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UNEMPLOYMENT AMONG FINNISH MANUFACTURING WORKERS

WHO GETS UNEMPLOYED AND FROM WHERE?

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ABSTRACT: This study explores the unemployment risk of Finnish manufacturing workers in the period 1990–96. Special attention is thereby paid to the R&D intensity and size of the employing firm. The data used is a representative, 20 per cent sample of the whole Finnish population drawn from Employment Statistics, which is a register-based data source compiled by Statistics Finland. Information on R&D intensity and size has been merged from R&D surveys undertaken by Statistics Finland.

The results indicate that the risk of becoming unemployed is a decreasing function of both R&D intensity and size. The well-established instability of jobs created by smaller firms could then be improved by increased R&D activities also among smaller firms. The composition of those having become unemployed differs only marginally across firms differing in R&D intensity and size, the unemployment risk being highest among manufacturing workers characterised by a low-paid job, a high age and previous unemployment. The results also imply that the re-employability among the unemployed has worsened considerably and that the jobs eventually offered are to an increasing extent of a fix-term nature. There is a strong tendency of a growing number of individuals circulating between temporary job contracts and unemployment.

Keywords: : firm size, manufacturing workers, R&D intensity, unemployment

ASPLUND, Rita, **SUOMEN TEHDASTEOLLISUUDEN TYÖNTEKIJÖIDEN TYÖTTÖMYYSRISKI: KUKA JÄÄ TYÖTTÖMÄKSI JA MISTÄ?** Helsinki: ETLA, Elinkeinoelämän Tutkimuslaitos, The Research Institute of the Finnish Economy, 2000, 51 s. (Keskusteluaiheita, Discussion Papers, ISSN 0781-6847; No. 711).

TIIVISTELMÄ: Tässä tutkimuksessa selvitetään Suomen tehdasteollisuuden työntekijöiden työttömyysriskiä ja sen kehitystä ajanjaksolla 1990–96. Tarkastelu tehdään työnantajayrityksen teknologisen tason sekä koon mukaan. Aineistona käytetään Tilastokeskuksen työssäkäyntitilastoa, josta on poimittu koko Suomen väestöä edustava, 20 prosentin otos. Tietoja työnantajayrityksen teknologisesta tasosta ja koosta on täydennetty Tilastokeskuksen T&K haastatteluilla.

Tulokset osoittavat, että työttömyysriski alenee selvästi työnantajayrityksen teknologisen tason ja koon kasvaessa. Näin ollen yksi varteenotettava tapa vähentää pienempien yritysten luomien työpaikkojen usein todettua epävarmuutta olisi kannustaa niitä investoimaan T&K-toimintaan. Edelleen tulokset osoittavat, että erityyppisistä yrityksistä joutuu työttömäksi hyvin samankaltaisia henkilöitä. Yrityksen teknologisesta tasosta ja koosta riippumatta työttömyysriski on ollut suurin työntekijöillä, joille on ollut ominaista matalapalkkainen työ, korkea ikä ja/tai aikaisempi työttömyys. Tuloksien mukaan työttömiksi jääneiden uudelleentyöllistymisen mahdollisuudet ovat lisäksi heikentyneet merkittävästi tarkasteluperiodilla samalla, kun tarjotut työt ovat enenevässä määrin olleet määräaikaisia. Kasvava osa työttömiksi joutuneista ovat tästä syystä joutuneet pätkätöistä ja työttömyydestä koostuvaan kierteeseen.

Avainsanat: T&K, tehdasteollisuus, työttömyys, yrityksen koko

YHTEENVETO

Tässä tutkimuksessa selvitetään Suomen tehdasteollisuuden työntekijöiden työttömyysriskiä ja sen kehitystä 1990-luvulla. Tilastoaineistona käytetään Tilastokeskuksen koko Suomen väestöä kattavaa työssäkäyntitilastoa, josta on poimittu edustava, 20 prosentin otos. Otoksen noin miljoonan henkilön työmarkkinasiirtymiä voidaan seurata vuodesta toiseen silloin, kun henkilöt ovat työssä, ja silloin, kun he ovat joutuneet työttömäksi tai siirtyneet kokonaan työvoiman ulkopuolelle.

Työssäkäyntitilaston yksilöitä koskevia taustatietoja on tehdasteollisuuden työntekijöiden osalta täydennetty kahdella työnantajayritystä kuvaavalla tiedolla: yrityksen T&K-intensiteetillä (T&K-menot jaettuina liikevaihdolla) sekä yrityksen koolla. Tietosuojavaatimuksista johtuen yritykset on T&K-menojensa suhteen jaettu kolmeen ryhmään: yritykset, joiden T&K-intensiteetti ylittää mediaanitason; yritykset, joiden T&K-intensiteetti alittaa mediaanitason; sekä yritykset, jotka eivät ole panostaneet tutkimus- ja kehittämistoimintaan. Vastaavasti yritykset on luokiteltu neljään ryhmään kokonsa mukaan: henkilöstöön kuuluu alle 50 henkilöä, 50–199 henkilöä, 200–399 henkilöä ja vähintään 400 henkilöä. Nämä tiedot on saatu Tilastokeskuksen T&K yrityshaastatteluista. Näitä haastatteluja on tehty vuodelle 1989 sekä vuodesta 1991 eteenpäin. Tämä tutkimus rajoittuu siten pakosta samoihin vuosiin.

Työnantajayrityksen T&K-intensiteetti sekä koko mahdollistavat kahden hypoteesin testaamisen Suomen tehdasteollisuuden osalta. Molemmat hypoteesit liittyvät kiinteästi käynnissä olevaan keskusteluun siitä, miten työttömyyttä voitaisiin alentaa. Usein kuulee väitettävän, että uusien työpaikkojen luomisessa nykyään korkean teknologian yrityksillä sekä pienillä ja keskisuurilla yrityksillä on ratkaiseva rooli. Tilastot, kuten myös tutkimus – niin kansainvälinen kuin suomalainenkin – osoittavat, että nämä yritykset todella luovat suhteellisesti enemmän uusia työpaikkoja. Tämä tosiasia kertoo kuitenkin vain puolet koko tarinasta. Yhtä tärkeää olisi tietää missä määrin nämä yritykset tuhoavat työpaikkoja eli lisäävät työttömyyttä. Toisin sanoen, miten pysyviä ovat loppujen lopuksi näiden yritysten luomat työpaikat? Jos uusien työpaikkojen pysyvyys on enimmäkseen heikohkoa, ei ole toivoa luoda talouteen ja työmarkkinoille sitä vakautta, jota tarvitaan markkinaehtoisessa toimintaympäristössä. Edelleen olisi tärkeää tietää, minkä tyyppisillä ominaisuuksilla työttömiksi joutuneet tehdasteollisuuden työntekijät ovat varustettuja ja erityisesti, ovatko työttömiksi joutuneet erilaisia riippuen entisen työnantajan teknologisesta tasosta ja koosta. Tämä tieto antaisi muun muassa käsityksen heidän uudelleentyöllistymisen mahdollisuuksista.

Tässä tutkimuksessa yritetään vastata nimenomaan yllä esitettyihin kysymyksiin Suomen tehdasteollisuuden osalta. Keskeisimmät tulokset ovat seuraavat:

- √ työttömyysriski pienenee työnantajayrityksen teknologisen tason mukaan eli työpaikkojen pysyvyys on selvästi heikompaa yrityksissä, jotka eivät investoi tutkimus- ja kehittämistoimintaan;
- √ työttömyysriski pienenee työnantajayrityksen koon mukaan eli työpaikkojen pysyvyys on selvästi heikompaa pienemmissä yrityksissä;
- √ näin ollen yksi tärkeä keino, jolla pienten ja keskisuurten yritysten luomien työpaikkojen pysyvyyttä voitaisiin parantaa, on niiden kannustaminen panostamaan T&K-investointeihin;

- √ teknologisesta tasosta ja koosta riippumatta tehdasteollisuuden yritykset ovat kehittäneet työvoimansa rakennetta hyvin samalla tavalla eli kaikissa näissä yrityksissä työttömyysriski on ollut suurin samantyyppisillä henkilöillä;
- √ eniten työttömyysriskiä kasvattaviksi taustaominaisuuksiksi paljastuivat matalapalkkatyö, korkea ikä (50 ja yli) sekä aikaisempi työttömyys;
- √ lisäksi tulokset viittaavat siihen, että näiden ominaisuuksien työttömyyttä kasvattava riski on voimistunut 1990-luvulla, mikä vuorostaan tukee viime aikoina varsin usein esitettyä väitettä, että Suomen työmarkkinat olisivat segmentoitumassa;
- √ samalla tehdasteollisuudesta työttömiksi joutuneiden uudelleentyöllistymisen mahdollisuudet ovat heikentyneet ratkaisevasti;
- √ uudelleentyöllistymisen mahdollisuudet ovat heikentyneet 1990-luvulla kaikilla työttömillä riippumatta entisen työnantajan teknologisesta tasosta ja koosta, mikä ei ole sinänsä yllättävä tulos ottaen huomioon, että työvoiman rationalisointi on ollut samansuuntaista kaikissa yrityksissä;
- √ yhä useampi tehdasteollisuuden yritys näyttää rekrytoineen työttömiä, mutta pelkästään määräajaksi, jonka jälkeen henkilö on palannut työttömäksi;
- √ etenkin pienemmät yritykset näyttävät enenevässä määrin omaksuneen tämän “rekrytointistrategian”, mikä tietysti lisää niiden luomien työpaikkojen epävarmuutta;
- √ tehdasteollisuudesta työttömiksi joutuneiden joukossa on kuitenkin edelleen suhteellisen vähän sellaisia, joiden kohtaloksi on muodostunut kierto työttömyyden ja lyhytkestoisten työsuhteiden välillä. Huolestuttava piirre kuitenkin on, että heidän osuutensa näyttää olevan tasaisessa kasvussa ja että kasvuvauhti on selvästi nopeampaa yrityksissä, jotka eivät panosta T&K-toimintaan kuten myös pienemmissä yrityksissä.

Nämä tulokset ovat keskeisiltä osin hyvin samansuuntaisia kuin muissa Suomen 1990-luvun työmarkkinoita koskevista tutkimuksista raportoidut tulokset, siitäkin huolimatta, että niissä tutkimusongelma, lähestymistapa ja käytetty tilastoaineisto on ollut erilainen. Lisäksi yllä esitetyt päätulokset avaavat monia lisätutkimuksen mahdollisuuksia ja tarpeita. Ensinnäkin tulisi tutkia ikääntyvien syrjäytymistä Suomen työmarkkinoilla. Tämä on keskeinen teema ETLAssa käynnistyvässä, Suomen Akatemian rahoittamassa tutkimushankkeessa. Toiseksi, heikosti koulutettujen sekä matalapalkkaisten asemaa Suomen työmarkkinoilla tulisi tutkia yleisemmin – ei pelkästään ikääntyvien osalta. Tämä on muun muassa EU:n rahoittaman tutkijaverkoston (LoWER) keskeinen teema. Verkostoon kuuluu myös ETLA. Kolmanneksi, tässä esitettyä tutkimusta pitäisi päivittää, jotta saisi varmistusta siihen, ovatko tutkimuksessa paljastuneet kehitystrendit heikentyneet vai vahvistuneet 1990-luvun puolivälin jälkeen.

CONTENTS

1. INTRODUCTION

The deep recession years of the early 90s shifted Finland from one of the lowest to one of the highest positions at the OECD unemployment rate scale. This turned job creation into a high priority issue also on the Finnish political agenda. In Finland as in many other European countries the debate has emphasised the crucial role of especially high-tech firms in enhancing employment. In addition also small and medium-sized firms are seen to be of decisive importance in fighting unemployment.

However, equally important as the creation of new jobs is the destruction of existing jobs; that is, the contribution of different types of firms to unemployment records. If job creation occurs mainly in firms that are characterised by relatively high volatility with respect to employment, this is likely to increase instability as well as insecurity on the labour market. And in case of an economic downturn, job destruction and thus unemployment growth can be expected to be notable.[1]

Evidence for the Finnish manufacturing sector clearly shows that employment growth over the recent decade has, indeed, been heavily concentrated to high-tech industries and firms/plant.[2] With respect to firm/plant size, on the other hand, existing evidence, again for the manufacturing sector, indicates that large firms/plants have contributed the most to employment creation. Small plants not only create jobs in disproportional numbers, but they also destroy jobs in disproportional numbers (Hohti, 2000; Ilmakunnas and Maliranta, 2000a).[3] Furthermore, their share in gross job creation and destruction exceeds their share of employment.

Apart from the number of workers flowing into unemployment, also their composition is of economic, political and social relevance. In particular, according to the so-called technological skill bias hypothesis[4] high-tech firms tend to "push" relatively more low-skilled people into unemployment; that is, individuals whose re-employment possibilities are mitigated by a low education and obsolete skills, often in combination with old age.

The present study explores trends in employment stability of Finnish manufacturing workers over the years 1990 to 1996, with the emphasis being on the impact of the technological level and size of the employing firm. Two main questions are then addressed: First, does the risk of flowing into unemployment vary across manufacturing firms differing in technological level and size? Second, does the composition of the workers having lost their job differ across manufacturing firms of different technological intensity and size? Answering these questions will provide further insight on the mechanisms at force on the Finnish labour market.

The main findings from this individual-level analysis suggest that employment volatility among Finnish manufacturing workers is, indeed, a decreasing function of both the technological level and the size of the employing firm, and that this negative correlation has strengthened over the investigated time period. One major implication of this outcome is

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1 Of course, this process may be coupled with simultaneous job creation due to profound re-shuffling of plant and firm structures in a productivity-enhancing manner. See e.g. Maliranta (1997).

2 For industry-based numbers, see e.g. Asplund & Lilja (1999), Parjanne (1999) and European Commission & Eurostat (1999) and for firm/plant-based numbers, e.g. Maliranta (2000).

3 Similar results are reported in a recent study of manufacturing plants in Sweden (Andersson, 1999). The study also shows that smaller plants contributed more to the negative employment record in Sweden in the early 90s than larger plants did.

4 For a recent, comprehensive survey, see Gregory & Machin (2000).

that the sustainability of the jobs created in smaller firms will largely depend on their capacity to innovate. The composition of the manufacturing workers having flown into unemployment, on the other hand, reveals no marked variation depending on the technological level or size of the firm in which previously employed. Instead the strategy of replacing less skilled with more skilled seems to have spread to the whole manufacturing sector. This finding is in line with the results reported in previous studies of Finnish manufacturing (Asplund and Vuori, 1996; Asplund and Lilja, 1999, 2000a), using a cruder categorisation of manufacturing workers, viz. according to the technological level of the industry in which employed.

The rest of the study is organised as follows. The next section presents the data. Section 3 illustrates the overall risk of becoming unemployed depending on the technological level and size of the employing firm, and also looks more in detail on the role of education, age and recent unemployment. The impact of various individual and job-related background factors on the manufacturing workers' risk of flowing into unemployment is evaluated by estimating a multinomial logit model, which is briefly discussed in Section 4. The estimated unemployment risks are reported in Section 5 along with an attempt to identify the "winners" and the "losers"; that is, those with the lowest and the highest risk of loosing their manufacturing job. Section 6 concludes.

2. THE DATA

The data set used in the subsequent analysis is a 20 per cent representative sample drawn from *Employment Statistics* compiled by Statistics Finland. This data source has been constructed by merging administrative registers, and covers the whole Finnish population starting from 1987. The sample was drawn randomly from the 1987 population and the close to one million people included in the sample were followed up to 1996.

The analysis focuses on those holding a manufacturing job and their labour market outcome, especially in terms of unemployment, depending on the R&D intensity and the size of the firm in which employed. Information on the employing firm's R&D intensity (defined as R&D expenditures divided by sales) and size is added from firm-based R&D surveys undertaken by Statistics Finland. The reason for restricting the analysis to the manufacturing sector is dictated by the fact that the R&D surveys comprise mainly manufacturing firms. Moreover, these surveys have been realised for a selected number of years only, viz. for 1989 and for 1991 and onwards. In addition, the sampling procedure has varied from year to year. More specifically, each R&D survey has covered all large firms but merely a sample of smaller firms. This sample has been larger for odd than for even years, which means that the odd years stand for a broader coverage of manufacturing firms.

Hence, due to these qualifications of the R&D surveys, the study has to be confined to a sub-sample with respect both to the employees and the years analysed. The year 1989 represents a boom year with an unemployment rate among the lowest – some 3½ per cent – within the OECD area. The year 1991 stands for the worst recession in Finland since the economic crises in the 1930s, with tremendous job losses first in the private export sectors but gradually also in domestic branches, including the public sector. Within three years half a million jobs were lost and the average unemployment rate rose to over 18 per cent. In the years after 1993 the Finnish economy has experienced strengthening recovery, which has gradually moved it back to pre-recession growth paths. Despite this advantageous development, however, unemployment figures have come down only slowly.

The mobility of manufacturing workers was particularly strong in the boom years in the late 1980s. Indeed, of the some 100,000 manufacturing workers that were drawn randomly into the 1987 sample almost one-half had left the manufacturing sector two years later, while at the same time the inflow to manufacturing jobs was rather modest. This explains why the sample employees engaged in manufacturing amounted to only some 54,500 in 1989, and had declined further by 1991 (see *Table 1*).[5] With the turbulence that the Finnish labour market plunged into in 1991, however, this relatively high mobility *on* the labour market turned into mobility *out* from the labour market.[6] The variation over time in the sample size thus mirrors the mobility of individuals, mostly out from but occasionally also into manufacturing jobs, that has occurred in response to the ongoing structural re-shaping of the economy and that in the 90s was further speeded up by a deep economic recession.

Table 1. Distribution of sample individuals employed in manufacturing across R&D intensity and size groups in the years 1989 and 1991–95, %

Firm category	1989	1991	1992	1993	1994	1995
R&D intensity:						
Above median level	34.1	42.4	53.1	35.9	51.2	30.6
Below median level	56.5	43.1	30.0	45.2	35.0	48.2
Zero or missing value	9.4	14.5	16.9	18.9	13.8	21.2
Size:						
< 50 employees	3.4	3.9	<0.1	4.6	1.1	11.9
50–199 employees	8.3	12.9	12.4	15.5	13.0	15.6
200–399 employees	6.7	10.3	14.0	13.8	17.0	14.8
400+ employees	81.5	72.9	73.5	66.1	68.9	57.7
No. of observations	54,424	51,829	44,911	47,625	46,369	57,636

Note: Since the focus is on the flow from employment in manufacturing into unemployment, the year 1996 is not displayed in the table.

The grouping of the sample individuals working in the manufacturing sector according to, respectively, the R&D intensity and the size of their employer is rather crude for data secrecy reasons. For each year covered, all firms having invested in R&D during that particular year have been ranked according to their R&D intensity and divided into two groups depending on whether their R&D intensity level is below or above the median for

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5 It should be noted that the observed mobility is not the outcome of a changing definition of the manufacturing sector; the sector is defined in an identical way across all years studied.

6 The mobility into and out from the manufacturing sector as well as within the sector (change of branch and/or employer) is analysed using the same data set in a separate study in progress (Asplund, 2000a). A conspicuous decline in individual mobility both within the manufacturing sector and from the manufacturing sector into the services sector from the late 80s to the early 90s is also reported in Asplund & Lilja (1999, 2000a) and Ilmakunnas & Maliranta (2000a). In Asplund & Bingley (1996) this downward trend in mobility shows up as rapidly declining wage mobility in Finnish manufacturing during the first half of the 1990s.

their respective industry. The third group contains firms having reported no R&D expenditures for the year in question as well as firms with missing information on R&D investments. Unfortunately the coding of R&D expenditures makes no distinction between zero and missing information. This, of course, should be kept in mind when assessing the results reported for this rather heterogeneous group of firms.[7] With respect to size, the firms have been coded into four categories: less than 50 employees, between 50 and 200 employees, between 200 and 400 employees and 400 employees or more.

The distribution of the manufacturing sample workers across the three R&D intensity groups and the four size groups is displayed in Table 1. The annual fluctuations in the percentage shares of the different firm categories reflect by necessity the aforementioned sampling construction of the R&D surveys. We believe, however, that the overall patterns and conclusions that emerge from the cross-sectional analysis reported in the subsequent sections are only marginally affected by this circumstance.

3. SOME ILLUSTRATIVE DESCRIPTIVES

3.1 The overall risk of becoming unemployed

The overall risk of manufacturing workers of becoming unemployed depending on, respectively, the R&D intensity and the size of their employer, is illustrated in *Tables 2 and 3*. The incidence or risk of being hit by unemployment is measured by relating the number of unemployed who in the previous year were employed in a particular type of firms to the total number of individuals employed in that firm category in that specific year.

Table 2 shows that the risk of flowing into unemployment from firms investing in R&D has persistently been below the average for the manufacturing sector, and much below the risk experienced by those working in non-R&D firms. The difference between high-intensity and low-intensity R&D firms turns out to have remained small during most of the time period investigated. The only conspicuous exception is the deep recession year of 1991 when the risk of becoming unemployed seems to have been clearly lowest in high-intensity R&D firms.

These R&D-specific risk figures, however, can say nothing about possible trends over time because they are affected by the overall variation in the risk of unemployment in the years investigated. In order to clean the risk figures from these fluctuations, they are divided by the corresponding risk figure for all manufacturing firms (as reported in Table 2, row 4). This provides an indicator of the concentration or relative risk of becoming unemployed in each R&D category identified. These figures are reported in the lower panel of Table 2.

The relative risk figures quantify the unemployment-reducing effect of being employed in an R&D investing manufacturing firm compared to the situation faced by the *average* worker in manufacturing. They also display the heavy concentration of unemployment to people working in non-R&D firms; their unemployment risk has on average been some 50 per cent higher than that of the average manufacturing worker. It is noteworthy that the

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[7] On the other hand, the results with respect to differences in technology levels are well in line with those obtained in previous studies (Asplund & Vuori, 1996; Asplund & Lilja, 1999, 2000a), which might be interpreted as indicative of a majority of the zeros being "true" zeros instead of missing information.

distribution of relative risks across the three R&D categories has remained roughly unchanged during the period under study despite dramatic changes in unemployment rates.

Table 2. The incidence (risk) and concentration (relative risk) of unemployment across manufacturing firms differing in R&D intensity

Firm category	**89 to 90**	**91 to 92**	**92 to 93**	**93 to 94**	**94 to 95**	**95 to 96**
Incidence (risk):						
Above R&D median level	2.0	5.7	6.0	3.0	3.1	3.7
Below R&D median level	2.0	7.5	5.4	3.6	3.6	4.2
Zero or missing value	4.0	10.4	7.8	5.1	7.2	6.4
All manufacturing firms	2.2	7.1	6.1	3.7	3.8	4.5
Concentration:						
Above R&D median level	0.9	0.8	1.0	0.8	0.8	0.8
Below R&D median level	0.9	1.0	0.9	1.0	0.9	0.9
Zero or missing value	1.8	1.5	1.3	1.4	1.9	1.4
All manufacturing firms	1	1	1	1	1	1
No. of observations	54,424	51,829	44,911	47,625	46,369	57,636

Notes: The unemployed comprise all those individuals who were employed in a firm belonging to a particular category in the "starting" year (1989, 1991, 1992, 1993, 1994, 1995) but were recorded to be unemployed in the next year, that is, in 1990, 1992, 1993, 1994, 1995 and 1996, respectively.

Incidence or risk measures the percentage share of all those employed in a particular firm category in a given year who are unemployed the next year.

The indicator of concentration or relative risk is calculated by dividing the risk of becoming unemployed for each firm category by the overall risk of unemployment in manufacturing.

A similar analysis of manufacturing firms categorised by size suggests that the most risky work places are offered by firms with less than 50 employees, followed by firms with a personnel ranging between 50 and 200 persons (Table 3). The risk of manufacturing workers of loosing their job is lowest in large firms. Moreover, also with respect to size the unemployment risk pattern has remained strikingly stable from 1989 to 1996.

In sum, small manufacturing firms do seem to have contributed relatively much to employment destruction in Finland. Technological progress and innovativeness, on the other hand, stand out as a potential cure rather than as a major cause of unemployment. Combining these two outcomes implies that the least unemployment-risky work places are found in large R&D firms. Also smaller firms might offer relatively stable employment opportunities provided that they are R&D intensive. The worst combination seems to be smallness and no R&D activities.

Table 3. The incidence (risk) and concentration (relative risk) of unemployment across manufacturing firms differing in size

Firm category	89 to 90	91 to 92	92 to 93	93 to 94	94 to 95	95 to 96
Incidence (risk):						
< 50 employees	5.3	10.9	--	6.8	4.7	6.7
50-199 employees	4.3	9.7	8.8	4.2	5.4	5.2
200-399 employees	2.5	8.2	7.2	3.6	4.6	5.0
400+ employees	1.8	6.3	5.5	3.4	3.3	3.8
All manufacturing firms	2.2	7.1	6.1	3.7	3.8	4.5
Concentration:						
< 50 employees	2.4	1.5	--	1.8	1.2	1.5
50–199 employees	2.0	1.4	1.4	1.2	1.4	1.1
200–399 employees	1.2	1.1	1.2	1.0	1.2	1.1
400+ employees	0.8	0.9	0.9	0.9	0.9	0.8
All manufacturing firms	1	1	1	1	1	1
No. of observations	54,424	51,829	44,911	47,625	46,369	57,636

Notes: See Table 2.

3.2 Does education or age matter?

Even though R&D investing firms seem to contribute no more, evidently even less, to unemployment than manufacturing firms on average, it might still be that the composition of those flowing into unemployment from these firms is different from the structure of those having become unemployed from non-R&D firms. If, for instance, the so-called skill-bias effect has induced more pronounced skill adjustments in the labour force of technically more dynamic firms, then this could be expected to show up in a relatively stronger outflow of low-skilled people from R&D investing firms. Moreover, since a majority of the least educated is found among older workers, also the age composition of those having become unemployed might be different depending on the R&D intensity of the former employer.[8] These two aspects are highlighted in *Figures 1 and 2*.

Figure 1 shows that to the extent a skill-bias tendency has characterised Finnish manufacturing in the 1990s, it has exerted a similar influence on all manufacturing firms irrespective of R&D activities or not. Indeed, the educational composition of those employees who are recorded as unemployed the next year, reveals only minor differences across the three R&D categories, and has also changed over time in much the same way.

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[8] According to OECD statistics the gap in formal education between young and old age cohorts is in Finland among the largest within the OECD area (see e.g. OECD, *Education at a Glance*).

Figure 1. Educational composition (% shares) of those having become unemployed, by R&D intensity of the firm in which employed in the previous year

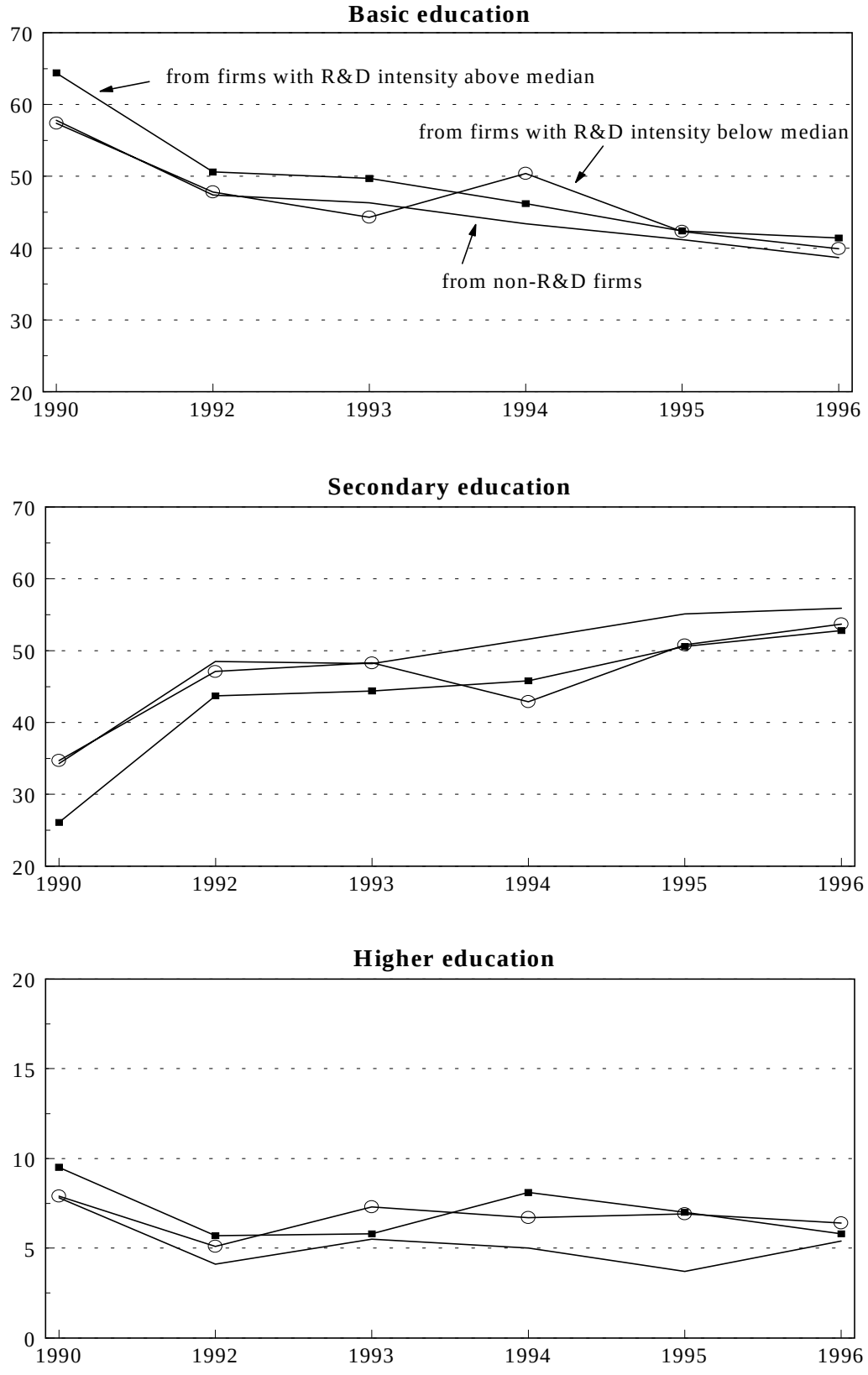


Figure 2. Age composition (% shares) of those having become unemployed, by R&D intensity of the firm in which employed in the previous year

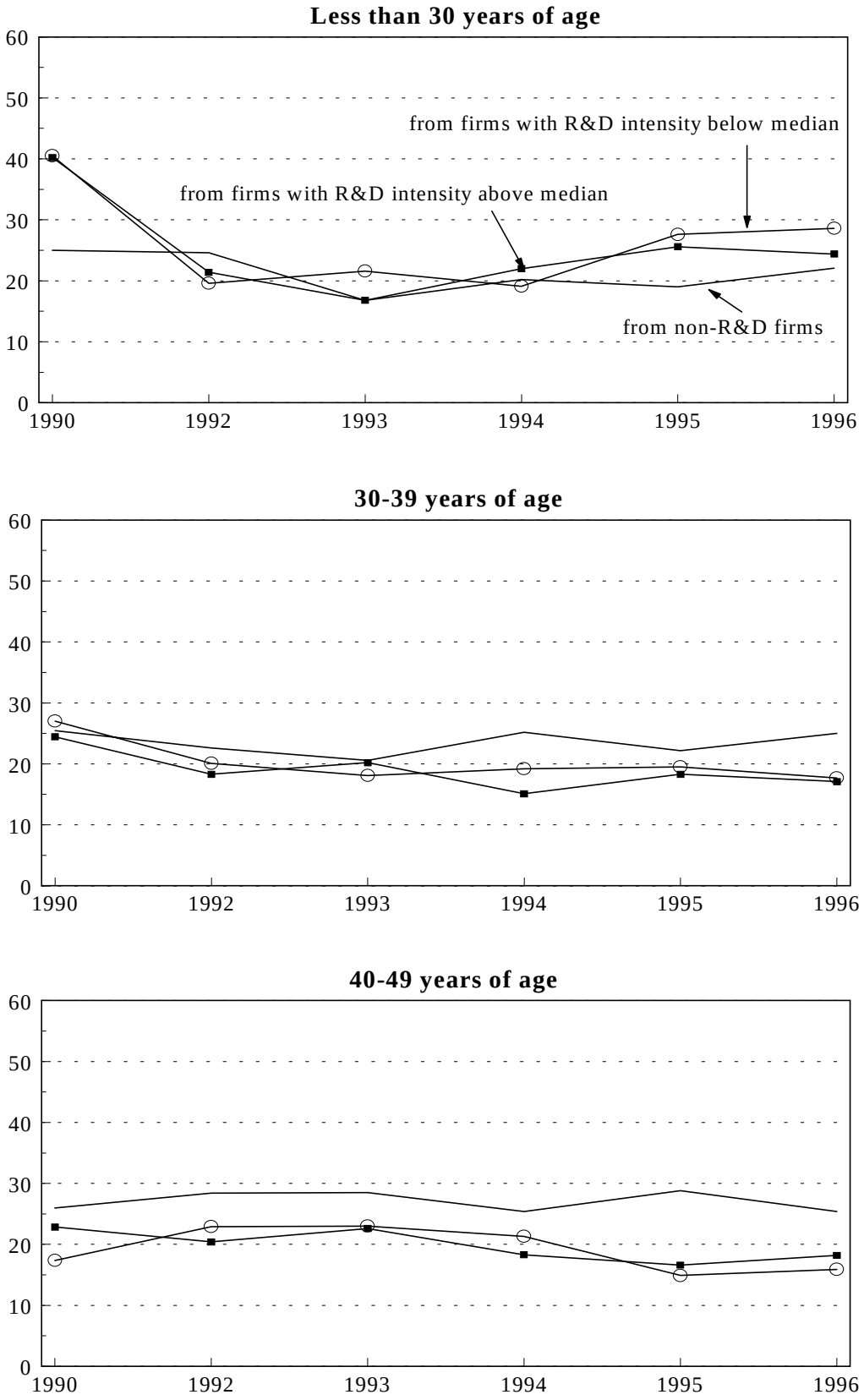
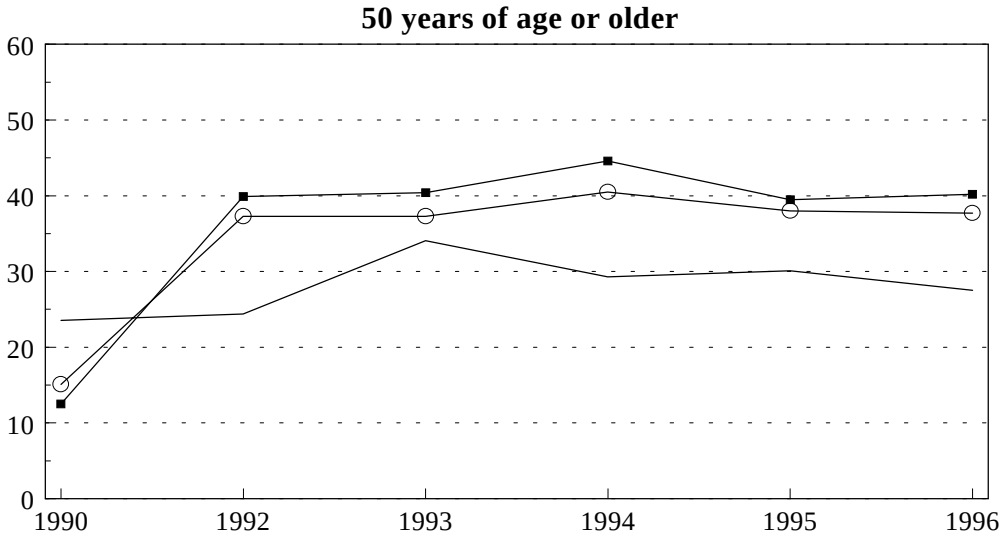


Figure 2. (cont.)



The turn of the decade 1980/90 is exceptional in the sense that it represents a period of extremely low unemployment with most of the unemployed having completed only a basic education. The first recession year, 1991, turns out to have increased the risk of unemployment especially among manufacturing workers having completed a vocational education at the secondary level (Figure 1, middle chart). Ever since, a growing share of the outflow from manufacturing jobs has been made up of this particular education group, while the corresponding share of the least educated reveals a decreasing trend. This pattern, however, reflects to a large extent the rapid decline in the overall share in the Finnish labour force of those with only a basic education.[9]

Also the age composition of those having flown from manufacturing jobs into unemployment is conspicuously similar across the three R&D categories both when looking at a particular year and when tracing the minor compositional changes that have occurred up to 1996. This similarity is particularly outstanding with respect to those below 40 years of age. A slight differentiation can be noticed for those in their 40s with the unemployment risk being somewhat higher if employed in a non-R&D firm. The largest difference shows up in the oldest age group, who is clearly over-represented among those previously employed in R&D investing firms.

Much the same conclusions can be drawn when comparing the educational and age compositions of those having become unemployed based on the size of the former employer (see Figures A1 and A2 of the Appendix).

In other words, the demand-driven re-structuring of the Finnish labour force that intensified dramatically in the early 1990s has not been limited to specific types of manufacturing firms. Instead the tough economic reality pushed practically all firms into the same process, forcing much the same type of workers into unemployment. Put differently, based on

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[9] A high unemployment risk among manufacturing workers with a secondary education is also reported in Asplund & Lilja (1999, 2000a). The upgrading of skills that took place in the Finnish labour market over the period 1975 to 1995 is analysed in Asplund & Lilja (2000b). Vainiomäki (1999), in turn, investigates the relationship between *changes* in the R&D intensity of Finnish manufacturing firms and changes in their skill structure.

the simple descriptive analysis presented above, a lower education or a higher age seems to have induced much the same risk of becoming unemployed irrespective of the type of firm employed in. Hence, education and age do matter, but the demand or non-demand for these characteristics has been strikingly similar across firms.

3.3 Do unemployment spells affect employability?

Before trying to establish by use of a statistical model the relative importance of a selected number of background characteristics on the risk of becoming unemployed, it is of interest to look briefly not only at the educational attainment and age, but also at the unemployment experience of those manufacturing workers having lost their job. Again this is done separately with respect to the R&D intensity and the size of the manufacturing firm in which the individual was employed before being hit by unemployment.

Figure 3 illustrates the labour market situation of these ex-manufacturing workers *after* their first year of unemployment. Their chances of finding a new job seem to have evolved in much the same way irrespective of the R&D intensity of the manufacturing firm in which previously employed. The minor difference in outcomes across the three R&D categories is in line with the previous notion of a striking similarity in the educational and age composition of those having lost their job (cf. Figures 1 and 2 above).

The overall trend definitely reveals a more interesting pattern. Thus, of those manufacturing workers who became unemployed in 1990, close to 40 per cent were re-employed already the next year, in 1991.[10] The probability of finding a new job among those who became unemployed in 1992 was considerably lower (roughly one out of five was re-employed in 1993) which is, of course, largely explained by the dramatically worsened employment situation in the early 90s.

The weak recovery that the export-intensive manufacturing industries began to experience in 1993/94 resulted in a slight but, as it seems, only temporary improvement in re-employment probabilities. Among those who lost their job in 1994 or 1995 less than 30 per cent were able to find a new job already the next year, despite the steady recovery of the economy. These rather low re-employment chances no doubt reflect, at least in part, the unfavourable educational and age structure of those having flown into unemployment. Obviously they are also symptoms of a more profound structural problem in the Finnish labour market.

A high and increasing persistence in unemployment is the destiny common to most unemployed having previously been in a manufacturing job (Figure 3, middle chart). This is the result not only of low re-employment probabilities but also of small and declining chances to opt for the retirement alternative (Figure 3, last chart).

These overall probabilities of being re-employed, of remaining unemployed and of leaving the labour force are largely repeated when undertaking the same comparison according to the size of the manufacturing firm in which previously employed (Figure A3 of the Appendix). Moreover, the differences between differently sized firms have persistently been quite small, albeit slightly more pronounced when compared to those emerging from the R&D-based categorisation of firms.

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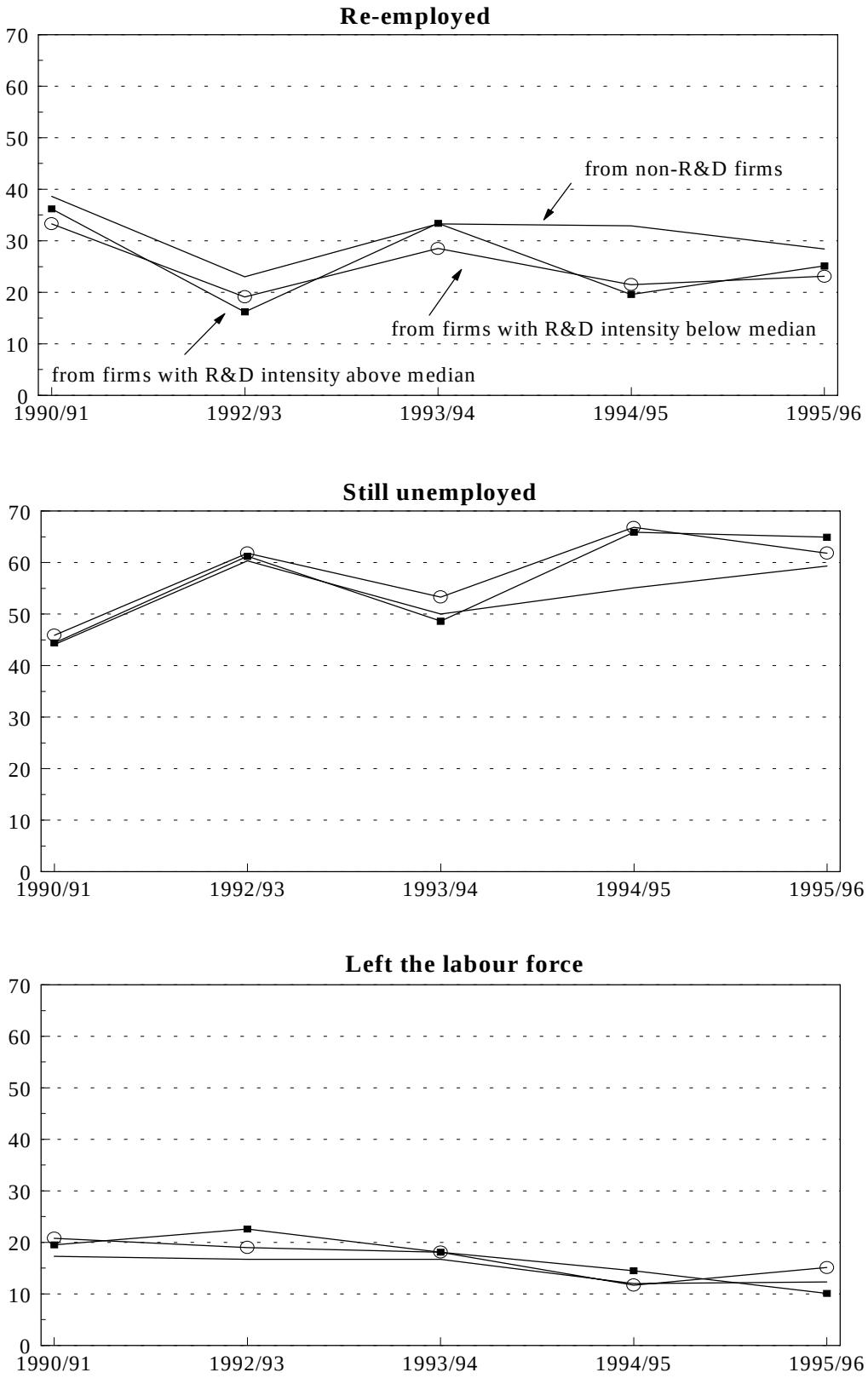
[10] This re-employment is not restricted to the manufacturing sector but refers to a new job in any sector of the economy.

Figure 3. Labour market status of those having become unemployed according to their situation in the year following upon the first unemployment year, by R&D intensity of the firm in which employed before unemployment



The declining re-employment probability may, as noted above, be the outcome of an increasingly more unfavourable educational and/or age composition of those having lost their manufacturing job. But this trend may also reflect changes in the working history of those having become unemployed. It is, therefore, of interest to look at the labour market situation of these unemployed individuals in the year *before* they were observed as employees in a manufacturing firm of certain R&D intensity or size.[11] *Figure 4* shows the outcome from such an exercise with the manufacturing firms classified according to their R&D intensity.

Again the differences between the three R&D categories turn out to be small or negligible. Instead, also here the overall patterns displayed in the figure deserve the main attention. In the deep recession years of 1991 and 1992 (notified as 1992/90 and 1993/91 in the figure) the risk of becoming unemployed was exceptionally high among the continuously employed. This can without doubt be ascribed to the overall low mobility into employment in these years; there just were not very many newly recruited.[12] Indeed, of those who worked in the manufacturing sector either in 1991 or 1992 but were hit by unemployment in the next year (in 1992 or 1993), only some 10 per cent, at most, had been recruited (in 1990 or 1991) either among the unemployed or among those outside the labour force.

After 1993, however, the risk of the continuously employed of being hit by unemployment fell to the pre-recession level, or even below it. In other words, employment stability among the employed increased steadily with the recovery of the economy. Simultaneously a growing share of those having lost their manufacturing job had been recruited out of the unemployed or among those outside the labour force.[13] This more frequent recruitment among the non-employed into manufacturing jobs can be argued to reveal a rather negative trend in the Finnish labour market, viz. a growing tendency of people of circulating between non-employment and employment. Moreover, when combined with the declining chances of finding a new job (Figure 3 above) these individuals seem to be increasingly stuck in a vicarious circle with steadily prolonged unemployment spells. Equally important is that this circling between employment and unemployment became more common not only among the unemployed but also among those – mostly youths – entering the labour market. In other words, the deep recession years seem to have worsened the possibilities of young people to get a solid and durable foothold in the labour market.[14]

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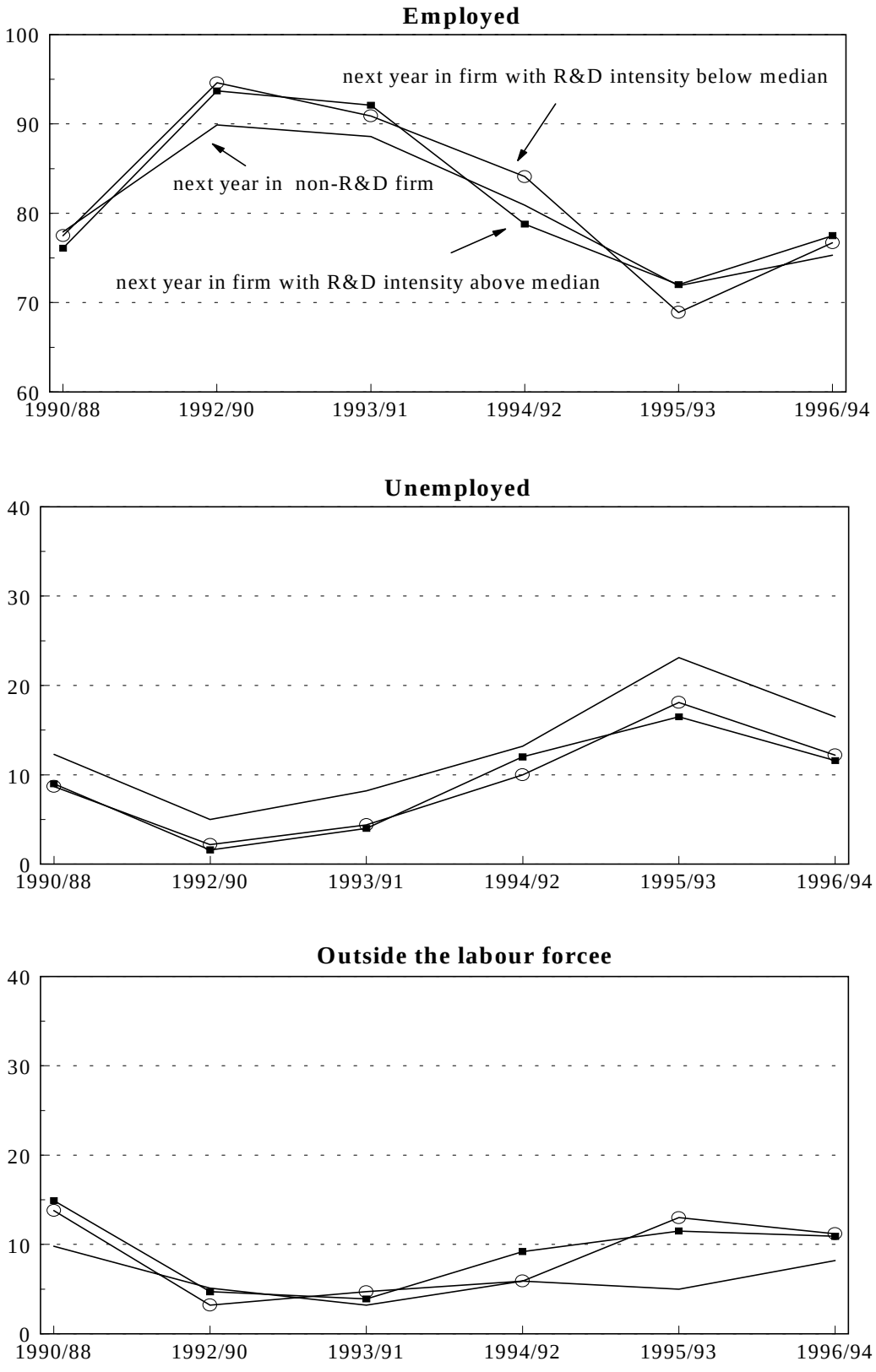
[11] The recruitment patterns of manufacturing firms in the years 1988 to 1996, especially with respect to the unemployed, is analysed in-depth in a separate study in progress (Asplund, 2000b). The study also accounts for differences in the R&D intensity and size of the hiring firms.

[12] A notable decline in the number of hirings into manufacturing during the recession years is reported by e.g. Böckerman & Piekkola (2000) and Ilmakunnas & Maliranta (2000a).

[13] Similar results are reported by Ilmakunnas & Maliranta (2000a) in that when comparing manufacturing worker inflows and outflows for the periods 1991–92 and 1994–96 they find that the flow into unemployment has been thinning out but simultaneously a growing number of those having become unemployed are ex-unemployed.

[14] A marked increase in the first half of the 1990s in the mobility of young people between employment, especially low-wage employment, and unemployment has been reported also in previous studies of the Finnish labour market. See e.g. Eriksson (1998) and Asplund (1998). Moreover, a recent study of the labour market situation of young people in Finland reveals that the worst situation is found among the less than 25 year-olds who have dropped out from school. (Nuorisoasiain neuvottelukunta – NUORA, 1999). Another interesting finding is that in contrast to younger people, the 25–29 year-olds usually regard fixed-term job contracts as problematic.

Figure 4. Labour market status two years earlier of those having become unemployed, that is, in the year before observed as an employee in a manufacturing firm representing a particular R&D intensity category



Obviously this increase in employment instability is mainly the outcome of intensified use of atypical and especially of temporary job contracts.[15] As the work contract is of limited duration, the individual has a high risk of becoming unemployed upon its termination.[16] However, this tendency of increased employment instability is likely to have been fuelled also by labour market policy measures with the aim of providing incentives for employers to offer jobs to unemployed.[17]

From Figure 4 it can be seen that all manufacturing firms, irrespective of their R&D intensity level, have adopted this new "hiring strategy". The main difference between the three R&D categories is that R&D investing firms have offered relatively more of their temporary job contracts to people outside the labour force while non-R&D firms have been slightly more interested in recruiting unemployed on a temporary basis.

When this exercise is repeated with the manufacturing firms being categorised according to their size, further support is obtained for the contention that small firms tend to be more volatile with respect to employment. As can be seen from Figure A4 of the Appendix, a considerable share of those having flown into unemployment from a manufacturing firm with less than 50 employees, had been unemployed two years earlier. In other words, especially those unemployed who have been recruited into small firms, have faced a clearly higher risk of returning into unemployment after a one-year or so spell of employment. This finding points to small firms having been particularly frequent users of atypical job contracts and/or subsidised employment arrangements. There is, however, no empirical evidence available to support or reject such a contention.[18]

The increasing risk in the Finnish labour market of being trapped in a circle of employment and unemployment is further illustrated in *Table 4*. This table partly summarises the information provided in Figures 3 and 4 above by showing for five 4-year periods the *frequency* of two slightly different but obviously equally problematic types of labour market mobility:

- √ unemployed in year t–2, manufacturing worker in year t–1, return into unemployment in year t, re-employed in year $t+1$;
- √ unemployed in year t–2, manufacturing worker in year t–1, return into unemployment in year t, remains unemployed in year t+1.

The term "manufacturing worker" indicates that the individual was working in the manufacturing sector the year before being recorded as unemployed. Since this particular unemployment year is the year of main interest throughout this study, it is denoted by t in the

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15 According to statistics published by Eurostat (1998, Tables 032 and 064) Finland had in 1997 the second highest share of employees with a temporary job among EU countries. Moreover, among these temporary job holders 72.4% of the males and 79.4% of the females reported the temporary job to be "involuntary". A survey conducted among Finnish manufacturing firms indicates that in 1998 one out of five temporary job contracts resulted in a permanent employment relationship (Alanko, 1999).

16 Happonen & Nätti (2000) have reported evidence for Finland on a high unemployment risk being a distinct feature of temporary job contracts.

17 For more information on such policy measures, see e.g. Santamäki–Vuori & Parviainen (1996).

18 The evaluations of the effects of subsidised employment undertaken in Finland have not included firm-specific factors such as the size of the hiring firm. See e.g. the reports by Aho et al. (1996, 1998, 1999) and Nätti et al. (2000).

two listings above. As indicated, the focus is restricted to those individuals who were recruited as unemployed into a manufacturing firm and who had returned into unemployment the next year. Thereafter a distinction is made according to whether the individual was re-employed (in any sector of the economy) or remained unemployed also the next year. These two "circulating" groups are then related to the total number of individuals having flown into unemployment from manufacturing. In Table 4, these calculations are reported with respect to the R&D intensity level of the firms.[19] The corresponding information based on firm size is provided in *Table 5*.

Table 4. The share (%) of two specific types of circulation between employment and unemployment among all who became unemployed, by R&D intensity of the manufacturing firm in which employed in the previous year

Circle I: Unemployment/manufacturing-worker/unemployment/employment					
R&D intensity:	**m-w in –89**	**m-w in –91**	**m-w in –92**	**m-w in –93**	**m-w in –94**
Above median level	3.5	0.5	2.2	4.3	5.1
Below median level	2.2	0.5	2.2	4.5	6.7
Zero or missing value	3.9	0.9	4.2	4.1	8.1
All manuf. firms	2.9	0.6	2.6	4.3	6.4
Circle II: Unemployment/manufacturing-worker/unemployment/unemployment					
Above median level	4.6	1.0	1.7	5.3	9.6
Below median level	5.1	1.4	1.9	4.4	8.3
Zero or missing value	6.9	3.7	3.9	7.6	12.2
All manuf. firms	5.3	1.8	2.2	5.5	9.8

Notes: As before the reference group comprises all sample individuals who were employed in a manufacturing firm belonging to a particular category in the "starting" year (m-w in 1989, 1991, 1992, 1993 or 1994) but were recorded to be unemployed in the next year, that is, in 1990, 1992, 1993, 1994 and 1995, respectively. The upper panel of the table gives the percentage share within this reference group of those who had experienced unemployment the year before the "starting" year but were employed again the year after having returned into unemployment. The lower panel of the table gives the percentage share within this reference group of those who had experienced unemployment the year before the "starting" year and had remained unemployed also the year after having returned into unemployment.

The upper panel of Table 4 suggests that when related to all individuals having flown from a manufacturing job into unemployment the risk of ending up in a circle of employment and unemployment spells has so far been realised only for a relatively small segment of the labour force. The figures, however, also indicate that a growing portion of individuals is entering this circle and that the individuals' experience of having worked in a high, low or non-R&D firm is gaining more importance in this respect.

[19] In other words, the reference unemployment groups are the same as in Figures 3 and 4.

The lower panel of Table 4 shows that the probability of remaining unemployed for at least another year instead of finding a new job, has persistently been somewhat higher. Moreover, also this type of circulation has become more common during the 90s, but the differences between the three R&D categories are not equally clear-cut as in the re-employment case.

When undertaking the same exercise with respect to the size of the manufacturing firm in which temporarily employed, further support is gained for the contention that the sustainability of jobs is a decreasing function of size. Moreover, this tendency seems to have strengthened markedly during the investigated time period.

Table 5. The share (%) of two specific types of circulation between employment and unemployment among all who became unemployed, by the size of the manufacturing firm in which employed in the previous year

Circle I: Unemployment/manufacturing-worker/unemployment/employment					
R&D intensity:	**m-w in –89**	**m-w in –91**	**m-w in –92**	**m-w in –93**	**m-w in –94**
< 50 employees	7.1	0.4	--	9.4	--
50-199 employees	3.1	1.1	5.9	4.2	9.3
200-399 employees	5.4	0.5	2.2	3.4	6.4
400+ employees	2.1	0.5	1.9	3.9	5.7
Circle II: Unemployment/manufacturing-worker/unemployment/unemployment					
< 50 employees	9.1	2.7	--	12.8	33.3
50-199 employees	2.6	3.4	3.0	5.1	13.6
200-399 employees	4.3	1.2	4.2	9.3	9.7
400+ employees	5.6	1.3	1.5	3.7	8.2

Notes: See Table 4.

Thus, both types of circulation seem to have spread in the Finnish labour market at the same time as the overall unemployment risk of manufacturing workers has been declining (cf. Table 2). Unemployed recruited into manufacturing jobs have to an increasing extent been offered only temporary job contracts, and after having returned into unemployment the probability of remaining unemployed turns out to have been clearly higher than the probability of being re-employed. Simultaneously employment stability has improved among those with a strong attachment to the labour market, as have their possibilities to avoid or escape these vicarious circles. Information for later years is needed, though, to be able to draw firm conclusions about whether this kind of segmentation is factually impairing the Finnish labour market or whether the observed trends mainly reflect the enormous fluctuation in the unemployment rate that has characterised the time period under study.

4. STATISTICAL FRAMEWORK

In modelling the probability of a manufacturing worker of becoming unemployed, a multinomial logit approach[20] is used. The choice of this model framework is obvious. From being employed in a manufacturing firm in year *t*, the individual's labour market status may in year *t*+1 be one out of three main, mutually exclusive options: still employed (in any sector), unemployed, or outside the labour force.[21]

As indicated in the previous section, the probability of moving from a manufacturing job into unemployment is the combined outcome of a variety of individual and job-related characteristics. The question then arises how important these different background factors are, in the last resort, when it comes to explaining the flow of manufacturing workers into unemployment. Of particular interest is whether or not the R&D intensity and size of the manufacturing firm in which employed do have an independent effect on the individual's risk of becoming unemployed.

The estimated multinomial logit model specification includes the following set of variables, all given the form of dummy indicators:

- three R&D intensity categories: high, low and no R&D activities;
- four size categories: 1–49, 50–199, 200–399 and 400 or more employees;
- three educational levels: basic, secondary and higher;
- four age categories: 16–29, 30–39, 40–49 and 50 years or older;
- gender;
- civil status;
- five wage categories (quintiles) based on average monthly earnings;
- status in year *t* –1: employed, unemployed and outside the labour force;
- 11 two-digit manufacturing industries.

This quite standard set of variables reflects the fact that the analysis is based on register data, which are commonly less rich compared with survey data. It is therefore comforting to notice that all variables available have exerted a statistically significant influence on the probability of manufacturing workers of becoming unemployed in the six two-year comparisons undertaken.[22] Experiments were also made to add interaction terms in order to capture primarily age- and education-related differences between firms differing in R&D intensity and size in the flow of manufacturing workers into unemployment. Problems of collinearity between variables, however, prevented these experiments from being successful. Instead these combined effects are calculated from the coefficients estimated for the single variables (see the next section).

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[20] For details, see e.g. Greene (1993).

[21] No distinction is made between the reason – retirement, studies, etc. – for leaving the labour force altogether.

[22] As in the previous section, these are 1989–90, 1991–92, 1992–93, 1993–94, 1994–95 and 1995–96.

The multinomial logit estimates are throughout transformed not into marginal effects on transition probabilities of single explanatory variables[23] but into comparisons of average transition probabilities of individuals assigned the sample mean values of the background factors accounted for.[24] More specifically, the independent or "pure" impact of each explanatory variable on the probability of manufacturing workers of remaining employed, becoming unemployed and moving out of the labour force, is calculated for individuals who are assumed to differ only with respect to the explanatory variable in question. With respect to all other background factors they are taken to represent the average manufacturing worker.

5. ESTIMATED TRANSITION PROBABILITIES

This section presents average estimated probabilities for manufacturing workers of moving into the three labour market states identified depending on the individual and job-related characteristics possessed. The emphasis is on the results obtained for manufacturing workers having flown into unemployment. The presentation starts with a look at the transition probabilities for the "average" manufacturing worker. Thereafter the analysis moves to the single explanatory variables. Finally the relative importance of these variables in explaining transition probabilities, especially into unemployment, is evaluated and the combined effects of, respectively, the "best" and the "worst" characteristics are compared.

5.1 Average transition probabilities

Table 5 displays the average transition probabilities for manufacturing workers to remain employed, to become unemployed and to leave the labour force altogether. In other words, these probabilities are calculated from the multinomial logit estimates and the sample means for all explanatory variables included in the model. As before, the destination years are 1990, 1992, 1993, 1994, 1995 and 1996.

Table 5. Average transition probabilities among manufacturing workers

Status in destination year	**Transition periods (starting year to destination year)**					
	89 to 90	**91 to 92**	**92 to 93**	**93 to 94**	**94 to 95**	**95 to 96**
Still employed	88.4	91.4	93.0	95.6	95.6	94.9
Unemployed	6.2	5.6	4.5	2.4	2.3	3.1
Out of the labour force	5.4	3.0	2.6	2.0	2.0	2.1
Total	100.0	100.0	100.0	100.0	100.0	100.0

These transition probabilities indicate that the average manufacturing worker has experienced a steady increase in employment stability and a corresponding decline in the risk of becoming unemployed and of moving out of the labour force. Since the average characteristics of manufacturing workers have changed markedly over the years (see Section 3 above for education and age), this trend clearly reflects a continuous improvement in those

[23] See Greene (1993) for the calculation of such marginal effects.
[24] The original multinomial logit estimates may, of course, be obtained by request.

background factors that tend to increase the individual's propensity of remaining employed. This structural re-shaping of the labour force was substantial in the early 90s, but slowed down after the deepest recession years.

In this context it should also be pointed out that the average transition probabilities reported in Table 5 by necessity differ quite markedly from the average mobility patterns presented in Table 2. In particular, Table 2 compares mobility patterns of manufacturing workers with highly different background characteristics (sample transitions) while Table 5 restricts the comparison to manufacturing workers with similar – in this case average – characteristics (estimated transitions).

5.2 The impact of the R&D intensity and size of the employing firm

As can be expected from the average transition probabilities presented in Table 5, also the impact of the single explanatory variables reveals the same overall trend. All the individual and job-related characteristics accounted for have exerted a weakening influence on the manufacturing workers' probability of moving into unemployment as well as of leaving the labour force while their effect on remaining employed has strengthened over the years examined.

However, the main interest of the present study is not on the absolute transition probabilities[25] calculated for the various background factors but on potential differences in these probabilities across variables. In the following, therefore, the results concerning single explanatory variables are reported and discussed in relative terms. More exactly, the transition probabilities are related to the characteristic causing the lowest probability of becoming unemployed and of leaving the labour force. In addition, comparisons are also made with respect to the transition probabilities experienced by the average manufacturing worker as reported in Table 5. These latter comparisons are available in Tables A4–A6 of the Appendix.

Table 6. Effects of R&D intensity and size on the relative probability of flowing into unemployment among manufacturing workers

	Transition periods (starting year to destination year)					
	89 to 90	**91 to 92**	**92 to 93**	**93 to 94**	**94 to 95**	**95 to 96**
R&D intensity:						
High R&D	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Low R&D	1.09	1.24	0.81	1.34	1.16	1.10
No R&D activities	1.29	1.50	0.98	1.43	1.63	1.22
Size:						
< 50 employees	1.61	1.17	--	1.43	1.04	1.14
50–199 employees	1.29	1.14	1.29	0.97	1.02	1.08
200–399 employees	1.18	1.11	1.18	0.86	1.10	1.18
400+ employees	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*

[25] These are displayed in Tables A1– A3 of the Appendix.

Table 6 gives the relative probabilities of becoming unemployed for manufacturing workers employed in firms that differ in, respectively, R&D intensity and size. Otherwise these workers are identical; that is, they are assigned the sample mean of the other characteristics accounted for. The reference categories are high R&D firms and large firms, since these firms are estimated to offer the best possibilities of escaping unemployment. The table thus gives an indication of their unemployment reducing advantage over less R&D intensive and smaller manufacturing firms.

From the table it can be concluded that manufacturing workers employed in high R&D intensity firms have almost persistently faced a notably lower risk of loosing their job. The risk of becoming unemployed has been some 10 per cent higher among workers employed in low R&D intensity firms, with the risk having been even higher than this in the recession years. Workers in manufacturing firms not investing in R&D have experienced the highest risk of flowing into unemployment. These differences across firms differing in R&D intensity are equally pronounced when compared with the risk of the average manufacturing worker of being hit by unemployment (Table A5 of the Appendix). The only transition period breaking this trend is 1992–93, which seems to be more due to the underlying sampling of firms than to exceptional behaviour of manufacturing firms in these years.

Table 7. Effects of different R&D intensity and size combinations on the relative probability of flowing into unemployment among manufacturing workers

	Transition periods (starting year to destination year)					
	89 to 90	**91 to 92**	**92 to 93**	**93 to 94**	**94 to 95**	**95 to 96**
R&D intensity and size combined:						
High R&D * < 50	1.61	1.17	--	1.44	1.04	1.14
High R&D * 50–199	1.29	1.14	1.29	0.97	1.02	1.08
High R&D * 200–399	1.19	1.11	1.18	0.86	1.10	1.18
*High R&D * 400+*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Low R&D * < 50	1.75	1.44	--	1.92	1.21	1.26
Low R&D * 50–199	1.40	1.41	1.05	1.31	1.18	1.19
Low R&D * 200–399	1.29	1.37	0.96	1.16	1.28	1.30
Low R&D * 400+	1.09	1.24	0.81	1.34	1.16	1.10
No R&D * < 50	2.05	1.74	--	2.05	1.70	1.39
No R&D * 50–199	1.66	1.71	1.27	1.39	1.66	1.31
No R&D * 200–399	1.52	1.66	1.16	1.23	1.80	1.44
No R&D * 400+	1.29	1.50	0.98	1.43	1.63	1.22

In sum, the R&D intensity of the employing firm does have an independent impact on workers' risk of loosing their job. High R&D intensity manufacturing firms stand for higher employment stability in boom years and even more so in recession years. The estimation results thus support the general picture provided by the incidence and concentration figures presented in Table 2.

The results are not equally clear-cut when it comes to the size of the employing firm. Nevertheless it seems fair to conclude that also the size of the firm affects independently the workers' risk of loosing their job. Large firms tend to offer more stable jobs, albeit the differences in this respect across different-sized firms have become more vague with the recovering of the economy.[26]

The R&D intensity and size effects are combined in *Table 7*. Generally speaking, two patterns emerge from the table. First, within all R&D intensity categories the risk of becoming unemployed has commonly been lowest in large manufacturing firms. Second, for all size categories the unemployment reducing effect has mostly been strongest in high R&D firms. Indeed, even when compared with large non-R&D firms the risk of becoming unemployed has almost persistently been lower in R&D firms of any size. The worst performance regarding employment stability is found in smaller non-R&D firms.

These differences in employment stability across manufacturing firms differing in R&D intensity and size may, at least in part, reflect differences in the shares of workers on permanent and temporary job contracts. Unfortunately, the data do not allow this aspect to be investigated. The only aspect covered in this study refers to the workers' labour market status in the previous year. The results for this variable are discussed in sub-section 5.4.

5.3 The impact of education, age, gender and wage level

Table 8 presents the calculated effects of education, age, gender and wages on the relative probability of manufacturing workers of having become unemployed in the period 1990–96. Again each background factor is investigated one at a time in order to separate out potential independent effects on the unemployment risk.[27]

Except for the low unemployment years of 1989 and 1990, the workers' educational attainment level has had a substantial impact on the unemployment risk. Moreover, the favourable employment situation of workers having completed a higher education compared to their less educated counterparts seems to have strengthened markedly in the mid-90s. Among otherwise similar manufacturing workers in 1995, the risk of being unemployed in 1996 was 70 per cent higher for those with a secondary education and almost 100 per cent higher for those with only a basic education.[28] Compared to the average manufacturing worker, the least educated experienced a 20 per cent higher unemployment risk (Table A5 of the Appendix).

When combining the worker's educational attainment level with the R&D intensity of the employing firm *(Table 9)*, the same pattern in repeated within all three R&D intensity categories. Irrespective of the R&D intensity level, the higher educated have persistently faced a much lower risk of loosing their job. Within educational categories the unemployment risk seems to decrease with the R&D intensity of the firm, with the low educated working in non-R&D firms showing the highest risk of flowing into unemployment.

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[26] In a recent study of perceived job insecurity in the Finnish labour market Happonen & Nätti (2000) estimate the unemployment risk among employees in small and medium-sized workplaces to be significantly higher than for those in large workplaces.

[27] The corresponding effects on the workers' probability of remaining employed and of leaving the labour force are given in the appendix tables.

[28] Their risk of leaving the labour force is considerably lower (cf. Table A8 of the Appendix).

Table 8. Effects of education, age, gender and wage level on the relative probability of flowing into unemployment among manufacturing workers

	Transition periods (starting year to destination year)					
	89 to 90	**91 to 92**	**92 to 93**	**93 to 94**	**94 to 95**	**95 to 96**
Education:						
Basic	0.99	1.64	1.42	1.49	1.67	1.96
Secondary	0.97	1.40	1.19	1.17	1.44	1.69
Higher	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Age:						
16–29 years	1.16	1.11	1.10	1.08	1.14	1.20
30–39 years	1.07	0.94	0.99	1.11	1.08	1.02
40–49 years	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
50 years or older	1.66	2.53	2.96	3.45	3.86	3.29
Gender:						
Man	1.63	1.59	1.28	1.18	1.29	1.23
Woman	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Wage quintile:						
1st (lowest)	3.56	4.25	3.80	4.61	4.54	5.05
2nd	2.75	2.42	2.19	2.58	2.31	3.25
3rd	1.85	1.81	1.91	1.65	1.73	2.18
4th	1.34	1.43	1.13	1.52	1.17	1.91
5th (highest)	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*

The worker's age turns out to be another individual characteristic with tremendous impact on the unemployment risk. The 50 to 64 year-olds have throughout faced the highest risk of becoming unemployed. Moreover, compared to their younger (but otherwise similar) counterparts the unemployment risk has more than doubled between 1990 and 1996. In the mid-90s the risk of the 50 to 64 year-olds of flowing into unemployment was more than three times as high as for their younger colleagues and more than two and a half times as high as for the average manufacturing worker. Simultaneously their probability of leaving the labour force has declined substantially (Tables A6 and A8 of the Appendix), which reflects the stricter early retirement arrangements that came into force in the early 90s. Obviously much of the increase in the unemployment risk of the oldest age group simply reflects the fact that those older-aged who previously would have been shuffled away into the retirement system are now "stored" in the unemployment records.

Also young manufacturing workers (16 to 29 year-olds) turn out to have faced a higher unemployment risk than their prime-aged colleagues, but not compared with the average manufacturing worker (cf. Table A5 of the Appendix). Instead their main alternative to remaining employed is to move out of the labour force. And compared to the average

manufacturing worker their probability of leaving the labour force seems to have increased over the investigated time period (see Table A6 of the Appendix).

Table 9. Effects of different firm R&D intensity and worker education combinations on the relative probability of flowing into unemployment

	Transition periods (starting year to destination year)					
	89 to 90	**91 to 92**	**92 to 93**	**93 to 94**	**94 to 95**	**95 to 96**
R&D intensity and education combined:						
High R&D * Basic	0.99	1.65	1.42	1.49	1.67	1.96
High R&D * Secondary	0.97	1.41	1.19	1.17	1.44	1.69
*High R&D * Higher*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Low R&D * Basic	1.08	2.03	1.15	2.00	1.94	2.15
Low R&D * Secondary	1.05	1.74	0.96	1.58	1.67	1.86
Low R&D * Higher	1.09	1.24	0.81	1.35	1.16	1.10
No R&D * Basic	1.27	2.45	1.39	2.13	2.72	2.38
No R&D * Secondary	1.25	2.11	1.16	1.68	2.35	2.06
No R&D * Higher	1.29	1.51	0.98	1.43	1.64	1.22

Table 10. Effects of different firm R&D intensity and worker age combinations on the relative probability of flowing into unemployment

	Transition periods (starting year to destination year)					
	89 to 90	**91 to 92**	**92 to 93**	**93 to 94**	**94 to 95**	**95 to 96**
R&D intensity and age combined:						
High R&D * 16–29 years	1.16	1.11	1.09	1.08	1.14	1.21
High R&D * 30–39 years	1.07	0.94	0.99	1.11	1.08	1.02
*High R&D * 40–49 years*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
High R&D * 50+ years	1.67	2.56	2.93	3.49	3.88	3.30
Low R&D * 16–29 years	1.26	1.38	0.89	1.46	1.33	1.32
Low R&D * 30–39 years	1.16	1.16	0.80	1.49	1.25	1.12
Low R&D * 40–49 years	1.09	1.24	0.81	1.35	1.16	1.10
Low R&D * 50+ years	1.80	3.13	2.43	4.62	4.49	3.61
No R&D * 16–29 years	1.50	1.66	1.07	1.55	1.87	1.47
No R&D * 30–39 years	1.38	1.41	0.97	1.59	1.76	1.24
No R&D * 40–49 years	1.29	1.51	0.98	1.44	1.64	1.22
No R&D * 50+ years	2.12	3.72	2.88	4.89	6.19	3.99

In *Table 10* the age effects have been combined with the effects of the R&D intensity level of the employing firm. The findings are in line with those obtained with respect to the workers' education. More specifically, irrespective of the R&D intensity of the employing firm, the prime-aged have experienced the highest probability of remaining employed while the 50–64 year-olds have faced the highest risk of loosing their job. Within age groups the unemployment risk decreases with the R&D intensity of the employing firm. The worst employment situation is found among old workers employed in non-R&D firms.

The unemployment risk of male relative to female manufacturing workers largely reflects the strong male dominance in manufacturing jobs and the marked gender segregation across manufacturing industries.[29] The time trend in this risk, in turn, traces the spread of the recession from male-dominated export-led industries to female-dominated industries (cf. Table A5 of the Appendix).

An individual's wage level is usually highly correlated with his or her completed education. Consequently it is only to be expected that the risk of becoming unemployed decreases when moving from the bottom end to the top of the earnings distribution. Moreover, this difference in unemployment risks between higher-paid and lower-paid manufacturing workers seems to have widened over the investigated years.[30] In 1989 the lowest-paid manufacturing workers faced an unemployment risk that was three and a half times as high as the unemployment risk experienced by their highest-paid counterparts. In 1995 the lowest-paid workers' unemployment risk was five times higher. Simultaneously also their probability of leaving the labour force was notably higher than for their higher-paid colleagues (Table A8 of the Appendix).

In sum, the highest risk of loosing their job is found among older, low-skilled and low-paid manufacturing workers. Furthermore, the results indicate that the employment situation of these workers has worsened dramatically during the 90s.

5.4 The role of previous labour market status

As noted earlier, the observed differences in unemployment risks may be partly due to systematic differences across firms and/or worker groups in the use of temporary and other types of atypical job contracts. The available data, however, contain no such information. Instead a rough approximation is used; that is, the manufacturing worker's labour market status in the previous year.

The relative probabilities displayed in *Table 11* show that a recent unemployment spell increases considerably the risk of flowing back into unemployment. The risk of becoming unemployed has persistently been clearly lower among those recruited from outside the labour force. Instead these labour force entrants, if loosing their job, tend to return to a life outside the labour force (cf. Table A8 of the Appendix).

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[29] When analysing the whole Finnish economy Happonen & Nätti (2000) also obtained a significantly higher unemployment risk of men than of women in the early 90s.

[30] Similar findings are reported by Ilmakunnas & Maliranta (2000a, 2000b) based on Finnish plant-level data.

Table 11. Effects of the labour market status in year t–1 on the relative probability of flowing into unemployment among manufacturing workers

	Transition periods (starting year to destination year)					
	89 to 90	**91 to 92**	**92 to 93**	**93 to 94**	**94 to 95**	**95 to 96**
Labour market status in the previous year:						
Employed	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Unemployed	3.08	2.00	2.74	3.80	3.39	2.77
Outside the labour force	1.48	1.34	1.71	2.38	2.87	2.30

Table 12. Effects of different firm R&D intensity and workers' previous labour market status combinations on the relative probability of flowing into unemployment

	Transition periods (starting year to destination year)					
	89 to 90	**91 to 92**	**92 to 93**	**93 to 94**	**94 to 95**	**95 to 96**
R&D intensity and previous labour market status combined:						
*High R&D * Employed*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
High R&D * Unempl.	3.12	2.02	2.72	3.84	3.41	2.79
High R&D * Outside l.f.	1.49	1.35	1.70	2.40	2.88	2.31
Low R&D * Employed	1.09	1.24	0.81	1.34	1.16	1.10
Low R&D * Unempl.	3.35	2.47	2.24	5.07	3.93	3.05
Low R&D * Outside l.f.	1.60	1.66	1.40	3.19	3.35	2.53
No R&D * Employed	1.29	1.50	0.98	1.43	1.64	1.22
No R&D * Unempl.	3.87	2.95	2.67	5.38	5.41	3.36
No R&D * Outside l.f.	1.89	2.79	1.67	3.59	4.63	2.80

From these results follow that firms recruiting relatively more unemployed and/or labour force entrants can be expected to be characterised by higher employment instability.[31] Thus one potential explanation for the higher probability of manufacturing workers of becoming unemployed if working in a non-R&D firm could be that these firms recruit relatively more unemployed on a temporary basis. *Table 12* reports on an attempt to highlight this aspect by combining the previous labour market status effects with the effects originating in the R&D intensity of the employing firm. As can be seen from the table, unemployed recruited into a manufacturing job face the highest probability of returning into unemployment already the next year if the employer is a non-R&D investing firm. This indicates, indeed, that temporary job contracts have a much higher tendency of ending with unemployment in non-R&D firms.

[31] According to the findings of Ilmakunnas & Maliranta (2000b) the firms recruiting relatively more unemployed are characterised by a low wage level, low R&D intensity, low capital intensity, and weak profitability.

5.5 Winners and losers

From the above it is obvious that the unemployment increasing risk varies considerably across individual as well as job-related background characteristics. Some characteristics, such as a low education or a high age, increase considerably the worker's risk of becoming unemployed. Other characteristics, in turn, guarantee that the worker faces a minimal risk of loosing his or her job. If trying to rank the unemployment increasing risk induced by each of the background factors considered above, a recent unemployment spell stands out as the inevitably worst characteristic in all the years investigated.[32] The second worst characteristic is a high age (50 years or older), and the third worst characteristic is a low-paid job. The lowest unemployment risk is attached to high-paid jobs and a completed higher education.

Table 13. Absolute and relative transition probabilities of winners and losers

	Transition periods (starting year to destination year)					
	89 to 90	**91 to 92**	**92 to 93**	**93 to 94**	**94 to 95**	**95 to 96**
Winners – absolute probabilities:						
Employed	95.2	97.3	96.5	98.3	97.8	98.6
Unemployed	2.4	1.4	1.6	0.6	0.5	0.5
Outside the labour force	2.4	1.3	1.9	1.2	1.7	0.9
Total	100.0	100.0	100.0	100.0	100.0	100.0
Winners – relative probabilities:						
Employed	1.08	1.06	1.04	1.03	1.03	1.04
Unemployed	0.39	0.25	0.35	0.23	0.21	0.15
Outside the labour force	0.44	0.43	0.74	0.58	0.43	0.48
Losers – absolute probabilities:						
Employed	34.0	38.0	36.7	47.9	46.9	54.1
Unemployed	45.4	50.5	49.3	44.0	48.2	39.3
Outside the labour force	20.6	11.4	14.0	8.1	4.9	6.6
Total	100.0	100.0	100.0	100.0	100.0	100.0
Losers – relative probabilities:						
Employed	0.38	0.42	0.39	0.50	0.49	0.57
Unemployed	7.33	9.04	11.00	18.42	20.77	12.83
Outside the labour force	3.79	3.80	5.51	3.99	2.41	3.19

Notes: The winners are characterised by the following background factors: male, 40–49 years of age, completed higher education, married, employed in the previous year, working in a high-paid job in a large, high R&D firm.
The losers are characterised by the following background factors: male, 50–64 years of age, a basic education only, married, unemployed in the previous year, working in a low-paid job in a small, non-R&D firm.
Relative probabilities refer to the absolute probabilities of the winners and the losers in relation to the absolute probabilities calculated for the average manufacturing worker (as reported in Table 5).

[32] The ranking outcome is based on Table A5 of the Appendix. Happonen & Nätti (2000) also identified previous unemployment as the strongest unemployment-inducing factor in the Finnish labour market in the 90s.

The actual unemployment risk of a manufacturing worker thus depends on his or her combination of "good" and "bad" characteristics. *Table 13* presents the outcome for the two extreme cases – the winners and the losers. The winners possess all those characteristics that tend to reduce the risk of becoming unemployed while the losers' destiny is a combination of all those characteristics that have been found to notably increase the risk of flowing into unemployment.

The difference between the two extreme worker groups is astounding and it has narrowed only marginally during the time period investigated. Still in 1996 the losers faced a 40 per cent risk of loosing their job and only a 54 per cent probability of remaining employed. Compared to the average manufacturing worker that became unemployed in that year, their risk of being hit by unemployment was almost 13 times higher. Simultaneously the winners were very likely to remain employed; their risk of becoming unemployed was only half a per cent.

6. CONCLUSIONS

The main findings concerning Finnish manufacturing workers and their risk of becoming unemployed may be summarised as follows:

√ In accordance with previous evidence for Finland, as for other European countries, the risk of becoming unemployed is found to be a decreasing function of the R&D intensity of the employing firm.

√ Also in accordance with previous evidence for Finland, as for other European countries, the risk of becoming unemployed declines with the size of the employing firm. One way of abating the well-established instability of jobs created by smaller firms would then be to improve the creative environment of these firms in order to provide more incentives for them to invest in R&D.

√ The composition of those having lost their manufacturing job turns out to be very similar across firms differing in R&D intensity and size, a finding also in line with previously reported results for Finland. Accordingly it is hardly surprising that among unemployed ex-manufacturing workers the chances of being re-employed, the risk of remaining unemployed as well as the probability of leaving the labour force altogether have varied only marginally across different types of firms.

√ The highest risk of becoming unemployed is clearly linked to certain kinds of background factors, of which the most important are a low-wage job, a high age (50 years of age or older) and, particularly, previous unemployment. Moreover, the results indicate that the unemployment-inducing risk of these background factors has increased over the investigated time period, which is likely to also explain the finding of a worsening re-employability among those having flown from a manufacturing job into unemployment. These results further show that the recent warnings of an ongoing segmentation on the Finnish labour market should be taken seriously.

√ The results also indicate that a growing number of manufacturing firms are recruiting out of the unemployed, but primarily on a fix-term basis, after which the individual usually returns to unemployment. This new "hiring strategy" seems to have been

adopted not least by smaller firms, which further increases the instability and insecurity of the jobs they create.

√ However, the results imply that so far the share among unemployed ex-manufacturing workers having entered the vicarious circle of short employment spells and (often increasingly prolonged) unemployment spells, is still reasonably moderate. A feature of concern though is that the proportion of these circulating people has increased steadily over the investigated time period. Simultaneously the difference in this respect between firms differing in R&D intensity and size seems to have widened.

Apart from lending support to empirical evidence for Finland reported in other studies focusing on the labour market situation in the 90s, the reported results display phenomena and trends that inspire to further research. First, the ongoing exclusion of the ageing workforce deserves special attention. Second, the labour market situation of the low-skilled and low-paid should be explored in-depth, not only with respect to the ageing part of the workforce. Last, but not least, the research presented in this study should be extended to later years in order to test whether the trends that are discernible up to 1996 have strengthened or weakened towards the end of the decade. Preliminary plans have been made for extending the research in all three directions.

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APPENDIX FIGURES & TABLES

Figure A1. Educational composition (% shares) of those having become unemployed, by the size of the manufacturing firm in which employed in the previous year

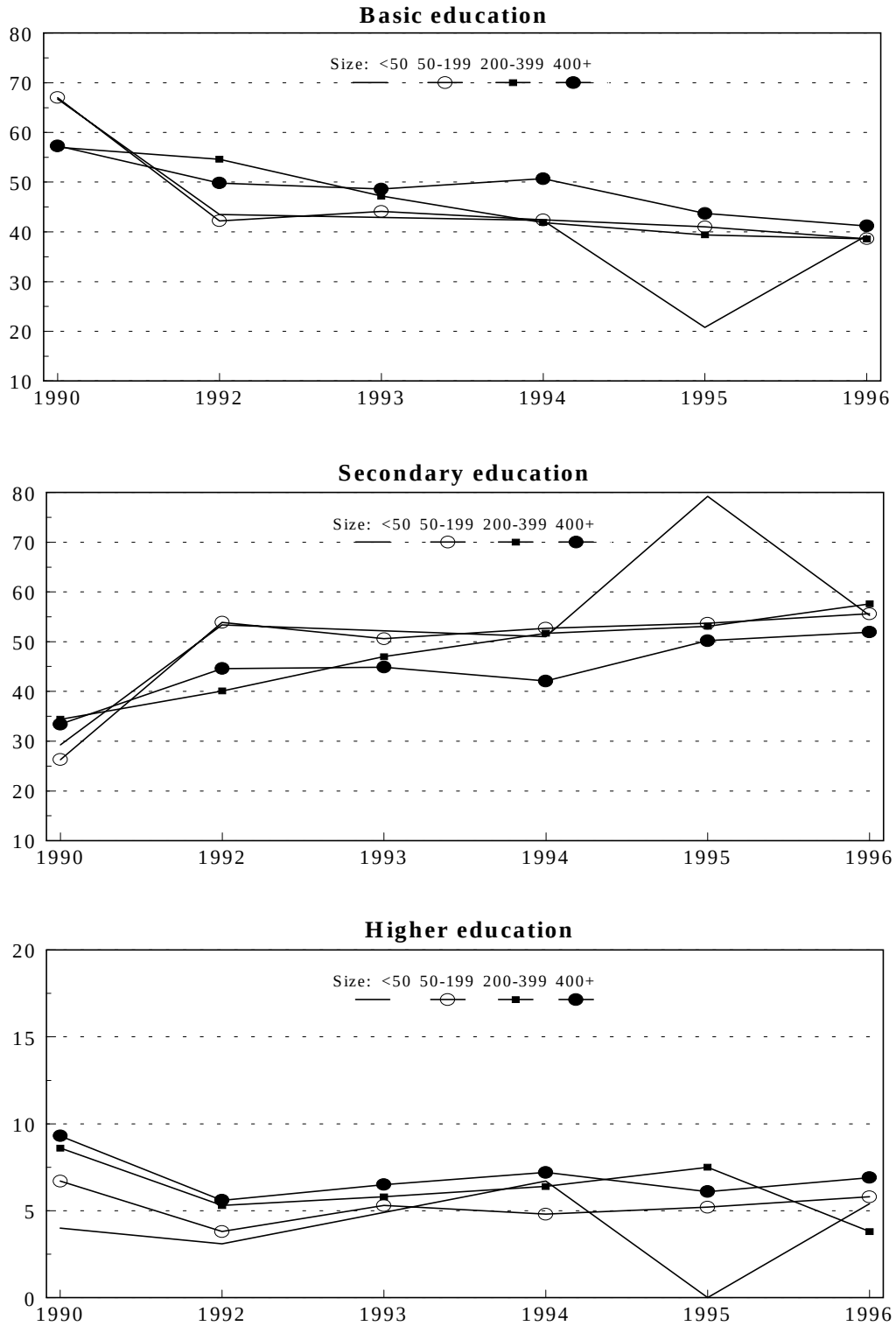

Figure A2. Age composition (% shares) of those having become unemployed, by the size of the manufacturing firm in which employed in the previous year

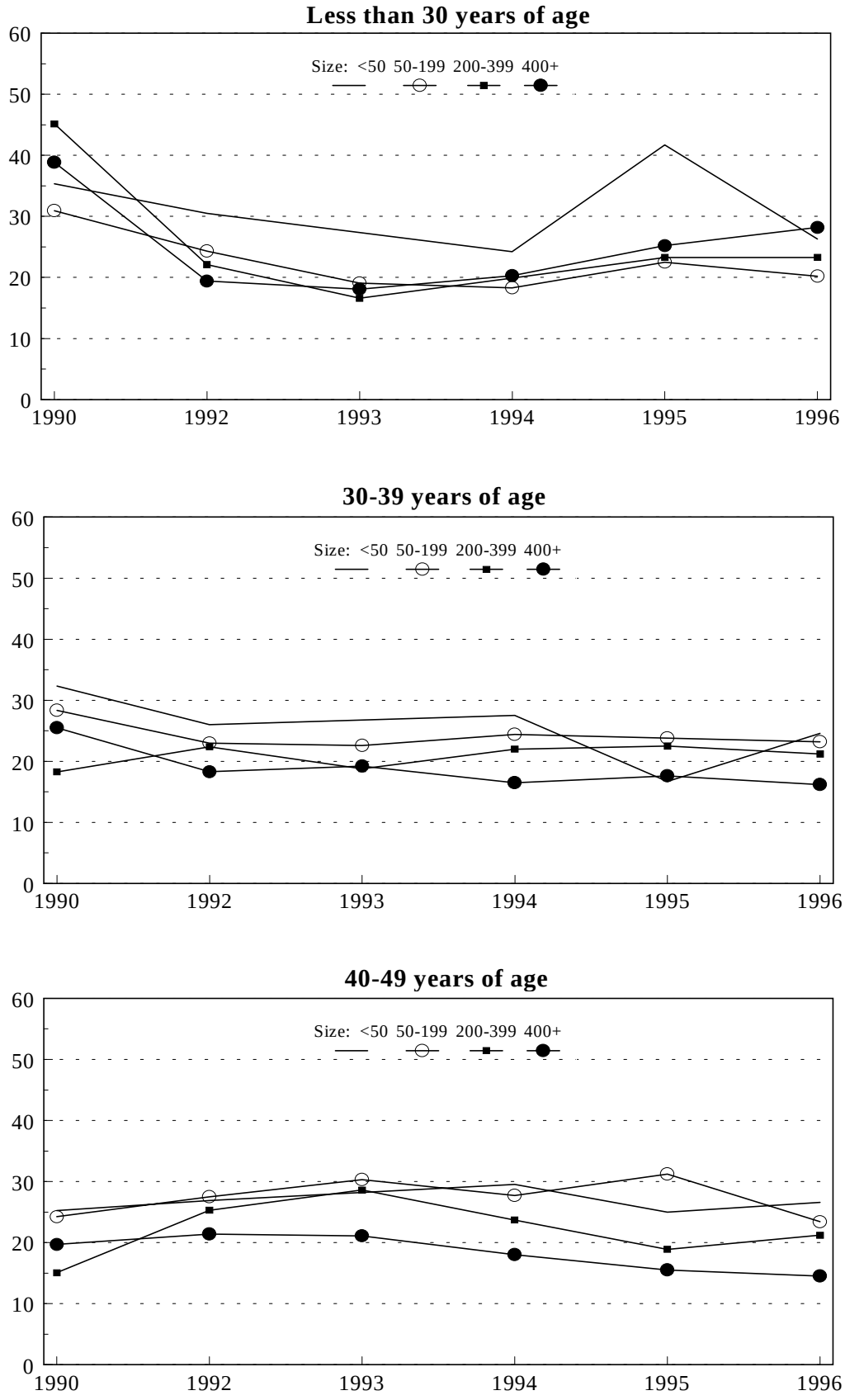

Figure A2. (cont.)

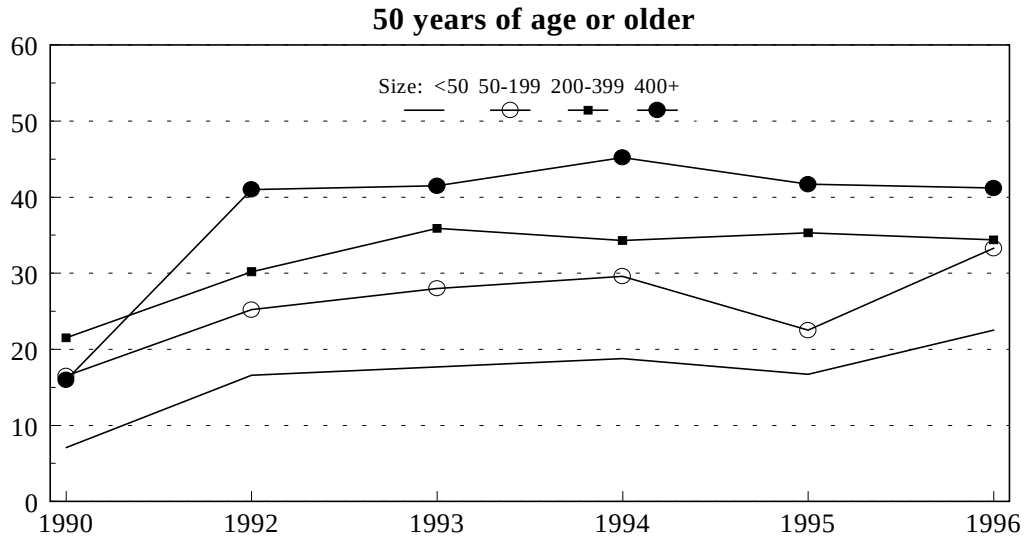

Figure A3. Labour market status of those having become unemployed according to their situation in the year following upon the first unemployment year, by size of the manufacturing firm in which employed before unemployment

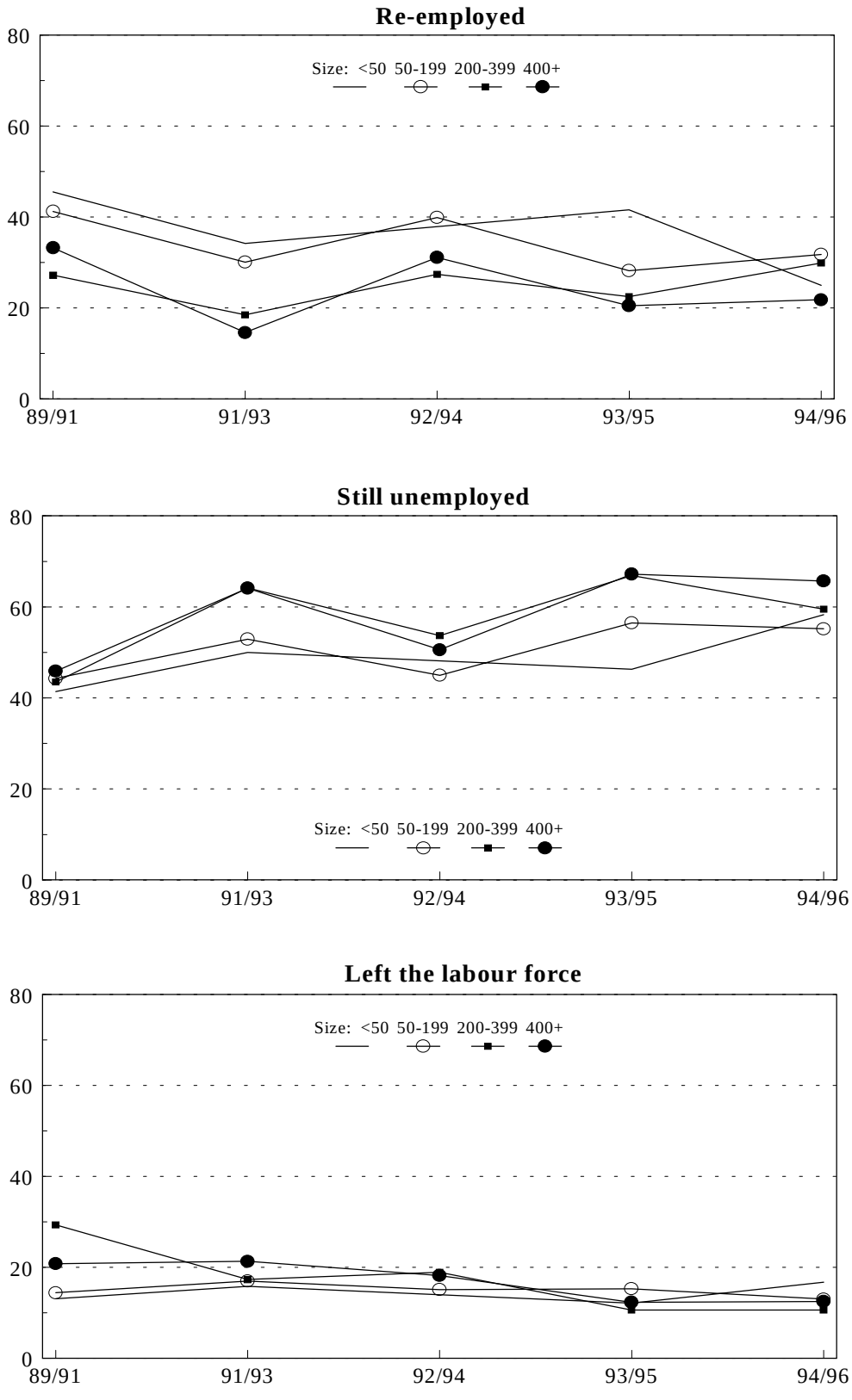

Figure A4. Labour market status two years earlier of those having become unemployed, that is, in the year before observed as an employee in a manufacturing firm of a particular size

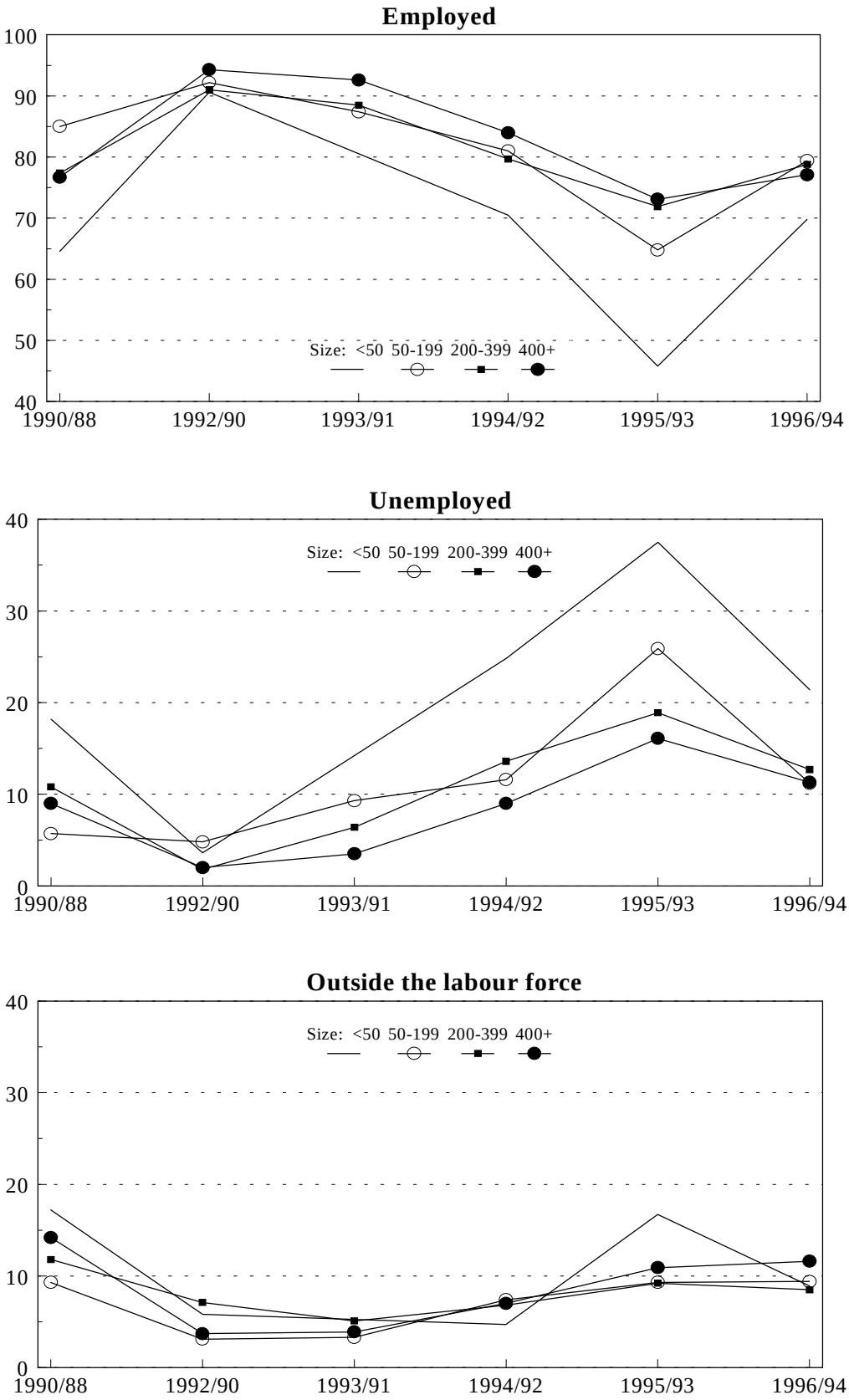

Table A1. Calculated probabilities for manufacturing workers of remaining in employment, by background factor

	Transition periods (starting year to destination year)					
	89 to 90	**91 to 92**	**92 to 93**	**93 to 94**	**94 to 95**	**95 to 96**
R&D intensity:						
High R&D	89.0	92.2	92.5	96.1	95.8	95.1
Low R&D	88.2	91.1	93.9	95.3	95.6	94.8
No R&D activities	87.1	89.7	92.6	95.0	94.7	94.6
Size:						
< 50 employees	84.5	90.0	--	94.4	95.5	94.8
50-199 employees	87.1	90.8	92.4	95.9	95.9	94.8
200-399 employees	87.6	91.2	92.5	96.0	95.5	94.6
400+ employees	88.7	91.6	93.1	95.5	95.6	94.9
R&D intensity and size combined:						
High R&D * < 50	85.4	90.9	--	95.2	95.7	95.0
High R&D * 50-199	87.8	91.7	92.0	96.4	96.1	95.0
High R&D * 200-399	88.2	92.0	92.1	96.5	95.7	94.9
High R&D * 400+	89.3	92.4	92.6	96.0	95.8	95.2
Low R&D * < 50	84.3	89.6	--	94.1	95.5	94.7
Low R&D * 50-199	86.9	90.5	93.4	95.7	95.9	94.7
Low R&D * 200-399	87.4	90.8	93.5	95.8	95.4	94.6
Low R&D * 400+	88.5	91.3	94.0	95.2	95.6	94.9
No R&D * < 50	82.7	88.1	--	93.6	94.5	94.5
No R&D * 50-199	85.6	89.0	92.1	95.3	94.9	94.5
No R&D * 200-399	86.2	89.4	92.2	95.5	94.5	94.3
No R&D * 400+	87.5	89.9	92.7	94.8	94.7	94.7
Education:						
Basic	88.5	90.3	92.2	95.0	95.1	94.0
Secondary	88.2	91.5	93.4	95.8	95.7	94.9
Higher	88.1	93.9	93.2	95.8	96.5	96.3
Age:						
16-29 years	86.4	90.3	92.2	94.4	94.1	93.8
30-39 years	90.9	93.5	94.6	96.3	96.3	95.9
40-49 years	91.5	93.8	95.0	97.2	97.3	96.5
50 years or older	73.7	80.3	81.9	87.9	88.5	87.9
Wage quintile:						
1st (lowest)	79.2	82.4	82.4	89.8	89.8	88.1
2nd	85.6	90.6	92.4	95.2	95.4	94.1
3rd	89.3	92.5	93.7	96.9	96.4	95.8
4th	91.8	93.9	95.8	96.7	97.3	96.2
5th (highest)	91.9	93.2	95.0	96.3	96.4	96.4

Table A1. (cont.)

Gender:						
Man	87.6	90.6	92.5	95.5	95.6	94.7
Woman	89.5	92.5	93.8	95.8	95.7	95.1
R&D intensity and education combined:						
High R&D * Basic	89.1	91.2	91.7	95.7	95.3	94.3
High R&D * Secondary	88.8	92.3	93.0	96.3	95.9	95.1
High R&D * Higher	88.7	94.5	92.8	96.3	96.7	96.4
Low R&D * Basic	88.3	90.0	93.2	94.8	95.1	93.9
Low R&D * Secondary	88.0	91.2	94.2	95.6	95.7	94.8
Low R&D * Higher	87.9	93.7	94.0	95.6	96.5	96.2
No R&D * Basic	87.2	88.4	91.8	94.3	94.0	93.7
No R&D * Secondary	86.9	89.8	93.1	95.2	94.7	94.6
No R&D * Higher	86.8	92.7	92.8	95.2	95.9	96.1
R&D intensity and age combined:						
High R&D * 16-29 years	87.0	91.0	91.8	95.0	94.2	94.0
High R&D * 30-39 years	91.5	94.1	94.3	96.8	96.5	96.1
High R&D * 40-49 years	92.0	94.4	94.7	97.6	97.5	96.7
High R&D * 50+ years	74.7	81.8	80.9	89.3	89.0	88.4
Low R&D * 16-29 years	86.1	90.0	93.2	94.2	94.1	93.7
Low R&D * 30-39 years	90.8	93.2	95.3	96.1	96.3	95.9
Low R&D * 40-49 years	91.4	93.5	95.7	97.0	97.3	96.4
Low R&D * 50+ years	73.3	79.7	84.0	87.3	88.4	87.7
No R&D * 16-29 years	85.1	88.7	91.9	93.7	93.4	93.6
No R&D * 30-39 years	89.8	92.1	94.3	95.8	95.6	95.7
No R&D * 40-49 years	90.4	92.4	94.8	96.8	96.6	96.3
No R&D * 50+ years	72.1	77.2	81.1	86.4	86.0	87.3
Labour market status in previous year:						
Employed	88.9	91.7	93.2	95.8	96.0	95.2
Unemployed	74.7	85.1	85.1	89.4	91.1	90.4
Outside the labour force	75.1	83.2	85.6	87.4	87.1	86.7
R&D intensity and previous labour market status combined:						
High R&D * Employed	89.5	92.4	92.7	96.3	96.2	95.4
High R&D * Unempl.	76.0	86.5	84.3	91.0	91.8	91.0
High R&D * Outside l.f.	76.1	84.2	84.8	88.7	87.5	87.2
Low R&D * Employed	88.8	91.3	94.0	95.6	96.0	95.2
Low R&D * Unempl.	74.4	84.5	86.9	88.6	90.9	90.3
Low R&D * Outside l.f.	74.7	82.8	87.3	86.9	87.1	86.6
No R&D * Employed	87.7	90.0	92.8	95.2	95.1	95.0
No R&D * Unempl.	71.8	82.1	84.5	87.9	88.3	89.6
No R&D * Outside l.f.	73.5	77.6	85.0	91.3	85.0	86.4

Table A2. Calculated probabilities for manufacturing workers of flowing into unemployment, by background factor

	Transition periods (starting year to destination year)					
	89 to 90	**91 to 92**	**92 to 93**	**93 to 94**	**94 to 95**	**95 to 96**
R&D intensity:						
High R&D	5.8	4.8	4.8	2.0	2.1	2.8
Low R&D	6.3	6.0	3.9	2.6	2.4	3.1
No R&D activities	7.4	7.2	4.7	2.8	3.4	3.4
Size:						
< 50 employees	9.5	6.3	--	3.4	2.4	3.3
50-199 employees	7.6	6.2	5.5	2.3	2.3	3.1
200-399 employees	7.0	6.0	5.0	2.1	2.5	3.4
400+ employees	5.9	5.4	4.3	2.4	2.3	2.9
R&D intensity and size combined:						
High R&D * < 50	8.8	5.4	--	2.8	2.1	3.0
High R&D * 50-199	7.1	5.3	5.9	1.9	2.1	2.9
High R&D * 200-399	6.5	5.1	5.4	1.7	2.2	3.2
High R&D * 400+	5.5	4.6	4.5	2.0	2.0	2.7
Low R&D * < 50	9.6	6.7	--	3.8	2.5	3.3
Low R&D * 50-199	7.7	6.6	4.8	2.6	2.4	3.2
Low R&D * 200-399	7.1	6.4	4.3	2.3	2.6	3.5
Low R&D * 400+	6.0	5.8	3.7	2.6	2.3	2.9
No R&D * < 50	11.3	8.1	--	4.0	3.4	3.7
No R&D * 50-199	9.1	7.9	5.8	2.7	3.4	3.5
No R&D * 200-399	8.3	7.7	5.3	2.4	3.6	3.8
No R&D * 400+	7.1	7.0	4.5	2.8	3.3	3.2
Education:						
Basic	6.2	6.4	5.1	2.9	2.7	3.6
Secondary	6.1	5.5	4.3	2.2	2.3	3.2
Higher	6.3	3.9	3.6	1.9	1.6	1.9
Age:						
16-29 years	6.1	5.1	3.9	2.0	2.0	2.8
30-39 years	5.6	4.3	3.5	2.0	1.8	2.4
40-49 years	5.3	4.6	3.6	1.8	1.7	2.3
50 years or older	8.8	11.7	10.5	6.2	6.6	7.7
Wage quintile:						
1st (lowest)	11.5	12.2	9.4	5.5	5.7	6.6
2nd	8.9	6.9	5.4	3.1	2.9	4.2
3rd	6.0	5.2	4.7	2.0	2.2	2.8
4th	4.3	4.1	2.8	1.8	1.5	2.5
5th (highest)	3.2	2.9	2.5	1.2	1.3	1.3

Table A2. (cont.)

Gender:						
Man	7.3	6.5	4.9	2.5	2.5	3.3
Woman	4.4	4.1	3.8	2.1	2.0	2.7
R&D intensity and education combined:						
High R&D * Basic	5.8	5.5	5.5	2.3	2.4	3.3
High R&D * Secondary	5.7	4.7	4.6	1.8	2.1	2.9
High R&D * Higher	5.9	3.3	3.9	1.6	1.4	1.7
Low R&D * Basic	6.3	6.8	4.4	3.1	2.8	3.7
Low R&D * Secondary	6.2	5.8	3.7	2.5	2.4	3.2
Low R&D * Higher	6.4	4.2	3.1	2.1	1.7	1.9
No R&D * Basic	7.5	8.2	5.4	3.3	3.9	4.1
No R&D * Secondary	7.3	7.0	4.5	2.6	3.4	3.5
No R&D * Higher	7.5	5.0	3.8	2.2	2.4	2.1
R&D intensity and age combined:						
High R&D * 16-29 years	5.7	4.4	4.2	1.6	1.7	2.6
High R&D * 30-39 years	5.2	3.7	3.8	1.6	1.6	2.2
High R&D * 40-49 years	4.9	3.9	3.8	1.5	1.5	2.1
High R&D * 50+ years	8.2	10.1	11.1	5.1	5.9	7.1
Low R&D * 16-29 years	6.2	5.4	3.4	2.1	2.0	2.8
Low R&D * 30-39 years	5.7	4.6	3.0	2.2	1.9	2.4
Low R&D * 40-49 years	5.3	4.9	3.1	2.0	1.8	2.4
Low R&D * 50+ years	8.8	12.4	9.2	6.8	6.8	7.8
No R&D * 16-29 years	7.3	6.6	4.1	2.3	2.8	3.2
No R&D * 30-39 years	6.8	5.6	3.7	2.3	2.7	2.7
No R&D * 40-49 years	6.3	5.9	3.7	2.1	2.5	2.6
No R&D * 50+ years	10.4	14.7	10.9	7.2	9.4	8.6
Labour market status in previous year:						
Employed	6.0	5.5	4.4	2.2	2.1	2.8
Unemployed	18.4	11.0	11.9	8.5	7.1	7.8
Outside the labour force	8.8	7.4	7.4	5.4	6.0	6.5
R&D intensity and previous labour market status combined:						
High R&D * Employed	5.5	4.7	4.7	1.8	1.8	2.6
High R&D * Unempl.	17.3	9.5	12.7	7.1	6.3	7.2
High R&D * Outside l.f.	8.2	6.4	7.9	4.4	5.3	6.0
Low R&D * Employed	6.0	5.8	3.8	2.5	2.1	2.8
Low R&D * Unempl.	18.6	11.7	10.4	9.3	7.3	7.9
Low R&D * Outside l.f.	8.9	7.8	6.5	5.9	6.2	6.5
No R&D * Employed	7.1	7.1	4.6	2.6	3.0	3.1
No R&D * Unempl.	21.4	13.9	12.4	9.9	10.0	8.7
No R&D * Outside l.f.	10.5	13.1	7.8	6.6	8.5	7.2

Table A3. Calculated probabilities for manufacturing workers of leaving the labour force, by background factor

	Transition periods (starting year to destination year)					
	89 to 90	**91 to 92**	**92 to 93**	**93 to 94**	**94 to 95**	**95 to 96**
R&D intensity:						
High R&D	5.2	3.0	2.7	1.9	2.1	2.1
Low R&D	5.5	3.0	2.3	2.0	2.0	2.1
No R&D activities	5.5	3.1	2.7	2.3	1.9	2.0
Size:						
< 50 employees	6.0	3.7	--	2.1	2.1	1.9
50-199 employees	5.3	3.0	2.1	1.8	1.8	2.1
200-399 employees	5.5	2.8	2.5	1.9	2.0	1.9
400+ employees	5.4	3.0	2.7	2.1	2.1	2.2
R&D intensity and size combined:						
High R&D * < 50	5.8	3.7	--	2.0	2.2	1.9
High R&D * 50-199	5.1	3.0	2.2	1.7	1.9	2.1
High R&D * 200-399	5.3	2.8	2.6	1.8	2.1	1.9
High R&D * 400+	5.2	3.0	2.8	2.0	2.2	2.2
Low R&D * < 50	6.1	3.7	--	2.1	2.1	1.9
Low R&D * 50-199	5.4	3.0	1.8	1.8	1.8	2.1
Low R&D * 200-399	5.6	2.8	2.2	1.9	2.0	2.0
Low R&D * 400+	5.5	3.0	2.4	2.1	2.0	2.2
No R&D * < 50	6.0	3.8	--	2.3	2.0	1.8
No R&D * 50-199	5.3	3.1	2.2	1.9	1.7	2.0
No R&D * 200-399	5.5	2.9	2.6	2.1	1.9	1.8
No R&D * 400+	5.5	3.1	2.8	2.4	2.0	2.0
Education:						
Basic	5.3	3.3	2.7	2.1	2.2	2.4
Secondary	5.7	3.0	2.3	1.9	2.0	2.0
Higher	5.6	2.2	3.2	2.3	1.8	1.9
Age:						
16-29 years	7.5	4.6	3.9	3.6	4.0	3.4
30-39 years	3.4	2.2	1.9	1.7	1.8	1.7
40-49 years	3.2	1.6	1.4	1.0	0.9	1.2
50 years or older	17.6	8.0	7.6	5.9	4.9	4.4
Wage quintile:						
1st (lowest)	9.2	5.4	8.2	4.7	4.5	5.3
2nd	5.5	2.4	2.2	1.7	1.7	1.7
3rd	4.7	2.3	1.6	1.2	1.5	1.4
4th	3.9	2.0	1.4	1.5	1.3	1.3
5th (highest)	4.9	3.9	2.6	2.4	2.3	2.3

Table A3. (cont.)

Gender:						
Man	5.2	2.8	2.7	2.0	1.9	2.0
Woman	6.0	3.4	2.4	2.1	2.4	2.2
R&D intensity and education combined:						
High R&D * Basic	5.1	3.3	2.8	2.0	2.3	2.4
High R&D * Secondary	5.5	3.0	2.5	1.8	2.1	2.0
High R&D * Higher	5.4	2.2	3.4	2.1	1.9	1.9
Low R&D * Basic	5.4	3.2	2.4	2.1	2.2	2.4
Low R&D * Secondary	5.8	3.0	2.1	1.9	1.9	2.0
Low R&D * Higher	5.7	2.2	2.8	2.3	1.8	1.9
No R&D * Basic	5.3	3.4	2.8	2.3	2.1	2.2
No R&D * Secondary	5.7	3.1	2.5	2.1	1.9	1.9
No R&D * Higher	5.7	2.3	3.4	2.5	1.7	1.8
R&D intensity and age combined:						
High R&D * 16-29 years	7.2	4.6	4.1	3.4	4.1	3.4
High R&D * 30-39 years	3.3	2.2	2.0	1.6	1.9	1.7
High R&D * 40-49 years	3.1	1.6	1.5	0.9	1.0	1.2
High R&D * 50+ years	17.0	8.1	7.9	5.6	5.1	4.5
Low R&D * 16-29 years	7.7	4.5	3.4	3.6	3.9	3.5
Low R&D * 30-39 years	3.5	2.2	1.7	1.7	1.8	1.7
Low R&D * 40-49 years	3.3	1.6	1.2	1.0	0.9	1.2
Low R&D * 50+ years	17.9	7.9	6.8	5.9	4.7	4.5
No R&D * 16-29 years	7.6	4.8	4.1	4.0	3.8	3.2
No R&D * 30-39 years	3.5	2.3	2.0	1.9	1.8	1.6
No R&D * 40-49 years	3.2	1.7	1.5	1.1	0.9	1.1
No R&D * 50+ years	17.5	8.1	7.9	6.4	4.5	4.2
Labour market status in previous year:						
Employed	5.1	2.9	2.5	2.0	1.9	2.0
Unemployed	6.9	3.9	3.0	2.1	1.9	1.8
Outside the labour force	16.1	9.5	7.0	7.2	7.0	6.8
R&D intensity and previous labour market status combined:						
High R&D * Employed	4.9	2.9	2.6	1.8	2.0	2.0
High R&D * Unempl.	6.7	4.0	3.1	2.0	1.9	1.8
High R&D * Outside l.f.	15.6	9.5	7.3	6.9	7.2	6.9
Low R&D * Employed	5.2	2.8	2.2	2.0	1.9	2.0
Low R&D * Unempl.	7.1	3.9	2.6	2.1	1.8	1.8
Low R&D * Outside l.f.	16.4	9.3	6.2	7.2	6.8	6.9
No R&D * Employed	5.1	3.0	2.6	2.2	1.8	1.9
No R&D * Unempl.	6.8	4.0	3.1	2.3	1.7	1.7
No R&D * Outside l.f.	16.1	9.3	7.3	2.1	6.5	6.4

Table A4. Calculated probabilities of remaining in employment, by background factor, relative to the average manufacturing worker remaining employed

	Transition periods (starting year to destination year)					
	89 to 90	**91 to 92**	**92 to 93**	**93 to 94**	**94 to 95**	**95 to 96**
R&D intensity:						
High R&D	1.01	1.01	1.00	1.01	1.00	1.00
Low R&D	1.00	1.00	1.01	1.00	1.00	1.00
No R&D activities	0.99	0.98	1.00	0.99	0.99	1.00
Size:						
< 50 employees	0.96	0.98	1.08	0.99	1.00	1.00
50-199 employees	0.99	0.99	0.99	1.00	1.00	1.00
200-399 employees	0.99	1.00	1.00	1.00	1.00	1.00
400+ employees	1.00	1.00	1.00	1.00	1.00	1.00
R&D intensity and size combined:						
High R&D * < 50	0.97	0.99	1.08	1.00	1.00	1.00
High R&D * 50-199	0.99	1.00	0.99	1.01	1.00	1.00
High R&D * 200-399	1.00	1.01	0.99	1.01	1.00	1.00
High R&D * 400+	1.01	1.01	1.00	1.00	1.00	1.00
Low R&D * < 50	0.95	0.98	1.08	0.98	1.00	1.00
Low R&D * 50-199	0.98	0.99	1.00	1.00	1.00	1.00
Low R&D * 200-399	0.99	0.99	1.01	1.00	1.00	1.00
Low R&D * 400+	1.00	1.00	1.01	1.00	1.00	1.00
No R&D * < 50	0.94	0.96	1.08	0.98	0.99	1.00
No R&D * 50-199	0.97	0.97	0.99	1.00	0.99	1.00
No R&D * 200-399	0.97	0.98	0.99	1.00	0.99	0.99
No R&D * 400+	0.99	0.98	1.00	0.99	0.99	1.00
Education:						
Basic	1.00	0.99	0.99	0.99	0.99	0.99
Secondary	1.00	1.00	1.00	1.00	1.00	1.00
Higher	1.00	1.03	1.00	1.00	1.01	1.01
Age:						
16-29 years	0.98	0.99	0.99	0.99	0.98	0.99
30-39 years	1.03	1.02	1.02	1.01	1.01	1.01
40-49 years	1.04	1.03	1.02	1.02	1.02	1.02
50 years or older	0.83	0.88	0.88	0.92	0.93	0.93
Wage quintile:						
1st (lowest)	0.90	0.90	0.89	0.94	0.94	0.93
2nd	0.97	0.99	0.99	1.00	1.00	0.99
3rd	1.01	1.01	1.01	1.01	1.01	1.01
4th	1.04	1.03	1.03	1.01	1.02	1.01
5th (highest)	1.04	1.02	1.02	1.01	1.01	1.02

Table A4. (cont.)

Gender:						
Man	0.99	0.99	0.99	1.00	1.00	1.00
Woman	1.01	1.01	1.01	1.00	1.00	1.00
R&D intensity and education combined:						
High R&D * Basic	1.01	1.00	0.99	1.00	1.00	0.99
High R&D * Secondary	1.01	1.01	1.00	1.01	1.00	1.00
High R&D * Higher	1.00	1.03	1.00	1.01	1.01	1.02
Low R&D * Basic	1.00	0.98	1.00	0.99	0.99	0.99
Low R&D * Secondary	1.00	1.00	1.01	1.00	1.00	1.00
Low R&D * Higher	0.99	1.03	1.01	1.00	1.01	1.01
No R&D * Basic	0.99	0.97	0.99	0.99	0.98	0.99
No R&D * Secondary	0.98	0.98	1.00	1.00	0.99	1.00
No R&D * Higher	0.98	1.01	1.00	1.00	1.00	1.01
R&D intensity and age combined:						
High R&D * 16-29 years	0.98	1.00	0.99	0.99	0.98	0.99
*High R&D * 30-39 years*	1.03	1.03	1.01	1.01	1.01	1.01
High R&D * 40-49 years	1.04	1.03	1.02	1.02	1.02	1.02
High R&D * 50+ years	0.85	0.89	0.87	0.93	0.93	0.93
Low R&D * 16-29 years	0.97	0.98	1.00	0.99	0.98	0.99
Low R&D * 30-39 years	1.03	1.02	1.03	1.01	1.01	1.01
Low R&D * 40-49 years	1.03	1.02	1.03	1.02	1.02	1.02
Low R&D * 50+ years	0.83	0.87	0.90	0.91	0.92	0.92
No R&D * 16-29 years	0.96	0.97	0.99	0.98	0.98	0.99
No R&D * 30-39 years	1.02	1.01	1.01	1.00	1.00	1.01
No R&D * 40-49 years	1.02	1.01	1.02	1.01	1.01	1.01
No R&D * 50+ years	0.82	0.84	0.87	0.90	0.90	0.92
Labour market status in previous year:						
Employed	1.01	1.00	1.00	1.00	1.00	1.00
Unemployed	0.85	0.93	0.92	0.94	0.95	0.95
Outside the labour force	0.85	0.91	0.92	0.91	0.91	0.91
R&D intensity and previous labour market status combined:						
High R&D * Employed	1.01	1.01	1.00	1.01	1.01	1.01
High R&D * Unempl.	0.86	0.95	0.91	0.95	0.96	0.96
High R&D * Outside l.f.	0.86	0.92	0.91	0.93	0.91	0.92
Low R&D * Employed	1.00	1.00	1.01	1.00	1.00	1.00
Low R&D * Unempl.	0.84	0.92	0.94	0.93	0.95	0.95
Low R&D * Outside l.f.	0.85	0.91	0.94	0.91	0.91	0.91
No R&D * Employed	0.99	0.98	1.00	1.00	0.99	1.00
No R&D * Unempl.	0.81	0.90	0.91	0.92	0.92	0.94
No R&D * Outside l.f.	0.83	0.85	0.91	0.96	0.89	0.91

Table A5. Calculated probabilities of flowing into unemployment, by background factor, relative to the average manufacturing worker having become unemployed

	Transition periods (starting year to destination year)					
	89 to 90	**91 to 92**	**92 to 93**	**93 to 94**	**94 to 95**	**95 to 96**
R&D intensity:						
High R&D	0.93	0.86	1.07	0.82	0.89	0.92
Low R&D	1.01	1.06	0.87	1.10	1.03	1.01
No R&D activities	1.20	1.29	1.05	1.17	1.45	1.12
Size:						
< 50 employees	1.53	1.13	--	1.45	1.02	1.08
50-199 employees	1.23	1.10	1.23	0.98	1.00	1.02
200-399 employees	1.13	1.07	1.12	0.87	1.08	1.12
400+ employees	0.95	0.97	0.95	1.01	0.98	0.95
R&D intensity and size combined:						
High R&D * < 50	1.43	0.97	--	1.18	0.91	0.99
High R&D * 50-199	1.15	0.95	1.31	0.80	0.88	0.94
High R&D * 200-399	1.05	0.92	1.20	0.71	0.96	1.03
High R&D * 400+	0.89	0.83	1.02	0.82	0.87	0.87
Low R&D * < 50	1.55	1.20	--	1.59	1.06	1.09
Low R&D * 50-199	1.24	1.17	1.06	1.08	1.03	1.03
Low R&D * 200-399	1.14	1.14	0.97	0.95	1.12	1.13
Low R&D * 400+	0.96	1.03	0.82	1.11	1.01	0.96
No R&D * < 50	1.82	1.45	--	1.69	1.48	1.21
No R&D * 50-199	1.47	1.42	1.29	1.15	1.45	1.14
No R&D * 200-399	1.35	1.38	1.17	1.01	1.57	1.25
No R&D * 400+	1.14	1.25	1.00	1.18	1.42	1.06
Education:						
Basic	1.01	1.14	1.15	1.19	1.16	1.19
Secondary	0.99	0.98	0.96	0.94	1.00	1.03
Higher	1.02	0.70	0.81	0.80	0.70	0.61
Age:						
16-29 years	0.99	0.91	0.87	0.82	0.84	0.92
30-39 years	0.91	0.77	0.78	0.84	0.79	0.78
40-49 years	0.85	0.82	0.79	0.76	0.74	0.77
50 years or older	1.42	2.08	2.35	2.60	2.85	2.52
Wage quintile:						
1st (lowest)	1.86	2.18	2.11	2.32	2.45	2.15
2nd	1.44	1.24	1.22	1.30	1.25	1.39
3rd	0.97	0.93	1.06	0.83	0.93	0.93
4th	0.70	0.74	0.62	0.76	0.63	0.81
5th (highest)	0.52	0.51	0.55	0.50	0.54	0.43

Table A5. (cont.)

Gender:						
Man	1.17	1.17	1.09	1.06	1.09	1.07
Woman	0.72	0.74	0.85	0.90	0.84	0.87
R&D intensity and education combined:						
High R&D * Basic	0.94	0.98	1.22	0.98	1.03	1.09
High R&D * Secondary	0.92	0.84	1.02	0.77	0.89	0.94
High R&D * Higher	0.95	0.60	0.86	0.66	0.62	0.56
Low R&D * Basic	1.02	1.22	0.99	1.31	1.20	1.20
Low R&D * Secondary	1.00	1.04	0.83	1.03	1.04	1.04
Low R&D * Higher	1.03	0.74	0.70	0.88	0.72	0.61
No R&D * Basic	1.21	1.47	1.20	1.40	1.68	1.33
No R&D * Secondary	1.18	1.26	1.00	1.10	1.45	1.15
No R&D * Higher	1.22	0.90	0.84	0.94	1.01	0.68
R&D intensity and age combined:						
High R&D * 16-29 years	0.92	0.78	0.93	0.67	0.75	0.84
*High R&D * 30-39 years*	0.85	0.66	0.84	0.68	0.70	0.71
High R&D * 40-49 years	0.79	0.71	0.85	0.62	0.65	0.70
High R&D * 50+ years	1.33	1.81	2.49	2.15	2.54	2.32
Low R&D * 16-29 years	1.00	0.97	0.75	0.90	0.87	0.93
Low R&D * 30-39 years	0.92	0.82	0.68	0.92	0.82	0.78
Low R&D * 40-49 years	0.86	0.88	0.68	0.83	0.76	0.77
Low R&D * 50+ years	1.43	2.21	2.06	2.85	2.94	2.53
No R&D * 16-29 years	1.19	1.18	0.91	0.96	1.22	1.03
No R&D * 30-39 years	1.09	1.00	0.82	0.98	1.15	0.87
No R&D * 40-49 years	1.02	1.06	0.83	0.89	1.07	0.85
No R&D * 50+ years	1.68	2.63	2.44	3.01	4.05	2.80
Labour market status in previous year:						
Employed	0.96	0.98	0.97	0.94	0.90	0.92
Unemployed	2.97	1.97	2.66	3.57	3.04	2.55
Outside the labour force	1.42	1.32	1.66	2.24	2.58	2.12
R&D intensity and previous labour market status combined:						
High R&D * Employed	0.90	0.84	1.04	0.77	0.79	0.84
High R&D * Unempl.	2.79	1.70	2.83	2.95	2.71	2.35
High R&D * Outside l.f.	1.33	1.14	1.76	1.85	2.29	1.95
Low R&D * Employed	0.97	1.04	0.84	1.03	0.93	0.93
Low R&D * Unempl.	3.00	2.09	2.33	3.90	3.13	2.57
Low R&D * Outside l.f.	1.44	1.40	1.45	2.46	2.66	2.13
No R&D * Employed	1.15	1.26	1.02	1.10	1.30	1.03
No R&D * Unempl.	3.47	2.49	2.78	4.14	4.30	2.83
No R&D * Outside l.f.	1.69	2.35	1.73	2.76	3.68	2.36

Table A6. Calculated probabilities of leaving the labour force, by background factor, relative to the average manufacturing worker having left the labour force

	Transition periods (starting year to destination year)					
	89 to 90	**91 to 92**	**92 to 93**	**93 to 94**	**94 to 95**	**95 to 96**
R&D intensity:						
High R&D	0.96	1.00	1.05	0.94	1.03	1.01
Low R&D	1.02	0.99	0.88	1.00	0.97	1.02
No R&D activities	1.01	1.03	1.05	1.11	0.95	0.95
Size:						
< 50 employees	1.10	1.23	--	1.04	1.05	0.91
50-199 employees	0.97	1.00	0.81	0.86	0.89	1.01
200-399 employees	1.01	0.94	0.96	0.94	0.99	0.92
400+ employees	1.00	1.00	1.05	1.05	1.02	1.04
R&D intensity and size combined:						
High R&D * < 50	1.07	1.23	0.00	0.98	1.08	0.92
High R&D * 50-199	0.93	1.00	0.85	0.81	0.91	1.02
High R&D * 200-399	0.97	0.94	1.01	0.89	1.02	0.93
High R&D * 400+	0.96	1.00	1.11	0.99	1.06	1.05
Low R&D * < 50	1.13	1.21	0.00	1.04	1.02	0.93
Low R&D * 50-199	0.99	0.98	0.72	0.87	0.86	1.03
Low R&D * 200-399	1.03	0.93	0.85	0.95	0.96	0.94
Low R&D * 400+	1.02	0.99	0.93	1.05	1.00	1.06
No R&D * < 50	1.10	1.27	0.00	1.15	0.99	0.86
No R&D * 50-199	0.97	1.03	0.85	0.96	0.84	0.95
No R&D * 200-399	1.01	0.98	1.01	1.04	0.94	0.87
No R&D * 400+	1.01	1.03	1.10	1.16	0.97	0.98
Education:						
Basic	0.97	1.09	1.05	1.04	1.09	1.14
Secondary	1.05	1.01	0.92	0.95	0.98	0.96
Higher	1.03	0.72	1.26	1.12	0.90	0.90
Age:						
16-29 years	1.38	1.53	1.51	1.79	1.94	1.63
30-39 years	0.63	0.73	0.74	0.84	0.91	0.81
40-49 years	0.59	0.54	0.55	0.48	0.46	0.57
50 years or older	3.23	2.67	2.98	2.89	2.40	2.14
Wage quintile:						
1st (lowest)	1.70	1.80	3.21	2.30	2.22	2.56
2nd	1.01	0.81	0.85	0.83	0.85	0.82
3rd	0.86	0.77	0.62	0.57	0.72	0.66
4th	0.71	0.65	0.55	0.74	0.62	0.63
5th (highest)	0.89	1.29	1.01	1.20	1.15	1.11

Table A6. (cont.)

Gender:						
Man	0.95	0.94	1.04	0.99	0.93	0.97
Woman	1.11	1.12	0.93	1.03	1.17	1.06
R&D intensity and education combined:						
High R&D * Basic	0.94	1.09	1.11	0.98	1.12	1.15
High R&D * Secondary	1.01	1.01	0.97	0.90	1.01	0.96
High R&D * Higher	1.00	0.72	1.32	1.05	0.93	0.91
Low R&D * Basic	0.99	1.07	0.93	1.04	1.06	1.16
Low R&D * Secondary	1.07	0.99	0.81	0.96	0.95	0.97
Low R&D * Higher	1.05	0.72	1.11	1.12	0.87	0.92
No R&D * Basic	0.98	1.12	1.10	1.15	1.03	1.08
No R&D * Secondary	1.06	1.04	0.96	1.05	0.93	0.90
No R&D * Higher	1.04	0.75	1.32	1.24	0.85	0.85
R&D intensity and age combined:						
High R&D * 16-29 years	1.33	1.53	1.60	1.68	2.00	1.65
*High R&D * 30-39 years*	0.61	0.73	0.78	0.79	0.93	0.82
High R&D * 40-49 years	0.57	0.54	0.58	0.45	0.48	0.58
High R&D * 50+ years	3.14	2.69	3.11	2.76	2.48	2.16
Low R&D * 16-29 years	1.41	1.51	1.34	1.79	1.89	1.66
Low R&D * 30-39 years	0.64	0.73	0.65	0.84	0.88	0.83
Low R&D * 40-49 years	0.60	0.54	0.49	0.48	0.45	0.58
Low R&D * 50+ years	3.28	2.63	2.67	2.89	2.33	2.17
No R&D * 16-29 years	1.39	1.58	1.59	1.97	1.85	1.55
No R&D * 30-39 years	0.64	0.76	0.77	0.93	0.86	0.77
No R&D * 40-49 years	0.59	0.57	0.58	0.54	0.44	0.54
No R&D * 50+ years	3.23	2.71	3.11	3.17	2.23	2.01
Labour market status in previous year:						
Employed	0.94	0.95	0.97	0.96	0.95	0.94
Unemployed	1.27	1.30	1.16	1.02	0.92	0.87
Outside the labour force	2.96	3.14	2.73	3.56	3.41	3.27
R&D intensity and previous labour market status combined:						
High R&D * Employed	0.90	0.95	1.03	0.91	0.98	0.95
High R&D * Unempl.	1.24	1.31	1.21	0.97	0.95	0.88
High R&D * Outside l.f.	2.87	3.15	2.86	3.38	3.53	3.30
Low R&D * Employed	0.96	0.94	0.86	0.96	0.92	0.96
Low R&D * Unempl.	1.30	1.28	1.04	1.01	0.89	0.88
Low R&D * Outside l.f.	3.01	3.10	2.44	3.56	3.32	3.32
No R&D * Employed	0.95	0.98	1.02	1.06	0.90	0.89
No R&D * Unempl.	1.25	1.33	1.21	1.11	0.85	0.81
No R&D * Outside l.f.	2.96	3.09	2.85	1.05	3.19	3.08

Table A7. Relative probabilities for manufacturing workers of remaining in employment, by background factor

	Transition periods (starting year to destination year)					
	89 to 90	**91 to 92**	**92 to 93**	**93 to 94**	**94 to 95**	**95 to 96**
R&D intensity:						
High R&D	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Low R&D	0.99	0.99	1.01	0.99	1.00	1.00
No R&D activities	0.98	0.97	1.00	0.99	0.99	0.99
Size:						
< 50 employees	0.95	0.98	1.07	0.99	1.00	1.00
50-199 employees	0.98	0.99	0.99	1.00	1.00	1.00
200-399 employees	0.99	1.00	0.99	1.01	1.00	1.00
400+ employees	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
R&D intensity and size combined:						
High R&D * < 50	0.96	0.98	1.08	0.99	1.00	1.00
High R&D * 50-199	0.98	0.99	0.99	1.00	1.00	1.00
High R&D * 200-399	0.99	1.00	0.99	1.00	1.00	1.00
*High R&D * 400+*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Low R&D * < 50	0.94	0.97	1.08	0.98	1.00	1.00
Low R&D * 50-199	0.97	0.98	1.01	1.00	1.00	1.00
Low R&D * 200-399	0.98	0.98	1.01	1.00	1.00	0.99
Low R&D * 400+	0.99	0.99	1.01	0.99	1.00	1.00
No R&D * < 50	0.93	0.95	1.08	0.98	0.99	0.99
No R&D * 50-199	0.96	0.96	0.99	0.99	0.99	0.99
No R&D * 200-399	0.97	0.97	0.99	0.99	0.99	0.99
No R&D * 400+	0.98	0.97	1.00	0.99	0.99	1.00
Education:						
Basic	1.00	0.96	0.99	0.99	0.98	0.98
Secondary	1.00	0.97	1.00	1.00	0.99	0.99
Higher	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Age:						
16-29 years	0.94	0.96	0.97	0.97	0.97	0.97
30-39 years	0.99	1.00	1.00	0.99	0.99	0.99
40-49 years	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
50 years or older	0.81	0.86	0.86	0.90	0.91	0.91
Wage quintile:						
1st (lowest)	0.86	0.88	0.87	0.93	0.93	0.91
2nd	0.93	0.97	0.97	0.99	0.99	0.98
3rd	0.97	0.99	0.99	1.01	1.00	0.99
4th	1.00	1.01	1.01	1.00	1.01	1.00
5th (highest)	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*

Table A7. (cont.)

Gender:						
Man	0.98	0.98	0.99	1.00	1.00	1.00
Woman	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
R&D intensity and education combined:						
High R&D * Basic	1.00	0.97	0.99	0.99	0.99	0.98
High R&D * Secondary	1.00	0.98	1.00	1.00	0.99	0.99
*High R&D * Higher*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Low R&D * Basic	1.00	0.95	1.00	0.98	0.98	0.97
Low R&D * Secondary	0.99	0.97	1.02	0.99	0.99	0.98
Low R&D * Higher	0.99	0.99	1.01	0.99	1.00	1.00
No R&D * Basic	0.98	0.94	0.99	0.98	0.97	0.97
No R&D * Secondary	0.98	0.95	1.00	0.99	0.98	0.98
No R&D * Higher	0.98	0.98	1.00	0.99	0.99	1.00
R&D intensity and age combined:						
High R&D * 16-29 years	0.95	0.96	0.97	0.97	0.97	0.97
High R&D * 30-39 years	0.99	1.00	1.00	0.99	0.99	0.99
*High R&D * 40-49 years*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
High R&D * 50+ years	0.81	0.87	0.85	0.91	0.91	0.91
Low R&D * 16-29 years	0.94	0.95	0.98	0.97	0.97	0.97
Low R&D * 30-39 years	0.99	0.99	1.01	0.98	0.99	0.99
Low R&D * 40-49 years	0.99	0.99	1.01	0.99	1.00	1.00
Low R&D * 50+ years	0.80	0.84	0.89	0.89	0.91	0.91
No R&D * 16-29 years	0.92	0.94	0.97	0.96	0.96	0.97
No R&D * 30-39 years	0.98	0.98	1.00	0.98	0.98	0.99
No R&D * 40-49 years	0.98	0.98	1.00	0.99	0.99	1.00
No R&D * 50+ years	0.78	0.82	0.86	0.88	0.88	0.90
Labour market status in previous year:						
Employed	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Unemployed	0.84	0.93	0.91	0.93	0.95	0.95
Outside the labour force	0.84	0.91	0.92	0.91	0.91	0.91
R&D intensity and previous labour market status combined:						
High R&D * Employed	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
High R&D * Unempl.	0.85	0.94	0.91	0.94	0.95	0.95
High R&D * Outside l.f.	0.85	0.91	0.91	0.92	0.91	0.91
Low R&D * Employed	0.99	0.99	1.01	0.99	1.00	1.00
Low R&D * Unempl.	0.83	0.91	0.94	0.92	0.95	0.95
Low R&D * Outside l.f.	0.83	0.90	0.94	0.90	0.91	0.91
No R&D * Employed	0.98	0.97	1.00	0.99	0.99	1.00
No R&D * Unempl.	0.80	0.89	0.91	0.91	0.92	0.94
No R&D * Outside l.f.	0.82	0.84	0.92	0.95	0.88	0.90

Table A8. Relative probabilities for manufacturing workers of leaving the labour force, by background factor

	Transition periods (starting year to destination year)					
	89 to 90	**91 to 92**	**92 to 93**	**93 to 94**	**94 to 95**	**95 to 96**
R&D intensity:						
High R&D	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Low R&D	1.06	0.99	0.84	1.06	0.94	1.01
No R&D activities	1.04	1.04	1.00	1.17	0.92	0.94
Size:						
< 50 employees	1.11	1.23	--	0.99	1.02	0.88
50-199 employees	0.97	1.00	0.77	0.83	0.86	0.97
200-399 employees	1.01	0.95	0.92	0.90	0.97	0.89
400+ employees	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
R&D intensity and size combined:						
High R&D * < 50	1.11	1.23	--	0.99	1.02	0.88
High R&D * 50-199	0.97	1.00	0.77	0.83	0.86	0.97
High R&D * 200-399	1.01	0.95	0.92	0.90	0.97	0.89
*High R&D * 400+*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Low R&D * < 50	1.17	1.22	--	1.05	0.96	0.89
Low R&D * 50-199	1.03	0.99	0.65	0.88	0.82	0.98
Low R&D * 200-399	1.07	0.94	0.77	0.96	0.91	0.90
Low R&D * 400+	1.06	0.99	0.84	1.06	0.94	1.01
No R&D * < 50	1.15	1.27	--	1.16	0.94	0.82
No R&D * 50-199	1.01	1.03	0.77	0.97	0.79	0.91
No R&D * 200-399	1.05	0.98	0.91	1.06	0.89	0.83
No R&D * 400+	1.05	1.04	1.00	1.17	0.92	0.94
Education:						
Basic	0.94	1.51	0.84	0.93	1.21	1.27
Secondary	1.01	1.39	0.73	0.85	1.09	1.06
Higher	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Age:						
16-29 years	2.35	2.81	2.75	3.70	4.20	2.86
30-39 years	1.07	1.35	1.34	1.73	1.96	1.42
40-49 years	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
50 years or older	5.49	4.90	5.41	5.99	5.19	3.74
Wage quintile:						
1st (lowest)	1.90	1.39	3.19	1.91	1.94	2.31
2nd	1.13	0.63	0.84	0.69	0.74	0.74
3rd	0.97	0.59	0.61	0.47	0.63	0.60
4th	0.80	0.50	0.54	0.62	0.54	0.57
5th (highest)	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*

Table A8. (cont.)

Gender:						
Man	0.86	0.84	1.12	0.96	0.79	0.92
Woman	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
R&D intensity and education combined:						
High R&D * Basic	0.94	1.51	0.84	0.93	1.21	1.27
High R&D * Secondary	1.01	1.40	0.73	0.85	1.09	1.06
*High R&D * Higher*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Low R&D * Basic	0.99	1.49	0.70	0.99	1.14	1.28
Low R&D * Secondary	1.07	1.38	0.61	0.91	1.03	1.08
Low R&D * Higher	1.06	0.99	0.84	1.07	0.94	1.01
No R&D * Basic	0.98	1.56	0.83	1.09	1.11	1.19
No R&D * Secondary	1.06	1.45	0.73	1.00	1.00	1.00
No R&D * Higher	1.04	1.04	1.00	1.17	0.92	0.94
R&D intensity and age combined:						
High R&D * 16-29 years	2.36	2.81	2.75	3.71	4.20	2.86
High R&D * 30-39 years	1.07	1.35	1.34	1.73	1.96	1.42
*High R&D * 40-49 years*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
High R&D * 50+ years	5.54	4.95	5.37	6.06	5.21	3.76
Low R&D * 16-29 years	2.49	2.78	2.31	3.95	3.96	2.89
Low R&D * 30-39 years	1.14	1.33	1.12	1.85	1.85	1.43
Low R&D * 40-49 years	1.06	0.99	0.84	1.07	0.94	1.01
Low R&D * 50+ years	5.80	4.83	4.61	6.36	4.89	3.77
No R&D * 16-29 years	2.46	2.91	2.74	4.34	3.87	2.68
No R&D * 30-39 years	1.13	1.40	1.33	2.04	1.81	1.33
No R&D * 40-49 years	1.05	1.04	1.00	1.18	0.92	0.94
No R&D * 50+ years	5.70	4.98	5.36	6.97	4.68	3.49
Labour market status in previous year:						
Employed	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Unemployed	1.36	1.37	1.19	1.06	0.97	0.92
Outside the labour force	3.16	3.31	2.80	3.70	3.60	3.46
R&D intensity and previous labour market status combined:						
High R&D * Employed	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
High R&D * Unempl.	1.37	1.39	1.18	1.07	0.97	0.92
High R&D * Outside l.f.	3.18	3.32	2.79	3.74	3.62	3.47
Low R&D * Employed	1.06	0.99	0.84	1.06	0.94	1.01
Low R&D * Unempl.	1.44	1.35	1.01	1.12	0.91	0.93
Low R&D * Outside l.f.	3.33	3.27	2.38	3.93	3.40	3.49
No R&D * Employed	1.05	1.04	1.00	1.17	0.92	0.94
No R&D * Unempl.	1.38	1.40	1.18	1.23	0.87	0.86
No R&D * Outside l.f.	3.27	3.26	2.78	1.16	3.27	3.24

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