intra-occupational earnings differential between genders, i.e. the unconditional earnings gap within occupations attributable to differences in, respectively, personal characteristics and estimated coefficients. The third term is that part of the aggregate earnings differential which is associated with the explained allocation of employees into each occupational category, while the last term is thought to measure the earnings effects of occupational segregation, i.e. the unexplained inter-occupational earnings differential between genders.

Table I1 reports an attempt to exploit the extent of occupational segregation in the Finnish labour market. The actual mean occupational distributions for the sample male and female employees across the four occupational categories investigated are shown in columns 1 and 2 of the table. The third column gives the female occupational distribution that would follow from the imposition of a male occupational structure. This predicted distribution is obtained by applying the multinomial logit estimates for males (Table H of Appendix II) to the female realizations of the explanatory variables included in the occupational choice model. As can be seen from the table, the most notable change in the female distribution is a dramatic shift of females away from the lower-level non-manual category to the other occupational categories; that is, females are over-represented in lower-level non-manual jobs and under-represented both in upper-level non-manual jobs and in manual works.

Table I1 also shows two indices of occupational dissimilarity (e.g. Gabriel et al., 1990). The segregation index D gives an objective measure of occupational differences across genders and is defined as

$$\text{(I3)} \qquad D = (1/2)\sum_{j=1}^{J} |\,\overline{p}_j^m - \overline{p}_j^f\,| \,.$$

Table I1. Male and female occupational distributions and occupational segregation indices

Occupational category	$\bar{p}_j^m$	$\bar{p}_j^f$	$\bar{p}_j^*$	$\lvert\bar{p}_j^m - \bar{p}_j^f\rvert$	$\lvert\bar{p}_j^m - \bar{p}_j^*\rvert$
Upper-level non-manual workers	0.2051	0.1379	0.2106	0.0672	0.0055
Lower-level non-manual workers	0.2169	0.5634	0.2510	0.3465	0.0341
Manufacturing workers	0.3315	0.1065	0.2521	0.2250	0.0794
Other manual workers	0.2465	0.1922	0.2863	0.0543	0.0398
D				0.3465	
D^*					0.0794

The index thus indicates the percentage of females (or males or a combination of females and males) that would have to shift to equalize gender representation across occupational categories. A zero value implies equal proportions of male and female employees in each occupational category, while a value of unity indicates total occupational segregation by gender. In order to approximate the impact of factors other than personal characteristics, a second index, D^*, is calculated for the actual male means and predicted female means:

$$D^* = (1/2) \sum_{j=1}^{J} \lvert \bar{p}_j^m - \bar{p}_j^* \rvert \tag{I4}$$

If D^* turns out to be substantially smaller than D, this is interpreted as supportive of the proposition that part of the observed occupational segregation can be explained by demand-side discrimination, supply-side preferences, unexplained occupational labour market structures or some combination of these (Reilly, 1991).

The calculated D index suggests that some 35 per cent of females and/or males would have to change jobs to equalize the sample occupational distribution of the two genders. D^*, on the other hand, indicates that only some 8 per cent would have to shift between occupational categories. This means that only about 23 per cent of the observed occupational dissimilarity is explained by differences in personal characteristics with some 77 per cent attributable to various occupational labour market features.

How important is the earnings effect of the observed occupational segregation? Using equation (I1), the unconditional mean gender earnings differential across the four occupational categories considered is estimated at close to 37 per cent. A decomposition of this mean differential into intra- and inter-occupational effects in line with equation (I2) reveals that both the explained and the unexplained allocation of employees into occupational categories constitute an almost negligible part of the overall mean earnings differential. In fact, the empirical evidence suggests that the gender earnings differential is for the most part due to unexplained intra-occupational effects; i.e., the disadvantaged earnings position of female employees seems to result primarily from their weaker status within occupations and not from female occupational segregation.

This finding is consistent with the minor drop in the parameter estimate of the gender indicator when occupation controls are included in the full sample earnings equation. Moreover, the same conclusion is drawn by Allén (1990) in a study of occupational segregation and wage differentials using Finnish Population Census data for 1985 in combination with income data from the tax rolls. Further support for this assertion is provided in a comparative study of wage discrimination in the Nordic countries (Asplund et al., 1993) in the sense that occupational differences between men and women are found to contribute less to the wage gap in Finland than in the other Nordic countries.

These aggregate figures mask considerable differences, however, both within and across occupational categories. For example, the estimated unexplained intra-occupational earnings effect ranges from under 20 per cent in the upper-level non-manual category to almost 60 per cent in the manual worker categories. It may be reminded that the two manual worker groups were also the only occupational categories for which the occupation-specific earnings equations were found to reveal any evidence of selectivity bias arising from occupational choice.

Footnotes:

1. The concept of unconditional earnings refers to the earnings a randomly selected individual would receive if employed in the occupational category considered. Following Gyourko & Tracy (1988) and Reilly (1991), the female and male unconditional earnings are calculated by setting the selectivity effects equal to zero.

APPENDIX II

Table A. Summary of definitions of included variables

Variable	**Definition**
EARN	Average hourly earnings (in FIM) calculated from the before-tax annual wage and salary income (incl. fringe benefits) recorded in the tax rolls and an estimated amount of annual normal working hours.
ln EARN	Natural logarithm of EARN.
SCHOOL	Years of formal schooling evaluated from register information on the single highest level of education completed using the Finnish standard classification of education.
S	Years of formal schooling with basic education (9 years of schooling) set equal to zero.
BASIC EDUC.	Indicator for persons with basic education only (about 9 years or less).
LOWER VOCATIONAL	Indicator for persons with completed lower-level of upper secondary education (about 10-11 years).
UPPER VOCATIONAL	Indicator for persons with completed upper-level of upper secondary education (about 12 years).
SHORT NON-UNIV	Indicator for persons with completed lowest level of higher education (about 13-14 years).
UNDER-GRADUATE	Indicator for persons with completed undergraduate university education (about 15 years).
GRADUATE	Indicator for persons with completed graduate university education (more than 16 years).
EXP	Self-reported total years of work experience.
SEN	Seniority, i.e. self-reported years with the present employer.
WOM	Indicator for gender.
AGE	Physical age of the individual.
MARRIED	Indicator for married persons and singles living together.
$CHILD^{0-6}$	Indicator for children aged 0-6 living at home.
$CHILD^{7-17}$	Indicator for children aged 7-17 living at home.
$CHILD^{0-17}$	Indicator for children aged 0-17 living at home.
CAPITAL	Indicator for residence within the capital region (the Helsinki area).
UUSIMAA	Indicator for residence in the province of Uusimaa but outside the capital region.
OTHER SOUTH	Indicator for residence in the southern parts of Finland other than Uusimaa.
SOUTH	Indicator for residence in the southern parts of Finland.
MIDDLE	Indicator for residence in the middle parts of Finland.
NORTH	Indicator for residence in the northern parts of Finland.
PUBLIC	Indicator for employment in the public sector.
TEMPEMPL	Indicator for persons who self-reportedly are in temporary employment.
PART-TIME	Indicator for persons who self-reportedly are in part-time employment.
PIECE-RATE	Indicator for persons who are not being paid on an hourly, weekly or monthly basis.

NODAYWORK	Indicator for persons who are not in regular day-time work.
UNEMPL	Indicator for persons who have been unemployed or temporarily laid off during the previous twelve months.
UNION	Indicator for unionized employees.
OJT	Indicator for persons who self-reportedly have received employer-sponsored formal on-the-job training during the previous twelve months.
INDU11-13	Indicator for employment in agriculture, forestry and fishing.
INDU31	Indicator for employment in food manufacturing.
INDU32	Indicator for employment in textile.
INDU33	Indicator for employment in manufacturing of wood products.
INDU34	Indicator for employment in manufacturing of paper products.
INDU35	Indicator for employment in manufacturing of chemicals.
INDU36	Indicator for employment in manufacturing of non-metallic products.
INDU37	Indicator for employment in basic metal in industries.
INDU38	Indicator for employment in manufacturing of metal products.
INDU20/39	Indicator for employment in other manufacturing, including mining.
INDU40	Indicator for employment in electricity.
INDU50	Indicator for employment in construction.
INDU61	Indicator for employment in wholesale trade.
INDU62	Indicator for employment in retail trade.
INDU63	Indicator for employment in restaurants.
INDU71	Indicator for employment in transport.
INDU72	Indicator for employment in communications.
INDU81	Indicator for employment in financing.
INDU82	Indicator for employment in insurance.
INDU83	Indicator for employment in real estate.
INDU91	Indicator for employment in public administration.
INDU92	Indicator for employment in sanitary services.
INDU93	Indicator for employment in social services.
INDU94	Indicator for employment in recreational and cultural services.
INDU95	Indicator for employment in personal and household services.
OCC31	Indicator for senior officials and employees in upper management.
OCC32	Indicator for senior officials and employees in research and planning.
OCC33	Indicator for senior officials and employees in education and training.
OCC34	Indicator for other senior officials and employees.
OCC41	Indicator for supervisors.
OCC42	Indicator for clerical and sales workers, independent work.
OCC43	Indicator for clerical and sales workers, routine work.
OCC44	Indicator for other lower-level employees with administrative and clerical occupations.
OCC51	Indicator for workers in agriculture, forestry and commercial fishing.
OCC52	Indicator for manufacturing workers.
OCC53	Indicator for other production workers.
OCC54	Indicator for distribution and service workers.

Table B. Sample mean characteristics of all female employees retained in the actual estimating data and separately for the occupational social status categories considered[1]

Variable	All female employees	Upper-level non-manual (OCC31-34)	Lower-level non-manual (OCC41-44)	Manu-facturing workers (OCC52)	Other manual workers (OCC53-54)
EARN	41.09	57.09	40.66	33.00	35.69
	(23.66)	(20.08)	(24.80)	(13.54)	(22.31)
ln EARN	3.63	3.99	3.63	3.45	3.49
	(0.37)	(0.32)	(0.34)	(0.27)	(0.34)
SCHOOL	10.99	13.78	10.86	9.89	10.03
	(1.94)	(2.07)	(1.58)	(1.15)	(1.14)
BASIC EDUCATION (1,0)	0.3674	0.0669	0.3409	0.5952	0.5321
LOWER VOCATIONAL (1,0)	0.2823	0.0595	0.2884	0.3476	0.3797
UPPER VOCATIONAL (1,0)	0.2174	0.2082	0.2966	0.0524	0.0856
SHORT NON-UNIV (1,0)	0.0604	0.2119	0.0552	-	0.0027
UNDERGRADUATE (1,0)	0.0352	0.2119	0.0118	-	-
GRADUATE (1,0)	0.0372	0.2416	0.0072	0.0048	-
EXP	16.14	14.74	15.92	16.89	17.48
	(9.82)	(9.30)	(9.51)	(8.82)	(11.22)
SEN	8.60	8.04	8.88	8.43	8.48
	(8.09)	(7.87)	(8.23)	(7.60)	(8.13)
MARRIED (1,0)	0.7313	0.7026	0.7378	0.7762	0.7112
CHILD$^{0-6}$ (1,0)	0.2094	0.2565	0.2188	0.2143	0.1471
CHILD$^{7-17}$ (1,0)	0.3694	0.3123	0.3951	0.3857	0.3342
CAPITAL (1,0)	0.2074	0.2416	0.2450	0.0810	0.1524
TEMPEMPL (1,0)	0.1188	0.1970	0.1139	0.0476	0.1177
PART-TIME (1,0)	0.0609	0.0595	0.0515	0.0048	0.1150
PIECE-RATE (1,0)	0.0649	0.0112	0.0127	0.4238	0.0588
NODAYWORK (1,0)	0.2486	0.0966	0.2278	0.2762	0.3824
UNEMPL (1,0)	0.0981	0.0046	0.0461	0.0172	0.0289
UNION (1,0)	0.7957	0.7770	0.7957	0.9143	0.7781
OJT (1,0)	0.3770	0.6171	0.4349	0.0952	0.2112
OCC31 (1,0)	0.0106	0.0706			
OCC32 (1,0)	0.0156	0.1115			
OCC33 (1,0)	0.0478	0.3532			
OCC34 (1,0)	0.0629	0.4647			
OCC41 (1,0)	0.0423		0.0750		
OCC42 (1,0)	0.2058		0.3671		
OCC43 (1,0)	0.1309		0.2351		
OCC44 (1,0)	0.1802		0.3228		
OCC51 (1,0)	0.0075				
OCC52 (1,0)	0.1057			1.000	
OCC53 (1,0)	0.0554				0.2914
OCC54 (1,0)	0.1354				0.7086
INDU11-13 (1,0)	0.0096				
INDU31 (1,0)	0.0357			0.1810	
INDU32 (1,0)	0.0433			0.3524	
INDU33 (1,0)	0.0161			0.0810	
INDU34 (1,0)	0.0367	0.0929[2]	0.1004[2]	0.1000	0.1203[2]
INDU35 (1,0)	0.0116			0.0333	
INDU36 (1,0)	0.0035			0.0190	
INDU37 (1,0)	0.0020				
INDU38 (1,0)	0.0393			0.2095	
INDU20/39 (1,0)	0.0025				
INDU40 (1,0)	0.0055		0.0072		0.0080
INDU50 (1,0)	0.0146		0.0172	0.0238	0.0134
INDU61 (1,0)	0.0287				
INDU62 (1,0)	0.0946	0.0669[3]	0.2025[3]		0.2112[3]

Table B. (cont.)

Variable	All female employees	Upper-level non-manual (OCC31-34)	Lower-level non-manual (OCC41-44)	Manu-facturing workers (OCC52)	Other manual workers (OCC53-54)
INDU63 (1,0)	0.0393				
INDU71 (1,0)	0.0272	0.0149[4]	0.0615[4]		0.0668[4]
INDU72 (1,0)	0.0226				
INDU81 (1,0)	0.0589				
INDU82 (1,0)	0.0086	0.1115[5]	0.1438[5]		0.0562[5]
INDU83 (1,0)	0.0398				
INDU91 (1,0)	0.0694				
INDU92 (1,0)	0.0121				
INDU93 (1,0)	0.3468	0.7138[6]	0.4674[6]		0.5241[6]
INDU94 (1,0)	0.0242				
INDU95 (1,0)	0.0080				
Number of obs.	1987	269	1106	210	374

1 The figures in parentheses below the continuous variables give the standard deviation of the variable in question.

2 The percentage share refers to the whole manufacturing sector (INDU11-39), including mining (INDU20).

3 The percentage share refers to the whole sector of trade, restaurants and hotels (INDU61-63).

4 The percentage share refers to the whole sector of transport and communication (INDU71-72).

5 The percentage share refers to the whole sector of financing, insurance, real estate and business services (INDU81-83).

6 The percentage share refers to the whole sector of public, social and personal services (INDU91-95).

Table C. Sample mean characteristics of all male employees retained in the actual estimating data and separately for the occupational social status categories considered[1]

Variable	All male employees	Upper-level non-manual (OCC31-34)	Lower-level non-manual (OCC41-44)	Manu-facturing workers (OCC52)	Other manual workers (OCC53-54)
EARN	49.56	72.91	48.82	44.13	39.70
	(24.10)	(32.78)	(19.41)	(16.62)	(14.99)
ln EARN	3.82	4.21	3.83	3.74	3.64
	(0.37)	(0.38)	(0.34)	(0.30)	(0.27)
SCHOOL	11.01	13.54	11.22	10.15	10.06
	(1.98)	(2.25)	(1.49)	(1.06)	(1.13)
BASIC EDUCATION (1,0)	0.3532	0.0878	0.2275	0.4500	0.5123
LOWER VOCATIONAL (1,0)	0.3354	0.0585	0.2650	0.5050	0.4094
UPPER VOCATIONAL (1,0)	0.1819	0.2686	0.4475	0.0433	0.0738
SHORT NON-UNIV (1,0)	0.0524	0.2207	0.0350	0.0017	0.0045
UNDERGRADUATE (1,0)	0.0157	0.0771	0.0025	-	-
GRADUATE (1,0)	0.0613	0.2872	0.0225	-	-
EXP	17.46	17.34	17.06	17.44	17.81
	(10.84)	(9.96)	(10.67)	(11.09)	(11.58)
SEN	9.26	9.54	9.64	8.77	9.47
	(8.58)	(8.46)	(8.78)	(8.52)	(8.69)
MARRIED (1,0)	0.7421	0.8723	0.7750	0.6950	0.6868
CHILD$^{0-6}$ (1,0)	0.2584	0.2872	0.2825	0.2433	0.2304
CHILD$^{7-17}$ (1,0)	0.3297	0.4388	0.3375	0.3150	0.2573
CAPITAL (1,0)	0.1813	0.3032	0.2100	0.0917	0.1991
TEMPEMPL (1,0)	0.0749	0.0851	0.0575	0.0833	0.0671
PART-TIME (1,0)	0.0121	0.0160	0.0200	-	0.0201
PIECE-RATE (1,0)	0.1164	0.0293	0.0500	0.2200	0.0716
NODAYWORK (1,0)	0.2311	0.0745	0.1875	0.2617	0.3311
UNEMPL (1,0)	0.1074	0.0048	0.0124	0.0619	0.0253
UNION (1,0)	0.7296	0.6676	0.6800	0.8417	0.7383
OJT (1,0)	0.3569	0.6383	0.5150	0.1633	0.2640
OCC31 (1,0)	0.0639	0.3165			
OCC32 (1,0)	0.0529	0.2686			
OCC33 (1,0)	0.0388	0.1942			
OCC34 (1,0)	0.0440	0.2207			
OCC41 (1,0)	0.1064		0.5075		
OCC42 (1,0)	0.0587		0.2800		
OCC43 (1,0)	0.0084		0.0375		
OCC44 (1,0)	0.0377		0.1750		
OCC51 (1,0)	0.0262				
OCC52 (1,0)	0.3229			1.0000	
OCC53 (1,0)	0.0970				0.4049
OCC54 (1,0)	0.1431				0.5951
INDU11-13 (1,0)	0.0351				
INDU31 (1,0)	0.0299			0.0484	
INDU32 (1,0)	0.0105			0.0200	
INDU33 (1,0)	0.0341			0.0767	
INDU34 (1,0)	0.0655	0.2127[2]	0.2525[2]	0.1267	0.1433[2]
INDU35 (1,0)	0.0288			0.0533	
INDU36 (1,0)	0.0168			0.0400	
INDU37 (1,0)	0.0131			0.0250	
INDU38 (1,0)	0.1221			0.2433	
INDU20/39 (1,0)	0.0052			0.0100	
INDU40 (1,0)	0.0210	0.0133	0.0175	0.0383	0.0089
INDU50 (1,0)	0.1441	0.0319	0.1075	0.3183	0.0514
INDU61 (1,0)	0.0451				
INDU62 (1,0)	0.0576	0.1170[3]	0.2300[3]		0.1678[3]

Table C. (cont.)

Variable	All male employees	Upper-level non-manual (OCC31-34)	Lower-level non-manual (OCC41-44)	Manu-facturing workers (OCC52)	Other manual workers (OCC53-54)
INDU63 (1,0)	0.0094				
INDU71 (1,0)	0.0818	0.0293[4]	0.0925[4]		0.3669[4]
INDU72 (1,0)	0.0314				
INDU81 (1,0)	0.0126				
INDU82 (1,0)	0.0079	0.1729[5]	0.0800[5]		0.0492[5]
INDU83 (1,0)	0.0430				
INDU91 (1,0)	0.0582				
INDU92 (1,0)	0.0084				
INDU93 (1,0)	0.0901	0.4229[6]	0.2200[6]		0.2125[6]
INDU94 (1,0)	0.0110				
INDU95 (1,0)	0.0173				
Number of obs.	1908	376	400	600	447

1 The figures in parentheses below the continuous variables give the standard deviation of the variable in question.

2 The percentage share refers to the whole manufacturing sector (INDU11-39), including mining (INDU20).

3 The percentage share refers to the whole sector of trade, restaurants and hotels (INDU61-63).

4 The percentage share refers to the whole sector of transport and communication (INDU71-72).

5 The percentage share refers to the whole sector of financing, insurance, real estate and business services (INDU81-83).

6 The percentage share refers to the whole sector of public, social and personal services (INDU91-95).

Table D. Maximum likelihood estimates of the selection (probit) equation explaining the probability of females and males being employed (eq. (2) in the text)[1]

	FEMALE EMPLOYEES		MALE EMPLOYEES	
Variable	Coeff.	Mean	Coeff.	Mean
CONSTANT	-5.4340** (.7625)		-6.7155** (.8319)	
AGE	0.3349** (.0652)	38.42	0.4733** (.0723)	37.25
AGE^2	-0.0043** (.0017)	1662.4	-0.0086** (.0019)	1572.7
AGE^3 /1000	0.0005 (.0142)	78637	0.0376* (.0162)	73038
MARRIED	0.0840 (.0654)	0.6630	0.5640** (.0795)	0.6368
$CHILD^{0-17}$	-0.1842** (.0687)	0.3946	0.3419** (.0929)	0.3488
SOUTH	0.3985** (.0526)	0.6257	0.3532** (.0612)	0.6046
BASIC EDUCATION	-0.3269** (.0574)	0.4641	-0.2931** (.0649)	0.4506
No. of obs.	3193		2825	
Prob(W=1), %***	88.5		89.2	

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1 Standard errors are given in parentheses below the estimates.
* Denotes significant estimate at a 5 % level.
** Denotes significant estimate at a 1 % level.
*** Percentage share of correctly predicted (probit) employment.

Table E. Regression results for extended human capital earnings equations estimated by gender using OLS.[1] The dependent variable is log hourly earnings inclusive of fringe benefits. Columns 2 and 4 comprise occupation controls.

Variable	Female employees (1)	Female employees (2)	Male employees (3)	Male employees (4)
CONSTANT	3.2825** (.0498)	3.3641** (.0572)	3.3805** (.0345)	3.4193** (.0489)
BASIC EDUCATION	0	0	0	0
LOWER VOCATIONAL	0.0121 (.0186)	0.0007 (.0182)	0.1027** (.0172)	0.0903** (.0162)
UPPER VOCATIONAL	0.1818** (.0243)	0.1194** (.0265)	0.2692** (.0232)	0.1554** (.0254)
SHORT NON-UNIV	0.3714** (.0326)	0.2211** (.0380)	0.4843** (.0363)	0.2606** (.0430)
UNDERGRADUATE	0.5239** (.0359)	0.2870** (.0422)	0.4676** (.0550)	0.2116** (.0599)
GRADUATE	0.6117** (.0408)	0.3686** (.0498)	0.6384** (.0359)	0.3978** (.0469)
EXP	0.0145** (.0030)	0.0107** (.0030)	0.0177** (.0030)	0.0134** (.0029)
$EXP^2/1000$	-0.2071** (.0682)	-0.1353* (.0665)	-0.2452** (.0703)	-0.1804** (.0658)
MARRIED	-0.0162 (.0158)	-0.0197 (.0153)	0.0517** (.0192)	0.0365* (.0183)
$CHILD^{0\text{-}6}$	0.0299 (.0207)	0.0248 (.0200)	-0.0125 (.0158)	-0.0112 (.0151)
$CHILD^{7\text{-}17}$	0.0026 (.0137)	0.0088 (.0132)	0.0536** (.0165)	0.0460** (.0156)
CAPITAL	0.0900** (.0189)	0.0870** (.0183)	0.1290** (.0226)	0.1213** (.0217)
TEMPEMPL	0.0622* (.0318)	0.0377 (.0314)	-0.0708* (.0373)	-0.0773* (.0372)
PART-TIME	0.2784** (.0499)	0.2873** (.0483)	0.2037 (.1314)	0.1845 (.1368)
PIECE-RATE	0.0129 (.0328)	0.0370 (.0356)	0.0901** (.0214)	0.1014** (.0206)
NODAYWORK	0.1302** (.0189)	0.1596** (.0187)	0.0177 (.0172)	0.0533** (.0171)
UNEMPLOYMENT	-0.0267 (.0311)	-0.0065 (.0306)	-0.0717** (.0278)	-0.0560* (.0275)
UNION	-0.0325 (.0226)	-0.0152 (.0222)	-0.0115 (.0191)	0.0153 (.0177)

Table E. (cont.)

Variable	Female employees (1)	(2)	Male employees (3)	(4)
Industry sector indicators:				
INDU11-13 (agriculture)	0.0375 (.0628)	0.0510 (.0677)	-0.1304** (.0413)	-0.0869* (.0467)
INDU31 (food manuf.)	-0.0224 (.0392)	-0.0050 (.0387)	-0.0256 (.0466)	0.0048 (.0451)
INDU32 (textile)	-0.0477 (.0417)	-0.0294 (.0417)	0.0394 (.0477)	0.0420 (.0474)
INDU33 (wood prod.)	-0.0112 (.0441)	-0.0199 (.0439)	-0.1182** (.0346)	-0.1140** (.0316)
INDU34 (paper prod.)	0.1640** (.0389)	0.1402** (.0370)	0.2107** (.0341)	0.2116** (.0308)
INDU35 (chemicals)	0.0326 (.0529)	0.0196 (.0498)	0.1035* (.0502)	0.1067* (.0487)
INDU36 (non-metallic)	-0.0340 (.0665)	-0.0119 (.0576)	-0.0103 (.0616)	0.0118 (.0618)
INDU37*** (basic metal)			0.1678** (.0421)	0.1926** (.0382)
INDU38 (metal products)	0	0	0	0
INDU20/39**** (oth. manuf.)	0.2322* (.1184)	0.0964 (.0900)	0.1094 (.0900)	0.0759 (.0801)
INDU40 (electricity)	0.0294 (.0473)	-0.0148 (.0375)	0.0888* (.0412)	0.0957** (.0377)
INDU50 (construction)	0.0308 (.0516)	0.0183 (.0483)	0.0286 (.0246)	0.0520* (.0241)
INDU61 (wholesale)	0.0802* (.0467)	0.0272 (.0447)	0.0523 (.0449)	0.0260 (.0420)
INDU62 (retail trade)	-0.0553 (.0390)	-0.1418** (.0395)	-0.0867* (.0388)	-0.0290 (.0417)
INDU63 (restaurants)	0.0129 (.0449)	0.0091 (.0440)	-0.0340 (.0512)	-0.0141 (.0591)
INDU71 (transport)	0.1049* (.0537)	0.0622 (.0522)	-0.0193 (.0269)	0.0496 (.0307)
INDU72 (communication)	0.1020** (.0410)	0.0737* (.0394)	0.0103 (.0328)	0.0901** (.0342)
INDU81 (financing)	0.2005** (.0400)	0.1522** (.0396)	0.2534** (.0693)	0.2067** (.0726)
INDU82 (insurance)	0.1538* (.0718)	0.1027 (.0730)	0.1572** (.0348)	0.2100** (.0474)

Table E. (cont.)

Variable	Female employees (1)	(2)	Male employees (3)	(4)
INDU83 (real estate)	0.0373 (.0474)	-0.0080 (.0440)	0.0333 (.0352)	0.0199 (.0347)
INDU91 (public adm.)	0.0707* (.0328)	0.0368 (.0311)	-0.0130 (.0329)	0.0162 (.0333)
INDU92 (sanitary services)	-0.0475 (.0897)	-0.0149 (.0878)	-0.2041** (.0802)	-0.1688* (.0881)
INDU93 (social services)	0.0304 (.0318)	-0.0147 (.0313)	-0.0338 (.0327)	-0.0182 (.0389)
INDU94 (cultural services)	0.1011 (.0719)	0.0568 (.0722)	0.0283 (.0820)	-0.0150 (.0740)
INDU95 (personal services)	-0.0421 (.0697)	-0.0224 (.0623)	-0.1646** (.0330)	-0.0782* (.0389)
Occupational status indicators:				
OCC31 (management)		0.3620** (.0609)		0.3936** (.0552)
OCC32 (research)		0.0988* (.0603)		0.2192** (.0543)
OCC33 (education)		0.3481** (.0419)		0.2620** (.0669)
OCC34 (oth. seniors)		0.1685** (.0367)		0.1566** (.0538)
OCC41 (supervisors)		0.0856** (.0325)		0.0899** (.0383)
OCC42 (indep. clericals)		0.0440 (.0302)		-0.0552 (.0484)
OCC43 (routine clericals)		0.0047 (.0285)		-0.0063 (.1052)
OCC44 (oth. lower-level non-manual workers)		0		0
OCC51 (agriculture workers)		-0.1547* (.0756)		-0.0487 (.0648)
OCC52 (manufacturing workers)		-0.1038** (.0348)		-0.0213 (.0401)
OCC53 (oth. prod. workers)		-0.1205** (.0313)		-0.0963** (.0405)
OCC54 (service workers)		-0.1045** (.0316)		-0.1072** (.0386)
R^2 adj.	0.3048	0.3513	0.3916	0.4561
SEE	0.3069	0.2964	0.2958	0.2796

F-statistic	22.77	22.09	30.93	31.75
Number of obs.	1987	1987	1908	1908

1 Standard errors are given in parentheses below the estimates and are adjusted for heteroscedasticity according to White (1980). A simple Chow test suggests that the hypothesis of the parameter estimates being equal for males and females can be rejected at a 0.1 % level.

* Denotes significant estimate at a 5 % level.

** Denotes significant estimate at a 1 % level.

*** The four observations on females employed in basic metal industries are included in the reference category INDU38.

**** Includes employment in mining and quarrying.

Table F. Correlation matrix for schooling and occupational category variables by gender

	S	BASIC EDUCA-TION	LOWER VOCA-TIONAL	UPPER VOCA-TIONAL	SHORT NON-UNIV	UNDER-GRA-DUATE	GRA-DUATE
Females:							
OCC31	0.07923	-0.05834	-0.03202	0.06484	-0.00554	0.06034	0.03165
OCC32	0.16833	-0.08751	-0.05190	0.04194	0.00218	0.13014	0.12537
OCC33	0.42856	-0.16587	-0.13007	-0.08380	0.22044	0.32821	0.31717
OCC34	0.31156	-0.13726	-0.12107	0.01419	0.16925	0.15287	0.24460
OCC41	-0.00688	-0.00965	0.00158	0.01660	0.04123	-0.02658	-0.04132
OCC42	-0.05318	0.03547	-0.08704	0.13000	-0.06637	-0.02301	-0.06069
OCC43	-0.09397	0.03863	-0.03782	0.11748	-0.09837	-0.06605	-0.07631
OCC44	0.04659	-0.14810	0.13941	0.03862	0.10103	-0.08958	-0.07837
OCC51	-0.04168	0.01796	0.04863	-0.04597	-0.02211	-0.01667	-0.01715
OCC52	-0.19642	0.16247	0.04986	-0.13754	-0.08715	-0.06569	-0.05897
OCC53	-0.09334	0.03920	0.08284	-0.06357	-0.05214	-0.04626	-0.04761
OCC54	-0.21641	0.16530	0.06553	-0.13724	-0.10032	-0.07561	-0.07783
Males:							
OCC31	0.18466	-0.09007	-0.14031	0.14891	0.08273	0.03585	0.12071
OCC32	0.36829	-0.16003	-0.14813	-0.00224	0.35404	0.02657	0.27130
OCC33	0.37813	-0.14277	-0.13696	-0.04545	0.20855	0.34555	0.25414
OCC34	0.24634	-0.12118	-0.10917	0.09751	0.04124	0.07556	0.22201
OCC41	0.03290	-0.09143	-0.07593	0.28679	-0.04301	-0.04361	-0.06694
OCC42	0.00688	-0.01662	-0.06407	0.13081	-0.01871	-0.01364	-0.02665
OCC43	0.04598	-0.05594	-0.00447	0.06094	0.02995	-0.01162	0.00045
OCC44	0.02832	-0.09456	0.04572	0.09915	-0.00955	-0.02503	-0.03915
OCC51	-0.10316	0.09841	-0.00536	-0.06033	-0.03858	-0.02073	-0.04193
OCC52	-0.30156	0.14633	0.23830	-0.24419	-0.15736	-0.08727	-0.17648
OCC53	-0.14411	0.08022	0.08233	-0.09021	-0.07706	-0.04141	-0.08375
OCC54	-0.20679	0.16460	0.03306	-0.11505	-0.08267	-0.05165	-0.10444

Table G. Female occupational earnings equations corrected for selectivity bias (eq. (13) in the text).[1] The dependent variable is log hourly earnings inclusive of fringe benefits.

Variable	Upper-level non-manual (OCC31-34)	Lower-level non-manual (OCC41-44)	Manu-facturing workers (OCC52)	Other manual workers (OCC53-54)
CONSTANT	3.6359** (.2316)	3.2742** (.0585)	3.2410** (.1164)	2.9305** (.1724)
S	0.0639* (.0290)	0.0449** (.0078)	-0.0003 (.0204)	-0.0128 (.0184)
EXP	0.0096 (.0073)	0.0077* (.0043)	0.0161** (.0067)	0.0036 (.0064)
EXP^2 /1000	-0.1265 (.1911)	-0.1786* (.0971)	-0.1991 (.1593)	-0.0368 (.1227)
SEN	0.0067* (.0033)	0.0093** (.0012)	-0.0035 (.0033)	0.0038* (.0019)
OJT	-0.0096 (.0361)	0.0194 (.0179)	0.1794** (.0487)	-0.0158 (.0311)
MARRIED	-0.0803* (.0385)	-0.0073 (.0209)	0.0725* (.0336)	-0.0243 (.0327)
CAPITAL	-0.0210 (.0432)	0.1438** (.0233)	-0.0434 (.0599)	0.0877 (.0546)
TEMEMPL	0.1145* (.0523)	0.0108 (.0444)	0.1274 (.1089)	0.1238 (.0840)
PART-TIME	0.3466** (.1014)	0.3747** (.0775)		0.3422** (.0813)
PIECE-RATE		-0.0315 (.1142)	0.0119 (.0409)	0.2522** (.0767)
NODAYWORK	0.1075 (.0887)	0.1583** (.0270)	0.0865* (.0468)	0.2196** (.0395)
UNEMPLOYMENT		-0.0007 (.0439)	-0.0430 (.0637)	0.0322 (.0600)
UNION	0.0051 (.0526)	-0.0137 (.0285)	-0.1536** (.0488)	-0.0323 (.0515)
INDU11-39	0	0		0
INDU40		-0.0204 (.0360)		-0.1623* (.0908)
INDU50		0.0034 (.0618)	0.0455 (.0692)	0.0264 (.0624)
INDU61-63	-0.1145 (.0881)	-0.0884** (.0327)		-0.0547 (.0540)

Table G. (cont.)

Variable	Upper-level non-manual (OCC31-34)	Lower-level non-manual (OCC41-44)	Manu-facturing workers (OCC52)	Other manual workers (OCC53-54)
INDU71-72	-0.4066** (.1366)	0.0709* (.0389)		0.1091 (.0689)
INDU81-83	-0.0493 (.0779)	0.1108** (.0307)		-0.2257** (.0757)
INDU91-95	-0.1280* (.0569)	-0.0169 (.0286)		0.0262 (.0483)
INDU31			-0.0416 (.0609)	
INDU32			-0.0545 (.0517)	
INDU33			-0.0110 (.0678)	
INDU34			0.1656* (.0723)	
INDU35			-0.0406 (.0761)	
INDU36			-0.0820 (.0990)	
INDU38			0	
LAMBDA	0.0153 (.0848)	0.0778 (.0554)	0.0769 (.0685)	0.3097** (.1019)
R^2 adj.	0.2257	0.2145	0.1611	0.1998
SEE	0.2832	0.3025	0.2511	0.3072
F-statistic	5.88	16.09	3.01	5.66
No. of obs.	269	1106	210	374

---

1 Standard errors are in parentheses below the estimates and are adjusted for heteroscedasticity according to White (1980). The corresponding multinomial logit estimates are reported in Table I below.

* Denotes significant estimate at a 5 % level.

** Denotes significant estimate at a 1 % level.

Table H. Male occupational earnings equations corrected for selectivity bias (eq. (13) in the text).[1] The dependent variable is log hourly earnings inclusive of fringe benefits.

Variable	Upper-level non-manual (OCC31-34)	Lower-level non-manual (OCC41-44)	Manu-facturing workers (OCC52)	Other manual workers (OCC53-54)
CONSTANT	3.5948**	3.2828**	3.4358**	3.3973**
	(.1752)	(.0949)	(.0531)	(.0718)
S	0.0710**	0.0634**	0.0391**	0.0194
	(.0197)	(.0142)	(.0112)	(.0136)
EXP	0.0185*	0.0241**	0.0136**	0.0062
	(.0082)	(.0052)	(.0040)	(.0049)
EXP^2 /1000	-0.1002	-0.3778**	-0.2655**	-0.0926
	(.2055)	(.1104)	(.0901)	(.0989)
SEN	-0.0031	0.0011	0.0041*	0.0057**
	(.0031)	(.0025)	(.0019)	(.0017)
OJT	0.1003**	0.0824**	0.0450*	0.0838**
	(.0352)	(.0282)	(.0218)	(.0264)
MARRIED	0.0148	0.0904**	0.0640*	0.0383
	(.0534)	(.0341)	(.0276)	(.0260)
CAPITAL	0.0882*	0.1307**	0.2058**	0.1291**
	(.0416)	(.0361)	(.0585)	(.0379)
TEMEMPL	-0.1483*	-0.1209	-0.0282	0.0935
	(.0739)	(.1153)	(.0536)	(.0912)
PART-TIME	-0.0659	0.5811*		0.0113
	(.1309)	(.0250)		(.2044)
PIECE-RATE	0.2792**	0.1100	0.0743**	0.0774
	(.0877)	(.0741)	(.0241)	(.0517)
NODAYWORK	-0.1372	0.0293	0.1004**	0.0855**
	(.0868)	(.0404)	(.0250)	(.0263)
UNEMPLOYMENT		-0.0415	-0.0864**	-0.0610
		(.0994)	(.0362)	(.0655)
UNION	-0.0843*	0.0034	0.0412	-0.0059
	(.0408)	(.0345)	(.0341)	(.0376)
INDU11-39	0	0		0
INDU40	-0.1318	0.2059**	0.1419**	-0.0588
	(.1181)	(.0658)	(.0498)	(.1065)
INDU50	0.0550	-0.0221	0.1055**	0.0258
	(.1506)	(.0451)	(.0297)	(.0543)
INDU61-63	0.0702	-0.1935**		0.0269
	(.0670)	(.0440)		(.0446)

Table H. (cont.)

Variable	Upper-level non-manual (OCC31-34)	Lower-level non-manual (OCC41-44)	Manu-facturing workers (OCC52)	Other manual workers (OCC53-54)
INDU71-72	-0.0690 (.1117)	-0.0131 (.0512)		0.0268 (.0388)
INDU81-83	0.0110 (.0513)	0.0198 (.0538)		0.0124 (.0512)
INDU91-95	-0.0634 (.0488)	-0.0934* (.0459)		-0.0351 (.0427)
INDU31			0.0339 (.0693)	
INDU32			0.1037* (.0618)	
INDU33			-0.0930** (.0372)	
INDU34			0.1643** (.0342)	
INDU35			0.1349* (.0701)	
INDU36			-0.0105 (.0487)	
INDU37			0.1110** (.0353)	
INDU38			0	
INDU39			-0.0288 (.0774)	
LAMBDA	0.0491 (.0661)	0.0356 (.0446)	-0.1215** (.0426)	-0.0122 (.0402)
R^2 adj.	0.2510	0.3541	0.2581	0.1502
SEE	0.3247	0.2748	0.2582	0.2479
F-statistic	7.61	11.94	10.06	4.94
No. of obs.	376	400	600	447

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1 Standard errors are in parentheses below the estimates and are adjusted for heteroscedasticity according to White (1980). The corresponding multinomial logit estimates are reported in Table J below.

* Denotes significant estimate at a 5 % level.

** Denotes significant estimate at a 1 % level.

Table I. Multinomial logit estimates for occupational choice equations (eq. (10) in the text), female employees[1]

Variable	Upper-level non-manual	Manufacturing workers	Other manual workers
CONSTANT	-3.72458** (.40818)	-1.39394** (.35353)	-1.15095** (.24114)
LOWER VOCATIONAL	0.38907 (.35834)	-0.34012* (.19381)	-0.22260 (.14662)
UPPER VOCATIONAL	1.58004** (.30739)	-2.46816** (.35089)	-1.74525** (.22155)
SHORT NON-UNIV	3.30884** (.33285)		-3.51825** (1.01642)
UNDERGRADUATE	4.87645** (.42315)		
GRADUATE	5.55610** (.48242)		
EXP	0.02589** (.01042)	-0.02174* (.00973)	-0.00376 (.00701)
MARRIED	0.22356 (.23378)	0.07407 (.22569)	-0.05600 (.16323)
MARRIED·CHILD$^{0-6}$	0.00905 (.23720)	-0.06332 (.23378)	-0.51437** (.19433)
MARRIED·CHILD$^{7-17}$	-0.56058** (.22019)	-0.14514 (.19449)	-0.25319* (.15111)
PART-TIME	0.04010 (.41755)	-2.90800** (1.02174)	0.77572** (.23159)
NODAYWORK	-0.79757** (.26068)	0.21063 (.19238)	0.69416** (.13602)
PUBLIC	-0.09523 (.19528)		0.11204 (.13053)
UUSIMAA	0.87352** (.32798)	1.68158** (.37544)	0.56086* (.27246)
OTHER SOUTH	0.00018 (.24664)	1.38645** (.28935)	0.60342** (.18327)
MIDDLE	0.09339 (.30170)	1.58666** (.33887)	0.51690* (.22584)
NORTH	0.60690* (.28757)	1.75038** (.33291)	0.72101* (.21895)

Log-Likelihood = -1647.3   Pred.[2] = 63.2%
Chi-square (48) = 1248.8   No. of obs. = 1972

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1 Standard errors are in parentheses below the estimates. The reference group is lower-level salaried employees OCC41-44.
2 Percentage of correctly predicted occupational attainment.
* Denotes significant estimate at a 5 % level.
** Denotes significant estimate at a 1 % level.

Table J. Multinomial logit estimates for occupational choice equations (eq. (10) in the text), male employees[1]

Variable	Upper-level non-manual	Manufacturing workers	Other manual workers
CONSTANT	-1.43756** (.39920)	1.39352** (.31251)	1.69844** (.30335)
LOWER VOCATIONAL	-0.32912 (.31990)	-0.22183 (.18449)	-0.62703** (.19115)
UPPER VOCATIONAL	0.71664** (.26776)	-3.15939** (.26416)	-2.97573** (.25472)
SHORT NON-UNIV	3.10459** (.38147)	-3.82779** (1.05710)	-3.13757** (.77632)
UNDERGRADUATE	4.83503** (1.06255)		
GRADUATE	3.83825** (.43922)		
EXP	0.02085* (.01048)	-0.02200** (.00839)	-0.02464** (.00860)
MARRIED	0.41637 (.28889)	-0.42543* (.21614)	-0.34918 (.21980)
MARRIED·CHILD$^{0-6}$	-0.11322 (.22600)	-0.12633 (.19024)	-0.06712 (.19808)
MARRIED·CHILD$^{7-17}$	0.20592 (.19827)	-0.11060 (.17391)	-0.39217* (.18248)
PART-TIME	0.94469 (.64973)		-0.89945 (.62813)
NODAYWORK	-0.72137** (.27787)	0.50730** (.18185)	0.69768** (.18087)
PUBLIC	-0.33466 (.21190)	-1.54414** (.21127)	0.39015* (.17157)
UUSIMAA	-0.59093 (.36283)	1.15263** (.31683)	0.00434 (.32343)
OTHER SOUTH	-0.44008* (.22845)	0.82168** (.22547)	-0.24368 (.21448)
MIDDLE	-0.45267 (.31372)	1.00447** (.27359)	0.17286 (.26118)
NORTH	-0.58836* (.28236)	0.70264** (.25939)	0.02959 (.24412)

Log-Likelihood = -1779.7 Pred.[2] = 59.7%
Chi-square (48) = 1522.6 No. of obs. = 1858

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1 Standard errors are in parentheses below the estimates. The reference group is lower-level salaried employees OCC41-44.

2 Percentage of correctly predicted occupational attainment.

* Denotes significant estimate at a 5 % level.

** Denotes significant estimate at a 1 % level.

CHAPTER V

PRIVATE/PUBLIC-SECTOR EARNINGS STRUCTURES IN FINLAND

Empirical evidence from a cross section of individuals

ABSTRACT:

This chapter focuses on displaying similarities and dissimilarities in the earnings structure of the private and public sectors in Finland. Special attention is thereby paid to the returns on investments in human capital received by male and female employees in the two sectors, with a further distinction made between males and females employed in, respectively, non-manual and manual jobs. The earnings equations are estimated using general selection techniques in order to account for potential selection bias arising from the individuals' decisions on labour force participation and their choice of sectoral and occupational status. The empirical evidence suggests that the estimation of separate earnings equations for the private and the public sector may produce quite a puzzling picture of the effects of human capital on the earnings structure of the two sectors. This picture changes dramatically, however, when a further distinction is made between employees in non-manual and manual jobs in each sector. In particular, the estimation results display a high degree of similarity in sectoral returns on investment in human capital within the broad categories of non-manual and manual workers, implying that the differences in human capital returns tend to be larger between occupational categories than across sectors.

1. INTRODUCTION*

In the past few decades, the public sector has experienced a rapid increase both in employment and in relative earnings (e.g. Oxley & Martin, 1991). Simultaneously the traditional differences between the private- and public-sector labour markets have become more vague or vanished. In view of this it is hardly surprising that earnings differentials between the private and public sectors have received much attention in the international literature.

The original stimulus for this development was provided by Smith (1976,1977) who analysed the wage setting processes in the government and private sectors in the United States by estimating separate earnings equations for the two sectors from a large micro-level data set. The methodology introduced by Smith has been frequently repeated by other authors. It has also been criticized, however, for producing biased estimates since it assumes a random distribution of individuals between sectors (Belman & Heywood, 1989).

In more recent years, empirical evidence on private/public-sector wage structures and differentials has been published also for the Nordic countries: for Denmark by Pedersen et al. (1990), for Norway by Barth & Mastekaasa (1990), and for Sweden by Johansson & Selén (1988), Zetterberg (1988), Arai (1991), and Kazamaki & D'Agostino (1992). The estimation results reported in these studies are, however, hard to generalize because of notable differences in underlying data, included variables and estimation methods used. Moreover, some studies control for the sectoral status of employees by adding indicator variables to a single earnings equation, while other studies estimate separate earnings equations for the private and the public sector, occasionally with a further distinction made in each sector between male and female employees or white- and blue-collar workers.

The empirical evidence available for Finland is restricted to a few estimates on private/public-sector earnings differentials as measured by sector controls introduced in a single earnings equation. Estimation results reported by Brunila (1990) suggest that in both 1975 and 1985, the average earnings

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level of upper-level non-manual workers in the public sector was lower for men and higher for women as compared to the private sector. Among lower-level non-manual workers, on the other hand, the average earnings level of both genders was found to be higher in the public sector in 1975 but lower in 1985. Estimates reported by Eriksson (1992), also based on Population Census data, point to a significantly positive wage premium on the part of both local and central government employees in the early 1970s. This wage differential had turned negative by 1985, but significantly so for the local government level only. Estimates based on Labour Force Survey data for 1987 point to a significant negative public-sector wage differential for men and to a negligible wage differential across sectors among women (Asplund et al., 1993).

A negative wage differential for public-sector employment has generally been obtained also for the other Nordic countries. A common interpretation of this negative public-sector differential is that it is the price public-sector employees pay for better job security and/or other non-pecuniary rewards. In the United States, in turn, the general finding is a positive public-sector wage differential (e.g. Ehrenberg & Schwarz (1986), Moulton (1990)), which is found to increase further if the wage rates are adjusted for fringe benefits (Bellante & Long, 1981). This positive wage gap is commonly interpreted as an economic rent.

Controlling for the sectoral status of employees by introducing indicator variables into a single earnings equation can be criticized, however, for restricting the earnings effects of various background factors to be the same across sectors. Since the private and public sectors act in different market environments, the wage determination process may be expected to differ between the two sectors. Therefore, in the subsequent empirical analysis of earnings determination in the private and public sectors in Finland, separate earnings equations of the Mincer (1974) type are estimated for each sector and gender. In doing this, the individuals are assumed to exercise some choice over their sectoral status; that is, the observed allocation is thought to be the outcome of a non-random distribution of individuals on sectors, reflecting different preferences over, inter alia, working conditions.

The Swedish labour market has been found to show tendencies of producing higher mean wages in the private sector for high-paid groups and higher mean wages in the public sector for a number of low-paid groups (e.g.

Wadensjö (1986), Johansson & Selén (1988), and Zetterberg (1988)). Hence, of perhaps even more interest than the overall sectoral earnings structures are the differences between specific categories of private- and public-sector employees.

In a second step, therefore, both the private/public-sector status and the occupational social status of the employees are treated as endogenously determined through a selection process. More formally, this multiple choice is dealt with in the estimations by using a general selection model proposed by Lee (1983), which, in the present analysis, allows the employees to select across four labour markets: private- and public-sector non-manual/manual jobs. This model has previously been applied by Trost & Lee (1984) to the estimation of returns to technical schooling, by Reilly (1991) and myself (Chapter IV of this study) to the estimation of occupational earnings equations, and by Gyourko & Tracy (1988) to the analysis of private- and public-sector union/non-union wage structures.

The rest of the chapter is organized as follows. Section 2 presents the empirical models, the estimation methods employed and the data underlying the estimation results reported in the next two sections. Section 3 focuses on the role of primarily acquired human capital but also of other relevant personal and job-related characteristics in the determination of male and female earnings in the private and the public sector. In Section 4, the empirical analysis is extended to the gender-specific earnings structures of non-manual and manual workers employed in the two sectors. In particular, separate earnings equations are estimated by gender and sector for employees in, respectively, non-manual and manual jobs. Section 5 summarizes the reported empirical evidence with reference to evidence obtained for the other Nordic countries.

2. MODEL SPECIFICATIONS AND DATA

Separate private-sector and public-sector earnings equations of the Mincer (1974) type are estimated for each gender.[1] Specifically, the log earnings of the i^{th} male/female employed in the respective sector j (j=1,2) are explained in terms of a broad set of personal and job-related characteristics. The gender-specific earnings equations for the private sector ($\ln EARN_{i1}^{g}$) and the public sector ($\ln EARN_{i2}^{g}$) may be written in the general form

$$(1) \qquad lnEARN^g_{i1} = X^g_{i1}\alpha^g_1 + \varepsilon^g_{i1}\,, \qquad\qquad \varepsilon^g_{ij} \sim N(0, \sigma^2_j)$$

$$(2) \qquad lnEARN^g_{i2} = X^g_{i2}\alpha^g_2 + \varepsilon^g_{i2}\,, \qquad\qquad i = 1,...,N$$

where X_{ij} denotes the vectors of explanatory variables, α_j is the vectors of the parameters to be estimated, and ε_{ij} denotes the disturbance terms. For convenience, the superscript g denoting gender is suppressed in the following.

Estimation of the sector-specific earnings equations in (1) and (2) using ordinary least squares (OLS) techniques may involve problems of sample selectivity bias and endogeneity of explanatory variables. First, in the survey data used in the analysis, the sample individuals recorded as being employed represent persons who were employed during the week of the questionnaire, excluding all individuals who, for some reason, were not employed at that particular time. Second, the allocation of employees into the private and public sectors may not be the outcome of a random drawing, allowing sector employment to be treated as exogenously given. Instead it can be expected to be the outcome of individual choice over employment in the two sectors. Given that these potential sources of selection bias have a non-negligible influence on the estimation results, OLS estimation of the sectoral earnings equations will result in inconsistent parameter estimates.

Adjustment for potential selection bias influencing the estimation results is done by estimating the earnings functions in (1) and (2) in combination with a sequential selection model of the bivariate probit type explaining the probability of the i^{th} sample individual being employed and, moreover, in the given sector. In other words, there are two criterion functions: the selection of being employed (W^*_{i1}), and the selection of private versus public status (W^*_{i2}). These two criteria for selectivity may be written as

$$(3) \qquad W^*_{i1} = Y_{i1}\beta_1 - \mu_{i1}\,, \qquad\qquad \mu_{i1}, \mu_{i2} \sim N(0, 1)$$

$$(4) \qquad W^*_{i2} = Y_{i2}\beta_2 - \mu_{i2}\,, \qquad\qquad Cov\,(\mu_{i1}, \mu_{i2}) = \rho_{\mu_1\mu_2}$$

where Y_{ik} denotes the vectors of the explanatory variables, β_k is the vectors of the unknown parameters, and μ_{ik} denotes the disturbance terms with a bivariate standard normal distribution and correlation ρ. Hence, no restrictions are imposed a priori on the independence or dependence of the two decisions.

The dependent variables (W_{ik}^*) in the bivariate probit model are unobservable, but both have a dichotomous observable realization W_{i1} (employed or not) and W_{i2} (employment in given sector) which is related to, respectively, W_{i1}^* and W_{i2}^* as follows:

$$W_{i1} = 1 \qquad \textit{iff} \;\; W_{i1}^* > 0, \quad W_{i1} = 0 \;\; \textit{otherwise}$$

$$W_{i2} = 1 \qquad \textit{iff} \;\; W_{i2}^* > 0, \quad W_{i2} = 0 \;\; \textit{otherwise.}$$

Data on W_{i2} are, however, not observed unless $W_{i1} = 1$; that is, employment in the private or the public sector is observed only for the subset of working individuals, implying that the data on W_{i2} are nonrandomly selected from the entire sample population. Furthermore, the private-sector earnings equation in (1) is observed only if $W_{i1} = 1$ and $W_{i2} = 1$, while the public-sector earnings equation in (2) is observed only if $W_{i1} = 1$ and $W_{i2} = 0$. The two sets with $W_{i1} = 0$ will logically be empty.

The information obtained from estimating the bivariate sequential-decision model in (3) and (4), i.e.

$$\text{(5)} \qquad Prob\,(W_{i1} = 1, W_{i2} = 1) = Prob\,(\mu_{i1} < Y_{i1}\beta_1, \mu_{i2} < Y_{i2}\beta_2)$$
$$= F(Y_{i1}\beta_1, Y_{i2}\beta_2, \rho_{\mu_1\mu_2})$$

applying bivariate probit analysis is then used to correct the sector-specific earnings equations in (1) and (2) for the potential presence of selectivity bias arising from the decision of whether or not to enter the labour force and, if so, whether to work in the private sector or the public sector. By allowing the two decisions to be correlated, i.e. $\text{Cov}(\mu_{i1}, \mu_{i2}) = \rho_{\mu_1\mu_2}$, the expressions for the selectivity bias correction become considerably more complicated compared to those of the standard Heckman (1979) two-stage estimation procedure, which would require the two decisions to be independent ($\text{Cov}(\mu_{i1},\mu_{i2}) = 0$).

Following Fishe et al. (1981) and Maddala (1983), the conditional expectation of, say, the private-sector earnings equation in (1), when assuming dependence in the underlying decisions, may be written as

$$(6)\quad E(lnEARN_{i1}|W_{i1}=1,\ W_{i2}=1)=X_{i1}\alpha_1+E(\varepsilon_{i1}|\mu_{i1}<Y_{i1}\beta_1,\ \mu_{i2}<Y_{i2}\beta_2)$$

$$=X_{i1}\alpha_1+\lambda_{11}M_{12}+\lambda_{12}M_{21}\ ,$$

where ε_{i1}, μ_{i1} and μ_{i2} are assumed to follow a trivariate normal distribution and where

$$(7)\qquad \lambda_{jk}=Cov\ (\varepsilon_j,\ \mu_k)\ ,\qquad\qquad j=1,2\quad k=1,2$$

$$(8)\qquad M_{jk}=(1-\rho^2_{\mu_1\mu_2})^{-1}\ (P_j-\rho_{\mu_1\mu_2}P_k)$$

$$(9)\qquad P_k=\frac{\int_{-\infty}^{Y_{i1}\beta_1}\int_{-\infty}^{Y_{i2}\beta_2}\mu_{ik}f\ (\mu_{i1},\ \mu_{i2})\ d\mu_{i2}d\mu_{i1}}{F(Y_{i1}\beta_1,\ Y_{i2}\beta_2)}\ .$$

After having used bivariate probit methods to estimate β_1, β_2, and $\rho_{\mu_1\mu_2}$, the second stage of the estimation procedure thus involves regression of individual private-sector earnings (lnEARN_{i1}) on X_{i1} and the constructed variables M_{12} and M_{21} in order to obtain consistent estimates of α_1, λ_{11}, and λ_{12}. The public-sector earnings equation in (2) is corrected for potential selection bias in an analogous way.

Various empirical specifications of the sectoral earnings equations in (1) and (2) are estimated with the LIMDEP program, whereby correction for the potential presence of the two sources of selectivity bias is made using the bivariate probit sample selection procedure outlined above. More formally, the applied estimation method allows the two decisions underlying employment in a given sector to be correlated, and accounts for sample selection both in the bivariate probit model and in the earnings model.

Because of the different occupational structure of the private and public sectors there is nevertheless reason to expect some degree of selectivity also when it comes to the occupational status of the employee. Therefore, in the following model specification both the sectoral status and the occupational status of employees are treated as endogenous variables. A distinction is made between four labour markets: private-sector non-manual workers, private-sector manual workers, public-sector non-manual workers, and public-sector manual workers. The potential sample selectivity bias arising from the decision of whether or not to join the labour force is not accounted for in this context.[2]

Following Lee (1983), the adopted approach, involving censored dependent variables in combination with multiple choice, can be formulated in terms of a polychotomous choice model with four mutually exclusive labour markets (LM_{im}) and four earnings equations ($EARN_{im}$):

$$(10) \qquad lnEARN_{im} = Z_{im}\gamma_m + \zeta_{im}, \qquad \zeta_{im} \sim N(0, \sigma_m^2)$$

$$(11) \qquad LM_{im}^* = V_i\theta_m + \eta_{im}, \qquad i = 1,\ldots,N \qquad m = 1,2,3,4$$

where Z_{im} and V_i are vectors of explanatory variables, γ_m and θ_m are vectors of unknown parameters, and ζ_{im} and η_{im} are disturbance terms. The potential earnings of the i^{th} sample employee in the m^{th} labour market given by the earnings function in (10) will be affected by selectivity bias if the disturbances in (10) and (11) are correlated.

The dependent variable ($lnEARN_{im}$) in the labour market earnings equation is observed only if the employee chooses to work in labour market m. This choice is assumed to be the outcome of an optimization process where the individual compares the maximum lifetime expected utility attainable from participating in the respective labour market and selects that alternative which provides the highest present value of net benefits. The utility maximization process is thought to be captured by the labour market indicator function

$$(12) \qquad LM_i = m \qquad iff \;\; LM_{im}^* > \max LM_{ik}^*, \quad k = 1,2,3,4 \quad k \neq m.$$

Following Lee (1983), the i^{th} individual's choice of the m^{th} labour market as expressed in (12) can be reformulated as a binary decision, i.e.

$$(13) \qquad LM_i = m \qquad iff \;\; V_i\theta_m > \psi_{im},$$

where ψ_{im} is the residual for each individual and labour market and is defined as

$$(14) \qquad \psi_{im} = \max LM^*_{ik} - \eta_{im}, \qquad k = 1,2,3,4 \qquad k \neq m .$$

Assuming that the residuals η_{im} of the utility function in (11) are independently and identically distributed with the Type 1 extreme value distribution[3], the probability that the labour market m will be chosen can be represented by a multinomial logit model[4]

$$(15) \qquad Prob\,(\psi_{im} < V_i\theta_m) = Prob\,(LM_i = m) = \frac{\exp\,(V_i\theta_m)}{1 + \sum_{k=1}^{4} \exp\,(V_i\theta_k)} .$$

Only the parameters of three of the four labour markets investigated can be identified, which requires a normalization $\Sigma\theta_m = 0$ (m = 1,2,3,4) to be imposed in the estimations.[5] The earnings equation conditional on labour market m being chosen may then be written as

$$(16) \qquad E(lnEARN_{im} \mid LM_i = m) = Z_{im}\gamma_m + E(\zeta_{im} \mid LM_i = m)$$

$$= Z_{im}\gamma_m + E(\zeta_{im} \mid \psi_{im} < V_i\theta_m) .$$

Given that ζ_{im} and ψ_{im} follow a bivariate normal distribution, a two-step estimation procedure similar to that postulated by Heckman (1979) can be used in order to correct the labour market earnings function in (10) for the potential effects of selectivity bias arising from the employees' choice of labour markets. Following Lee (1983), the ψ_{im} terms are transformed into standard normal random variables and a modified earnings equation conditional on labour market m being chosen is derived

$$(17) \qquad E(lnEARN_{im} \mid LM_i = m) = Z_{im}\gamma_m - \rho_m\sigma_m \frac{\varphi\,[F_m(V_i\theta_m)]}{\Phi\,[F_m(V_i\theta_m)]}$$

$$= Z_{im}\gamma_m - \rho_m\sigma_m\lambda_m ,$$

where ρ_m is the correlation coefficient between ζ_{im} and the transformed residuals ψ_{im}, σ_m is the standard deviation of the disturbance term in the earnings equation, $\varphi(\cdot)$ and $\Phi(\cdot)$ are, respectively, the density function and the distribution function of the standard normal distribution, and $F(\cdot)$ denotes the probability distribution function.

Various empirical specifications of the labour market earnings equation in (17) are estimated with the LIMDEP program using the multinomial logit-OLS two-stage estimator of Lee (1983). More exactly, the multinomial probability function in (15) is estimated by maximum likelihood and the obtained information is used to compute λ_m, i.e. the term controlling for the potential effects of selectivity bias. Consistent estimates of γ_m and $\Omega_m=\rho_m\sigma_m$ are then obtained by ordinary least squares regression of $lnEARN_{im}$ on Z_{im} and $\hat{\lambda}_m$:

$$(18) \qquad lnEARN_{im} = Z_{im}\gamma_m + \Omega_m\hat{\lambda}_m + \tau_{im} \, ,$$

where $E(\tau_{im} \mid LM_i{=}m) = 0$ and $E(\tau^2_{im} \mid LM_i{=}m) \neq$ constant (see e.g. Trost & Lee, 1984). The standard errors are corrected using the heteroscedasticity-consistent estimator suggested by White (1980).

The three criterion functions appearing in the two selection models outlined above are specified as follows. The selectivity criterion in (3) explaining the probability of the i[th] sample individual being employed includes a set of personal characteristics containing age and indicators for educational level, marital status, family size, and location of residence.

The probability of private/public-sector employment (eq. (4)), in turn, is taken to depend on the individual's accumulated human capital, marital status, preferences regarding job characteristics, and on variations across regional labour markets. The allocation of employees in the four labour markets of private/public-sector non-manual/manual workers (eq. (15)) is assumed to depend on the same broad set of characteristics. The current age of the individual is not included as an explanatory variable in the sectoral and labour market criterion functions (eqs. (4) and (15)), the underlying assumption being that there is no systematic movement of employees between labour markets as they grow older (cf. Gyourko & Tracy, 1988).

Finally, the observed earnings variance among male and female employees in the private and public sectors is assumed to depend on the employees' formal education, labour market experience and training, family responsibilities, location of residence, employment and working conditions, union membership, and industry affiliation. Apart from these explanatory variables, the sector-specific earnings models in (1) and (2) are also supplemented with a set of occupation indicators in order to examine whether the interaction effects of the individual's position in the occupational hierarchy differ between the two sectors. The observed earnings differentials between the four labour markets (eq. (10)) are explained in terms of the same set of explanatory variables, except for occupation controls.

It should be pointed out in this context that at least in the United States, the inclusion of occupation controls in earnings equations and especially in sectoral earnings equations has generated some controversy. In particular, it has occasionally been claimed that occupation indicators should be excluded from the regressions as certain jobs may be classified differently in the private and public sectors (cf. Belman & Heywood, 1989). It is argued that the addition of occupation controls will, as a consequence, distort the comparability of estimates across sectors. Estimation of sectoral earnings functions both inclusive and exclusive of occupation controls may therefore shed some further light on this topic.

The earnings models outlined above are estimated using cross-sectional micro-level data from the Labour Force Survey for 1987 conducted by Statistics Finland. The survey covers a random sample of some 9000 persons, representing the entire population aged 15-64 years as stratified according to sex, age and region. When the data are restricted to employed wage and salary earners aged 16-64 and sorted out with respect to missing and incomplete information on crucial variables, the sample of employees retained in the actual estimating data shrinks to covering a total of 3895 individuals.

The dependent variable is chosen to be average before-tax hourly earnings in order to account for interpersonal differences in months and weekly hours worked, and to make the earnings of full-time and part-time employees comparable. The earnings data used comprise most types of compensation, including overtime and vacation pay and fringe benefits.[6] The available register data on formal schooling merely show the single highest level of

Table 1. Sample statistics for selected variables (standard deviations are in parentheses)

Variable	MALE EMPLOYEES Private sector	Public sector	FEMALE EMPLOYEES Private sector	Public sector
Hourly earnings	49.12 (23.57)	50.84 (25.59)	39.65 (24.31)	42.86 (22.71)
Log hourly earnings	3.81 (0.38)	3.85 (0.37)	3.60 (0.36)	3.68 (0.37)
Hourly earnings$^{\text{no fringes}}$	48.43 (22.64)	50.67 (25.31)	39.27 (23.52)	42.69 (22.65)
Log hourly earnings$^{\text{no fringes}}$	3.80 (0.37)	3.85 (0.37)	3.59 (0.36)	3.67 (0.37)
Schooling (S+9 years)	10.77 (1.76)	11.70 (2.39)	10.54 (1.65)	11.55 (2.11)
Experience	17.15 (10.98)	18.34 (10.39)	16.27 (9.95)	15.98 (9.65)
Seniority (tenure)	8.58 (8.36)	11.23 (8.93)	8.42 (8.04)	8.82 (8.14)
Share of trained employees	0.33	0.46	0.32	0.46
Number of obs.	1423	485	1099	888
Share in				
- sample,%	36.5	12.5	28.2	22.8
- whole economy,%	40.7	10.5	30.6	18.3
Share of females in resp. sector				
- sample,%			43.6	64.7
- whole economy,%			42.9	63.6

Source: Labour Force Survey for 1987 and Table B of the Appendix.

education completed by each sample individual, not their actual schooling years. There is a total of eight levels of education, which are represented in the estimations by both linear and non-linear schooling variables. A notable advantage of the data set employed is that it provides (self-reported) information on each person's total years of labour market experience as well as on his or her years with the current employer, i.e. seniority (tenure). Hence, the estimation results reflect the earnings effects of the individuals' "actual" and not of their potential work experience.

A summary of definitions of the variables employed in the subsequent empirical analysis is given in Table A of the Appendix. Sample statistics for selected variables are shown in Table 1 above. A complete list of sample means for all males and females in private/public-sector employment and separately for the four labour markets considered is found in Tables B and D of the Appendix. A detailed description of the construction of the underlying data and of the definition of key variables is given in Chapter VII.

3. PRIVATE/PUBLIC-SECTOR EARNINGS STRUCTURES

3.1. Sectoral earnings effects of education and experience

The regression results obtained from estimating private/public-sector human capital earnings functions for each gender are displayed in Tables 2 and 3. The bivariate probit estimates are reported in Table E of the Appendix.

Before turning to the estimated earnings effects of the various explanatory variables included in the estimations, three features of the results deserve attention. First, the estimated earnings functions succeed in explaining substantially more of the observed earnings dispersion in the public sector. Second, the standardized hourly earnings differential between central and local government employees (PUBLOCAL) is found to be negligible among both males and females. Finally, the exclusion of fringe benefits from the dependent variable leaves the parameter estimates of the various explanatory variables roughly unchanged.[7]

For both genders, the average level of schooling is higher among public-sector employees (Table 1). If education is equally rewarded in the two sectors, then because of the larger share of well educated persons the returns to schooling would be expected to be higher in the public sector. The schooling coefficients estimated for males suggest, however, that there are no notable differences[8] in educational returns between private-sector and public-sector male employees. In both sectors, the average return to an additional year in above-primary level schooling amounts to some 9 per cent (estimation results not shown). Also the returns to different educational

Table 2. Private/public-sector estimates for male employees obtained from eq. (6).[1] The dependent variable is log hourly earnings inclusive of fringe benefits. (Occupation controls are included in columns 2 and 4.)

Variable	Private-sector males (1)	Private-sector males (2)	Public-sector males (3)	Public-sector males (4)
CONSTANT	3.3555** (.0738)	3.5185** (.0997)	3.2312** (.1032)	3.3986** (.1152)
BASIC EDUCATION	0	0	0	0
LOWER VOCATIONAL	0.1057** (.0221)	0.0794** (.0213)	0.1055** (.0340)	0.0792** (.0326)
UPPER VOCATIONAL	0.2928** (.0277)	0.1487** (.0298)	0.2605** (.0390)	0.1733** (.0419)
SHORT NON-UNIV	0.4684** (.0521)	0.2032** (.0572)	0.4955** (.0516)	0.2514** (.0700)
UNDERGRADUATE	0.5336** (.1160)	0.2433* (.1143)	0.4904** (.0650)	0.2280** (.0828)
GRADUATE	0.6622** (.0522)	0.3754** (.0570)	0.6460** (.0488)	0.3820** (.0691)
EXP	0.0178** (.0047)	0.0100* (.0045)	0.0280** (.0061)	0.0248** (.0063)
EXP^2 /1000	-0.2461* (.1198)	-0.1037 (.1146)	-0.4895** (.1563)	-0.4496** (.1604)
MARRIED	0.0557* (.0281)	0.0317 (.0266)	0.0884* (.0395)	0.0729* (.0386)
$CHILD^{0-6}$	-0.0034 (.0221)	-0.0042 (.0209)	-0.0532* (.0303)	-0.0382 (.0278)
$CHILD^{7-17}$	0.0544** (.0212)	0.0439* (.0201)	0.0536* (.0285)	0.0469* (.0271)
CAPITAL	0.1676** (.0233)	0.1484** (.0222)	0.0686* (.0314)	0.0755** (.0295)
TEMPEMPL	-0.0594 (.0387)	-0.0549 (.0367)	0.0016 (.0447)	-0.0185 (.0432)
PART-TIME	0.1219 (.0924)	0.0988 (.0879)	0.3146** (.0946)	0.3071** (.0994)
PUBLOCAL			-0.0008 (.0253)	-0.0019 (.0244)
PIECE-RATE	0.0481* (.0244)	0.0660** (.0234)	0.1695* (.0851)	0.1780** (.0757)
NODAYWORK	0.0493* (.0215)	0.0880** (.0207)	0.0541* (.0292)	0.0501* (.0282)
UNEMPL	-0.0754** (.0294)	-0.0602* (.0277)	-0.1682** (.0527)	-0.1410** (.0513)
UNION	-0.0023 (.0198)	0.0204 (.0188)	0.0045 (.0367)	0.0424 (.0351)

Table 2. (cont.)

Occupational status indicators:

OCC31		0.4038^{**}		0.6128^{**}
(management)		(.0769)		(.1082)
OCC32		0.2113^{**}		0.1962^{**}
(research)		(.0804)		(.0704)
OCC33		0.1385		0.2076^{**}
(education)		(.1650)		(.0662)
OCC34		0.1917^{**}		0.1305^{*}
(oth.seniors)		(.0810)		(.0621)
OCC41		0.0931		0.0346
(supervisors)		(.0716)		(.0493)
OCC42		-0.0403		-0.1371
(indep. clericals)		(.0802)		(.0986)
OCC43		0.1098		-0.1983^{*}
(rout. clericals)		(.1146)		(.1083)
OCC44 (oth. lower-level non-manual workers)		0		0
OCC51		-0.0862		-0.1148
(workers, agriculture)		(.0983)		(.0911)
OCC52		-0.0266		-0.0421
(workers, manufacturing)		(.0757)		(.0747)
OCC53		-0.0864		-0.0585
(workers, oth. prod.)		(.0745)		(.0609)
OCC54		-0.1413^{*}		-0.0998^{*}
(workers, service)		(.0714)		(.0442)
LAMBDA1(ε, μ_1)	-0.0120	-0.0510	0.0835	0.0723
(working sel.)	(.0585)	(.0563)	(.0672)	(.0729)
LAMBDA2(ε, μ_2)	-0.0380	0.0108	0.0152	0.0705
(sector sel.)	(.0413)	(.0566)	(.0332)	(.0439)
R^2 adj.	0.3146	0.3885	0.5422	0.5934
SEE	0.3137	0.2952	0.2416	0.2249
F-value	26.11	25.42	22.23	19.59
Number of obs.	1423	1423	485	485

1 Standard errors are given in parentheses below the estimates. Bivariate sample selection estimates where LAMBDA1(ε, μ_1) gives the selectivity bias associated with the individual's labour force status and LAMBDA2(ε, μ_2) measures the selectivity bias arising from choosing between the two sectors. The bivariate probit estimates are displayed in Table E of the Appendix.
The estimated earnings equations also include seven one-digit industry sector controls (INDU1, INDU2/3, INDU4, INDU5, INDU6, INDU8, INDU9), employment in transport and communication (INDU7) being the excluded variable. It may be noted that the addition of industry sector controls has no significant impact on the regression results.

* Denotes significant estimate at a 5 % level.

** Denotes significant estimate at a 1 % level.

Table 3. Private/public-sector estimates for female employees obtained from eq. (6).[1] The dependent variable is log hourly earnings inclusive of fringe benefits. (Occupation controls are included in columns 2 and 4.)

Variable	Private-sector females (1)	(2)	Public-sector females (3)	(4)
CONSTANT	3.4499** (.0848)	3.5568** (.0973)	3.3162** (.0831)	3.3330** (.0832)
BASIC EDUCATION	0	0	0	0
LOWER VOCATIONAL	-0.0429 (.0265)	-0.0387 (.0255)	0.0445 (.0300)	0.0189 (.0290)
UPPER VOCATIONAL	0.1446** (.0313)	0.0974** (.0310)	0.2099** (.0326)	0.1331** (.0327)
SHORT NON-UNIV	0.3358** (.0708)	0.2506** (.0722)	0.3944** (.0404)	0.1994** (.0438)
UNDERGRADUATE	0.4374** (.0735)	0.3557** (.0767)	0.5525** (.0513)	0.2318** (.0608)
GRADUATE	0.4622** (.0856)	0.3278** (.0879)	0.6897** (.0491)	0.3882** (.0582)
EXP	0.0098* (.0048)	0.0071 (.0047)	0.0123** (.0047)	0.0094* (.0046)
EXP^2 /1000	-0.1215 (.1195)	-0.0780 (.1171)	-0.0992 (.1217)	-0.0694 (.1185)
MARRIED	-0.0171 (.0241)	-0.0205 (.0232)	-0.0346 (.0246)	-0.0364 (.0237)
$CHILD^{0-6}$	0.0298 (.0260)	0.0163 (.0252)	0.0372 (.0254)	0.0412* (.0240)
$CHILD^{7-17}$	-0.0148 (.0222)	-0.0051 (.0216)	0.0200 (.0226)	0.0222 (.0214)
CAPITAL	0.1240** (.0250)	0.1169** (.0244)	0.0469* (.0277)	0.0672** (.0264)
TEMPEMPL	0.0638 (.0404)	0.0527 (.0396)	0.0939** (.0326)	0.0542* (.0316)
PART-TIME	0.2482** (.0402)	0.2667** (.0397)	0.3731** (.0469)	0.3557** (.0451)
PUBLOCAL			-0.0288 (.0295)	-0.0045 (.0285)
PIECE-RATE	0.0010 (.0331)	0.0449 (.0340)	-0.0937 (.1134)	-0.1404 (.1086)
NODAYWORK	0.1180** (.0236)	0.1403** (.0242)	0.1694** (.0234)	0.2194** (.0239)
UNEMPL	-0.0491 (.0338)	-0.0245 (.0330)	-0.0421 (.0382)	-0.0224 (.0370)
UNION	-0.0606** (.0240)	-0.0437* (.0239)	0.0482 (.0321)	0.0530* (.0308)

Table 3. (cont.)

Occupational status indicators:

OCC31 (management)		0.2768** (.0862)		
OCC32 (research)		-0.0957 (.0980)		0.2326** (.0759)
OCC33 (education)		0.1437 (.2271)		0.4028** (.0476)
OCC34 (oth.seniors)		0.1168* (.0624)		0.1783** (.0460)
OCC41 (supervisors)		0.0005 (.0661)		0.1469** (.0527)
OCC42 (indep. clericals)		-0.0655 (.0550)		0.2038** (.0452)
OCC43 (rout. clericals)		-0.0385 (.0562)		0.0939* (.0428)
OCC44 (oth. lower-level non-manual workers)		0		0
OCC51 (workers, agriculture)		-0.3134** (.1219)		0.0482 (.1543)
OCC52 (workers, manufacturing)		-0.1845** (.0642)		
OCC53 (workers, oth. prod.)		-0.1567** (.0632)		-0.1014* (.0453)
OCC54 (workers, service)		-0.1614** (.0503)		-0.0413 (.0342)
LAMBDA1(ε, μ_1) (working sel.)	-0.1225** (.0524)	-0.0991* (.0498)	0.0020 (.0455)	0.0369 (.0478)
LAMBDA2(ε, μ_2) (sector sel.)	0.0371 (.0278)	0.0098 (.0340)	-0.0163 (.0315)	0.0765* (.0371)
R^2 adj.	0.2340	0.2728	0.3620	0.4266
SEE	0.3135	0.3039	0.2907	0.2741
F-value	13.90	12.13	19.64	19.33
Number of obs.	1099	1099	888	888

1 Standard errors are given in parentheses below the estimates. Bivariate sample selection estimates where LAMBDA1(ε, μ_1) gives the selectivity bias associated with the individual's labour force status and LAMBDA2(ε, μ_2) measures the selectivity bias arising from choosing between the two sectors. The bivariate probit estimates are displayed in Table E of the Appendix.
The estimated earnings equations also include seven one-digit industry sector controls (INDU1, INDU2/3, INDU4, INDU5, INDU6, INDU8, INDU9), employment in transport and communication (INDU7) being the excluded variable. It may be noted that the addition of industry sector controls has no significant impact on the regression results.

* Denotes significant estimate at a 5 % level.

** Denotes significant estimate at a 1 % level.

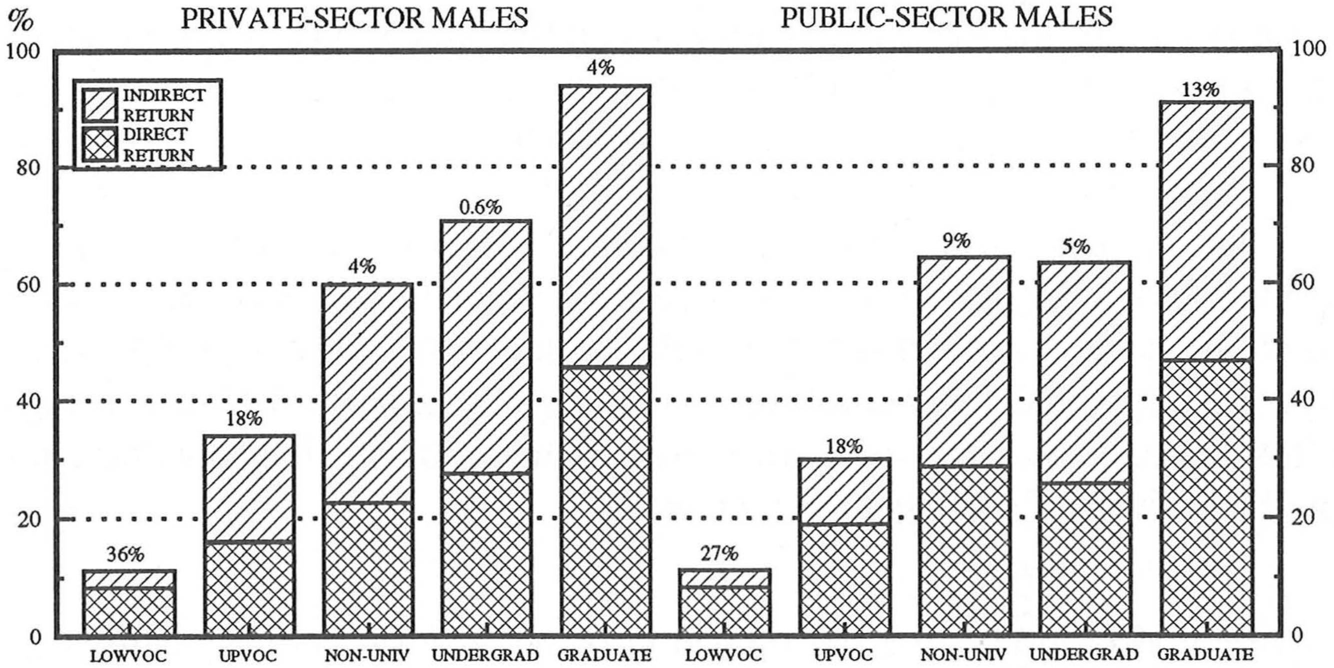
degrees are very similar in the two sectors, ranging from some 11 per cent for graduation at the LOWER VOCATIONAL level to over 90 per cent for a university GRADUATE degree when compared to the average return received by persons with only a basic education (columns 1 and 3 in Table 2).[9]

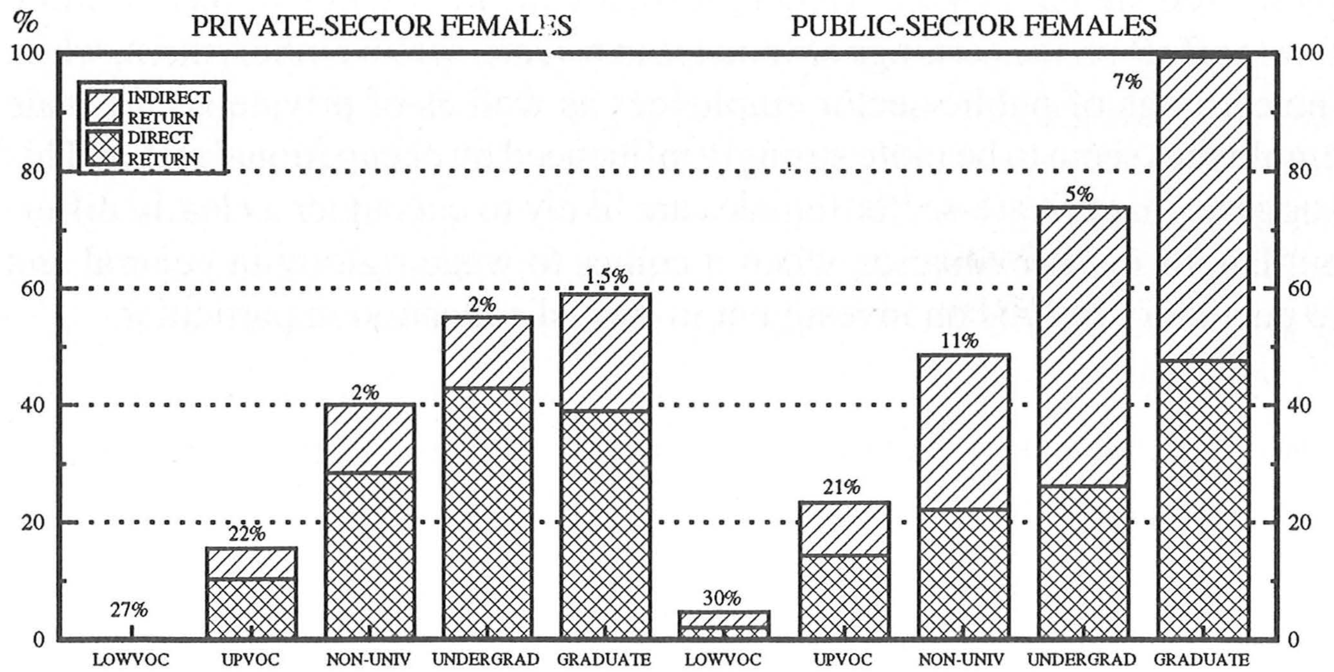
Among female employees, on the other hand, the average return to an additional year in postcompulsory schooling seems to be substantially higher for females in public-sector employment (about 10 per cent compared with some 5 per cent for private-sector females). Yet, this result cannot be generalized for the estimated returns to educational degrees (columns 1 and 3 in Table 3). Irrespective of sector, women with completed LOWER VOCATIONAL education tend to have no relative income advantage over women with only a basic education. The estimation results further point to small, if any, differences between sectoral returns to non-university higher education degrees (SHORT NON-UNIV). In contrast, females with graduation from UPPER VOCATIONAL education and females with an UNDERGRADUATE or GRADUATE university degree seem to be more highly rewarded in the public sector. In fact, at these three educational levels females in public-sector employment tend to receive approximately the same return to their schooling investment as their male counterparts in the private and public sectors. But apart from this, the estimated returns to educational degrees are, on average, lower in both sectors for females.

The estimation results reported in Chapter IV of this study indicate that the earnings effects of formal schooling mediated by the individual's position in the occupational hierarchy tend to be notably larger for male than for female employees. This points to a more rigid occupational structure of male earnings. It might, as a consequence, be of interest to examine whether the interactions between education and occupational status differ, not only by gender, but also across sectors. This is done by adding a set of occupation indicators to the sectoral earnings equations (columns 2 and 4 in Tables 2 and 3).

Following this approach, the schooling coefficients obtained from estimating earnings equations exclusive of occupation controls will measure the total effect of education on earnings. When occupation indicator variables are introduced, the parameter estimates of the schooling variables will

Figure 1. Decomposition of the estimated average return to different educational levels, by sector and gender, into a "direct" and an "indirect" (through occupational attainment) effect, the reference being the average return received by persons with only a basic education.





Note. The figure on the top of each pile gives the percentage sample share of each educational level in the employee category in question (e.g. 36%+18%+4%+0.6%+4% +residual%=100%). The residual percentage share in each category refers to employees with only a basic education.

Source: Antilogs of the schooling coefficients in Tables 2-3.

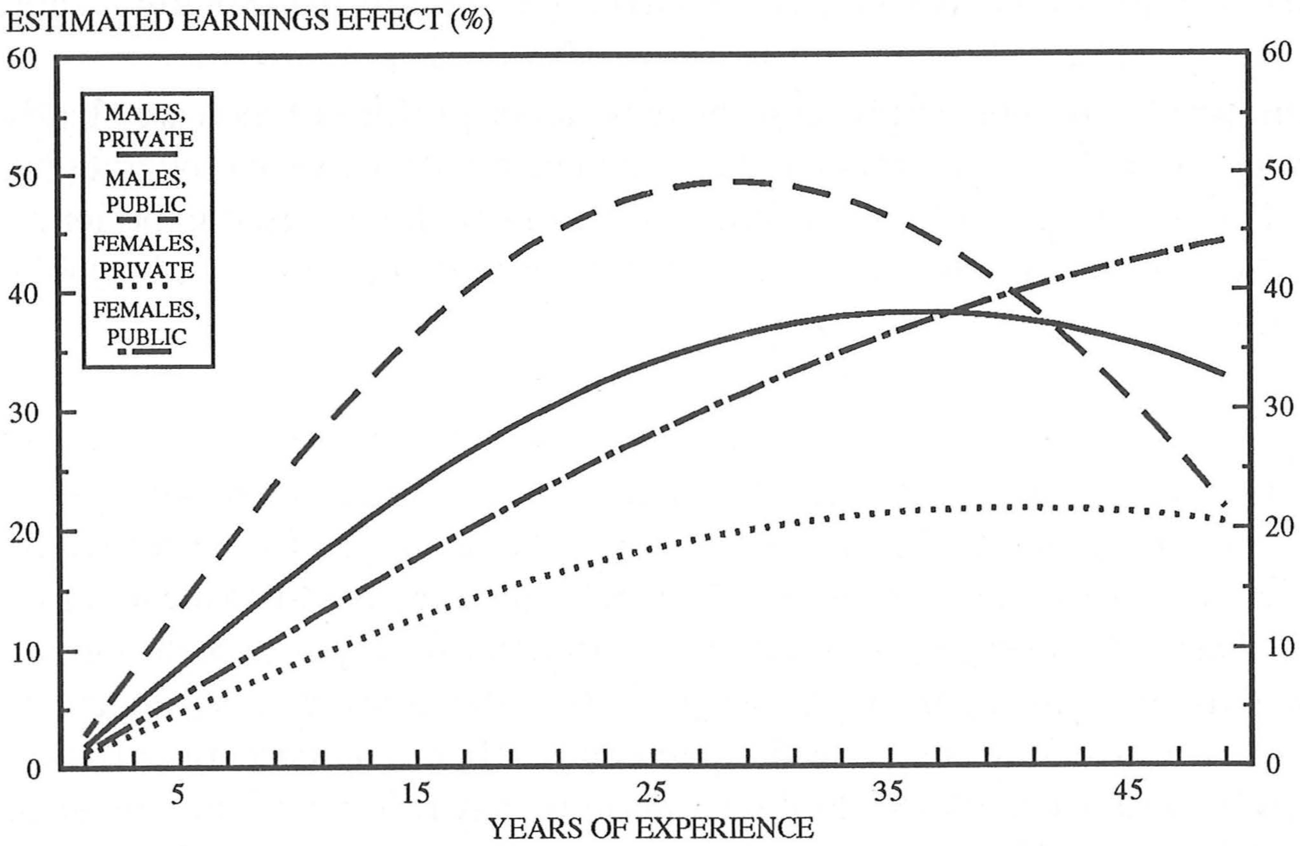
capture only the direct earnings effect of schooling. Calculations reported in Chapter IV of this study indicate that the difference between the two groups of schooling coefficients provides a rough proxy of the degree of occupational rigidity, i.e. of the indirect effect education has on earnings by influencing the individual's occupational attainment.

Comparison of the parameter estimates on the educational level variables in Tables 2 and 3 reveals that the addition of occupation controls to the sectoral earnings equations results in a substantial reduction in the estimated returns to formal education for male employees, the only exception being graduation from lower vocational education. Moreover, a similar pattern of reductions occurs in both sectors (Figure 1). Again the situation for females in public-sector employment resembles strongly that for male employees. Specifically, for all three employee categories a large portion of the earnings effects of education seems to arise through the influence that education has on the individual's occupational chances.

Figure 1 also shows that the inclusion of occupation controls causes an almost negligible drop in the schooling coefficients estimated for private-sector female employees. Hence, formal education tends to have a more direct effect on the earnings of females in private-sector employment, while the earnings of public-sector employees as well as of private-sector male employees seem to be more strongly influenced by occupational status. This suggests that private-sector females are likely to encounter a clearly different labour market situation when it comes to wage rigidity in general and to pecuniary returns on investment in formal education in particular.

The highly disparate pattern of educational returns estimated for females employed in the private sector may in part be explained by their typically lower level of formal education and the allocation on sectors and occupations that this may imply. Controlling for the employees' occupational social status, however, does not offer a full solution to the different labour market situation of private-sector women. Instead it seems as if the major explanations are to be found in differences not only across but also within occupational categories; females in private-sector employment tend to crowd into certain occupational categories and, moreover, to hold lower-paid jobs within these categories (cf. Table C of the Appendix). This aspect is analysed somewhat more in detail in Section 4.

Figure 2. Experience-earnings profiles by sector and gender



Note: The percentage growth in earnings is calculated as the antilog of (α_1EXP - α_2EXP^2).

Source: Calculations based on the experience coefficients reported in Tables 2 and 3.

The initial earnings effect of labour market experience (EXP) turns out to be highest, or almost 3 per cent, for public-sector male employees. It is notably lower (close to 2 per cent) for males employed in the private sector. Earnings growth of females, when first entering the labour market, is of approximately the same magnitude in both sectors (about 1 per cent), and significantly lower compared with the earnings effects of experience estimated for their male counterparts.

The estimation results further point to an upward-sloping concave experience-earnings profile for male employees only (Figure 2). The magnitudes of the parameter estimates on the experience variables for men indicate that earnings growth decreases fairly slowly and reaches zero earlier for public-sector than for private-sector males. More exactly, a maximum of some 50 per cent cumulative growth[10] in public-sector male earnings is reached after 28 years of work experience, while the cumulative growth in private-sector male earnings peaks at roughly 38 per cent after no less than 36 years in the labour market. Thus the experience-earnings curves tend to be steeper and to also fall off more rapidly in the public sector.

Compared to female employees, the experience profiles of men are clearly steeper in both sectors. Indeed, the estimates point to a very moderate but fairly constant growth rate of female earnings with increased experience. Yet, also for women the experience curve turns out to be steeper in the public sector.

In interpreting the estimated experience coefficients, it should nevertheless be kept in mind that they are obtained from a single cross section of individuals, implying that no cohort effects are accounted for. Specifically, the experience-earnings profiles drawn in Figure 2 are based on the assumption that the estimated cross-sectional coefficients for experience do capture the dynamics of changes in earnings over the individual's life cycle. Moreover, even similarity in the percentage effects on earnings of more work experience and/or additional schooling may result in highly different absolute returns if the average earnings levels vary by sector and/or gender.

Although the earnings effects of the other personal and job characteristics accounted for in the estimations and displayed in Tables 2 and 3 are not the central focus of this chapter, a few comments may, nonetheless, be justified. (See further the discussion in Chapter III of this study.) In both sectors, family responsibilities (MARRIED,CHILD) tend to have a positive effect on male earnings, but typically no significant influence on female earnings. Residence within the capital region (CAPITAL) is associated with a notable income advantage of both males and females in private-sector employment. The earnings differentials between public-sector employees living inside and outside the capital region are substantially lower, which is obviously attributable to the standard salary schemes and schedules applied in the public sector.

The estimated coefficients for the various job characteristics point to several interesting similarities and dissimilarities between private- and public-sector employees.[11] Presumably a major part of these findings can be given institutional explanations such as differences across the two sectors in the conditions of employment and the method of wage setting. Thus temporary employment (TEMPEMPL) seems to imply significantly higher hourly earnings as compared to a permanent job relationship for public-sector females only. A most conspicuous relative income advantage is obtained for part-time employees (PART-TIME); only private-sector males seem to encounter no significant differential between average pay in full-time and part-time employment. The results further point to clearly higher earnings of male employees in jobs covered by some other compensation system than wages/salaries paid on a monthly, weekly, or hourly basis (PIECE-RATE). For females, such extraordinary compensation systems imply a small, if any, income disadvantage. In both sectors, both genders are compensated when working in jobs entailing inconvenient working hours (NODAY-WORK).

Periods of unemployment or temporary layoffs during the time period covered by the survey (UNEMPL) typically implied a negative earnings effect, which turns out to have been much stronger for public- than for private-sector males. The negative coefficients on the unemployment variable obtained for females do not differ significantly from zero.[12] The influence of union membership (UNION) is found to be insignificant also when analysing earnings differentials separately for the private and the public sector (cf. previous chapters of this study). There is one notable exception, though, namely the significant negative earnings effect of union membership obtained for females in private-sector employment. A possible explanation for this somewhat unexpected outcome is that the union variable captures some unobserved effects, such as poorer working conditions, which are less strongly present in the other three employee categories. Furthermore, the magnitudes and significance levels of the parameter estimates on the occupational indicator variables show much the same general pattern as the coefficients estimated for all male and female employees (cf. Chapter IV of this study and Figure A of the Appendix).

Finally, there is some evidence of both working (LAMBDA1) and sector (LAMBDA2) selectivity bias present in the estimations for females. This suggests that estimation of sector-specific earnings equations for female employees using ordinary least squares techniques, thereby assuming a random distribution of women on labour force status groups and/or sectors, might result in inconsistent parameter estimates. For men, on the other hand, the insignificant coefficients for the selection variables indicate that consistent estimates would be obtained also when less sophisticated estimation methods are used. For comparison, regression results obtained from estimating sectoral earnings equations for each gender using (1) the standard Heckman (1979) two-stage procedure for correction of sector (but not for being employed) selectivity, and (2) ordinary least squares techniques are reported in Tables F and G of the Appendix.

3.2. Sectoral earnings effects of seniority and OJT

The estimation results reported in Tables 2 and 3 above suggest that for both genders, starting wages/salaries are typically lower in the public than in the private sector. This is, however, compensated for by a much faster growth rate of public-sector earnings with increased work experience. One possible interpretation of this result is that private-sector employees receive more specific training in the Becker (1962,1964) sense[13] compared with public-sector employees. An alternative explanation would be the conditions of employment and the method of earnings determination adopted in the public sector. In particular, the public sector represents a large, hierarchical internal labour market bound by fairly strict rules of employment and with the length of the employment relationship playing a major part in promotion.

In order to assess these types of effects, the sector-specific earnings equations are augmented with survey information on the number of years employed at the present employer (SENiority, tenure) and on the occurrence of formal on-the-job training sponsored by the employer (OJT).[14] Tables 4 and 5 display the estimated coefficients for the included experience and training variables only. The parameter estimates on the other explanatory variables are very close to their counterparts in Tables 2-3 and are therefore not reported or commented on.

As can be seen from Table 4, the earnings effects of general experience (EXP) tend to be substantially higher for public-sector than for private-sector male employees. This weaker earnings effect of general experience obtained for private-sector males is, however, accompanied by a notable impact of seniority (SEN) and formal on-the-job training (OJT). More exactly, seniority accounts for about one fourth of the initial earnings effect of total work experience (i.e. EXP+SEN) for private-sector males but for only about one tenth for males employed in the public sector (Figure 3).

Table 4. Sectoral earnings effects of experience for men obtained from estimating the human capital earnings model (eq. (6)) augmented with information on years with the current employer (SENiority) and participation in formal on-the-job training (OJT).[1] The dependent variable is log hourly earnings inclusive of fringe benefits.

	PRIVATE-SECTOR MALE EMPLOYEES				PUBLIC-SECTOR MALE EMPLOYEES			
Variable	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
EXP	0.0147^{**}	0.0063	0.0135^{**}	0.0063	0.0237^{**}	0.0223^{**}	0.0231^{**}	0.0217^{**}
	(.0048)	(.0047)	(.0047)	(.0046)	(.0058)	(.0056)	(.0057)	(.0055)
EXP^2 /1000	-0.2217^{*}	-0.0704	-0.1990^{*}	-0.0642	-0.4268^{*}	-0.4229^{**}	-0.4075^{**}	-0.4062^{**}
	(.1214)	(.1173)	(.1184)	(.1157)	(.1431)	(.1389)	(.1412)	(.1371)
SEN	0.0050^{**}	0.0044^{**}	0.0043^{**}	0.0038^{**}	0.0036^{*}	0.0035^{*}	0.0035^{*}	0.0035^{*}
	(.0014)	(.0013)	(.0014)	(.0013)	(.0019)	(.0018)	(.0019)	(.0018)
OJT			0.1296^{**}	0.1033^{**}			0.0824^{**}	0.0728^{**}
			(.0196)	(.0190)			(.0233)	(.0218)
Occupation controls	no	yes	no	yes	no	yes	no	yes
R^2 adj.	0.3275	0.3988	0.3439	0.4109	0.5610	0.6202	0.5714	0.6280
SEE	0.3119	0.2938	0.3080	0.2907	0.2276	0.2091	0.2247	0.2067
F-value	26.14	25.33	27.10	25.93	22.73	20.93	22.88	21.09
Number of obs.	1395	1395	1395	1395	477	477	477	477

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1 Bivariate sample selection estimates with standard errors in parentheses below the estimates. The estimated earnings equations also include the personal and job characteristics displayed in Tables 2-3 above (LOWER VOCATIONAL, UPPER VOCATIONAL, SHORT NON-UNIV, UNDERGRADUATE, GRADUATE, MARRIED, $CHILD^{0-6}$, $CHILD^{7-17}$, CAPITAL, TEMPEMPL, PART-TIME, PUBLOCAL, PIECE-RATE, NODAYWORK, UNEMPL, UNION) as well as seven one-digit industry sector controls (INDU1, INDU2/3, INDU4, INDU5, INDU6, INDU8, INDU9). The omitted educational level variable is BASIC = primary education (about 9 years or less), and the reference industry sector is employment in transport and communication (INDU7). The coefficients estimated for these indicator variables are very close to their counterparts in Tables 2-3 and are therefore not reported here.

* Significant estimate at a 5 % level.

** Significant estimate at a 1 % level.

Table 5. Sectoral earnings effects of experience for women obtained from estimating the human capital earnings model (eq. (6)) augmented with information on years with the current employer (SENiority) and participation in formal on-the-job training (OJT).[1] The dependent variable is log hourly earnings inclusive of fringe benefits.

	PRIVATE-SECTOR FEMALE EMPLOYEES				PUBLIC-SECTOR FEMALE EMPLOYEES			
Variable	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
EXP	0.0057 (.0049)	0.0038 (.0048)	0.0054 (.0048)	0.0036 (.0048)	0.0049 (.0048)	0.0038 (.0046)	0.0050 (.0048)	0.0040 (.0046)
EXP^2 /1000	-0.0841 (.1206)	-0.0499 (.1181)	-0.0736 (.1187)	-0.0411 (.1175)	-0.0375 (.1205)	-0.0195 (.1158)	-0.0381 (.1204)	-0.0217 (.1159)
SEN	0.0056** (.0016)	0.0048** (.0016)	0.0053** (.0016)	0.0046** (.0016)	0.0100** (.0018)	0.0078** (.0017)	0.0100** (.0018)	0.0077** (.0017)
OJT			0.0890** (.0219)	0.0701** (.0216)			-0.0100 (.0213)	-0.0279 (.0208)
Occupation controls	no	yes	no	yes	no	yes	no	yes
R^2 adj. SEE	0.2421 0.3115	0.2766 0.3027	0.2527 0.3091	0.2828 0.3013	0.3873 0.2846	0.4440 0.2697	0.3867 0.2846	0.4445 0.2694
F-value	13.90	11.98	14.18	12.03	20.89	20.02	20.16	19.55
Number of obs.	1092	1092	1092	1092	882	882	882	882

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1 Bivariate sample selection estimates with standard errors in parentheses below the estimates. The estimated earnings equations also include the personal and job characteristics displayed in Tables 2-3 above (LOWER VOCATIONAL, UPPER VOCATIONAL, SHORT NON-UNIV, UNDERGRADUATE, GRADUATE, MARRIED, $CHILD^{0-6}$, $CHILD^{7-17}$, CAPITAL, TEMPEMPL, PART-TIME, PUBLOCAL, PIECE-RATE, NODAYWORK, UNEMPL, UNION) as well as seven one-digit industry sector controls (INDU1, INDU2/3, INDU4, INDU5, INDU6, INDU8, INDU9). The omitted educational level variable is BASIC = primary education (about 9 years or less), and the reference industry sector is employment in transport and communication (INDU7). The coefficients estimated for these indicator variables are very close to their counterparts in Tables 2-3 and are therefore not reported here.

* Significant estimate at a 5 % level.

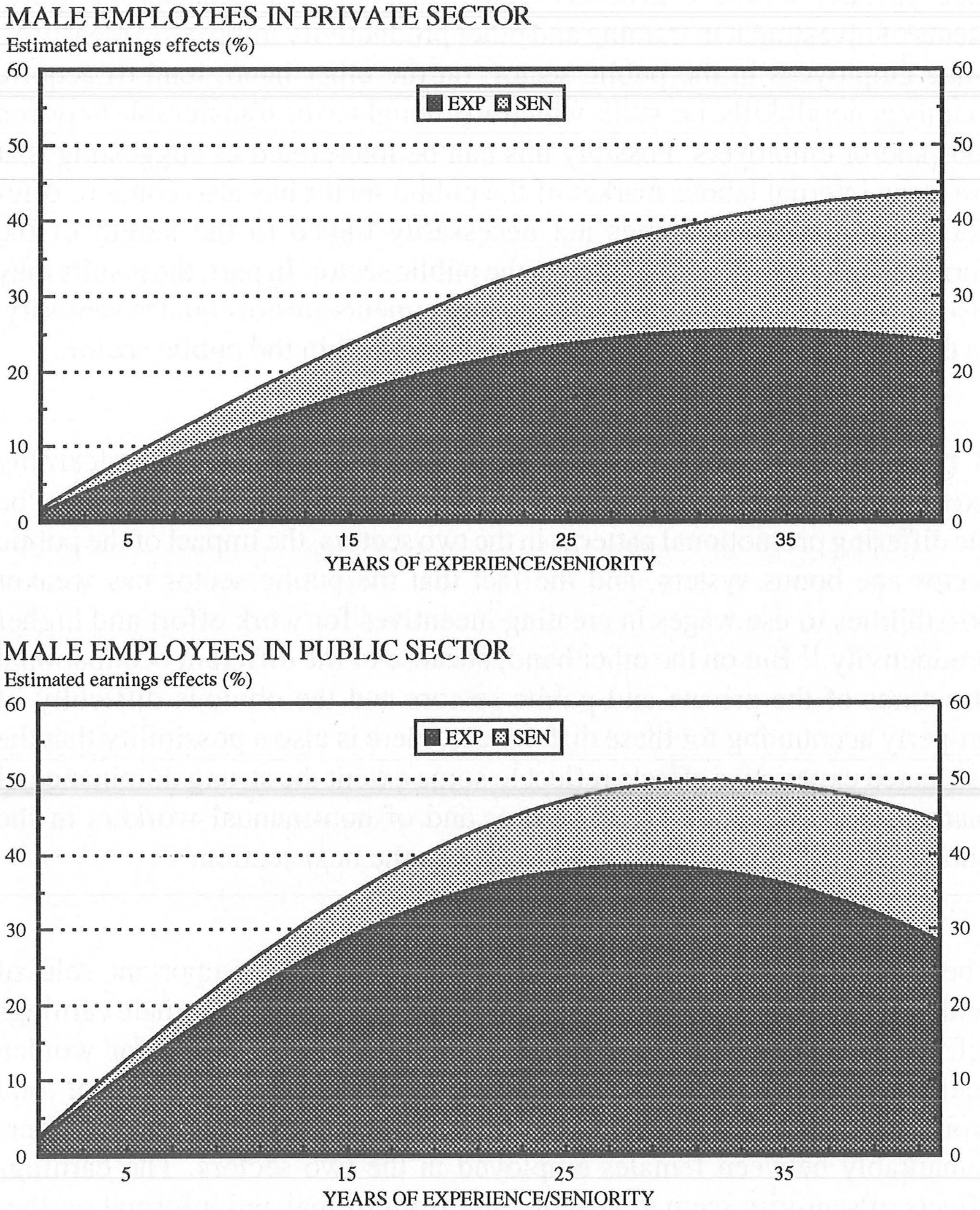
** Significant estimate at a 1 % level.

These results may be seen as supportive of the human capital interpretation of the seniority variable as reflecting earnings effects of primarily acquired specific skills and not of job duration. Put differently, the jobs private-sector men typically hold seem to involve substantial opportunities and/or requirements of investment in training and other productivity improving measures. Male employees in the public sector, on the other hand, tend to acquire mainly general skills, i.e. skills which are thought to be transferable between jobs and/or employers. Possibly this can be interpreted as suggesting that the large internal labour market of the public sector has also come to offer notable career opportunities not necessarily linked to the length of the current employment relationship in the public sector. In part, the results may also reflect the fact that age-related pay increments are not equal to seniority, as they are not lost when changing employer within the public sector.

A potential explanation of the somewhat unexpected results concerning experience effects obtained for private- and public-sector men may thus be the differing promotional patterns in the two sectors, the impact of the public sector age bonus system, and the fact that the public sector has weaker possibilities to use wages in creating incentives for work effort and higher productivity.[15] But on the other hand, because of the different occupational structures of the private and public sectors and the obvious difficulty of properly accounting for these differences, there is also a possibility that the estimated experience effects reflect to some extent the strong dominance of manual workers in the private sector and of non-manual workers in the public sector. This question is addressed in the next section.

The estimation results point, once again, to a more important role of seniority than of general experience in the determination of female earnings (cf. the results reported in Chapter III of this study). Indeed, for women seniority accounts for a half or more of the initial earnings effect of total work experience (Figure 4). But apart from this, the situation differs remarkably between females employed in the two sectors. The earnings effects of seniority seem to arise mainly from formal and informal on-the-job training for private-sector females, but almost exclusively from the duration of the current employment relationship for public-sector females. Indeed, despite a very high participation rate in formal on-the-job training courses among public-sector women, this type of training is found to have had no significant effect on their average earnings level.

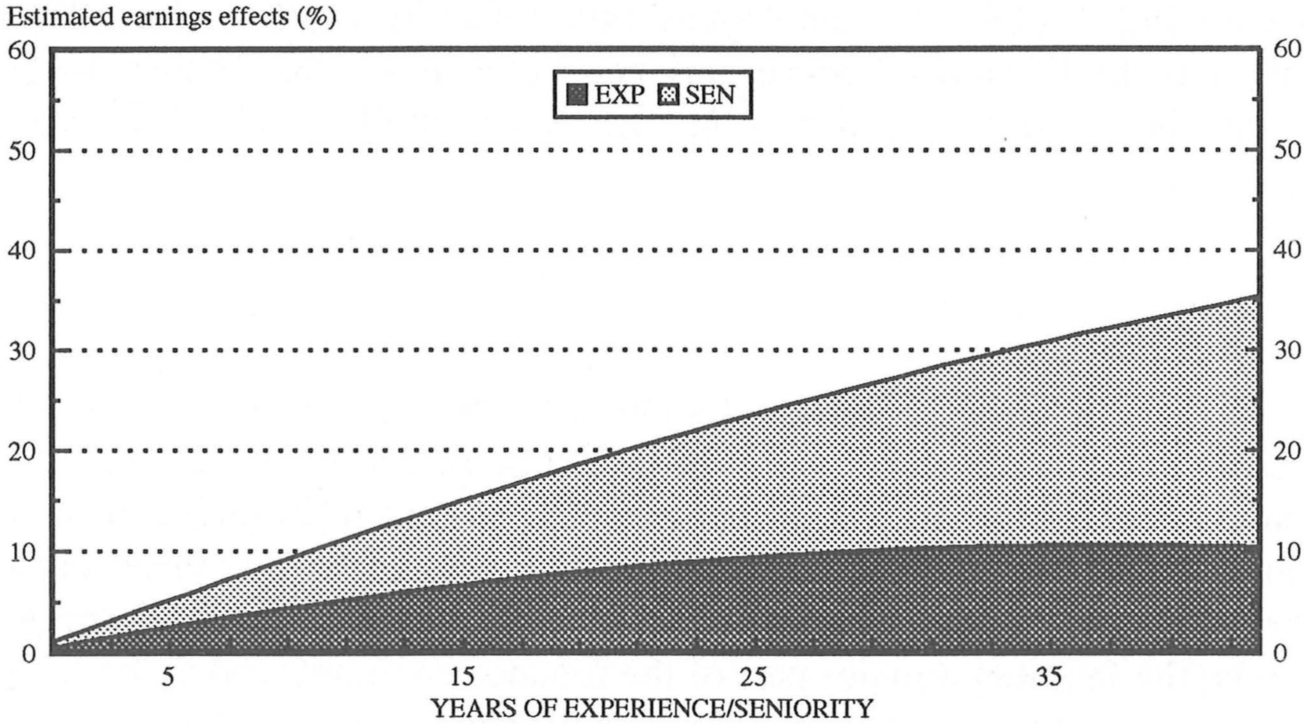
Figure 3. Earnings profiles for general experience and seniority, private- and public-sector male employees



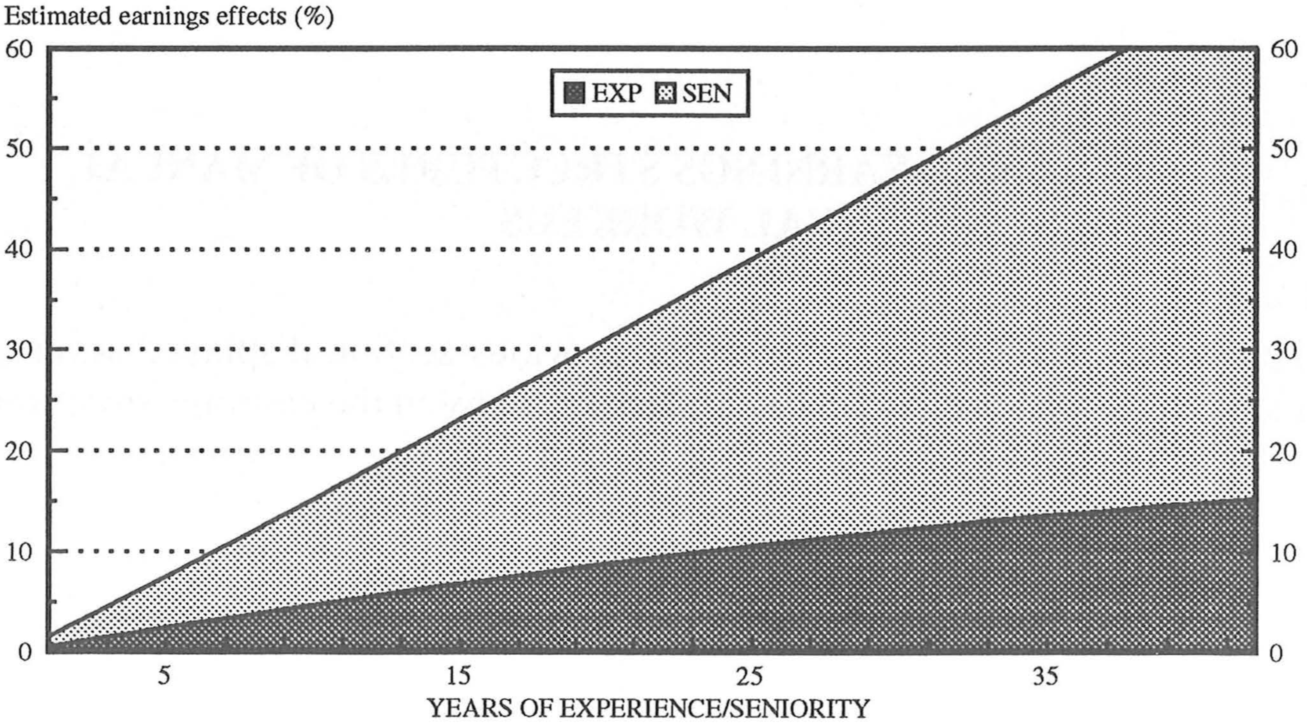
Source: Calculations for a hypothetical individual staying with the same employer up to 42 years (sample maximum of seniority) based on the estimated coefficients reported in column 3 of Table 4. The calculations are made as in Figure 2 above.

Figure 4. Earnings profiles for general experience and seniority, private- and public-sector female employees

FEMALE EMPLOYEES IN PRIVATE SECTOR



FEMALE EMPLOYEES IN PUBLIC SECTOR



Source: Calculations for a hypothetical individual staying with the same employer up to 42 years (sample maximum of seniority) based on the estimated coefficients reported in column 3 of Table 5. The calculations are made as in Figure 2 above.

All in all, then, the estimation results obtained when augmenting the sectoral earnings equations with seniority and on-the-job training variables point to highly differing earnings effects of labour force experience across both genders and sectors. Earnings growth in the private sector seems to be strongly influenced by the employees' investment in specific training. The most notable difference between private-sector males and females is the significantly stronger earnings effect of general skills obtained for male employees.

The differences across genders in the public sector are much more pronounced. Males employed in the public sector receive a fairly high return on their investments in general skills and OJT, whereas the estimated effects of these two human capital variables on public-sector female earnings are small or negligible. The reverse holds for the estimated earnings effects of seniority. One possible explanation for these fundamental differences in the labour market situation for males and females in public-sector employment may be the fact that a major part of the females are employed at the local government level and that this affects both their promotional pattern and the type of on-the-job training they receive.

4. SECTORAL EARNINGS STRUCTURES OF MANUAL AND NON-MANUAL WORKERS

The estimation results reported in the previous section displayed several fundamental similarities and dissimilarities between the earnings structure of the private and the public sector. In particular, the earnings position of private-sector women was found to be fairly weak compared not only to that of male employees but especially to that of females employed in the public sector. The differing impact of the investigated earnings determinants and, especially, of the various human capital proxies may, however, at least partly originate in the distinct occupational structures of the two sectors. Suppose that non-manual and manual workers are paid different returns on equal units of human capital. In that case, the larger share of manual workers in the private sector could offer an explanation for the observed earnings differentials as well as to the finding of an overall weaker earnings position of females in private-sector employment.

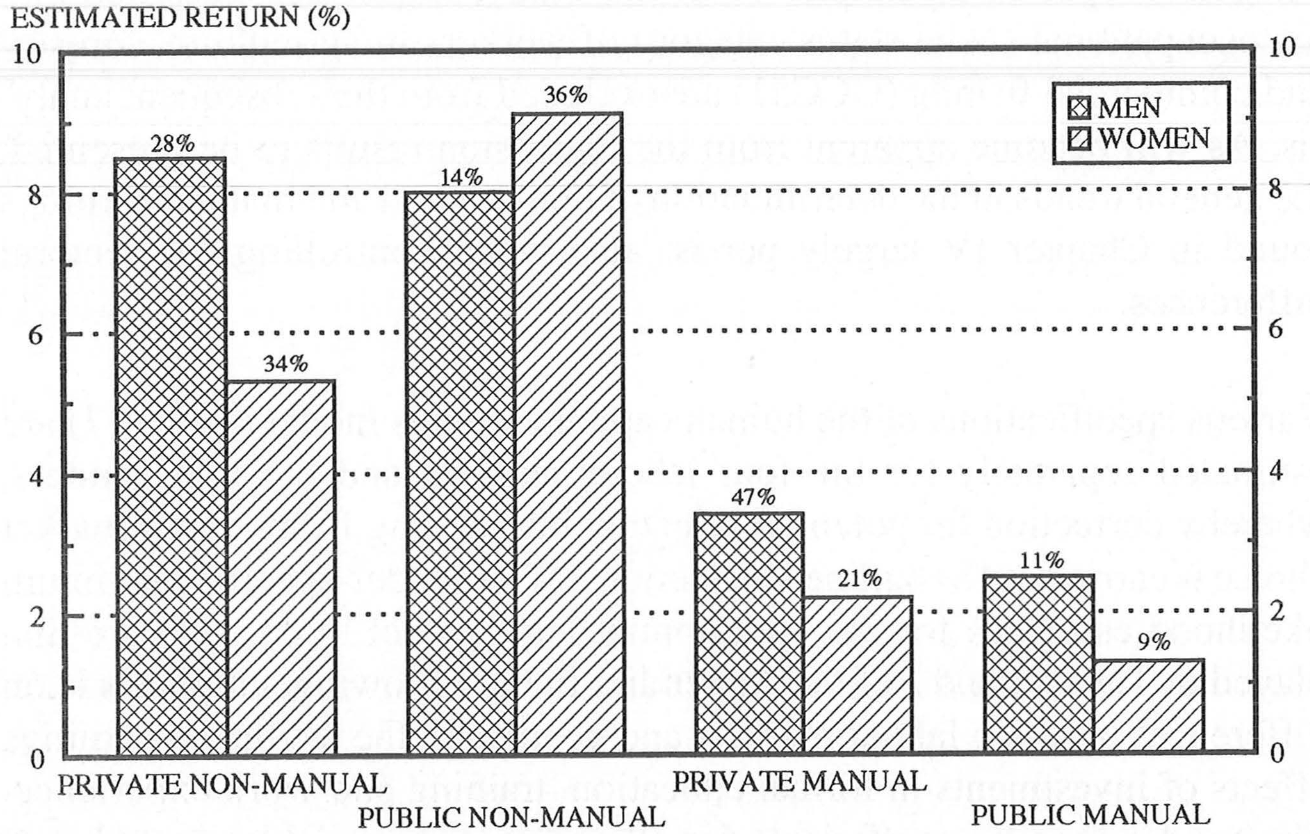
With this point in mind, each sector is divided into two labour markets, one for non-manual and one for manual workers. Both genders thus face four labour markets. (Sample means are given in Table D of the Appendix.) In order to maintain comparability with the estimation results for occupational categories reported in Chapter IV of this study, employees classified into the occupational social status category of workers in agriculture, forestry and commercial fishing (OCC51) are excluded from the subsequent analysis. As will become apparent from the regression results to be presented, the general trends in the determination of non-manual and manual earnings found in Chapter IV largely persist also when controlling for sectoral differences.

Various specifications of the human capital earnings model in eq. (17) are estimated separately for the four labour markets and the two genders, whereby correction for potential selection bias arising from labour market choice is carried out as outlined in Section 2. The gender-specific maximum likelihood estimates for the multinomial logit model in eq. (15) are displayed in Tables I and J of the Appendix. In the following, emphasis is on differences between labour markets and genders in the estimated earnings effects of investments in formal education, training and work experience. The gender-specific coefficients for all explanatory variables included in the estimated earnings equations are given in Tables K and L of the Appendix.

The regression results reported in Section 3 pointed to small or negligible differences in educational returns between private- and public-sector male employees. The rates of return to education estimated for females in public-sector employment were, except for lower-level educations, found to exceed those received by private-sector women and, moreover, to be very close to the returns paid to male employees. Broadly speaking, these overall trends persist when a further distinction is made between employees in non-manual and manual jobs.

The average return to an additional year in schooling beyond compulsory schooling is estimated at some 8 per cent for males in non-manual jobs and at roughly 3 per cent for males in manual jobs (Figure 5). In other words, there seem to be small, if any, differences across sectors in the average returns to schooling estimated for the broad categories of non-manual and manual workers. The returns to different educational degrees estimated for

Figure 5. Average returns to additional years in schooling after completed compulsory schooling, estimated by gender and labour market



Note. The figure on the top of each pile gives the percentage sample share of, respectively, male and female employees in the labour market in question.

Source: Estimation results not shown.

non-manual and manual workers are also very similar in magnitude across sectors (Table 6 below). Furthermore, irrespective of sector, male employees in manual jobs tend to receive significantly lower returns on their investments in above-primary education as compared to male employees in non-manual jobs.

The average return to an additional year in postcompulsory education is estimated at close to 9 per cent for female non-manual workers in public-sector employment (Figure 5). The average rate of return obtained for female non-manual workers employed in the private sector is notably lower, i.e. some 5 per cent. Evidently, this difference in sectoral returns on education is largely attributable to the substantially higher return to a university graduate degree estimated for public-sector females (Table 7 below). For females in manual jobs, the estimated average return to an additional year's schooling beyond primary education turns out to be insignificant in both sectors and thus significantly lower compared to the average returns received by non-manual females. The insignificant educational return obtained for public-sector manual workers is presumably for the most part due to the small variance in educational endowments within the category, while the return estimated for private-sector manual workers becomes insignificant only after controlling also for the individuals' industry affiliation.

Comparison of gender-specific rates of return to additional years in post-compulsory schooling suggests that female public-sector non-manual workers receive approximately the same average return as male non-manual workers, whereas female private-sector non-manual workers are paid a markedly lower average return on their investments in formal education. Among manual workers there seem to be small, if any, differences in educational returns across genders and sectors. As to the estimated returns to different educational levels, the most conspicuous gender gap is, once again, obtained for degrees at the lower vocational and professional level.

The sectoral estimates on earnings effects of work experience reported in Section 3 indicated that the experience-earnings profiles of male employees tend to be steeper and to also fall off more rapidly in the public sector. When a distinction is made between non-manual and manual workers in the two sectors, these differences across sectors tend to disappear. It may also be noted that the significance levels of the quadratic experience term point to a concave earnings profile for manual workers only.

Furthermore, the sectoral estimates of experience-imputed earnings growth displayed a very moderate but fairly constant growth rate for female earnings with increased experience. Moreover, also among women the experience profile was found to be steeper in the public sector. As for male employees, however, estimation of separate earnings equations for private- and public-sector females employed in non-manual and manual jobs, respectively, reveals no outstanding differences in the estimated earnings effects of total work experience across sectors.

The sectoral estimates reported in Section 3 also suggested that in both sectors, the experience profiles are steeper for men. Comparison of the gender-specific experience coefficients across the four labour markets indicates, in turn, that the gender gaps in the estimated earnings effects of labour market experience are small or negligible, except in public-sector non-manual jobs. It is worthwhile emphasizing once again, however, that this impressive similarity in the percentage effects on earnings of more work experience will result in different absolute returns because of largely differing average earnings levels across genders and labour markets.

A division of the earnings effects of total work experience into earnings effects of, respectively, general experience and seniority produced somewhat surprising sectoral estimates for male employees (Table 4 above). The earnings effects of general experience, i.e. of skills which by definition are transferable between jobs and/or employers, were found to be notably stronger for males in public-sector employment, while the earnings effects of seniority turned out to be much stronger for males employed in the private sector. Dividing the sample employees in each sector into non-manual and manual workers adds to the understanding of this rather puzzling outcome in the sense that now the sectoral differences in earnings growth attributable to general experience and seniority have turned into remarkable conformity within the two broad occupational categories under study.

Specifically, as can be seen from Table 6, the sectoral earnings effects of work experience estimated for male employees in non-manual jobs are of approximately the same size and almost exclusively attributable to general experience (EXP); the estimated coefficients for the quadratic experience variable and the seniority variable (SEN) do not differ significantly from zero. Also among manual workers, there is a strong similarity in the estimated returns to general experience and seniority across sectors. Compared to their non-manual counterparts, however, the earnings effects of general experience are significantly lower and those of seniority notably stronger. This outcome may be taken to reflect the different types of working tasks performed by the two employee categories. The most conspicuous remaining earnings difference among male employees is the insignificant return on formal on-the-job training (OJT) obtained for manual workers in the public sector.

Table 6. Private/public-sector estimates obtained from eq. (17) for male employees in, respectively, non-manual and manual jobs.[1] The dependent variable is log hourly earnings inclusive of fringe benefits. (The estimation results are fully reported in Table K of the Appendix.)

Variable	PRIVATE-SECTOR MEN Non-manual	Manual	PUBLIC-SECTOR MEN Non-manual	Manual
BASIC EDUCATION	0	0	0	0
LOWER VOCATIONAL	0.1276* (.0550)	0.0614** (.0216)	0.1152 (.0717)	0.0531* (.0272)
UPPER VOCATIONAL	0.2396** (.0486)	0.0932 (.0610)	0.1987** (.0717)	0.0402 (.0692)
SHORT NON-UNIV	0.3622** (.0667)		0.3268** (.0899)	
UNDERGRADUATE	0.3489** (.1382)		0.3411** (.1151)	
GRADUATE	0.5375** (.0704)		0.5158** (.1002)	
EXP	0.0187** (.0068)	0.0093* (.0043)	0.0236** (.0092)	0.0108* (.0054)
$EXP^2/1000$	-0.1812 (.1549)	-0.1766* (.0922)	-0.1601 (.2880)	-0.2376* (.1077)
SEN	0.0001 (.0026)	0.0052** (.0016)	-0.0039 (.0048)	0.0064** (.0020)
OJT	0.1108** (.0320)	0.0940** (.0221)	0.0916** (.0327)	0.0322 (.0244)
UNION	-0.0540* (.0323)	0.0376 (.0285)	-0.0228 (.0577)	-0.0490 (.0459)
LAMBDA (labour market selectivity)	0.0432 (.0512)	-0.0578 (.0406)	-0.0334 (.0459)	-0.0194 (.0382)
R^2 adj.	0.3447	0.1912	0.5436	0.3620
SEE	0.3373	0.2752	0.2501	0.1744
F-value	11.09	9.65	12.68	5.80
No. of obs.	519	843	256	204

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1 Standard errors are in parentheses below the estimates and are adjusted for heteroscedasticity according to White (1980). The earnings equations are corrected for potential selectivity bias arising from labour market choice. The corresponding multinomial logit estimates are reported in Table I of the Appendix.

* Denotes significant estimate at a 5 % level.

** Denotes significant estimate at a 1 % level.

Table 7. Private/public-sector estimates obtained from eq. (17) for female employees in, respectively, non-manual and manual jobs.[1] The dependent variable is log hourly earnings inclusive of fringe benefits. (The estimation results are fully reported in Table L of the Appendix.)

Variable	PRIVATE-SECTOR WOMEN Non-manual	PRIVATE-SECTOR WOMEN Manual	PUBLIC-SECTOR WOMEN Non-manual	PUBLIC-SECTOR WOMEN Manual
BASIC EDUCATION	0	0	0	0
LOWER VOCATIONAL	-0.0229 (.0366)	-0.0402 (.0356)	0.0225 (.0342)	-0.0055 (.0448)
UPPER VOCATIONAL	0.0809* (.0416)	0.2620** (.1022)	0.1311** (.0330)	0.2137 (.1514)
SHORT NON-UNIV	0.2830** (.0982)		0.2915** (.0531)	
UNDERGRADUATE	0.4190** (.0722)		0.4570** (.0552)	
GRADUATE	0.3899** (.1153)		0.6047** (.0597)	
EXP	0.0121* (.0061)	0.0132* (.0061)	0.0044 (.0049)	0.0082 (.0114)
EXP^2 /1000	-0.2545* (.1335)	-0.2051 (.1316)	-0.0102 (.1177)	-0.0989 (.1905)
SEN	0.0062** (.0016)	-0.0011 (.0024)	0.0110** (.0016)	0.0031 (.0025)
OJT	0.0752** (.0224)	0.0490 (.0355)	-0.0286 (.0215)	-0.0432 (.0290)
UNION	-0.0724* (.0326)	-0.0426 (.0420)	0.0671* (.0405)	-0.0747 (.0934)
LAMBDA (labour market selectivity)	0.0443 (.0304)	0.0916** (.0376)	-0.0542 (.0451)	0.0110 (.0791)
R^2 adj.	0.2503	0.2208	0.4054	0.0808
SEE	0.3128	0.2962	0.2852	0.2723
F-value	9.68	6.00	18.60	1.91
No. of obs.	677	407	698	177

1 Standard errors are in parentheses below the estimates and are adjusted for heteroscedasticity according to White (1980). The earnings equations are corrected for potential selectivity bias arising from labour market choice. The corresponding multinomial logit estimates are reported in Table J of the Appendix.

* Denotes significant estimate at a 5 % level.

** Denotes significant estimate at a 1 % level.

The sectoral estimates for females discussed in the previous section pointed to a relatively important role of seniority in the determination of both private- and public-sector female earnings. The overall conclusions drawn for female employees from these sectoral estimates on work experience seem to hold largely also when examining separately non-manual and manual females employed in the two sectors (Table 7). There are small, if any, differences among females in the estimated earnings effects of general experience (EXP) across the four labour markets considered. In both sectors, the returns to seniority (SEN) and formal on-the-job training (OJT) are insignificant for female manual workers. Among non-manual females, on the other hand, the seniority effect is found to be stronger in the public sector, whereas the sector's return to OJT is estimated to be negative but insignificant. This is to be compared with female non-manual workers employed in the private sector, for whom the weaker seniority effect is accompanied with a relatively strong return on investments in formal OJT. Giving these findings a human capital interpretation, the seniority effects estimated for public-sector non-manual workers seem to reflect primarily the length of the current employment relationship, while the seniority effects obtained for private-sector non-manual workers in contrast point to an important role of acquired specific skills.

Comparison of the earnings effects of general experience and seniority across genders and labour markets reveals no significant gender gap in the estimated earnings effects of general experience within the broad categories of private-sector non-manuals and manuals. Contrary to this, notable gender gaps show up in the estimated earnings effects of seniority and formal OJT. The role of seniority in the determination of private-sector earnings is much stronger for females than for males in non-manual jobs, but clearly weaker for females than for males in manual jobs. Among both employee categories, men receive a higher return on investments in formal OJT in the private sector.

A picture similar to that observed for private-sector non-manual workers emerges when comparing public-sector men and women in non-manual jobs; the return to seniority is substantially higher among female non-manual workers, whereas the return to formal OJT is significantly higher among male non-manual workers. But contrary to the situation in the private sector, the earnings of male non-manual workers tend to be more strongly affected also by general skills. The gender differences in experience and

OJT effects among manual workers employed in the public sector are almost negligible.

Finally a few comments on the estimates of the union membership (UNION) and selectivity (LAMBDA) variables also displayed in Tables 6 and 7. Not surprisingly, a significant negative earnings effect on the part of unionized employees is obtained for private-sector non-manual workers. Less expected is perhaps the finding that the same effect shows up for both males and females in non-manual jobs. Union membership, when measured by means of a simple indicator variable, seems to have no significant earnings effect in the other labour markets. The only exception is female non-manual workers in public-sector employment for whom union membership is found to imply a positive earnings effect. Their relative income advantage is caused by a fairly small number of non-unionized females working mainly in temporary and/or part-time jobs in the local government service sector (SIC 9).

The estimated coefficients for the selectivity term indicate that there is generally no serious selectivity bias arising from labour market choice influencing the estimation results. Accordingly ordinary least squares techniques would produce consistent parameter estimates. These are reported in Tables M and N of the Appendix. There is one exception, though. The strong significant selectivity effect obtained for females in private-sector manual jobs suggests, when evaluated at the sample mean level of LAMBDA, that females entering this particular labour market earn, on average, some 5 per cent less than females with identical observable characteristics drawn at random from the labour force would be expected to earn in that labour market. It may be noted that a much stronger crowding-in effect was estimated for females in non-manufacturing jobs in Chapter IV (Table 2) of this study.

5. DISCUSSION AND CONCLUDING REMARKS

The present chapter has focused on displaying similarities and dissimilarities in the earnings structure of the private and the public sector in Finland. Special attention has thereby been paid to the sectoral returns on investments in human capital received by male and female employees, with a further distinction made between males and females employed in non-manual and manual jobs in the two sectors. In summarizing the general findings of the chapter, emphasis will be on comparing the estimated human capital effects on sectoral earnings with empirical evidence for the 1980s available for the other Nordic countries. The comparison concerns private/public-sector estimates only, since no previous evidence has been found based on a division of employees into non-manual and manual workers by sector *and* gender. It should, however, be kept in mind that the differences in estimates across the Nordic countries that will become evident in the following are not necessarily "genuine" differences but may at least partly be due to differences in, inter alia, sample data sets used, variables included in the estimations, and estimation methods employed.

The regression results point to small, if any, differences in educational returns between private- and public-sector male employees. The rates of return on education estimated for females in public-sector employment are generally found to exceed those received by private-sector women and, moreover, to be very close to the returns paid to male employees. In both sectors, however, females tend to get a very moderate return on low levels of education, which shows up in notable gender gaps at the lower end of the educational scale. Furthermore, non-manual workers in the public sector and male non-manual workers in the private sector are estimated to receive approximately the same average return to additional years in postcompulsory schooling, whereas female non-manual workers in private-sector employment are paid a significantly lower average return on their investments in formal education. Among manual workers, there seem to be no notable differences in educational returns across genders and sectors.

Estimation results obtained for the other Nordic countries display a slightly different pattern of educational returns. Estimates for Sweden reveal no significant differences in educational returns across sectors when education is measured in years (Zetterberg, 1988), but point to a lower return in the public sector when education is accounted for by means of educational level indicators (Kazamaki & D'Agostino, 1992). The two studies provide an ambiguous picture of the gender gaps in sectoral returns on education in Sweden. The Norwegian estimates reported by Barth & Mastekaasa (1990) point to a higher return on education in the private sector for both genders. There seem to be no significant gender gaps in educational returns within the two sectors in Norway, however. Estimates reported for Denmark

(Pedersen et al., 1990) display a higher return on education in the public sector for both genders, and a higher return for men than for women within each sector.

The estimation results reported in this chapter also suggest that for both genders, the experience-earnings profiles are on average steeper in the public sector. Furthermore, in both sectors the experience curves are found to be flatter for women. When a distinction is made, however, between non-manual and manual workers in the two sectors, these differences across sectors and genders become small or vanish; the gender gap in the earnings effects of work experience is significant among public-sector non-manual workers only.

Again the empirical evidence obtained for Finland differs from that reported for the other Nordic countries. In particular, the experience effects have been estimated to be stronger in the private sector in Norway for both genders (Barth & Mastekaasa, 1990) and in Sweden for women (Zetterberg (1988), Kazamaki & D'Agostino (1992)). The earnings effects of work experience are estimated to be of approximately the same magnitude in the two sectors for Swedish men. This holds for both genders in Denmark (Pedersen et al., 1990). The Swedish estimates point to small, if any, gender gaps in the estimated experience effects, while the Danish and Norwegian results suggest that the return to experience is lower for women in both sectors.

A division of the earnings effects of total work experience into earnings effects of general experience and seniority produce somewhat surprising sectoral estimates for Finnish male employees; the earnings effects of general experience are found to be notably stronger for males in public-sector employment, while the earnings effects of seniority turn out to be clearly stronger for males employed in the private sector. In the other Nordic countries the general finding points to a stronger seniority effect in the public sector (cf. Arai (1991), Kazamaki & D'Agostino (1992), Asplund et al. (1993)). These mixed results may arise, however, from a different treatment in the datasets of age bonuses payed by the public sector.

Anyhow, dividing the sample employees in each sector into non-manual and manual workers markedly changes this rather puzzling picture of experience effects on earnings obtained for Finnish men; irrespective of the sector, the earnings effects of general experience are found to be significantly higher for non-manual males, while those of seniority are estimated to be significantly higher for manual males. This outcome may well be taken to reflect the different types of working tasks performed by non-manual and manual workers. The most conspicuous remaining earnings differential among male employees is the insignificant return on formal on-the-job training obtained for manual workers in the public sector.

The sectoral estimates for females suggest that seniority has a relatively important role in the determination of both private- and public-sector female earnings. When examining separately non-manuals and manuals employed in the two sectors, however, these seniority effects show up for non-manual employees only, and more strongly in the public sector. It is also noteworthy that despite a relatively high participation rate in formal on-the-job training programmes among female employees, only private-sector women in non-manual jobs tend to receive a significant return on such investments.

In view of this, it is hardly surprising that the estimates point to notable gender gaps in the estimated earnings effects of both seniority and formal on-the-job training. Among non-manual workers, the seniority effects are much stronger for females than for males, while the reverse holds among manual workers in private sector jobs. Also, in all three employee categories men generally receive a higher return on investments in formal on-the-job training. Among public-sector manual workers, the gender differences in experience and on-the-job training effects are almost negligible.

All in all, the empirical evidence on the earnings structure of the private and the public sector in Finland presented in this chapter does seem to indicate that the earnings effects of especially general and specific work experience estimated from sectoral earnings equations are to some extent "distorted" by the strong dominance of manual workers in the private sector and of non-manual workers in the public sector. A further division of the employees in each sector into non-manual and manual workers provides support of this hypothesis; the estimation results now point to a high degree of similarity in sectoral returns on investments in human capital within the broad categories of non-manual and manual workers, implying that the differences in human capital returns tend to be larger between occupational categories than between sectors.

Finally, the estimation results do not seem to point to the presence of a "double-imbalance" problem in the Finnish labour market. Instead the comparatively high returns on investments in human capital received in the public sector can be expected to attract also high-educated individuals to the sector's large and, until recent years, rapidly growing number of both upper- and lower-level non-manual jobs.[16]

Footnotes:

1. The human capital earnings equation is derived and commented on in Chapter II of this study.

2. The adopted approach can be seen as justified in view of the empirical evidence reported in Chapters III-IV of this study and in Section 3 of the present chapter, suggesting that this source of selection bias is generally no serious problem in the employed data set.

3. The Type 1 distribution is occasionally referred to as the exponential or Gumbel distribution (Johnson & Kotz, 1970).

4. The multinomial logit model is preferred to the unordered multinomial probit model because it is less difficult to estimate, and to the ordered probit model because it does not require a sequential ranking of labour markets which would involve arbitrary judgements. Moreover, the ordered probit model has been found to predict less well than the multinomial logit model (cf. de Beyer & Knight (1989) and Reilly (1991)).

5. Specifically, the probability of participation in labour market m, Prob(LM_i=m), is estimated in relation to the labour market, say, k chosen for the purpose of normalization. This implies estimation of three functions of the form

$$\text{(i)} \qquad \ln\left[\frac{Prob(LM_i = m)}{Prob(LM_i = k)}\right] = \delta_m + \theta_m V_i + \eta_{im}, \quad m = 1,2,3,4 \qquad m \neq k$$

where Prob(LM_i=m)/Prob(LM_i=k) is the ratio of the probability of participating in labour market m to that of participating in labour market k, and δ is a constant term. A comparison of any labour markets m and r can then be derived as

$$\text{(ii)} \qquad \ln\left[\frac{Prob(LM_i = m)}{Prob(LM_i = r)}\right] = \ln\left[\frac{Prob(LM_i = m)}{Prob(LM_i = k)}\right] - \ln\left[\frac{Prob(LM_i = r)}{Prob(LM_i = k)}\right]$$

$$= (\delta_m - \delta_r) + (\theta_m - \theta_r)V_i + (\eta_{im} - \eta_{ir}) .$$

6. Since the income data come from the tax rolls, the information concerns the tax value of taxable fringe benefits. In 1987, the tax value of fringe benefits was, on average, 80 per cent of their market value. Furthermore, virtually all fringe benefits had by 1987 become subject to taxation, the most important exceptions being reasonable health and recreational benefits financed by the employer.

7. Cf. the regression results reported in Table H of the Appendix. This outcome may be partly explained by the fact that the tax rolls provide information merely on the tax value of fringe benefits subject to taxation. Moreover, of the male employees retained in the actual estimating data only some 16 per cent are recorded to have received taxable fringe benefits in 1987. The corresponding share for female employees is close to 20 per cent.

8. A t-test for testing the statistical significance of the difference between single coefficients estimated for males/females employed in the private and the public sector cannot be

made as the sectoral parameter estimates are correlated due to the correction for potential sector selection bias undertaken in the estimations. I am indebted to Markus Jäntti for making me aware of this problem.

9. Following Halvorsen & Palmquist (1980), the percentage differential for indicator variables obtained from estimating various specifications of the semilogarithmic human capital earnings function is calculated as $(e^{\alpha} - 1)*100$.

10. The cumulative earnings effect of labour market experience (EXP) measures total percentage additions to earnings due to experience and is calculated as the antilog of $(\alpha_1 EXP - \alpha_2 EXP^2)$.

11. The quite large number of public-sector employees (both manual and non-manual workers) in industry sectors other than the service sector (SIC9) explain the introduction of the full set of job-related variables also into the public-sector earnings equations.

12. A more frequent occurrence of unemployment and temporary layoffs in 1987 among especially lower-paid private-sector males may offer a potential explanation to the negative earnings effect of UNEMPL obtained for that category. The strong negative earnings effect estimated for public-sector males may, in turn, be the outcome of the special arrangements in force at that time. In particular, a fairly large number of the public-sector staff was still in 1987 paid by means of budgetary employment grants (Finnish Labour Review 1/1990, Tables 22-23). Apart from this, also central and local government jobs were to a certain extent filled with the aid of pay subsidies. The lack of similar effects for female employees may simply be due to their lower average hourly earnings level and smaller wage dispersion (cf. Table 1).

13. If acquiring general skills, i.e. skills which are by definition transferable across jobs/employers, the employee is thought to have to pay all the costs of his or her training and to also receive the full return from his or her accumulated investment in training. If acquiring specific skills, on the other hand, the employee and the employer are likely to share both the costs and the returns associated with the training. In the first (second) case, starting wages will be lower (higher) and earnings growth with increased experience faster (slower). For critics of the Becker theorem, see e.g. Ballot (1992).

14. The estimated coefficients of the quadratic seniority term were insignificant throughout, and the variable was therefore abandoned in the estimations. (Cf. the results reported in Chapters III-IV of this study.) For a more detailed discussion of the theoretical considerations and the empirical implications of this approach, see Chapters II and III of this study.

15. Arai (1991) presents evidence on this for Sweden.

16. Possibly this can be taken to actualize the wage-twist policy option discussed in Pedersen et al. (1990): "When (these) high tax rates reflect that a major part of the labour force is employed in the public sector, more than they reflect a high share of cash transfers, a new policy option is open for government. If the public sector can use its role as a dominant employer to reduce relative public sector wages, it can lessen the effects both on and from the tax pressure with a given relative size of public sector employment. Such a wage policy would further tend to reduce the number of public employees by voluntary

mobility from the public sector. In a political sense this could be an attractive option as an alternative to direct cuts of in-kind transfers which will usually be strongly resisted by both the public employees in question and by the users of public institutions" (p. 126). The authors conclude that the hypothesis about a wage-twist policy being pursued in Denmark in the period 1976-85 cannot be rejected.

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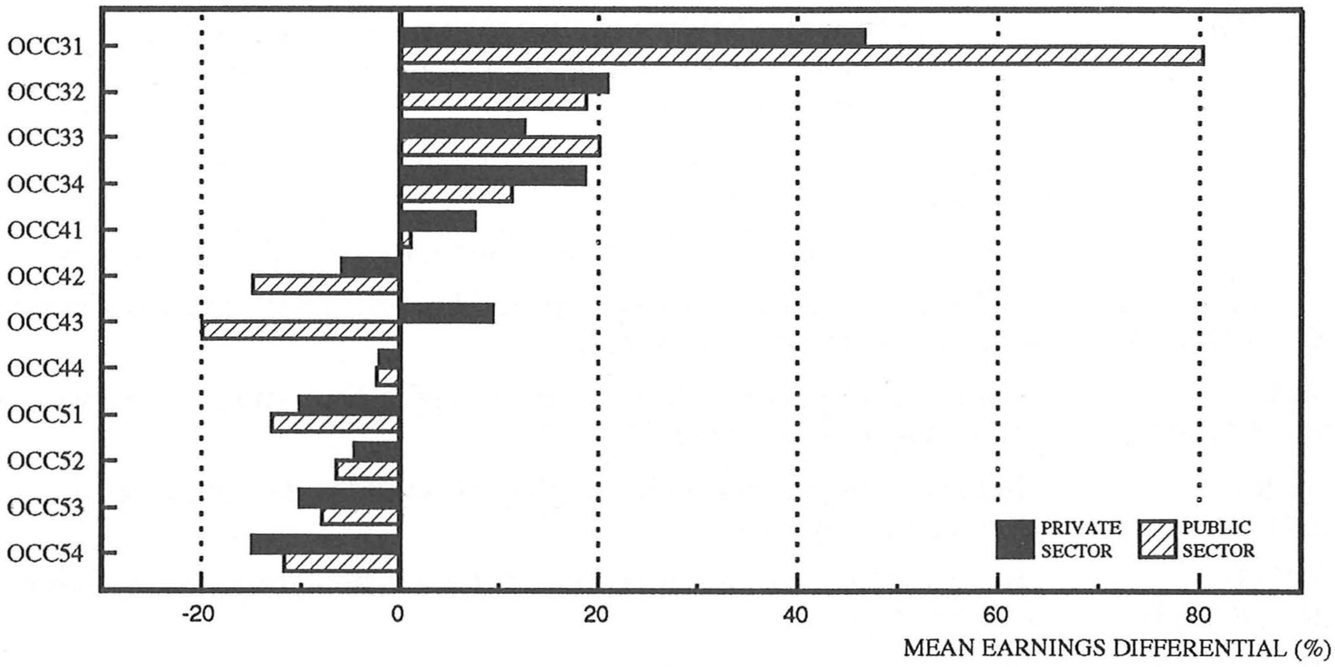
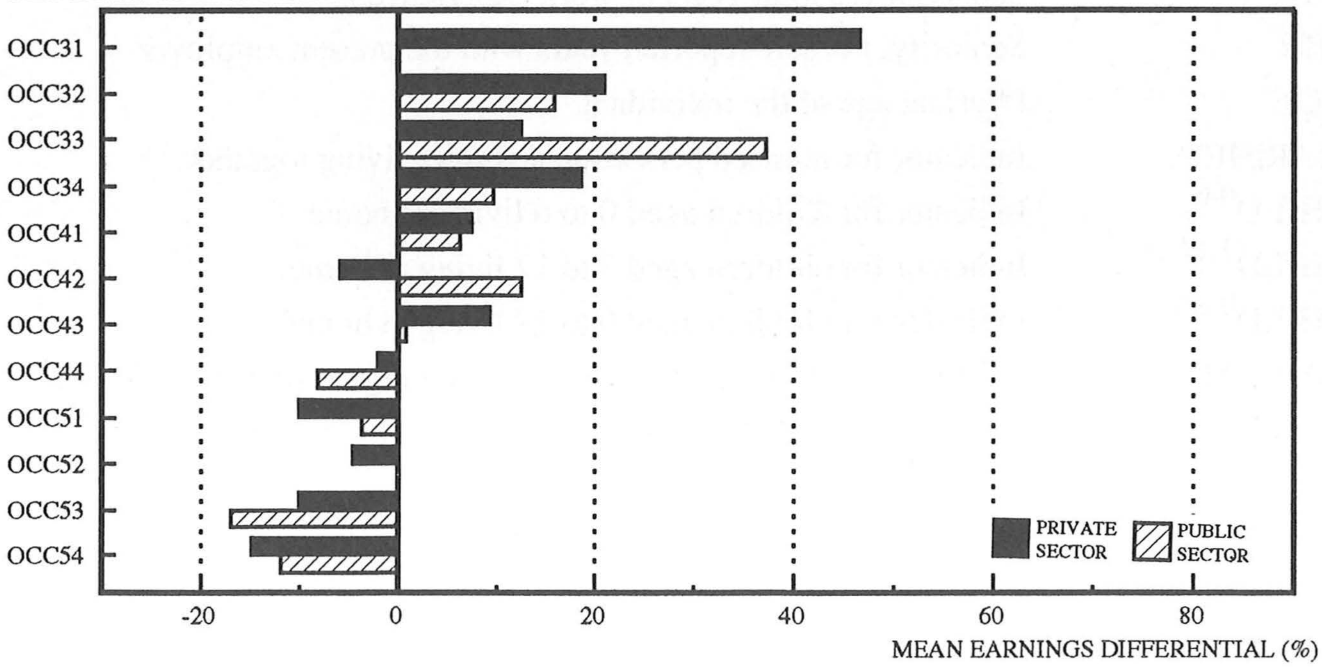
APPENDIX

Figure A. Employment-weighted mean differentials in hourly earnings levels inclusive of fringe benefits between 12 occupational social status categories after having controlled for various background factors, by gender and sector

MALE EMPLOYEES



FEMALE EMPLOYEES



Source: Calculated from the occupation coefficients reported in Tables 2-3 in the text and the sample means given in Table B of the Appendix. For the formulae used, see footnote 10 in Chapter IV of this study.

Table A. Summary of definitions of included variables

Variable	Definition
EARN	Average hourly earnings (in FIM) calculated from the before-tax annual wage and salary income recorded in the tax rolls and an estimated amount of annual normal working hours. The earnings data include most types of compensation, including fringe benefits.
ln EARN	Natural logarithm of EARN.
SCHOOL	Years of formal schooling evaluated from register information on the single highest level of education completed using the Finnish standard classification of education.
S	Years of formal schooling with basic education (9 years of schooling) set equal to zero.
BASIC	Indicator for persons with basic education only (about 9 years or less).
LOWER VOCATIONAL	Indicator for persons with completed lower-level of upper secondary education (about 10-11 years).
UPPER VOCATIONAL	Indicator for persons with completed upper-level of upper secondary education (about 12 years).
SHORT NON-UNIV	Indicator for persons with completed lowest level of higher education (about 13-14 years).
UNDER-GRADUATE	Indicator for persons with completed graduate university education (about 15 years).
GRADUATE	Indicator for persons with completed graduate university education (more than 16 years).
EXP	Self-reported total years of work experience.
SEN	Seniority, i.e. self-reported years with the present employer.
AGE	Physical age of the individual.
MARRIED	Indicator for married persons and singles living together.
$CHILD^{0\text{-}6}$	Indicator for children aged 0 to 6 living at home.
$CHILD^{7\text{-}17}$	Indicator for children aged 7 to 17 living at home.
$CHILD^{0\text{-}17}$	Indicator for children aged 0 to 17 living at home.
CAPITAL	Indicator for residence within the capital region (the Helsinki area).
UUSIMAA	Indicator for residence in the province of Uusimaa but outside the capital region.
OTHER SOUTH	Indicator for residence in the southern parts of Finland other than Uusimaa.
MIDDLE	Indicator for residence in the middle parts of Finland.
NORTH	Indicator for residence in the northern parts of Finland.
PUBLOCAL	Indicator for employment in the local government (municipality) sector.
TEMPEMPL	Indicator for persons who self-reportedly are in temporary employment.
PART-TIME	Indicator for persons who self-reportedly are in part-time employment.

PIECE-RATE	Indicator for persons who are not being paid on an hourly, weekly or monthly basis.
NODAYWORK	Indicator for persons who are not engaged in regular day-time work.
UNEMPL	Indicator for persons who have been unemployed or temporarily laid off during the previous twelve months.
UNION	Indicator for unionized employees.
OJT	Indicator for persons who self-reportedly have received employer-sponsored formal on-the-job-training during the previous twelve months.
OCC31	Indicator for senior officials and upper management.
OCC32	Indicator for senior officials and employees in research and planning.
OCC33	Indicator for senior officials and employees in education and training.
OCC34	Indicator for other senior officials and employees.
OCC41	Indicator for supervisors.
OCC42	Indicator for clerical and sales workers, independent work.
OCC43	Indicator for clerical and sales workers, routine work.
OCC44	Indicator for other lower-level employees with administrative and clerical occupations.
OCC51	Indicator for workers in agriculture, forestry and commercial fishing.
OCC52	Indicator for manufacturing workers.
OCC53	Indicator for other production workers.
OCC54	Indicator for distribution and service workers.
INDU1	Indicator for employment in agriculture, forestry and fishing.
INDU2/3	Indicator for employment in mining, quarrying and manufacturing.
INDU4	Indicator for employment in electricity, gas and water.
INDU5	Indicator for employment in construction.
INDU6	Indicator for employment in trade, restaurants and hotels.
INDU7	Indicator for employment in transport and communication.
INDU8	Indicator for employment in financing, insurance, reale estate and business services.
INDU9	Indicator for employment in public, social and personal services.
WORK1	Indicator for persons in technical, physical science, social science, humanistic and artistic work.
WORK2	Indicator for persons in managerial, administrative, and clerical work.
WORK3	Indicator for persons in commercial work.
WORK4	Indicator for persons in agriculture, forestry, and fishing.
WORK5	Indicator for persons in manufacturing work, mining and quarrying.
WORK6	Indicator for persons in transport and communication work.
WORK7	Indicator for persons in health care and social work.
WORK8	Indicator for persons in other service work.

Table B. Sample statistics by sector for all male and female employees retained in the actual estimating data[1]

Variable	MALE EMPLOYEES Private sector	Public sector	FEMALE EMPLOYEES Private sector	Public sector
EARN	49.12	50.84	39.65	42.86
	(23.57)	(25.59)	(24.31)	(22.71)
ln EARN	3.81	3.85	3.60	3.68
	(0.38)	(0.37)	(0.36)	(0.37)
SCHOOL (S + 9)	10.77	11.70	10.54	11.55
	(1.76)	(2.39)	(1.65)	(2.11)
BASIC EDUCATION (1,0)	0.3746	0.2907	0.4522	0.2624
LOWER VOCATIONAL (1,0)	0.3577	0.2701	0.2684	0.2996
UPPER VOCATIONAL (1,0)	0.1841	0.1753	0.2220	0.2117
SHORT NON-UNIV (1,0)	0.0401	0.0887	0.0218	0.1081
UNDERGRADUATE (1,0)	0.0056	0.0454	0.0209	0.0529
GRADUATE (1,0)	0.0379	0.1299	0.0146	0.0653
EXP	17.15	18.34	16.27	15.98
	(10.98)	(10.39)	(9.95)	(9.65)
SEN	8.58	11.23	8.42	8.82
	(8.36)	(8.93)	(8.04)	(8.14)
MARRIED (1,0)	0.7344	0.7650	0.7234	0.7410
$CHILD^{0-6}$ (1,0)	0.2621	0.2474	0.1920	0.2309
$CHILD^{7-17}$ (1,0)	0.3183	0.3629	0.3576	0.3840
CAPITAL (1,0)	0.1855	0.1691	0.2320	0.1768
TEMPEMPL (1,0)	0.0611	0.1155	0.0682	0.1813
PART-TIME (1,0)	0.0091	0.0206	0.0682	0.0518
PUBLOCAL (1,0)	-	0.4969	-	0.7522
PIECE-RATE (1,0)	0.1483	0.0227	0.1110	0.0079
NODAYWORK (1,0)	0.2228	0.2557	0.2466	0.2511
UNEMPL (1,0)	0.1174	0.0784	0.0955	0.1014
UNION (1,0)	0.6859	0.8577	0.7307	0.8761
OJT (1,0)	0.3290	0.4644	0.3159	0.4580
OCC31 (1,0)	0.0808	0.0144	0.0191	-
OCC32 (1,0)	0.0450	0.0763	0.0136	0.0180
OCC33 (1,0)	0.0028	0.1443	0.0018	0.1047
OCC34 (1,0)	0.0372	0.0639	0.0528	0.0754
OCC41 (1,0)	0.1047	0.1113	0.0419	0.0428
OCC42 (1,0)	0.0731	0.0165	0.2884	0.1036
OCC43 (1,0)	0.0077	0.0103	0.1474	0.1104
OCC44 (1,0)	0.0162	0.1010	0.0546	0.3356
OCC51 (1,0)	0.0232	0.0350	0.0073	0.0079
OCC52 (1,0)	0.4020	0.0907	0.1902	-
OCC53 (1,0)	0.0991	0.0907	0.0491	0.0642
OCC54 (1,0)	0.1082	0.2454	0.1338	0.1374
INDU1 (1,0)	0.0358	0.0330	0.0082	0.0113
INDU2/3 (1,0)	0.4336	0.0103	0.3412	0.0034
INDU4 (1,0)	0.0176	0.0309	0.0064	0.0045
INDU5 (1,0)	0.1511	0.1237	0.0227	0.0045
INDU6 (1,0)	0.1462	0.0124	0.2821	0.0146
INDU7 (1,0)	0.0737	0.2289	0.0400	0.0619
INDU8 (1,0)	0.0773	0.0227	0.1665	0.0338
INDU9 (1,0)	0.0647	0.5381	0.1328	0.8660
Number of obs.	1423	485	1099	888

1 The figures in parentheses below the continuous variables give the standard deviation of the variable in question.

Table C. Sample means for selected variables by gender, sector, and occupational status

	Private-sector male employees					Public-sector male employees				
	EARN	$EARN^{NO\ FRINGES}$	SCHOOL	EXP	No. of obs.	EARN	$EARN^{NO\ FRINGES}$	SCHOOL	EXP	No. of obs.
OCC31	80.77	76.58	12.31	20.35	115	114.79	113.40	14.00	27.00	7
OCC32	67.88	66.47	13.64	12.47	64	71.22	71.22	14.89	17.38	37
OCC33	56.92	56.92	14.50	13.75	4	72.02	71.37	14.76	18.70	70
OCC34	63.71	62.25	13.08	16.09	53	63.15	63.04	13.64	13.64	31
OCC41	53.59	52.70	11.22	20.13	149	47.41	47.37	11.13	18.65	54
OCC42	44.43	43.46	10.91	14.88	104	40.91	40.76	13.00	16.00	8
OCC43	60.50	59.92	12.09	14.18	11	33.50	33.48	11.80	9.60	5
OCC44	47.37	47.22	11.39	12.91	23	45.25	45.21	11.24	14.12	49
OCC51	36.96	36.68	9.97	17.54	33	35.06	35.02	9.35	21.71	17
OCC52	44.48	44.39	10.15	17.17	572	40.32	40.26	10.02	21.11	44
OCC53	40.05	39.92	10.07	16.79	141	39.04	39.01	10.34	18.20	44
OCC54	38.86	38.84	9.95	16.85	154	40.85	40.74	10.07	19.82	119

	Private-sector female employees					Public-sector female employees				
	EARN	$EARN^{NO\ FRINGES}$	SCHOOL	EXP	No. of obs.	EARN	$EARN^{NO\ FRINGES}$	SCHOOL	EXP	No. of obs.
OCC31	62.47	60.16	12.48	16.48	21	-	-	-	-	-
OCC32	49.82	48.98	14.07	11.20	15	45.96	45.76	13.12	12.88	16
OCC33	55.32	55.32	14.50	10.00	2	65.82	65.29	14.70	15.95	93
OCC34	53.51	53.21	12.41	16.02	58	50.95	50.77	14.10	12.85	67
OCC41	39.59	39.22	10.37	19.67	46	45.10	45.10	11.60	19.66	38
OCC42	39.43	39.14	10.68	16.04	317	43.11	42.90	11.16	17.51	92
OCC43	39.86	39.02	10.40	16.41	162	37.78	37.57	10.74	15.08	98
OCC44	48.93	47.93	10.73	14.87	60	40.57	40.50	11.28	14.52	298
OCC51	26.47	26.47	10.00	10.75	8	36.51	36.51	10.14	8.71	7
OCC52	33.03	33.00	9.88	16.85	209	26.29	26.29	11.00	18.00	1
OCC53	34.45	34.22	10.17	17.46	54	31.22	30.91	10.32	16.82	56
OCC54	38.19	38.06	10.04	15.76	147	35.20	35.12	9.80	20.15	122

Table D. Sample means for male and female employees by sector and occupational status (Standard deviations of continuous variables are given in parentheses.)

	MALE EMPLOYEES				FEMALE EMPLOYEES			
	Private sector		Public sector		Private sector		Public sector	
	Non-manual	Manual	Non-manual	Manual	Non-manual	Manual	Non-manual	Manual
EARN	60.47	42.67	59.27	40.45	42.50	35.12	45.21	33.82
	(28.43)	(17.36)	(23.54)	(8.91)	(26.02)	(20.69)	(23.52)	(17.00)
ln EARN	4.01	3.70	4.01	3.68	3.66	3.48	3.73	3.47
	(0.42)	(0.31)	(0.37)	(0.22)	(0.36)	(0.34)	(0.37)	(0.28)
SCHOOL	11.94	10.11	13.14	10.12	10.88	9.98	11.97	9.97
(S + 9)	(2.08)	(1.08)	(2.28)	(1.15)	(1.81)	(1.16)	(2.12)	(1.10)
BASIC (1,0)	0.1927	0.4745	0.0938	0.4853	0.3900	0.5577	0.1877	0.5480
LOWER VOC. (1,0)	0.1773	0.4698	0.1406	0.4412	0.2098	0.3612	0.2765	0.3842
UPPER VOC. (1,0)	0.4027	0.0546	0.2773	0.0637	0.3117	0.0762	0.2478	0.0678
SHORT NON-UNIV (1,0)	0.1079	0.0012	0.1562	0.0098	0.0325	0.0025	0.1375	-
UNDER-GRAD. (1,0)	0.0154	-	0.0859	-	0.0340	-	0.0673	-
GRAD-UATE (1,0)	0.1040	-	0.2461	-	0.0222	0.0025	0.0831	-
EXP	17.27	17.02	17.01	19.98	16.18	16.49	15.22	19.04
	(10.52)	(11.26)	(9.54)	(11.17)	(9.75)	(10.17)	(9.19)	(10.79)
SEN	9.04	8.35	10.71	12.01	8.71	8.05	8.72	9.41
	(8.55)	(8.27)	(8.69)	(9.30)	(8.24)	(7.70)	(8.10)	(8.41)
MARRIED (1,0)	0.8208	0.6845	0.8242	0.7206	0.7223	0.7297	0.7393	0.7458
$\text{CHILD}^{0\text{-}6}$ (1,0)	0.2929	0.2432	0.2695	0.2157	0.1994	0.1867	0.2522	0.1356
$\text{CHILD}^{7\text{-}17}$ (1,0)	0.3738	0.2871	0.4141	0.3039	0.3560	0.3636	0.4012	0.3277
CAPITAL (1,0)	0.2929	0.1281	0.1797	0.1765	0.2998	0.1253	0.1905	0.1299
TEMPEMPL (1,0)	0.0405	0.0700	0.1328	0.1029	0.0709	0.0614	0.1877	0.1638
PART-TIME (1,0)	0.0173	0.0047	0.0195	0.0245	0.0591	0.0786	0.0473	0.0678
PUB-LOCAL (1,0)	-	-	0.5312	0.4510	-	-	0.7507	0.7571
PIECE-RATE (1,0)	0.0597	0.1886	-	0.0245	0.0162	0.2727	0.0860	-
NODAY-WORK (1,0)	0.0963	0.2859	0.2070	0.3137	0.1551	0.3907	0.2478	0.2373
UNEMPL (1,0)	0.0328	0.1601	0.0547	0.1029	0.0665	0.1400	0.0788	0.1921
UNION (1,0)	0.5838	0.7758	0.8555	0.8872	0.6987	0.8010	0.8825	0.8870
OJT (1,0)	0.5607	0.1850	0.6016	0.2941	0.4165	0.1548	0.5229	0.2034
INDU1 (1,0)	0.0347	0.0024	0.0117	0.0049	0.0074	0.0025	0.0057	-
INDU2/3 (1,0)	0.3083	0.5243	-	0.0245	0.1846	0.6093	0.0029	0.0056
INDU4 (1,0)	0.0193	0.0166	0.0078	0.0637	0.0059	0.0074	0.0057	-
INDU5 (1,0)	0.0674	0.2076	0.0781	0.1912	0.0266	0.0172	0.0014	0.0169
INDU6 (1,0)	0.2563	0.0854	0.0117	0.0147	0.3471	0.1794	0.0100	0.0339
INDU7 (1,0)	0.0385	0.0985	0.1094	0.3971	0.0502	0.0221	0.0544	0.0904
INDU8 (1,0)	0.1792	0.0178	0.0156	0.0343	0.2393	0.0442	0.0387	0.0169
INDU9 (1,0)	0.0963	0.0474	0.7656	0.2696	0.1388	0.1179	0.8811	0.8362
Number of obs.	519	843	256	204	677	407	698	177

Table E. Full information maximum likelihood estimates of the bivariate probit model (eq. (15) in the text) explaining the probability of labour force participation and private-sector employment, by gender[1]

Variable	Males	Sample mean	Females	Sample mean
Working selection:				
CONSTANT	-6.7401** (.8271)		-5.5965** (.7310)	
BASIC EDUCATION	-0.2901** (.0648)	0.4506	-0.3250** (.0571)	0.4641
AGE	0.4752** (.0718)	37.25	0.3484** (.0625)	38.42
AGE^2	-0.0087** (.0019)	1572.7	-0.0047** (.0016)	1662.4
AGE^3 /1000	0.0381** (.0161)	73038	0.0034 (.0135)	78637
MARRIED	0.5614** (.0793)	0.6368	0.0786 (.0648)	0.6630
$CHILD^{0-17}$	0.3412** (.0929)	0.3487	-0.1818** (.0682)	0.3946
SOUTH	0.3514** (.0615)	0.6046	0.3940** (.0524)	0.6257
Private-sector selection:				
CONSTANT	0.8822** (.1787)		0.0322 (.1755)	
BASIC EDUCATION	0	0.3533	0	0.3673
VOCATIONAL (levels 3-4)	-0.1028 (.0900)	0.5173	-0.0880 (.0863)	0.4998
HIGHER EDUC. (levels 5-8)	-0.8178** (.1374)	0.1294	-0.5202** (.1301)	0.1329
EXP	-0.0150** (.0039)	17.46	-0.0058 (.0037)	16.14
CAPITAL	0	0.1814	0	0.2073
UUSIMAA	-0.0426 (.1441)	0.0896	-0.1606 (.1368)	0.0856
OTHER SOUTH	-0.0780 (.0992)	0.3789	-0.1949* (.0916)	0.3855
MIDDLE	-0.3950** (.1168)	0.1562	-0.4855** (.1115)	0.1530

Table E. (cont.)

Variable	Males	Sample mean	Females	Sample mean
NORTH	-0.3848** (.1116)	0.1939	-0.6956** (.1125)	0.1686
MARRIED	0.1261 (.1034)	0.7421	-0.0461 (.0812)	0.7321
PART-TIME	-0.3774 (.2762)	0.0121	0.2819* (.1347)	0.0609
NODAYWORK	0.0644 (.0934)	0.2311	0.4368** (.0860)	0.2486
WORK1	0	0.1845	0	0.1208
WORK2	0.5114** (.1216)	0.1132	0.7902** (.1129)	0.2672
WORK3	1.8839** (.3479)	0.0592	2.4844** (.2975)	0.0810
WORK4	-0.0138 (.1805)	0.0351	0.0967 (.3183)	0.0091
WORK5	0.6849** (.1056)	0.4308	2.2213** (.2228)	0.1243
WORK6	-0.4182** (.1288)	0.1059	-0.4200* (.1993)	0.0337
WORK7	-1.2612** (.2448)	0.0210	-0.8636** (.1242)	0.1691
WORK8	-0.7551** (.1653)	0.0503	-0.0028 (.1220)	0.1948
RHO(μ_1,μ_2)	0.1842 (.1311)		0.2725** (.1160)	
Log-Likelihood	-1996.3		-2508.9	
No of obs. in				
- working selection	2825		3193	
- sector selection	1908		1987	

1 Standard errors are given in parentheses below the estimates.
* Denotes significant estimate at a 5 % level.
** Denotes significant estimate at a 1 % level.

Table F. Private/public-sector estimates of eqs. (1) and (2) for males using the standard Heckman two-stage procedure and ordinary least squares (OLS) techniques.[1] The dependent variable is log hourly earnings inclusive of fringe benefits.

	PRIVATE-SECTOR MALES		PUBLIC-SECTOR MALES	
Variable	Heckman	OLS	Heckman	OLS
CONSTANT	3.3419** (.0481)	3.3271** (.0472)	3.3188** (.0801)	3.2957** (.0803)
BASIC EDUCATION	0	0	0	0
LOWER VOCATIONAL	0.1068** (.0213)	0.1056** (.0214)	0.0969** (.0332)	0.0988** (.0261)
UPPER VOCATIONAL	0.2940** (.0264)	0.2916** (.0286)	0.2498** (.0380)	0.2522** (.0342)
SHORT NON-UNIV	0.4675** (.0508)	0.4518** (.0444)	0.4893** (.0519)	0.4994** (.0590)
UNDER GRADUATE	0.5331** (.1157)	0.5210** (.1153)	0.4796** (.0648)	0.4878** (.0566)
GRADUATE	0.6617** (.0512)	0.6485** (.0534)	0.6396** (.0489)	0.6491** (.0462)
EXP	0.0184** (.0031)	0.0183** (.0036)	0.0233** (.0048)	0.0233** (.0054)
EXP^2 /1000	-0.2615** (.0738)	-0.2638** (.0817)	-0.3491** (.1099)	-0.3458** (.1267)
MARRIED	0.0593** (.0237)	0.0595** (.0239)	0.0641* (.0343)	0.0626* (.0317)
$CHILD^{0-6}$	-0.0030 (.0219)	-0.0034 (.0197)	-0.0578* (.0300)	-0.0583* (.0271)
$CHILD^{7-17}$	0.0547** (.0211)	0.0548** (.0205)	0.0468* (.0279)	0.0470* (.0273)
CAPITAL	0.1684** (.0232)	0.1696** (.0277)	0.0650* (.0313)	0.0618* (.0319)
TEMPEMPL	-0.0598 (.0386)	-0.0601 (.0499)	-0.0025 (.0446)	-0.0022 (.0495)
PART-TIME	0.1180 (.0919)	0.1121 (.1990)	0.3500** (.0886)	0.3542* (.1621)
PUBLOCAL			-0.0027 (.0253)	-0.0014 (.0250)
PIECE-RATE	0.0488* (.0243)	0.0508* (.0220)	0.1665* (.0852)	0.1657* (.0796)

Table F. (cont.)

Variable	PRIVATE-SECTOR MALES Heckman	OLS	PUBLIC-SECTOR MALES Heckman	OLS
NODAYWORK	0.0493* (.0215)	0.0486** (.0207)	0.0506* (.0292)	0.0552* (.0291)
UNEMPL	-0.0753** (.0294)	-0.0747** (.0309)	-0.1579** (.0517)	-0.1580** (.0595)
UNION	-0.0023 (.0197)	-0.0029 (.0218)	0.0045 (.0367)	0.0052 (.0481)
LAMBDA2(ε,μ_2) (sector sel.)	-0.0316 (.0414)		0.0173 (.0336)	
R^2 adj.	0.3150	0.3152	0.5417	0.5424
SEE	0.3138	0.3166	0.2420	0.2488
F-value	27.15	28.27	23.00	23.95
Number of obs.	1423	1423	485	485

1 Standard errors are given in parentheses below the estimates. Heckman (1979) estimates where LAMBDA2 (ε,μ_2) measures the selectivity bias arising from choosing between the two sectors. The probit estimates for the sector selection function are very close to those given in Table D above and are therefore not reported here. Since maximum likelihood estimates (see Chapters III-IV of this study for an explanation of this estimation method) were obtained for private-sector employees only, standard Heckman estimates are reported for both employee categories. The OLS-estimates are corrected for heteroscedasticity according to White (1980). The estimated earnings equations also include seven one-digit industry sector controls (INDU1, INDU2/3, INDU4, INDU5, INDU6, INDU8, INDU9), employment in transport and communication (INDU7) being the reference sector.

* Significant estimate at a 5 % level.

** Significant estimate at a 1 % level.

Table G. Private/public-sector estimates of eqs. (1) and (2) for females using the standard Heckman two-stage procedure and ordinary least squares (OLS) techniques.[1] The dependent variable is log hourly earnings inclusive of fringe benefits.

Variable	PRIVATE-SECTOR FEMALES Heckman	OLS	PUBLIC-SECTOR FEMALES Heckman	OLS
CONSTANT	3.3155**	3.3398**	3.3219**	3.3321**
	(.0640)	(.0775)	(.0671)	(.0764)
BASIC EDUCATION	0	0	0	0
LOWER VOCATIONAL	-0.0228	-0.0163	0.0435	0.0413
	(.0246)	(.0250)	(.0284)	(.0279)
UPPER VOCATIONAL	0.1733**	0.1772**	0.2090**	0.2072**
	(.0284)	(.0352)	(.0310)	(.0334)
SHORT NON-UNIV	0.3585**	0.3916**	0.3924**	0.3864**
	(.0694)	(.0788)	(.0397)	(.0347)
UNDERGRADUATE	0.4772**	0.5006**	0.5506**	0.5453**
	(.0706)	(.0709)	(.0501)	(.0426)
GRADUATE	0.4997**	0.5303**	0.6875**	0.6820**
	(.0831)	(.1041)	(.0473)	(.0439)
EXP	0.0177**	0.0174**	0.0121**	0.0122**
	(.0037)	(.0042)	(.0040)	(.0043)
EXP^2 /1000	-0.3227**	-0.3114**	-0.0936	-0.0964
	(.0931)	(.0959)	(.1010)	(.0988)
MARRIED	-0.0092	-0.0081	-0.0348	-0.0356
	(.0230)	(.0220)	(.0244)	(.0226)
$CHILD^{0\text{-}6}$	0.0290	0.0313	0.0373	0.0374
	(.0258)	(.0274)	(.0254)	(.0297)
$CHILD^{7\text{-}17}$	-0.0079	-0.0061	0.0198	0.0197
	(.0218)	(.0189)	(.0225)	(.0204)
CAPITAL	0.1335**	0.1293**	0.0471*	0.0489*
	(.0246)	(.0272)	(.0271)	(.0250)
TEMPEMPL	0.0576	0.0588	0.0936**	0.0924**
	(.0406)	(.0570)	(.0326)	(.0364)
PART-TIME	0.2313**	0.2254**	0.3736**	0.3761**
	(.0398)	(.0602)	(.0470)	(.0851)
PUBLOCAL			-0.0301	-0.0343
			(.0295)	(.0232)
PIECE-RATE	0.0018	-0.0081	-0.0942	-0.0941
	(.0332)	(.0318)	(.1133)	(.1334)

Table G. (cont.)

Variable	PRIVATE-SECTOR FEMALES Heckman	OLS	PUBLIC-SECTOR FEMALES Heckman	OLS
NODAYWORK	0.1149** (.0236)	0.1149** (.0253)	0.1694** (.0234)	0.1693** (.0280)
UNEMPL	-0.0451 (.0339)	-0.04478 (.0388)	-0.0421 (.0381)	-0.0422 (.0492)
UNION	-0.0568** (.0240)	-0.0548* (.0272)	0.0478 (.0320)	0.0472 (.0376)
LAMBDA2(ε,μ_2) (sector sel.)	0.0459* (.0275)		-0.0130 (.0320)	
R^2 adj.	0.2298	0.2286	0.3627	0.3633
SEE	0.3145	0.3185	0.2907	0.2951
F-value	14.10	14.56	20.41	21.24
Number of obs.	1099	1099	888	888

1 Standard errors are given in parentheses below the estimates. Heckman (1979) estimates where LAMBDA2 (ε,μ_2) measures the selectivity bias arising from choosing between the two sectors. The probit estimates for the sector selection function are fairly close to those given in Table D above and are therefore not reported here. Since maximum likelihood estimates (see Chapters III-IV of this study for an explanation of this estimation method) were obtained for private-sector employees only, standard Heckman estimates are reported for both employee categories. The OLS-estimates are corrected for heteroscedasticity according to White (1980). The estimated earnings equations also include seven one-digit industry sector controls (INDU1, INDU2/3, INDU4, INDU5, INDU6, INDU8, INDU9), employment in transport and communication (INDU7) being the reference sector.

* Significant estimate at a 5 % level.

** Significant estimate at a 1 % level.

Table H. Private/public-sector estimates of eqs. (1) and (2) for male and female employees using OLS.[1] The dependent variable is log hourly earnings *exclusive* of fringe benefits.

Variable	MALE EMPLOYEES Private sector	Public sector	FEMALE EMPLOYEES Private sector	Public sector
CONSTANT	3.3269** (.0469)	3.2924** (.0805)	3.3239** (.0781)	3.3279** (.0764)
BASIC EDUCATION	0	0	0	0
LOWER VOCATIONAL	0.1051** (.0211)	0.0990** (.0260)	-0.0152 (.0246)	0.0409 (.0280)
UPPER VOCATIONAL	0.2813** (.0281)	0.2532** (.0342)	0.1784** (.0348)	0.2062** (.0334)
SHORT NON-UNIV	0.4430** (.0419)	0.4958** (.0587)	0.3885** (.0788)	0.3834** (.0347)
UNDER GRADUATE	0.4926** (.1122)	0.4801** (.0565)	0.5061** (.0707)	0.5426** (.0425)
GRADUATE	0.6158** (.0541)	0.6488** (.0459)	0.5176** (.0993)	0.6801** (.0440)
EXP	0.0181** (.0035)	0.0237** (.0055)	0.0176** (.0041)	0.0123** (.0043)
EXP^2 /1000	-0.2609* (.0806)	-0.3547** (.1277)	-0.3128** (.0947)	-0.0986 (.0988)
MARRIED	0.0557** (.0235)	0.0626* (.0316)	-0.0098 (.0218)	-0.0376* (.0226)
$CHILD^{0-6}$	-0.0026 (.0193)	-0.0577* (.0270)	0.0282 (.0273)	0.0392 (.0297)
$CHILD^{7-17}$	0.0527** (.0202)	0.0452* (.0272)	-0.0081 (.0187)	0.0210 (.0204)
CAPITAL	0.1607** (.0273)	0.0624* (.0317)	0.1291** (.0268)	0.0495* (.0250)
TEMPEMPL	-0.0578 (.0498)	-0.0014 (.0494)	0.0581 (.0568)	0.0934** (.0364)
PART-TIME	0.1285 (.1984)	0.3564* (.1624)	0.2137** (.0592)	0.3787** (.0851)
PUBLOCAL		-0.0011 (.0249)		-0.0336 (.0232)
PIECE-RATE	0.0479* (.0216)	0.1636* (.0791)	-0.0061 (.0316)	-0.0956 (.1340)
NODAYWORK	0.0494** (.0207)	0.0566* (.0291)	0.1174** (.0252)	0.1726** (.0280)

Table H. (cont.)

Variable	MALE EMPLOYEES Private sector	Public sector	FEMALE EMPLOYEES Private sector	Public sector
UNEMPL	-0.0727**	-0.1581**	-0.0446	-0.0450
	(.0308)	(.0596)	(.0386)	(.0493)
UNION	0.0061	0.0052	-0.0499*	0.0508
	(.0215)	(.0480)	(.0269)	(.0377)
R^2 adj.	0.3031	0.5417	0.2236	0.3636
SEE	0.3126	0.2480	0.3156	0.2950
F-value	26.77	23.88	14.17	21.27
Number of obs.	1423	485	1099	888

[1] For notes, see Table G above.

Table I. Multinomial logit estimates of eq. (15) for labour market choice equations, male employees[1]

Variable	Public-sector manual	Private-sector non-manual	Private sector manual
CONSTANT	2.8908** (.6773)	0.2571 (.5516)	3.2677** (.6648)
BASIC EDUCATION	0	0	0
LOWER VOCATIONAL	-1.2079** (.4140)	-0.1057 (.3499)	-1.5837** (.4051)
UPPER VOCATIONAL	-3.1004** (.5137)	-0.3786 (.3161)	-3.5624** (.4865)
SHORT NON-UNIV	-3.4756** (.9120)	-1.0478** (.3616)	-5.2409** (1.3202)
UNDERGRADUATE		-2.9725** (.5419)	
GRADUATE		-1.9363** (.3681)	
EXP	-0.0207 (.0157)	-0.0213* (.0102)	-0.0538** (.0154)
MARRIED	-0.1939 (.3759)	0.2787 (.2496)	-0.2027 (.3608)
CAPITAL	0	0	0
UUSIMAA	-1.1623* (.6175)	-0.3908 (.3615)	-0.9271 (.5807)
OTHER SOUTH	-0.9682* (.4327)	-0.6050** (.2451)	-0.6276 (.4172)
MIDDLE	-0.1940 (.5221)	-1.2156** (.3190)	-0.4829 (.5187)
NORTH	-0.4068 (.4816)	-1.2298** (.2865)	-0.6686 (.4775)
PART-TIME	-0.0501 (.9202)	-0.0735 (.6748)	-1.0711 (.9946)
NODAYWORK	-0.3178 (.3267)	-0.4912* (.2749)	0.1213 (.3200)
WORK1		1.8263** (.3766)	
WORK2		3.0743** (.4237)	
WORK3		2.9760** (.4425)	
WORK4-5	2.3875** (.5506)	1.7664** (.6330)	4.7957** (.5494)
WORK6	0.8369* (.3878)	0.3276 (.5307)	1.4164** (.3942)
WORK7-8	0	0	0

Log-Likelihood = -1037.6   Corr. pred.[2] = 76.7 %
Chi-square (54) = 2505.6   No. of obs. = 1858

1 Standard errors are in parentheses below the estimates. The reference category is public-sector non-manual workers.
2 Percentage of correctly predicted labour market status.
* Denotes significant estimate at a 5 % level.
** Denotes significant estimate at a 1 % level.

Table J. Multinomial logit estimates of eq. (15) for labour market choice equations, female employees[1]

Variable	Public-sector manual	Private-sector non-manual	Private sector manual
CONSTANT	0.1433 (.3978)	-0.6037* (.3000)	0.1363 (.3822)
BASIC EDUCATION	0	0	0
LOWER VOCATIONAL	-0.9130** (.2272)	-0.4805* (.1999)	-0.9356** (.2305)
UPPER VOCATIONAL	-2.1618** (.3559)	-0.3682* (.1949)	-1.9190** (.3230)
SHORT NON-UNIV		-1.1649** (.3000)	-4.1677** (1.0291)
UNDERGRADUATE		-1.0791** (.3282)	
GRADUATE		-1.5130** (.3694)	-4.3054** (1.3480)
EXP	0.0180* (.0102)	-0.0093 (.0080)	-0.0007 (.0103)
MARRIED	-0.2800 (.2304)	-0.1394 (.1551)	-0.3200 (.2232)
CAPITAL	0	0	0
UUSIMAA	-0.2405 (.4588)	-0.4843* (.2626)	0.1220 (.4139)
OTHER SOUTH	0.3372 (.3042)	-0.3739* (.1766)	0.2331 (.2853)
MIDDLE	0.1753 (.3491)	-0.7750** (.2250)	-0.4849 (.3505)
NORTH	0.4960 (.3366)	-1.0415** (.2270)	-0.4830 (.3518)
PART-TIME	0.4236 (.4262)	0.0918 (.3138)	1.4464** (.3563)
NODAYWORK	-0.7112** (.2196)	0.2515 (.1949)	0.6063** (.2038)
WORK1		1.2710** (.2231)	
WORK2		2.4320** (.1913)	
WORK3		5.9841** (.7307)	
WORK4-5	1.0079 (.7353)	0.6127 (1.1680)	5.2067** (.6159)
WORK6	-0.5673 (.3538)	0.2863 (.3994)	-0.8296* (.4122)
WORK7-8	0	0	0

Log-Likelihood = -1351.6 Corr. pred.[2] = 69.6 %
Chi-square (54) = 2342.0 No. of obs. = 1972

1 Standard errors are in parentheses below the estimates. The reference category is public-sector non-manual workers.
2 Percentage of correctly predicted labour market status.
* Denotes significant estimate at a 5 % level.
** Denotes significant estimate at a 1 % level.

Table K. Private/public-sector estimates of eq. (17) for male employees in non-manual and manual jobs, respectively.[1] The dependent variable is log hourly earnings inclusive of fringe benefits.

Variable	PRIVATE-SECTOR MEN Non-manual	PRIVATE-SECTOR MEN Manual	PUBLIC-SECTOR MEN Non-manual	PUBLIC-SECTOR MEN Manual
CONSTANT	3.3859** (.1143)	3.3458** (.0550)	3.3451** (.1591)	3.5193** (.1009)
BASIC EDUCATION	0	0	0	0
LOWER VOCATIONAL	0.1276* (.0550)	0.0614** (.0216)	0.1152 (.0717)	0.0531* (.0272)
UPPER VOCATIONAL	0.2396** (.0486)	0.0932 (.0610)	0.1987** (.0717)	0.0402 (.0692)
SHORT NON-UNIV	0.3622** (.0667)		0.3268** (.0899)	
UNDERGRADUATE	0.3489** (.1382)		0.3411** (.1151)	
GRADUATE	0.5375** (.0704)		0.5158** (.1002)	
EXP	0.0187** (.0068)	0.0093* (.0043)	0.0236** (.0092)	0.0108* (.0054)
$EXP^2/1000$	-0.1812 (.1549)	-0.1766* (.0922)	-0.1601 (.2880)	-0.2376* (.1077)
SEN	0.0001 (.0026)	0.0052** (.0016)	-0.0039 (.0048)	0.0064** (.0020)
OJT	0.1108** (.0320)	0.0940** (.0221)	0.0916** (.0327)	0.0322 (.0244)
MARRIED	0.0581 (.0442)	0.0433 (.0264)	0.0454 (.0518)	0.0158 (.0317)
$CHILD^{0-6}$	-0.0119 (.0355)	0.0080 (.0218)	-0.0042 (.0381)	-0.0470 (.0359)
$CHILD^{7-17}$	0.0907** (.0341)	0.0227 (.0227)	0.0566* (.0328)	0.0600* (.0295)
CAPITAL	0.1804** (.0367)	0.1795** (.0394)	0.0702 (.0494)	0.0740* (.0346)
TEMPEMPL	-0.2105* (.1023)	0.0071 (.0574)	-0.0457 (.0662)	0.1782** (.0733)
PART-TIME	0.2415 (.2305)	0.0078 (.3237)	0.6032** (.1741)	-0.0154 (.1751)
PUBLOCAL			0.0272 (.0338)	-0.0083 (.0294)
PIECE-RATE	0.1502* (.0664)	0.0534** (.0222)		0.1027 (.1043)

Table K. (cont.)

Variable	PRIVATE-SECTOR MEN Non-manual	Manual	PUBLIC-SECTOR MEN Non-manual	Manual
NODAYWORK	-0.1080 (.0656)	0.1217** (.0206)	-0.0005 (.0522)	0.0838** (.0296)
UNEMPL	0.0584 (.0816)	-0.0665* (.0343)	-0.2055* (.1051)	-0.2721** (.0808)
UNION	-0.0540* (.0323)	0.0376 (.0285)	-0.0228 (.0577)	-0.0490 (.0459)
INDU1	-0.2152** (.1168)			
INDU2/3	0.0421 (.0893)			
INDU1-3		0.0716* (.0330)	-0.2133** (.0734)	-0.0688 (.0565)
INDU4	0.0448 (.1111)	0.1293* (.0717)	0.2670** (.0966)	0.1192* (.0592)
INDU5	0.0231 (.1024)	0.1562** (.0394)	-0.0781 (.0596)	-0.0544 (.0337)
INDU6	-0.1090 (.0902)	0.0133 (.0472)	-0.3722* (.1842)	-0.1286 (.1149)
INDU7	0	0	0	0
INDU8	0.0579 (.0908)	-0.0584 (.0443)	0.0485 (.1981)	0.0999 (.0696)
INDU9	-0.1274 (.1094)	-0.0722 (.0466)	0.0221 (.0464)	-0.0867** (.0336)
LAMBDA (labour market selectivity)	0.0432 (.0512)	-0.0578 (.0406)	-0.0334 (.0459)	-0.0194 (.0382)
R^2 adj.	0.3447	0.1912	0.5436	0.3620
SEE	0.3373	0.2752	0.2501	0.1744
F-value	11.09	9.65	12.68	5.80
No. of obs.	519	843	256	204

1 Standard errors are in parentheses below the estimates and are adjusted for heteroscedasticity according to White (1980). The earnings equations are corrected for potential selectivity bias arising from labour market choice. The corresponding multinomial logit estimates are reported in Table I above.

* Denotes significant estimate at a 5 % level.

** Denotes significant estimate at a 1 % level.

Table L. Private/public-sector estimates of eq. (17) for female employees in non-manual and manual jobs, respectively.[1] The dependent variable is log hourly earnings inclusive of fringe benefits.

Variable	PRIVATE-SECTOR WOMEN Non-manual	PRIVATE-SECTOR WOMEN Manual	PUBLIC-SECTOR WOMEN Non-manual	PUBLIC-SECTOR WOMEN Manual
CONSTANT	3.3552** (.1013)	3.1952** (.1615)	3.4074** (.0806)	3.3157** (.2354)
BASIC EDUCATION	0	0	0	0
LOWER VOCATIONAL	-0.0229 (.0366)	-0.0402 (.0356)	0.0225 (.0342)	-0.0055 (.0448)
UPPER VOCATIONAL	0.0809* (.0416)	0.2620** (.1022)	0.1311** (.0330)	0.2137 (.1514)
SHORT NON-UNIV	0.2830** (.0982)		0.2915** (.0531)	
UNDERGRADUATE	0.4190** (.0722)		0.4570** (.0552)	
GRADUATE	0.3899** (.1153)		0.6047** (.0597)	
EXP	0.0121* (.0061)	0.0132* (.0061)	0.0044 (.0049)	0.0082 (.0114)
$EXP^2/1000$	-0.2545* (.1335)	-0.2051 (.1316)	-0.0102 (.1177)	-0.0989 (.1905)
SEN	0.0062** (.0016)	-0.0011 (.0024)	0.0110** (.0016)	0.0031 (.0025)
OJT	0.0752** (.0224)	0.0490 (.0355)	-0.0286 (.0215)	-0.0432 (.0290)
MARRIED	-0.0294 (.0281)	0.0243 (.0319)	-0.0497* (.0251)	-0.0074 (.0454)
$CHILD^{0-6}$	0.0487 (.0359)	-0.0077 (.0389)	0.0554* (.0313)	-0.0868 (.0694)
$CHILD^{7-17}$	-0.0022 (.0227)	-0.0106 (.0294)	0.0197 (.0224)	0.0031 (.0442)
CAPITAL	0.1116** (.0337)	0.1028* (.0449)	0.0389 (.0249)	0.1350* (.0717)
TEMPEMPL	0.0050 (.0731)	0.2043* (.0997)	0.0847* (.0401)	0.0809 (.0901)
PART-TIME	0.2814** (.0746)	0.3376** (.0868)	0.4955** (.1100)	0.1224 (.0900)
PUBLOCAL			-0.0381 (.0264)	0.0051 (.0397)

Table L. (cont.)

Variable	PRIVATE-SECTOR WOMEN Non-manual	PRIVATE-SECTOR WOMEN Manual	PUBLIC-SECTOR WOMEN Non-manual	PUBLIC-SECTOR WOMEN Manual
PIECE-RATE	-0.0472 (.1213)	0.0758* (.0340)	-0.1750 (.1651)	
NODAYWORK	0.1105** (.0378)	0.1408** (.0298)	0.1550** (.0323)	0.1420** (.0530)
UNEMPL	-0.0433 (.0462)	-0.0071 (.0553)	-0.0053 (.0646)	0.0082** (.0622)
UNION	-0.0724* (.0326)	-0.0426 (.0420)	0.0671* (.0405)	-0.0747 (.0934)
INDU1-3	0.0553 (.0487)	0.0394 (.1377)	0.1161 (.1333)	
INDU4	0.0216 (.0682)	-0.1250 (.1684)	-0.0204 (.0695)	
INDU5	0.0461 (.0742)	0.0808 (.1379)	-0.1404** (.0583)	
INDU6	-0.0462 (.0501)	-0.0676 (.1355)	0.2641 (.2017)	
INDU7	0	0	0	
INDU8	0.1359** (.0491)	-0.2541 (.1566)	0.0329 (.0655)	
INDU9	0.0811 (.0600)	-0.0990 (.1440)	-0.0483 (.0588)	
LAMBDA (labour market selectivity)	0.0443 (.0304)	0.0916** (.0376)	-0.0542 (.0451)	0.0110 (.0791)
R^2 adj.	0.2503	0.2208	0.4054	0.0808
SEE	0.3128	0.2962	0.2852	0.2723
F-value	9.68	6.00	18.60	1.91
No. of obs.	677	407	698	177

1 Standard errors are in parentheses below the estimates and are adjusted for heteroscedasticity according to White (1980). The earnings equations are corrected for potential selectivity bias arising from labour market choice. The corresponding multinomial logit estimates are reported in Table J above.

* Denotes significant estimate at a 5 % level.

** Denotes significant estimate at a 1 % level.

Table M. Private/public-sector estimates of eqs. (1) and (2) for male employees in, respectively, non-manual and manual jobs using ordinary least squares (OLS) techniques.[1] The dependent variable is log hourly earnings inclusive of fringe benefits.

Variable	PRIVATE-SECTOR MEN Non-manual	PRIVATE-SECTOR MEN Manual	PUBLIC-SECTOR MEN Non-manual	PUBLIC-SECTOR MEN Manual
CONSTANT	3.4292** (.1186)	3.3199** (.0542)	3.2760** (.1309)	3.4955** (.0847)
BASIC EDUCATION	0	0	0	0
LOWER VOCATIONAL	0.1299** (.0554)	0.0557** (.0215)	0.1250* (.0690)	0.0528* (.0272)
UPPER VOCATIONAL	0.2411** (.0485)	0.0767 (.0596)	0.2204** (.0633)	0.0366 (.0691)
SHORT NON-UNIV	0.3714** (.0642)		0.3613** (.0751)	
UNDERGRADUATE	0.3837** (.1294)		0.3923** (.0844)	
GRADUATE	0.5538** (.0653)		0.5584** (.0751)	
EXP	0.0180** (.0067)	0.0089* (.0042)	0.0235** (.0092)	0.0108* (.0054)
EXP^2 /1000	-0.1658 (.1512)	-0.1769* (.0918)	-0.1498 (.2854)	-0.2333* (.1071)
SEN	0.0002 (.0026)	0.0054** (.0016)	-0.0039 (.0048)	0.0065** (.0020)
OJT	0.1096** (.0318)	0.0964** (.0222)	0.0930** (.0323)	0.0312 (.0247)
MARRIED	0.0569 (.0446)	0.0421 (.0264)	0.0397 (.0515)	0.0150 (.0314)
$CHILD^{0-6}$	-0.0140 (.0353)	0.0075 (.0219)	-0.0015 (.0385)	-0.0484 (.0358)
$CHILD^{7-17}$	0.0923** (.0339)	0.0246 (.0226)	0.0594* (.0330)	0.0596* (.0294)
CAPITAL	0.1724** (.0368)	0.1792** (.0393)	0.0587 (.0479)	0.0735* (.0346)
TEMPEMPL	-0.2063* (.1052)	0.0079 (.0574)	-0.0419 (.0670)	0.1768** (.0740)
PART-TIME	0.2339 (.2330)	-0.0325 (.3148)	0.6039** (.1726)	-0.0062 (.1748)
PUBLOCAL			0.0302 (.0338)	-0.0092 (.0299)

Table M. (cont.)

Variable	PRIVATE-SECTOR MEN Non-manual	PRIVATE-SECTOR MEN Manual	PUBLIC-SECTOR MEN Non-manual	PUBLIC-SECTOR MEN Manual
PIECE-RATE	0.1441* (.0666)	0.0554** (.0221)		0.0997 (.1025)
NODAYWORK	-0.0995 (.0660)	0.1223** (.0206)	0.0129 (.0468)	0.0844** (.0293)
UNEMPL	0.0501 (.0830)	-0.0657* (.0343)	-0.2059* (.1055)	-0.2724** (.0816)
UNION	-0.0538* (.0323)	0.0389 (.0285)	-0.0223 (.0574)	-0.0500 (.0459)
INDU1	-0.1931* (.1090)			
INDU2/3	0.0217 (.0935)			
INDU1-3		0.0911** (.0319)	-0.2210** (.0786)	-0.0767 (.0555)
INDU4	0.0284 (.1142)	0.1459* (.0723)	0.2677** (.0974)	0.1114* (.0549)
INDU5	0.0057 (.1057)	0.1757** (.0381)	-0.0706 (.0578)	-0.0598* (.0341)
INDU6	-0.1328 (.0946)	0.0240 (.0482)	-0.3706* (.1879)	-0.1279 (.1156)
INDU7	0	0	0	0
INDU8	0.0366 (.0946)	-0.0650 (.0410)	0.0627 (.1884)	0.1018 (.0704)
INDU9	-0.1347 (.1119)	-0.0623 (.0456)	0.0260 (.0461)	-0.0850** (.0335)
R^2 adj.	0.3447	0.1906	0.5447	0.3648
SEE	0.3373	0.2752	0.2498	0.1740
F-value	11.48	10.01	13.20	6.07
No. of obs.	519	843	256	204

1 Standard errors are in parentheses below the estimates and are adjusted for heteroscedasticity according to White (1980).

* Denotes significant estimate at a 5 % level.

** Denotes significant estimate at a 1 % level.

Table N. Private/public-sector estimates of eqs. (1) and (2) for female employees in, respectively, non-manual and manual jobs using ordinary least squares (OLS) techniques.[1] The dependent variable is log hourly earnings inclusive of fringe benefits.

Variable	PRIVATE-SECTOR WOMEN Non-manual	PRIVATE-SECTOR WOMEN Manual	PUBLIC-SECTOR WOMEN Non-manual	PUBLIC-SECTOR WOMEN Manual
CONSTANT	3.3778** (.1030)	3.2861** (.1604)	3.3496** (.0752)	3.3312** (.1793)
BASIC EDUCATION	0	0	0	0
LOWER VOCATIONAL	-0.0140 (.0351)	-0.0231 (.0344)	0.0368 (.0324)	-0.0031 (.0412)
UPPER VOCATIONAL	0.0841* (.0412)	0.2824** (.1048)	0.1547** (.0332)	0.2217 (.1605)
SHORT NON-UNIV	0.3125** (.0933)		0.3398** (.0362)	
UNDERGRADUATE	0.4377** (.0715)		0.5005** (.0451)	
GRADUATE	0.4196** (.1077)		0.6548** (.0438)	
EXP	0.0119* (.0061)	0.0131* (.0061)	0.0042 (.0049)	0.0080 (.0109)
$EXP^2/1000$	-0.2505* (.1337)	-0.2037 (.1344)	0.0014 (.1190)	-0.0974 (.1868)
SEN	0.0065** (.0016)	-0.0007 (.0024)	0.0108** (.0016)	0.0031 (.0025)
OJT	0.0734** (.0224)	0.0530 (.0353)	-0.0286 (.0215)	-0.0440 (.0294)
MARRIED	-0.0288 (.0280)	0.0260 (.0326)	-0.0457* (.0250)	-0.0066 (.0450)
$CHILD^{0-6}$	0.0499 (.0360)	-0.0041 (.0394)	0.0541* (.0314)	-0.0860 (.0686)
$CHILD^{7-17}$	0.0001 (.0226)	-0.0062 (.0296)	0.0203 (.0223)	0.0024 (.0426)
CAPITAL	0.1084** (.0336)	0.1073** (.0457)	0.0329 (.0250)	0.1361* (.0698)
TEMPEMPL	0.0060 (.0733)	0.1981* (.1006)	0.0870* (.0400)	0.0795 (.0872)
PART-TIME	0.2759** (.0754)	0.3100** (.0891)	0.4881** (.1095)	0.1226 (.0898)
PUBLOCAL			-0.0308 (.0253)	0.0037 (.0391)

Table N. (cont.)

Variable	PRIVATE-SECTOR WOMEN Non-manual	Manual	PUBLIC-SECTOR WOMEN Non-manual	Manual
PIECE-RATE	-0.0546* (.1263)	0.0587* (.0326)	-0.1874 (.1619)	
NODAYWORK	0.1187** (.0397)	0.1371** (.0303)	0.1582** (.0318)	0.1457** (.0452)
UNEMPL	-0.0387 (.0461)	-0.0036 (.0562)	-0.0061 (.0645)	0.0076 (.0619)
UNION	-0.0698* (.0328)	-0.0445 (.0429)	0.0683* (.0405)	-0.0760 (.0919)
INDU1-3	0.0518 (.0493)	-0.0386 (.1369)	0.0838 (.1281)	
INDU4	0.0229 (.0704)	-0.0888 (.1703)	-0.0224 (.0675)	
INDU5	0.0405 (.0745)	0.0137 (.1372)	-0.1373** (.0586)	
INDU6	-0.0608 (.0520)	-0.0734 (.1358)	0.2509 (.1985)	
INDU7	0	0	0	
INDU8	0.1315** (.0497)	-0.2508 (.1581)	0.0178 (.0609)	
INDU9	0.0999* (.0593)	-0.0912 (.1441)	-0.0636 (.0515)	
R^2 adj.	0.2488	0.2123	0.4052	0.0865
SEE	0.3132	0.2979	0.2852	0.2715
F-value	9.95	5.97	19.26	2.04
No. of obs.	677	407	698	177

1 Standard errors are in parentheses below the estimates and are adjusted for heteroscedasticity according to White (1980).

* Denotes significant estimate at a 5 % level.

** Denotes significant estimate at a 1 % level.

CHAPTER VI

HUMAN CAPITAL AND INDUSTRY WAGE DIFFERENTIALS IN FINLAND

Empirical evidence from micro-level data

ABSTRACT:

The main purpose of the present chapter is to contribute to the limited knowledge of wage differentials across Finnish industries based on individual data. The analysis is undertaken for all employees and separately for female and male employees using Labour Force Survey data for 1987. A distinction is also made between the labour market as a whole and the private-sector labour market. A frequently adopted approach is used to assess the impact and importance of inter-industry wage differentials from cross-sectional micro-level data. More exactly, a simple earnings model comprising industry indicator variables only is stepwise completed with variables controlling for differences in observable personal and job characteristics across industries. The empirical results suggest that substantial industry-related wage differentials remain even after controlling for a broad set of personal and job characteristics. The estimation results nevertheless also indicate that these characteristics explain relatively more of the observed industry wage structure than does the individuals' industry affiliation. Indeed, nearly half of the wage variance among Finnish industries can be attributable to differences in observable personal and job characteristics across industries. These overall patterns seem to hold largely for both genders.

1. INTRODUCTION

There is a growing body of international literature on large and persistent inter-industry wage differentials, even after controlling for differences in worker and job characteristics among industries. Moreover, these differentials have been found to be remarkably stable over time and very similar across countries despite differing institutional labour market characteristics. A most conspicuous feature of the inter-industry wage pattern is its stability also across occupations.

The empirically established stability of inter-industry wage differentials is clearly at variance with the standard competitive model of the labour market, according to which competition between industries will force equilibrium wages to reflect merely differentials compensating for differences in personal and job-related characteristics across industries. More exactly, although compensating differentials are without doubt important determinants of industry wages (e.g. Rosen, 1986)[1], this hypothesis can provide only part of an explanation of the substantial, mostly highly significant and very stable wage differentials observed across industries.

Several theoretical hypotheses have been put forth as an explanation of the persistence of non-competitive wage differentials in situations with involuntary unemployment. Presumably the most prominent explanations are offered by the efficiency wage theory, search theory, the insider-outsider hypothesis, and bargaining models. The efficiency wage theory suggests that the observed wage premiums are due to differences between firms and industries in, inter alia, monitoring possibilities and turnover costs. Search theory and the insider-outsider theory, on the other hand, suggest that the wage premiums are attributable to differences in costs of vacancies and costs of firing and hiring. The bargaining models, finally, emphasize the institutional features of the labour market, especially the trade union power in influencing wage determination.[2]

Of these alternative hypotheses only the efficiency wage theory is discussed at some length in Section 2 of this chapter. This may be justified by recent attempts to test empirically predictions of efficiency wage models of wage-setting behaviour, attempts which have mainly focussed on explaining measured industry wage differentials in terms of efficiency wage arguments. Some of the existing empirical evidence is reviewed in Section 3.

There is, so far, very little empirical evidence on wage differentials across Finnish industries based on individual data. Eriksson (1991) uses preliminary estimation results from the present study. Vainiomäki & Laaksonen (1992) estimate inter-industry wage differentials for the private sector from wage-level as well as first-differenced wage equations using longitudinal population census data covering the period 1975-85. They also make an attempt to explain the measured industry wage premiums by means of industry characteristics.

The labour force survey data used in the present study are fairly rich in personal and job characteristics and have in this respect a strong advantage over population census data. The labour force surveys do not, however, provide panel data covering several decades or even years, and have, in fact, been supplemented with income data for two years only (1987 and 1989). A common feature of the labour force surveys and the population censuses is that both lack information on firm and industry characteristics such as working conditions and employer size. Hence, the database used in the subsequent analysis can, at most, indicate the degree to which the observed industry-related wage differentials reflect compensating (competitive) differentials captured by the available information on background characteristics; it does not allow discriminating tests of alternative explanations for the existence of non-competitive wage differentials across industries.

The empirical analysis uses a frequently adopted approach to assessing the impact and importance of inter-industry wage differentials from cross-sectional micro-level data. More exactly, a simple earnings model comprising industry indicator variables only is gradually completed with variables controlling for differences in observable personal and job characteristics across industries. The empirical specifications of the earnings model and the data used are presented in Section 4. The earnings equations are estimated jointly and separately by gender for all employees, on the one hand, and for private-sector employees, on the other. The analysis is restricted throughout to non-agricultural employees.

The regression results obtained from estimating the overall and the gender-specific earnings equations are discussed in Section 5. Section 6 reports a simple attempt to display the influence of a limited number of industry characteristics on the measured wage differentials across Finnish private-sector industries. Concluding remarks are given in Section 7.

2. EFFICIENCY WAGE THEORIES

Perhaps the most distinguishing feature of efficiency wage theories is that firms may profit from setting wages above the market-clearing wage rate because the increase in wages will boost workers' effort or productivity. And since the degree of dependence between productivity and the level of compensation, i.e. the extent to which efficiency wages are utilized, will vary - possibly systematically - among firms and industries due to their heterogeneity, wage dispersion will arise. In other words, equally able individuals will be paid differently depending on the firm or industry in which they are employed.

This relationship between the wage level and worker productivity has been rationalized in four different ways. In particular, justification for efficiency wage models has been provided in terms of shirking, adverse selection, labour turnover, and on sociological grounds. A similar theoretical approach is adopted in the shirking and adverse selection versions of the efficiency wage theory in the sense that both sets of models analyse the consequences of firms' asymmetric information by relaxing the perfect information assumption underlying the standard microeconomic model of the labour market. The turnover and the sociological models, on the other hand, attempt to introduce new dimensions into the standard competitive model. Since there are excellent surveys of the efficiency wage literature[3], only the basic features of the different models are outlined below.

2.1. Shirking models

The assumption of perfect observability of actual labour productivity is without doubt incompatible with the real world, where firms mostly have only limited information about the workers' actual productivity. This fairly strong assumption is relaxed in the shirking model of efficiency wage theory (e.g. Calvo (1979,1985), Eaton & White (1983), Shapiro & Stiglitz (1984), Bowles (1985), Bowles & Summers (1986), Summers (1988), Albrecht & Vroman (1992)).[4] The shirking model predicts that relatively high wages should be paid in industries which face high monitoring costs and/or bear relatively high costs of shirking.

The point of departure is that firms are unable to observe actual labour productivity because of monitoring difficulties. Workers may, as a consequence, choose to shirk, i.e. to supply substandard effort. There is some chance that shirking workers will be caught, with the risk of being fired. The loss due to shirking, however, is minor if, as in the conventional model, markets are assumed to clear - i.e., there is no unemployment as workers will immediately find an equivalent job at the same rate of pay. In such a situation, firms may choose to pay wage premiums (efficiency wages) in order to prevent workers from shirking; the economic rent increases the cost of shirking (job loss) and thus provides workers with incentives not to shirk or, put differently, to increase work effort.

In equilibrium, all firms are paying premium wages, whereby the market wage will be above the market-clearing level. The resulting unemployment is involuntary thereby acting as a worker discipline device; the unemployed are willing to work for lower pay than the going wage but the employers refuse the opportunity of lowering wages as this is taken to lead to a lower average productivity and thus to reduced profits. A dynamic version of this standard shirking efficiency wage model is derived and tested by Machin & Manning (1992).

In the standard shirking efficiency wage model uncertainty is reduced to the risk of being detected if shirking. In other words, workers are assumed to have perfect information about the employer's minimum effort requirement. Arai (1989) introduces worker uncertainty about the level of effort that the employer considers as shirking, and shows that under circumstances when worker effort is hard to observe, intensified monitoring is not only costly but may result in a decline in average worker effort since it reduces workers' uncertainty about the employer's minimum effort requirement. In that case, wages above the market-clearing level may be chosen not only because of costly monitoring, as claimed in the standard shirking model, but also because of the inefficiency of monitoring in increasing worker effort.

The shirking model has occasionally been claimed to overlook the possibility of bonding as a means of preventing workers from shirking. Lazear (1979,1981,1986), for example, has argued that there is no need for efficiency wages as rising wage profiles, i.e. performance bonding, will prevent workers from shirking. Akerlof & Katz (1989), however, argue that rising wage profiles are not a perfect substitute for explicit bonding in situations where workers discount future gains at a higher rate than firms. In that case, firms may find it profitable to raise wages above the workers' opportunity cost, implying that workers may be paid rents even when explicit bonding is allowed. Macleod & Malcomson (1989) show that this is a potential outcome in a perfect equilibrium of a repeated game.

2.2. Adverse selection models

A second set of efficiency wage models relaxes the assumption that the quality of workers, either as applicants or on the job, is known to the firm (Weiss (1980), Greenwald (1986)). In particular, the adverse selection model posits that if the quality of workers is not observable at reasonable costs, firms may use wage premiums as a selection method; by raising wages firms can attract an applicant pool of higher average quality, which will increase the firm's probability of hiring workers with higher productivity. The empirical implication is that relatively high wages should be offered by industries which are more sensitive to quality differences or have higher costs of measuring quality.

The formal adverse selection model developed by Weiss (1980) has no unemployment. An extension in this respect is suggested by Greenwald (1986), who draws on the adverse selection phenomenon described by Akerlof (1970). More formally, Greenwald shows that adverse selection in the labour market may seriously impair a worker's freedom to change jobs; since current employers are generally better informed about the quality of their workers than potential alternative employers, they will probably concentrate on keeping their more able workers by raising the wages. If the employers succeed in their efforts to prevent turnover of their more able workers, then the job-changing pool should be composed disproportionately of less capable workers. Workers entering this "secondhand" labour market may, as a consequence, experience involuntary unemployment as they are marked as being part of an inferior group; firms are unwilling to hire from the job-changing pool, except at low wages, i.e. at rates that reflect the expected average ability (productivity) of this inferior group of workers. Whenever employers seek to fill jobs that require more capable workers, they may instead rely on internal labour pools.

2.3. Turnover models

Generally speaking, the turnover models have a formal structure similar to that of shirking models, but here a high relative wage and/or a high level of unemployment is assumed to increase worker productivity by increasing workers' quitting costs and thereby reducing costly labour turnover (e.g. Salop (1979), Stiglitz (1974,1985)). In brief, a wage rate above the worker's opportunity cost will make the job more attractive and, as a consequence, fewer workers will find it profitable to change jobs. Accordingly the turnover model predicts that the high-wage industries are those which face the highest turnover costs.

2.4. Sociological models

The sociological models of efficiency wage theory explain the wage-worker productivity relationship by emphasizing the role that social conventions and principles of appropriate behaviour have in the individuals' effort decisions (Solow (1979), Akerlof (1982,1984), Akerlof & Yellen (1990)). More exactly, Akerlof's partial gift exchange model predicts that it may be profitable for the firm to pay wages above competitive wages since this gift of wages can be expected to raise the firm's group work norms and thereby boost average productivity by making grateful workers feel that they must reciprocate their good treatment.

Akerlof & Yellen (1990) extend this sociological foundation for the efficiency wage theory by arguing that workers will exert more effort if they think they are being paid fairly: worker effort is taken to depend on the ratio between actual pay and fair pay. This fair wage-effort hypothesis, which also involves unemployment, is seen to be consistent with cross-section wage differentials as well as with unemployment patterns (cf. Thaler, 1989).

In brief, the sociological models predict that the high-pay industries will be those with high profits and/or with teamwork and worker cooperation playing an important role.

3. EXISTING EVIDENCE - WHAT DOES IT IMPLY?

By regarding worker productivity as an increasing function of the wage level, the efficiency wage models offer a potential explanation of several important aspects of the labour market, such as involuntary unemployment, non-degenerate wage distribution for apparently identical workers, labour market segmentation, and discrimination. The issue of whether or not the efficiency wage hypotheses are robust to allowing alternative contracts has been lively discussed (e.g. Akerlof & Yellen (1986) and Katz (1986)).

Most of the research in this area has been theoretical. Despite the difficulties of testing the efficiency wage theory, however, attempts have been made in more recent years to assess empirically the validity of the efficiency wage hypotheses. Following Machin & Manning (1992), two principal approaches can be distinguished: a more direct approach which attempts to test specific predictions of efficiency wage models, and a more indirect approach which focuses on explaining measured wage differentials across industries in terms of the efficiency wage theory by eliminating alternative explanations generally derived from competitive models of labour markets. Existing empirical evidence obtained from using these two approaches is briefly reviewed below.

3.1. Direct testing of efficiency wage hypotheses

Raff & Summers (1987) argue that Henry Ford's decision in 1913 to double wages increased productivity and profits significantly, and that this decision was most likely dictated by the kind of wage-productivity relations covered by efficiency wage models.

Cappelli & Chauvin (1991) provide a direct test of the main implications of the shirking model of efficiency wage theory by examining the relation between disciplinary dismissals and relative wage premiums using plant-level data from the same firm. They find evidence supporting the hypothesis that wage premiums are associated with reductions in shirking as measured by discipline rates. It is, however, less clear whether the value of the reduction in shirking is enough to offset the costs of the wage premium.

Wadhwani & Wall (1991) test, using panel data on 219 U.K. manufacturing companies, two predictions of efficiency wage theory, viz. that changes in unemployment will affect a firm's productivity, and that a high relative wage in a firm will make it more productive than its counterparts. The authors estimate production functions and provide evidence in favour of both predictions: firm-level productivity is found to increase when either relative wages rise or the level of unemployment rises. They also report some support for the idea that a change in the relative wage increases productivity. Wadhwani and Wall acknowledge, however, that their results are also consistent with the existence of unobserved human capital and of rent-sharing. They attempt, therefore, to discriminate between these alternative explanations, and conclude from this that the efficiency wage model is a more plausible interpretation of the obtained results.

Machin & Manning (1992) continue on this topic. In particular, they estimate Euler equations using panel data on 486 U.K. companies to test three dynamic models of worker effort determination. These models are derived from a shirking efficiency wage model, a compensating differentials model, and a union-firm bargaining model. Their discriminating test provides evidence in support of the shirking model in firms with low levels of unionization but of the bargaining model in highly unionized industries.

Barth (1992), finally, tests implications of efficiency wage theory, agency theory and union bargaining theory on Norwegian firm-level data, and finds evidence in support of all three types of non-market clearing models. The empirical results obtained also suggest that the three theories under study do not reinforce each other; instead the firms' wage premiums tend to serve several purposes at a time.

All in all, the efficiency wage models have, so far, little direct empirical support. This is without doubt mainly due to the lack of empirical data suitable for evaluating the different models and their predictions.

3.2. Evidence on inter-industry wage differentials

According to the standard competitive theory of labour markets, the observed wage differentials across industries should merely reflect differences in worker and job characteristics. Several studies, however, provide evidence of substantial and highly persistent inter-industry wage differentials which, moreover, have been found to be very similar across countries.

Slichter (1950) and Cullen (1956) found, using aggregated data for the United States, remarkably stable patterns of inter-industry wage differentials: Cullen (1956) estimated the rank correlation between industry wages in 1899 and 1950 to be 0.66, while Slichter (1950) reported a rank correlation between 1923 and 1946 of 0.73. Krueger & Summers (1987) compared the 1923 pattern with data for 1984 and reported a correlation of industry wages of 0.56 for these two years. Based on this evidence they concluded that the wage structure in the United States has remained relatively stable over a very long period of time. These findings are supported by recent empirical evidence obtained from U.S. census data. In particular, Helwege (1992) finds that very little has changed in the U.S. industrial wage structure over the years 1940-80; the correlations of the estimated industry effects are always significantly positive and over 0.7.

A notable stability over time in inter-industry wage structures has also been found for the Nordic countries. Using aggregate data Holmlund & Zetterberg (1991) report high correlations between manufacturing wages in 1965 and 1985 for five countries, including Finland, Norway and Sweden. Similar results have been obtained from individual data. Thus Arai (1992) finds that despite a substantial fall in the absolute size of industry wage effects in Sweden during the period 1968-81, the ranking of the measured inter-industry wage differentials remained relatively stable with the correlations between industry premiums after control ranging from 0.62 to 0.90. Vainiomäki & Laaksonen (1992) report for Finland correlations between private-sector industry wage premiums after control in the interval 0.83 to 0.93 for the period 1975-85.

As to cross-country similarities, both Krueger & Summers (1987) and Katz & Summers (1989) report high correlations of log manufacturing wages across countries. Krueger & Summers (1987) argue that the remarkably similar patterns of inter-industry wage differentials across countries imply that the differences cannot be explained by country-specific institutional factors but are instead due to some common thread across countries, such as technology. Katz & Summers (1989) make the same conclusion in arguing that the observed stability in cross-country wage differentials is not the outcome of particular collective bargaining systems or government interactions in the labour market but reflect the impact of factors fundamental to the operation of industrial economies.

This evidence on a similar pattern of inter-industry wage differentials across countries is based, however, on aggregated data, implying that differences in labour quality characteristics are not accounted for. For example, Edin & Zetterberg (1992) show for Sweden and the United States that aggregate data may, as a consequence, overstate cross-country correlations considerably.

The past few years have produced several studies comparing the pattern of industry wage differentials across countries using micro-level data. The findings are, however, quite mixed. Wagner (1990) estimates identically specified earnings functions for men from five countries[5] using internationally comparable micro-level data and notes that the pattern of inter-industry wage differentials varies a lot across the investigated countries. This evidence is interpreted as clearly contradicting previous conclusions drawn from studies using aggregated data.

Barth & Zweimüller (1992), on the other hand, find when comparing the industry wage structure of a slightly different set of OECD countries[6] that the patterns of the inter-industry pay structure tend to be remarkably similar across the countries under study and thus largely independent of the countries' highly different labour market institutions. They also argue that their results are more reliable than those of Wagner (1990) because of their much larger samples. Perhaps less surprising is the finding of very similar industry wage patterns across the Nordic countries (Albæk et al., 1993).

A common feature of micro-level studies of inter-industry wage differentials is the strong evidence on large and mostly highly significant industry wage premiums also after controlling for observable individual and job characteristics. Thus Krueger & Summers (1988) report the weighted and adjusted standard deviation of wage premiums (WASD)[7] across U.S. industries to be 13.2 per cent in 1974, 10.8 per cent in 1979 and 14.0 per cent in 1984. Dickens & Katz (1987) obtained similar results and found little difference between a sample of union workers and non-union workers.

Cross-sectional estimates of inter-industry wage differentials for Sweden reported by Arai (1992) suggest that the weighted and adjusted standard deviation of wage differentials varies between 0.071 in 1968 and 0.026 in 1981. These differentials are noted to be about half of the corresponding differentials for the U.S. in 1968 and about 25 per cent in 1981. Edin & Zetterberg (1992) report a variability of only 1.3 per cent in Swedish industry wages for 1984. The weighted and adjusted standard deviation is calculated to be 5.3 per cent for Norway (Barth & Zweimüller, 1992), 3.2 and 5.5 per cent for Austria (Barth & Zweimüller (1992) and Winter-Ebmer (1992), respectively), and 7.2 per cent for Germany (Zanchi, 1991). The corresponding figure for Finland is estimated at 8.5 per cent for 1975, 7.5 per cent for 1980, and 7.9 per cent for 1985 (Vainiomäki & Laaksonen, 1992). Evidently, the slightly higher standard deviation calculated for Finnish industries as compared to the other Nordic countries is partly due to the fact that the Finnish figures are not adjusted for sampling errors.

Finally, the inter-industry wage differentials have, at least in the U.S., been found to be significant and very stable also across occupations, implying that virtually all occupations tend to be better paid in high-wage industries than in low-wage industries. Early evidence on this issue is provided by Dunlop (1957), who finds when studying wages in Boston in 1951 that a truck driver in a high-paid industry was paid almost twice as much as a truck driver in a low-paid industry. Leonard (1987) reports substantial inter-firm wage differentials for 290 occupational definitions in the high-technology sector in one state of the United States. Katz & Summers (1989), in turn, calculate industry wage differentials for secretaries, janitors, and managers and find significant industry differentials of roughly the same magnitude as for all workers. Groshen & Krueger (1990) examine pay in four occupations using data on 300 U.S. hospitals and find a strong hospital-specific effect on wages that cut across occupations.

In contrast to the above evidence, Helwege (1992) finds when analysing 11 narrowly defined occupations from U.S. census data that "the industry rankings for each occupation scarcely strayed from the industry ranking of the entire sample" (p. 77), but that few of the occupations "had wages that were significantly different across industries, suggesting that efficiency wages are not paid, or at least not for the same occupation" (p. 83).

3.3. Do industry premiums reflect efficiency wage aspects?

Attempts have been made, in more recent years, to unravel the determinants of the substantial industry wage premiums that tend to remain also after controlling for a large set of productivity- and job-related background factors. As noted earlier, much of this effort has been directed towards testing predictions of efficiency wage models. A major part of this research work has been done in order to rule out other potential explanations of the measured industry effects, such as unobserved differences across industries in workers' productive abilities and/or working conditions. A brief look at the existing empirical evidence on this issue, however, makes one inclined to agree with Thaler (1989) who qualifies the non-competitive wage differentials as an anomaly, i.e. as an empirical result that is difficult to rationalize or to explain within the paradigm without imposing implausible assumptions.

Krueger & Summers (1988) find that the remaining industry-related wage differentials are not due to unmeasured worker ability[8] or compensating differentials but can at least partly be explained by wage premiums paid by employers in order to avoid costly labour turnover. They conclude, therefore, that the evidence on the industry wage structure in the United States is not consistent with competitive theory but is instead supportive of the turnover model of efficiency wage theory. Blackburn & Neumark (1988) and Gibbons & Katz (1989) obtain similar results regarding the impact of ability bias. In particular, Blackburn & Neumark (1988) provide evidence suggesting that neither inter-industry nor inter-occupation wage differentials can be attributable to differences in unobserved worker ability. Gibbons & Katz (1989), in turn, find that their "empirical findings...are difficult to reconcile with either pure unmeasured-ability or pure industry-effects explanations" (p. 25), but conclude that "a modified version of the true-industry-effects explanation fits more easily than does any (existing) version of the unmeasured-ability explanation" (pp. 3-4).

This evidence rejecting classical competitive theories of wage determination is not uncontroversial, however. Murphy & Topel (1987), Dickens & Katz (1987), and Topel (1989), for example, give the data an alternative interpretation. Murphy & Topel (1987) provide evidence in support of the unobserved ability model, and conclude that a major part of the measured industry (and occupational) effects is primarily due to unobserved productive ability among workers and not to equalizing wage differences or efficiency wages. Dickens & Katz (1987) and Topel (1989) also argue that the forces that cause sorting by measured human capital (more human capital is associated with higher-wage industries) cause similar sorting by unmeasured human capital and thus overestimation of actual industry wage premiums.

Empirical results for Sweden also provide mixed evidence on the impact of unmeasured worker ability. Edin & Zetterberg (1992) fail to establish significant industry wage effects when estimating fixed effect models for Swedish survey data. In contrast, Arai (1992) using another survey data set finds that a substantial part of the industry-related wage differentials obtained from wage-level estimations remains also after controlling for unobserved worker productivity. Evidence for Finland reported by Vainiomäki & Laaksonen (1992), in turn, indicates that at least part of the estimated cross-section industry wage effects seems to be explained by differences in unobserved worker quality and sorting of individuals by endogenous mobility.

The determinants of quit rates in U.S. industries have been studied by e.g. Pencavel (1970), Akerlof et al. (1988), Krueger & Summers (1988), and Katz & Summers (1989), and all find a strong negative correlation between inter-industry wage differentials and quit rates - i.e., high-wage industries tend to have lower quit rates, which is interpreted as supportive of the hypothesis that workers in high-wage industries receive non-competitive rents. This clearly violates the compensating wage hypothesis. These findings for the United States are, however, rejected for Sweden by Arai (1992), who finds that the probability of shifting to another industry is positively and significantly dependent on the industry wage premiums. Arai argues, though, that due to data limitations neither the Swedish nor the U.S. findings can reject or confirm the hypothesis of the turnover model. Weak support for the turnover model is, on the other hand, seen to be provided by the positive and significant correlation between industry wage premiums and individual tenure obtained both for Sweden (Arai (1992), Edin & Zetterberg (1992)) and the United States (Krueger & Summers, 1988).

Arai (1992) also finds a large and highly significant negative correlation between industry wage premiums and the extent of monitoring measured by workers' autonomy in setting hours and the pace of work. This evidence on industry effects being an increasing function of the degree of the workers' job autonomy is seen to support the shirking model. When extending the analysis to the private and the public sector in Sweden, Arai (1991) finds a positive wage-job autonomy relation in the private sector as predicted by the shirking model and a negative relation in the public sector, which is consistent with the predictions of the theory of compensating wage differentials.

A few recent studies supporting the efficiency wage hypothesis that wages increase with employer size are also worth mentioning. Rebitzer & Robinson (1991), for example, test this hypothesis for primary and secondary labour markets using U.S. survey data and find evidence compatible with the predictions of Bulow & Summer's (1986) efficiency wage model of dual labour markets. A positive wage effect of plant and firm size is also reported for Sweden by Arai (1991,1992). These findings are consistent not only with the predictions of the shirking model (larger firms have more monitoring difficulties) but also with those of the sociological model (larger firms have greater incentives to increase worker morale and loyalty because of less personal employee-employer relations).

As to the large inter-industry wage differentials observed across occupations, Leonard (1987) tests the predictions of the shirking model by using the ratio of supervisors to workers as an indicator of monitoring intensity, but finds little evidence in support of this efficiency wage argument. Groshen & Krueger (1990), on the other hand, find a negative relation between wages and the extent of supervision measured by the ratio of supervisors to staff, a finding which is consistent with the shirking hypothesis. On the whole, though, neither the efficiency wage hypotheses nor the theory of compensating wage differentials seems to be capable of explaining the observed uniformity of inter-industry wage differentials across occupations (cf. e.g. Thaler (1989), Gibbons & Katz (1990)).

4. METHODOLOGY AND DATA

The subsequent empirical analysis uses a frequently adopted approach to assessing the impact and importance of inter-industry wage differentials from cross-sectional micro-level data. More formally, standard earnings equations are estimated in three steps. In the first step, the dispersion of individual log earnings (lnEARN) is explained merely in terms of a vector (INDU) of primarily two-digit industry control variables in order to obtain crude measures of industry-related wage differentials. In the next two steps, attempts are made to test for competitive theories of wage determination by, first, adding a vector (HUMCAP) of human capital variables to the earnings equation, and second, a vector (OTHER) comprising a broad set of other personal and job characteristics. This yields three earnings equations of the following general form

$$(1) \qquad lnEARN_{i1} = \alpha_1 + \sum_{k=1}^{K} \beta_{k1} INDU_{i1} + \varepsilon_{i1} \,,$$

$$(2) \qquad lnEARN_{i2} = \alpha_2 + \sum_{k=1}^{K} \beta_{k2} INDU_{i2} + \sum_{l=1}^{L} \gamma_{l2}\, HUMCAP_{i2} + \varepsilon_{i2} \,,$$

$$(3) \qquad lnEARN_{i3} = \alpha_3 + \sum_{k=1}^{K} \beta_{k3} INDU_{i3} + \sum_{l=1}^{L} \gamma_{l3}\, HUMCAP_{i3} + \sum_{m=1}^{M} \delta_{m3}\, OTHER_{i3} + \varepsilon_{i3}$$

$$\varepsilon_{i1}, \varepsilon_{i2}, \varepsilon_{i3} \sim N(0,\sigma_j^2) \qquad j = 1,2,3 \qquad \mathrm{i} = 1,\ldots,N$$

where subscript i refers to the i[th] individual, α_j denotes constant terms, β_{kj}, γ_{lj} and δ_{mj} are unknown parameters, and ε_{ij} denotes the disturbance terms.

These earnings equations are estimated for all non-agricultural employees, on the one hand, and for non-agricultural private-sector employees, on the other. The gender aspect is accounted for in two different ways: first, by estimating the earnings equations for all employees in the respective category with gender appearing as an explanatory variable, and second, by estimating separate earnings equations for male and female employees.

The cross-sectional micro-level data used in the estimations come from the Labour Force Survey for 1987 conducted by Statistics Finland. The data set is supplemented with income data from the tax rolls. When the data are sorted out with respect to missing and incomplete information on crucial variables and restricted to wage and salary earners aged 16 to 64 not employed in the agricultural sectors (SIC11-13), the sample of employees retained in the actual estimating data shrinks to covering a total of 3748 individuals. Of these, nearly two thirds are employed in the private sector.

The dependent variable is chosen to be average before-tax hourly earnings in order to allow for interpersonal differences in weekly working hours and in months worked, and to make the earnings of full-time and part-time employees comparable. The earnings data used comprise most types of compensation, including overtime and vacation pay and the tax value of fringe benefits.

The Finnish Labour Force Survey is fairly rich in information about the individuals' acquired human capital. In particular, the survey comprises register data on the single highest level of education completed by each sample individual as well as self-reported information on the individuals' total years of work experience, their years with the present employer, and their participation in formal on-the-job training programmes during the time period covered by the survey. Other relevant information provided in the survey and utilized in the subsequent empirical analysis concerns a wide variety of other personal and job characteristics: marital status, family size, location of residence, temporary employment, part-time job, pay system, working-time scheme, unemployment or temporary layoffs, union membership, and occupational social status.

A summary of definitions of the variables employed in the empirical analysis is given in Table A of the Appendix. The employee categories investigated are described in terms of these variables in Tables B and C of the Appendix. A detailed presentation of the construction of the underlying data, definitions of variables used and estimation results for alternative definitions of crucial variables is given in Chapter VII of this study.

The earnings equations in (1)-(3) are estimated using ordinary least squares (OLS) techniques with standard errors adjusted for heteroscedasticity according to White (1980). This means that the disturbance terms in the above earnings models are assumed to be randomly distributed among the population, with an expected value equal to zero.

Two potential sources of selection bias are thereby overlooked. First, the sample individuals recorded as being employed represent persons who were employed during the week of the questionnaire, excluding all individuals who, for some reason, were not employed at that particular time. Second, the allocation of employees into the private sector may not be the outcome of a random drawing, allowing sector employment to be treated as exogenously given. Instead it can be expected to be the outcome of the individuals' preferences for employment in the private sector. Given that these potential sources of selection bias have a non-negligible influence on the estimation results, OLS estimation of the earnings equations in (1)-(3) will produce inconsistent parameter estimates.

The decision not to adjust the estimation results for potential sample selectivity bias can be justified in at least two ways. Estimation results reported in Chapters III-V of this study point to no serious selection biases arising from the individuals' decisions on labour force participation and sector employment. Moreover, when the earnings models in (1)-(3) were re-estimated using the more sophisticated estimation methods employed in Chapters III-V, the estimated selection coefficients were mostly statistically insignificant at conventional levels, and the parameter estimates of the included explanatory variables were very close to those obtained when using OLS.

5. ESTIMATED INTER-INDUSTRY WAGE DIFFERENTIALS

5.1. Empirical evidence for all employees

The regression results obtained from estimating the conventional earnings equations in (1)-(3) for all non-agricultural employees are reported in column 1 of Tables D1-3 in the Appendix. The corresponding estimates for non-agricultural private-sector employees are given in column 1 of Tables F1-3 in the Appendix.

As can be seen from these tables, about half or more of the estimated coefficients for the included, primarily two-digit[9] industry indicator variables remain statistically significant at conventional levels also after controlling for differences in acquired human capital and job-related characteristics of the labour force across different industries. Indeed, F-tests suggest that the null hypothesis whereby the earnings effect of the industry controls is jointly equal to zero can be rejected at a 0.0001 per cent level of significance, implying that the estimated industry effects are highly significant.

The importance of industry affiliation in explaining the observed dispersion in log hourly earnings across Finnish industries may also be examined in terms of the standard error of the regression (SEE).[10] Thus the SEE declines by roughly 1.7 per cent for the labour market as a whole and by nearly 2.4 per cent for the private-sector labour market when controls for human capital, gender, and other personal and job characteristics are added to the earnings equation merely controlling for industry affiliation. Larger drops in the SEE occur when the gender indicator (close to 2.4 per cent in the labour market as a whole, and some 3 per cent in the private sector), the human capital variables (4.2 resp. 3.6 per cent) and the broad set of other personal and job characteristics (over 7 per cent in both markets) are, by turn, introduced into the earnings equation.

In sum, the empirical evidence suggests that the relative importance of industry affiliation in explaining the observed variation in hourly earnings across Finnish industries is quite small. Similar results have been obtained for Sweden (Arai (1992), Edin & Zetterberg (1992)), Norway (Barth & Zweimüller, 1992), Austria (Barth & Zweimüller, 1992), and the UK (Elliott et al., 1992), while the results for the United States point to a markedly stronger explanatory power of industry affiliation than of worker and job characteristics (e.g. Krueger & Summers, 1988).

The estimated industry coefficients are turned into employment-weighted mean differentials in Tables 1 and 2 for all employees and private-sector employees in non-farm jobs, respectively. Put differently, the industry wage premiums indicated by the estimated industry coefficients are normalized to measure the proportional difference in hourly earnings between an employee in the given industry and the average employee.[11] The tables also display four widely-used summary measures of the importance of estimated industry coefficients, namely the standard deviation of the measured industry wage premiums. The unweighted standard deviation (SD) measures the industry effect for a randomly chosen industry, while the weighted (by employment shares) standard deviation (WSD) measures the effect for a randomly chosen individual. The ASD and WASD give the corresponding measures adjusted for the least squares sampling error.[12]

Table 1. Estimated inter-industry log wage differentials for non-agricultural employees. Employment-weighted mean wage differentials for primarily two-digit industries.

Industry	Un-controlled diff.	Human capital controls	All controls
Mining	-0.0202	-0.0514	-0.0126
Food manufacturing	-0.1144	-0.0501	-0.0385
Textile industries	-0.2571	-0.1089	-0.0935
Wood products	-0.1227	-0.0879	-0.0783
Furniture	-0.2235	-0.1418	-0.1372
Paper products	0.1661	0.1483	0.1621
Printing etc. industries	0.1655	0.1872	0.1402
Chemicals	0.0947	0.0518	0.0524
Non-metallic products	-0.0295	-0.0260	-0.0087
Basic metal industries	0.1865	0.1043	0.1282
Metal products	-0.0002	-0.0185	-0.0119
Other manufacturing	0.2650	0.1777	0.1170
Electricity etc.	0.0744	0.0322	0.0658
Construction	-0.0045	-0.0080	0.0452
Wholesale trade	0.1179	0.0690	0.0155
Retail trade	-0.1738	-0.0900	-0.1016
Restaurants, hotels	-0.1111	0.0298	0.0131
Transport	-0.0105	-0.0091	0.0196
Communication	-0.0160	-0.0298	0.0339
Financing	0.1382	0.1479	0.1286
Insurance	0.2190	0.1098	0.1037
Real estate	0.0764	0.0415	0.0010
Public administration	0.0461	-0.0146	0.0045
Sanitary services	-0.1955	-0.0609	-0.0910
Social services	0.0220	-0.0142	-0.0310
Recreational services	0.0568	0.1083	0.0345
Personal services	-0.1669	-0.1288	-0.0620
No. of observations	3748	3748	3748
R^2 adj.	0.0641	0.3382	0.4355
SD	0.1390	0.0927	0.0804
ASD	0.1282	0.0809	0.0683
WSD	0.1029	0.0691	0.0642
WASD	0.0970	0.0626	0.0575
F-all variables	10.87	54.19	52.62
F-industry controls		6.72	5.88

Source: Calculations based on the employment shares and industry coefficients reported in Tables B and D1-3 of the Appendix.

Table 2. Estimated inter-industry log wage differentials for non-agricultural private-sector employees. Employment-weighted mean wage differentials for primarily two-digit industries.

Industry	Un-controlled diff.	Human capital controls	All controls
Mining	0.0060	-0.0196	0.0227
Food manufacturing	-0.1058	-0.0525	-0.0344
Textile industries	-0.2466	-0.1053	-0.0848
Wood products	-0.1141	-0.0939	-0.0754
Furniture	-0.2149	-0.1447	-0.1385
Paper products	0.1747	0.1344	0.1629
Printing	0.1740	0.1780	0.1359
Chemicals	0.1033	0.0392	0.0476
Non-metallic products	-0.0209	-0.0373	-0.0129
Basic metal industries	0.1950	0.0735	0.1127
Metal products	0.0085	-0.0321	-0.0222
Other manufacturing	0.2059	0.1153	0.0658
Electricity etc.	0.0818	0.0147	0.0548
Construction	0.0230	0.0101	0.0553
Wholesale trade	0.1366	0.0599	0.0035
Retail trade	-0.1710	-0.1062	-0.1064
Restaurants, hotels	-0.1095	0.0304	0.0178
Transport	-0.0501	-0.0406	0.0003
Communication	0.0959	-0.0002	0.0150
Financing	0.1643	0.1469	0.1299
Insurance	0.2276	0.0879	0.0798
Real estate	0.0930	0.0310	-0.0232
Sanitary services	-0.2501	-0.1220	-0.1702
Social services	0.0681	0.0319	-0.0297
Recreational services	0.2010	0.2598	0.1562
Personal services	-0.1651	-0.1542	-0.0954
No. of observations	2416	2416	2416
R^2 adj.	0.1030	0.3276	0.4180
SD	0.1500	0.1022	0.0885
ASD	0.1369	0.0882	0.0734
WSD	0.1311	0.0885	0.0798
WASD	0.1247	0.0814	0.0723
F-all variables	12.09	34.62	32.54
F-industry controls		6.99	5.72

Source: Calculations based on the employment shares and industry coefficients reported in Tables C and F1-3 of the Appendix.

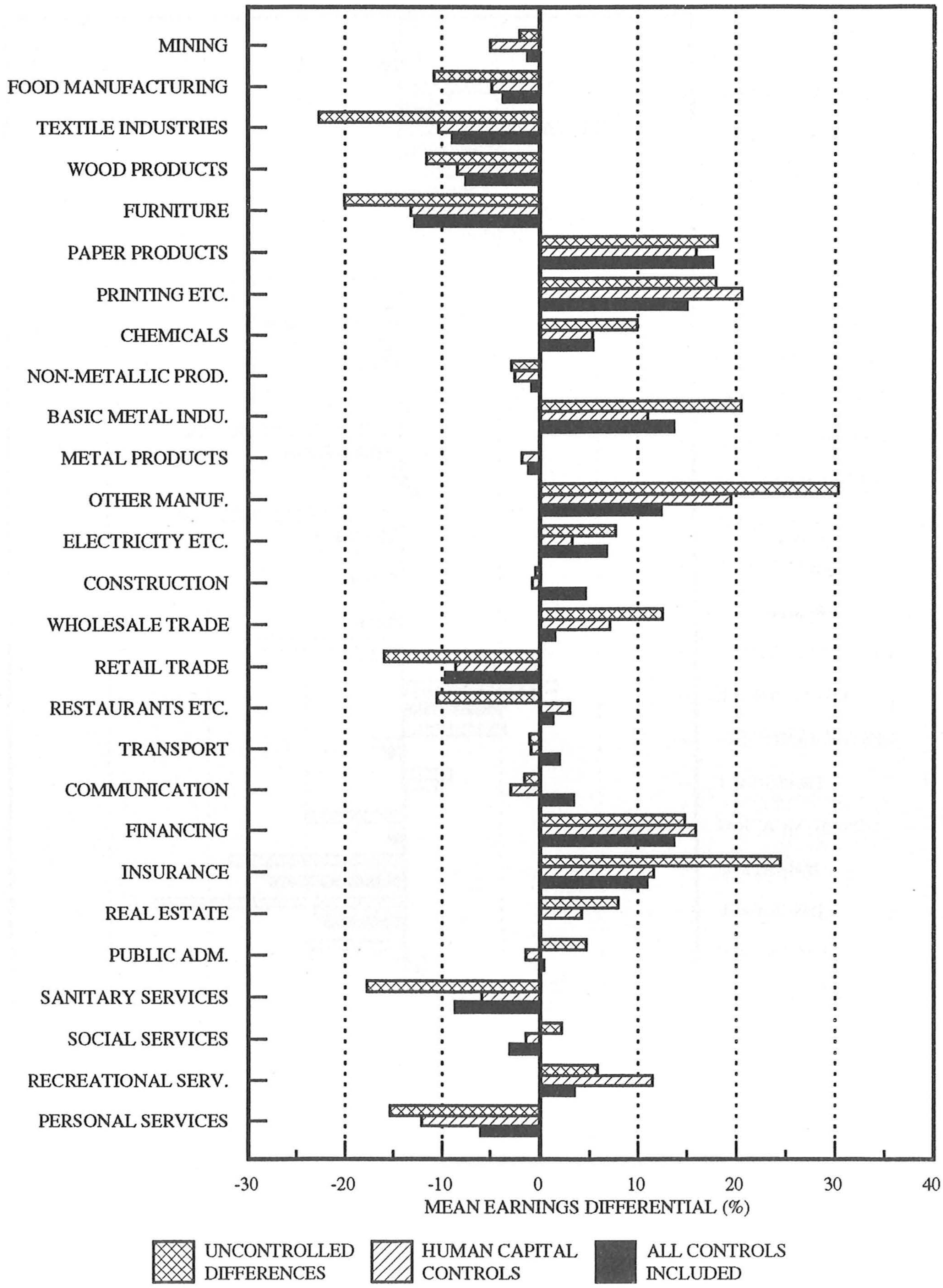
As shown in Tables 1 and 2, the (probably underestimated)[13] WASD measure drops to 0.063 in the labour market as a whole and to 0.081 in the private-sector labour market after controlling for differences in observable labour quality across industries. A notably smaller drop occurs when further controlling for a wide set of other personal and job characteristics: the WASD falls to 0.058 in the labour market as a whole and to 0.072 in the private-sector labour market. These figures are almost doubled when no differences in individual and job characteristics are accounted for in the estimations, suggesting that nearly half of the observed wage dispersion among Finnish industries is attributable to differences in worker and job characteristics. It is also worth noting that the WASDs calculated for private-sector employees are larger than for employees of both the private and the public sector throughout. Similar results are reported for Sweden by Arai (1992).

The obtained patterns of industry wage effects for the Finnish labour market as a whole and separately for the private sector stand out more clearly in Figures 1 and 2. The figures show that the overall pattern of industry wage premiums largely remains also after controlling for a wide variety of personal and job characteristics. In particular, the rank correlation between the uncontrolled (column 1) and the fully controlled (column 3) industry wage structure is 0.887 for the labour market as a whole and 0.871 for the private-sector labour market.

Another general trend is that the measured wage premiums tend to decline when more controls are added. There are, however, clear high-pay and low-pay industries even after control. Thus the hourly earnings of an average Finnish employee in manufacturing of paper products, printing and publishing industries, basic metal industries, financing, and insurance were in 1987 more than 10 per cent above the hourly earnings of an average employee in the overall labour market (Figure 1). In contrast, the hourly earnings of an average employee in the textile and wood (wood products and furniture) industries, retail trade and sanitary services were some 10 per cent or more below the hourly earnings of the average Finnish employee with identical characteristics.

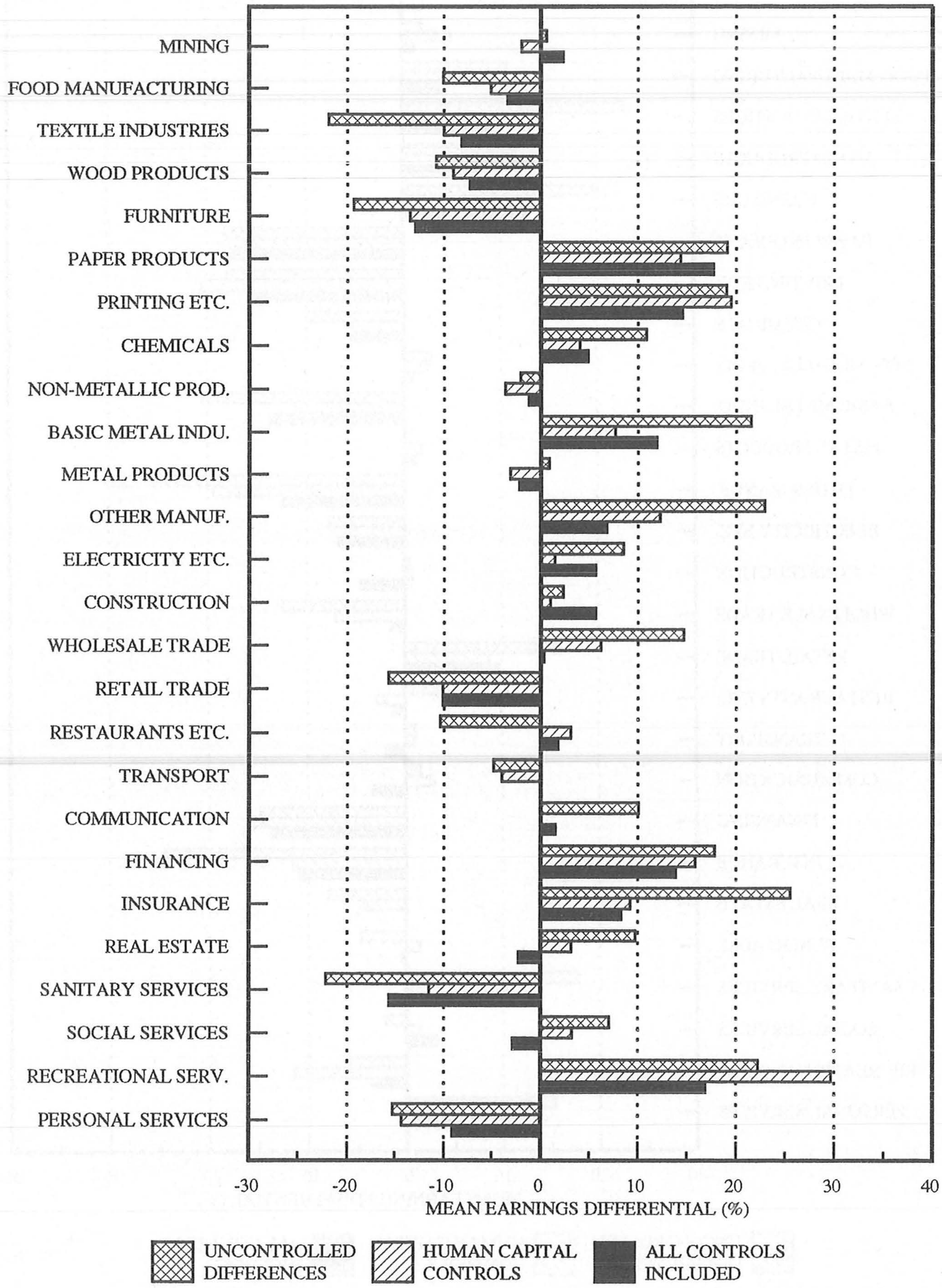
These wage premiums and dispremiums show up strongly also in the private-sector labour market for the simple reason that the public-sector employment in these industries is relatively small; the rank correlation be-

Figure 1. Estimated inter-industry wage differentials for non-agricultural employees. Employment-weighted mean wage differentials for primarily two-digit industries.



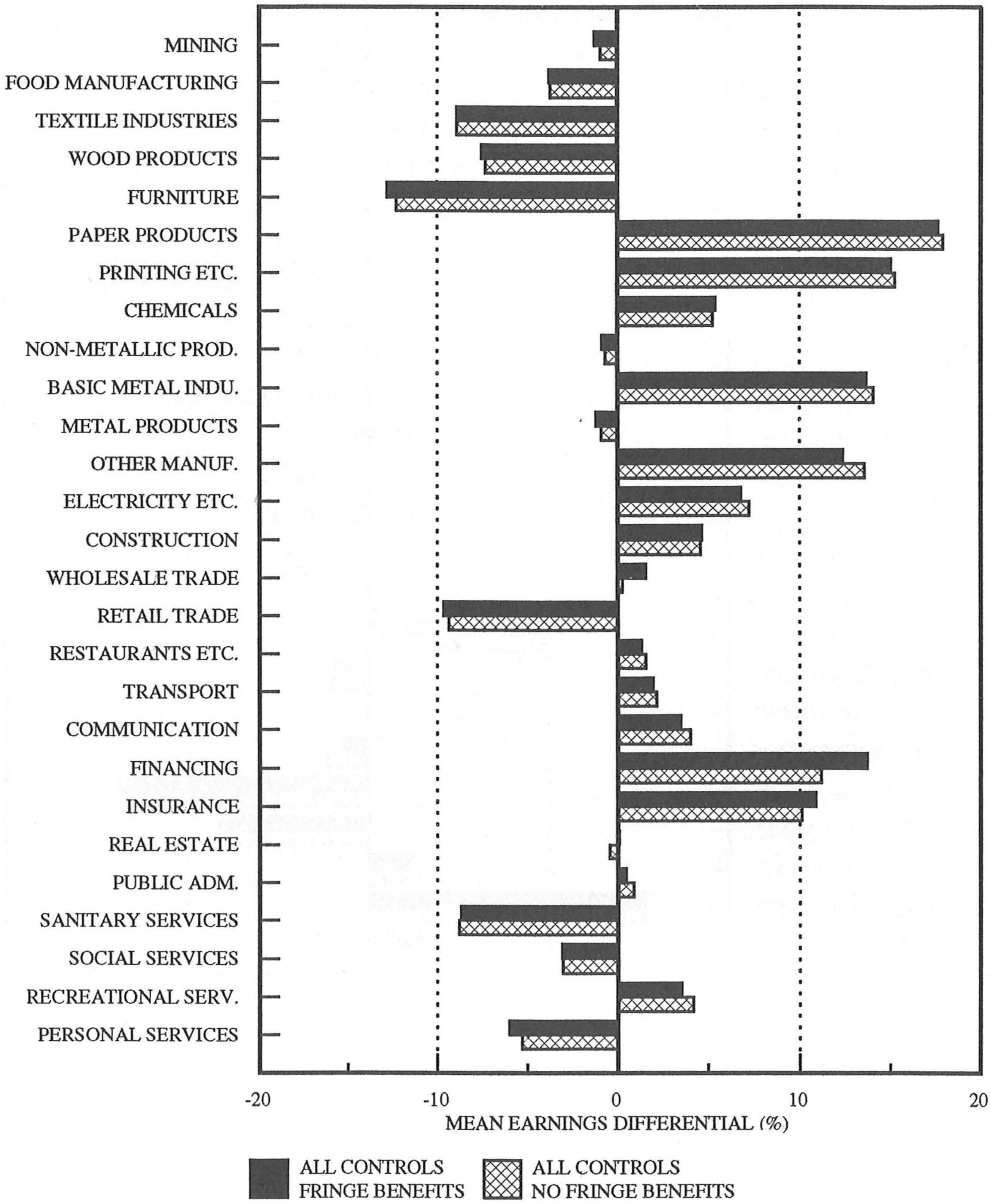
Source: Antilogs of the differentials reported in Table 1.

Figure 2. Estimated inter-industry wage differentials for non-agricultural private-sector employees. Employment-weighted mean wage differentials for primarily two-digit industries.



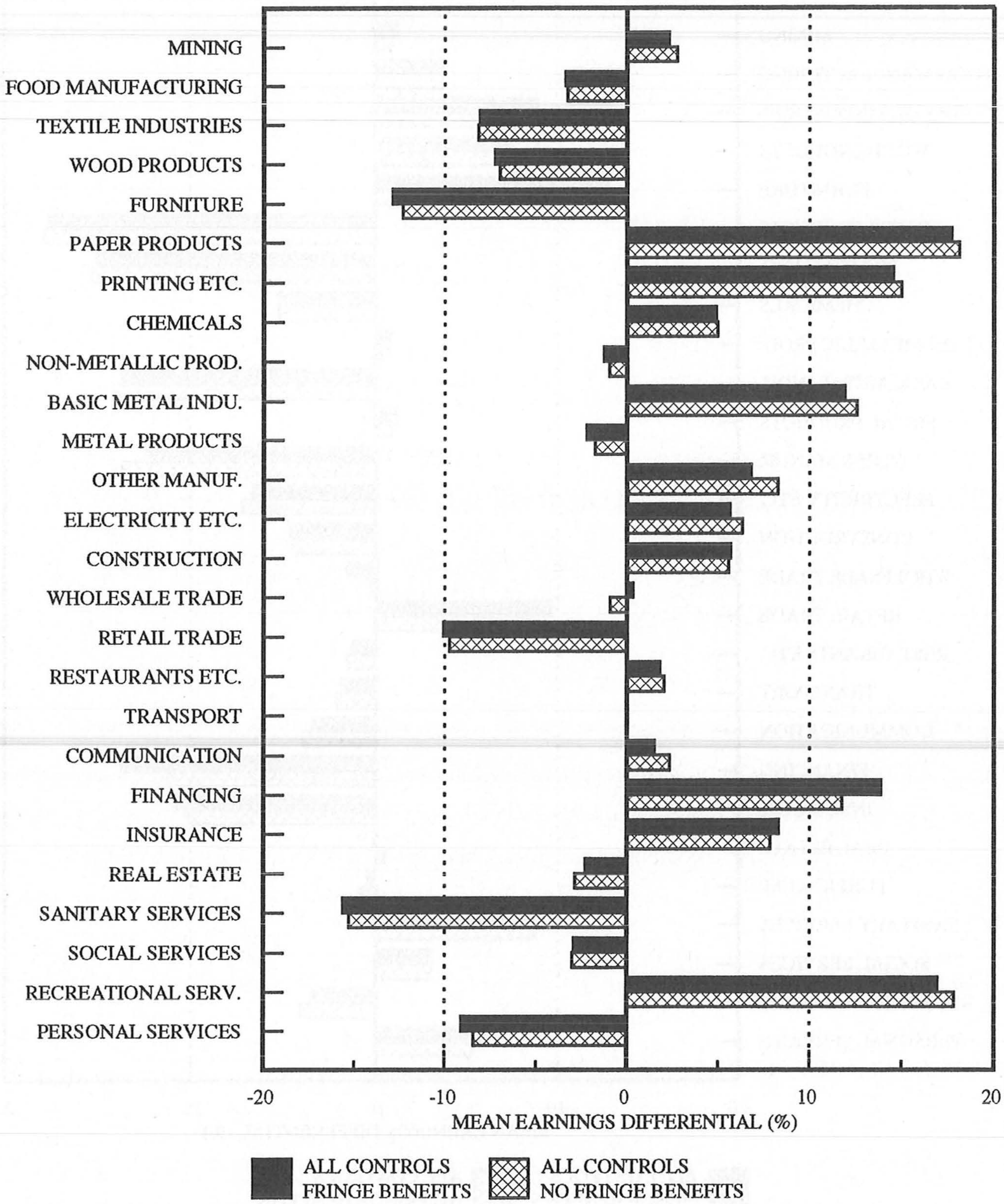
Source: Antilogs of the differentials reported in Table 2.

Figure 3. Controlled inter-industry wage differentials for non-agricultural employees, with hourly earnings including and excluding fringe benefits. Employment-weighted mean differentials for primarily two-digit industries.



Source: Antilogs of the differentials reported in Table 1 and corresponding calculations from the non-fringe estimates reported in Tables E1-3 of the Appendix.

Figure 4. Controlled inter-industry wage differentials for non-agricultural private-sector employees, with hourly earnings including and excluding fringe benefits. Employment-weighted mean differentials for primarily two-digit industries.



Source: Antilogs of the differentials reported in Table 2 and corresponding calculations from the non-fringe estimates reported in Tables G1-3 of the Appendix.

tween the whole economy and the private-sector industry wage premiums after control is 0.940.[14] There is, however, one notable difference between Figures 1 and 2, which relates to the service sector (SIC9). In particular, both the positive and the negative industry effects turn out to be much more pronounced in the private sector, especially in sanitary services and in recreational and cultural services. This possibly reflects a phenomenon similar to that observed for Sweden by Arai (1991), namely that the public sector seems to have much weaker possibilities and incentives to pay higher wages in order to increase productivity as compared to private-sector employers.

Finally it may be of interest to briefly examine the impact of fringe benefits on the measured industry wage premiums. As noted earlier, the earnings data used in the present chapter comprise most types of compensation, including the taxable value of fringe benefits as recorded in the tax rolls. In 1987, the taxable value of fringe benefits was, on average, some 80 per cent of their market value. Moreover, virtually all fringe benefits are subject to taxation, the most important exceptions being reasonable health and recreational benefits financed by the employer.

As can be seen from Figures 3 and 4, the size of the measured industry wage effects does not change much when fringe benefits are excluded from the dependent variable. The most conspicuous exception is the financing sector, for which the exclusion of fringe benefits results in a notable drop in the wage premium of the average financing employee. These minor differences in measured industry wage premiums from including and excluding fringe benefits are perhaps somewhat surprising in the sense that the progressive income tax system would be expected to create strong incentives to compensate employees with fringe benefits, at least at higher income levels. Evidence in support of this hypothesis is provided by Krueger & Summers (1988).

5.2. Empirical evidence by gender

In this subsection, the previous analysis for all employees is repeated for female and male employees in the Finnish labour market and separately for females and males employed in the private sector. A distinction by gender may be justified not least in view of the different distribution of men and women across industries (cf. Tables B and C of the Appendix). The regression results underlying the employment-weighted mean differentials reported for non-agricultural female employees in Tables 3-4 and for non-agricultural male employees in Tables 5-6 are displayed in columns 2 and 3 of Tables D1-3 and F1-3 in the Appendix.

A brief examination of the relative importance of the individuals' industry affiliation in explaining the observed respective dispersions of female and male log hourly earnings across Finnish industries indicates the following. For male employees, nearly half of the estimated coefficients for the included industry controls remain statistically significant at conventional levels, even after controlling for differences in personal and job characteristics. For women, only about one fifth of the industry coefficients remain significant after control. Nevertheless, F-tests suggest that for both genders, the null hypothesis that the investigated set of industry controls has no significant influence on hourly earnings can be rejected at a 0.0001 per cent level of significance.

Furthermore, the standard error of the regression (SEE) declines by slightly more for men (2.1 per cent in the labour market as a whole, and 2.5 per cent in the private sector) than for women (1.3 resp. 1.9 per cent) when industry indicator variables are added to the gender-specific earnings equations already controlling for differences in acquired human capital and other personal and job characteristics. For both genders, larger drops in SEE occur when the human capital variables (4.6 resp. 4.0 per cent for men, and 3.8 resp. 3.1 per cent for women) and the large set of other individual and job-related variables (8.0 resp. 7.7 per cent for men, and 8.2 resp. 6.0 per cent for women) are, by turn, introduced into the earnings equation. All in all, then, industry affiliation seems to be of relatively small importance in explaining the observed dispersion in hourly earnings among both male and female employees.

As shown in Tables 3 and 4, the weighted and adjusted standard deviation (WASD) of the measured industry wage premiums drops from 9.5 per cent to 5.0 per cent after control for all female employees, and from 12.4 per cent to 7.2 per cent after control for females in private-sector employment. The corresponding measures for men are found in Tables 5 and 6. Thus the WASD falls from 12.8 per cent to 6.0 per cent after control for all male

Table 3. Estimated inter-industry log wage differentials for non-agricultural female employees. Employment-weighted mean wage differentials for primarily two-digit industries.

Industry	Un-controlled diff.	Human capital controls	All controls
Mining	0.0545	-0.0278	-0.0178
Food manufacturing	-0.1352	-0.0713	-0.0147
Textile industries	-0.2258	-0.1444	-0.0367
Wood products	-0.0962	-0.0645	-0.0074
Furniture	-0.1788	-0.1134	-0.0704
Paper products	0.0137	0.0254	0.0969
Printing etc. industries	0.2265	0.1928	0.1475
Chemicals	-0.0117	-0.0423	0.0130
Non-metallic products	-0.1810	-0.1355	-0.0261
Basic metal industries	-0.0401	-0.0033	0.0221
Metal products	-0.1453	-0.0863	-0.0034
Other manufacturing	0.4531	0.3688	0.2620
Electricity etc.	-0.1280	-0.0841	-0.0418
Construction	-0.0550	-0.0005	0.0305
Wholesale trade	0.0446	0.0318	0.0184
Retail trade	-0.1444	-0.0901	-0.1357
Restaurants, hotels	-0.0433	0.0305	0.0180
Transport	0.0661	0.0840	0.0618
Communication	-0.0160	-0.0095	0.0537
Financing	0.1445	0.1395	0.1383
Insurance	0.1148	0.0947	0.0896
Real estate	0.0095	0.0134	0.0036
Public administration	0.0221	-0.0029	0.0290
Sanitary services	-0.1209	-0.0163	-0.0011
Social services	0.0535	0.0057	-0.0173
Recreational services	0.1707	0.1454	0.0544
Personal services	-0.0845	-0.0039	-0.0004
No. of observations	1949	1949	1949
R^2 adj.	0.0703	0.2416	0.3588
SD	0.1444	0.1088	0.0788
ASD	0.1157	0.0874	0.0503
WSD	0.1060	0.0736	0.0649
WASD	0.0950	0.0596	0.0502
F-all variables	6.67	18.73	20.82
F-industry controls		3.69	2.88

Source: Calculations based on the employment shares and industry coefficients reported in Tables B and D1-3 of the Appendix.

Table 4. Estimated inter-industry log wage differentials for non-agricultural private-sector female employees. Employment-weighted mean wage differentials for primarily two-digit industries.

Industry	Un-controlled diff.	Human capital controls	All controls
Mining	0.0912	-0.0002	-0.0150
Food manufacturing	-0.0986	-0.0604	-0.0102
Textile industries	-0.1874	-0.1360	-0.0480
Wood products	-0.0595	-0.0514	0.0061
Furniture	-0.1421	-0.1007	-0.0643
Paper products	0.0504	0.0382	0.1018
Printing	0.2632	0.2059	0.1599
Chemicals	0.0250	-0.0247	0.0197
Non-metallic products	-0.1444	-0.1232	-0.0232
Basic metal industries	-0.0034	0.0246	0.0360
Metal products	-0.1087	-0.0907	-0.0171
Other manufacturing	0.1083	0.1136	0.0826
Electricity etc.	-0.1631	-0.1292	-0.0444
Construction	0.0190	0.0291	0.0491
Wholesale trade	0.0788	0.0223	-0.0066
Retail trade	-0.1175	-0.0999	-0.1233
Restaurants, hotels	-0.0191	0.0310	0.0198
Transport	0.0689	0.0403	0.0181
Communication	-0.0882	-0.0971	-0.0457
Financing	0.1973	0.1590	0.1664
Insurance	0.1515	0.0947	0.0831
Real estate	0.0399	0.0034	-0.0229
Sanitary services	-0.1674	-0.1045	-0.1192
Social services	0.1369	0.1048	-0.0000
Recreational services	0.3014	0.3030	0.1674
Personal services	-0.0478	-0.0167	-0.0308
No. of observations	1076	1076	1076
R^2 adj.	0.1190	0.2064	0.2963
SD	0.1326	0.1082	0.0767
ASD	0.1054	0.0796	0.0304
WSD	0.1356	0.1079	0.0879
WASD	0.1236	0.0945	0.0724
F-all variables	6.81	9.22	9.38
F-industry controls		4.33	2.58

Source: Calculations based on the employment shares and industry coefficients reported in Tables C and F1-3 of the Appendix.

Table 5. Estimated inter-industry log wage differentials for non-agricultural male employees. Employment-weighted mean wage differentials for primarily two-digit industries.

Industry	Un-controlled diff.	Human capital controls	All controls
Mining	-0.1134	-0.0452	-0.0333
Food manufacturing	-0.0724	-0.0302	-0.0266
Textile industries	-0.0688	-0.0015	-0.0014
Wood products	-0.1988	-0.0865	-0.1109
Furniture	-0.2802	-0.1763	-0.1756
Paper products	0.1616	0.1852	0.1893
Printing etc. industries	0.0941	0.1941	0.1258
Chemicals	0.0754	0.0830	0.0668
Non-metallic products	-0.0775	-0.0038	-0.0192
Basic metal industries	0.1246	0.0814	0.1016
Metal products	-0.0220	-0.0030	-0.0328
Other manufacturing	0.1303	0.1404	0.0818
Electricity etc.	0.0546	0.0414	0.0479
Construction	-0.0926	-0.0016	0.0306
Wholesale trade	0.1282	0.0885	-0.0096
Retail trade	-0.1648	-0.1049	-0.0658
Restaurants, hotels	-0.0930	-0.0079	-0.0485
Transport	-0.1076	-0.0385	0.0090
Communication	-0.0495	-0.0524	0.0223
Financing	0.4635	0.2450	0.1568
Insurance	0.3420	0.1254	0.1475
Real estate	0.1312	0.0648	0.0032
Public administration	0.0942	-0.0300	-0.0198
Sanitary services	-0.2504	-0.2001	-0.3010
Social services	0.1753	-0.0596	-0.0515
Recreational services	-0.0894	0.0004	-0.0464
Personal services	-0.2647	-0.1865	-0.1257
No. of observations	1799	1799	1799
R^2 adj.	0.1149	0.3754	0.4716
SD	0.1751	0.1107	0.1033
SD	0.1606	0.0922	0.0851
WSD	0.1360	0.0830	0.0709
WASD	0.1283	0.0734	0.0597
F-all variables	9.97	31.87	30.17
F-industry controls		5.21	3.99

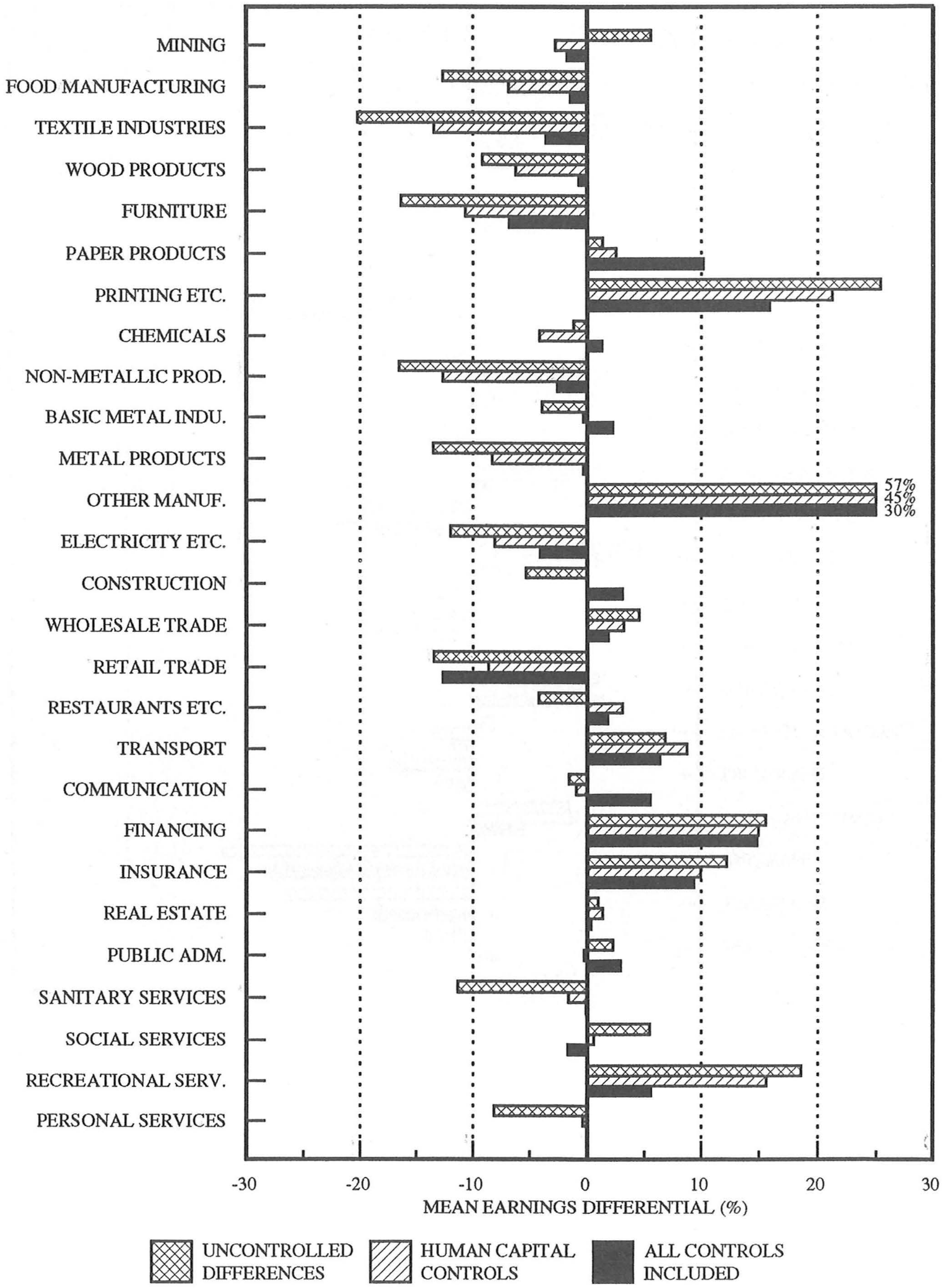
Source: Calculations based on the employment shares and industry coefficients reported in Tables B and D1-3 of the Appendix.

Table 6. Estimated inter-industry log wage differentials for non-agricultural private-sector male employees. Employment-weighted mean wage differentials for primarily two-digit industries.

Industry	Un-controlled diff.	Human capital controls	All controls
Mining	-0.0678	0.0188	0.0192
Food manufacturing	-0.0595	-0.0501	-0.0345
Textile industries	-0.0560	-0.0218	-0.0054
Wood products	-0.1859	-0.1034	-0.1168
Furniture	-0.2673	-0.1944	-0.1892
Paper products	0.1745	0.1632	0.1818
Printing	0.1070	0.1737	0.1178
Chemicals	0.0883	0.0613	0.0561
Non-metallic products	-0.0646	-0.0223	-0.0250
Basic metal industries	0.1375	0.0561	0.0924
Metal products	-0.0085	-0.0224	-0.0419
Other manufacturing	0.1432	0.1205	0.0782
Electricity etc.	0.0898	0.0323	0.0385
Construction	-0.0614	0.0215	0.0469
Wholesale trade	0.1598	0.0805	-0.0104
Retail trade	-0.1519	-0.1266	-0.0818
Restaurants, hotels	-0.0545	0.0089	-0.0388
Transport	-0.1475	-0.0561	0.0232
Communication	0.0911	-0.0009	0.0261
Financing	0.4766	0.2034	0.1001
Insurance	0.3549	0.0895	0.1211
Real estate	0.1606	0.0634	-0.0072
Sanitary services	-0.2435	-0.2093	-0.2993
Social services	0.0920	-0.1370	-0.1184
Recreational services	0.1485	0.1417	0.0885
Personal services	-0.2614	-0.2181	-0.1504
No. of observations	1340	1340	1340
R^2 adj.	0.1158	0.3399	0.4377
SD	0.1799	0.1147	0.1056
ASD	0.1593	0.0891	0.0783
WSD	0.1399	0.0938	0.0814
WASD	0.1304	0.0827	0.0684
F-all variables	8.01	21.28	20.30
F-industry controls		4.72	3.67

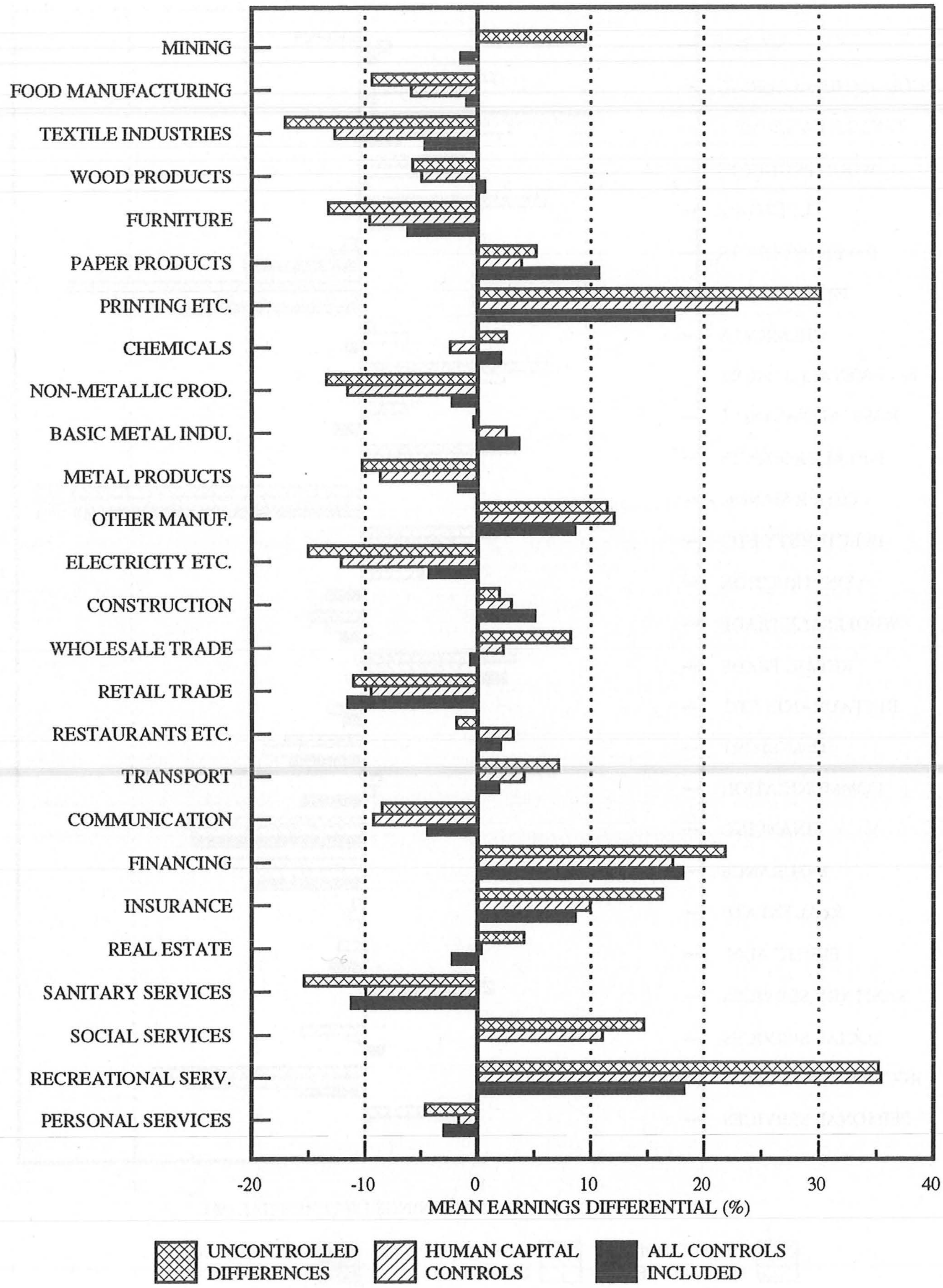
Source: Calculations based on the employment shares and industry coefficients reported in Tables C and F1-3 of the Appendix.

Figure 5. Estimated inter-industry wage differentials for non-agricultural female employees. Employment-weighted mean wage differentials for primarily two-digit industries.



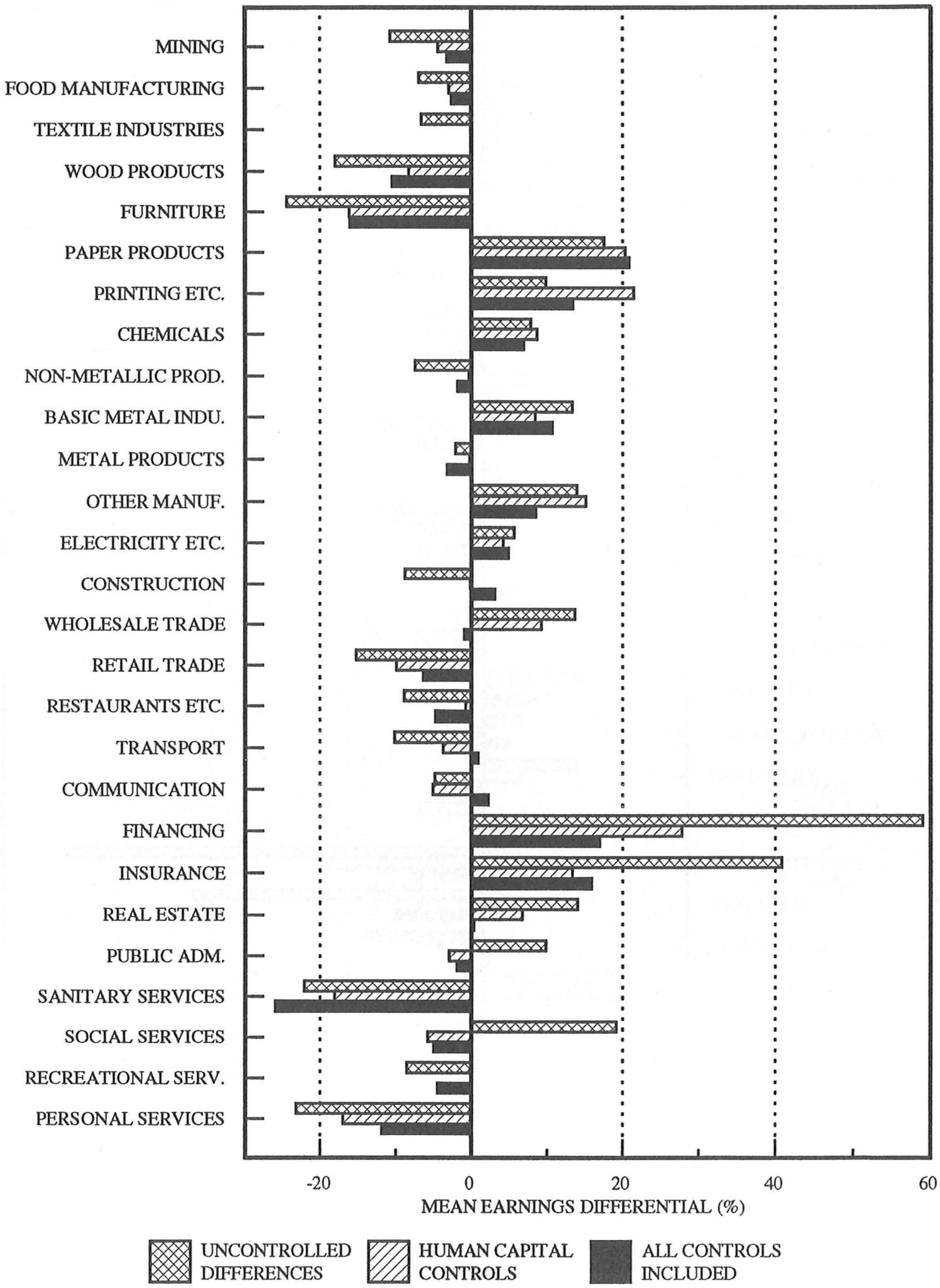
Source: Antilogs of the differentials reported in Table 3.

Figure 6. Estimated inter-industry wage differentials for non-agricultural private-sector female employees. Employment-weighted mean wage differentials for primarily two-digit industries.



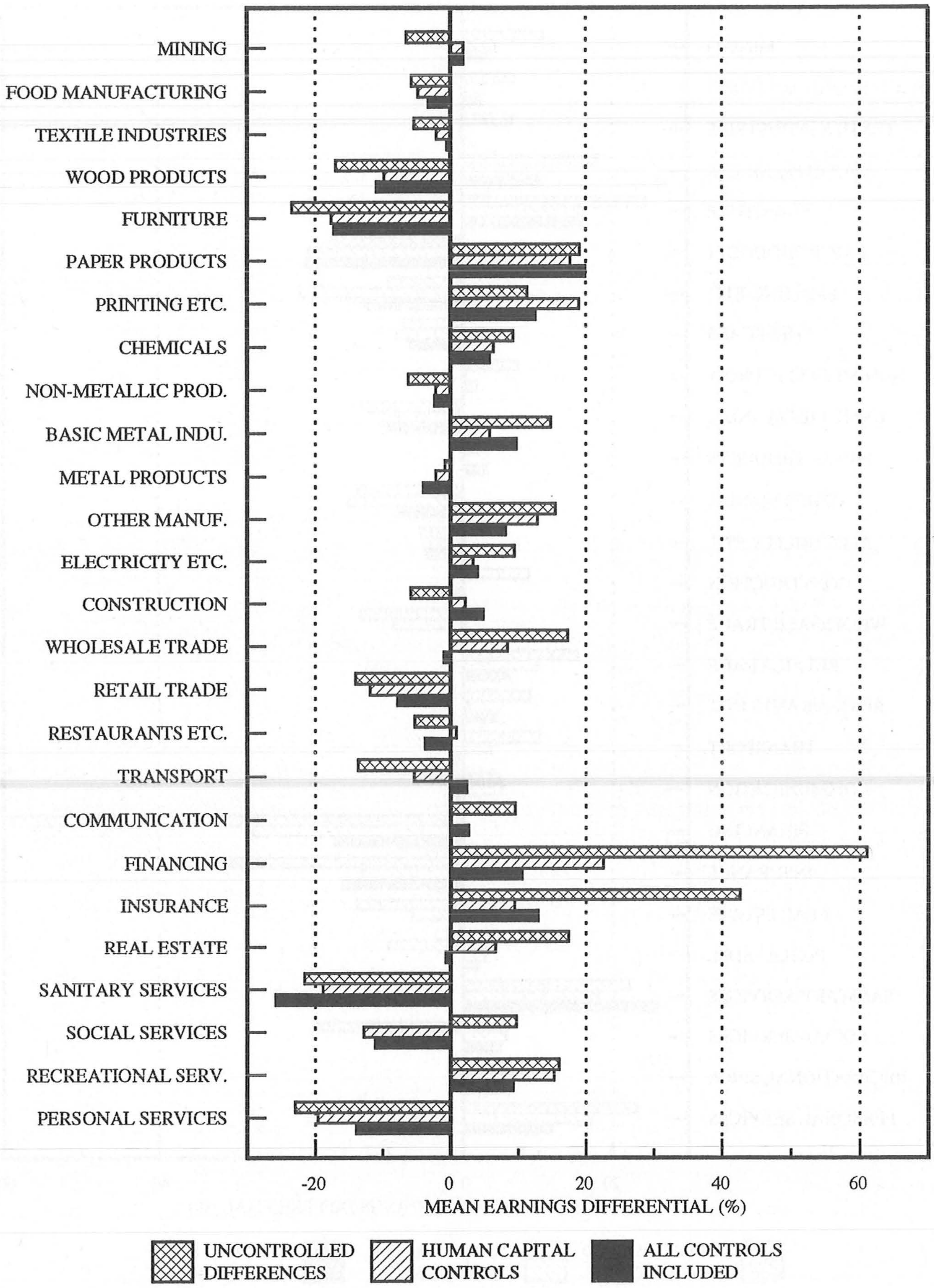
Source: Antilogs of the differentials reported in Table 4.

Figure 7. Estimated inter-industry wage differentials for non-agricultural male employees. Employment-weighted mean wage differentials for primarily two-digit industries.



Source: Antilogs of the differentials reported in Table 5.

Figure 8. Estimated inter-industry wage differentials for non-agricultural private-sector male employees. Employment-weighted mean wage differentials for primarily two-digit industries.



Source: Antilogs of the differentials reported in Table 6.

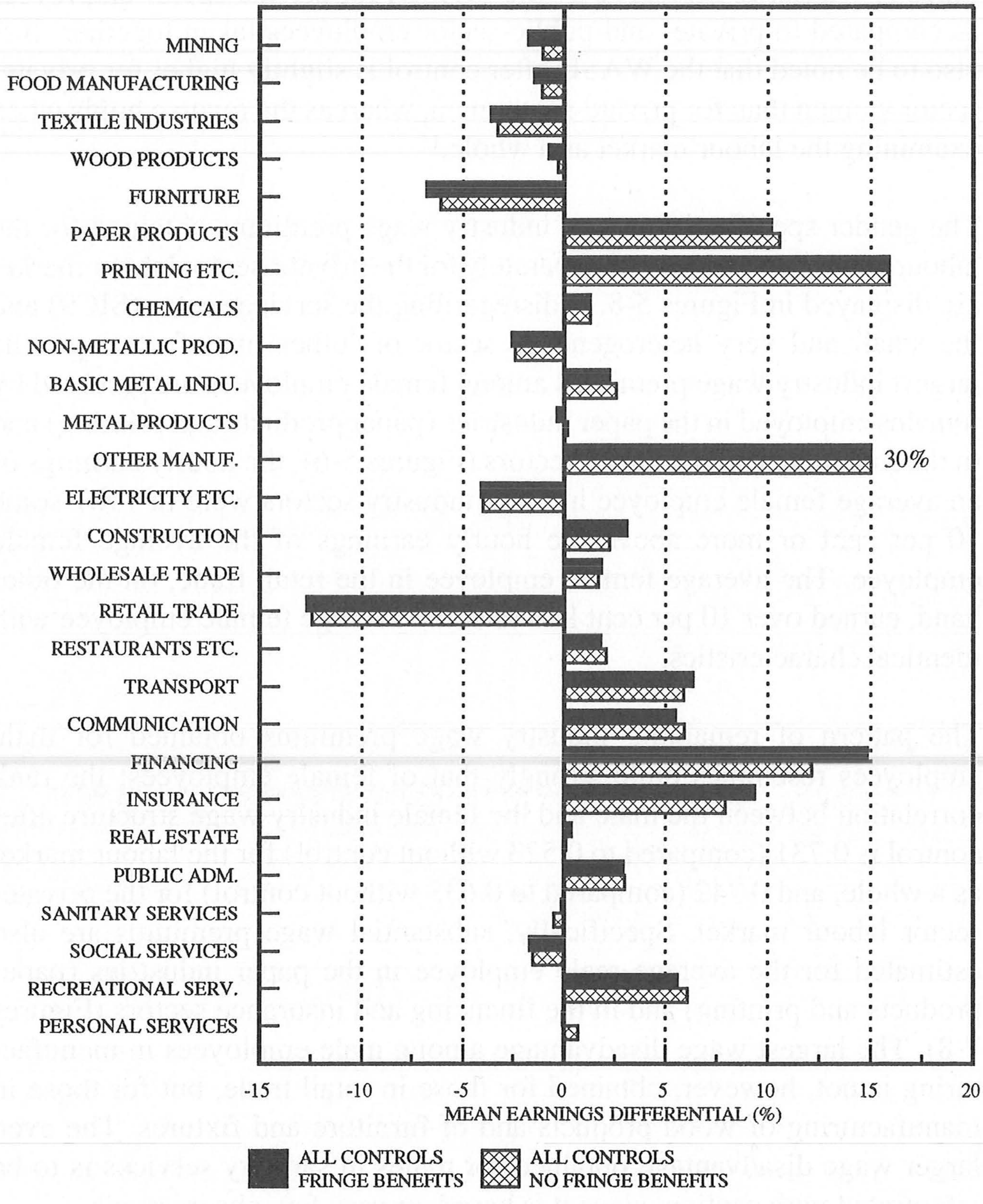
employees, and from 13.0 per cent to 6.8 per cent after control for males employed in the private sector. For both genders, controlling for differences in observable labour quality causes a major part of the decline in the WASD measure. Another similarity across genders is the larger variability in industry wages, as measured by the WASD, for private-sector employees as compared to private- and public-sector employees taken together. It is also to be noted that the WASD after control is slightly higher for private-sector women than for private-sector men, whereas the reverse holds when examining the labour market as a whole.[15]

The gender-specific patterns of industry wage premiums obtained for the labour market as a whole and separately for the private-sector labour market are displayed in Figures 5-8. If disregarding the service sector (SIC9) and the small and very heterogeneous sector of 'other manufacturing', the largest industry wage premiums among female employees are received by females employed in the paper industries (paper products and printing) and in the financing and insurance sectors (Figures 5-6); the hourly earnings of an average female employee in these industry sectors were in 1987 some 10 per cent or more above the hourly earnings of the average female employee. The average female employee in the retail trade, on the other hand, earned over 10 per cent less than the average female employee with identical characteristics.

The pattern of remaining industry wage premiums obtained for male employees resembles quite strongly that of female employees; the rank correlation between the male and the female industry wage structure after control is 0.731 (compared to 0.523 without control) for the labour market as a whole, and 0.742 (compared to 0.633 without control) for the private-sector labour market. Specifically, substantial wage premiums are also estimated for the average male employee in the paper industries (paper products and printing) and in the financing and insurance sectors (Figures 7-8). The largest wage disadvantage among male employees in manufacturing is not, however, obtained for those in retail trade, but for those in manufacturing of wood products and of furniture and fixtures. The even larger wage disadvantage obtained for males in sanitary services is to be interpreted with caution, since it is based on very few observations.

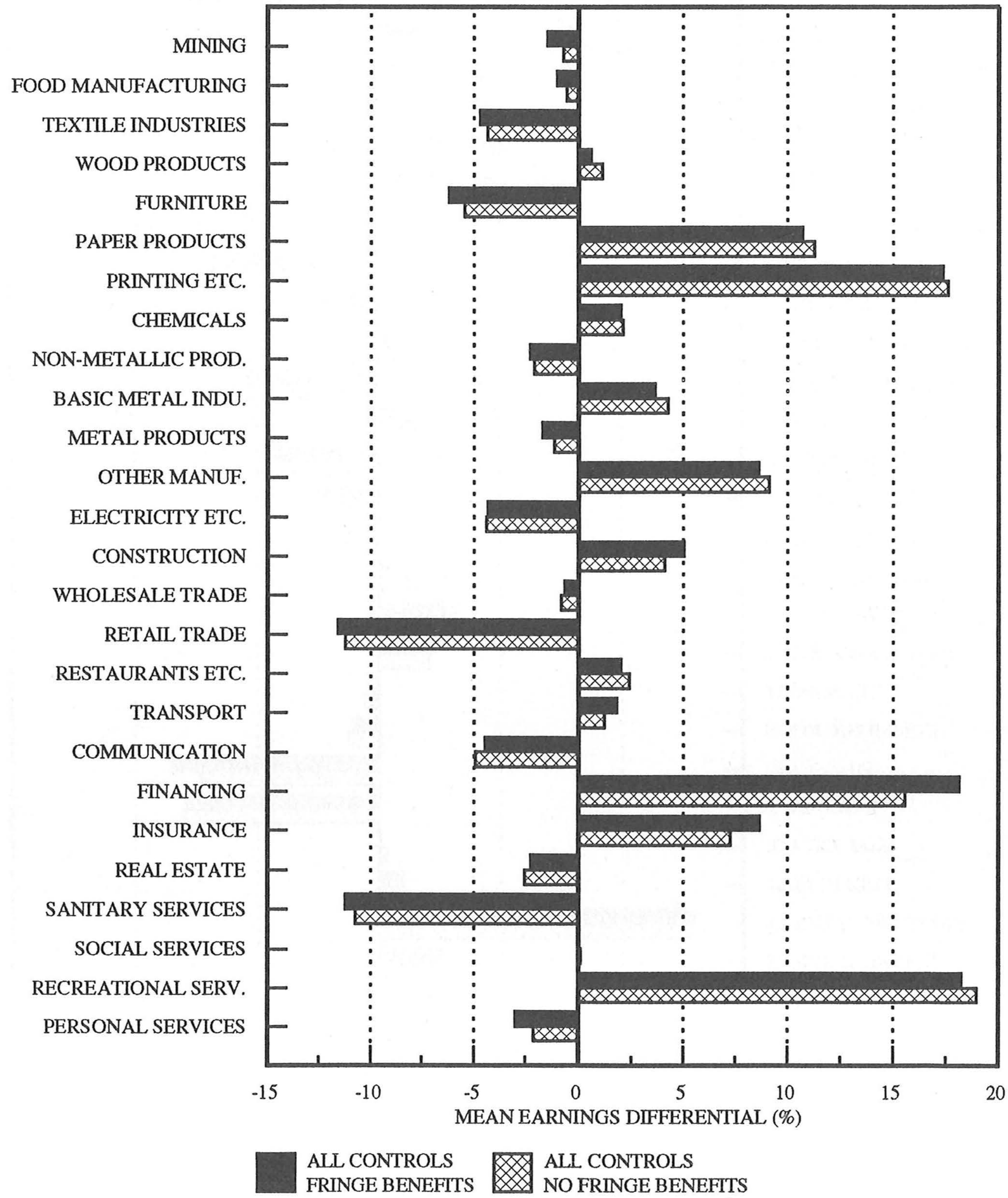
Figures 9-12, finally, show that the exclusion of fringe benefits from the analysis affects the gender-specific industry wage structures only margi-

Figure 9. Controlled inter-industry wage differentials for non-agricultural female employees, with hourly earnings including and excluding fringe benefits. Employment-weighted mean differentials for primarily two-digit industries.



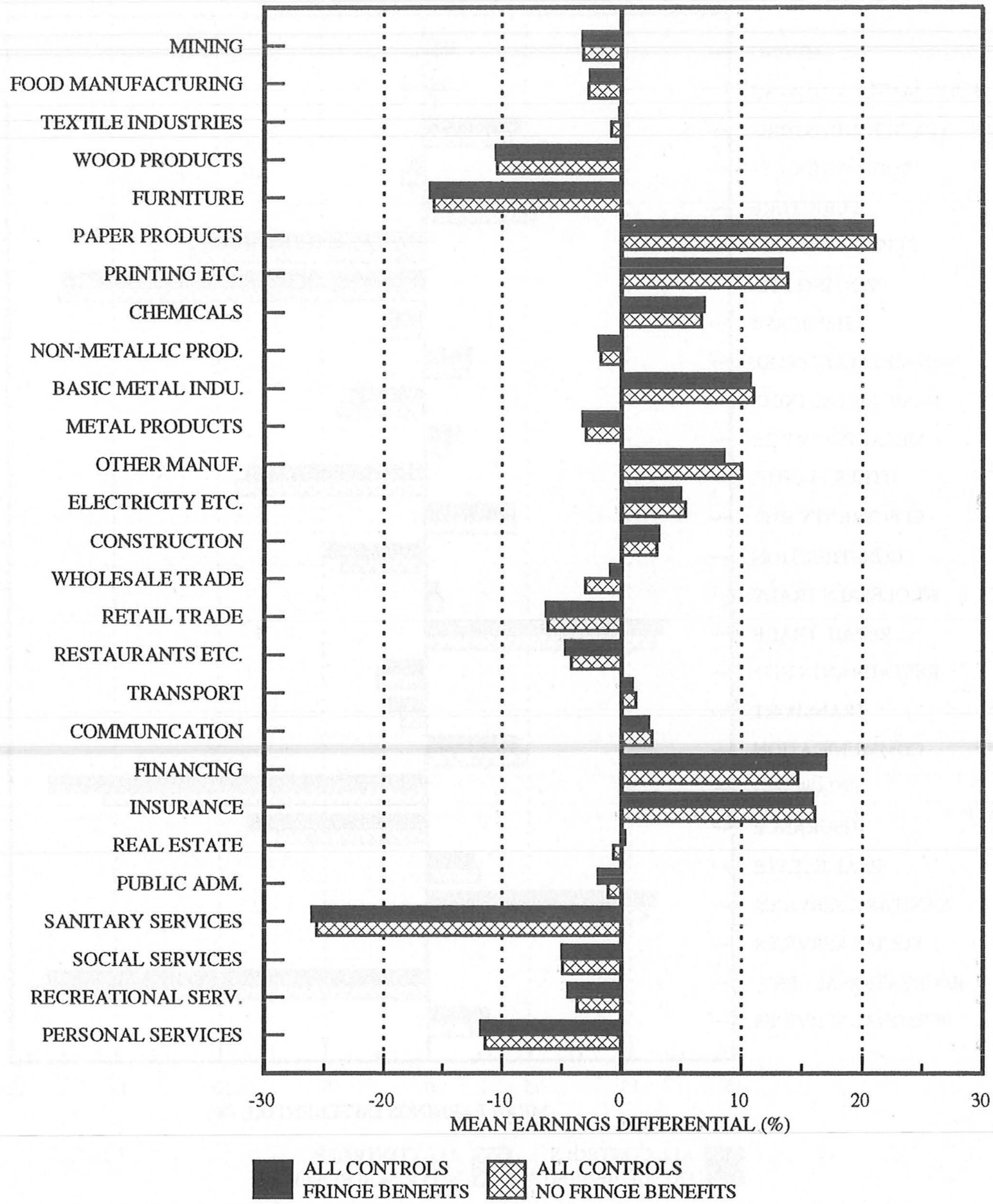
Source: Antilogs of the differentials reported in Table 3 and corresponding calculations from the non-fringe estimates reported in Tables E1-3 of the Appendix.

Figure 10. Controlled inter-industry wage differentials for non-agricultural private-sector female employees, with hourly earnings including and excluding fringe benefits. Employment-weighted mean differentials for primarily two-digit industries.



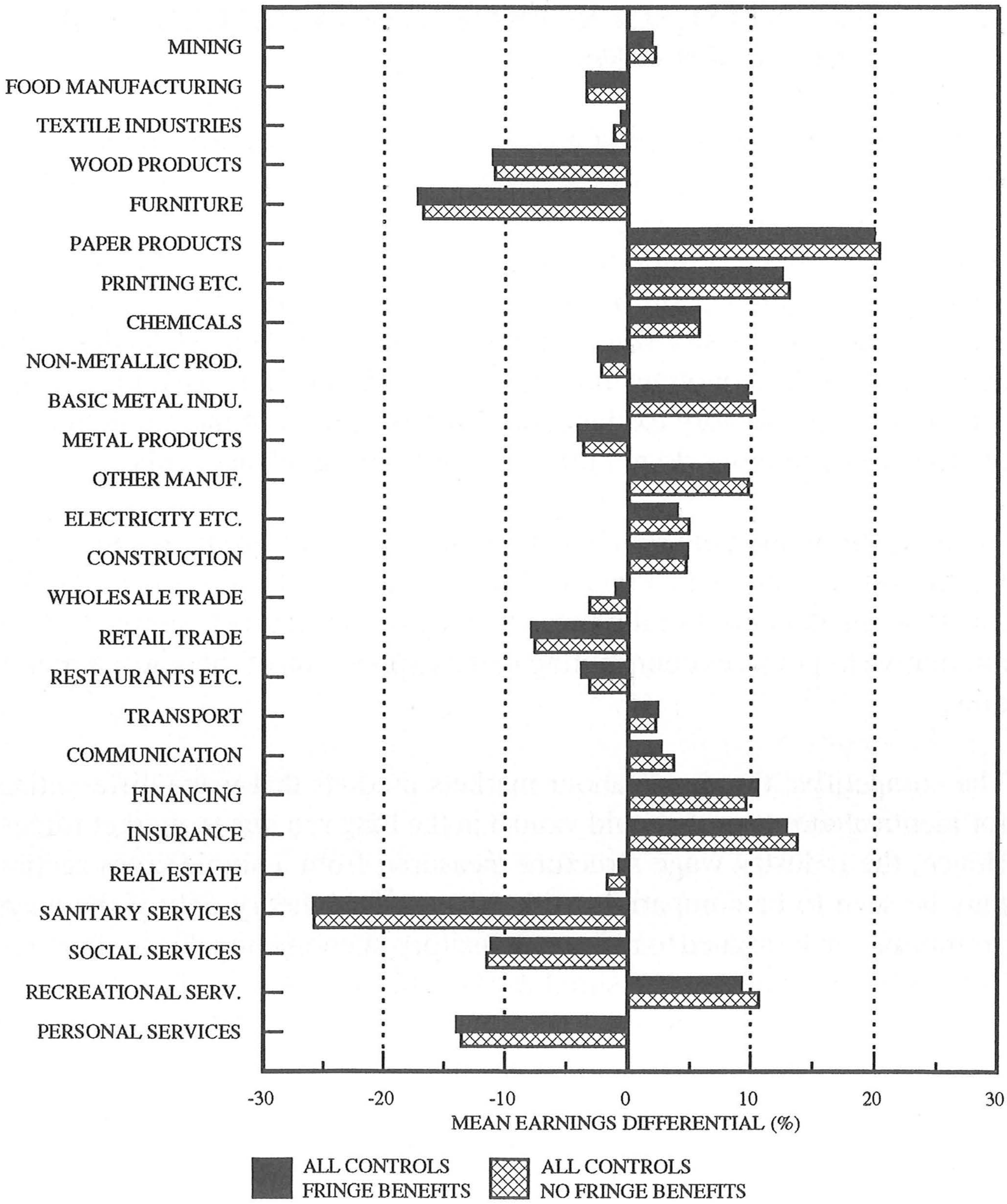
Source: Antilogs of the differentials reported in Table 4 and corresponding calculations from the non-fringe estimates reported in Tables G1-3 of the Appendix.

Figure 11. Controlled inter-industry wage differentials for non-agricultural male employees, with hourly earnings including and excluding fringe benefits. Employment-weighted mean differentials for primarily two-digit industries.



Source: Antilogs of the differentials reported in Table 5 and corresponding calculations from the non-fringe estimates reported in Tables E1-3 of the Appendix.

Figure 12. Controlled inter-industry wage differentials for non-agricultural private-sector male employees, with hourly earnings including and excluding fringe benefits. Employment-weighted mean differentials for primarily two-digit industries.



Source: Antilogs of the differentials reported in Table 6 and corresponding calculations from the non-fringe estimates reported in Tables G1-3 of the Appendix.

nally. Again the most conspicuous difference occurs for the financing sector, especially among female employees.

6. POTENTIAL SOURCES OF ESTIMATED INDUSTRY WAGE PREMIUMS

The empirical evidence presented in the previous section suggests that substantial industry wage differentials remain also after controlling for a broad set of personal and job characteristics. Indeed, these background factors succeed in explaining only about half or less of the observed dispersion in hourly earnings across Finnish industries. How then is the other half of the industry wage differentials to be explained? As discussed in Section 3, the economics literature has so far failed to give these wage premiums a satisfactory explanation. Empirical tests of the predictions of alternative hypotheses do not provide conclusive evidence, either.

In this section, potential sources of the industry wage premiums measured for the private sector in Finland (Table 2) are briefly discussed. Unfortunately, the data used in the present study allow, at most, simple tests of alternative hypotheses contributing to the explanation of these wage premiums.

The competitive theory of labour markets predicts that wage differentials for identical employees should vanish in the long run due to market forces. Hence, the industry wage structure measured from a single cross section may be seen to be compatible with this standard theory only if the wage premiums can be argued to reflect a transitory phenomenon due to short-run immobility of labour, unmeasured worker ability, and/or unobserved working conditions. These potential explanations cannot be ruled out based on the available data. Comparison with other studies suggests, however, that they can hardly offer a full explanation of the remaining industry-related wage differentials. As noted earlier, the empirical findings of Vainiomäki & Laaksonen (1992) obtained from Finnish population census data indicate that the private-sector industry wage structure has remained fairly stable over the period 1975-85, and that only part of the measured industry wage effects seems to reflect unobserved worker quality.

Moreover, if high-ability employees were systematically allocated into high-pay industries, then the addition of labour quality variables to the earnings equation should substantially reduce observed industry wage effects. As can be seen from Table 2, the introduction of proxy measures of human capital (educational attainment, total work experience, seniority, participation in on-the-job training programmes) results in a reduction in the weighted and adjusted standard deviation (WASD) of industry wage differentials by one third only. If it is assumed, as in Krueger & Summers (1988), that unmeasured labour quality is correlated with measured quality and that the variation in measured labour quality is much more important than the variation in unmeasured labour quality, then it may be concluded that differences in unobserved worker ability can offer only part of an explanation to the remaining industry wage premiums. In view of the broad set of job-related characteristics controlled for in the estimations, the same conclusion can probably be drawn with respect to the influence of unobservable working conditions.

The next question to ask then is whether the inter-industry wage structure is attributable to specific characteristics of industries, not least in an organizational and technological sense, as predicted by non-market clearing theories. The problem, however, is that the estimated wage effects of industry characteristics are generally consistent with the predictions of more than one labour market model. Neglecting the underlying theoretical reasoning, existing evidence points to a fairly strong relationship between the level of compensation and the following four industry characteristics: firm size, profits and monopoly power, capital intensity, and union density (Thaler, 1989).

Empirical findings suggest that large firms tend to pay higher wages than small firms. This positive effect of firm size on wages has been found to remain also after controlling for various worker and job characteristics (e.g. Brown & Medoff (1989) and Schmidt & Zimmermann (1991)). Accordingly, industries may show up as high-pay industries because they have large average firm/plant sizes (cf. Arai, 1992).

Empirical evidence on the correlation between capital intensity and industry wage rates indicates that industries with high capital-labour ratios tend to pay higher wages (e.g. Slichter (1950), Lawrence & Lawrence (1985), Dickens & Katz (1987)). These findings can be interpreted as suggesting that high-pay industries try to substitute capital for expensive labour or, alternatively, that highly capital-intensive industries use technologies which induce them to pay more (e.g. because of complementarity between capital and skills not captured by the human capital variables included in the earnings equation).[16] Results for Finland (Vainiomäki & Laaksonen, 1992) and Sweden (Arai, 1992) point to no significant influence of the capital-labour ratio on the industry wage structure.

Finally, the percentage of the employees in an industry who are unionized (i.e. the union density) has typically been found to increase wages in the industry.

Of these industry characteristics, the labour force survey data used in the present study can only provide information on the unionization rate within each industry. The average firm/plant size of each industry is not known, while information on profitability and capital intensity by industry can be calculated from National Accounts data. Other industry characteristics which have been frequently used when trying to explain measured industry wage premiums are: average years of schooling, average years of experience, fraction of females, and fraction of manual workers. These industry-specific means of individual characteristics are available from the survey data.

A simple attempt is made using this limited information to explain the log industry wage differentials measured for the Finnish private-sector labour market (column 3 of Table 2). Regression of industry wage premiums on industry characteristics is generally coupled, however, with problems of highly correlated explanatory variables (cf. Table I of the Appendix). Hence, it is easy to obtain a relatively high explanatory power in terms of R^2 but often at the expense of "wrong-signed" coefficients. The estimation results displayed in Table 7 show that the different combinations of a selected set of less correlated explanatory variables can explain only a small part of the overall variation in the private-sector industry wage structure. A statistically significant coefficient is obtained for two variables only, namely the average number of years of schooling and the union density of the different industries.

Table 7. Regression of log industry wage premiums after control measured for Finnish private-sector employees (column 3 of Table 2) on different combinations of selected industry-specific characteristics[1]

Variable	Equation (1)	(2)	(3)	(4)
Constant	-0.3216 (.2007)	-0.2921 (.2151)	-0.0560 (.2765)	0.0774 (.2595)
Average years of above-primary schooling	0.0851* (.0435)	0.0824* (.0448)	0.0215 (.0637)	-0.0268 (.0624)
Average years of experience	0.0034 (.0106)	0.0030 (.0108)	-0.00002 (.0109)	-0.0087 (.0108)
Capital-labour ratio[2]	11.2076 (39.5156)	9.4308 (40.5211)	17.4194 (40.2056)	
Productivity[2]				0.0013* (.0006)
Profitability[2]	-0.2049 (.2895)	-0.1713 (.3048)	-0.1611 (.2991)	-0.3209 (.2776)
Average union density	0.2176* (.1158)	0.2080* (.1201)	0.2159* (.1180)	0.1803 (.1074)
Average share of females		-0.0377 (.0839)	-0.0739 (.0867)	-0.0467 (.0801)
Average share of manual workers			-0.1424 (.1078)	-0.1535 (.0973)
R^2	0.2801	0.2877	0.3506	0.4631
R^2 adj.	0.1001	0.0627	0.0981	0.2543
F-value	1.56	1.28	1.39	2.22
No. of obs.	26	26	26	26

1 Standard errors are given in parentheses. The variables are industry-specific means calculated from the labour force survey data used in the present study, if not otherwise indicated. Variable means and correlations are reported in, respectively, Table H and Table I of the Appendix.

2 Variable calculated from National Accounts data. The capital-labour ratio is defined as the ratio of the gross fixed capital stock to hours worked, productivity as the ratio of real value added to hours worked, and profitability as the ratio of net operating profit to gross output.

* Denotes significant estimate at a 5 % level.

A positive effect of schooling, even after having eliminated individual returns on education in the earnings regression, has also been obtained by e.g. Dickens & Katz (1987), Arai (1992) and Winter-Ebmer (1992). Moreover, Winter-Ebmer (1992) interprets this evidence as supporting Lucas' (1988) model of endogenous growth, according to which human capital investments of an individual have external effects upon his or her co-workers, thereby boosting overall productivity. The effect of schooling becomes insignificant, however, when a variable measuring the share of manual workers in each industry is added to the equation. This can be ascribed to the high correlation between the two variables. The inclusion of both variables also probably explains the insignificant effect of schooling on the industry wage premiums of the Finnish private sector obtained by Vainiomäki & Laaksonen (1992).

The positive effect of union density indicates that industries with a higher unionization rate tend to pay higher wages. The other industry characteristics listed in Table 7 seem to have no significant influence on industry wages, except for productivity (column 4). Nonetheless, also the productivity variable is highly correlated with the schooling variable, suggesting that its coefficient should be interpreted with caution.

7. CONCLUDING REMARKS

The main purpose of the present chapter has been to contribute to the limited knowledge of wage differentials across Finnish industries based on individual data. The analysis has been undertaken for all employees and separately for female and male employees. A distinction has also been made between the labour market as a whole and the private-sector labour market.

The empirical results indicate that substantial industry-related wage differentials remain even after controlling for a broad set of personal and job characteristics. Indeed, F-tests suggest that the null hypothesis that the earnings effect of the industry indicator variables is jointly equal to zero is clearly rejected for all employee categories under study. But simultaneously the estimation results indicate that worker and job characteristics explain relatively more of the observed industry wage structure than does the individuals' industry affiliation. This holds for both genders.

The measured wage premiums across industries tend to decline when more labour force characteristics are controlled for in the estimations. Nevertheless, the overall pattern of inter-industry wage premiums largely remains; the rank correlation between the uncontrolled and the controlled wage premiums in the labour market as a whole is 0.739 for female employees and 0.736 for male employees. In the private-sector labour market the corresponding rank correlation for female employees is 0.821 and that for male employees is 0.734. In other words, the uncontrolled industry wage differentials provide a relatively good prediction of the pattern of industry wage premiums that emerges after controlling for a wide variety of relevant individual and job characteristics. In particular, industries paying above-average/below-average wages generally stay high-pay/low-pay industries also after control.

Moreover, the pattern of remaining industry wage differentials shows striking similarities across genders; the rank correlation between the male and the female industry wage structure after control is 0.731 for the labour market as a whole and 0.742 for the private-sector labour market. For both genders, the paper industries and the financing and insurance sectors show up as high-pay industries also after control. These patterns change only marginally when fringe benefits are excluded from the analysis.

The weighted and adjusted standard deviation (WASD) of the measured industry wage differentials drops from 9.7 to 5.8 per cent after control for the labour market as a whole, and from 12.5 to 7.2 per cent after control for the private-sector labour market. The corresponding figures for male and female employees display much the same trend. The standard deviation calculated for the private sector after control is, in fact, very close to the standard deviation calculated by Vainiomäki & Laaksonen (1992) from census data. Obviously the difference (7.2 vs. 7.9 per cent) is partly explained by the fact that Vainiomäki and Laaksonen are not able to control for other differences in job characteristics than occupation, and that they do not adjust the standard deviation for sampling error.

The Finnish results imply that the overall variability in industry wages is somewhat higher in Finland than in the other Nordic countries, but still clearly lower than in the United States. Similar results are obtained in a Nordic comparison reported in Albæk et al. (1993). Hence, the industry wage structure in Finland, as in the other Nordic countries, can be argued to show more resemblance to the competitive model of the labour market than does the U.S. industry wage structure (cf. Holmlund & Zetterberg (1991), Edin & Zetterberg (1992)). The results for Finland may also be interpreted as supporting the assertion that wage inequality among similar workers is smaller in countries with centralized bargaining (cf. Barth & Zweimüller, 1992).

Furthermore, the standard deviation of the measured industry wage premiums indicates that nearly half of the observed wage dispersion among Finnish industries can be attributable to differences in observable personal and job characteristics across industries. Again this seems to largely hold for both genders. Obviously the remaining inter-industry wage differentials reflect some combined effect of alternative explanations such as unmeasured worker ability, unobservable working conditions, collective bargaining, and efficiency wages. Indeed, despite a highly unionized labour market and central wage setting, efficiency wage mechanisms may, nevertheless, be present in the Finnish economy; since firms and industries can set some part of the wages (wage drift), the industry wage distribution may be affected by employer differentials through these industry- and firm-level negotiations (cf. Arai, 1991).

The data used in the present study do not, however, allow discriminating tests of alternative models of the labour market. A simple attempt was made to explain the industry wage premiums measured for the private sector, but this attempt proved to be less successful because of the small number of industries under study and the high correlation between explanatory variables. Nevertheless, the estimation results suggest that the rewards to education differ across industries, and that industries with a higher unionization rate tend to pay higher wages.

In sum, the overall impression mediated by the empirical results presented in this chapter is that the inter-industry wage structure in Finland is less rigid than in many other countries. The fact remains, however, that there are significant industry wage premiums also in Finland, even after controlling for differences in personal and job characteristics of the labour force in different industries. In the same breath, it should nevertheless be emphasized that the examination of inter-industry wage differentials is, in the last resort, quite an approximate way of addressing the question of why employees with identical characteristics are paid differently; sources of inter-industry wage variation operate also within an industry, as shown by e.g. Groshen (1991) and Barth (1992). Future research in this field should therefore be directed at a more disaggregated level also in Finland.

Footnotes:

1. Most prior empirical work on compensating wage differentials has been based on the estimation of a single wage equation using cross-sectional labour market data. Underlying this work is the implicit assumption that the bias arising from the inability to observe workers' full labour market productivity is not significant. Hwang et al. (1992) show, however, that the size of this bias may "cause estimates to underestimate true compensating differentials by a factor of 50 percent or more, and even to result in wrong-signed coefficients" and state that "contemporary labour market studies may severely underestimate workers' marginal willingness to pay for job attributes" (p. 837).
More recent research in this field has focussed on developing simultaneous models of job choice, labour supply and wages to estimate the magnitude of compensating wage differentials (e.g. Woittiez (1990) and the references therein).

2. For a survey of search theory, see e.g. Mortensen (1986), and of the insider-outsider theory, see e.g. Lindbeck & Snower (1988). There is so far very little theoretical work on the connection between bargaining institutions and wage inequality; both the theoretical and the empirical work on bargaining institutions is almost exclusively concerned with macroeconomic performance (see e.g. the discussion and references in Barth & Zweimüller, 1992).

3. Surveys of the efficiency wage literature can be found in e.g. Yellen (1984), Akerlof & Yellen (1986), Katz (1986), Stiglitz (1987), and Weiss (1991). A comprehensive survey in Finnish by Kurjenoja (1992) also deserves to be mentioned.

4. Cf. also Weisskopf et al. (1983).

5. The investigated countries are Austria, the Federal Republic of Germany, Great Britain, Switzerland, and the United States.

6. The analysis focuses on Austria, Norway and the United States, but is also supplemented with similar figures from Canada, Sweden and Germany.

7. For a definition of this measure, see footnote 12.

8. The unobserved ability hypothesis and the approach used to explore the hypothesis are analogous to the concern of controlling for unobserved ability in estimating the return to schooling. (Cf. the theoretical discussion in Chapter II of this study.)

9. Because of the very different nature of manufacturing of paper products (SIC331) and the printing and publishing industries (SIC332), on the one hand, and of manufacturing of wood products (SIC341) and manufacturing of furniture and fixtures (SIC342), on the other, these industries were not aggregated to the two-digit level.

10. Following Arai (1992), the explanatory power of variables is examined by comparing the standard error of the regression including all explanatory variables, i.e. eq. (3), with the standard error of the regression omitting the given variable(s).

11. More formally, the wage premium ($PREMIUM_k$) received in industry k (k = 1,...,K) is calculated as

$$PREMIUM_k = \hat{\beta}_k - \sum_{k=1}^{K} e_k \hat{\beta}_k ,$$

where $\hat{\beta}_k$ is the estimated coefficient for the k[th] industry and e_k is its employment share in the sample. A value of zero is assigned to the omitted industry (= employment in manufacturing of metal products, SIC38).

12. The unweighted standard deviation (SD) is calculated as

$$SD(\hat{\beta}) = \left[\sum_{k=1}^{K} (\hat{\beta}_k - \sum_{k=1}^{K} e_k \hat{\beta}_k)^2 / K \right]^{\frac{1}{2}} ,$$

the adjusted standard deviation (ASD) as

$$ASD(\beta) = \left[SD(\hat{\beta})^2 - \sum_{k=1}^{K} \hat{\sigma}_k^2 / K + \sum_{j=1}^{J} \sum_{k=1}^{K} \hat{\sigma}_{jk} / K^2 \right]^{\frac{1}{2}} ,$$

the weighted standard deviation (WSD) as

$$WSD(\hat{\beta}) = \left[\sum_{k=1}^{K} e_k \; (\hat{\beta}_k - \sum_{k=1}^{K} e_k \hat{\beta}_k)^2 \right]^{\frac{1}{2}} ,$$

and the weighted and adjusted standard deviation (WASD) as

$$WASD(\beta) = \left[WSD(\hat{\beta})^2 - \sum_{k=1}^{K} e_k \hat{\sigma}_k^2 + \sum_{j=1}^{J} \sum_{k=1}^{K} \hat{\sigma}_{jk} / K^2 \right]^{\frac{1}{2}} ,$$

where e_k is the sample employment share of each industry k (k = 1,...,K), $\hat{\sigma}_k$ is the estimated standard error of the industry coefficients ($\hat{\beta}_k$) obtained from estimating eqs. (1)-(3) in the text, and $\hat{\sigma}_{jk}$ is the covariance among the various $\hat{\varepsilon}_k$.
The reason for undertaking the adjustment in the ASD and WASD measures is that, although the estimated wage differential ($\hat{\beta}_k$) for each industry is an unbiased estimate of the true differential (β_k), the standard deviation of $\hat{\beta}$ is an upwardly biased estimate of the standard deviation of β due to sampling error. In particular, this bias occurs because $\hat{\beta}_k = \beta_k + \hat{\varepsilon}_k$, where $\hat{\varepsilon}_k$ is a least squares sampling error.
It is to be noted that the adjustment undertaken in the ASD and WASD measures reported in the present paper neglects the covariance term (i.e. the third term on the right-hand side of the above expressions for ASD and WASD), implying that the true standard deviation of β is underestimated. The amount of sampling error in the estimates seems to be quite small, however, in view of the for the most part small drop in the standard deviation when

adjusted in this respect.

13. See footnote 12 for an explanation of this assertion.

14. Maliranta (1992) provides a more detailed analysis of the private- sector wage structure of Finnish manufacturing industries based on the estimating data used in the present study.

15. Barth & Zweimüller (1992) report the WASD for men/women to be 0.037/0.029 for Austria and 0.055/0.051 for Norway as compared to 0.124/0.118 for U.S. union workers and 0.123/0.126 for U.S. non-union workers. Empirical evidence reported by Edin & Zetterberg (1992) indicates that industry affiliation has a stronger impact on male than on female wages also in the Swedish labour market (the WASD after control is approximately zero for females and 4.5 per cent for males).

16. A negative relationship between industry wages and the capital-labour ratio is to be expected if higher wages give rise to a higher labour share.

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APPENDIX

Table A. Summary of definitions of included variables

Variable	**Definition**
EARN	Average hourly earnings (in FIM) calculated from the before-tax annual wage and salary income (incl. fringe benefits) recorded in the tax rolls and an estimated amount of annual normal working hours.
ln EARN	Natural logarithm of EARN.
BASIC EDUCATION	Indicator for persons with basic education only (about 9 years or less).
LOWER VOCATIONAL	Indicator for persons with completed lower-level of upper secondary education (about 10-11 years).
UPPER VOCATIONAL	Indicator for persons with completed upper- level of upper secondary education (about 12 years).
SHORT NON-UNIV	Indicator for persons with completed lowest level of higher education (about 13-14 years).
UNDERGRADUATE	Indicator for persons with completed undergraduate university education (about 15 years).
GRADUATE	Indicator for persons with completed graduate university education (more than 16 years).
EXP	Self-reported total years of work experience.
SEN	Seniority, i.e. self-reported years with the present employer.
OJT	Indicator for persons who self-reportedly have received employer-sponsored formal on-the-job-training during the previous twelve months.
WOM	Indicator for gender.
MARRIED	Indicator for married persons and singles living together.
$CHILD^{0-6}$	Indicator for children aged 0 to 6 living at home.
$CHILD^{7-17}$	Indicator for children aged 7 to 17 living at home.
CAPITAL	Indicator for residence within the capital region (the Helsinki area).
TEMPEMPL	Indicator for persons who self-reportedly are in temporary employment.
PART-TIME	Indicator for persons who self-reportedly are in part-time employment.
PIECE-RATE	Indicator for persons who are not being paid on an hourly, weekly, or monthly basis.
NODAYWORK	Indicator for persons who are not in regular day-time work.
UNEMPL	Indicator for persons who have been unemployed or temporarily laid off during the previous twelve months.
UNION	Indicator for unionized employees.
INDU20	Employment in mining and quarrying.
INDU31	Indicator for employment in food manufacturing.

INDU32	Indicator for employment in textile industries.
INDU331	Indicator for employment in manufacturing of wood products, except furniture.
INDU332	Indicator for employment in manufacturing of furniture and fixtures, except primarily of metal.
INDU341	Indicator for employment in manufacturing of paper and paper products.
INDU342	Inducator for employment in printing, publishing and allied industries.
INDU35	Indicator for employment in manufacturing of chemicals.
INDU36	Indicator for employment in manufacturing of non-metallic products.
INDU37	Indicator for employment in basic metal industries.
INDU38	Indicator for employment in manufacturing of metal products.
INDU39	Indicator for employment in other manufacturing.
INDU40	Indicator for employment in electricity.
INDU50	Indicator for employment in construction.
INDU61	Indicator for employment in wholesale trade.
INDU62	Indicator for employment in retail trade.
INDU63	Indicator for employment in restaurants.
INDU71	Indicator for employment in transport.
INDU72	Indicator for employment in communication.
INDU81	Indicator for employment in financing.
INDU82	Indicator for employment in insurance.
INDU83	Indicator for employment in real estate.
INDU91	Indicator for employment in public administration.
INDU92	Indicator for employment in sanitary services.
INDU93	Indicator for employment in social services.
INDU94	Indicator for employment in recreational and cultural services.
INDU95	Indicator for employment in personal and household services.
OCC31	Indicator for senior officials and upper management.
OCC32	Indicator for senior officials and employees in research and planning.
OCC33	Indicator for senior officials and employees in education and training.
OCC34	Indicator for other senior officials and employees.
OCC41	Indicator for supervisors.
OCC42	Indicator for clerical and sales workers, independent work.
OCC43	Indicator for clerical and sales workers, routine work.
OCC44	Indicator for other lower-level employees with administrative and clerical occupations.
OCC52	Indicator for manufacturing workers.
OCC53	Indicator for other production workers.
OCC54	Indicator for distribution and service workers.

Table B. Sample mean characteristics of all nonfarm employees retained in the actual estimating data and separately for male and female employees

Variable	All obs.	Women	Men
EARN	45.46	41.17	50.10
ln EARN	3.73	3.63	3.83
EARN$^{NO\ FRINGES}$	45.03	40.88	49.53
ln EARN$^{NO\ FRINGES}$	3.72	3.63	3.81
BASIC EDUCATION (1,0)	0.3562	0.3679	0.3436
LOWER VOCATIONAL (1,0)	0.3074	0.2807	0.3363
UPPER VOCATIONAL (1,0)	0.2006	0.2165	0.1834
SHORT NON-UNIV (1,0)	0.0582	0.0611	0.0550
UNDERGRADUATE (1,0)	0.0267	0.0359	0.0167
GRADUATE (1,0)	0.0510	0.0380	0.0650
EXP	16.74	16.17	17.37
SEN	8.93	8.65	9.24
OJT (1,0)	0.3703	0.3802	0.3596
WOM (1,0)	0.5200	-	-
MARRIED (1,0)	0.7399	0.7322	0.7482
CHILD$^{0-6}$ (1,0)	0.2321	0.2098	0.2562
CHILD$^{7-17}$ (1,0)	0.3527	0.3725	0.3313
CAPITAL (1,0)	0.2004	0.2098	0.1901
TEMPEMPL (1,0)	0.0974	0.1180	0.0750
PART-TIME (1,0)	0.0368	0.0595	0.0122
PIECE-RATE (1,0)	0.0859	0.0652	0.1084
NODAYWORK (1,0)	0.2359	0.2447	0.2262
UNEMPL (1,0)	0.1003	0.0970	0.1040
UNION (1,0)	0.7759	0.8040	0.7454
INDU20 (1,0)	0.0016	0.0010	0.0022
INDU31 (1,0)	0.0336	0.0359	0.0311
INDU32 (1,0)	0.0280	0.0441	0.0106
INDU331 (1,0)	0.0187	0.0103	0.0278
INDU332 (1,0)	0.0067	0.0062	0.0072
INDU341 (1,0)	0.0280	0.0154	0.0417
INDU342 (1,0)	0.0237	0.0221	0.0256
INDU35 (1,0)	0.0208	0.0118	0.0306
INDU36 (1,0)	0.0101	0.0036	0.0172
INDU37 (1,0)	0.0069	0.0015	0.0128
INDU38 (1,0)	0.0819	0.0400	0.1273
INDU39 (1,0)	0.0021	0.0010	0.0033
INDU40 (1,0)	0.0133	0.0056	0.0217
INDU50 (1,0)	0.0795	0.0149	0.1495
INDU61 (1,0)	0.0371	0.0287	0.0461
INDU62 (1,0)	0.0792	0.0959	0.0611
INDU63 (1,0)	0.0256	0.0400	0.0100
INDU71 (1,0)	0.0547	0.0272	0.0845
INDU72 (1,0)	0.0277	0.0226	0.0334
INDU81 (1,0)	0.0371	0.0590	0.0133
INDU82 (1,0)	0.0085	0.0087	0.0083
INDU83 (1,0)	0.0422	0.0400	0.0445
INDU91 (1,0)	0.0654	0.0703	0.0600
INDU92 (1,0)	0.0088	0.0118	0.0056
INDU93 (1,0)	0.2278	0.3504	0.0950
INDU94 (1,0)	0.0179	0.0241	0.0111
INDU95 (1,0)	0.0128	0.0077	0.0183
OCC31 (1,0)	0.0368	0.0097	0.0661
OCC32 (1,0)	0.0347	0.0154	0.0556
OCC33 (1,0)	0.0448	0.0487	0.0406
OCC34 (1,0)	0.0552	0.0636	0.0461
OCC41 (1,0)	0.0726	0.0421	0.1056
OCC42 (1,0)	0.1371	0.2068	0.0617
OCC43 (1,0)	0.0728	0.1324	0.0083
OCC44 (1,0)	0.1118	0.1821	0.0356
OCC52 (1,0)	0.2161	0.1078	0.3335
OCC53 (1,0)	0.0763	0.0554	0.0989
OCC54 (1,0)	0.1417	0.1360	0.1479
Number of obs.	3748	1949	1799

Table C. Sample mean characteristics of all nonfarm private-sector employees retained in the actual estimating data and separately for male and female employees

Variable	All obs.	Women	Men
EARN	45.16	39.73	49.52
ln EARN	3.72	3.60	3.82
$EARN^{NO\ FRINGES}$	44.60	39.34	48.82
ln $EARN^{NO\ FRINGES}$	3.71	3.59	3.81
BASIC EDUCATION (1,0)	0.4069	0.4535	0.3694
LOWER VOCATIONAL (1,0)	0.3175	0.2667	0.3582
UPPER VOCATIONAL (1,0)	0.2016	0.2221	0.1851
SHORT NON-UNIV (1,0)	0.0323	0.0214	0.0410
UNDERGRADUATE (1,0)	0.0128	0.0214	0.0060
GRADUATE (1,0)	0.0290	0.0149	0.0403
EXP	16.67	16.25	17.01
SEN	8.50	8.43	8.56
OJT (1,0)	0.3208	0.3178	0.3231
WOM (1,0)	0.4454	-	-
MARRIED (1,0)	0.7322	0.7258	0.7373
$CHILD^{0\text{-}6}$ (1,0)	0.2322	0.1961	0.2612
$CHILD^{7\text{-}17}$ (1,0)	0.3386	0.3606	0.3209
CAPITAL (1,0)	0.2119	0.2351	0.1933
TEMPEMPL (1,0)	0.0629	0.0669	0.0597
PART-TIME (1,0)	0.0339	0.0660	0.0082
PIECE-RATE (1,0)	0.1291	0.1134	0.1418
NODAYWORK (1,0)	0.2285	0.2435	0.2164
UNEMPL (1,0)	0.1047	0.0939	0.1134
UNION (1,0)	0.7194	0.7398	0.7030
INDU20 (1,0)	0.0021	0.0019	0.0022
INDU31 (1,0)	0.0522	0.0651	0.0418
INDU32 (1,0)	0.0430	0.0790	0.0142
INDU331 (1,0)	0.0290	0.0186	0.0373
INDU332 (1,0)	0.0103	0.0112	0.0097
INDU341 (1,0)	0.0435	0.0279	0.0560
INDU342 (1,0)	0.0368	0.0400	0.0343
INDU35 (1,0)	0.0323	0.0214	0.0410
INDU36 (1,0)	0.0157	0.0065	0.0231
INDU37 (1,0)	0.0108	0.0028	0.0172
INDU38 (1,0)	0.1250	0.0716	0.1679
INDU39 (1,0)	0.0029	0.0009	0.0045
INDU40 (1,0)	0.0128	0.0065	0.0179
INDU50 (1,0)	0.0973	0.0232	0.1567
INDU61 (1,0)	0.0555	0.0502	0.0597
INDU62 (1,0)	0.1221	0.1719	0.0821
INDU63 (1,0)	0.0348	0.0641	0.0112
INDU71 (1,0)	0.0534	0.0362	0.0672
INDU72 (1,0)	0.0070	0.0037	0.0097
INDU81 (1,0)	0.0480	0.0883	0.0157
INDU82 (1,0)	0.0132	0.0158	0.0112
INDU83 (1,0)	0.0579	0.0632	0.0537
INDU92 (1,0)	0.0103	0.0167	0.0052
INDU93 (1,0)	0.0509	0.0790	0.0284
INDU94 (1,0)	0.0137	0.0204	0.0082
INDU95 (1,0)	0.0194	0.0139	0.0239
OCC31 (1,0)	0.0538	0.0177	0.0828
OCC32 (1,0)	0.0315	0.0121	0.0470
OCC33 (1,0)	0.0025	0.0019	0.0030
OCC34 (1,0)	0.0455	0.0530	0.0396
OCC41 (1,0)	0.0757	0.0428	0.1022
OCC42 (1,0)	0.1730	0.2928	0.0769
OCC43 (1,0)	0.0708	0.1496	0.0075
OCC44 (1,0)	0.0319	0.0539	0.0142
OCC52 (1,0)	0.3166	0.1942	0.4149
OCC53 (1,0)	0.0778	0.0493	0.1008
OCC54 (1,0)	0.1209	0.1329	0.1112
Number of obs.	2416	1076	1340

Table D1. Regression results for non-agricultural employees. Estimation of earnings equations including industry sector controls only using OLS techniques.[1] The dependent variable is log hourly earnings *inclusive* of fringe benefits.

Variable	All obs.	Women	Men
CONSTANT	3.7291** (.0194)	3.4880** (.0308)	3.8112** (.0212)
INDU20 (mining)	-0.0199 (.1195)	0.1999 (.1750)	-0.0914 (.1557)
INDU31 (food manuf.)	-0.1142** (.0372)	0.0101 (.0449)	-0.0504 (.0564)
INDU32 (textile)	-0.2569** (.0357)	-0.0804* (.0437)	-0.0468 (.0529)
INDU331 (wood prod.)	-0.1225** (.0355)	0.0491 (.0571)	-0.1768** (.0420)
INDU332 (furniture)	-0.2233** (.0522)	-0.0334 (.0727)	-0.2582** (.0712)
INDU341 (paper prod.)	0.1663** (.0365)	0.1590** (.0445)	0.1836** (.0413)
INDU342 (printing)	0.1657** (.0488)	0.3719** (.0691)	0.1161* (.0676)
INDU35 (chemicals)	0.0949* (.0490)	0.1337* (.0642)	0.0974* (.0594)
INDU36 (non-metallic)	-0.0292 (.0581)	-0.0357 (.0753)	-0.0555 (.0646)
INDU37 (basic metal)	0.1867** (.0525)	0.1053* (.0622)	0.1466** (.0526)
INDU38 (metal products)	0	0	0
INDU39 (oth. manuf.)	0.2652** (.1090)	0.5985* (.2715)	0.1524 (.1104)
INDU40 (electricity)	0.0746* (.0436)	0.0174 (.0529)	0.0766* (.0446)
INDU50 (construction)	-0.0043 (.0281)	0.0903 (.0570)	-0.0706* (.0303)
INDU61 (wholesale trade)	0.1182** (.0428)	0.1900** (.0541)	0.1502** (.0570)
INDU62 (retail trade)	-0.1736** (.0304)	0.0009 (.0415)	-0.1428** (.0447)
INDU63 (restaurants)	-0.1108** (.0373)	0.1020* (.0476)	-0.0709 (.0597)
INDU71 (transport)	-0.0102 (.0284)	0.2115** (.0554)	-0.0856** (.0312)

Table D1. (cont.)

Variable	All obs.	Women	Men
INDU72 (communication)	-0.0158 (.0324)	0.1293** (.0418)	-0.0275 (.0430)
INDU81 (financing)	0.1384** (.0376)	0.2899** (.0417)	0.4855** (.0881)
INDU82 (insurance)	0.2192** (.0620)	0.2601** (.0769)	0.3640** (.0585)
INDU83 (real estate)	0.0766* (.0367)	0.1548** (.0512)	0.1532** (.0448)
INDU91 (public adm.)	0.0463 (.0288)	0.1674** (.0365)	0.1162** (.0423)
INDU92 (sanitary services)	-0.1953* (.0861)	0.0244 (.1076)	-0.2284 (.1430)
INDU93 (social services)	0.0222 (.0243)	0.1989** (.0344)	0.1973** (.0388)
INDU94 (cultural services)	0.0570 (.0632)	0.3160** (.0839)	-0.0674 (.0853)
INDU95 (personal services)	-0.1667** (.0402)	0.0608 (.0874)	-0.2427** (.0412)
R^2 adj.	0.0641	0.0703	0.1149
SEE	0.3749	0.3553	0.3583
F-all variables	10.87	6.67	9.97
Number of obs.	3748	1949	1799

1 Standard errors are given in parentheses below the estimates and are adjusted for heteroscedasticity according to White (1980). A simple Chow test suggests that the hypothesis of the parameter estimates being equal for male and female employees can be rejected at a 0.1 % level.

* Denotes significant estimate at a 5 % level.

** Denotes significant estimate at a 1 % level.

Table D2. Regression results for non-agricultural employees. Estimation of earnings equations including human capital variables as well as industry sector controls using OLS techniques.[1] The dependent variable is log hourly earnings *inclusive* of fringe benefits.

Variable	All obs.	Women	Men
CONSTANT	3.4919** (.0263)	3.3531** (.0429)	3.3910** (.0320)
BASIC EDUCATION	0	0	0
LOWER VOCATIONAL	0.0380** (.0135)	-0.0054 (.0194)	0.0781** (.0182)
UPPER VOCATIONAL	0.2040** (.0181)	0.1551** (.0253)	0.2354** (.0257)
SHORT NON-UNIV	0.3793** (.0253)	0.3304** (.0343)	0.4188** (.0375)
UNDERGRADUATE	0.4829** (.0312)	0.4918** (.0361)	0.4293** (.0592)
GRADUATE	0.6007** (.0274)	0.5818** (.0407)	0.6034** (.0373)
EXP	0.0138** (.0022)	0.0054* (.0033)	0.0222** (.0028)
EXP^2 /1000	-0.2238** (.0488)	-0.0902 (.0720)	-0.3669** (.0639)
SEN	0.0039** (.0008)	0.0052** (.0011)	0.0027* (.0012)
OJT	0.0583** (.0110)	0.0029 (.0146)	0.1190** (.0166)
WOM	-0.1917** (.0116)		
Industry sector indicators:			
INDU20 (mining)	-0.0328 (.0944)	0.0585 (.1108)	-0.0422 (.1420)
INDU31 (food manuf.)	-0.0316 (.0298)	0.0150 (.0410)	-0.0272 (.0482)
INDU32 (textile)	-0.0904** (.0301)	-0.0580 (.0413)	0.0015 (.0423)
INDU331 (wood prod.)	-0.0694* (.0310)	0.0218 (.0538)	-0.0835* (.0377)
INDU332 (furniture)	-0.1233** (.0511)	-0.0270 (.0732)	-0.1733** (.0642)
INDU341 (paper prod.)	0.1669** (.0293)	0.1117** (.0409)	0.1882** (.0367)
INDU342 (printing)	0.2058** (.0423)	0.2791** (.0593)	0.1971** (.0596)
INDU35 (chemicals)	0.0703* (.0383)	0.0440 (.0507)	0.0860* (.0485)

Table D2. (cont.)

Variable	All obs.	Women	Men
INDU36 (non-metallic)	-0.0074 (.0569)	-0.0492 (.0734)	-0.0008 (.0702)
INDU37 (basic metal)	0.1228** (.0374)	0.0830 (.0591)	0.0844* (.0417)
INDU38 (metal products)	0	0	0
INDU39 (oth. manuf.)	0.1963* (.0880)	0.4551** (.1339)	0.1435 (.1144)
INDU40 (electricity)	0.0507 (.0334)	0.0022 (.0483)	0.0444 (.0397)
INDU50 (construction)	0.0106 (.0229)	0.0858 (.0561)	0.0014 (.0250)
INDU61 (wholesale trade)	0.0876** (.0339)	0.1181** (.0485)	0.0915* (.0453)
INDU62 (retail trade)	-0.0714** (.0264)	-0.0038 (.0389)	-0.1019** (.0394)
INDU63 (restaurants)	0.0483 (.0335)	0.1168** (.0448)	-0.0049 (.0566)
INDU71 (transport)	0.0094 (.0242)	0.1703** (.0547)	-0.0355 (.0263)
INDU72 (communication)	-0.0112 (.0248)	0.0768* (.0391)	-0.0494 (.0339)
INDU81 (financing)	0.1664** (.0292)	0.2258** (.0385)	0.2480** (.0699)
INDU82 (insurance)	0.1284** (.0405)	0.1810** (.0706)	0.1284** (.0395)
INDU83 (real estate)	0.0600* (.0284)	0.0997* (.0483)	0.0678* (.0338)
INDU91 (public adm.)	0.0039 (.0212)	0.0834** (.0322)	-0.0270 (.0324)
INDU92 (sanitary services)	-0.0424 (.0858)	0.0700 (.1087)	-0.1971* (.1103)
INDU93 (social services)	0.0043 (.0205)	0.0920** (.0323)	-0.0566* (.0342)
INDU94 (cultural services)	0.1268* (.0631)	0.2317** (.0826)	0.0034 (.0825)
INDU95 (personal services)	-0.1103** (.0335)	0.0824 (.0707)	-0.1834** (.0324)
R^2 adj.	0.3382	0.2416	0.3754
SEE	0.3152	0.3209	0.3010
F-all variables	54.19	18.73	31.87
F-industry controls	6.72	3.69	5.21
Number of obs.	3748	1949	1799

1 For notes, see Table D1.

Table D3. Regression results for non-agricultural employees. Estimation of earnings equations controlling for a large set of personal and job characteristics using OLS techniques.[1] The dependent variable is log hourly earnings *inclusive* of fringe benefits.

Variable	All obs.	Women	Men
CONSTANT	3.4626** (.0399)	3.3515** (.0589)	3.4168** (.0521)
BASIC EDUCATION	0	0	0
LOWER VOCATIONAL	0.0460** (.0126)	0.0052 (.0183)	0.0758** (.0168)
UPPER VOCATIONAL	0.1357** (.0193)	0.1200** (.0268)	0.1355** (.0266)
SHORT NON-UNIV	0.2408** (.0291)	0.2211** (.0386)	0.2309** (.0432)
UNDERGRADUATE	0.2710** (.0354)	0.2996** (.0422)	0.1764** (.0592)
GRADUATE	0.3818** (.0351)	0.3821** (.0500)	0.3633** (.0467)
EXP	0.0103** (.0022)	0.0080** (.0031)	0.0130** (.0031)
EXP^2 /1000	-0.1526** (.0486)	-0.1282* (.0668)	-0.1996** (.0669)
SEN	0.0042** (.0008)	0.0056** (.0010)	0.0024* (.0011)
OJT	0.0498** (.0101)	0.0194 (.0138)	0.0856** (.0150)
WOM	-0.1684** (.0122)		
MARRIED	0.0086 (.0119)	-0.0193 (.0154)	0.0307 (.0186)
$CHILD^{0-6}$	0.0149 (.0125)	0.0239 (.0200)	-0.0096 (.0156)
$CHILD^{7-17}$	0.0254** (.0102)	0.0077 (.0133)	0.0450** (.0157)
CAPITAL	0.1075** (.0142)	0.0902** (.0185)	0.1283** (.0220)
TEMPEMPL	0.0136 (.0252)	0.0610* (.0326)	-0.0802* (.0383)
PART-TIME	0.2975** (.0489)	0.3002** (.0501)	0.2113 (.1428)
PIECE-RATE	0.0762** (.0190)	0.0394 (.0361)	0.1039** (.0213)
NODAYWORK	0.1075** (.0133)	0.1611** (.0190)	0.0509** (.0177)

Table D3. (cont.)

Variable	All obs.	Women	Men
UNEMPL	-0.0230 (.0215)	0.0103 (.0310)	-0.0476* (.0288)
UNION	-0.0137 (.0147)	-0.0283 (.0228)	-0.0034 (.0190)
Occupational status indicators:			
OCC31 (management)	0.4005** (.0408)	0.3629** (.0628)	0.3768** (.0588)
OCC32 (education)	0.1796** (.0384)	0.0922 (.0601)	0.1990** (.0565)
OCC33 (research)	0.2914** (.0363)	0.3274** (.0423)	0.2619** (.0670)
OCC34 (oth. seniors)	0.1446** (.0318)	0.1615** (.0374)	0.1405** (.0563)
OCC41 (supervisors)	0.0768** (.0246)	0.0846** (.0321)	0.0677 (.0418)
OCC42 (indep. clericals)	0.0050 (.0260)	0.0430 (.0302)	-0.0724 (.0515)
OCC43 (routine clericals)	-0.0124 (.0257)	0.0048 (.0282)	0.0021 (.1136)
OCC44 (oth. lower-level non-manual workers)	0	0	0
OCC52 (manufacturing)	-0.0292 (.0256)	-0.0871** (.0355)	-0.0146 (.0427)
OCC53 (oth. production)	-0.0939** (.0252)	-0.1196** (.0306)	-0.0935* (.0433)
OCC54 (service)	-0.1014** (.0249)	-0.0946** (.0315)	-0.1023** (.0410)
Industry sector indicators:			
INDU20 (mining)	-0.0007 (.0860)	-0.0144 (.1258)	-0.0005 (.1215)
INDU31 (food manuf.)	-0.0265 (.0293)	-0.0114 (.0393)	0.0062 (.0456)
INDU32 (textile)	-0.0815** (.0301)	-0.0334 (.0425)	0.0314 (.0451)
INDU331 (wood prod.)	-0.0664* (.0287)	-0.0040 (.0515)	-0.0782* (.0345)
INDU332 (furniture)	-0.1253** (.0407)	-0.0670 (.0616)	-0.1429** (.0494)
INDU341 (paper prod.)	0.1740** (.0275)	0.1003** (.0398)	0.2220** (.0352)
INDU342 (printing)	0.1521** (.0350)	0.1508** (.0487)	0.1586** (.0510)
INDU35 (chemicals)	0.0643* (.0384)	0.0163 (.0491)	0.0996* (.0476)

Table D3. (cont.)

Variable	All obs.	Women	Men
INDU36 (non-metallic)	0.0032 (.0495)	-0.0227 (.0578)	0.0135 (.0632)
INDU37 (basic metal)	0.1402** (.0350)	0.0254 (.0895)	0.1343** (.0392)
INDU38 (metal products)	0	0	0
INDU39 (oth. manuf.)	0.1289 (.0845)	0.2654** (.1019)	0.1146 (.1092)
INDU40 (electricity)	0.0777** (.0321)	-0.0385 (.0375)	0.0806* (.0394)
INDU50 (construction)	0.0572** (.0221)	0.0338 (.0482)	0.0633** (.0244)
INDU61 (wholesale trade)	0.0274 (.0306)	0.0218 (.0460)	0.0231 (.0416)
INDU62 (retail trade)	-0.0896** (.0278)	-0.1324** (.0401)	-0.0330 (.0409)
INDU63 (restaurants)	0.0250 (.0347)	0.0213 (.0444)	-0.0158 (.0622)
INDU71 (transport)	0.0315 (.0261)	0.0651 (.0534)	0.0418 (.0309)
INDU72 (communication)	0.0459* (.0259)	0.0570 (.0392)	0.0551 (.0348)
INDU81 (financing)	0.1405** (.0313)	0.1417** (.0395)	0.1896** (.0725)
INDU82 (insurance)	0.1156** (.0454)	0.0929 (.0710)	0.1802** (.0481)
INDU83 (real estate)	0.0130 (.0279)	0.0070 (.0451)	0.0359 (.0341)
INDU91 (public adm.)	0.0164 (.0218)	0.0323 (.0315)	0.0129 (.0336)
INDU92 (sanitary services)	-0.0790 (.0770)	0.0023 (.0910)	-0.2683** (.1119)
INDU93 (social services)	-0.0191 (.0227)	-0.0139 (.0323)	-0.0187 (.0389)
INDU94 (cultural services)	0.0464 (.0579)	0.0578 (.0732)	-0.0136 (.0772)
INDU95 (personal services)	-0.0500 (.0327)	0.0029 (.0628)	-0.0930** (.0396)
R^2 adj.	0.4355	0.3588	0.4716
SEE	0.2911	0.2950	0.2769
F-all variables	52.62	20.82	30.17
F-industry controls	5.88	2.88	3.99
Number of obs.	3748	1949	1799

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1 For notes, see Table D1.

Table E1. Regression results for non-agricultural employees. Estimation of earnings equations including industry sector controls only using OLS techniques.[1] The dependent variable is log hourly earnings *exclusive* of fringe benefits.

Variable	All obs.	Women	Men
CONSTANT	3.7247** (.0190)	3.4877** (.0307)	3.8054** (.0207)
INDU20 (mining)	-0.0167 (.1190)	0.2002 (.1750)	-0.0873 (.1548)
INDU31 (food manuf.)	-0.1141** (.0366)	0.0088 (.0449)	-0.0523 (.0553)
INDU32 (textile)	-0.2567** (.0354)	-0.0824* (.0436)	-0.0536 (.0530)
INDU331 (wood prod.)	-0.1209** (.0347)	0.0495 (.0571)	-0.1750** (.0407)
INDU332 (furniture)	-0.2190** (.0520)	-0.0331 (.0726)	-0.2525** (.0710)
INDU341 (paper prod.)	0.1685** (.0362)	0.1585** (.0442)	0.1866** (.0408)
INDU342 (printing)	0.1644** (.0478)	0.3659** (.0678)	0.1167* (.0662)
INDU35 (chemicals)	0.0911* (.0487)	0.1291* (.0623)	0.0936 (.0593)
INDU36 (non-metallic)	-0.0272 (.0586)	-0.0385 (.0762)	-0.0519 (.0652)
INDU37 (basic metal)	0.1902** (.0523)	0.1051* (.0620)	0.1515** (.0525)
INDU38 (metal products)	0	0	0
INDU39 (oth. manuf.)	0.2683** (.1082)	0.5936* (.2678)	0.1582 (.1103)
INDU40 (electricity)	0.0773* (.0435)	0.0142 (.0532)	0.0812* (.0443)
INDU50 (construction)	-0.0062 (.0276)	0.0761 (.0550)	-0.0702** (.0297)
INDU61 (wholesale trade)	0.0938* (.0408)	0.1809** (.0536)	0.1143* (.0538)
INDU62 (retail trade)	-0.1750** (.0297)	-0.0016 (.0412)	-0.1475** (.0434)
INDU63 (restaurants)	-0.1095** (.0372)	0.1003* (.0476)	-0.0727 (.0605)
INDU71 (transport)	-0.0101 (.0282)	0.2012** (.0566)	-0.0818** (.0306)

Table E1. (cont.)

Variable	All obs.	Women	Men
INDU72	-0.0119	0.1285**	-0.0217
(communication)	(.0323)	(.0420)	(.0428)
INDU81	0.1094**	0.2596**	0.4442**
(financing)	(.0374)	(.0420)	(.0867)
INDU82	0.2048**	0.2412**	0.3515**
(insurance)	(.0619)	(.0768)	(.0583)
INDU83	0.0636*	0.1450**	0.1346**
(real estate)	(.0358)	(.0507)	(.0435)
INDU91	0.0478*	0.1635**	0.1210**
(public adm.)	(.0286)	(.0364)	(.0421)
INDU92	-0.1999**	0.0144	-0.2285*
(sanitary services)	(.0859)	(.1083)	(.1397)
INDU93	0.0215	0.1951**	0.1940**
(social services)	(.0240)	(.0344)	(.0386)
INDU94	0.0609	0.3156**	-0.0616
(cultural services)	(.0631)	(.0839)	(.0852)
INDU95	-0.1629**	0.0612	-0.2377**
(personal services)	(.0401)	(.0874)	(.0410)
R^2 adj.	0.0619	0.0668	0.1107
SEE	0.3709	0.3538	0.3529
F-all variables	10.51	6.36	9.61
Number of obs.	3748	1949	1799

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1 Standard errors are given in parentheses below the estimates and are adjusted for heteroscedasticity according to White (1980). A simple Chow test suggests that the hypothesis of the parameter estimates being equal for male and female employees can be rejected at a 0.1 % level.

* Denotes significant estimate at a 5 % level.

** Denotes significant estimate at a 1 % level.

Table E2. Regression results for non-agricultural employees. Estimation of earnings equations including human capital variables as well as industry sector controls using OLS techniques.[1] The dependent variable is log hourly earnings *exclusive* of fringe benefits.

Variable	All obs.	Women	Men
CONSTANT	3.4878** (.0260)	3.3496** (.0426)	3.3901** (.0317)
BASIC EDUCATION	0	0	0
LOWER VOCATIONAL	0.0388** (.0134)	-0.0048 (.0193)	0.0792** (.0180)
UPPER VOCATIONAL	0.2009** (.0178)	0.1556** (.0252)	0.2293** (.0252)
SHORT NON-UNIV	0.3767** (.0250)	0.3290** (.0343)	0.4148** (.0364)
UNDERGRADUATE	0.4795** (.0310)	0.4917** (.0360)	0.4160** (.0581)
GRADUATE	0.5909** (.0272)	0.5783** (.0403)	0.5886** (.0371)
EXP	0.0137** (.0022)	0.0057* (.0033)	0.0219** (.0028)
EXP^2 /1000	-0.2233** (.0485)	-0.0943 (.0715)	-0.3620** (.0634)
SEN	0.0040** (.0008)	0.0052** (.0011)	0.0029** (.0012)
OJT	0.0559** (.0109)	0.0030 (.0146)	0.1141** (.0163)
WOM	-0.1880** (.0115)		
Industry sector indicators:			
INDU20 (mining)	-0.0306 (.0938)	0.0577 (.1105)	-0.0406 (.1406)
INDU31 (food manuf.)	-0.0334 (.0296)	0.0135 (.0410)	-0.0297 (.0478)
INDU32 (textile)	-0.0934** (.0299)	-0.0602 (.0413)	-0.0062 (.0416)
INDU331 (wood prod.)	-0.0690* (.0302)	0.0221 (.0538)	-0.0841** (.0363)
INDU332 (furniture)	-0.1208** (.0509)	-0.0269 (.0733)	-0.1695** (.0640)
INDU341 (paper prod.)	0.1684** (.0292)	0.1114** (.0407)	0.1900** (.0366)
INDU342 (printing)	0.2040** (.0414)	0.2736** (.0585)	0.1971** (.0584)
INDU35 (chemicals)	0.0669* (.0385)	0.0401 (.0502)	0.0822* (.0490)

Table E2. (cont.)

Variable	All obs.	Women	Men
INDU36 (non-metallic)	-0.0059 (.0574)	-0.0515 (.0739)	0.0012 (.0707)
INDU37 (basic metal)	0.1270** (.0373)	0.0825 (.0587)	0.0903* (.0415)
INDU38 (metal products)	0	0	0
INDU39 (oth. manuf.)	0.2004* (.0876)	0.4499** (.1305)	0.1495 (.1146)
INDU40 (electricity)	0.0533 (.0334)	-0.0007 (.0492)	0.0489 (.0395)
INDU50 (construction)	0.0088 (.0225)	0.0712 (.0539)	0.0008 (.0246)
INDU61 (wholesale trade)	0.0639* (.0322)	0.1089* (.0478)	0.0576 (.0426)
INDU62 (retail trade)	-0.0744** (.0259)	-0.0065 (.0386)	-0.1064** (.0383)
INDU63 (restaurants)	0.0472 (.0336)	0.1151** (.0449)	-0.0065 (.0574)
INDU71 (transport)	0.0092 (.0241)	0.1601** (.0560)	-0.0332 (.0259)
INDU72 (communication)	-0.0081 (.0247)	0.0755* (.0392)	-0.0435 (.0337)
INDU81 (financing)	0.1370** (.0291)	0.1954** (.0388)	0.2146** (.0687)
INDU82 (insurance)	0.1163** (.0407)	0.1623* (.0703)	0.1242** (.0405)
INDU83 (real estate)	0.0476* (.0278)	0.0898* (.0478)	0.0522 (.0330)
INDU91 (public adm.)	0.0059 (.0210)	0.0795** (.0322)	-0.0186 (.0321)
INDU92 (sanitary services)	-0.0488 (.0858)	0.0601 (.1095)	-0.1962* (.1078)
INDU93 (social services)	0.0035 (.0202)	0.0887** (.0322)	-0.0527 (.0340)
INDU94 (cultural services)	0.1300* (.0630)	0.2319** (.0827)	0.0092 (.0822)
INDU95 (personal services)	-0.1070** (.0334)	0.0825 (.0706)	-0.1792** (.0334)
R^2 adj.	0.3346	0.2392	0.3693
SEE	0.3124	0.3195	0.2972
F-all variables	53.34	18.50	31.09
F-industry controls	6.30	3.37	4.91
Number of obs.	3748	1949	1799

1 For notes, see Table E1.

Table E3. Regression results for non-agricultural employees. Estimation of earnings equations controlling for a large set of personal and job characteristics using OLS techniques.[1] The dependent variable is log hourly earnings *exclusive* of fringe benefits.

Variable	All obs.	Women	Men
CONSTANT	3.4559** (.0393)	3.3461** (.0579)	3.4094** (.0519)
BASIC EDUCATION	0	0	0
LOWER VOCATIONAL	0.0465** (.0125)	0.0055 (.0181)	0.0765** (.0168)
UPPER VOCATIONAL	0.1366** (.0191)	0.1210** (.0266)	0.1374** (.0264)
SHORT NON-UNIV	0.2421** (.0289)	0.2201** (.0386)	0.2338** (.0425)
UNDERGRADUATE	0.2731** (.0352)	0.3019** (.0421)	0.1731** (.0589)
GRADUATE	0.3792** (.0350)	0.3809** (.0497)	0.3603** (.0466)
EXP	0.0105** (.0022)	0.0082** (.0031)	0.0132** (.0031)
EXP^2 /1000	-0.1557** (.0484)	-0.1305* (.0662)	-0.2015** (.0668)
SEN	0.0042** (.0008)	0.0056** (.0010)	0.0025* (.0011)
OJT	0.0485** (.0101)	0.0192 (.0137)	0.0830** (.0150)
WOM	-0.1663** (.0122)		
MARRIED	0.0061 (.0118)	-0.0208 (.0154)	0.0283 (.0183)
$CHILD^{0-6}$	0.0147 (.0125)	0.0237 (.0200)	-0.0094 (.0154)
$CHILD^{7-17}$	0.0246** (.0101)	0.0073 (.0132)	0.0441** (.0156)
CAPITAL	0.1056** (.0141)	0.0910** (.0183)	0.1235** (.0219)
TEMPEMPL	0.0166 (.0251)	0.0628* (.0324)	-0.0766* (.0382)
PART-TIME	0.2926** (.0487)	0.2926** (.0498)	0.2223 (.1422)
PIECE-RATE	0.0736** (.0188)	0.0401 (.0359)	0.1005** (.0210)
NODAYWORK	0.1082** (.0133)	0.1635** (.0190)	0.0490** (.0177)
UNEMPL	-0.0243 (.0214)	0.0090 (.0310)	-0.0483* (.0287)

Table E3. (cont.)

Variable	All obs.	Women	Men
UNION	-0.0081 (.0147)	-0.0230 (.0227)	0.0031 (.0189)
Occupational status indicators:			
OCC31 (management)	0.3671** (.0403)	0.3393** (.0634)	0.3444** (.0584)
OCC32 (education)	0.1760** (.0382)	0.0916 (.0594)	0.1959** (.0562)
OCC33 (research)	0.2870** (.0362)	0.3230** (.0422)	0.2593** (.0669)
OCC34 (oth. seniors)	0.1406** (.0320)	0.1612** (.0374)	0.1318** (.0567)
OCC41 (supervisors)	0.0725** (.0245)	0.0834** (.0321)	0.0631 (.0418)
OCC42 (indep. clericals)	0.0023 (.0259)	0.0430 (.0302)	-0.0793 (.0512)
OCC43 (routine clericals)	-0.0153 (.0256)	0.0037 (.0281)	0.0058 (.1144)
OCC44 (oth. lower- level non-manual workers)	0	0	0
OCC52 (manufacturing)	-0.0273 (.0255)	-0.0875** (.0354)	-0.0116 (.0428)
OCC53 (oth. production)	-0.0951** (.0251)	-0.1255** (.0304)	-0.0899* (.0434)
OCC54 (service)	-0.0999** (.0248)	-0.0936** (.0314)	-0.0983** (.0409)
Industry sector indicators:			
INDU20 (mining)	-0.0003 (.0853)	-0.0122 (.1267)	-0.0021 (.1203)
INDU31 (food manuf.)	-0.0288 (.0292)	-0.0126 (.0393)	0.0023 (.0453)
INDU32 (textile)	-0.0848** (.0302)	-0.0352 (.0424)	0.0223 (.0485)
INDU331 (wood prod.)	-0.0671** (.0284)	-0.0046 (.0516)	-0.0796** (.0340)
INDU332 (furniture)	-0.1224** (.0405)	-0.0648 (.0611)	-0.1411** (.0499)
INDU341 (paper prod.)	0.1734** (.0274)	0.0988** (.0397)	0.2218** (.0353)
INDU342 (printing)	0.1510** (.0347)	0.1458** (.0485)	0.1600** (.0503)
INDU35 (chemicals)	0.0600 (.0387)	0.0112 (.0481)	0.0949* (.0485)
INDU36 (non-metallic)	0.0021 (.0501)	-0.0264 (.0580)	0.0128 (.0637)

Table E3. (cont.)

Variable	All obs.	Women	Men
INDU37 (basic metal)	0.1404** (.0349)	0.0239 (.0891)	0.1350** (.0392)
INDU38 (metal products)	0	0	0
INDU39 (oth. manuf.)	0.1364* (.0827)	0.2617** (.1002)	0.1258 (.1079)
INDU40 (electricity)	0.0785** (.0320)	-0.0424 (.0379)	0.0820* (.0393)
INDU50 (construction)	0.0534** (.0219)	0.0203 (.0469)	0.0596** (.0242)
INDU61 (wholesale trade)	0.0115 (.0296)	0.0148 (.0452)	-0.0004 (.0401)
INDU62 (retail trade)	-0.0896** (.0276)	-0.1345** (.0400)	-0.0332 (.0405)
INDU63 (restaurants)	0.0245 (.0346)	0.0190 (.0444)	-0.0130 (.0620)
INDU71 (transport)	0.0303 (.0261)	0.0555 (.0551)	0.0423 (.0304)
INDU72 (communication)	0.0481* (.0258)	0.0558 (.0393)	0.0557 (.0346)
INDU81 (financing)	0.1153** (.0312)	0.1129** (.0397)	0.1675** (.0718)
INDU82 (insurance)	0.1053** (.0450)	0.0746 (.0707)	0.1794** (.0469)
INDU83 (real estate)	0.0044 (.0276)	-0.0006 (.0449)	0.0239 (.0335)
INDU91 (public adm.)	0.0177 (.0217)	0.0280 (.0314)	0.0192 (.0336)
INDU92 (sanitary services)	-0.0833 (.0767)	-0.0066 (.0913)	-0.2654** (.1099)
INDU93 (social services)	-0.0218 (.0225)	-0.0174 (.0323)	-0.0206 (.0392)
INDU94 (cultural services)	0.0496 (.0579)	0.0572 (.0735)	-0.0074 (.0776)
INDU95 (personal services)	-0.0454 (.0325)	0.0054 (.0629)	-0.0906* (.0392)
R^2 adj.	0.4271	0.3553	0.4584
SEE	0.2899	0.2941	0.2754
F-all variables	50.88	20.52	28.67
F-industry controls	5.63	2.63	3.94
Number of obs.	3748	1949	1799

1 For notes, see Table E1.

Table F1. Regression results for non-agricultural private-sector employees. Estimation of earnings equations including industry sector controls only using OLS techniques.[1] The dependent variable is log hourly earnings *inclusive* of fringe benefits.

Variable	All obs.	Women	Men
CONSTANT	3.7292** (.0197)	3.4880** (.0312)	3.8118** (.0216)
INDU20 (mining)	-0.0026 (.1416)	0.2000 (.1751)	-0.0593 (.0203)
INDU31 (food manuf.)	-0.1144** (.0373)	0.0102 (.0452)	-0.0510 (.0566)
INDU32 (textile)	-0.2551** (.0361)	-0.0787* (.0442)	-0.0475 (.0530)
INDU331 (wood prod.)	-0.1227** (.0357)	0.0492 (.0573)	-0.1775** (.0422)
INDU332 (furniture)	-0.2235** (.0523)	-0.0334 (.0728)	-0.2588** (.0713)
INDU341 (paper prod.)	0.1662** (.0367)	0.1591** (.0447)	0.1829** (.0414)
INDU342 (printing)	0.1655** (.0489)	0.3720** (.0692)	0.1155* (.0677)
INDU35 (chemicals)	0.0947* (.0491)	0.1337* (.0644)	0.0968 (.0595)
INDU36 (non-metallic)	-0.0294 (.0582)	-0.0356 (.0755)	-0.0561 (.0647)
INDU37 (basic metal)	0.1865** (.0526)	0.1053* (.0624)	0.1460** (.0528)
INDU38 (metal products)	0	0	0
INDU39 (oth. manuf.)	0.1974* (.1009)	0.2171** (.0312)	0.1517 (.1105)
INDU40 (electricity)	0.0733 (.0584)	-0.0543 (.0587)	0.0983* (.0562)
INDU50 (construction)	0.0145 (.0309)	0.1277* (.0603)	-0.0529 (.0336)
INDU61 (wholesale trade)	0.1281** (.0438)	0.1876** (.0555)	0.1682** (.0576)
INDU62 (retail trade)	-0.1795** (.0304)	-0.0088 (.0414)	-0.1434** (.0449)
INDU63 (restaurants)	-0.1180** (.0383)	0.0896* (.0482)	-0.0460 (.0613)
INDU71 (transport)	-0.0586* (.0327)	0.1776** (.0512)	-0.1390** (.0394)

Table F1. (cont.)

Variable	All obs.	Women	Men
INDU72 (communication)	0.0873 (.0822)	0.0205 (.1755)	0.0996 (.0747)
INDU81 (financing)	0.1558** (.0405)	0.3060** (.0447)	0.4851** (.0888)
INDU82 (insurance)	0.2191** (.0621)	0.2602** (.0771)	0.3633** (.0586)
INDU83 (real estate)	0.0844* (.0397)	0.1486** (.0553)	0.1691** (.0480)
INDU92 (sanitary services)	-0.2587** (.0915)	-0.0587 (.1001)	-0.2350 (.2007)
INDU93 (social services)	0.0595 (.0459)	0.2456** (.0576)	0.1005 (.0788)
INDU94 (cultural services)	0.1924* (.0933)	0.4101** (.1322)	0.1570* (.0951)
INDU95 (personal services)	-0.1736** (.0405)	0.0609 (.0875)	-0.2530** (.0412)
R^2 adj.	0.1030	0.1190	0.1158
SEE	0.3707	0.3410	0.3618
F-all variables	12.09	6.81	8.01
Number of obs.	2416	1076	1340

1 Standard errors are given in parentheses below the estimates and are adjusted for heteroscedasticity according to White (1980). A simple Chow test suggests that the hypothesis of the parameter estimates being equal for male and female employees can be rejected at a 0.1 % level.

* Denotes significant estimate at a 5 % level.

** Denotes significant estimate at a 1 % level.

Table F2. Regression results for non-agricultural private-sector employees. Estimation of earnings equations including human capital variables as well as industry sector controls using OLS techniques.[1] The dependent variable is log hourly earnings *inclusive* of fringe benefits.

Variable	All obs.	Women	Men
CONSTANT	3.4768** (.0314)	3.3490** (.0540)	3.3856** (.0362)
BASIC EDUCATION	0	0	0
LOWER VOCATIONAL	0.0313* (.0167)	-0.0347 (.0256)	0.0789** (.0216)
UPPER VOCATIONAL	0.2000** (.0230)	0.1189** (.0353)	0.2506** (.0312)
SHORT NON-UNIV	0.3760** (.0420)	0.3277** (.0870)	0.3930** (.0487)
UNDERGRADUATE	0.5130** (.0618)	0.4899** (.0675)	0.4487** (.1385)
GRADUATE	0.5439** (.0505)	0.4276** (.1053)	0.6183** (.0548)
EXP	0.0166** (.0028)	0.0086* (.0046)	0.0221** (.0033)
EXP^2 /1000	-0.2801** (.0604)	-0.1558 (.0992)	-0.3668** (.0740)
SEN	0.0026** (.0010)	0.0022 (.0014)	0.0029* (.0015)
OJT	0.0994** (.0150)	0.0469* (.0208)	0.1340** (.0212)
WOM	-0.2142** (.0144)		
Industry sector indicators:			
INDU20 (mining)	0.0125 (.1041)	0.0905 (.1147)	0.0411 (.1660)
INDU31 (food manuf.)	-0.0203 (.0301)	0.0302 (.0404)	-0.0277 (.0484)
INDU32 (textile)	-0.0732** (.0302)	-0.0453 (.0410)	0.0005 (.0429)
INDU331 (wood prod.)	-0.0617* (.0312)	0.0393 (.0524)	-0.0810* (.0379)
INDU332 (furniture)	-0.1125* (.0512)	-0.0100 (.0724)	-0.1720** (.0648)
INDU341 (paper prod.)	0.1665** (.0295)	0.1289** (.0409)	0.1855** (.0375)
INDU342 (printing)	0.2101** (.0422)	0.2966** (.0607)	0.1961** (.0597)
INDU35 (chemicals)	0.0713* (.0382)	0.0660 (.0506)	0.0837* (.0484)

Table F2. (cont.)

Variable	All obs.	Women	Men
INDU36 (non-metallic)	-0.0051 (.0572)	-0.0325 (.0770)	0.0001 (.0705)
INDU37 (basic metal)	0.1056** (.0371)	0.1153* (.0648)	0.0785* (.0426)
INDU38 (metal products)	0	0	0
INDU39 (oth. manuf.)	0.1474 (.0910)	0.2043** (.0363)	0.1429 (.1122)
INDU40 (electricity)	0.0469 (.0421)	-0.0385 (.0482)	0.0547 (.0504)
INDU50 (construction)	0.0423 (.0260)	0.1198* (.0601)	0.0439 (.0287)
INDU61 (wholesale trade)	0.0921** (.0341)	0.1130** (.0466)	0.1029* (.0454)
INDU62 (retail trade)	-0.0741** (.0266)	-0.0092 (.0385)	-0.1042** (.0395)
INDU63 (restaurants)	0.0626* (.0343)	0.1216** (.0455)	0.0313 (.0528)
INDU71 (transport)	-0.0084 (.0293)	0.1310** (.0512)	-0.0337 (.0358)
INDU72 (communication)	0.0320 (.0620)	-0.0064 (.1820)	0.0215 (.0570)
INDU81 (financing)	0.1791** (.0323)	0.2497** (.0414)	0.2257** (.0791)
INDU82 (insurance)	0.1200** (.0412)	0.1854** (.0710)	0.1118** (.0440)
INDU83 (real estate)	0.0631* (.0308)	0.0941* (.0516)	0.0858** (.0364)
INDU92 (sanitary services)	-0.0899 (.0856)	-0.0138 (.0984)	-0.1869 (.1549)
INDU93 (social services)	0.0641 (.0459)	0.1955** (.0584)	-0.1147 (.0780)
INDU94 (cultural services)	0.2919** (.0930)	0.3937** (.1272)	0.1640 (.1052)
INDU95 (personal services)	-0.1221** (.0338)	0.0739 (.0680)	-0.1958** (.0335)
R^2 adj.	0.3276	0.2064	0.3399
SEE	0.3210	0.3237	0.3126
F-all variables	34.62	9.22	21.28
F-industry controls	6.99	4.33	4.72
Number of obs.	2416	1076	1340

1 For notes, see Table F1.

Table F3. Regression results for non-agricultural private-sector employees. Estimation of earnings equations controlling for a large set of personal and job characteristics using OLS techniques.[1] The dependent variable is log hourly earnings *inclusive* of fringe benefits.

Variable	All obs.	Women	Men
CONSTANT	3.5224** (.0674)	3.4474** (.0963)	3.4042** (.1031)
BASIC EDUCATION	0	0	0
LOWER VOCATIONAL	0.0408** (.0156)	-0.0150 (.0246)	0.0715** (.0199)
UPPER VOCATIONAL	0.1275** (.0249)	0.0977** (.0382)	0.1424** (.0320)
SHORT NON-UNIV	0.2520** (.0491)	0.2507** (.0951)	0.2215** (.0558)
UNDERGRADUATE	0.3548** (.0587)	0.4033** (.0699)	0.2063* (.1081)
GRADUATE	0.3411** (.0564)	0.3087** (.1103)	0.3734** (.0634)
EXP	0.0114** (.0028)	0.0116** (.0042)	0.0118** (.0036)
EXP^2 /1000	-0.1844** (.0617)	-0.2247** (.0912)	-0.1828* (.0793)
SEN	0.0031** (.0010)	0.0031** (.0013)	0.0026* (.0014)
OJT	0.0808** (.0136)	0.0566** (.0193)	0.0937** (.0195)
WOM	-0.1945** (.0157)		
MARRIED	0.0194 (.0151)	-0.0038 (.0215)	0.0372* (.0219)
$CHILD^{0-6}$	0.0106 (.0150)	0.0071 (.0264)	-0.0015 (.0184)
$CHILD^{7-17}$	0.0209 (.0131)	-0.0060 (.0182)	0.0425* (.0191)
CAPITAL	0.1280** (.0190)	0.1016** (.0268)	0.1443** (.0274)
TEMPEMPL	-0.0111 (.0403)	0.0516 (.0593)	-0.0820 (.0520)
PART-TIME	0.2924** (.0628)	0.2818** (.0603)	0.1879 (.2517)
PIECE-RATE	0.0761** (.0192)	0.0593* (.0361)	0.0993** (.0216)
NODAYWORK	0.0827** (.0170)	0.1128** (.0255)	0.0473* (.0222)
UNEMPL	-0.0222 (.0248)	0.0071 (.0384)	-0.0393 (.0320)

Table F3. (cont.)

Variable	All obs.	Women	Men
UNION	-0.0298* (.0173)	-0.0703** (.0292)	-0.0012 (.0214)
Occupational status indicators:			
OCC31 (management)	0.3182** (.0627)	0.2410** (.0806)	0.3765** (.1104)
OCC32 (education)	0.1144 (.0718)	-0.0741 (.1166)	0.2046* (.1155)
OCC33 (research)	0.0229 (.1475)	0.1467 (.1023)	0.1015 (.1846)
OCC34 (oth. seniors)	0.0990 (.0616)	0.0885 (.0734)	0.1387 (.1113)
OCC41 (supervisors)	0.0404 (.0528)	0.0050 (.0616)	0.0933 (.1007)
OCC42 (indep. clericals)	-0.0510 (.0528)	-0.0580 (.0576)	-0.0492 (.1056)
OCC43 (routine clericals)	-0.0536 (.0551)	-0.0892 (.0591)	0.1508 (.1719)
OCC44 (oth. lower-level non-manual workers)	0	0	0
OCC52 (manufacturing)	-0.0710 (.0530)	-0.1524** (.0613)	0.0012 (.0998)
OCC53 (oth. production)	-0.1261* (.0555)	-0.1523* (.0660)	-0.0722 (.1027)
OCC54 (service)	-0.1470** (.0558)	-0.1625** (.0649)	-0.1148 (.1021)
Industry sector indicators:			
INDU20 (mining)	0.0449 (.1027)	0.0021 (.1237)	0.0611 (.1508)
INDU31 (food manuf.)	-0.0121 (.0296)	0.0069 (.0385)	0.0075 (.0457)
INDU32 (textile)	-0.0625* (.0303)	-0.0309 (.0414)	0.0365 (.0438)
INDU331 (wood prod.)	-0.0531* (.0290)	0.0232 (.0523)	-0.0749* (.0343)
INDU332 (furniture)	-0.1162** (.0402)	-0.0472 (.0600)	-0.1472** (.0491)
INDU341 (paper prod.)	0.1851** (.0287)	0.1189** (.0418)	0.2237** (.0366)
INDU342 (printing)	0.1582** (.0358)	0.1770** (.0516)	0.1597** (.0522)
INDU35 (chemicals)	0.0699* (.0384)	0.0368 (.0508)	0.0980* (.0478)
INDU36 (non-metallic)	0.0094 (.0498)	-0.0061 (.0597)	0.0169 (.0622)

Table F3. (cont.)

Variable	All obs.	Women	Men
INDU37 (basic metal)	0.1350** (.0353)	0.0531 (.0886)	0.1344** (.0406)
INDU38 (metal products)	0	0	0
INDU39 (oth. manuf.)	0.0881 (.0898)	0.0997* (.0461)	0.1202 (.1101)
INDU40 (electricity)	0.0770* (.0402)	-0.0273 (.0429)	0.0805 (.0518)
INDU50 (construction)	0.0776** (.0252)	0.0662 (.0518)	0.0889** (.0285)
INDU61 (wholesale trade)	0.0257 (.0311)	0.0105 (.0449)	0.0315 (.0431)
INDU62 (retail trade)	-0.0842** (.0282)	-0.1062** (.0407)	-0.0399 (.0417)
INDU63 (restaurants)	0.0401 (.0378)	0.0370 (.0482)	0.0031 (.0690)
INDU71 (transport)	0.0225 (.0321)	0.0352 (.0535)	0.0652 (.0421)
INDU72 (communication)	0.0372 (.0630)	-0.0286 (.1694)	0.0681 (.0485)
INDU81 (financing)	0.1522** (.0361)	0.1836** (.0456)	0.1421* (.0812)
INDU82 (insurance)	0.1020* (.0468)	0.1002 (.0714)	0.1630** (.0506)
INDU83 (real estate)	-0.0001 (.0308)	-0.0058 (.0487)	0.0347 (.0378)
INDU92 (sanitary services)	-0.1479* (.0744)	-0.1021 (.0773)	-0.2573 (.1663)
INDU93 (social services)	-0.0074 (.0414)	0.0171 (.0497)	-0.0764 (.0810)
INDU94 (cultural services)	0.1785* (.0868)	0.1845 (.1176)	0.1304 (.0946)
INDU95 (personal services)	-0.0732* (.0352)	-0.0137 (.0679)	-0.1085** (.0424)
R^2 adj.	0.4180	0.2963	0.4377
SEE	0.2986	0.3048	0.2885
F-all variables	32.54	9.38	20.30
F-industry controls	5.72	2.58	3.67
Number of obs.	2416	1076	1340

1 For notes, see Table F1.

Table G1. Regression results for non-agricultural private-sector employees. Estimation of earnings equations including industry sector controls only using OLS techniques.[1] The dependent variable is log hourly earnings *exclusive* of fringe benefits.

Variable	All obs.	Women	Men
CONSTANT	3.7248** (.0193)	3.4876** (.0311)	3.8059** (.0210)
INDU20 (mining)	0.0005 (.1410)	0.2003 (.1751)	-0.0557 (.2023)
INDU31 (food manuf.)	-0.1142** (.0368)	0.0088 (.0452)	-0.0528 (.0555)
INDU32 (textile)	-0.2549** (.0357)	-0.0807* (.0441)	-0.0541 (.0532)
INDU331 (wood prod.)	-0.1210** (.0348)	0.0495 (.0573)	-0.1755** (.0409)
INDU332 (furniture)	-0.2191** (.0521)	-0.0330 (.0728)	-0.2530** (.0711)
INDU341 (paper prod.)	0.1684** (.0363)	0.1586** (.0445)	0.1861** (.0410)
INDU342 (printing)	0.1643** (.0479)	0.3660** (.0680)	0.1162* (.0663)
INDU35 (chemicals)	0.0910* (.0488)	0.1292* (.0625)	0.0931 (.0595)
INDU36 (non-metallic)	-0.0273 (.0587)	-0.0384 (.0763)	-0.0524 (.0653)
INDU37 (basic metal)	0.1901** (.0524)	0.1051* (.0622)	0.1510** (.0526)
INDU38 (metal products)	0	0	0
INDU39 (oth. manuf.)	0.2018* (.1008)	0.2174** (.0311)	0.1576 (.1104)
INDU40 (electricity)	0.0765 (.0585)	-0.0595 (.0584)	0.1042* (.0560)
INDU50 (construction)	0.0110 (.0304)	0.1112* (.0583)	-0.0538 (.0330)
INDU61 (wholesale trade)	0.1028** (.0416)	0.1781** (.0550)	0.1309** (.0544)
INDU62 (retail trade)	-0.1808** (.0297)	-0.0114 (.0411)	-0.1480** (.0435)
INDU63 (restaurants)	-0.1159** (.0382)	0.0887* (.0483)	-0.0471 (.0625)
INDU71 (transport)	-0.0608* (.0325)	0.1636** (.0534)	-0.1364** (.0387)

Table G1. (cont.)

Variable	All obs.	Women	Men
INDU72 (communication)	0.0889 (.0833)	0.0083 (.1804)	0.1055 (.0746)
INDU81 (financing)	0.1270** (.0403)	0.2751** (.0450)	0.4487** (.0871)
INDU82 (insurance)	0.2048** (.0620)	0.2413** (.0769)	0.3509** (.0584)
INDU83 (real estate)	0.0694* (.0387)	0.1373** (.0547)	0.1480** (.0466)
INDU92 (sanitary services)	-0.2589** (.0904)	-0.0616 (.0999)	-0.2376 (.1959)
INDU93 (social services)	0.0521 (.0452)	0.2382** (.0565)	0.0851 (.0799)
INDU94 (cultural services)	0.1958* (.0933)	0.4089** (.1323)	0.1629* (.0950)
INDU95 (personal services)	-0.1697** (.0403)	0.0612 (.0875)	-0.2479** (.0409)
R^2 adj.	0.1000	0.1114	0.1107
SEE	0.3647	0.3383	0.3547
F-all variables	11.73	6.39	7.66
Number of obs.	2416	1076	1340

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1 Standard errors are given in parentheses below the estimates and are adjusted for heteroscedasticity according to White (1980). A simple Chow test suggests that the hypothesis of the parameter estimates being equal for male and female employees can be rejected at a 0.1 % level.

* Denotes significant estimate at a 5 % level.

** Denotes significant estimate at a 1 % level.

Table G2. Regression results for non-agricultural private-sector employees. Estimation of earnings equations including human capital variables as well as industry sector controls using OLS techniques.[1] The dependent variable is log hourly earnings *exclusive* of fringe benefits.

Variable	All obs.	Women	Men
CONSTANT	3.4748**	3.3445**	3.3881**
	(.0310)	(.0533)	(.0358)
BASIC EDUCATION	0	0	0
LOWER VOCATIONAL	0.0329*	-0.0336	0.0802**
	(.0165)	(.0252)	(.0213)
UPPER VOCATIONAL	0.1955**	0.1210**	0.2424**
	(.0226)	(.0350)	(.0305)
SHORT NON-UNIV	0.3739**	0.3291**	0.3896**
	(.0410)	(.0874)	(.0465)
UNDERGRADUATE	0.5096**	0.4949**	0.4173**
	(.0610)	(.0671)	(.1326)
GRADUATE	0.5188**	0.4157**	0.5888**
	(.0499)	(.1010)	(.0547)
EXP	0.0164**	0.0089*	0.0216**
	(.0027)	(.0045)	(.0033)
EXP^2 /1000	-0.2754**	-0.1586	-0.3581**
	(.0597)	(.0980)	(.0733)
SEN	0.0026**	0.0021	0.0031*
	(.0010)	(.0014)	(.0015)
OJT	0.0949**	0.0467*	0.1266**
	(.0148)	(.0207)	(.0208)
WOM	-0.2088**		
	(.0142)		
Industry sector indicators:			
INDU20 (mining)	0.0136	0.0893	0.0394
	(.1040)	(.1139)	(.1655)
INDU31 (food manuf.)	-0.0230	0.0288	-0.0304
	(.0299)	(.0404)	(.0482)
INDU32 (textile)	-0.0780**	-0.0474	-0.0079
	(.0300)	(.0409)	(.0421)
INDU331 (wood prod.)	-0.0624*	0.0396	-0.0831*
	(.0303)	(.0524)	(.0365)
INDU332 (furniture)	-0.1115*	-0.0098	-0.1696**
	(.0510)	(.0726)	(.0646)
INDU341 (paper prod.)	0.1680**	0.1290**	0.1870**
	(.0294)	(.0407)	(.0374)
INDU342 (printing)	0.2084**	0.2919**	0.1955**
	(.0414)	(.0601)	(.0584)
INDU35 (chemicals)	0.0687*	0.0633	0.0801*
	(.0384)	(.0500)	(.0488)

Table G2. (cont.)

Variable	All obs.	Women	Men
INDU36 (non-metallic)	-0.0039 (.0576)	-0.0349 (.0777)	0.0014 (.0708)
INDU37 (basic metal)	0.1110** (.0370)	0.1152* (.0643)	0.0854* (.0422)
INDU38 (metal products)	0	0	0
INDU39 (oth. manuf.)	0.1530* (.0913)	0.2048 (.0363)	0.1483 (.1124)
INDU40 (electricity)	0.0505 (.0423)	-0.0432 (.0489)	0.0614 (.0502)
INDU50 (construction)	0.0380 (.0256)	0.1024* (.0577)	0.0401 (.0283)
INDU61 (wholesale trade)	0.0677* (.0324)	0.1031* (.0459)	0.0682 (.0427)
INDU62 (retail trade)	-0.0781** (.0261)	-0.0120 (.0382)	-0.1091** (.0384)
INDU63 (restaurants)	0.0604* (.0344)	0.1206** (.0456)	0.0294 (.0539)
INDU71 (transport)	-0.0117 (.0293)	0.1168* (.0535)	-0.0346 (.0353)
INDU72 (communication)	0.0348 (.0631)	-0.0179 (.1861)	0.0288 (.0572)
INDU81 (financing)	0.1504** (.0323)	0.2186** (.0417)	0.2040** (.0784)
INDU82 (insurance)	0.1109** (.0415)	0.1672** (.0708)	0.1136** (.0446)
INDU83 (real estate)	0.0487 (.0303)	0.0822 (.0509)	0.0685* (.0358)
INDU92 (sanitary services)	-0.0940 (.0849)	-0.0163 (.0982)	-0.1888 (.1514)
INDU93 (social services)	0.0583 (.0453)	0.1885** (.0571)	-0.1181 (.0789)
INDU94 (cultural services)	0.2936** (.0929)	0.3927** (.1275)	0.1712* (.1043)
INDU95 (personal services)	-0.1195** (.0336)	0.0741 (.0679)	-0.1921** (.0334)
R^2 adj.	0.3208	0.2014	0.3289
SEE	0.3168	0.3207	0.3081
F-all variables	33.58	8.98	20.30
F-industry controls	6.82	4.08	4.67
Number of obs.	2416	1076	1340

1 For notes, see Table G1.

Table G3. Regression results for non-agricultural private-sector employees. Estimation of earnings equations controlling for a large set of personal and job characteristics using OLS techniques.[1] The dependent variable is log hourly earnings *exclusive* of fringe benefits.

Variable	All obs.	Women	Men
CONSTANT	3.5173** (.0657)	3.4411** (.0927)	3.4033** (.1027)
BASIC EDUCATION	0	0	0
LOWER VOCATIONAL	0.0417** (.0155)	-0.0141 (.0242)	0.0726** (.0198)
UPPER VOCATIONAL	0.1291** (.0246)	0.1005** (.0378)	0.1445** (.0318)
SHORT NON-UNIV	0.2565** (.0485)	0.2516** (.0951)	0.2283** (.0544)
UNDERGRADUATE	0.3598** (.0585)	0.4083** (.0700)	0.1957* (.1069)
GRADUATE	0.3279** (.0562)	0.2996** (.1078)	0.3601** (.0631)
EXP	0.0116** (.0028)	0.0118** (.0041)	0.0118** (.0036)
EXP^2 /1000	-0.1865** (.0612)	-0.2282** (.0899)	-0.1820* (.0791)
SEN	0.0031** (.0010)	0.0030* (.0013)	0.0027* (.0014)
OJT	0.0780** (.0135)	0.0558** (.0192)	0.0894** (.0194)
WOM	-0.1909** (.0157)		
MARRIED	0.0164 (.0150)	-0.0050 (.0214)	0.0339 (.0217)
$CHILD^{0-6}$	0.0099 (.0149)	0.0047 (.0264)	-0.0012 (.0182)
$CHILD^{7-17}$	0.0197 (.0130)	-0.0076 (.0181)	0.0427** (.0190)
CAPITAL	0.1256** (.0189)	0.1025** (.0264)	0.1388** (.0273)
TEMPEMPL	-0.0081 (.0400)	0.0528 (.0591)	-0.0795 (.0519)
PART-TIME	0.2809** (.0622)	0.2679** (.0593)	0.2044 (.2503)
PIECE-RATE	0.0736** (.0190)	0.0605* (.0359)	0.0960** (.0214)
NODAYWORK	0.0821** (.0169)	0.1143** (.0253)	0.0442* (.0222)

Table G3. (cont.)

Variable	All obs.	Women	Men
UNEMPL	-0.0230 (.0248)	0.0058 (.0382)	-0.0389 (.0319)
UNION	-0.0235 (.0172)	-0.0640* (.0290)	0.0059 (.0213)
Occupational status indicators:			
OCC31 (management)	0.2839** (.0617)	0.2186** (.0801)	0.3391** (.1098)
OCC32 (education)	0.1080 (.0710)	-0.0730 (.1138)	0.1941* (.1150)
OCC33 (research)	0.0354 (.1437)	0.1490 (.1021)	0.1154 (.1847)
OCC34 (oth. seniors)	0.0935 (.0612)	0.0903 (.0725)	0.1247 (.1115)
OCC41 (supervisors)	0.0327 (.0522)	0.0007 (.0608)	0.0817 (.1006)
OCC42 (indep. clericals)	-0.0544 (.0520)	-0.0579 (.0564)	-0.0607 (.1052)
OCC43 (routine clericals)	-0.0596 (.0543)	-0.0919 (.0579)	0.1526 (.1725)
OCC44 (oth. lower-level non-manual workers)	0	0	0
OCC52 (manufacturing)	-0.0702 (.0522)	-0.1529** (.0600)	-0.0011 (.0997)
OCC53 (oth. production)	-0.1258* (.0548)	-0.1564** (.0648)	-0.0719 (.1026)
OCC54 (service)	-0.1435** (.0549)	-0.1610** (.0637)	-0.1092 (.1017)
Industry sector indicators:			
INDU20 (mining)	0.0450 (.1021)	0.0046 (.1242)	0.0591 (.1490)
INDU31 (food manuf.)	-0.0154 (.0295)	0.0059 (.0385)	0.0029 (.0454)
INDU32 (textile)	-0.0675* (.0305)	-0.0328 (.0413)	0.0263 (.0472)
INDU331 (wood prod.)	-0.0547* (.0287)	0.0023 (.0523)	-0.0773* (.0338)
INDU332 (furniture)	-0.1142** (.0402)	-0.0444 (.0599)	-0.1464** (.0496)
INDU341 (paper prod.)	0.1844** (.0287)	0.1183** (.0417)	0.2234** (.0367)
INDU342 (printing)	0.1574** (.0355)	0.1736** (.0514)	0.1602** (.0513)

Table G3. (cont.)

Variable	All obs.	Women	Men
INDU35 (chemicals)	0.0664* (.0388)	0.0324 (.0500)	0.0934* (.0487)
INDU36 (non-metallic)	0.0081 (.0504)	-0.0097 (.0602)	0.0154 (.0625)
INDU37 (basic metal)	0.1361** (.0352)	0.0535 (.0871)	0.1354** (.0405)
INDU38 (metal products)	0	0	0
INDU39 (oth. manuf.)	0.0972 (.0880)	0.0988* (.0460)	0.1306 (.1086)
INDU40 (electricity)	0.0792* (.0402)	-0.0335 (.0426)	0.0853* (.0515)
INDU50 (construction)	0.0720** (.0250)	0.0519 (.0504)	0.0831** (.0283)
INDU61 (wholesale trade)	0.0084 (.0302)	0.0033 (.0441)	0.0055 (.0416)
INDU62 (retail trade)	-0.0852** (.0279)	-0.1077** (.0406)	-0.0416 (.0413)
INDU63 (restaurants)	0.0379 (.0376)	0.0353 (.0482)	0.0054 (.0679)
INDU71 (transport)	0.0178 (.0321)	0.0237 (.0561)	0.0591 (.0414)
INDU72 (communication)	0.0408 (.0635)	-0.0390 (.1721)	0.0733 (.0484)
INDU81 (financing)	0.1290** (.0362)	0.1561** (.0458)	0.1289 (.0817)
INDU82 (insurance)	0.0935* (.0464)	0.0819 (.0711)	0.1663** (.0495)
INDU83 (real estate)	-0.0111 (.0305)	-0.0143 (.0484)	0.0206 (.0373)
INDU92 (sanitary services)	-0.1485* (.0738)	-0.1020 (.0776)	-0.2606 (.1628)
INDU93 (social services)	-0.0129 (.0412)	0.0124 (.0488)	-0.0848 (.0830)
INDU94 (cultural services)	0.1816* (.0872)	0.1851 (.1182)	0.1388 (.0953)
INDU95 (personal services)	-0.0705* (.0350)	-0.0099 (.0677)	-0.1083** (.0420)
R^2 adj.	0.4038	0.2879	0.4182
SEE	0.2968	0.3029	0.2869
F-all variables	30.74	9.05	18.82
F-industry controls	5.61	2.41	3.72
Number of obs.	2416	1076	1340

1 For notes, see Table G1.

Table H. Industry means for 26 private-sector industries, 1987

Industry	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Mining	1.00	21.20	0.762	114.00	0.075	0.400	0.400	0.800
Food manufacturing	1.29	18.44	0.340	98.44	0.063	0.818	0.556	0.754
Textile industries	1.00	17.71	0.146	65.24	0.085	0.846	0.817	0.865
Wood products	1.03	18.89	0.262	77.44	0.044	0.829	0.286	0.771
Furniture	1.36	16.80	0.160	83.39	0.154	0.800	0.480	0.800
Paper products	1.37	18.90	0.893	158.12	0.065	0.895	0.286	0.705
Printing	1.73	15.57	0.174	107.28	0.119	0.786	0.483	0.562
Chemicals	1.94	16.86	0.558	138.14	0.111	0.846	0.295	0.577
Non-metallic products	1.18	18.18	0.273	108.28	0.160	0.868	0.184	0.842
Basic metal industries	1.35	19.50	0.555	117.56	0.036	1.000	0.115	0.769
Metal products	1.84	16.02	0.177	99.30	0.130	0.798	0.255	0.676
Other manufacturing	2.14	13.14	0.151	83.67	0.138	0.571	0.143	0.286
Electricity etc.	1.87	18.84	2.270	206.65	0.098	0.839	0.226	0.548
Construction	1.46	16.19	0.064	91.09	0.086	0.723	0.106	0.774
Wholesale trade	2.08	17.74	0.313	111.53	0.110	0.478	0.403	0.239
Retail trade	1.21	17.48	0.209	64.38	0.050	0.661	0.627	0.186
Restaurants, hotels	1.54	15.19	0.095	62.47	0.072	0.702	0.821	0.690
Transport	1.40	15.66	0.560	112.75	0.126	0.620	0.302	0.651
Communication	1.47	17.88	0.473	106.96	0.157	0.941	0.235	0.471
Financing	2.09	17.51	0.270	132.48	0.247	0.759	0.819	0.034
Insurance	2.91	16.06	0.597	129.71	0.174	0.656	0.531	0.031
Real estate	2.72	14.22	0.563	157.83	0.252	0.500	0.486	0.200
Sanitary services	1.36	13.00	1.129	90.78	0.143	0.400	0.720	0.840
Social services	2.85	15.37	0.122	155.31	0.410	0.658	0.691	0.130
Recreational services	1.55	13.82	0.322	129.66	0.240	0.788	0.667	0.333
Personal services	1.40	15.32	0.078	71.28	0.211	0.574	0.319	0.808

(1) Average years of above-primary schooling.
(2) Average years of experience.
(3) Capital-labour ratio, calculated from National Accounts data as the ratio of the gross fixed capital stock to hours worked. (The means are multiplied by 10^3.)
(4) Productivity, calculated from National Accounts data as the ratio of real value added to hours worked.
(5) Profitability, calculated from National Accounts data as the ratio of net operating profit to gross output.
(6) Average union density.
(7) Average share of females.
(8) Average share of manual workers.

Table I. Correlations between the industry wage premiums measured for private-sector employees (column 3 of Table 2 in the text) and the industry characteristics in Table H above.

Industry	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Wage premium	1.00								
2. Average years of above-primary schooling	0.26	1.00							
3. Average years of experience*	0.11	-0.43	1.00						
4. Capital-labour ratio	0.12	0.04	0.24	1.00					
5. Productivity	0.50	0.52	0.15	0.68	1.00				
6. Profitability	0.01	0.65	-0.49	-0.17	0.35	1.00			
7. Average union density	0.34	-0.25	0.39	-0.01	0.12	-0.23	1.00		
8. Average share of females	-0.20	0.12	-0.26	-0.17	-0.16	0.32	-0.24	1.00	
9. Average share of manual workers	-0.32	-0.78	0.28	0.05	-0.36	-0.54	0.22	-0.29	1.00

* The industry means of average seniority, i.e. average years with the present employer, were not included because of the strong multicollinearity between average years of total work experience and seniority (the simple correlation is 0.85).

CHAPTER VII

DATA ANALYSIS AND COMPLEMENTARY ESTIMATION RESULTS

ABSTRACT:

The present chapter examines in detail the cross-sectional micro-level data, i.e. the Labour Force Survey for 1987 conducted by Statistics Finland, underlying the empirical analyses of human capital-related earnings effects for Finland reported in the previous chapters of this study. In addition, the chapter offers complementary as well as comparative empirical evidence on earnings determination in support of the definitions of variables actually used in the estimations, and of the sorting procedures resulting in the final estimating data.

LIST OF CONTENTS:

1. INTRODUCTION

The present chapter examines in detail the data underlying the empirical analyses of human capital-related earnings effects for Finland reported in the previous chapters of this study. It also offers complementary as well as comparative empirical evidence on earnings determination in support of the definitions of variables actually used in the estimations, and of the sorting procedures resulting in the final estimating data.

The cross-sectional micro-level data used come from the Labour Force Survey for 1987 conducted by Statistics Finland.[1] The year 1987 is chosen because it is the first and, until recently, the only year for which Finnish Labour Force Survey data have been supplemented with income data from the tax rolls. The Labour Force Survey database is preferred to Population Census data because it comprises additional information of vital importance in human capital earnings analysis not available in Finnish census data. A fundamental shortcoming of the survey database, however, is that it is does not provide the type of panel data needed in studies of the present kind, because the survey sample varies from one year to another.

There is, however, also another problem present in the data set, a shortcoming which it has in common with most other survey data sets. This drawback arises from the combination of survey data collected at a particular time during the year (in August in the current survey) with annual income data for that same year. The survey data do not concern the calendar year but the twelve months preceding the time of the questionnaire. Hence, the implicit assumption made in using the two data sources is that these twelve months can be taken to reflect the situation prevailing during the entire calendar year, i.e. also the four months after August about which no information is available. Obviously, this inevitable assumption will affect the construction of some variables, not least the hourly earnings variable. It also adds to the explanation of some of the problems that will be pointed out later on.

The regression results reported in this chapter are based on the standard Mincer (1974) earnings function[2] completed with a broad set of other personal and job-related variables. This extended earnings model is estimated using sample selection procedures to allow for the possibility of selectivity bias influencing the estimation results. The econometric specification of the earnings function and the estimation procedure used are described in Chapter III of this study.

The chapter is organized as follows. Section 2 defines the variables used in the estimations of human capital earnings specifications. Section 3 describes the procedures adopted for sorting out the survey data, and compares various sorted sample groups mainly in terms of their distribution across central personal and job characteristics. In Section 4, the actual estimating data set is investigated in more detail with respect to alternative definitions of crucial variables and to the conspicuous parameter estimates obtained for certain explanatory variables included in the estimations.

2. DEFINITIONS OF VARIABLES

This section defines the variables used in the estimations of human capital earnings equations. Some of the variables are described in somewhat more detail in subsections 2.1 to 2.7. A summary of definitions concludes the section. In some cases, alternative definitions of variables have been implemented. These alternative definitions and the corresponding estimation results are reported and discussed in Section 4.

2.1. Earnings

The dependent variable is chosen to be before-tax average hourly earnings (EARN) in order to allow for individual differences in months and weekly hours worked. This approach also aims at making the earnings of full-time and part-time employees comparable. The hourly earnings of individuals are calculated from the annual wage and salary income recorded in the tax rolls and an estimated annual amount of hours worked, exclusive of earnings from and hours worked in spare-time occupations. The earnings data used comprise most types of compensation. Fringe benefits are not accounted for, unless otherwise indicated.

The annual amount of working hours is estimated from survey information on the total number of months worked during the time period covered by the survey and weekly normal working hours. In the case of part-time employees, account is also made for the weekly frequency of part-time work. The annual amount of hours worked thus refers to normal working hours, while the earnings data include, inter alia, overtime and vacation pay. As a consequence, the calculated average hourly earnings may overestimate the individuals' actual hourly earnings. (For slightly different definitions of the dependent variable, see Section 4.1.)

2.2. Schooling

The regular education system in Finland is composed of the comprehensive school, the senior secondary school, vocational and professional education institutions, and universities. A detailed presentation of the Finnish education system is given in CSO (1991, pp. 211-244).

The comprehensive school provides basic education and is compulsory for the whole age group 7 to 16. It was introduced gradually in the 1970s, which means that age groups attending basic education have completed the 9 years of compulsory general education only since the early 1980s. Before that, these young age groups were principally divided into two categories: those who received 6-8 years of general education at the primary level, and those who received 4 years in primary school followed by 5 years at the lower secondary level. Because of the increasing length of basic education, especially older age groups have usually received less compulsory general education.

Vocational and professional education institutions provide education both at the upper secondary level (vocational schools) and at the tertiary level (vocational colleges, technical institutes). Vocational education provided by vocational schools usually takes 2-3 years. Based on the length of the training, upper secondary education is divided into lower-level and upper-level education, whereby the former refers to less than three years of vocational and professional training and the latter to about three years of training.

The post-comprehensive general education provided by senior secondary schools is also classified as an upper level of upper secondary education. The share of persons with no degree other than the matriculation examination is, however, very low in Finland (less than 3 per cent of the population).

Tertiary-level or higher education comprises three (previously four) levels of education. Vocational and professional schooling at the lowest level of tertiary education is provided by vocational colleges and technical institutes and takes 4-6 years. The certificates issued to graduates of education institutions at this level are not equivalent to university degrees.

A declining number of persons have completed an undergraduate, i.e. Bachelor-level, university degree. This is partly the result of a degree system reform, whereby the first degrees of Candidates in the Humanitites and Candidates in the Natural Sciences were abolished and that of Candidates of Economics and the class teacher qualifications were raised to Master's level. Today, all first university degrees are equivalent to a Master's degree and take, on average, 6-8 years to complete, whereas BA-level degrees are completed mainly in vocational and professional education institutions. Postgraduate schooling, finally, includes degrees at the licentiate and doctorate levels.

Ideally, earnings differentials should be related to the actual schooling differences which generate them. The employed data set does not allow this, however; the available register data[3] on formal schooling merely show the single highest level of education completed by each individual. There is a total of eight levels of education which are turned into years of full-time schooling (SCHOOL) using the Finnish Standard Classification of Education (CSO, 1985):

Basic education:
1. lower level of basic education (less than 9 years),
2. upper level of basic education (about 9 years),

Upper secondary education:
3. lower level of upper secondary education (about 10-11 years),
4. upper level of upper secondary education (about 12 years),

Higher education:
5. lowest level of higher education (about 13-14 years),
6. undergraduate level of higher education (about 15 years),
7. graduate level of higher education (about 16 years), and
8. postgraduate or equivalent education.

The use of this stereotype key gives rise to several problems, especially when the person has completed no formal schooling beyond the basic level of education. First, the only information provided by the classification key is that a person at the lower level of basic education has acquired less than 9 years of formal schooling. The actual number of schooling years is not known but can be expected to vary considerably, not least across age groups. The question then is how many years of primary education these persons should be assigned.

Closely linked to this question is a second complication: due to an increasing length of compulsory schooling, persons from different age groups have of necessity received different amounts of basic education as mentioned above. Should persons with a shorter compulsory education be regarded as less educated than persons with a longer compulsory schooling? And how are such differences to be taken into account when people from different age groups are registered to have completed the same level of above-primary education?

These types of problem have been circumvented by setting the basic education equal to 9 years for all individuals with no formal schooling beyond the primary education. Likewise, each individual with a given level of above-primary education has been assigned the same "normal" number of schooling years irrespective of the length of the previous schooling and the actual number of years needed by the individual to acquire the degree.[4] In the estimations, the schooling variable (S) is defined as total years of schooling minus 9 - i.e., the estimated coefficient of S measures the average return to an additional year in postcompulsory schooling.

The question has also been raised whether it is appropriate to let schooling enter the regression in a linear form as in the standard human capital earnings function. This question is addressed by letting indicator variables represent the different levels of education listed above. More exactly, six schooling indicators are distinguished in the estimations. BASIC EDUCATION, which is used as the reference group, comprises all individuals with only a basic education (educational levels 1 and 2). LOWER VOCATIONAL and UPPER VOCATIONAL stand for individuals with, respectively, completed lower-level (educational level 3) and completed upper-level (educational level 4) of upper secondary education. The four levels of higher education are represented by three indicator variables: SHORT

NON-UNIV (educational level 5), UNDERGRADUATE (educational level 6), GRADUATE (educational levels 7 and 8). Unfortunately, too few observations in the data prevent a distinction to be made between persons with a graduate degree and persons with a postgraduate degree.

2.3. Experience

The data comprise self-reported information on the person's total work experience (EXP) and his or her years with the current employer (SEN), i.e. seniority (tenure). The reported years of work experience have been checked against the person's age and his or her transformed years of formal schooling plus 7 (the age of school start in Finland). If the sum of experience years, formal schooling years and pre-school years exceeds the person's physical age, the total years of work experience are reduced to the same extent. Any inconsistencies between reported total work experience and seniority are also eliminated, the reason being that people generally remember their years with the present employer better than their total work experience.

2.4. On-the-job training

The survey information on on-the-job training (OJT) received by the employee during the previous twelve months refers to any professional or trade union training provided within the framework of a structured course that is partly or wholly sponsored by the employer. In other words, these self-reported data cover only employer-financed formal on-the-job training, excluding all other forms of labour market training. But on the other hand, this is the by far most important mode of formal adult training in Finland (e.g. Asplund, 1991).

2.5. Unemployment

The survey data provide information on unemployment and temporary layoffs experienced by individuals classified as employees as well as on unemployment benefits received during the survey year. The information on the individuals' state of employment is self-reported, whereas the information on unemployment benefits is compiled from the tax rolls.

More detailed analysis of the data reveals that there is some degree of inconsistency between the self-reported state of employment and the unemployment benefits recorded in the tax rolls. This is without doubt partly explained by the fact that the former only reflects the situation up to the week of the questionnaire (August), while the latter concerns the calendar year. The discrepancy between the survey data and the income data is probably no serious problem, however, in view of the mostly insignificant parameter estimates obtained for this variable.

Three categories can be distinguished: (1) individuals who self-reportedly have been unemployed or temporarily laid off during the time period covered by the survey and who have also received unemployment benefits subject to taxation; (2) individuals who self-reportedly have been unemployed or temporarily laid off but who have not received unemployment benefits subject to taxation; and (3) individuals who self-reportedly have been constantly employed but who have, according to the tax rolls, received unemployment benefits.[5] In the estimations, the unemployment indicator variable (UNEMPL) takes a value of one in all three cases, and a value of zero otherwise.

2.6. Occupational social status

The Labour Force Survey comprises two-digit level information on the individuals' occupational social status according to the standard Finnish Classification of Socio-economic Groups of 1983 (CSO, 1983). Indeed, this classification is argued to be the most appropriate to use when a distinction is to be made between non-manual and manual workers based on a data set covering the entire population in paid-employment (Lehto, 1988).

In determining the occupational social status of an individual, several different classification criteria are used, of which by far the most decisive is the nature of the person's occupation and work. In part, also industry, the juridical form of the enterprise or workplace, and the size of the personnel are used as a basis of division. Based on these criteria, individuals in paid-employment are classified into three broad categories: upper-level salaried employees, lower-level salaried employees, and manual workers.

Each of the two categories of salaried employees is further divided into four subgroups depending on, inter alia, the level of responsibility and independency associated with the working tasks performed. The category of manual workers is also divided into four subgroups, but according to occupational group and industrial sector. Hence, a distinction is made between a total of 12 occupational social status categories:

Upper-level employees with administrative, managerial, professional and related occupations:
31 Senior officials and upper management
32 Senior officials and employees in research and planning
33 Senior officials and employees in education and training
34 Other senior officials and employees

Lower-level employees with administrative and clerical occupations:
41 Supervisors
42 Clerical and sales workers, independent work
43 Clerical and sales workers, routine work
44 Other lower-level employees with administrative and clerical occupations

Manual workers:
51 Workers in agriculture, forestry and commercial fishing
52 Manufacturing workers
53 Other production workers
54 Distribution and service workers

2.7. Industrial sector

The survey data provide three-digit level information on the employees' distribution across industrial sectors according to the Standard Industrial Classification (SIC) 1979 (CSO, 1979). Since the SIC is an application for Finland of the 1968 edition of the ISIC, the main principles and definitions used in compiling the SIC follow the recommendations in the ISIC.

The most detailed level of the SIC is represented by six-digit codes, in which the first four digits are identical with the code of the ISIC group to which the class in question belongs. Exceptions occur, though, in the case of some classes, in which the last digit or the last two or three digits in the ISIC are zeros. In these cases, national subdivisions of the ISIC classes have been introduced already at the two-, three- or four-digit levels. The ISIC groups where national subdivisions have been introduced at the four-digit or higher level are the following: agricultural and livestock production (1110), forestry (1210), construction (5000), wholesale trade (6100), retail trade (6200), restaurants and other eating and drinking places (6310), hotels and other lodging places (6320), insurance (8200), real estate (8310), public administration and defense (9100), sanitary and similar services (9200), education services (9310), and welfare institutions (9340).

2.8. Summary of definitions

Table 1 gives a summary of definitions of variables employed in the more detailed examination of the estimation data undertaken in the next two sections as well as in the empirical analyses of earnings determination in Finland reported in Chapters III-VI of this study. The male and female employees retained in the actual estimating data are described in terms of these variables in Table A of the Appendix. The simple correlations between selected variables are displayed in Tables B-D of the Appendix.

3. SORTING OUT THE SURVEY DATA

The Labour Force Survey contains 9000 individuals, representing the entire population aged 15 to 64 years as stratified according to sex, age, and region. For data quality-related reasons such as drop-outs, the effective survey database, from which the actual estimation data are formed, comprises a total of 7748 persons. These individuals are classified into nine categories according to their main state of activity during the week of the questionnaire. When disregarding self-employed persons (some 14 per cent of the employed and close to 5 per cent of the unemployed), the remaining 6964 sample individuals are distributed across the nine activity categories as shown in Table 2. As can be seen from the table, a large majority of the sample individuals is recorded to be employed.

Table 1. Summary of definitions of variables employed in the empirical analysis of earnings differentials in Finland. The information is self-reported, except for the earnings data and the data on formal schooling, age, gender, marital status, and location of residence.

Variable	**Definition**
EARN	Average hourly earnings (in FIM) calculated from the before-tax annual wage and salary income recorded in the tax rolls and an estimated amount of annual normal working hours. The earnings data comprise most types of compensation, including overtime and vacation pay. Fringe benefits are not included, unless otherwise indicated.
ln EARN	Natural logarithm of EARN.
SCHOOL	Years of formal schooling evaluated from register information on the single highest level of education completed using the Finnish Standard Classification of Education.
S	Years of formal schooling with basic education (9 years of schooling) set equal to zero, i.e. S = SCHOOL - 9.
BASIC EDUCATION	Indicator for persons with basic education only (educational level 1 or 2).
LOWER VOCATIONAL	Indicator for persons with completed lower-level of upper secondary education (educational level 3 = less than three years in vocational school).
UPPER VOCATIONAL	Indicator for persons with completed upper-level of upper secondary education (educational level 4 = about three years in vocational school, matriculation).
SHORT NON-UNIV	Indicator for persons with completed lowest level of higher education (educational level 5 = vocational non-university degree).
UNDERGRADUATE	Indicator for persons with completed undergraduate university education (educational level 6 = BA level).
GRADUATE	Indicator for persons with completed graduate university education (educational level 7 or 8 = MA level or above).
EXP	Total years of work experience.
SEN	Seniority, i.e. years with the present employer.
PREEXP	Total years of experience with previous employers calculated as PREEXP = EXP - SEN.
WOM, MALE	Indicators for gender.
AGE	Physical age of the individual.
MARRIED	Indicator for married persons and singles living together.
$CHILD^{0-17}$	Indicator for children aged 0 to 17 living at home.
$CHILD^{0-6}$	Indicator for children aged 0 to 6 living at home.
$CHILD^{7-17}$	Indicator for children aged 7 to 17 living at home.

SOUTH	Indicator for residence in the southern parts of Finland (Uudenmaan province, Turun- ja Porin province, Ahvenanmaa, Hämeen province, and Kymen province).
CAPITAL	Indicator for residence within the Great Helsinki area.
TEMPEMPL	Indicator for persons in temporary employment.
PART-TIME	Indicator for persons in part-time work.
PIECE-RATE	Indicator for persons not paid on a monthly, weekly or hourly basis.
NODAYWORK	Indicator for persons not engaged in regular day-time work.
UNEMPL	Indicator for persons who have been unemployed or temporarily laid off during the previous twelve months.
UNION	Indicator for unionized employees.
OJT	Indicator for persons who have received formal on-the-job training during the previous twelve months.
OJTDAYS	Total number of days of formal on-the-job training during the previous twelve months.
MOVE	Indicator for job mobility proxied by MOVE = 1 if EXP > SEN.
NWWH	Weekly normal working hours.
SWWH	Hours worked during the week of the questionnaire.
OTWH	Overtime hours worked during the week of the questionnaire.
PUBLOCAL	Indicator for employment in the local government (municipality) sector.
OCC31	Indicator for senior officials and upper management (FCSEG=31).
OCC32	Indicator for senior officials and employees in research and planning (FCSEG=32).
OCC33	Indicator for senior officials and employees in education and training (FCSEG=33).
OCC34	Indicator for other senior officials and employees (FCSEG=34).
OCC41	Indicator for supervisors (FCSEG=41).
OCC42	Indicator for clerical and sales workers, independent work (FCSEG=42).
OCC43	Indicator for clerical and sales workers, routine work (FCSEG=43).
OCC44	Indicator for other lower-level employees with administrative and clerical occupations (FCSEG=44).
OCC51	Indicator for workers in agriculture, forestry and commercial fishing (FCSEG=51).
OCC52	Indicator for manufacturing workers (FCSEG=52).
OCC53	Indicator for other production workers (FCSEG=53).
OCC54	Indicator for distribution and service workers (FCSEG=54).

INDU11-13	Indicator for employment in agriculture (SIC11), forestry (SIC12), fishing (SIC13).
INDU20	Indicator for employment in mining and quarrying (SIC20).
INDU31	Indicator for employment in food manufacturing (SIC31).
INDU32	Indicator for employment in textile and equiv. industries (SIC32).
INDU33	Indicator for employment in manufacturing of wood products (SIC33).
INDU34	Indicator for employment in manufacturing of paper products (SIC34).
INDU35	Indicator for employment in manufacturing of chemicals (SIC35).
INDU36	Indicator for employment in manufacturing of non-metallic products (SIC36).
INDU37	Indicator for employment in basic metal industries (SIC37).
INDU38	Indicator for employment in manufacturing of metal products (SIC38).
INDU39	Indicator for employment in other manufacturing (SIC39).
INDU40	Indicator for employment in electricity, gas and water (SIC40).
INDU50	Indicator for employment in construction (SIC50).
INDU61	Indicator for employment in wholesale trade (SIC61).
INDU62	Indicator for employment in retail trade (SIC62).
INDU63	Indicator for employment in restaurants and hotels (SIC63).
INDU71	Indicator for employment in transport and storage (SIC71).
INDU72	Indicator for employment in communication (SIC72).
INDU81	Indicator for employment in financing (SIC81).
INDU82	Indicator for employment in insurance (SIC82).
INDU83	Indicator for employment in real estate and business services (SIC83).
INDU91	Indicator for employment in public administration, defence and public order (SIC91).
INDU92	Indicator for employment in sanitary services (SIC92).
INDU93	Indicator for employment in social services (SIC93).
INDU94	Indicator for employment in recreational and cultural services (SIC94).
INDU95	Indicator for employment in personal and household services (SIC95).

Notes. FCSEG = Finnish Classification of Socio-economic Groups of 1983.
SIC = National Standard Industrial Classification of 1979.

Table 2. Distribution of sample individuals according to their main activity during the week of the questionnaire

Category of activity	Effective survey data No. of obs.	Rel. share	Actual estimating data No. of obs.	Rel. share
1. Employed*	4 694	67.4	3 895	64.7
2. Students	824	11.8	680	11.3
3. Disability pensioners	569	8.2	568	9.4
4. Unemployed*	261	3.7	260	4.3
5. Persons doing housework	258	3.7	257	4.3
6. Old-age pensioners	161	2.3	161	2.7
7. Unemployment pensioners	115	1.6	115	1.9
8. Conscripts	56	0.8	56	0.9
9. Others	26	0.4	26	0.4
1-9 Total	6 964	100.0	6 018	100.0

* Exclusive of self-employed persons.

This section outlines in more detail the sorting procedures resulting in the actual estimating data set, which is also displayed in Table 2. In addition, each category of sample individuals is described in terms of the variables used in the empirical analysis of earnings determination. Section 3.1. starts with the non-participant groups (categories 2-9), which are used to correct for the potential presence of sample selectivity bias in the estimations of earnings equations. Thereafter the focus is turned to the main issue of the data analysis, i.e. the category of employed persons.

3.1. Non-participants

The slight difference in the absolute size of the various non-participant categories between the effective survey data and the actual estimating data (Table 2) is almost entirely due to restricting the investigated sample to individuals aged 16 to 64. As is to be expected, the exclusion of 15-year-old persons from the sample reduces mainly the number of students.

Table 3. Sample means of explanatory variables included in the selectivity equation, i.e. the equation explaining the probability of being classified as an employee; non-participant categories compared with the category of employed persons and the whole estimation data set

Category of activity	AGE	MALE	MARRIED	CHILD$^{0-17}$	BASIC	SOUTH	No of obs.
	Selectivity equation variables						
1. Employed	37.17	0.4899	0.7366	0.4876	0.3605	0.6644	3 895
2. Students	20.13	0.4279	0.1500	0.0603	0.5882	0.5676	680
3. Disability pensioners	54.22	0.5229	0.6197	0.0880	0.7975	0.4912	568
4. Unemployed	35.20	0.5346	0.5423	0.2731	0.5385	0.4385	260
5. Persons doing housework	41.83	0.0156	0.8949	0.6381	0.4903	0.5486	257
6. Old-age pensioners	60.72	0.4348	0.7702	0.0435	0.6708	0.5838	161
7. Unemployment pensioners	59.87	0.4174	0.7217	0.0609	0.7826	0.5130	115
8. Conscripts	20.02	1.0000	0.1250	0.0536	0.3214	0.5357	56
9. Others	36.96	0.4615	0.3077	0.1154	0.6154	0.5769	26
1-9. Total	37.87	0.4694	0.6507	0.3730	0.4578	0.6158	6 018
- Males	37.25	-	0.6368	0.3487	0.4506	0.6046	2 825
- Females	38.42	-	0.6630	0.3946	0.4641	0.6257	3 193

Note. The variables are defined in Section 2.

Correction for potential sample selectivity bias in the estimations is done with reference to all non-participant categories in the survey. This approach is chosen because of the small share in the sample of each non-participant category. In the estimations, the probability of being employed, i.e. of being classified as an employee (category 1), is explained in terms of a vector of personal characteristics including age, gender, marital status, family size, educational degree, and location of residence. Specifically, apart from the physical age of the individual (AGE), the selectivity equation incorporates indicators for being a male (MALE), marriage (MARRIED), dependent children ($CHILD^{0-17}$), no formal schooling beyond a basic education (BASIC), and residence in the southern, economically more developed regions of Finland (SOUTH). In Table 3, each of the eight non-participant categories is described in terms of these characteristics. For comparison, the corresponding mean statistics for the category of employed as well as for the whole estimating data set are also displayed in the table.

3.2. The category of employed persons

The category of employed persons comprises only those sample individuals who had self-reportedly been in paid-employment during the week of the questionnaire, i.e. who had worked one or several days during the survey week or had been only temporarily away from work. As illustrated in Table 2 above, there is a total of 4694 employees in the effective survey data, of which 3895 are retained in the actual estimating data. The sorting procedures resulting in this reduction in the database is outlined below.

When the effective survey data are restricted to employed wage and salary earners aged 16 to 64, the data set shrinks only slightly (to some 4680 persons). As is to be expected, the number of employed 15-year-old persons is negligible. Missing data on critical variables cause a further reduction in the estimation database, yielding a total of 4040 observations. A relatively small number of observations is rejected because of incomplete information on explanatory variables used in the estimations of earnings equations. A major part of the rejected observations nevertheless had to be skipped because of inappropriate or missing data on variables needed for the calculation of the dependent variable, i.e. average before-tax hourly earnings.

In particular, all observations are rejected for which there is incomplete information either on total months worked during the previous twelve months or on weekly normal working hours, or on both. Part-time employees with insufficient information on the weekly frequency of their work are also disregarded. Individuals who had worked both full-time and part-time are also excluded. The reason is that the Labour Force Survey only provides information on weekly normal working hours in the current job. It is also not explicitly stated whether these working hours refer to the reported months worked in full-time or in part-time employment. Although the amount of weekly working hours allows a distinction ex post in this respect, we still lack information on weekly normal working hours for the rest of the months worked during the time period covered by the survey.

Of the almost 640 rejected observations, however, the above sorting procedures explain only about one half. A conspicuous number of observations (306 in all) had to be omitted because, according to the tax rolls, these self-reportedly employed persons had had no earnings from principal occupation subject to taxation during the survey year. For a large majority, no other incomes subject to taxation are recorded in the tax rolls, either. Detailed examination of personal and job characteristics reported by these zero earners offers no unambiguous explanation for this rather unsatisfactory outcome. On the contrary, it reveals quite a few circumstances which are clearly at odds with the zero earnings recorded in the tax rolls.

Thus only a minor number of the 306 zero earners had been unemployed/laid off or had been studying during at least part of the time period covered by the survey. Less than 5 per cent of them had been employed part-time (mostly during the entire time period surveyed). Conversely, some 95 per cent of the zero earners reported that they had been employed full-time. Of these, over 90 per cent had constantly worked full-time. Moreover, some 84 per cent of the full-time working individuals with zero earnings reported their weekly normal working hours to fall within the range 35 to 40 hours. About 6 per cent of them reported an even longer normal working time per week. Equally confusing is the fact that some 88 per cent of the 306 zero earners are reported to be engaged in a permanent employment relationship, which has generally lasted for several years; only 15 per cent had been with the present employer for less than a year. Furthermore, about 40 per cent of them had received employer-sponsored formal on-the-job training, and some 73 per cent were recorded to be unionized.

In view of these extraordinary characteristics of the 306 employees with recorded zero earnings it is comforting to note that, on the whole, they seem to be randomly distributed (cf. column 2 of Table 4). Hence, their exclusion from the sample of employees should not distort the estimation results to any significant degree.

As noted earlier, the dependent variable is before-tax average hourly earnings calculated by dividing the annual wage/salary income recorded in

Table 4. Sample means of personal and job characteristics for various sorted groups of employed individuals

Variable*	Various sorted groups of employed individuals**				
	(1)	(2)	(3)	(4)	(5)
EARN	40.57	0.00	43.65	12.24	44.82
SCHOOL	11.00	11.33	10.97	10.21	11.00
BASIC EDUCATION (1,0)	0.366	0.337	0.368	0.566	0.360
LOWER VOCATIONAL (1,0)	0.302	0.242	0.306	0.248	0.308
UPPER VOCATIONAL (1,0)	0.200	0.222	0.198	0.138	0.200
SHORT NON-UNIV (1,0)	0.059	0.111	0.055	0.021	0.056
UNDERGRADUATE (1,0)	0.024	0.016	0.025	0.007	0.026
GRADUATE (1,0)	0.050	0.072	0.048	0.021	0.049
EXP	16.93	21.68	16.57	10.79	16.78
SEN	8.93	11.33	8.75	3.94	8.92
AGE	37.35	42.62	36.95	30.96	37.17
WOM (1,0)	0.509	0.428	0.516	0.662	0.510
MARRIED (1,0)	0.742	0.869	0.732	0.614	0.737
$CHILD^{0-17}$ (1,0)	0.488	0.503	0.487	0.476	0.488
$CHILD^{0-6}$ (1,0)	0.236	0.212	0.238	0.359	0.233
$CHILD^{7-17}$ (1,0)	0.351	0.395	0.347	0.276	0.350
SOUTH (1,0)	0.657	0.634	0.659	0.510	0.664
CAPITAL (1,0)	0.190	0.180	0.191	0.090	0.195
PART-TIME (1,0)	0.038	0.049	0.038	0.055	0.037
TEMPEMPL (1,0)	0.100	0.075	0.102	0.234	0.097
PIECE-RATE (1,0)	0.090	0.069	0.092	0.131	0.090
NODAYWORK (1,0)	0.240	0.245	0.239	0.221	0.240
UNEMPL (1,0)	0.102	0.026	0.106	0.207	0.103
UNION (1,0)	0.750	0.729	0.751	0.428	0.763
OJT (1,0)	0.360	0.402	0.356	0.069	0.367
NWWH	38.23	37.90	38.26	41.39	38.14
SWWH	38.92	38.99	38.90	40.47	38.85
OWWH***	7.70	8.05	7.67	6.60	7.69
PUBLOCAL (1,0)	0.237	0.255	0.236	0.297	0.233
OCC31 (1,0)	0.038	0.062	0.036	0.007	0.037
OCC32 (1,0)	0.033	0.029	0.033	0.014	0.034
OCC33 (1,0)	0.044	0.075	0.042	-	0.043
OCC34 (1,0)	0.055	0.082	0.053	0.034	0.054
OCC41 (1,0)	0.074	0.114	0.071	0.007	0.074
OCC42 (1,0)	0.129	0.088	0.132	0.090	0.134
OCC43 (1,0)	0.068	0.049	0.070	0.041	0.071
OCC44 (1,0)	0.116	0.108	0.116	0.269	0.110
OCC51 (1,0)	0.020	0.013	0.021	0.138	0.017
OCC52 (1,0)	0.207	0.157	0.210	0.166	0.212
OCC53 (1,0)	0.074	0.056	0.076	0.069	0.076
OCC54 (1,0)	0.142	0.167	0.140	0.166	0.139
INDU1 (1,0)	0.025	0.010	0.026	0.131	0.022
INDU2 (1,0)	0.001	-	0.002	-	0.002

INDU3 (1,0)	0.248	0.209	0.251	0.131	0.255
INDU4 (1,0)	0.013	0.020	0.013	-	0.013
INDU5 (1,0)	0.078	0.085	0.078	0.069	0.078
INDU6 (1,0)	0.136	0.124	0.136	0.097	0.138
INDU7 (1,0)	0.082	0.101	0.080	0.062	0.081
INDU8 (1,0)	0.085	0.095	0.085	0.055	0.086
INDU9 (1,0)	0.332	0.356	0.330	0.455	0.326
No. of obs.	4 346	306	4 040	145	3 895

* The variables are defined in Section 2.

** (1) Retained sample of employees after rejection of 15-year-old employees and observations with incomplete or missing data on critical variables.
(2) Employees with no taxable earnings from principal occupation recorded in the tax rolls.
(3) Employees with positive earnings.
(4) Employees with below-minimum (< FIM 18) hourly earnings.
(5) Employees with above-minimum (>= FIM 18) hourly earnings.

*** The total number of employees in respective category, who had worked overtime during the week of the questionnaire, amounts to: (1) 517, (2) 37, (3) 480, (4) 10, and (5) 470.

the tax rolls with an annual amount of working hours estimated from information on the total number of months worked during the time period covered by the survey and weekly normal working hours. This way of calculating the annual amount of working hours and, moreover, from self-reported data is, however, likely to result also in clearly incorrect measures of annual hours worked and thus in unacceptable levels of average hourly earnings.

At least three potential sources of measurement error emerge. First, the sample individuals may simply have given incorrect information. For instance, it is questionable whether any person works regularly 98 hours a week. Apart from this exceptional survey individual, 14 other persons (some 0.4 per cent of the 4040 retained sample individuals with positive earnings) report their normal weekly working time to be over 60 hours.

Second, the survey only provides information on the total number of months a person is employed and, moreover, not during the calendar year but during the twelve months preceding the time of the questionnaire. This is definitely an imprecise measure of the actual working time and, especially, if the person has been employed during only part of the year and then for periods longer or shorter than full months. Similar imprecisions may arise if the person has been unemployed or temporarily laid off during the previous twelve months. In fact, comparison of reported total number of months worked and weeks of unemployment or layoffs reveals that such imprecisions occur to some degree in the survey data.

Third, the reported weekly normal working hours refer to the current job. Hence, if the individual has moved to that particular job during the examined time period, the information on normal weekly hours worked may not apply to the previous job(s) held during that same period. Already the fact that some 15 per cent of the 4040 retained sample individuals with positive earnings have reported their length of seniority to be less than a year indicates the presence of such measurement errors. It is, however, impossible to draw any conclusions about the factual importance of this source of measurement error on the basis of the survey data.

The calculated annual average hourly earnings of the 4040 retained sample employees range from FIM 1.06 to FIM 380.40, yielding a mean value of FIM 43.65. The lower end of the hourly earnings scale points to obvious shortcomings in the information used in calculating individual average hourly earnings. This conclusion is further strengthened by the fact that, as pointed out earlier, the calculated hourly earnings are likely to overestimate actual hourly earnings because the wage and salary income data used comprise most types of compensation. A minimum hourly earnings floor is therefore implemented[6], reducing the actual estimating data to a total of 3895 observations.

This 3.6 per cent loss in observations concerns mostly young persons and, consequently, persons with relatively little formal schooling and work experience (cf. column 4 of Table 4). Of the rejected observations, some 15 per cent are younger than 20 years of age, and more than one half are younger than 30 years of age. Close to 60 per cent have acquired no formal schooling beyond a primary education. About one third have reported less than five years of work experience; almost 60 per cent have been less than ten years in the labour market.

It is also of interest to analyse the observations with below-minimum hourly earnings with respect to the afore-mentioned potential sources of measurement error. First, these individuals have typically reported fairly large amounts of weekly normal working hours. In addition, quite a few have been unemployed or temporarily laid off during the surveyed time period, and about one fourth are recorded to be temporarily employed. Finally, close to 37 per cent of the 145 individuals with below-minimum hourly earnings have self-reportedly been with their current employer for less than a year. In sum, there seems to be good reason for implementing a minimum hourly earnings principle. For comparison, Table 5 reports estimation results for the extended human capital earnings function based on all 4040 sample observations with positive earnings, on the one hand, and the 3895 observations with above-minimum hourly earnings retained in the actual estimating data, on the other.

When comparing the two sets of estimation results, however, it should be kept in mind that both are based on sorted data. Moreover, twice as many observations had to be rejected because the tax rolls included no information on earned income subject to taxation. It is not known to what extent the rejection of these zero earners has influenced the regression results obtained for the 4040 sample individuals with positive earnings. On the whole, though, it is comforting to note that the means of the gradually sorted samples of employed persons and the fully sorted sample of employees (i.e. the actual estimating data) are very similar (cf. columns 1, 3 and 5 of Table 4). More important, a simple t-test indicates that the parameter estimates displayed in Table 5 do not differ significantly. The only exception is the schooling coefficient; the null hypothesis that the estimated coefficients of the schooling variable are identical is rejected at a 5 % level but is accepted at a 2.5 % level.

The overall distribution of the calculated average hourly earnings of the 3895 sample employees retained in the final estimation data is shown by means of a frequency diagram in Figure 1. The sample mean hourly earnings level is FIM 44.82 and the median FIM 39.25. Furthermore, 10 per cent of the sample employees retained in the actual estimation data are calculated to receive average hourly earnings less than some FIM 29.90, while 10 per cent of the sample employees have an average hourly earnings level above FIM 67.17. The variation in hourly earnings amounts to some 103 per cent when measured by the difference between the 90th percentile and the 10th percentile, scaled by the median.

Table 5. Comparison of regression results for the extended human capital earnings model using data comprising (1) sample employees with above-minimum hourly earnings and (2) all sample employees with positive earnings[a]

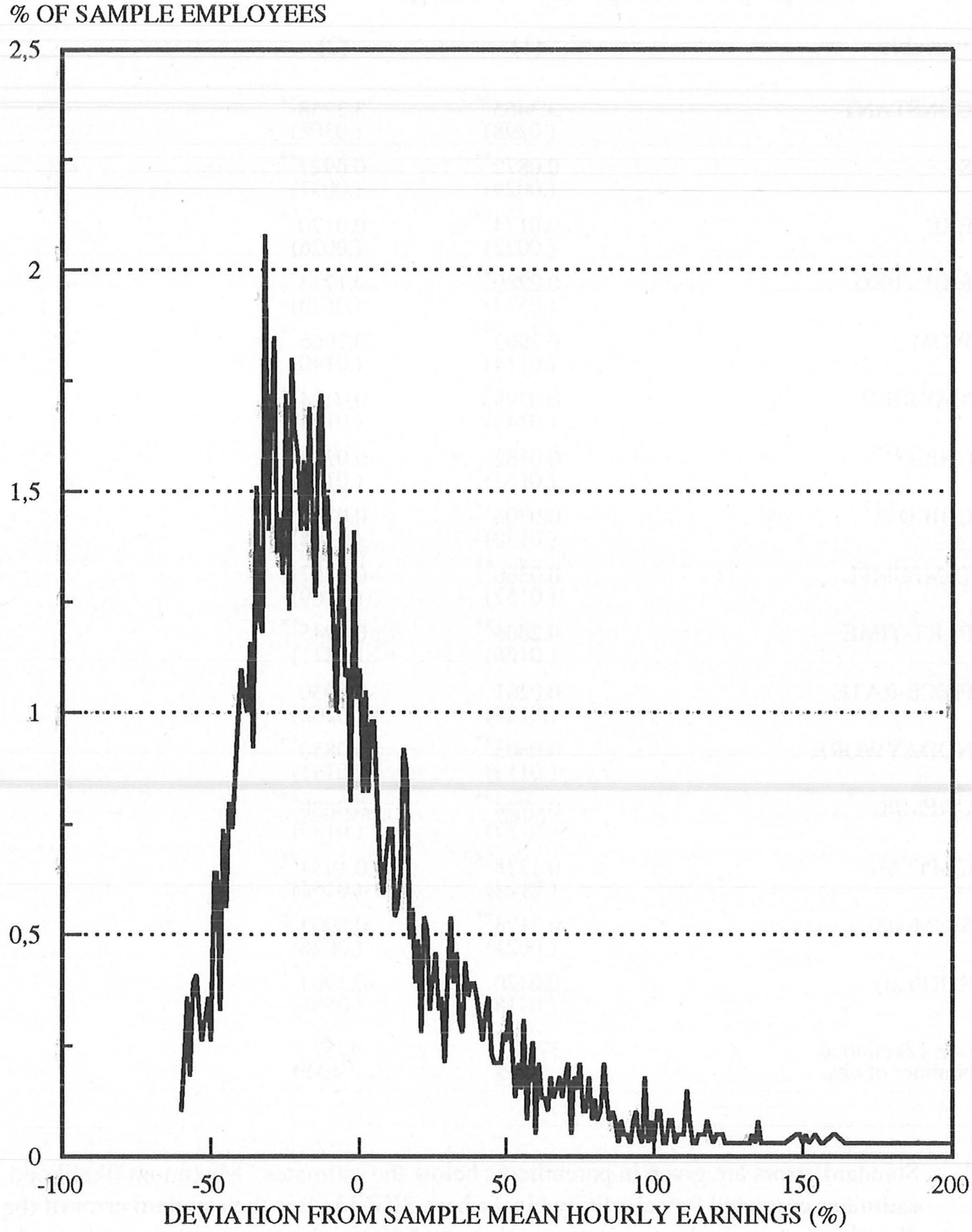
Variable	(1)	(2)
CONSTANT	3.3465** (.0298)	3.3258** (.0308)
S	0.0872** (.0029)	0.0927** (.0031)
EXP	0.0174** (.0022)	0.0170** (.0026)
EXP^2 /1000	-0.2280** (.0577)	-0.1773** (.0670)
WOM	-0.2002** (.0114)	-0.2066** (.0140)
MARRIED	0.0299* (.0143)	0.0424** (.0174)
$CHILD^{0-6}$	0.0162 (.0134)	-0.0217 (.0167)
$CHILD^{7-17}$	0.0308** (.0130)	0.0229 (.0168)
TEMPEMPL	0.0366** (.0157)	-0.0157 (.0169)
PART-TIME	0.2806** (.0166)	0.2945** (.0211)
PIECE-RATE	0.0261 (.0189)	-0.0030 (.0202)
NODAYWORK	0.0805** (.0117)	0.0850** (.0141)
UNEMPL	-0.0754** (.0157)	-0.0630** (.0189)
CAPITAL	0.1338** (.0124)	0.1434** (.0164)
SIGMA(ε)	0.3128** (.0021)	0.3903** (.0026)
RHO(ε,μ)	0.0420 (.0718)	-0.1903** (.0551)
Log-Likelihood	3769.7	4757.3
Number of obs.	3895	4040

a Standard errors are given in parentheses below the estimates. Maximum likelihood estimates corrected for selectivity bias, where SIGMA(ε) is the standard error of the disturbance term in the earnings equation and RHO(ε,μ) measures the correlation between the error term (ε) in the earnings equation and the error term (μ) in the selection (probit) equation. The corresponding probit estimates are reported in Table E of the Appendix.

* Significant at a 5 % level.

** Significant at a 1 % level.

Figure 1. Overall distribution of the calculated average hourly earnings of the sample employees retained in the final estimation data



Note. A total of 18 observations with a percentage deviation from the sample mean exceeding 300 per cent were excluded from the figure.

Source: Labour Force Survey for 1987

4. ACTUAL ESTIMATING DATA

In this section, the actual estimation database is analysed with respect to alternative definitions of crucial variables and the conspicuous coefficients obtained in the estimations for certain variables. In particular, in order to examine the sensitivity of the estimation results to the definition of the dependent variable used, the extended human capital earnings model is re-estimated using two alternative ways of calculating average hourly earnings. The self-reported total years of work experience also make it worthwhile to incorporate alternative definitions in the estimated earnings equations. In addition, the regression results obtained call for somewhat more detailed analysis of the categories of part-time employees and employees who are temporarily employed.

Summary statistics of relevant variables for the whole sample of retained employees and separately for male and female employees are reported in Table A of the Appendix.

4.1. Calculated hourly earnings - two extensions

As described earlier, the average hourly earnings of individuals are calculated as the annual wage/salary income recorded in the tax rolls divided by an estimated amount of annual normal hours worked. Accordingly, the earnings data used in the estimations comprise most types of compensation, whereas the annual amount of working hours includes only regular hours worked.

The tax rolls also provide information on the tax value of fringe benefits received by earners. One extension would thus be to account also for this type of compensation. The inclusion of fringe benefits in the dependent variable may be justified not least as a means of narrowing the gap between the individuals' money earnings and their "total" earnings, that is, earnings comprising not only pecuniary but also non-pecuniary aspects of jobs (Siebert, 1990).

Another digression of interest is linked to the estimated amount of annual working hours. As pointed out above, the adopted way of calculating individual average hourly earnings does not account for overtime working hours. Attempts were therefore made to estimate an annual amount of overtime working hours for each employee using the limited information provided in the survey; information on overtime hours worked is available for the week of the questionnaire only.

In brief, the required annual amounts of overtime working hours were estimated as follows. The sample of employees who are employed full-time[7] was stratified into 48 groups according to gender, sector of employment (private/public) and occupational social status (12 categories). For each group, the total amount of weekly overtime working hours was calculated and distributed across the employees in that group in two different ways.[8] In Method I, the total amount of weekly overtime hours worked was distributed across all employees in the group. More precisely, each employee was assigned the average amount of weekly overtime working hours estimated for the group. In Method II, half of the total amount of weekly overtime working hours was distributed across those in the group who had worked overtime during the week of the questionnaire, while the other half was distributed across those who had not worked overtime during that particular week.

The individual annual amounts of overtime working hours corresponding to these two methods were then calculated in proportion to the employees' total number of months worked during the surveyed time period and, finally, were added to their annual amount of normal working hours. These methods will, of course, produce both overestimations and underestimations of the actual amount of overtime worked by each sample individual during the survey year. Another source of overestimation originates in the assumption that all overtime is paid overtime. Evidence for Finland reported by Lehto (1988) suggests that a considerable part of the overtime done is unpaid, especially among upper-level non-manual workers.

The regression results obtained from estimating the extended human capital earnings equation on the full sample data with the dependent variable comprising fringe benefits, on the one hand, and two different estimates of the annual amount of overtime working hours, on the other, are reported in Table 6. The corresponding estimation results for each gender are given in Tables F and G of the Appendix.

Table 6. Comparison of regression results for the extended human capital earnings specification using different definitions of the dependent variable, all employees[a]

Variable	Definition of dependent variable[b] (1)	(2)	(3)	(4)
CONSTANT	3.3465**	3.3532**	3.3184**	3.3222**
	(.0298)	(.0302)	(.0294)	(.0294)
S	0.0872**	0.0882**	0.0866**	0.0861**
	(.0029)	(.0030)	(.0029)	(.0029)
EXP	0.0174**	0.0171**	0.0175**	0.0176**
	(.0022)	(.0023)	(.0022)	(.0022)
EXP^2 /1000	-0.2280**	-0.2195**	-0.2299**	-0.2306**
	(.0577)	(.0585)	(.0570)	(.0568)
WOM	-0.2002**	-0.2029**	-0.1854**	-0.1894**
	(.0114)	(.0114)	(.0113)	(.0113)
MARRIED	0.0299*	0.0332*	0.0301*	0.0294*
	(.0143)	(.0144)	(.0142)	(.0141)
$CHILD^{0-6}$	0.0162	0.0162	0.0152	0.0164
	(.0134)	(.0136)	(.0133)	(.0133)
$CHILD^{7-17}$	0.0308**	0.0324**	0.0298**	0.0295*
	(.0130)	(.0131)	(.0129)	(.0129)
TEMPEMPL	0.0366**	0.0346*	0.0360*	0.0365**
	(.0157)	(.0160)	(.0156)	(.0155)
PART-TIME	0.2806**	0.2877**	0.2976**	0.2957**
	(.0166)	(.0169)	(.0164)	(.0163)
PIECE-RATE	0.0261	0.0262	0.0270	0.0234
	(.0189)	(.0190)	(.0187)	(.0186)
NODAYWORK	0.0805**	0.0759**	0.0808**	0.0841**
	(.0117)	(.0120)	(.0116)	(.0116)
UNEMPL	-0.0754**	-0.0763**	-0.0751**	-0.0755**
	(.0157)	(.0160)	(.0156)	(.0154)
CAPITAL	0.1338**	0.1408**	0.1328**	0.1330**
	(.0124)	(.0125)	(.0122)	(.0122)
SIGMA(ε)	0.3128**	0.3159**	0.3100**	0.3096**
	(.0021)	(.0021)	(.0021)	(.0021)
RHO(ε,μ)	0.0420	0.0357	0.0407	0.0465
	(.0718)	(.0720)	(.0718)	(.0716)
Log-Likelihood	-3769.7	-3808.2	-3734.9	-3728.8
Mean of lnEARN	3.72	3.73	3.70	3.70

a Standard errors are given in parentheses below the estimates. Maximum likelihood estimates corrected for selectivity bias, where SIGMA(ε) is the standard error of the disturbance term in the earnings equation and RHO(ε,μ) measures the correlation between the error term (ε) in the earnings equation and the error term (μ) in the selection (probit) equation. The corresponding probit estimates are identical in all four cases and are reported in column (1) of Table E in the Appendix.

b
(1) Annual wage/salary income divided with the annual amount of normal working hours.
(2) Annual wage/salary income inclusive of the tax value of fringe benefits divided with the annual amount of normal working hours.
(3) Annual wage/salary income divided with the annual amount of normal working hours supplemented with an estimate of annual overtime hours worked (Method I).
(4) Annual wage/salary income divided with the annual amount of normal working hours supplemented with an estimate of annual overtime hours worked (Method II).

* Significant at a 5 % level.

** Significant at a 1 % level.

As is to be expected, the inclusion of fringe benefits in the dependent variable shifts the average earnings profile upwards, while the addition of overtime working hours to the measure of annual normal working hours logically has the reverse effect. The estimates reported in Table 6 also imply that male employees typically receive more fringe benefits and also work more overtime than their female counterparts. A simple t-test suggests, however, that these effects are not statistically significant. More generally, the alternative definitions of the dependent variable leave the estimated coefficients for the human capital variables as well as for the other explanatory variables included in the earnings specification roughly unchanged. Obviously, the most plausible explanation for this negligible average effect is a strong concentration of, in particular, more notable amounts of fringe benefits and overtime working hours to a fairly small number of employees.[9]

4.2. Actual vs. potential work experience

As noted in Section 2, the information on total years of work experience and years with the current employer is self-reported. For estimation purposes, the reported years of work experience were checked against the individual's age, years of formal schooling and pre-school years, and any inconsistencies were corrected for. Comparison of columns 1 and 2 of Tables 7-9 suggests that the influence of these corrections on the estimation results is negligible.

Since a majority of empirical studies has, of necessity, used potential years of work experience instead of actual (self-reported) years of work experience, it is of interest to examine how sensitive the estimation results are to the definition of total years on the labour market. In the case of potential years of work experience ($EXP^{pot.}$), the individuals are assumed to enter the labour market immediately after having completed schooling and to be continuously employed; i.e., $EXP^{pot.}$ is equal to age minus the sum of formal schooling and pre-school years.

Comparison of columns 1 and 3 of Tables 7-9 reveals that the difference in estimation results is substantial for women, especially when it comes to the estimated earnings effect of work experience; the use of potential instead of actual work experience gives a notable overestimation of the effect of

Table 7. Comparison of regression results for the extended human capital earnings specification using alternative definitions of total years of work experience, all employees[a]

Variable	Definition of total work experience[b] $EXP^{adj.}$	$EXP^{unadj.}$	$EXP^{pot.}$
CONSTANT	3.3465**	3.3635**	3.0429**
	(.0298)	(.0298)	(.0219)
S	0.0872**	0.0857**	0.0914**
	(.0029)	(.0029)	(.0028)
EXP	0.0174**	0.0156**	0.0416**
	(.0022)	(.0022)	(.0020)
EXP^2 /1000	-0.2280**	-0.1889**	-0.8225**
	(.0577)	(.0555)	(.0438)
WOM	-0.2002**	-0.1980**	-0.2291**
	(.0114)	(.0114)	(.0117)
MARRIED	0.0299*	0.0311*	0.0676**
	(.0143)	(.0143)	(.0146)
$CHILD^{0-6}$	0.0162	0.0141	0.0099
	(.0134)	(.0135)	(.0145)
$CHILD^{7-17}$	0.0308**	0.0333**	0.0086
	(.0130)	(.0130)	(.0143)
TEMPEMPL	0.0366**	0.0338*	0.0171
	(.0157)	(.0158)	(.0149)
PART-TIME	0.2806**	0.2799**	0.1777**
	(.0166)	(.0167)	(.0161)
PIECE-RATE	0.0261	0.0258	0.0226
	(.0189)	(.0189)	(.0170)
NODAYWORK	0.0805**	0.0797**	0.0733**
	(.0117)	(.0118)	(.0112)
UNEMPL	-0.0754**	-0.0769**	-0.0858**
	(.0157)	(.0158)	(.0153)
CAPITAL	0.1338**	0.1334**	0.1356**
	(.0124)	(.0124)	(.0124)
SIGMA(ε)	0.3128**	0.3135**	0.3601**
	(.0021)	(.0021)	(.0032)
RHO(ε,μ)	0.0420	0.0139	0.7932**
	(.0718)	(.0702)	(.0165)
Log-Likelihood	-3769.7	-3778.9	-3738.4
Number of obs.	3895	3895	3895
Mean of EXP	16.78	17.11	19.68

a Standard errors are given in parentheses below the estimates. Maximum likelihood estimates corrected for selectivity bias, where SIGMA(ε) is the standard error of the disturbance term in the earnings equation and RHO(ε,μ) measures the correlation between the error term (ε) in the earnings equation and the error term (μ) in the selection (probit) equation. The corresponding probit estimates are reported in Table H of the Appendix.
An F-test indicates that the hypothesis of unequal sample distributions for the two genders can be rejected at a significance level exceeding 99.9 per cent. A simple Chow-test can therefore be performed, which suggests that the null hypothesis of the parameter estimates being equal for male and female employees can be rejected at a 0.01 % level. These tests are based on Heckman estimates of the models.

b $EXP^{adj.}$ = self-reported total years of work experience checked against the individual's age, years of formal schooling, and pre-school years.
$EXP^{unadj.}$ = self-reported total years of work experience.
$EXP^{pot.}$ = physical age minus the sum of formal schooling and pre-school years.

* Significant at a 5 % level.

** Significant at a 1 % level.

Table 8. Comparison of regression results using alternative definitions of total years of work experience, male employees (1908 obs.)[a]

Variable	Definition of total work experience $EXP^{adj.}$	$EXP^{unadj.}$	$EXP^{pot.}$
CONSTANT	3.2989**	3.3043**	3.2081**
	(.0435)	(.0428)	(.0463)
S	0.0886**	0.0876**	0.0894**
	(.0038)	(.0038)	(.0038)
EXP	0.0202**	0.0194**	0.0263**
	(.0032)	(.0031)	(.0033)
EXP^2 /1000	-0.2991**	-0.2812**	-0.4290**
	(.0829)	(.0774)	(.0800)
MARRIED	0.0747**	0.0756**	0.0849**
	(.0219)	(.0216)	(.0216)
$CHILD^{0\text{-}6}$	-0.0131	-0.0139	-0.0131
	(.0206)	(.0206)	(.0209)
$CHILD^{7\text{-}17}$	0.0550**	0.0565**	0.0490**
	(.0183)	(.0184)	(.0185)
TEMPEMPL	-0.0627**	-0.0623**	-0.0685**
	(.0255)	(.0256)	(.0252)
PART-TIME	0.1986**	0.1957**	0.2051**
	(.0356)	(.0358)	(.0353)
PIECE-RATE	0.0552*	0.0541*	0.0558**
	(.0241)	(.0242)	(.0239)
NODAYWORK	0.0447**	0.0439**	0.0464**
	(.0176)	(.0176)	(.0175)
UNEMPL	-0.0742**	-0.0759**	-0.0727**
	(.0232)	(.0232)	(.0232)
CAPITAL	0.1380**	0.1376**	0.1391**
	(.0165)	(.0164)	(.0164)
SIGMA(ε)	0.3039**	0.3042**	0.3059**
	(.0036)	(.0036)	(.0044)
RHO(ε,μ)	0.1079	0.1000	0.2662*
	(.1241)	(.1204)	(.1251)
Log-Likelihood	-1557.6	-1559.7	-1550.0
Mean of EXP	17.46	17.88	19.13

a For notes, see Table 7. Probit estimates are given in Table H of the Appendix.

Table 9. Comparison of regression results using alternative definitions of total years of work experience, female employees (1987 obs.)[a]

	Definition of total work experience $EXP^{adj.}$	$EXP^{unadj.}$	$EXP^{pot.}$
CONSTANT	3.2215** (.0452)	3.2438** (.0450)	2.8293** (.0312)
S	0.0812** (.0046)	0.0798** (.0046)	0.0898** (.0044)
EXP	0.0148** (.0033)	0.0125** (.0033)	0.0471** (.0030)
EXP^2 /1000	-0.1826* (.0884)	-0.1353 (.0870)	-0.9742** (.0657)
MARRIED	-0.0157 (.0194)	-0.0134 (.0194)	-0.0025 (.0210)
$CHILD^{0-6}$	0.0306* (.0178)	0.0277 (.0178)	-0.0124 (.0190)
$CHILD^{7-17}$	0.0030 (.0182)	0.0064 (.0182)	-0.0407* (.0198)
TEMPEMPL	0.0899** (.0207)	0.0841** (.0209)	0.0618** (.0197)
PART-TIME	0.3002** (.0200)	0.2989** (.0201)	0.1830** (.0189)
PIECE-RATE	-0.0288 (.0314)	-0.0280 (.0313)	-0.0243 (.0263)
NODAYWORK	0.1124** (.0160)	0.1118** (.0161)	0.0948** (.0152)
UNEMPL	-0.0650** (.0219)	-0.0665** (.0220)	-0.0842** (.0214)
CAPITAL	0.1255** (.0187)	0.1255** (.0187)	0.1315** (.0182)
SIGMA(ε)	0.3154** (.0030)	0.3165** (.0031)	0.3839** (.0046)
RHO(ε,μ)	-0.0085 (.0943)	-0.0271 (.0933)	0.8749** (.0137)
Log-Likelihood	-2115.7	-2122.3	-2072.1
Mean of EXP	16.14	16.37	20.20

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[a] For notes, see Table 7. Probit estimates are given in Table H of the Appendix.

labour market experience on female earnings. Indeed, the absolute size of the female coefficient for the linear experience variable is tripled when using potential years of work experience, and is almost twice as large as the corresponding estimate obtained for their male counterparts. For male employees, on the other hand, a simple t-test suggests that the difference in the estimated earnings effect of experience is statistically insignificant. It is also noteworthy that the regression results based on potential work experience point to the presence of a non-negligible selectivity bias problem among both genders.

All in all, then, the information on self-reported work experience is clearly a strong advantage of the Labour Force Survey over, for example, Population Census data.

4.3. Part-time employees

A large majority of the employees in the estimating data is engaged in full-time employment; only 144 individuals, or some 3.7 per cent, are recorded as part-time employees, and most of them are women (about 84 per cent). Individuals engaged in full-time employment are generally expected to be better paid than those in part-time employment. The data set points, however, to the opposite. The average hourly earnings of all employees engaged in part-time employment amount to some FIM 59.00 compared with FIM 44.30 for their full-time counterparts. The difference in average hourly earnings between part-time and full-time employees is more moderate among male employees (FIM 57.30 vs. FIM 48.90) than among female employees (FIM 59.28 vs. FIM 39.60).

As is to be expected, these remarkable differences are strongly reflected in the parameter estimates of the indicator variable for part-time employment included in the earnings specifications. In particular, the estimates indicate that, other things held constant, the hourly earnings of part-time employees exceed those of full-time employees by some 20-35 per cent on average (cf. the estimation results reported in previous tables).

The higher hourly earnings level of part-time employees raises the question of whether this unexpected outcome is simply due to measurement errors and the way of calculating hourly earnings. Or, is it so that the personal and job characteristics of part-time employees do differ markedly from those of full-time employees, thereby pointing to some degree of self-selection. These questions cannot be answered unambiguously. More detailed analysis of critical variables offers no straightforward explanation for the earnings premium observed for part-time employees. For example, there seems to exist no inverse relation between calculated average hourly earnings and reported weekly normal working hours. Moreover, the hours worked during the week of the questionnaire are in most cases roughly the same as those normally worked during a week.

Change of employer during the surveyed time period may be a non-negligible source of measurement error among male part-time employees but to a much lesser extent among their predominant female counterparts; about one half of the male part-time employees but only one fourth of the female part-time employees have been with the current employer less than a year. In fact, the reported months worked in combination with the assumption that the time period covered by the survey applies to the whole calendar year seem to be the only potential source of measurement error of greater importance. For example, a majority of the female part-time employees with high average hourly earnings had been employed during only part of the year.[10]

But on the other hand, the share of these high earners among all female part-time employees is fairly small; only one fourth received hourly earnings higher than FIM 65, and for less than one tenth, the calculated hourly earnings exceeded FIM 100. In addition, most of the high earning males who were employed part-time had self-reportedly been continuously in employment. Hence, even if the reported months worked understated the actual time worked, this can hardly offer more than part of an explanation of the observed income advantage of part-time employees. Moreover, the same sources of measurement error obviously affect - possibly to an even larger extent - the calculated hourly earnings of full-time employees. All in all, then, it is very difficult to point to any specific measurement errors that would be more evident among part-time employees and therefore explain their higher average hourly earnings.

Analysis of personal and job characteristics seems to indicate that part-time employees differ from their full-time counterparts in at least certain aspects (cf. Table 10). Thus men in part-time employment are mostly young (some

Table 10. Sample means of personal and job characteristics for male and female employees who are employed part-time

Variable[a]	Male employees	Female employees
EARN	57.28	59.28
SCHOOL	10.91	10.87
BASIC EDUCATION (1,0)	0.391	0.446
LOWER VOCATIONAL (1,0)	0.130	0.231
UPPER VOCATIONAL (1,0)	0.391	0.190
SHORT NON-UNIV (1,0)	0.044	0.025
UNDERGRADUATE (1,0)	-	0.041
GRADUATE (1,0)	0.044	0.066
EXP	6.39	12.71
SEN	1.83	5.18
AGE	24.83	36.97
MARRIED (1,0)	0.174	0.744
CHILD$^{0\text{-}17}$ (1,0)	0.130	0.479
SOUTH (1,0)	0.609	0.645
CAPITAL (1,0)	0.304	0.207
TEMPEMPL (1,0)	0.522	0.223
PIECE-RATE (1,0)	0.044	0.091
NODAYWORK (1,0)	0.609	0.405
UNEMPL (1,0)	0.261	0.182
UNION (1,0)	0.130	0.504
OJT (1,0)	0.174	0.165
NWWH	18.00	18.13
SWWH	18.09	18.78
OTWH	-	8.25[b]
PUBLOCAL (1,0)	0.304	0.298
OCC31 (1,0)	0.087	0.008
OCC32 (1,0)	0.044	-
OCC33 (1,0)	0.087	0.091
OCC34 (1,0)	0.044	0.033
OCC41 (1,0)	-	0.008
OCC42 (1,0)	0.174	0.198
OCC43 (1,0)	0.174	0.116
OCC44 (1,0)	-	0.149
OCC51 (1,0)	-	0.025
OCC52 (1,0)	0.044	0.008
OCC53 (1,0)	0.348	0.041
OCC54 (1,0)	-	0.322
INDU1 (1,0)	0.044	0.016
INDU2 (1,0)	-	-
INDU3 (1,0)	0.130	0.066
INDU4 (1,0)	-	-
INDU5 (1,0)	-	0.025
INDU6 (1,0)	0.044	0.174
INDU7 (1,0)	0.130	0.041
INDU8 (1,0)	0.087	0.116
INDU9 (1,0)	0.565	0.562
Number of obs.	23	121

a The variables are defined in Section 2.8.

b Of the 121 female part-time employees in the estimating data, slightly less than 7 per cent had worked overtime during the week of the questionnaire.

52 per cent are in the age interval 16-20 years), unmarried, childless, and living in the southern parts of Finland. The young age of male part-time employees explains their relatively low educational level, their few years of work experience (about 60 per cent reported less than three years of work experience), and their short employment relationship with the present employer. Moreover, a large majority of them works for a private employer in the service sector (SIC6-9), thereby being classified as salaried employees. In addition, most of them are not engaged in regular day-time work. In the estimations, many of these characteristics are found to have a significant, positive effect on hourly earnings. Perhaps male part-time employment can be interpreted as some kind of interaction term combining these effects.

The personal characteristics of female part-time employees are very different from those of their male counterparts but fairly similar to those of females engaged in full-time employment. This is reflected not least in the distributions across age groups, educational levels, and years of work experience and seniority. But there are also certain similarities between men and women who are employed part-time. Like their male counterparts, a large majority of the female part-time employees is classified as salaried employees working in the private service sector. But apart from this, there seems to be no apparent personal- or job-related explanation for the higher average hourly earnings observed for female employees in part-time employment.

Hence, there is a possibility that the substantial income advantage obtained for employees in part-time employment is partly due to measurement errors or a distinct distribution of personal and job characteristics, or both. The stronger earnings effect of part-time employment obtained for female employees may, in turn, originate in a much larger variance in the average hourly earnings of female part-time employees.

4.4. Temporarily employed persons

Another category of employees requiring somewhat more detailed examination is employees engaged in temporary employment. As in the case of part-time employment, it would be expected that hourly earnings received by temporarily employed persons are typically lower than hourly earnings

Table 11. Sample means of personal and job characteristics for male and female employees engaged in temporary employment

Variable[a]	Male employees	Female employees
EARN[b]	41.66	45.23
SCHOOL	11.36	11.56
BASIC EDUCATION (1,0)	0.266	0.216
LOWER VOCATIONAL (1,0)	0.315	0.271
UPPER VOCATIONAL (1,0)	0.287	0.352
SHORT NON-UNIV (1,0)	0.035	0.055
UNDERGRADUATE (1,0)	0.007	0.042
GRADUATE (1,0)	0.091	0.064
EXP	9.69	7.85
SEN	1.18	1.63
AGE	29.78	29.96
MARRIED (1,0)	0.413	0.627
CHILD$^{0-17}$ (1,0)	0.231	0.424
SOUTH (1,0)	0.454	0.572
CAPITAL (1,0)	0.112	0.127
PART-TIME (1,0)	0.084	0.114
PIECE-RATE (1,0)	0.056	0.047
NODAYWORK (1,0)	0.182	0.267
UNEMPL (1,0)	0.518	0.377
UNION (1,0)	0.546	0.670
OJT (1,0)	0.133	0.203
NWWH	36.90	35.52
SWWH	38.24	35.29
OTWH[c]	9.00	7.26
PUBLOCAL (1,0)	0.210	0.525
OCC31 (1,0)	0.014	0.004
OCC32 (1,0)	0.063	0.013
OCC33 (1,0)	0.084	0.106
OCC34 (1,0)	0.063	0.102
OCC41 (1,0)	0.049	0.008
OCC42 (1,0)	0.042	0.093
OCC43 (1,0)	0.014	0.131
OCC44 (1,0)	0.056	0.301
OCC51 (1,0)	0.056	0.042
OCC52 (1,0)	0.350	0.072
OCC53 (1,0)	0.084	0.114
OCC54 (1,0)	0.126	-
INDU1 (1,0)	0.049	0.017
INDU2 (1,0)	0.007	-
INDU3 (1,0)	0.147	0.080
INDU4 (1,0)	-	0.013
INDU5 (1,0)	0.315	0.013
INDU6 (1,0)	0.042	0.064
INDU7 (1,0)	0.098	0.008
INDU8 (1,0)	0.049	0.072
INDU9 (1,0)	0.294	0.733
Number of obs.	143	236

a The variables are defined in Section 2.8.

b The average hourly earnings in permanent employment amount to FIM 49.60 for males and to FIM 40.20 for females.

c Of males temporarily employed, roughly 13 per cent had worked overtime during the week of the questionnaire. The corresponding share among females was some 8 per cent.

received by those who are permanently employed. The estimation results suggest that this holds for male employees only (cf. Tables 8 and 9). For female employees, there seems to be a fairly strong, positive relation between earnings and temporary employment. It is therefore of interest to investigate whether the distribution of male and female employees engaged in temporary employment across important variables can shed some light on the oppositely signed parameter estimates on the indicator variable capturing the earnings effect of temporary employment.

It seems very unlikely that the highly diverging male and female coefficients for temporary employment could be explained by significant differences in the sources of measurement error imbedded in the information used in calculating individual average hourly earnings. Instead, Table 11 displays conspicuous differences in the distribution of temporarily employed males and females across occupational social status categories, public and private sectors, and industries. Specifically, a large majority of the female employees engaged in temporary employment works in the local (municipality) service sector. This in combination with a fairly long seniority offers, in effect, quite a reasonable explanation of the earnings premium observed for females in temporary employment compared with their male counterparts and with their female colleagues engaged in permanent employment.

Footnotes:

1. The methods and definitions of the Labour Force Survey for 1987 are explained in CSO (1988).

2. For an introduction to the human capital theory of earnings determination, see Chapter II of this study and the literature referred to therein.

3. Register of Completed Education and Degrees compiled by Statistics Finland.

4. In other words, the analysis overlooks variations in the age at which schooling is completed and the impact this may have on post-school investments and thus on experience-earnings profiles. Empirical evidence for Sweden, presented by Klevmarken & Quigley (1976), indicates that there are substantial differences in the experience-earnings profiles of individuals who receive identical quantities of formal schooling but complete their schooling at different ages.

5. Of the total 400 employees in the actual estimating data who had been unemployed or temporarily laid off during the time period covered by the survey, roughly 61 per cent reported that they had been unemployed/laid off and had, according to the tax rolls, also received unemployment benefits subject to taxation. Some 17 per cent reported that they had been unemployed/laid off but had, according to the tax rolls, not received unemployment benefits subject to taxation. Finally, about 22 per cent reported that they had been constantly employed but had, according to the tax rolls, received unemployment benefits subject to taxation. For the 205 male employees who had experienced a spell of unemployment or temporary layoffs and/or had received unemployment benefits subject to taxation, the corresponding shares are: 58 per cent, 18 per cent, and 24 per cent, respectively. For the 195 female employees who had been unemployed or temporarily laid off and/or had received unemployment benefits subject to taxation, the corresponding shares are: 65 per cent, 16 per cent, and 19 per cent, respectively.

6. In Finland there is no minimum wage legislation. Between 1971 and 1976, a national minimum wage clause was included in the central income agreements. Since then, minimum wage levels to be applied in different contracting industries have been determined in wage negotiations. According to these standard wages, persons over 18 years of age are to be paid the full wage negotiated for the industry. This type of minimum wage clauses have not been implemented for persons under 18 years of age. See further Lilja et al. (1990). In view of this, a hypothetical minimum hourly earnings level is set at 20 per cent below the lowest salary-grade employed in the central government sector in 1987. This amounts to about 18 FIM.

7. Of the male employees engaged in part-time employment, no one had worked overtime during the week of the questionnaire. Among female employees engaged in part-time employment, only four were recorded to have worked overtime during the week of the questionnaire. Estimates of overtime working hours were therefore not made for employees engaged in part-time employment.

8. I am grateful to Tuire Santamäki-Vuori for these suggestions.

9. Of all employees retained in the actual estimating data, some 18 per cent are recorded

to have received fringe benefits subject to taxation, amounting to, on average, some FIM 4295 per receiver on an annual basis. The corresponding share is about 16 per cent for male employees, with an annual mean of FIM 6956, and close to 20 per cent for female employees, with an annual mean of FIM 2166. The frequency of overtime working hours is even more moderate. The share of overtime workers is some 12 per cent among all employees, close to 15 per cent among male employees, and slightly less than 10 per cent among female employees.

10. The simple correlation between calculated average hourly earnings and reported months worked is -0.572 for female part-time employees compared with 0.047 for male part-time employees.

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APPENDIX

Table A. Sample statistics for all employees in the estimating data and separately for male and female employees[a]

Variable	All obs. Mean	Women Mean	Men Mean
EARN	44.82	40.80	49.00
	(23.63)	(23.19)	(23.36)
ln EARN	3.72	3.63	3.81
	(0.38)	(0.37)	(0.37)
S	2.00	1.99	2.01
	(1.96)	(1.94)	(1.98)
BASIC EDUCATION (1,0)	0.3605	0.3674	0.3532
LOWER VOCATIONAL (1,0)	0.3083	0.2823	0.3354
UPPER VOCATIONAL (1,0)	0.2000	0.2174	0.1819
SHORT NON-UNIV (1,0)	0.0565	0.0604	0.0524
UNDERGRADUATE (1,0)	0.0257	0.0352	0.0157
GRADUATE (1,0)	0.0490	0.0372	0.0613
EXP	16.78	16.14	17.46
	(10.35)	(9.82)	(10.84)
EXP^2	388.85	356.83	422.19
	(412.95)	(375.99)	(445.88)
SEN	8.92	8.60	9.26
	(8.34)	(8.09)	(8.58)
SEN^2	149.11	139.40	159.34
	(232.49)	(221.58)	(243.10)
PREEXP	7.85	7.51	8.21
	(7.84)	(7.39)	(8.27)
$PREEXP^2$	123.09	110.99	135.84
	(215.90)	(191.99)	(237.91)
AGE	37.17	37.72	36.60
	(10.46)	(10.52)	(10.36)
WOM (1,0)	0.5101	-	-
MARRIED (1,0)	0.7366	0.7313	0.7421
$CHILD^{0-17}$ (1,0)	0.4875	0.4947	0.4801
$CHILD^{0-6}$ (1,0)	0.2334	0.2094	0.2584
$CHILD^{6-17}$ (1,0)	0.3499	0.3694	0.3297
SOUTH (1,0)	0.6644	0.6784	0.6499
CAPITAL (1,0)	0.1946	0.2074	0.1813
PART-TIME (1,0)	0.0370	0.0609	0.0121
TEMPEMPL (1,0)	0.0973	0.1188	0.0749
PIECE-RATE (1,0)	0.0901	0.0649	0.1164
NODAYWORK (1,0)	0.2401	0.2486	0.2311
UNEMPL (1,0)	0.1027	0.0981	0.1074
UNION (1,0)	0.7633	0.7957	0.7296
MOVE (1,0)	0.8614	0.8556	0.8676
OJT (1,0)	0.3671	0.3770	0.3569
OJTDAYS[b]	6.60	5.72	7.57
NWWH	38.14	37.10	39.23
SWWH	38.85	36.94	40.77
OTWH[c]	7.69	6.38	8.59
PUBLOCAL (1,0)	0.2334	0.3362	0.1263
OCC31 (1,0)	0.0367	0.0106	0.0639
OCC32 (1,0)	0.0339	0.0156	0.0529
OCC33 (1,0)	0.0434	0.0478	0.0388
OCC34 (1,0)	0.0537	0.0629	0.0440
OCC41 (1,0)	0.0737	0.0423	0.1064
OCC42 (1,0)	0.1338	0.2058	0.0587
OCC43 (1,0)	0.0709	0.1309	0.0084

Table A. (cont.)

Variable	All obs. Mean	Women Mean	Men Mean
OCC44 (1,0)	0.1104	0.1802	0.0377
OCC51 (1,0)	0.0167	0.0075	0.0262
OCC52 (1,0)	0.2121	0.1057	0.3229
OCC53 (1,0)	0.0757	0.0554	0.0970
OCC54 (1,0)	0.1392	0.1354	0.1431
INDU11-13 (1,0)	0.0221	0.0096	0.0351
INDU20 (1,0)	0.0015	0.0010	0.0021
INDU31 (1,0)	0.0329	0.0357	0.0299
INDU32 (1,0)	0.0272	0.0433	0.0105
INDU33 (1,0)	0.0249	0.0161	0.0341
INDU34 (1,0)	0.0508	0.0367	0.0655
INDU35 (1,0)	0.0200	0.0116	0.0288
INDU36 (1,0)	0.0100	0.0035	0.0168
INDU37 (1,0)	0.0072	0.0015	0.0131
INDU38 (1,0)	0.0798	0.0393	0.1221
INDU39 (1,0)	0.0023	0.0015	0.0031
INDU40 (1,0)	0.0131	0.0055	0.0210
INDU50 (1,0)	0.0780	0.0146	0.1441
INDU61 (1,0)	0.0367	0.0287	0.0451
INDU62 (1,0)	0.0765	0.0946	0.0577
INDU63 (1,0)	0.0246	0.0393	0.0094
INDU71 (1,0)	0.0539	0.0272	0.0818
INDU72 (1,0)	0.0270	0.0226	0.0314
INDU81 (1,0)	0.0362	0.0589	0.0126
INDU82 (1,0)	0.0082	0.0086	0.0079
INDU83 (1,0)	0.0413	0.0398	0.0430
INDU91 (1,0)	0.0639	0.0695	0.0582
INDU92 (1,0)	0.0103	0.0121	0.0084
INDU93 (1,0)	0.2211	0.3468	0.0901
INDU94 (1,0)	0.0177	0.0242	0.0110
INDU95 (1,0)	0.0126	0.0081	0.0173
Number of obs.	3895	1987	1908

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[a] The variables are defined in Section 2.8. in the text. The figures in parentheses below selected continuous variables give the standard deviation of the variable in question. The Min./Max. values, i.e. the variance interval, are for all employees 18.05/380.40 for EARN, 2.89/5.94 for lnEARN, 0/9 for S, 0/49 for EXP, 0/42 for SEN; for female employees 18.05/303.60 for EARN, 2.89/5.72 for lnEARN, 0/9 for S, 0/48 for EXP, 0/42 for SEN; for male employees 18.18/380.4 for EARN, 2.90/5.94 for lnEARN, 0/9 for S, 0/49 for EXP, 0/42 for SEN.

[b] Average days of formal on-the-job training for those who had received training during the previous twelve months.

[c] Of all employees in the actual estimating data, some 12 per cent (470 obs.) had worked overtime during the week of the questionnaire. The corresponding share was 14 per cent (279 obs.) for male employees and 9 per cent (191 obs.) for female employees.

Table B. Correlation matrix for all sample employees

	1-lnEARN	2-S	3-BASIC	4-LOWER VOCA-TIONAL	5-UPPER VOCA-TIONAL
1-lnEARN	1.0000				
2-S	0.3955	1.0000			
3-BASIC	-0.1919	-0.7648	1.0000		
4-LOWER VOC.	-0.1615	-0.0027	-0.5002	1.0000	
5-UPPER VOC.	0.0880	0.2505	-0.3737	-0.3338	1.0000
6-NON-UNIV	0.1806	0.3741	-0.1838	-0.1642	-0.1227
7-UNDERGRAD.	0.1430	0.3319	-0.1222	-0.1091	-0.0815
8-GRADUATE	0.3081	0.5917	-0.1710	-0.1527	-0.1141
9-EXP	0.1214	-0.2770	0.3687	-0.1494	-0.2134
10-SEN	0.1589	-0.1630	0.2300	-0.1179	-0.1159
11-MARRIED	0.1037	0.0066	0.0369	-0.0381	-0.0362
12-CHILD (0-6)	0.0494	0.1092	-0.1230	0.0545	0.0362
13-CHILD (7-17)	0.0910	0.0122	0.0230	-0.0092	-0.0573
14-WOM	-0.2497	-0.0084	0.0188	-0.0580	0.0428
15-CAPITAL	0.1682	0.0773	-0.0190	-0.0854	0.0637
16-TEMPEMPL	-0.0550	0.0803	-0.0855	-0.0151	0.1054
17-PART-TIME	0.0838	-0.0119	0.0305	-0.0391	0.0118
18-UNEMPL	-0.1430	-0.0905	0.0249	0.0754	-0.0267
19-PIECE-RATE	-0.0250	-0.1280	0.0810	0.0750	-0.0979
20-NODAYWORK	0.0268	-0.1126	0.0597	0.0642	-0.0596
21-UNION	-0.0200	-0.0135	0.0252	0.0729	-0.1587
22-OJT	0.2348	0.2832	-0.1809	-0.0996	0.1244
23-OCC31	0.2908	0.1415	-0.0715	-0.0956	0.0994
24-OCC32	0.1793	0.2837	-0.1285	-0.1037	0.0102
25-OCC33	0.2458	0.4070	-0.1572	-0.1345	-0.0653
26-OCC34	0.1553	0.2804	-0.1285	-0.1175	0.0502
27-OCC41	0.0875	0.0154	-0.0571	-0.0371	0.1608
28-OCC42	-0.0913	-0.0334	0.0223	-0.0856	0.1306
29-OCC43	-0.0568	-0.0566	0.0216	-0.0413	0.1037
30-OCC44	-0.0719	0.0368	-0.1195	0.0862	0.0657
31-OCC51	-0.0728	-0.0785	0.0658	0.0171	-0.0553
32-OCC52	-0.0817	-0.2438	0.1385	0.1736	-0.1989
33-OCC53	-0.1197	-0.1214	0.0613	0.0861	-0.0810
34-OCC54	-0.1514	-0.2099	0.1624	0.0506	-0.1244
35-INDU11	-0.0477	-0.0516	0.0261	0.0169	-0.0051
36-INDU20	-0.0016	-0.0236	0.0253	-0.0121	-0.0032
37-INDU31	-0.0548	-0.0666	0.0528	0.0150	-0.0376
38-INDU32	-0.1097	-0.0851	0.0642	0.0192	-0.0437
39-INDU33	-0.0623	-0.0736	0.0539	0.0120	-0.0298
40-INDU34	0.1013	-0.0553	0.0454	0.0053	-0.0199
41-INDU35	0.0367	-0.0052	0.0038	0.0076	-0.0072
42-INDU36	-0.0065	-0.0418	0.0348	0.0071	-0.0235
43-INDU37	0.0406	-0.0277	0.0242	0.0135	-0.0332
44-INDU38	0.0029	-0.0261	-0.0004	0.0523	-0.0342
45-INDU39	0.0318	0.0114	-0.0103	-0.0058	0.0057
46-INDU40	0.0233	-0.0109	-0.0284	0.0574	0.0001
47-INDU50	-0.0003	-0.0798	0.0324	0.0483	-0.0255
48-INDU61	0.0611	0.0041	0.0031	-0.0600	0.0705
49-INDU62	-0.1272	-0.1151	0.1063	-0.0204	-0.0396
50-INDU63	-0.0443	-0.0345	-0.0085	0.0373	0.0201
51-INDU71	-0.0039	-0.0769	0.0444	0.0267	-0.0287
52-INDU72	-0.0051	-0.0594	0.0523	-0.0246	0.0089
53-INDU81	0.0713	0.0084	-0.0026	-0.0691	0.1054
54-INDU82	0.0529	0.0418	-0.0208	-0.0364	0.0473
55-INDU83	0.0419	0.0676	-0.0682	-0.0342	0.0955
56-INDU91	0.0338	0.0747	-0.0420	-0.0337	0.0428
57-INDU92	-0.0488	-0.0479	0.0432	-0.0058	-0.0180
58-INDU93	0.0341	0.3063	-0.1905	-0.0194	-0.0170
59-INDU94	0.0193	0.0064	0.0024	-0.0256	0.0267
60-INDU95	-0.0509	-0.0358	0.0068	0.0444	-0.0277

Table B. (cont.)

	6-NON-UNIV	7-UNDER-GRAD.	8-GRAD-UATE	9-EXP	10-SEN
6-NON-UNIV	1.0000				
7-UNDERGRAD.	-0.0401	1.0000			
8-GRADUATE	-0.0561	-0.0373	1.0000		
9-EXP	0.0088	-0.0580	-0.0706	1.0000	
10-SEN	0.0243	-0.0386	-0.0415	0.6668	1.0000
11-MARRIED	0.0273	-0.0060	0.0416	0.1999	0.1438
12-CHILD (0-6)	0.0188	0.0493	0.0329	-0.2050	-0.1371
13-CHILD (7-17)	0.0234	0.0165	0.0371	0.1310	0.0867
14-WOM	0.0148	0.0610	-0.0574	-0.0655	-0.0392
15-CAPITAL	-0.0051	0.0595	0.0683	0.0100	-0.0352
16-TEMPEMPL	-0.0134	0.0062	0.0368	-0.2631	-0.2956
17-PART-TIME	-0.0245	0.0110	0.0120	-0.0986	-0.1008
18-UNEMPL	-0.0717	-0.0389	-0.0612	-0.1361	-0.2402
19-PIECE-RATE	-0.0654	-0.0513	-0.0509	-0.0107	-0.0309
20-NODAYWORK	-0.0443	-0.0663	-0.0629	-0.0283	0.0140
21-UNION	0.0535	0.0227	0.0075	0.1880	0.2261
22-OJT	0.1499	0.0940	0.1535	0.0340	0.0992
23-OCC31	0.0491	0.0299	0.1039	0.0619	0.0195
24-OCC32	0.2013	0.0594	0.2276	-0.0536	-0.0233
25-OCC33	0.2164	0.3328	0.2790	0.0038	0.0386
26-OCC34	0.1148	0.1270	0.2258	-0.0482	-0.0329
27-OCC41	-0.0097	-0.0400	-0.0510	0.0805	0.1016
28-OCC42	-0.0443	-0.0070	-0.0551	-0.0268	-0.0316
29-OCC43	-0.0594	-0.0389	-0.0587	-0.0285	0.0227
30-OCC44	0.0667	-0.0577	-0.0693	-0.0807	-0.0452
31-OCC51	-0.0322	-0.0214	-0.0299	0.0009	-0.0282
32-OCC52	-0.1241	-0.0843	-0.1151	0.0261	-0.0150
33-OCC53	-0.0659	-0.0466	-0.0652	0.0126	-0.0026
34-OCC54	-0.0918	-0.0653	-0.0914	0.0433	0.0091
35-INDU11	-0.0295	-0.0247	-0.0345	0.0227	-0.0019
36-INDU20	-0.0097	-0.0064	-0.0090	0.0257	0.0414
37-INDU31	-0.0391	-0.0210	-0.0221	0.0276	0.0374
38-INDU32	-0.0411	-0.0273	-0.0382	0.0152	0.0013
39-INDU33	-0.0321	-0.0261	-0.0365	0.0225	0.0238
40-INDU34	-0.0412	-0.0227	-0.0143	0.0134	0.0570
41-INDU35	-0.0114	-0.0235	0.0180	0.0011	0.0247
42-INDU36	-0.0245	-0.0163	-0.0107	0.0136	0.0170
43-INDU37	-0.0065	-0.0134	-0.0042	0.0217	0.0483
44-INDU38	-0.0185	-0.0239	-0.0099	-0.0191	-0.0171
45-INDU39	0.0380	-0.0074	-0.0104	-0.0083	-0.0023
46-INDU40	-0.0281	-0.0187	-0.0156	0.0291	0.0569
47-INDU50	-0.0376	-0.0412	-0.0572	0.0032	-0.0976
48-INDU61	0.0125	-0.0053	-0.0186	0.0217	0.0136
49-INDU62	-0.0416	-0.0105	-0.0661	0.0190	-0.0244
50-INDU63	-0.0393	-0.0261	-0.0365	-0.0237	-0.0488
51-INDU71	-0.0183	-0.0387	-0.0542	0.0227	0.0348
52-INDU72	-0.0271	-0.0272	-0.0307	0.0599	0.1226
53-INDU81	-0.0415	0.0121	-0.0057	0.0057	0.0509
54-INDU82	-0.0101	0.0030	0.0449	-0.0062	0.0053
55-INDU83	0.0447	0.0153	-0.0113	-0.0406	-0.0693
56-INDU91	0.0048	0.0042	0.0776	0.0162	0.0413
57-INDU92	-0.0136	-0.0165	-0.0231	-0.0108	-0.0354
58-INDU93	0.1976	0.1443	0.1769	-0.0681	-0.0468
59-INDU94	-0.0244	0.0400	-0.0034	-0.0474	-0.0458
60-INDU95	-0.0179	-0.0185	-0.0259	-0.0098	-0.0225

Table B. (cont.)

	11-MAR-RIED	12-CHILD (AGE 0-6)	13-CHILD (AGE 7-17)	14-WOM	15-CAPI-TAL
11-MARRIED	1.0000				
12-CHILD (0-6)	0.2816	1.0000			
13-CHILD (7-17)	0.2923	0.0716	1.0000		
14-WOM	-0.0126	-0.0550	0.0389	1.0000	
15-CAPITAL	-0.0621	-0.0523	-0.0679	0.0316	1.0000
16-TEMPEMPL	-0.1427	-0.0249	-0.0955	0.0724	-0.0617
17-PART-TIME	-0.0383	0.0057	-0.0209	0.1281	0.0140
18-UNEMPL	-0.0982	-0.0352	-0.0704	-0.0114	-0.1121
19-PIECE-RATE	-0.0078	0.0098	0.0005	-0.0900	-0.0610
20-NODAYWORK	-0.0187	0.0075	-0.0026	0.0299	-0.0543
21-UNION	0.1465	0.0575	0.1078	0.0706	-0.1751
22-OJT	0.0926	0.0174	0.0868	0.0163	0.0752
23-OCC31	0.0678	0.0229	0.0423	-0.1448	0.0882
24-OCC32	0.0277	0.0222	0.0267	-0.1067	0.0773
25-OCC33	0.0152	0.0089	0.0157	0.0223	-0.0251
26-OCC34	0.0178	0.0290	-0.0172	0.0420	0.0415
27-OCC41	0.0503	0.0176	0.0299	-0.1263	0.0202
28-OCC42	-0.0008	-0.0313	-0.0082	0.2136	0.0724
29-OCC43	0.0194	0.0026	0.0344	0.2399	0.0591
30-OCC44	-0.0252	0.0269	0.0291	0.2282	-0.0176
31-OCC51	-0.0497	-0.0100	-0.0036	-0.0740	-0.0646
32-OCC52	-0.0238	0.0041	-0.0198	-0.2623	-0.1388
33-OCC53	0.0009	-0.0055	-0.0102	-0.0784	-0.0190
34-OCC54	-0.0548	-0.0542	-0.0690	-0.0112	-0.0129
35-INDU11	-0.0372	0.0083	-0.0045	-0.0884	-0.0701
36-INDU20	0.0236	-0.0217	0.0122	-0.0142	-0.0194
37-INDU31	0.0048	-0.0052	0.0040	0.0169	-0.0213
38-INDU32	0.0060	-0.0128	0.0102	0.1025	-0.0705
39-INDU33	-0.0026	-0.0051	0.0112	-0.0575	-0.0704
40-INDU34	0.0219	0.0194	-0.0005	-0.0630	-0.0177
41-INDU35	-0.0144	0.0169	-0.0055	-0.0628	-0.0151
42-INDU36	-0.0178	-0.0176	0.0034	-0.0657	-0.0160
43-INDU37	0.0205	-0.0003	0.0455	-0.0656	-0.0326
44-INDU38	-0.0023	0.0060	-0.0099	-0.1526	-0.0363
45-INDU39	-0.0115	-0.0116	0.0022	-0.0240	0.0062
46-INDU40	0.0165	0.0020	-0.0172	-0.0672	-0.0102
47-INDU50	-0.0164	0.0385	-0.0403	-0.2410	-0.0570
48-INDU61	-0.0043	-0.0207	0.0032	-0.0427	0.1539
49-INDU62	0.0138	-0.0461	-0.0111	0.0674	-0.0197
50-INDU63	-0.0404	-0.0170	-0.0166	0.0958	0.0135
51-INDU71	-0.0051	-0.0072	-0.0220	-0.1208	0.0377
52-INDU72	0.0233	-0.0309	-0.0187	-0.0300	-0.0215
53-INDU81	0.0431	0.0286	0.0382	0.1217	0.0801
54-INDU82	0.0418	0.0241	-0.0135	0.0033	0.0847
55-INDU83	-0.0091	0.0279	-0.0107	-0.0067	0.0985
56-INDU91	0.0231	-0.0099	0.0352	0.0240	0.0351
57-INDU92	-0.0160	-0.0249	-0.0310	0.0155	0.0417
58-INDU93	-0.0090	0.0178	0.0287	0.3072	-0.0273
59-INDU94	-0.0272	-0.0224	0.0003	0.0517	0.0084
60-INDU95	-0.0162	-0.0021	-0.0011	-0.0424	-0.0150

Table B. (cont.)

	16-TEMP-EMPL	17-PART-TIME	18-UNEMPL	19-PIECE-RATE	20-NODAY-WORK
16-TEMPEMPL	1.0000				
17-PART-TIME	0.1148	1.0000			
18-UNEMPL	0.3579	0.0607	1.0000		
19-PIECE-RATE	-0.0459	-0.0041	0.0619	1.0000	
20-NODAYWORK	0.0027	0.0942	-0.0303	0.0494	1.0000
21-UNION	-0.1171	-0.1516	-0.0413	0.0304	0.0607
22-OJT	-0.1333	-0.0828	-0.1724	-0.0914	-0.0814
23-OCC31	-0.0496	-0.0157	-0.0558	-0.0264	-0.0991
24-OCC32	-0.0043	-0.0293	-0.0491	-0.0590	-0.0962
25-OCC33	0.0872	0.0454	-0.0384	-0.0582	-0.0870
26-OCC34	0.0482	-0.0165	-0.0654	-0.0550	-0.0221
27-OCC41	-0.0637	-0.0504	-0.0661	-0.0821	-0.0591
28-OCC42	-0.0588	0.0352	-0.0324	-0.0574	-0.0936
29-OCC43	0.0200	0.0201	-0.0469	-0.0766	-0.1043
30-OCC44	0.1025	0.0268	0.0201	-0.0995	0.1946
31-OCC51	0.0311	0.0062	0.0556	0.1209	-0.0575
32-OCC52	-0.0423	-0.0981	0.1310	0.3301	0.0417
33-OCC53	0.0014	-0.0248	0.0272	0.0031	-0.0002
34-OCC54	-0.0184	0.1046	0.0242	-0.0546	0.1807
35-INDU11	0.0149	-0.0018	0.0244	0.0938	-0.0579
36-INDU20	0.0090	-0.0077	-0.0133	-0.0124	0.0251
37-INDU31	-0.0171	-0.0286	-0.0142	0.0741	0.0297
38-INDU32	-0.0393	-0.0244	0.0646	0.1982	-0.0540
39-INDU33	-0.0361	-0.0226	-0.0099	0.1186	0.0189
40-INDU34	-0.0403	-0.0076	-0.0345	-0.0226	0.1158
41-INDU35	-0.0351	-0.0185	-0.0302	0.0256	0.0347
42-INDU36	-0.0153	-0.0057	0.0010	0.0696	0.0137
43-INDU37	-0.0272	-0.0162	-0.0278	-0.0037	0.0525
44-INDU38	-0.0619	-0.0578	-0.0043	0.1454	-0.0455
45-INDU39	0.0040	-0.0089	0.0034	-0.0143	-0.0250
46-INDU40	-0.0148	-0.0225	-0.0083	-0.0280	-0.0411
47-INDU50	0.0608	-0.0415	0.1783	0.0380	-0.1289
48-INDU61	-0.0453	-0.0380	-0.0331	-0.0024	-0.0897
49-INDU62	-0.0564	0.0409	-0.0139	-0.0432	-0.0154
50-INDU63	-0.0249	-0.0050	-0.0044	0.0254	0.1770
51-INDU71	-0.0395	-0.0221	-0.0188	-0.0503	0.1223
52-INDU72	-0.0228	0.0011	-0.0191	-0.0355	-0.0382
53-INDU81	0.0061	0.0134	-0.0515	-0.0559	-0.0864
54-INDU82	-0.0302	-0.0179	-0.0308	-0.0187	-0.0434
55-INDU83	-0.0292	0.0144	-0.0226	-0.0196	-0.0643
56-INDU91	0.0066	-0.0174	-0.0422	-0.0819	-0.0294
57-INDU92	-0.0160	0.0624	0.0001	-0.0227	0.0244
58-INDU93	0.1670	0.0864	0.0032	-0.1572	0.0547
59-INDU94	0.0748	0.0674	0.0198	-0.0214	0.1182
60-INDU95	0.0013	0.0021	-0.0000	0.0291	-0.0348

	21-UNION	22-OJT	23-OCC31	24-OCC32	25-OCC33
21-UNION	1.0000				
22-OJT	0.0637	1.0000			
23-OCC31	-0.1546	0.1061	1.0000		
24-OCC32	-0.0241	0.1136	-0.0362	1.0000	
25-OCC33	0.0617	0.0935	-0.0412	-0.0401	1.0000
26-OCC34	-0.0122	0.1324	-0.0461	-0.0448	-0.0510
27-OCC41	0.0173	0.0854	-0.0546	-0.0532	-0.0605
28-OCC42	-0.1009	0.0527	-0.0760	-0.0740	-0.0842
29-OCC43	0.0260	0.0559	-0.0535	-0.0520	-0.0592
30-OCC44	0.0543	0.0432	-0.0681	-0.0663	-0.0755
31-OCC51	-0.0583	-0.0090	-0.0252	-0.0246	-0.0280
32-OCC52	0.1094	-0.2415	-0.0996	-0.0969	-0.1103
33-OCC53	-0.0017	-0.0668	-0.0550	-0.0536	-0.0610

Table B. (cont.)

34-OCC54	-0.0209	-0.1175	-0.0771	-0.0751	-0.0855
35-INDU11	-0.0642	0.0292	-0.0291	-0.0186	-0.0323
36-INDU20	-0.0255	-0.0031	-0.0076	-0.0074	-0.0084
37-INDU31	0.0173	-0.0698	-0.0121	-0.0106	-0.0394
38-INDU32	0.0303	-0.0826	-0.0151	-0.0226	-0.0357
39-INDU33	0.0195	-0.0816	-0.0039	-0.0300	-0.0341
40-INDU34	0.0405	-0.0199	0.0066	-0.0301	-0.0492
41-INDU35	0.0255	0.0000	0.0119	0.0034	-0.0307
42-INDU36	0.0230	-0.0333	-0.0192	-0.0042	-0.0213
43-INDU37	0.0448	0.0481	-0.0159	0.0194	-0.0176
44-INDU38	0.0208	-0.0577	0.0463	0.0451	-0.0629
45-INDU39	-0.0159	0.0121	0.0218	0.0228	0.0181
46-INDU40	0.0351	0.0209	-0.0097	0.0290	-0.0245
47-INDU50	-0.0136	-0.1142	-0.0349	-0.0115	-0.0619
48-INDU61	-0.1301	0.0384	0.1798	0.0020	-0.0413
49-INDU62	-0.0745	-0.0249	-0.0034	-0.0543	-0.0618
50-INDU63	-0.0240	-0.0575	-0.0129	-0.0300	-0.0341
51-INDU71	-0.0142	-0.0124	-0.0270	-0.0317	-0.0506
52-INDU72	0.0449	0.0342	-0.0235	0.0128	-0.0356
53-INDU81	-0.0007	0.1104	0.0824	-0.0286	-0.0413
54-INDU82	-0.0251	0.0835	-0.0022	0.0143	-0.0195
55-INDU83	-0.1140	0.0024	0.0652	0.1554	-0.0443
56-INDU91	0.0658	0.0571	-0.0216	0.1212	-0.0557
57-INDU92	-0.0499	-0.0187	-0.0055	-0.0190	-0.0216
58-INDU93	0.1006	0.1135	-0.0830	-0.0522	0.3963
59-INDU94	-0.0209	-0.0092	-0.0046	-0.0143	-0.0286
60-INDU95	-0.0486	0.0037	-0.0094	-0.0213	-0.0242

	26-OCC34	27-OCC41	28-OCC42	29-OCC43	30-OCC44
26-OCC34	1.0000				
27-OCC41	-0.0677	1.0000			
28-OCC42	-0.0943	-0.1117	1.0000		
29-OCC43	-0.0663	-0.0786	-0.1094	1.0000	
30-OCC44	-0.0844	-0.1001	-0.1393	-0.0980	1.0000
31-OCC51	-0.0313	-0.0371	-0.0517	-0.0363	-0.0463
32-OCC52	-0.1234	-0.1463	-0.2037	-0.1432	-0.1824
33-OCC53	-0.0682	-0.0809	-0.1126	-0.0792	-0.1008
34-OCC54	-0.0956	-0.1134	-0.1578	-0.1110	-0.1413
35-INDU11	-0.0283	0.0509	-0.0390	-0.0283	-0.0086
36-INDU20	-0.0094	-0.0112	0.0037	-0.0109	-0.0139
37-INDU31	-0.0441	-0.0190	-0.0217	-0.0173	-0.0606
38-INDU32	-0.0400	-0.0231	-0.0333	-0.0464	-0.0591
39-INDU33	-0.0308	0.0054	-0.0338	-0.0314	-0.0512
40-INDU34	0.0394	-0.0245	-0.0213	-0.0408	-0.0511
41-INDU35	-0.0180	0.0225	-0.0081	-0.0184	-0.0332
42-INDU36	-0.0238	-0.0182	-0.0162	-0.0175	-0.0352
43-INDU37	-0.0197	0.0008	-0.0325	-0.0228	-0.0089
44-INDU38	-0.0449	0.0079	-0.0599	-0.0519	-0.1010
45-INDU39	0.0395	-0.0129	-0.0012	-0.0126	-0.0161
46-INDU40	-0.0274	0.0549	-0.0250	-0.0229	-0.0332
47-INDU50	-0.0692	0.0624	-0.0915	-0.0351	-0.0931
48-INDU61	-0.0031	-0.0070	0.1031	0.0003	-0.0595
49-INDU62	-0.0303	0.0108	0.4137	-0.0386	-0.0960
50-INDU63	-0.0382	0.0308	0.0003	-0.0379	-0.0459
51-INDU71	-0.0362	0.0386	-0.0223	-0.0164	-0.0506
52-INDU72	-0.0398	0.0382	-0.0563	0.0968	-0.0537
53-INDU81	-0.0031	-0.0283	-0.0396	0.4490	-0.0684
54-INDU82	0.0666	-0.0150	0.1231	-0.0143	-0.0323
55-INDU83	0.0600	0.0058	0.0252	0.0386	-0.0608
56-INDU91	0.0459	0.0194	0.0811	0.0681	-0.0142
57-INDU92	-0.0241	0.0108	-0.0399	-0.0079	-0.0357
58-INDU93	0.0959	-0.1015	-0.1396	-0.0780	0.4913
59-INDU94	0.1511	-0.0154	-0.0355	-0.0295	0.0405
60-INDU95	-0.0271	0.0119	-0.0312	-0.0315	-0.0327

Table B. (cont.)

	31-OCC51	32-OCC52	33-OCC53	34-OCC54	35-INDU11*
31-OCC51	1.0000				
32-OCC52	-0.0677	1.0000			
33-OCC53	-0.0374	-0.1474	1.0000		
34-OCC54	-0.0524	-0.2066	-0.1142	1.0000	
35-INDU11	0.6896	-0.0780	-0.0165	-0.0605	1.0000
36-INDU20	-0.0051	0.0442	-0.0112	0.0032	-0.0059
37-INDU31	-0.0129	0.1436	0.0629	-0.0444	-0.0279
38-INDU32	-0.0219	0.2500	-0.0297	-0.0577	-0.0253
39-INDU33	-0.0080	0.1748	-0.0078	-0.0398	-0.0241
40-INDU34	-0.0302	0.1636	-0.0118	-0.0405	-0.0348
41-INDU35	-0.0188	0.1021	-0.0061	-0.0522	-0.0217
42-INDU36	-0.0130	0.1289	-0.0086	-0.0247	-0.0151
43-INDU37	-0.0108	0.0741	0.0245	-0.0238	-0.0124
44-INDU38	-0.0386	0.2949	-0.0441	-0.0983	-0.0445
45-INDU39	-0.0059	0.0044	-0.0130	-0.0182	-0.0069
46-INDU40	-0.0150	0.0702	-0.0153	-0.0126	-0.0173
47-INDU50	-0.0379	0.3178	-0.0532	-0.0595	-0.0438
48-INDU61	-0.0253	-0.0999	0.0080	0.0073	-0.0292
49-INDU62	-0.0379	-0.1493	0.0317	-0.0479	-0.0437
50-INDU63	-0.0209	-0.0826	0.1310	0.1195	-0.0241
51-INDU71	-0.0311	-0.1225	-0.0019	0.2942	-0.0358
52-INDU72	-0.0218	-0.0860	0.0677	0.1145	-0.0252
53-INDU81	-0.0253	-0.0999	-0.0394	-0.0572	-0.0292
54-INDU82	-0.0120	-0.0472	-0.0153	-0.0366	-0.0138
55-INDU83	-0.0170	-0.1072	-0.0296	0.0229	-0.0313
56-INDU91	-0.0341	-0.1346	-0.0018	-0.0086	-0.0394
57-INDU92	0.1075	-0.0522	-0.0190	0.1475	-0.0153
58-INDU93	-0.0604	-0.2762	-0.0414	-0.0183	-0.0808
59-INDU94	-0.0022	-0.0692	-0.0233	0.0607	-0.0202
60-INDU95	0.0030	-0.0586	0.2221	0.0217	-0.0171

* The correlations between the different industry sectors are, not surprisingly, very low throughout (as exemplified by INDU11) and are therefore not reported here.

Table C. Correlation matrix for male employees

	1-lnEARN	2-S	3-BASIC	4-LOWER VOCA-TIONAL	5-UPPER VOCA-TIONAL
1-lnEARN	1.0000				
2-S	0.4357	1.0000			
3-BASIC	-0.2243	-0.7456	1.0000		
4-LOWER VOC.	-0.1649	-0.0089	-0.5220	1.0000	
5-UPPER VOC.	0.1137	0.2288	-0.3459	-0.3358	1.0000
6-NON-UNIV	0.2013	0.3547	-0.1741	-0.1690	-0.1120
7-UNDERGRAD.	0.1078	0.2546	-0.0935	-0.0908	-0.0601
8-GRADUATE	0.3398	0.6602	-0.1892	-0.1837	-0.1217
9-EXP	0.1677	-0.2660	0.3873	-0.2122	-0.1606
10-SEN	0.1983	-0.1344	0.2179	-0.1339	-0.0961
11-MARRIED	0.2465	0.0785	0.0227	-0.1021	-0.0096
12-CHILD (0-6)	0.0345	0.0939	-0.0945	0.0480	0.0051
13-CHILD (7-17)	0.2051	0.0491	0.0312	-0.0684	-0.0394
14-CAPITAL	0.2179	0.1314	-0.0712	-0.0761	0.1029
15-TEMPEMPL	-0.1364	0.0478	-0.0506	-0.0131	0.0779
16-PART-TIME	-0.0030	-0.0062	0.0097	-0.0485	0.0604
17-UNEMPL	-0.1999	-0.1089	0.0464	0.0602	-0.0317
18-PIECE-RATE	-0.0382	-0.1391	0.0759	0.0834	-0.0892
19-NODAYWORK	-0.0265	-0.1481	0.1083	0.0394	-0.0685
20-UNION	0.0345	-0.0188	0.0117	0.1138	-0.1885
21-OJT	0.3280	0.3214	-0.2168	-0.1058	0.1697
22-OCC31	0.3547	0.1835	-0.0854	-0.1437	0.1437
23-OCC32	0.2230	0.3684	-0.1602	-0.1499	-0.0023
24-OCC33	0.2002	0.3839	-0.1476	-0.1375	-0.0449
25-OCC34	0.1476	0.2460	-0.1198	-0.1093	0.0933
26-OCC41	0.0748	0.0301	-0.0900	-0.0773	0.2894
27-OCC42	-0.0716	0.0047	-0.0149	-0.0651	0.1319
28-OCC43	0.0051	0.0469	-0.0533	-0.0132	0.0662
29-OCC44	-0.0294	0.0300	-0.0972	0.0444	0.1039
30-OCC51	-0.1213	·0.1051	0.1008	-0.0057	-0.0609
31-OCC52	-0.1542	-0.3022	0.1443	0.2450	-0.2468
32-OCC53	-0.1614	-0.1465	0.0822	0.0845	-0.0934
33-OCC54	-0.1947	-0.2063	0.1635	0.0340	-0.1126
34-INDU11	-0.1039	-0.0717	0.0456	0.0089	-0.0089
35-INDU20	-0.0127	-0.0354	0.0388	-0.0084	-0.0218
36-INDU31	-0.0293	-0.0478	0.0553	-0.0254	-0.0097
37-INDU32	-0.0159	-0.0628	0.0710	-0.0382	-0.0063
38-INDU33	-0.1064	-0.0864	0.0592	0.0216	-0.0354
39-INDU34	0.1001	-0.0840	0.0441	0.0335	-0.0170
40-INDU35	0.0385	-0.0148	-0.0015	0.0234	-0.0083
41-INDU36	-0.0233	-0.0499	0.0364	0.0227	-0.0395
42-INDU37	0.0391	-0.0330	0.0300	0.0129	-0.0400
43-INDU38	-0.0128	0.0157	-0.0652	0.0930	-0.0198
44-INDU39	0.0207	0.0135	-0.0217	-0.0003	0.0222
45-INDU40	0.0243	-0.0168	-0.0285	0.0623	-0.0009
46-INDU50	-0.0901	-0.1228	0.0668	0.0371	-0.0275
47-INDU61	0.0776	0.0103	-0.0055	-0.0599	0.0866
48-INDU62	-0.1023	-0.0852	0.0691	-0.0240	0.0057
49-INDU63	-0.0217	-0.0122	-0.0148	0.0109	0.0386
50-INDU71	-0.0771	-0.1117	0.0649	0.0574	-0.0743
51-INDU72	-0.0194	-0.0631	0.0636	-0.0332	0.0005
52-INDU81	0.1415	0.1010	-0.0536	-0.0509	0.0569
53-INDU82	0.0829	0.0830	-0.0407	-0.0386	0.0352
54-INDU83	0.0778	0.1047	-0.0884	-0.0553	0.0987
55-INDU91	0.0671	0.1394	-0.0805	-0.0355	0.0316
56-INDU92	-0.0603	-0.0302	0.0292	-0.0169	0.0013
57-INDU93	0.1535	0.3999	-0.1741	-0.1236	-0.0054
58-INDU94	-0.0219	-0.0091	-0.0217	0.0139	0.0452
59-INDU95	-0.0900	-0.0404	0.0039	0.0420	-0.0106

Table C. (cont.)

	6-NON-UNIV	7-UNDER-GRAD.	8-GRAD-UATE	9-EXP	10-SEN
6-NON-UNIV	1.0000				
7-UNDERGRAD.	-0.0303	1.0000			
8-GRADUATE	-0.0613	-0.0329	1.0000		
9-EXP	-0.0159	-0.0380	-0.0581	1.0000	
10-SEN	0.0113	-0.0132	-0.0185	0.6596	1.0000
11-MARRIED	0.0585	0.0168	0.1067	0.3166	0.2291
12-CHILD (0-6)	0.0129	0.0420	0.0506	-0.1812	-0.1248
13-CHILD (7-17)	0.0440	0.0272	0.0799	0.2119	0.1571
14-CAPITAL	-0.0200	0.0497	0.1178	0.0072	-0.0367
15-TEMPEMPL	-0.0235	-0.0206	0.0337	-0.2062	-0.2706
16-PART-TIME	-0.0049	-0.0142	-0.0087	-0.1139	-0.0965
17-UNEMPL	-0.0662	-0.0438	-0.0743	-0.1263	-0.2594
18-PIECE-RATE	-0.0713	-0.0463	-0.0799	-0.0413	-0.0584
19-NODAYWORK	-0.0967	-0.0571	-0.0616	-0.0194	0.0776
20-UNION	0.0482	0.0074	0.0065	0.1728	0.2452
21-OJT	0.1414	0.0803	0.1901	0.0179	0.1138
22-OCC31	0.0841	0.0365	0.1227	0.0787	0.0171
23-OCC32	0.3533	0.0260	0.2704	-0.0705	-0.0193
24-OCC33	0.2098	0.3478	0.2558	0.0180	0.0447
25-OCC34	0.0411	0.0758	0.2231	-0.0442	-0.0089
26-OCC41	-0.0446	-0.0444	-0.0687	0.0728	0.1129
27-OCC42	-0.0198	-0.0142	-0.0278	-0.0584	-0.0760
28-OCC43	0.0319	-0.0114	0.0015	-0.0436	-0.0327
29-OCC44	-0.0092	-0.0251	-0.0392	-0.0682	-0.0246
30-OCC51	-0.0393	-0.0211	-0.0427	0.0227	-0.0227
31-OCC52	-0.1579	-0.0875	-0.1772	-0.0018	-0.0393
32-OCC53	-0.0776	-0.0417	-0.0844	-0.0066	-0.0111
33-OCC54	-0.0830	-0.0519	-0.1050	0.0273	0.0262
34-INDU11	-0.0329	-0.0245	-0.0497	0.0460	0.0042
35-INDU20	-0.0109	-0.0059	-0.0119	0.0214	0.0323
36-INDU31	-0.0277	-0.0223	-0.0064	0.0357	0.0429
37-INDU32	-0.0240	-0.0129	-0.0261	0.0545	0.0360
38-INDU33	-0.0446	-0.0239	-0.0485	0.0208	0.0124
39-INDU34	-0.0624	-0.0162	-0.0588	0.0088	0.0616
40-INDU35	-0.0131	-0.0221	-0.0056	0.0012	0.0330
41-INDU36	-0.0308	-0.0165	-0.0161	0.0140	0.0165
42-INDU37	-0.0049	-0.0142	-0.0087	0.0224	0.0531
43-INDU38	0.0056	-0.0346	-0.0087	-0.0468	-0.0254
44-INDU39	0.0285	-0.0072	-0.0146	-0.0259	-0.0017
45-INDU40	-0.0346	-0.0186	-0.0221	0.0443	0.0709
46-INDU50	-0.0430	-0.0522	-0.0931	-0.0195	-0.1477
47-INDU61	0.0181	-0.0274	-0.0127	0.0380	0.0246
48-INDU62	-0.0290	-0.0137	-0.0644	-0.0085	-0.0427
49-INDU63	-0.0233	-0.0125	-0.0254	-0.0491	-0.0418
50-INDU71	-0.0270	-0.0379	-0.0767	0.0215	0.0427
51-INDU72	-0.0162	-0.0232	-0.0344	0.0287	0.1160
52-INDU81	-0.0059	0.0989	0.0686	0.0213	-0.0028
53-INDU82	0.0053	0.0362	0.0758	0.0005	-0.0013
54-INDU83	0.1377	-0.0059	0.0000	-0.0559	-0.0709
55-INDU91	0.0533	0.0049	0.1254	0.0002	0.0267
56-INDU92	0.0037	-0.0118	-0.0239	-0.0088	-0.0190
57-INDU93	0.1473	0.2548	0.3241	-0.0241	0.0025
58-INDU94	-0.0246	-0.0132	-0.0268	-0.0524	-0.0455
59-INDU95	-0.0318	-0.0170	-0.0345	-0.0323	-0.0220

Table C. (cont.)

	11-MARRIED	12-CHILD (AGE 0-6)	13-CHILD (AGE 7-17)	14-CAPITAL	15-TEMP-EMPL.
11-MARRIED	1.0000				
12-CHILD (0-6)	0.3404	1.0000			
13-CHILD (7-17)	0.3747	0.1124	1.0000		
14-CAPITAL	0.0037	-0.0431	-0.0579	1.0000	
15-TEMPEMPL	-0.2165	-0.0904	-0.1005	-0.0526	1.0000
16-PART-TIME	-0.1448	-0.0321	-0.0787	0.0351	0.1870
17-UNEMPL	-0.1704	-0.0745	-0.0989	-0.0905	0.3850
18-PIECE-RATE	-0.0372	0.0081	-0.0053	-0.0681	-0.0541
19-NODAYWORK	-0.0104	0.0183	-0.0083	-0.0357	-0.0254
20-UNION	0.1418	0.0929	0.1172	-0.1717	-0.1283
21-OJT	0.1537	0.0342	0.0812	0.0823	-0.1378
22-OCC31	0.1035	0.0075	0.0762	0.1431	-0.0584
23-OCC32	0.0542	0.0114	0.0522	0.1135	0.0114
24-OCC33	0.0556	0.0144	0.0451	-0.0309	0.0667
25-OCC34	0.0557	0.0340	0.0296	0.0392	0.0260
26-OCC41	0.0798	0.0274	0.0454	0.0085	-0.0549
27-OCC42	-0.0006	0.0066	-0.0394	0.0498	-0.0216
28-OCC43	-0.0154	-0.0115	-0.0380	0.0350	0.0192
29-OCC44	-0.0382	0.0197	0.0042	-0.0129	0.0281
30-OCC51	-0.0689	-0.0213	0.0166	-0.0782	0.0521
31-OCC52	-0.0739	-0.0203	-0.0256	-0.1615	0.0180
32-OCC53	-0.0219	-0.0098	-0.0046	0.0091	-0.0123
33-OCC54	-0.0678	-0.0321	-0.1054	0.0214	-0.0132
34-INDU11	-0.0573	0.0054	0.0226	-0.0910	0.0204
35-INDU20	0.0272	-0.0271	0.0409	-0.0218	0.0302
36-INDU31	0.0031	-0.0168	0.0091	-0.0342	-0.0150
37-INDU32	-0.0255	-0.0472	-0.0036	-0.0340	-0.0291
38-INDU33	-0.0234	-0.0027	-0.0080	-0.0736	-0.0319
39-INDU34	0.0307	-0.0149	0.0126	-0.0230	-0.0346
40-INDU35	-0.0059	0.0355	0.0181	-0.0249	-0.0261
41-INDU36	-0.0191	-0.0282	0.0149	-0.0288	-0.0215
42-INDU37	0.0214	-0.0099	0.0653	-0.0401	-0.0320
43-INDU38	-0.0296	-0.0025	0.0097	-0.0287	-0.0643
44-INDU39	-0.0313	-0.0116	-0.0199	-0.0023	0.0192
45-INDU40	0.0261	-0.0085	-0.0156	-0.0108	-0.0419
46-INDU50	-0.0265	0.0420	-0.0596	-0.0792	0.1402
47-INDU61	0.0201	-0.0194	0.0186	0.1937	-0.0619
48-INDU62	0.0122	-0.0061	-0.0076	-0.0122	-0.0376
49-INDU63	0.0080	-0.0202	-0.0114	0.0526	0.0128
50-INDU71	-0.0035	-0.0221	-0.0355	0.0265	-0.0191
51-INDU72	0.0032	-0.0234	-0.0061	-0.0075	0.0047
52-INDU81	0.0454	0.0418	0.0505	0.0567	-0.0148
53-INDU82	0.0529	0.0570	-0.0252	0.0505	-0.0258
54-INDU83	-0.0022	0.0453	-0.0202	0.1188	-0.0010
55-INDU91	0.0411	-0.0192	0.0538	0.0550	0.0065
56-INDU92	-0.0381	-0.0411	-0.0285	0.0612	0.0170
57-INDU93	0.0427	0.0389	0.0044	-0.0058	0.0833
58-INDU94	-0.0456	-0.0371	-0.0292	0.0046	0.0679
59-INDU95	-0.0323	-0.0135	0.0174	-0.0212	-0.0232

	16-PART-TIME	17-UNEMPL	18-PIECE RATE	9-NODAY-WORK	20-UNION
16-PART-TIME	1.0000				
17-UNEMPL	0.0562	1.0000			
18-PIECE-RATE	-0.0253	0.0809	1.0000		
19-NODAYWORK	0.1053	-0.0556	0.0257	1.0000	
20-UNION	-0.1554	-0.0782	0.0321	0.1088	1.0000
21-OJT	-0.0439	-0.1587	-0.0459	-0.0556	0.0743
22-OCC31	0.0107	-0.0753	-0.0467	-0.1323	-0.1758
23-OCC32	-0.0051	-0.0667	-0.0866	-0.1147	0.0008

Table C. (cont.)

24-OCC33	0.0276	-0.0602	-0.0730	-0.0797	0.0623
25-OCC34	-0.0004	-0.0487	-0.0457	0.0180	-0.0148
26-OCC41	-0.0388	-0.0919	-0.1211	-0.0886	0.0218
27-OCC42	0.0536	-0.0207	0.0418	-0.0515	-0.1490
28-OCC43	-0.0100	0.0080	-0.0326	-0.0039	-0.0289
29-OCC44	0.0802	-0.0036	-0.0715	0.1275	0.0072
30-OCC51	-0.0184	0.0615	0.1774	-0.0795	-0.0533
31-OCC52	-0.0765	0.1770	0.2218	0.0719	0.1576
32-OCC53	-0.0200	-0.0125	-0.0003	-0.0285	-0.0170
33-OCC54	0.0657	-0.0005	-0.0951	0.2107	0.0100
34-INDU11	0.0046	0.0272	0.1273	-0.0878	-0.0633
35-INDU20	-0.0051	-0.0159	-0.0167	0.0315	0.0009
36-INDU31	-0.0195	-0.0297	0.0438	0.0210	0.0250
37-INDU32	-0.0112	-0.0174	-0.0035	-0.0148	-0.0009
38-INDU33	-0.0209	0.0022	0.1058	0.0215	0.0306
39-INDU34	-0.0095	-0.0550	-0.0411	0.1922	0.0661
40-INDU35	0.0093	-0.0289	0.0059	0.0688	0.0378
41-INDU36	0.0235	0.0098	0.0834	0.0428	0.0384
42-INDU37	-0.0124	-0.0383	-0.0102	0.0818	0.0659
43-INDU38	-0.0416	-0.0223	0.1288	-0.0473	0.0345
44-INDU39	-0.0063	0.0112	-0.0205	-0.0299	-0.0311
45-INDU40	-0.0162	-0.0258	-0.0412	-0.0408	0.0520
46-INDU50	-0.0456	0.2701	0.0222	-0.1759	0.0127
47-INDU61	-0.0240	-0.0402	0.0027	-0.1075	-0.1214
48-INDU62	-0.0072	-0.0267	0.0013	-0.0770	-0.1322
49-INDU63	-0.0109	0.0017	-0.0016	0.0936	-0.0542
50-INDU71	-0.0331	-0.0067	-0.0712	0.2167	0.0016
51-INDU72	0.0623	-0.0132	-0.0471	-0.0154	0.0521
52-INDU81	-0.0127	-0.0391	-0.0413	-0.0487	-0.0735
53-INDU82	-0.0100	-0.0308	-0.0139	-0.0329	-0.0289
54-INDU83	0.0243	-0.0210	-0.0190	-0.0477	-0.0800
55-INDU91	-0.0067	-0.0478	-0.0897	0.0743	0.0625
56-INDU92	0.0950	-0.0130	-0.0336	0.0071	-0.0113
57-INDU93	0.0993	-0.0607	-0.1150	-0.0239	0.0561
58-INDU94	0.0827	0.0149	-0.0377	0.0959	0.0021
59-INDU95	-0.0149	-0.0196	0.0399	-0.0609	-0.0412

	21-OJT	22-OCC31	23-OCC32	24-OCC33	25-OCC34
21-OJT	1.0000				
22-OCC31	0.1489	1.0000			
23-OCC32	0.1536	-0.0621	1.0000		
24-OCC33	0.1058	-0.0524	-0.0480	1.0000	
25-OCC34	0.1123	-0.0560	-0.0514	-0.0433	1.0000
26-OCC41	0.1292	-0.0908	-0.0832	-0.0702	-0.0750
27-OCC42	0.0808	-0.0656	-0.0602	-0.0507	-0.0543
28-OCC43	0.0317	-0.0234	-0.0214	-0.0180	-0.0193
29-OCC44	0.0266	-0.0513	-0.0470	-0.0396	-0.0424
30-OCC51	0.0056	-0.0431	-0.0395	-0.0333	-0.0356
31-OCC52	-0.2858	-0.1788	-0.1639	-0.1382	-0.1478
32-OCC53	-0.0255	-0.0851	-0.0780	-0.0658	-0.0704
33-OCC54	-0.1199	-0.1059	-0.0971	-0.0819	-0.0876
34-INDU11	0.0456	-0.0501	-0.0332	-0.0387	-0.0414
35-INDU20	-0.0109	-0.0120	-0.0110	-0.0093	-0.0099
36-INDU31	-0.0479	-0.0071	-0.0141	-0.0353	-0.0378
37-INDU32	-0.0100	-0.0045	-0.0005	-0.0203	-0.0217
38-INDU33	-0.0871	-0.0248	-0.0449	-0.0378	-0.0405
39-INDU34	-0.0225	-0.0061	-0.0531	-0.0529	0.0172
40-INDU35	0.0000	0.0065	-0.0135	-0.0350	-0.0374
41-INDU36	-0.0371	-0.0337	-0.0124	-0.0261	-0.0279
42-INDU37	0.0870	-0.0290	0.0163	-0.0224	-0.0240
43-INDU38	-0.0550	0.0297	0.0407	-0.0751	-0.0407
44-INDU39	-0.0035	0.0239	0.0282	-0.0114	0.0796
45-INDU40	0.0452	-0.0226	0.0314	-0.0293	-0.0314

Table C. (cont.)

46-INDU50	-0.1576	-0.0817	-0.0438	-0.0824	-0.0881
47-INDU61	0.0421	0.2204	0.0060	-0.0433	-0.0085
48-INDU62	0.0189	0.0094	-0.0596	-0.0503	-0.0537
49-INDU63	-0.0061	0.0192	-0.0235	-0.0198	-0.0212
50-INDU71	-0.0376	-0.0613	-0.0536	-0.0598	-0.0354
51-INDU72	0.0704	-0.0349	-0.0031	-0.0366	-0.0391
52-INDU81	0.0816	0.2038	-0.0061	-0.0229	-0.0014
53-INDU82	0.1064	0.0011	0.0050	-0.0180	0.1552
54-INDU83	0.0269	0.0748	0.1716	-0.0425	0.1084
55-INDU91	0.0606	-0.0174	0.1336	-0.0498	0.1248
56-INDU92	-0.0098	-0.0003	-0.0221	-0.0186	-0.0199
57-INDU93	0.1149	-0.0445	0.0063	0.6353	0.1208
58-INDU94	-0.0137	-0.0057	-0.0248	-0.0209	0.1543
59-INDU95	0.0084	-0.0182	-0.0319	-0.0269	-0.0288

	26-OCC41	27-OCC42	28-OCC43	29-OCC44	30-OCC51
26-OCC41	1.0000				
27-OCC42	-0.0879	1.0000			
28-OCC43	-0.0313	-0.0226	1.0000		
29-OCC44	-0.0686	-0.0496	-0.0177	1.0000	
30-OCC51	-0.0577	-0.0417	-0.0148	-0.0326	1.0000
31-OCC52	-0.2393	-0.1731	-0.0616	-0.1352	-0.1136
32-OCC53	-0.1140	-0.0824	-0.0293	-0.0644	-0.0541
33-OCC54	-0.1418	-0.1026	-0.0365	-0.0801	-0.0673
34-INDU11	0.0530	-0.0364	-0.0173	0.0529	0.7349
35-INDU20	-0.0161	-0.0116	-0.0041	-0.0091	-0.0076
36-INDU31	-0.0006	-0.0046	-0.0157	-0.0345	-0.0290
37-INDU32	-0.0010	-0.0030	-0.0090	-0.0199	-0.0167
38-INDU33	0.0100	-0.0350	-0.0169	-0.0370	-0.0129
39-INDU34	-0.0287	-0.0479	-0.0236	-0.0403	-0.0435
40-INDU35	0.0309	-0.0171	-0.0156	-0.0175	-0.0288
41-INDU36	-0.0317	0.0025	-0.0116	-0.0255	-0.0214
42-INDU37	-0.0232	-0.0281	-0.0100	0.0035	-0.0184
43-INDU38	-0.0095	-0.0460	-0.0152	-0.0735	-0.0618
44-INDU39	-0.0197	-0.0142	-0.0050	-0.0111	-0.0093
45-INDU40	0.0333	-0.0367	-0.0131	-0.0287	-0.0241
46-INDU50	0.0384	-0.0904	-0.0197	-0.0566	-0.0678
47-INDU61	-0.0166	0.0988	0.0097	-0.0424	-0.0356
48-INDU62	0.0005	0.4158	0.0030	-0.0372	-0.0413
49-INDU63	0.0184	-0.0017	-0.0088	0.0382	-0.0163
50-INDU71	0.0095	-0.0584	0.0171	-0.0173	-0.0492
51-INDU72	0.0146	-0.0458	0.0516	-0.0198	-0.0301
52-INDU81	-0.0091	0.0113	0.1495	-0.0224	-0.0188
53-INDU82	-0.0120	0.1289	-0.0080	-0.0177	-0.0148
54-INDU83	-0.0056	0.0024	0.0402	0.0001	-0.0349
55-INDU91	0.0242	-0.0334	0.0291	0.1806	-0.0409
56-INDU92	0.0422	-0.0234	-0.0083	-0.0182	0.2005
57-INDU93	-0.0866	-0.0173	-0.0284	0.1818	-0.0524
58-INDU94	-0.0028	-0.0262	-0.0093	0.0616	-0.0172
59-INDU95	-0.0075	-0.0337	-0.0120	-0.0263	-0.0221

	31-OCC52	32-OCC53	33-OCC54	34-INDU11*	35-INDU20*
31-OCC52	1.0000				
32-OCC53	-0.2245	1.0000			
33-OCC54	-0.2793	-0.1330	1.0000		
34-INDU11	-0.1322	-0.0338	-0.0783	1.0000	
35-INDU20	0.0673	-0.0151	-0.0188	-0.0089	1.0000
36-INDU31	0.0743	0.0274	-0.0265	-0.0338	-0.0081
37-INDU32	0.0675	-0.0331	-0.0106	-0.0194	-0.0046
38-INDU33	0.1606	-0.0117	-0.0681	-0.0362	-0.0087
39-INDU34	0.1733	-0.0124	-0.0571	-0.0506	-0.0121

Table C. (cont.)

40-INDU35	0.0974	-0.0140	-0.0617	-0.0335	-0.0080
41-INDU36	0.1261	-0.0141	-0.0407	-0.0249	-0.0060
42-INDU37	0.0792	0.0291	-0.0453	-0.0214	-0.0051
43-INDU38	0.2537	-0.0889	-0.1331	-0.0718	-0.0172
44-INDU39	0.0015	-0.0185	-0.0230	-0.0109	-0.0026
45-INDU40	0.0841	-0.0223	-0.0379	-0.0280	-0.0067
46-INDU50	0.3420	-0.0927	-0.1011	-0.0788	-0.0189
47-INDU61	-0.1478	0.0261	0.0313	-0.0414	-0.0099
48-INDU62	-0.1714	0.1411	-0.0430	-0.0481	-0.0115
49-INDU63	-0.0676	0.1159	-0.0087	-0.0189	-0.0045
50-INDU71	-0.2040	-0.0111	0.4728	-0.0572	-0.0137
51-INDU72	-0.1248	0.1252	0.1605	-0.0350	-0.0084
52-INDU81	-0.0782	-0.0211	-0.0191	-0.0219	-0.0052
53-INDU82	-0.0616	-0.0293	-0.0365	-0.0173	-0.0041
54-INDU83	-0.1450	-0.0154	0.0123	-0.0406	-0.0097
55-INDU91	-0.1698	0.0198	0.0043	-0.0476	-0.0114
56-INDU92	-0.0637	-0.0107	0.0287	-0.0178	-0.0042
57-INDU93	-0.2176	-0.0911	-0.0068	-0.0610	-0.0146
58-INDU94	-0.0713	-0.0163	0.0470	-0.0200	-0.0048
59-INDU95	-0.0919	0.3133	-0.0196	-0.0257	-0.0061

* The correlations between the different industry sectors are, not surprisingly, very low throughout (as exemplified by INDU11-20) and are therefore not reported here.

Table D. Correlation matrix for female employees

	1-lnEARN	2-S	3-BASIC	4-LOWER VOCA-TIONAL	5-UPPER VOCA-TIONAL
1-lnEARN	1.0000				
2-S	0.3766	1.0000			
3-BASIC	-0.1635	-0.7837	1.0000		
4-LOWER VOC.	-0.1998	0.0026	-0.4787	1.0000	
5-UPPER VOC.	0.0915	0.2719	-0.4007	-0.3298	1.0000
6-NON-UNIV	0.1806	0.3930	-0.1931	-0.1589	-0.1330
7-UNDERGRAD.	0.2068	0.3964	-0.1462	-0.1203	-0.1007
8-GRADUATE	0.2628	0.5153	-0.1505	-0.1238	-0.1036
9-EXP	0.0447	-0.2918	0.3549	-0.0897	-0.2624
10-SEN	0.1081	-0.1935	0.2442	-0.1062	-0.1322
11-MARRIED	-0.0341	-0.0626	0.0504	0.0230	-0.0586
12-CHILD (0-6)	0.0393	0.1247	-0.1503	0.0551	0.0708
13-CHILD (7-17)	0.0076	-0.0222	0.0141	0.0527	-0.0762
14-CAPITAL	0.1487	0.0279	0.0264	-0.0912	0.0282
15-TEMPEMPL	0.0399	0.1086	-0.1159	-0.0094	0.1211
16-PART-TIME	0.1889	-0.0142	0.0389	-0.0278	-0.0152
17-UNEMPL	-0.1007	-0.0721	0.0045	0.0900	-0.0213
18-PIECE-RATE	-0.0642	-0.1188	0.0935	0.0539	-0.1033
19-NODAYWORK	0.0940	-0.0791	0.0149	0.0918	-0.0545
20-UNION	-0.0424	-0.0066	0.0365	0.0376	-0.1378
21-OJT	0.1677	0.2466	-0.1482	-0.0920	0.0836
22-OCC31	0.1231	0.0807	-0.0536	-0.0388	0.0616
23-OCC32	0.0593	0.1650	-0.0861	-0.0503	0.0453
24-OCC33	0.3135	0.4295	-0.1665	-0.1306	-0.0836
25-OCC34	0.1927	0.3122	-0.1379	-0.1216	0.0149
26-OCC41	0.0360	-0.0082	-0.0079	0.0030	0.0125
27-OCC42	-0.0243	-0.0554	0.0381	-0.0856	0.1253
28-OCC43	0.0035	-0.0941	0.0384	-0.0382	0.1191
29-OCC44	-0.0106	0.0481	-0.1509	0.1405	0.0408
30-OCC51	-0.0564	-0.0417	0.0179	0.0487	-0.0459
31-OCC52	-0.1694	-0.1968	0.1627	0.0497	-0.1373
32-OCC53	-0.1246	-0.0939	0.0409	0.0797	-0.0623
33-OCC54	-0.1237	-0.2137	0.1619	0.0662	-0.1346
34-INDU11	-0.0223	-0.0236	0.0001	0.0187	0.0112
35-INDU20	0.0049	-0.0080	0.0087	-0.0199	0.0219
36-INDU31	-0.0730	-0.0833	0.0501	0.0539	-0.0618
37-INDU32	-0.1298	-0.1028	0.0636	0.0589	-0.0699
38-INDU33	-0.0436	-0.0594	0.0518	-0.0093	-0.0187
39-INDU34	0.0751	-0.0213	0.0509	-0.0395	-0.0181
40-INDU35	-0.0028	0.0077	0.0150	-0.0262	0.0002
41-INDU36	-0.0290	-0.0349	0.0428	-0.0374	0.0100
42-INDU37	-0.0040	-0.0266	0.0241	0.0043	-0.0204
43-INDU38	-0.0790	-0.1011	0.1095	-0.0349	-0.0434
44-INDU39	0.0394	0.0083	0.0087	-0.0199	-0.0167
45-INDU40	-0.0256	-0.0031	-0.0288	0.0436	0.0102
46-INDU50	-0.0175	-0.0103	-0.0232	0.0449	0.0074
47-INDU61	0.0217	-0.0040	0.0152	-0.0666	0.0584
48-INDU62	-0.1252	-0.1396	0.1335	-0.0109	-0.0775
49-INDU63	-0.0227	-0.0474	-0.0090	0.0632	0.0071
50-INDU71	0.0307	-0.0300	0.0227	-0.0416	0.0497
51-INDU72	-0.0057	-0.0560	0.0414	-0.0185	0.0206
52-INDU81	0.0991	-0.0324	0.0166	-0.0744	0.1267
53-INDU82	0.0296	0.0032	-0.0028	-0.0341	0.0575
54-INDU83	0.0047	0.0301	-0.0485	-0.0133	0.0936
55-INDU91	0.0179	0.0175	-0.0098	-0.0297	0.0501
56-INDU92	-0.0350	-0.0628	0.0542	0.0052	-0.0341
57-INDU93	0.1071	0.2973	-0.2337	0.0717	-0.0469
58-INDU94	0.0709	0.0176	0.0160	-0.0479	0.0129
59-INDU95	-0.0278	-0.0316	0.0130	0.0436	-0.0474

Table D. (cont.)

	6-NON-UNIV	7-UNDER-GRAD.	8-GRAD-UATE	9-EXP	10-SEN
6-NON-UNIV	1.0000				
7-UNDERGRAD.	-0.0485	1.0000			
8-GRADUATE	-0.0499	-0.0378	1.0000		
9-EXP	0.0355	-0.0684	-0.0973	1.0000	
10-SEN	0.0379	-0.0536	-0.0767	0.6737	1.0000
11-MARRIED	0.0000	-0.0195	-0.0366	0.0788	0.0585
12-CHILD (0-6)	0.0263	0.0627	0.0031	-0.2412	-0.1555
13-CHILD (7-17)	0.0043	0.0063	-0.0075	0.0546	0.0209
14-CAPITAL	0.0067	0.0638	0.0172	0.0171	-0.0315
15-TEMPEMPL	-0.0080	0.0137	0.0505	-0.3109	-0.3173
16-PART-TIME	-0.0377	0.0085	0.0390	-0.0918	-0.1076
17-UNEMPL	-0.0767	-0.0359	-0.0474	-0.1490	-0.2217
18-PIECE-RATE	-0.0580	-0.0504	-0.0194	0.0167	-0.0038
19-NODAYWORK	0.0000	-0.0769	-0.0623	-0.0337	-0.0451
20-UNION	0.0572	0.0272	0.0184	0.2173	0.2125
21-OJT	0.1572	0.1040	0.1149	0.0532	0.0863
22-OCC31	-0.0031	0.0652	0.0351	-0.0011	0.0099
23-OCC32	-0.0140	0.1329	0.1280	-0.0483	-0.0461
24-OCC33	0.2214	0.3280	0.3169	-0.0067	0.0350
25-OCC34	0.1701	0.1525	0.2443	-0.0475	-0.0508
26-OCC41	0.0423	-0.0265	-0.0413	0.0759	0.0776
27-OCC42	-0.0656	-0.0230	-0.0608	0.0137	0.0054
28-OCC43	-0.0986	-0.0665	-0.0768	-0.0080	0.0579
29-OCC44	0.1021	-0.0900	-0.0788	-0.0751	-0.0473
30-OCC51	-0.0221	-0.0167	-0.0172	-0.0564	-0.0505
31-OCC52	-0.0873	-0.0661	-0.0594	0.0273	-0.0074
32-OCC53	-0.0519	-0.0463	-0.0477	0.0268	0.0011
33-OCC54	-0.0997	-0.0755	-0.0777	0.0593	-0.0093
34-INDU11	-0.0249	-0.0189	-0.0194	-0.0392	-0.0246
35-INDU20	-0.0080	-0.0061	-0.0062	0.0305	0.0547
36-INDU31	-0.0489	-0.0223	-0.0381	0.0224	0.0340
37-INDU32	-0.0540	-0.0409	-0.0421	0.0079	-0.0091
38-INDU33	-0.0156	-0.0246	-0.0253	0.0161	0.0355
39-INDU34	-0.0157	-0.0230	0.0461	0.0100	0.0461
40-INDU35	-0.0076	-0.0208	0.0531	-0.0099	0.0064
41-INDU36	-0.0151	-0.0114	-0.0117	0.0001	0.0124
42-INDU37	-0.0098	-0.0074	-0.0076	0.0088	0.0421
43-INDU38	-0.0513	0.0032	-0.0400	-0.0007	-0.0215
44-INDU39	0.0588	-0.0061	-0.0062	0.0191	-0.0063
45-INDU40	-0.0189	-0.0143	-0.0147	-0.0119	0.0289
46-INDU50	-0.0309	-0.0006	-0.0240	0.0024	-0.0445
47-INDU61	0.0080	0.0167	-0.0337	-0.0057	-0.0037
48-INDU62	-0.0528	-0.0152	-0.0638	0.0511	-0.0053
49-INDU63	-0.0513	-0.0388	-0.0400	-0.0028	-0.0514
50-INDU71	-0.0025	-0.0318	-0.0327	0.0041	0.0112
51-INDU72	-0.0382	-0.0289	-0.0297	0.0949	0.1287
52-INDU81	-0.0629	-0.0243	-0.0376	0.0117	0.0905
53-INDU82	-0.0236	-0.0178	0.0104	-0.0128	0.0120
54-INDU83	-0.0408	0.0307	-0.0266	-0.0253	-0.0683
55-INDU91	-0.0356	0.0015	0.0300	0.0349	0.0570
56-INDU92	-0.0275	-0.0208	-0.0214	-0.0108	-0.0489
57-INDU93	0.2401	0.0846	0.1418	-0.0709	-0.0626
58-INDU94	-0.0261	0.0586	0.0207	-0.0407	-0.0447
59-INDU95	0.0008	-0.0173	-0.0178	0.0174	-0.0284

Table D. (cont.)

	11-MARRIED	12-CHILD (AGE 0-6)	13-CHILD (AGE 7-17)	14-CAPITAL	15-TEMP-EMPL.
11-MARRIED	1.0000				
12-CHILD (0-6)	0.2227	1.0000			
13-CHILD (7-17)	0.2185	0.0358	1.0000		
14-CAPITAL	-0.1202	-0.0582	-0.0792	1.0000	
15-TEMPEMPL	-0.0863	0.0364	-0.0979	-0.0731	1.0000
16-PART-TIME	0.0061	0.0355	-0.0060	0.0003	0.0826
17-UNEMPL	-0.0288	0.0046	-0.0425	-0.1318	0.3437
18-PIECE-RATE	0.0251	0.0007	0.0156	-0.0486	-0.0272
19-NODAYWORK	-0.0255	0.0003	0.0002	-0.0724	0.0199
20-UNION	0.1543	0.0268	0.0937	-0.1848	-0.1206
21-OJT	0.0364	0.0023	0.0908	0.0680	-0.1336
22-OCC31	0.0012	0.0384	-0.0002	0.0134	-0.0203
23-OCC32	-0.0180	0.0275	-0.0008	0.0384	-0.0074
24-OCC33	-0.0183	0.0062	-0.0104	-0.0217	0.0995
25-OCC34	-0.0111	0.0295	-0.0569	0.0412	0.0580
26-OCC41	0.0075	-0.0149	0.0225	0.0482	-0.0616
27-OCC42	0.0034	-0.0374	-0.0055	0.0793	-0.1025
28-OCC43	0.0369	0.0274	0.0460	0.0664	-0.0003
29-OCC44	-0.0177	0.0553	0.0299	-0.0329	0.1148
30-OCC51	-0.0258	-0.0020	-0.0307	-0.0448	0.0216
31-OCC52	0.0351	0.0038	0.0113	-0.1078	-0.0765
32-OCC53	0.0266	-0.0101	-0.0106	-0.0472	0.0271
33-OCC54	-0.0426	-0.0787	-0.0338	-0.0441	-0.0214
34-INDU11	-0.0104	0.0001	-0.0432	-0.0376	0.0276
35-INDU20	0.0193	-0.0164	-0.0243	-0.0163	-0.0117
36-INDU31	0.0067	0.0074	-0.0014	-0.0117	-0.0208
37-INDU32	0.0231	0.0119	0.0112	-0.0970	-0.0556
38-INDU33	0.0235	-0.0168	0.0429	-0.0657	-0.0349
39-INDU34	0.0099	0.0572	-0.0110	-0.0076	-0.0391
40-INDU35	-0.0299	-0.0211	-0.0342	0.0025	-0.0400
41-INDU36	-0.0214	-0.0097	-0.0103	0.0114	0.0042
42-INDU37	0.0236	0.0118	0.0239	-0.0199	-0.0143
43-INDU38	0.0350	-0.0022	-0.0260	-0.0397	-0.0426
44-INDU39	0.0193	-0.0164	0.0415	0.0229	-0.0117
45-INDU40	-0.0006	0.0115	-0.0150	-0.0047	0.0353
46-INDU50	-0.0113	-0.0111	0.0285	-0.0002	-0.0060
47-INDU61	-0.0339	-0.0280	-0.0108	0.1156	-0.0253
48-INDU62	0.0167	-0.0731	-0.0184	-0.0291	-0.0765
49-INDU63	-0.0646	-0.0086	-0.0260	-0.0076	-0.0506
50-INDU71	-0.0123	-0.0008	0.0090	0.0694	-0.0515
51-INDU72	0.0451	-0.0440	-0.0303	-0.0350	-0.0450
52-INDU81	0.0484	0.0365	0.0289	0.0912	0.0016
53-INDU82	0.0318	-0.0076	-0.0032	0.1144	-0.0343
54-INDU83	-0.0160	0.0090	-0.0011	0.0802	-0.0513
55-INDU91	0.0083	0.0013	0.0179	0.0174	0.0038
56-INDU92	0.0019	-0.0095	-0.0342	0.0258	-0.0400
57-INDU93	-0.0329	0.0374	0.0257	-0.0584	0.1873
58-INDU94	-0.0154	-0.0086	0.0153	0.0083	0.0736
59-INDU95	0.0038	0.0089	-0.0224	-0.0045	0.0363

	16-PART-TIME	17-UNEMPL	18-PIECE RATE	9-NODAY-WORK	20-UNION
16-PART-TIME	1.0000				
17-UNEMPL	0.0720	1.0000			
18-PIECE-RATE	0.0277	0.0369	1.0000		
19-NODAYWORK	0.0926	-0.0059	0.0853	1.0000	
20-UNION	-0.1859	-0.0003	0.0439	0.0088	1.0000
21-OJT	-0.1115	-0.1854	-0.1465	-0.1058	0.0509
22-OCC31	-0.0033	-0.0326	-0.0259	-0.0438	-0.1065
23-OCC32	-0.0316	-0.0272	-0.0327	-0.0705	-0.0519

Table D. (cont.)

24-OCC33	0.0517	-0.0189	-0.0399	-0.0945	0.0589
25-OCC34	-0.0313	-0.0791	-0.0600	-0.0555	-0.0158
26-OCC41	-0.0427	-0.0355	-0.0449	-0.0130	0.0351
27-OCC42	-0.0035	-0.0382	-0.1034	-0.1340	-0.1096
28-OCC43	-0.0113	-0.0687	-0.0843	-0.1617	0.0220
29-OCC44	-0.0203	0.0385	-0.1023	0.2361	0.0601
30-OCC51	0.0509	0.0492	-0.0230	-0.0224	-0.0584
31-OCC52	-0.0809	0.0729	0.5029	0.0261	0.0983
32-OCC53	-0.0150	0.0760	-0.0096	0.0384	0.0319
33-OCC54	0.1361	0.0489	-0.0071	0.1537	-0.0524
34-INDU11	0.0183	0.0195	-0.0048	-0.0076	-0.0546
35-INDU20	-0.0081	-0.0105	-0.0083	0.0190	-0.0637
36-INDU31	-0.0377	-0.0001	0.1148	0.0361	0.0079
37-INDU32	-0.0439	0.1123	0.3771	-0.0806	0.0382
38-INDU33	-0.0158	-0.0290	0.1291	0.0205	0.0139
39-INDU34	0.0063	-0.0108	-0.0079	0.0325	0.0172
40-INDU35	-0.0276	-0.0359	0.0480	-0.0066	0.0187
41-INDU36	-0.0151	-0.0197	0.0188	-0.0338	0.0084
42-INDU37	-0.0099	-0.0129	-0.0102	0.0081	0.0194
43-INDU38	-0.0516	0.0199	0.1472	-0.0363	0.0297
44-INDU39	-0.0081	-0.0105	-0.0083	-0.0180	0.0159
45-INDU40	-0.0190	0.0208	-0.0197	-0.0424	0.0203
46-INDU50	0.0217	0.0019	0.0020	-0.0496	-0.0232
47-INDU61	-0.0434	-0.0258	-0.0202	-0.0685	-0.1360
48-INDU62	0.0480	-0.0027	-0.0781	0.0259	-0.0375
49-INDU63	-0.0189	-0.0061	0.0627	0.2240	-0.0223
50-INDU71	0.0102	-0.0444	-0.0437	0.0006	-0.0189
51-INDU72	-0.0240	-0.0269	-0.0258	-0.0617	0.0410
52-INDU81	0.0000	-0.0605	-0.0567	-0.1159	0.0213
53-INDU82	-0.0237	-0.0308	-0.0245	-0.0529	-0.0220
54-INDU83	0.0129	-0.0242	-0.0222	-0.0797	-0.1502
55-INDU91	-0.0277	-0.0369	-0.0719	-0.1178	0.0665
56-INDU92	0.0514	0.0115	-0.0094	0.0373	-0.0875
57-INDU93	0.0372	0.0475	-0.1703	0.0894	0.1057
58-INDU94	0.0561	0.0248	-0.0015	0.1325	-0.0445
59-INDU95	0.0242	0.0268	-0.0008	0.0013	-0.0538

	21-OJT	22-OCC31	23-OCC32	24-OCC33	25-OCC34
21-OJT	1.0000				
22-OCC31	0.0512	1.0000			
23-OCC32	0.0650	-0.0122	1.0000		
24-OCC33	0.0826	-0.0221	-0.0279	1.0000	
25-OCC34	0.1481	-0.0256	-0.0322	-0.0584	1.0000
26-OCC41	0.0338	-0.0206	-0.0260	-0.0471	-0.0544
27-OCC42	0.0360	-0.0501	-0.0632	-0.1144	-0.1323
28-OCC43	0.0689	-0.0383	-0.0483	-0.0875	-0.1012
29-OCC44	0.0502	-0.0463	-0.0583	-0.1056	-0.1221
30-OCC51	-0.0323	-0.0086	-0.0108	-0.0196	-0.0227
31-OCC52	-0.2020	-0.0340	-0.0428	-0.0775	-0.0897
32-OCC53	-0.1159	-0.0238	-0.0300	-0.0543	-0.0628
33-OCC54	-0.1149	-0.0388	-0.0489	-0.0885	-0.1023
34-INDU11	0.0084	-0.0097	-0.0122	-0.0221	-0.0043
35-INDU20	0.0079	-0.0031	-0.0039	-0.0071	-0.0082
36-INDU31	-0.0893	-0.0190	-0.0017	-0.0434	-0.0502
37-INDU32	-0.1259	0.0043	-0.0265	-0.0479	-0.0554
38-INDU33	-0.0755	0.0284	-0.0159	-0.0288	-0.0169
39-INDU34	-0.0149	0.0081	-0.0024	-0.0440	0.0702
40-INDU35	0.0026	-0.0107	0.0250	-0.0244	0.0105
41-INDU36	-0.0290	-0.0058	-0.0074	-0.0134	-0.0155
42-INDU37	-0.0305	-0.0038	-0.0048	-0.0087	-0.0101
43-INDU38	-0.0621	0.0066	-0.0039	-0.0456	-0.0420
44-INDU39	0.0407	-0.0031	-0.0039	0.0672	-0.0082
45-INDU40	-0.0164	-0.0073	-0.0092	-0.0168	-0.0194

Table D. (cont.)

46-INDU50	-0.0434	-0.0120	-0.0151	-0.0274	-0.0317
47-INDU61	0.0361	0.0769	-0.0212	-0.0384	0.0056
48-INDU62	-0.0604	0.0035	-0.0401	-0.0727	-0.0201
49-INDU63	-0.0889	-0.0199	-0.0251	-0.0456	-0.0527
50-INDU71	0.0315	0.0157	-0.0206	-0.0373	-0.0303
51-INDU72	-0.0049	-0.0148	0.0373	-0.0339	-0.0392
52-INDU81	0.1308	0.0640	-0.0308	-0.0559	-0.0113
53-INDU82	0.0627	-0.0091	0.0332	-0.0209	-0.0017
54-INDU83	-0.0211	0.0592	0.1436	-0.0459	0.0211
55-INDU91	0.0534	-0.0269	0.1290	-0.0614	-0.0137
56-INDU92	-0.0265	-0.0107	-0.0134	-0.0244	-0.0282
57-INDU93	0.1186	-0.0609	-0.0557	0.3034	0.0726
58-INDU94	-0.0082	0.0181	0.0072	-0.0354	0.1480
59-INDU95	-0.0008	-0.0089	-0.0112	-0.0203	-0.0235

	26-OCC41	27-OCC42	28-OCC43	29-OCC44	30-OCC51
26-OCC41	1.0000				
27-OCC42	-0.1066	1.0000			
28-OCC43	-0.0815	-0.1981	1.0000		
29-OCC44	-0.0984	-0.2390	-0.1830	1.0000	
30-OCC51	-0.0183	-0.0445	-0.0340	-0.0411	1.0000
31-OCC52	-0.0722	-0.1755	-0.1343	-0.1621	-0.0301
32-OCC53	-0.0506	-0.1230	-0.0941	-0.1135	-0.0211
33-OCC54	-0.0824	-0.2003	-0.1533	-0.1850	-0.0344
34-INDU11	0.0051	-0.0116	-0.0077	-0.0193	0.5291
35-INDU20	-0.0066	0.0231	-0.0124	-0.0149	-0.0027
36-INDU31	-0.0404	-0.0377	-0.0269	-0.0836	0.0144
37-INDU32	-0.0199	-0.0717	-0.0831	-0.1002	-0.0186
38-INDU33	-0.0268	-0.0156	-0.0262	-0.0498	-0.0112
39-INDU34	-0.0410	0.0198	-0.0366	-0.0432	-0.0171
40-INDU35	-0.0227	0.0265	-0.0004	-0.0264	-0.0095
41-INDU36	-0.0124	-0.0092	0.0019	-0.0280	-0.0052
42-INDU37	0.0566	-0.0198	-0.0151	0.0154	-0.0034
43-INDU38	-0.0165	-0.0195	-0.0251	-0.0885	-0.0177
44-INDU39	-0.0066	0.0231	-0.0124	-0.0149	-0.0027
45-INDU40	0.0860	0.0124	-0.0090	-0.0174	-0.0065
46-INDU50	0.0163	0.0003	0.0894	-0.0573	-0.0106
47-INDU61	-0.0053	0.1395	0.0146	-0.0644	-0.0149
48-INDU62	0.0442	0.4131	-0.0748	-0.1475	-0.0283
49-INDU63	0.0741	-0.0260	-0.0713	-0.0953	-0.0177
50-INDU71	0.0588	0.0627	0.0187	-0.0373	-0.0145
51-INDU72	0.0709	-0.0598	0.1542	-0.0709	-0.0132
52-INDU81	-0.0197	-0.0891	0.4787	-0.1168	-0.0217
53-INDU82	-0.0195	0.1289	-0.0200	-0.0437	-0.0081
54-INDU83	0.0216	0.0431	0.0504	-0.0959	0.0118
55-INDU91	0.0222	0.1372	0.0822	-0.1076	-0.0238
56-INDU92	-0.0227	-0.0552	-0.0143	-0.0510	-0.0095
57-INDU93	-0.0625	-0.2893	-0.1926	0.5339	-0.0392
58-INDU94	-0.0166	-0.0559	-0.0517	0.0198	0.0240
59-INDU95	0.0373	-0.0180	-0.0352	-0.0277	0.0571

	31-OCC52	32-OCC53	33-OCC54	34-INDU11*	35-INDU20*
31-OCC52	1.0000				
32-OCC53	-0.0834	1.0000			
33-OCC54	-0.1358	-0.0951	1.0000		
34-INDU11	-0.0340	-0.0011	-0.0388	1.0000	
35-INDU20	-0.0109	-0.0076	0.0341	-0.0031	1.0000
36-INDU31	0.2686	0.1081	-0.0601	-0.0190	-0.0061
37-INDU32	0.5219	-0.0190	-0.0840	-0.0210	-0.0067
38-INDU33	0.1768	-0.0134	-0.0034	-0.0126	-0.0040
39-INDU34	0.1152	-0.0238	-0.0220	-0.0193	-0.0062

Table D. (cont.)

40-INDU35	0.0697	-0.0055	-0.0427	-0.0107	-0.0034
41-INDU36	0.0899	-0.0144	0.0015	-0.0058	-0.0018
42-INDU37	-0.0134	-0.0094	0.0227	-0.0038	-0.0012
43-INDU38	0.3011	0.0078	-0.0569	-0.0199	-0.0064
44-INDU39	-0.0109	-0.0076	-0.0125	-0.0031	-0.0010
45-INDU40	-0.0258	-0.0180	0.0304	-0.0073	-0.0023
46-INDU50	0.0261	-0.0295	0.0136	-0.0120	-0.0038
47-INDU61	-0.0589	-0.0279	-0.0225	-0.0168	-0.0054
48-INDU62	-0.1116	-0.0630	-0.0512	-0.0318	-0.0103
49-INDU63	-0.0699	0.1786	0.1947	-0.0199	-0.0064
50-INDU71	-0.0573	-0.0127	0.0265	-0.0163	-0.0052
51-INDU72	-0.0520	-0.0214	0.0613	-0.0148	-0.0048
52-INDU81	-0.0858	-0.0411	-0.0789	-0.0245	-0.0079
53-INDU82	-0.0321	0.0014	-0.0367	-0.0091	-0.0029
54-INDU83	-0.0704	-0.0493	0.0333	-0.0201	-0.0065
55-INDU91	-0.0942	-0.0223	-0.0198	-0.0269	-0.0086
56-INDU92	-0.0374	-0.0262	0.2480	-0.0107	-0.0034
57-INDU93	-0.2515	0.0334	-0.0217	-0.0718	-0.0232
58-INDU94	-0.0544	-0.0237	0.0728	-0.0155	-0.0050
59-INDU95	-0.0311	0.0523	0.0804	-0.0089	-0.0028

* The correlations between the different industry sectors are, not surprisingly, very low throughout (as exemplified by INDU11-20) and are therefore not reported here.

Table E. Comparison of regression results for the extended human capital earnings specification using data comprising (1) sample employees with above-minimum hourly earnings and (2) all sample employees with positive earnings: maximum likelihood estimates of the probit equation[a]

Variable	(1)	(2)
CONSTANT	-5.9355**	-5.6647**
	(.5483)	(.5330)
MALE	0.2345**	0.2236**
	(.0410)	(.0404)
AGE	0.3779**	0.3646**
	(.0470)	(.0459)
AGE^2	-0.0058**	-0.0056**
	(.0012)	(.0012)
AGE^3 /1000	0.0135	0.0124
	(.0103)	(.0101)
MARRIED	0.2880**	0.2801**
	(.0488)	(.0482)
$CHILD^{0-17}$	0.0097	0.0206
	(.0543)	(.0539)
SOUTH	0.3834**	0.3607**
	(.0393)	(.0385)
BASIC EDUCATION	-0.3140**	-0.2800**
	(.0424)	(.0416)
Number of obs.	6018	6163

a Standard errors are given in parentheses below the estimates.
* Significant at a 5 % level.
** Significant at a 1 % level.

Table F. Comparison of regression results for the extended human capital earnings specification using different definitions of the dependent variable, male employees[a]

Variable	Definition of dependent variable[b] (1)	(2)	(3)	(4)
CONSTANT	3.2989** (.0435)	3.3038** (.0446)	3.2724** (.0434)	3.2761** (.0429)
S	0.0886** (.0038)	0.0904** (.0038)	0.0882** (.0037)	0.0871** (.0037)
EXP	0.0202** (.0032)	0.0197** (.0033)	0.0201** (.0032)	0.0204** (.0031)
EXP^2 /1000	-0.2991** (.0829)	-0.2865** (.0851)	-0.2974** (.0826)	-0.3040** (.0815)
MARRIED	0.0747** (.0219)	0.0775** (.0223)	0.0741** (.0218)	0.0731** (.0217)
$CHILD^{0-6}$	-0.0131 (.0206)	-0.0135 (.0207)	-0.0138 (.0204)	-0.0137 (.0204)
$CHILD^{7-17}$	0.0550** (.0183)	0.0573** (.0184)	0.0538** (.0181)	0.0530** (.0182)
TEMPEMPL	-0.0627** (.0255)	-0.0661** (.0261)	-0.0631** (.0254)	-0.0638** (.0251)
PART-TIME	0.1986** (.0356)	0.1949** (.0364)	0.2290** (.0352)	0.2212** (.0348)
PIECE-RATE	0.0552* (.0241)	0.0581** (.0242)	0.0550* (.0238)	0.0505* (.0237)
NODAYWORK	0.0447** (.0176)	0.0404* (.0180)	0.0456** (.0175)	0.0505** (.0173)
UNEMPL	-0.0742** (.0232)	-0.0753** (.0236)	-0.0760** (.0229)	-0.0764** (.0227)
CAPITAL	0.1380** (.0165)	0.1496** (.0166)	0.1374** (.0162)	0.1383** (.0162)
SIGMA(ε)	0.3039** (.0036)	0.3076** (.0036)	0.3005** (.0035)	0.2997** (.0035)
RHO(ε,μ)	0.1079 (.1241)	0.0968 (.1258)	0.0996 (.1266)	0.1111 (.1244)
Log-Likelihood	-1557.6	-1581.3	-1536.6	-1530.8
Mean of lnEARN	3.81	3.82	3.79	3.79

a,b For notes, see Table 6 in the text. The corresponding probit estimates are identical in all four cases and can be found in column (1+2) for male employees in Table H below.

* Significant at a 5 % level.

** Significant at a 1 % level.

Table G. Comparison of regression results for the extended human capital earnings specification using different definitions of the dependent variable, female employees[a]

Variable	Definition of dependent variable[b] (1)	(2)	(3)	(4)
CONSTANT	3.2215** (.0452)	3.2287** (.0455)	3.2082** (.0447)	3.2055** (.0447)
S	0.0812** (.0046)	0.0813** (.0046)	0.0804** (.0046)	0.0806** (.0046)
EXP	0.0148** (.0033)	0.0145** (.0034)	0.0149** (.0033)	0.0149** (.0033)
EXP^2 /1000	-0.1826* (.0884)	-0.1781* (.0890)	-0.1848* (.0877)	-0.1846* (.0879)
MARRIED	-0.0157 (.0194)	-0.0139 (.0195)	-0.0155 (.0192)	-0.0154 (.0192)
$CHILD^{0\text{-}6}$	0.0306* (.0178)	0.0313* (.0179)	0.0295* (.0176)	0.0317* (.0176)
$CHILD^{7\text{-}17}$	0.0030 (.0182)	0.0039 (.0183)	0.0023 (.0180)	0.0025 (.0181)
TEMPEMPL	0.0899** (.0207)	0.0890** (.0209)	0.0888** (.0206)	0.0900** (.0206)
PART-TIME	0.3002** (.0200)	0.3092** (.0201)	0.3146** (.0197)	0.3138** (.0197)
PIECE-RATE	-0.0288 (.0314)	-0.0326 (.0317)	-0.0258 (.0310)	-0.0282 (.0310)
NODAYWORK	0.1124** (.0160)	0.1078** (.0162)	0.1120** (.0160)	0.1136** (.0160)
UNEMPL	-0.0650** (.0219)	-0.0658** (.0222)	-0.0623** (.0218)	-0.0627** (.0217)
CAPITAL	0.1255** (.0187)	0.1282** (.0188)	0.1238** (.0185)	0.1240** (.0186)
SIGMA(ε)	0.3154** (.0030)	0.3175** (.0030)	0.3132** (.0030)	0.3131** (.0029)
RHO(ε,μ)	-0.0085 (.0943)	-0.0096 (.0942)	-0.0088 (.0941)	-0.0019 (.0943)
Log-Likelihood	-2115.7	-2128.8	-2101.6	-2101.4
Mean of lnEARN	3.63	3.63	3.6	3.61

a,b For notes, see Table 6 in the text. The probit estimates are approximately identical in all four cases. The probit estimates corresponding to the regression results in column 1 are reported in column 1 for female employees in Table H below.

* Significant at a 5 % level.

** Significant at a 1 % level.

Table H. Comparison of regression results for the extended human capital earnings specification using alternative definitions of total years of work experience: maximum likelihood estimates of the probit equation explaining the probability of being employed[a]

Variable	ALL EMPLOYEES[b] $EXP^{adj.}$ (1+2)	$EXP^{pot.}$ (3)	MALE EMPLOYEES[b] $EXP^{adj.}$ (1+2)	$EXP^{pot.}$ (3)	FEMALE EMPLOYEES $EXP^{adj.}$ (1)	$EXP^{unadj.}$ (2)	$EXP^{pot.}$ (3)
CONSTANT	-5.9355** (.5483)	-5.5444** (.4394)	-6.7155** (.8295)	-6.7818** (.8316)	-5.5744** (.7613)	-5.5441** (.7606)	-4.7797** (.5666)
MALE	0.2345** (.0410)	0.2490** (.0400)					
AGE	0.3779** (.0470)	0.3666** (.0375)	0.4733** (.0721)	0.4792** (.0723)	0.3470** (.0650)	0.3441** (.0651)	0.3186** (.0481)
AGE^2	-0.0058** (.0012)	-0.0059** (.0010)	-0.0086** (.0019)	-0.0088** (.0019)	-0.0046** (.0017)	-0.0046** (.0017)	-0.0049** (.0012)
AGE^3 /1000	0.0135 (.0103)	0.0176* (.0082)	0.0378** (.0162)	0.0384** (.0163)	0.0032 (.0141)	0.0025 (.0141)	0.0121 (.0101)
MARRIED	0.2880** (.0488)	0.2850** (.0472)	0.5640** (.0793)	0.5627** (.0788)	0.0829 (.0652)	0.0829 (.0652)	0.1138* (.0625)
$CHILD^{0-17}$	0.0097 (.0543)	0.0132 (.0510)	0.3419** (.0928)	0.3287** (.0924)	-0.1841** (.0686)	-0.1843** (.0686)	-0.0644 (.0632)
SOUTH	0.3834** (.0393)	0.2435** (.0345)	0.3532** (.0610)	0.3256** (.0606)	0.3974** (.0526)	0.3981** (.0526)	0.2351** (.0440)
BASIC EDUCATION	-0.3140** (.0424)	-0.3936** (.0380)	-0.2931** (.0648)	-0.3054** (.0643)	-0.3265** (.0576)	-0.3224** (.0576)	-0.4397** (.0497)
Number of obs.	6018	6018	2825	2825	3193	3193	3193

a Standard errors are given in parentheses below the estimates. $EXP^{adj.}$ = corrected years of work experience, $EXP^{unadj.}$ = self-reported years of work experience, $EXP^{pot.}$ = physical age minus the sum of formal schooling and pre-school years.

b The estimates for $EXP^{adj.}$ and $EXP^{unadj.}$ are identical for all employees and male employees.

* Significant at a 5 % level.

** Significant at a 1 % level.

CHAPTER VIII

CONCLUDING REMARKS

The four empirical chapters (Chapters III-VI) of this study have provided fairly detailed discussions of the evidence obtained on the influence of investment in human capital on earnings determination and interpersonal earnings differentials in Finland. The chapters also contain summaries of the earnings effects estimated for the various human capital variables under study.

Because of the multitude of empirical results reported in the study it may, nevertheless, be fruitful to repeat at least some of the findings, but in a slightly different form. Specifically, since the analysis can be seen to go from an aggregated level comprising all individuals to more disaggregated categories of individuals, it might be interesting to compare how the earnings effects of specific characteristics change when splitting up the sample of individuals into more "homogeneous" groups. In other words, instead of summarizing the results by chapter, we draw together principal results across the chapters.

The estimates point to a direct rate of return on formal education for the average Finnish employee which is close to the average of estimates obtained for other industrialized countries, and to a remarkably high earnings effect of education when compared to the rates of return on education estimated for the other Nordic countries. Possibly the productivity-fostering effects of education are factually stronger in Finland than in the other Nordic countries. The results may, however, also reflect more severe shortages of skilled manpower in the Finnish labour market during the boom years of the late 1980s. But in comparing estimated returns for different countries it should be kept in mind that the estimates refer to "gross" returns not accounting for differences across countries in income taxation and private direct costs of schooling.

The estimation results also point to significant gender gaps in the returns to formal education. More important, these gaps seem to be largest at the lower end of the educational scale, i.e. at levels where a majority of the labour force is situated. In other words, the incentives to continue pursuing a formal education vary substantially and, moreover, tend to be the least encouraging at the beginning of the individual's educational career. For instance, irrespective of employee category investigated, women with graduation from lower vocational and professional education (mainly vocational schools) are found to have no relative income advantage over women with only a primary education.

A division of the sample individuals according to sectoral status points to small, if any, differences in educational returns between private- and public-sector male employees. The rates of return on primarily higher education estimated for females in public-sector employment are found to exceed those received by private-sector women and, in effect, to be very close to the returns paid to male employees. In both sectors, notable gender gaps in educational returns show up at the lower end of the educational scale.

The sample individuals were also divided into four occupational social status categories in order to examine whether the earnings effects of human capital differ markedly across occupations. Generally speaking, the schooling coefficients point to negligible differences in the estimated rates of return on education among the broad categories of non-manual and manual workers, but to significant differences between these two employee groups. This seems to hold largely for both genders. Conspicuous gender gaps in the estimated educational returns within occupational categories occur for the female-dominated category of lower-level non-manual workers and the male-dominated category of manufacturing workers.

These occupation-specific estimation results suggest that non-manual and manual workers are paid different returns also on equal units of education. In that case, the larger share of manual workers in the private sector and of non-manual workers in the public sector could offer an explanation for the finding of a weaker earnings position of females in private-sector employment. The estimation results seem to support this hypothesis; non-manual workers in the public sector and male non-manual workers in the private sector are estimated to receive appoximately the same average return on formal education, whereas female non-manual workers in private-sector employment are paid a significantly lower return on their investments in formal education. Among manual workers, there seem to be no notable differences in educational returns across genders and sectors.

Analysis of the interactions between occupational status and completed formal education indicates that the earnings effects of formal education mediated by the employee's position in the occupational hierarchy tend to be much larger for males than for females. This points to a more rigid occupational structure of male earnings. Separate analysis of private- and public-sector employees suggests, however, that the situation for females in public-sector employment again resembles strongly that for male employees. Specifically, also the earnings of public-sector female employees seem to be strongly influenced by occupational status, while formal education tends to have a more direct effect on the earnings of females in private-sector employment.

This suggests that private-sector females are likely to encounter a clearly different labour market situation when it comes to wage rigidity in general and to pecuniary returns on investment in formal education in particular. One potential explanation for the weaker returns on education obtained for private-sector females would thus be that their investments in formal education have been affected more strongly by the educational expansion of the past few decades.

The estimates reported in the previous chapters point to a fairly low increase in earnings per year of total work experience and of employment with the same employer, i.e. seniority (tenure). Indeed, the average increase in earnings per year of work experience turns out to be relatively low also in a Nordic perspective, which may be interpreted as indicative of insufficient possibilities of labour market training and/or other productivity improving measures in the Finnish labour market.

Furthermore, the crucial difference in the experience-earnings profile of the two genders turns out to lie in a substantially flatter profile for women, resulting in a notably smaller total influence of experience on female earnings. When a distinction is made between general and specific human capital, the increase in earnings from each year of general work experience is found to be clearly stronger for male employees, while seniority is estimated to play a more important role in the determination of female earnings. Accordingly, female employees would, on average, lose much more because of foregone specific capital than their male counterparts if their employment relationship were to be terminated for exogenous reasons.

The sector-specific estimation results suggest that for both genders, the experience-earnings profiles are on average steeper in the public sector. Furthermore, in both sectors the experience curves are found to be flatter for female employees. A division of the earnings effects of total work experience into earnings effects of general experience, on the one hand, and seniority, on the other, turned out to produce somewhat surprising sectoral estimates for especially male employees; the earnings effects of general experience were found to be notably stronger for males in public-sector employment, while the earnings effects of seniority turned out to be clearly stronger for males employed in the private sector. Intuitively, a stronger seniority effect would be expected in the public sector in view of the promotional patterns and the method of wage determination employed in the sector. As pointed out earlier, however, this unexpected result may at least partly be explained by the transferability of age bonuses within the public sector also when changing employer. Among female employees, the seniority effect dominates in both sectors.

As in the case of educational returns, occupation-specific estimates of the earnings effects of work experience indicate that at least part of the private/public-sector results can be explained by the disproportionate shares of non-manual and manual workers in the two sectors in combination with the different impact general and specific experience seems to have on the earnings of employees in non-manual and manual jobs. Indeed, dividing the sample employees in each sector into non-manual and manual workers changes markedly the rather puzzling picture of experience effects on earnings obtained for Finnish men; irrespective of sector, the earnings effects of general experience are found to be significantly higher for non-manual males, while those of seniority are estimated to be much higher for manual males. This outcome may well be taken to reflect the different types of working tasks performed by the two employee categories. Among female employees, the earnings effects of general experience are throughout almost negligible, while seniority effects show up for non-manual employees only, and more strongly in the public sector.

The estimation results display a strong, positive relation between earnings growth and participation in formal on-the-job training programmes (OJT), suggesting that productivity growth is important in shaping earnings profiles, as indicated by human capital theory. Moreover, the effect on earnings of formal OJT is found to be much stronger for male employees than for female employees. Comparison of the earnings effects of OJT between private- and public-sector employees indicates that this type of labour market training has a slightly stronger impact on the earnings of private-sector males than on those of public-sector males and private-sector females. It is noteworthy that despite a very high participation rate in formal OJT among public-sector females, this training seems to have had no significant effect on their average earnings level.

A division of the employees in each sector into non-manual and manual workers strengthens the picture of highly varying earnings effects of participation in formal OJT across employee categories. In particular, among male employees only manual workers in the public sector turn out to receive no pecunariary returns on their investments in formal OJT. Among female employees, on the other hand, only non-manual females employed in the private sector tend to be rewarded for their participation in formal OJT. These notable gaps in the estimated earnings effects of formal OJT across both genders and occupational categories are striking not least in view of the high participation rates in formal on-the-job training courses within all the employee categories under study.

The empirical results also display that substantial industry-related wage differentials remain even after controlling for a broad set of personal and job characteristics. Comparison with other countries implies that the overall variability in industry wages is somewhat higher in Finland than in the other Nordic countries, but still clearly lower than in the United States. Hence, the industry wage structure in Finland, as in the other Nordic countries, can be argued to show more resemblance to the competitive model of the labour market than does the U.S. industry wage structure. The results for Finland may also be interpreted in support of the assertion that wage inequality among similar workers is smaller in countries with centralized wage bargaining.

Although the measured wage premiums across industries tend to decline when more labour force characteristics are controlled for in the estimations, the overall pattern of inter-industry wage premiums nevertheless largely remains. In other words, the uncontrolled industry wage differentials provide a relatively good prediction of the pattern of industry wage premiums that emerges after controlling for a wide variety of relevant individual and job characteristics. In particular, industries paying above-average/below-average wages generally stay high-pay/low-pay industries also after control.

The estimation results also suggest that nearly half of the observed wage dispersion among Finnish industries can be attributable to differences in observable personal and job characteristics of the labour force in different industries. More important, the worker and job characteristics explain relatively more of the observed industry wage structure than does the individuals' industry affiliation. These findings hold for both genders.

Obviously the remaining inter-industry wage differentials reflect some combined effect of alternative explanations such as unmeasured worker ability, unobservable working conditions, collective bargaining, and efficiency wages. Simple attempts to explain these differentials indicate that industries with a higher average education level and/or a higher unionization rate tend to pay above-average wages.

In sum, the findings of the study suggest that (1) the incentives to invest in further education and training after completed formal education are, on average, fairly weak; (2) because of the comparatively high returns on investment in human capital paid in the public sector, the sector has succeeded in attracting high-educated individuals to its large and, until recent years, rapidly growing number of both upper- and lower-level non-manual jobs; and (3) there exists some degree of wage rigidity caused in part by the strong earnings effects of formal education mediated by the employee's position in the occupational hierarchy and in part by the employee's industry affiliation.

considerable potential and [illegible] of the labour force in different industries. [illegible] important, the worker and [illegible] employ[illegible] only [illegible] of the [illegible] hold [illegible] would [illegible] nationality, however [illegible].

Obviously the remaining [illegible] were, although [illegible], some combination of [illegible] explanations such as [illegible] working conditions in [illegible] industries, bargaining, and [illegible] supply. Simple attempts to explain these differentials indicate that industries with a higher average [illegible] and/or a higher unionisation rate tend to pay above-average wages.

In sum, the findings of the study suggest that (a) the investments to invest in further education and training after completed formal education are, on average, fairly weak; (b) because of the comparatively high returns on investment in human capital paid in the public sector, the sector has succeeded in attracting highly educated individuals to it in large numbers in recent years, rapidly growing number of both highly and lower-level educational [illegible]; (c) there exist substantial [illegible] differences in wages; they are caused in part by the strong earnings effects of formal education mediated by the employee's position in the occupational hierarchy and in part by the employee's industry affiliation.