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Gender Differences in Careers

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Tiivistelmä

Tutkimuksessa tarkastellaan sukupuolten välisiä eroja työurissa hyödyntäen laajaa yhdistettyä työnantaja-työntekijä aineistoa Suomen teollisuuden toimihenkilöistä vuosilta 1981–2006. Analyysi keskittyy työmarkkinatulokkaisiin, joiden urakehitystä seurataan yli ajan. Tutkimuksen keskeisimmät havainnot ovat seuraavat: Miehet aloittavat työuransa vaativammista tehtävistä kuin naiset. Keskeinen tekijä tämän työuran alun segregaation taustalla on sukupuolten erilaiset koulutusvalinnat. Tutkimuksessa havaitaan lisäksi, että miehet myös ylenevät naisia todennäköisemmin. Erityisen suuret sukupuolten väliset erot ylenemistodennäköisyydessä ovat heti työuran ensimmäisinä vuosina voimistaen miesten ja naisten eroja tehtävien vaativuustasoissa työmarkkinauran alussa. Tulokset palkkatarkastelusta puolestaan osoittavat, että miehillä on naisia suuremmat aloituspalkat. Sen sijaan tulokset sukupuolten välisistä eroista tehtävien vaihtoihin liittyvissä palkanmuutoksissa eivät ole yksiselitteisiä vaan riippuvat muun muassa tehtävän vaihdon laadusta (esim. ylennys vs. alennus) ja uravaiheesta. Kaiken kaikkiaan tutkimuksen tulokset auttavat ymmärtämään niitä tekijöitä, jotka vaikuttavat sukupuolten välisten palkkaerojen voimakkaaseen kasvuun työuran alussa.

Asiasanat: Työurat, yritysten sisäiset työmarkkinat, ylennykset, liikkuvuus, palkkakasvu, sukupuolten väliset palkkaerot

Abstract

We examine gender differences in careers using a large linked employer-employee dataset on Finnish white-collar manufacturing workers over the period of 1981–2006. Our focus is on labour market entrants whom we follow over time. We find that men start their careers from higher ranks of the hierarchy than women do, although gender differences in education explain much of this gap. Men are also more likely to be promoted than women, especially during the first years in the labour market, amplifying the gender differences in hierarchical positions already apparent at labour market entry. Men earn higher starting wages than women, while the results concerning gender differences in the returns to career progression are not clear-cut, but depend on the type of career event and on the career phase. Overall, our results helps to understand the factors behind the large increase in the gender wage gap during the early career observed in the earlier literature.

Key words: Careers, internal labour markets, promotions, mobility, wage growth, gender wage gap

JEL: J16, J24, J31, J62

1 Introduction

Women's wages lag stubbornly behind those of men. Recent studies have shown that gender wage gaps are mainly driven by gender differences in wage growth during the first ten years in the labour market (e.g. Manning and Swaffield 2008), although some studies have also found evidence of significant gender wage differentials already at entry to the labour market.(e.g. Napari 2009). Some part of the gender gap in early-career wage growth can be explained by differences in human capital investment and job mobility behaviour between men and women, but typically a substantial unexplained gap remains. One potentially important factor contributing to the observed growth of the gender wage gap early in the career is gender differences in career progression. If there are gender differences in promotion probabilities, propensity to change employers, and returns to different career events, men and women will indeed experience different early-career wage development.

There has been increasing interest in these issues, especially in gender differences in promotion probability and returns to promotion. However, this literature is still relatively small, and there is considerable variation in the main conclusions between studies, which makes it difficult to infer how important gender differences in promotion probability and associated wage returns actually are in contributing to the emergence of the gender wage gap. One reason for this variation in findings is that much of the existing literature consists of case studies using data from a single firm. Given that the rules and practices governing promotions differ between firms, it is not surprising to see studies reach such different conclusions. Therefore, it would be important to get results on gender differences in careers based on more general datasets. These studies would help in conforming which of the results of the previous studies hold across various settings and which are idiosyncratic to the particular firms.

By focusing on gender differences in promotion probabilities and associated wage gains, the literature has also neglected some important aspects of careers that potentially drive gender differences in wages. First, the research has paid little attention to whether there are gender differences in entry positions and starting wages. It is a stylised fact that women are less likely to work in high-ranking positions than men, but it is unclear what the role of gender differences in initial job assignment is in this respect. Some recent studies have pointed out that accounting for gender differences in initial job assignment helps to explain gender differences in subsequent careers (e.g. Pekkarinen and Vartiainen 2006). Also, little is known about the factors behind gender segregation in positions at the entry to labour market.

Second, even studies using large datasets have usually considered only promotions within firms and neglected promotions linked to job mobility. This is potentially important since previous research has documented gender differences in job mobility (e.g. Keith and McWilliams 1999). Third, gender differences in promotion patterns in different career phases have gone largely unstudied. Based on the observed development of the male-female wage differences, we would expect that the gender gap in promotion probability is higher immediately after labour market entry compared to the later career. Fourth, the literature is still dominated by studies that focus either on gender differences in promotion probabilities or on returns to promotions. However, without considering both of these aspects of careers, it is difficult to get a comprehensive picture of the importance of gender differences in career processes as a mechanism behind the gender wage gap. Furthermore, because many of the theoretical models of promotion pay attention to both the likelihood of promotion and the rewards to upward

mobility, it is necessary to analyse both of them to assess the theoretical work on gender differences in careers.

We use a large linked employee-employer dataset including roughly 4 000 firms and more than 640 000 observations on white-collar employees in the Finnish manufacturing sector over the period of 1981–2006. We concentrate on employees who enter the labour market in 1981–2006 and follow them over time. Key to our analysis is that we have detailed information on the features of jobs included in the data, which allows us to rank them in a systematic manner into hierarchies. Furthermore, because the job classification system is similar for all firms in the data, the resulting hierarchy is identical across firms. We are thus able to add to the literature by providing information on how well the conclusions of the gender differences in careers made in the previous case studies focusing on a particular firm or industry generalize to wider economy.

With this unique data, we examine gender differences in three important aspects of careers that improve our current understanding of the drivers of the gender wage differentials. First, we investigate gender differences in careers right from the very beginning by exploring gender segregation in starting positions. Second, we study later career development by investigating promotion probabilities in different career phases. We aim to answer the question of whether women catch up with men in terms of high-ranking positions later in their careers or whether they lag even further behind. Entry positions and promotions are, however, only one part of the career process – wages matter as well. Therefore, we complete our analysis of gender differences in careers by investigating starting wages and returns to changes in hierarchical positions. Equipped with information on the hierarchical structure of firms that is comparable across employers, we are able to explore gender differences in career and wage dynamics both within and between firms, a topic that has not so far received attention in the literature due to lack of suitable data.

The structure of the paper is as follows. Section 2 provides a short review of the earlier empirical literature on gender differences in career and wage dynamics. Section 3 discusses the theoretical framework of the paper. Data are presented in section 4. This is followed by an examination of gender differences in initial job assignment in section 5. Section 6 investigates promotion rates, and in section 7, gender differences in starting wages and returns to changes in hierarchical positions are analysed. The final section summarises the main conclusions.

2 Earlier empirical literature

The analysis of gender wage gaps has a long tradition in economic research (see Altonji and Blank 1999, Blau and Kahn 2000, Kunze 2008 for reviews). However, only fairly recently have researchers started paying more attention to how the gender wage gap varies with the phase of a career. A typical finding from these studies has been that the gender wage gap is fairly small at entry to the labour market, but after a few years a considerable gender wage gap emerges (e.g. Loprest 1992, Manning and Swaffield 2008, Napari 2009). Much of the analysis of the factors contributing to this growth of the gender wage gap has focused on the role played by gender differences in work experience and labour market participation. Studies have found that although women's tendency to spend more time outside the labour market than men dampers women's wage growth (e.g. Light and Ureta 1995, Manning and Swaffield 2008) gender dif-

ferences in early-career wage development are not only due to differences in work experience between men and women, but that a substantial unexplained gap remains after accounting for labour market experience (Kunze 2003, Manning and Swaffield 2008).

The more recent line of research has explored gender differences in career progression as one of the potential mechanism behind the gender wage gap. There are, for instance, a growing number of studies on gender differences in promotions and the wage returns to promotions. However, for several reasons, it is difficult to draw conclusions from them about the importance of promotions and the associated wage returns in explaining the emergence of the gender wage gap. First, previous studies differ significantly in their main findings. In terms of the gender differences in the probability of promotion, the most common finding is that men are more likely to be promoted than women[1]. There are, however, also many studies finding no gender differences in promotion probability[2], and still other papers conclude that the likelihood of promotion is higher for women[3]. In addition, the conclusions concerning gender differences in the returns to promotions vary greatly between studies. For example, Booth et al. (2003), Fransesconi (2001), and Hersch and Viscusi (1996) find that men benefit more from promotions than women. Blau and Devaro (2007), McCue (1996), Olson and Becker (1983), and Pergamit and Veum (1999), on the other hand, conclude that the returns are similar for men and women. Finally, Cobb-Clark (2001) finds that women experience higher returns to promotion than men. One reason for this variation in findings is that much of the existing literature consists of case studies using data from a single firm.[4]

Second, most of the previous studies on gender differences in promotions and the associated wage gains do not pay any attention to career phase. One exception to this is McCue (1996) who provides descriptive evidence of how the frequency of different career moves and the returns to these moves vary with experience separately for men and women. Her results for white men and women show that, somewhat surprisingly, men's advantage over women in the frequency of promotion is smallest during the first ten years in the labour market. On the other hand, when it comes to wage growth associated with promotions, men benefit more from promotions during the early career than women, but among the more experienced workers it is women who gain more from upward mobility.

Third, the literature is still dominated by studies that focus either on gender differences in promotion probabilities or in returns to promotions. However, because the total contribution of promotions to wage growth obviously depends on both of these aspects of careers, it would be important to consider both of them in order to get a better understanding of the role played by promotion processes behind the gender wage gap. A fairly complete list of studies analysing gender differences in the probability of promotion and the associated wage gains is Booth et al. (2003), Cobb-Clark (2001), Hersch and Viscusi (1996), and Olson and Becker (1983). Of these studies the papers by Booth et al. and Olson and Becker suggest that gender differences in promotion processes increase the wage gap between men and women because men experience higher returns to promotion than women and there are no gender differences in the

[1] (e.g. Cabral et al. 1981, Olson and Becker 1983, McCue 1996, Winter-Ebmer and Zweimuller 1997, Pergamit and Veum 1999, Cobb-Clark 2001, Ransom and Oaxaca 2005, Pekkarinen and Vartiainen 2006, Blau and Devaro 2007).

[2] (Jones and Makepeace 1996, Paulin and Mellor 1996, Pudney and Shields 2000, Booth et al. 2003).

[3] (Hersch and Viscusi 1996, Petersen and Spilerman 1999).

[4] Exceptions to this are, inter alia, Blau and DeVaro (2007), Booth et al. (2003), Cobb-Clark (2001), McCue (1996), Olson and Becker (1983), Pekkarinen and Vartiainen (2006), and Pergamit and Veum (1999).

probability of promotion, as was discussed above. Cobb-Clark and Hersch and Viscusi on the other hand do not provide clear-cut implications for the effects of promotion dynamics on the gender wage gap as they find that men have an advantage over women in one of the components of the promotion processes while women make better than men with respect the other component.

Yet another aspect of gender differences in careers from which we have currently only little knowledge is initial job assignment. However, some recent studies have shown that paying attention to gender segregation in initial positions might be important. This is well illustrated for instance by (e.g. Pekkarinen and Vartiainen 2006), who find that gender differences in the likelihood of promotion are small if initial assignment is ignored. However, when men and women sharing the same initial position are investigated, women are much less likely to be promoted than men. Cabral et al. (1981) and Ransom and Oaxaca (2005) are other examples of studies examining gender differences in initial positions. They both find that women start their careers at lower levels of the hierarchy than men do.

3 Theoretical background

The human capital theory is perhaps the tool most frequently applied by economists to explain job choices and why they might differ by gender. In brief, according to the human capital theory, segregation occurs because men and women differ in terms of investment to human capital. There are several potential reasons for this, but the human capital theory highlights the role played by gender differences in labour market attachment. Because of women's traditional role as the main provider of child care within the family, women tend to accumulate less work experience and have more sporadic employment histories than men do. Therefore, in anticipation of future career breaks, women might be less motivated than men are to apply for jobs requiring considerable investments in job-specific skills simply because they expect to spend less time in the labour market enjoying the returns of these investments. For these same reasons, we might see gender differences in educational choices – men might invest more or in different types of schooling than women do.

Obviously, there are several other explanations for why men and women often end up in different jobs and positions. For example, gender differences in competitiveness and risk preferences may contribute to labour market segregation (see e.g. Niederle and Vesterlund 2007, Croson and Gneezy 2009). Additionally, sex discrimination may lead to segregation.

Next, we review models that focus on gender differences in promotion and the associated wage gains. These models typically build on gender differences in firm-specific human capital. Naturally, however, the other factors considered above, such as discrimination or gender differences in psychological factors, might affect promotion probabilities and associated wage increases as well.

In the models we consider, gender differences in promotion rates and wage gains result from differences in outside options. Lazear and Rosen (1990) assume that there are no gender differences in productivity in market work but that women are on average more productive in non-market work. There are two types of jobs in their model. The more demanding job is more productive, and it is efficient to assign high-ability employees to this job. However, the

more demanding job involves a set-up cost: the employee has to acquire firm-specific human capital, which means low initial productivity in the new job. Thus, the firm wants to promote high-ability individuals who are likely to stay in the firm so that it can cover the set-up cost. An important feature of the model is that the employees learn their productivity in non-market work *after* the possible promotion. The assumption that women are on average more productive in non-market work means that they are more likely to leave the firm after promotion. This in turn indicates that they are less likely to be promoted in the first place. In this model, there are no gender differences in wage returns to promotion. Wages are attached to jobs and are thus equal for men and women.

Booth et al. (2003) present a model that is in many respects similar to Lazear and Rosen's. However, in their model wages are not attached to jobs because the promoted employees may receive heterogeneous outside offers from competing firms that the firm may wish to match. Maintaining the assumption of Lazear and Rosen that women have better outside opportunities, this model implies that women are less likely to be promoted but that the wage gain associated with promotion is larger for them. On the other hand, if they are promoted, their wages in the new job have to be larger on average to induce them to stay. However, Booth et al. (2003) challenge the assumption that women have better outside options. They argue that if one considers women with strong attachment to the labour market, women are likely to have worse outside options than men do. This may be due to women's receiving fewer outside offers or the fact that they may not be able to accept them as easily, for example, for family reasons. Firms may also respond differently to outside offers to men and women. If one assumes that women have worse outside options than men, the predictions are reversed: women are more likely to be promoted, but the associated wage gain is smaller.

Thus, the theoretical work on gender differences in promotions and associated wage increases does not offer clear-cut predictions. The results depend crucially on assumptions about differences in outside options, and these assumptions are hard to judge.

4 Data

4.1 The EK data

Our data come from the records of the Confederation of Finnish Industries (EK) covering the period of 1981–2006. Both employees and employers in Finland are highly organised, and EK is the main organisation of employers. EK has member firms from several different industries, but the most important sector represented in the data is manufacturing. The member firms account for over two thirds of the value added of Finnish manufacturing, and a clear majority of employees in manufacturing are employed in EK member firms. Of the total employment in Finland, the firms affiliated with EK account for over 30 percent. The sector under study is thus an important part of the whole Finnish economy.

EK gathers the data by sending annual surveys to the employers. The resulting dataset is highly reliable as the information comes directly from the administrative records of the member firms. Furthermore, because it is mandatory for the firms affiliated with EK to provide the required information, the non-response bias is practically non-existing. The data include a large set of variables that are likely to be important determinants of wages, promotions, and the at-

tached wage gains. Of the employees' characteristics, the data include information on gender, age, tenure, level and field of education, and job title. We can also control for employer characteristics, such as size and industry. Finally, what makes the EK dataset rather unique is the fact that it allows us to take a look inside the firms and construct variables measuring the characteristics of co-workers. We are thus able to control for the gender, tenure, and educational background of the co-workers.

The EK dataset is in many respects very suitable for the purposes of this paper. First, it is a panel dataset allowing us to follow individuals right from the beginning of their careers over a considerable period of time, up to 25 years. Second, as described above, the information content of the data is exceptionally rich. Therefore, we can take into account many issues that previous studies have not been able to control for. Finally, the jobs in the data can be allocated in a consistent way to six different hierarchical levels that are comparable across firms. Section 4.2 discusses in more detail how the hierarchy is constructed and examines its functionality by presenting descriptive statistics of the transitions between positions and the average hourly wages across hierarchical levels.

We consider full-time white-collar workers who entered the labour market for the first time during the observation period. By full-time workers, we refer to those whose regular weekly working time is over 30 hours. Restricting the sample to full-time workers is of little importance in practice because the share of part-time workers is negligible among white-collar workers, roughly 2 per cent in 2006. Furthermore, there are only small gender differences in this respect. EK also gathers information on blue-collar workers, but we exclude them from the analysis. The main reason for this is that, unlike for the white-collar workers, the occupation classification system in the blue-collar data is complex, with substantial differences between industries. Therefore, it is not possible to allocate the jobs in the blue-collar data systematically to different hierarchical positions. To be classified as a labour market entry, the person must be under 30 years old with less than 2 years of potential work experience when first observed in the data. We also dropped 303 observations with suspiciously low/high total hourly wages.[5] The resulting data include 641 888 observations, of which 39.6 percent are women. The number of individuals included in the data is 81 163, with the female share being 45.9 percent. Table A 1 in the appendix presents the summary statistics for the main variables.

4.2 The hierarchy

The EK data contain 75 different job titles. As part of its data-gathering process, EK provides a detailed description of the features of these jobs. For example, there is information on whether the job includes administrative or managerial tasks, what the educational requirements are, how much work experience is needed, whether the job includes repetitive tasks or whether the operational environment is dynamic and complex, etc. We apply this information to allocate the jobs to six different hierarchical levels. The top of the hierarchy consists of managerial jobs associated with financial responsibility. Jobs that require a profound expertise and in which the operational environment is complex and variable are allocated to the second level.

[5] Total hourly wages are calculated by scaling the total monthly wage (including overtime pay, fringe benefits, bonuses etc.) by the regular weekly working hours. Wages are converted into year 2000 money by using the cost-of-living index of Statistics Finland.

The third level consists of jobs associated with varying operational environments in which the required level of prior experience and expertise is lower than in jobs at the second level. Jobs at the fourth level require a reasonable level of expertise (i.e., through formal education), but the problems to be solved are less complex than in jobs higher in the hierarchy. The second-to-last level consists of jobs that require some previous work experience but where the tasks are repetitive in nature. At the bottom of the hierarchy are routine jobs with low educational requirements involving repetitive and simple tasks.

A novel feature of the EK dataset is that the same job classification system and job descriptions apply to every member firm. This is useful for our analysis. First, equipped with a measure of hierarchical level that is comparable across firms, we differ from the previous literature by being able to make both within-firm and between-firms comparisons. Second, by observing the hierarchical structures of firms, we can measure promotion as a transition from a lower hierarchical level to a higher position. Many of the previous studies lack information on the hierarchy, and therefore they must have been settled for other ways to define promotion.[6] One typical approach has been to base the promotion measure on a self-reported evaluation (e.g. Olson and Becker 1983, Hersch and Viscusi 1996). The drawback of this definition is that it is inevitably subjective: some people regard a certain career movement as a promotion, whereas others do not. Furthermore, Pergamit and Veum (1999) show that self-reported promotions are often associated with no change in actual job title. Many studies have also used changes in wage categories as a promotion measure (e.g. Petersen and Spilerman 1999). However, this definition also has its problems. For example, wage categories change for many reasons, with promotion being just one of them. Finally, without information on the hierarchy, it is also difficult to control for an individual's current position. This is unfortunate because both the probability of and the returns to promotion are likely to depend on an employee's current standing in the hierarchy. For example, the probability of promotion is likely to be negatively correlated with the employee's current position simply because there is more room for upward mobility at the lower ranks. On the other hand, the tournament theory of careers suggests that the returns to promotion can be expected to be positively associated with the current standing in the hierarchy.

Table 1 presents information on transitions between organisational levels. The first panel shows the results for the pooled sample. As expected, a clear majority of white-collar workers do not change hierarchical level between year t and t+1. Furthermore, promotions are more typical than demotions, although some people do seem to move downward in the hierarchy. This might be partly due to job rotation within firms. In the context of promotions, it is most typical to move up only one level at a time.

Panels B and C in Table 1 indicate that there are gender differences in raw transition probabilities. First, men are more likely to be promoted than women. Second, men are typically less likely to be demoted than women. Finally, multilevel promotions are more typical for men than for women.

Figure 1 shows the development of mean total hourly wages by hierarchical level over the investigation period. As expected, mean wages increase with the hierarchical level, although the

[6] Examples of studies that observe the actual rankings of jobs are Blackaby et al. (Blackaby et al. 2005), Ginther and Hayes (2003), McDowell et al. (1999, 2001), Pekkarinen and Vartiainen (2006), and Ward (2001). All of these papers, except for Pekkarinen and Vartiainen (2006), examine academic labour markets.

Table 1 Transitions between hierarchical levels

Panel A: All observations

		Level year t+1						
		1	*2*	*3*	*4*	*5*	*6*	*Total*
Level year t	1	89.77	4.87	2.51	1.96	0.88	0.01	100
	2	4.20	88.36	4.37	1.88	1.18	0.01	100
	3	1.49	6.31	87.01	2.85	2.28	0.07	100
	4	1.55	3.12	5.23	86.46	3.50	0.15	100
	5	0.54	1.37	3.08	4.30	89.99	0.72	100
	6	0.06	0.30	1.32	2.48	14.17	81.68	100

Panel B: Men

		Level year t+1						
		1	*2*	*3*	*4*	*5*	*6*	*Total*
Level year t	1	90.09	4.80	2.34	1.97	0.79	0.00	100
	2	4.74	88.23	4.15	1.83	1.04	0.00	100
	3	1.74	6.85	86.72	2.92	1.76	0.00	100
	4	2.04	3.49	5.67	86.23	2.56	0.01	100
	5	1.23	2.56	4.74	6.19	85.20	0.08	100
	6	0.30	1.07	3.05	3.20	11.58	80.81	100

Panel C: Women

		Level year t+1						
		1	*2*	*3*	*4*	*5*	*6*	*Total*
Level year t	1	85.63	5.76	4.66	1.85	1.97	0.13	100
	2	1.76	88.93	5.35	2.11	1.81	0.04	100
	3	0.77	4.79	87.82	2.64	3.74	0.24	100
	4	0.29	2.19	4.12	87.03	5.88	0.49	100
	5	0.14	0.70	2.15	3.23	92.70	1.08	100
	6	0.04	0.24	1.19	2.43	14.36	81.74	100

Source: ETLA.

difference is small between levels 1 and 2. Wage differences between levels have also remained practically constant over time. Figure 2 illustrates the structure of total hourly wages by showing the wage ranges by hierarchical level. Similar to Baker et al. (1994), there is significant wage overlap across levels. For example, white-collar workers belonging to the upper quartile of the wage distribution at level 4 have higher hourly wages than their colleagues at the lower quartile of the wage distribution at level 1. Overall, the results in Table 1 and in Figure 1 and Figure 2 are well in line with the existing literature. We take this as evidence that our job hierarchy based on the EK job classification system is meaningful.

Figure 1 Mean hourly wages by hierarchical level, 1981-2006

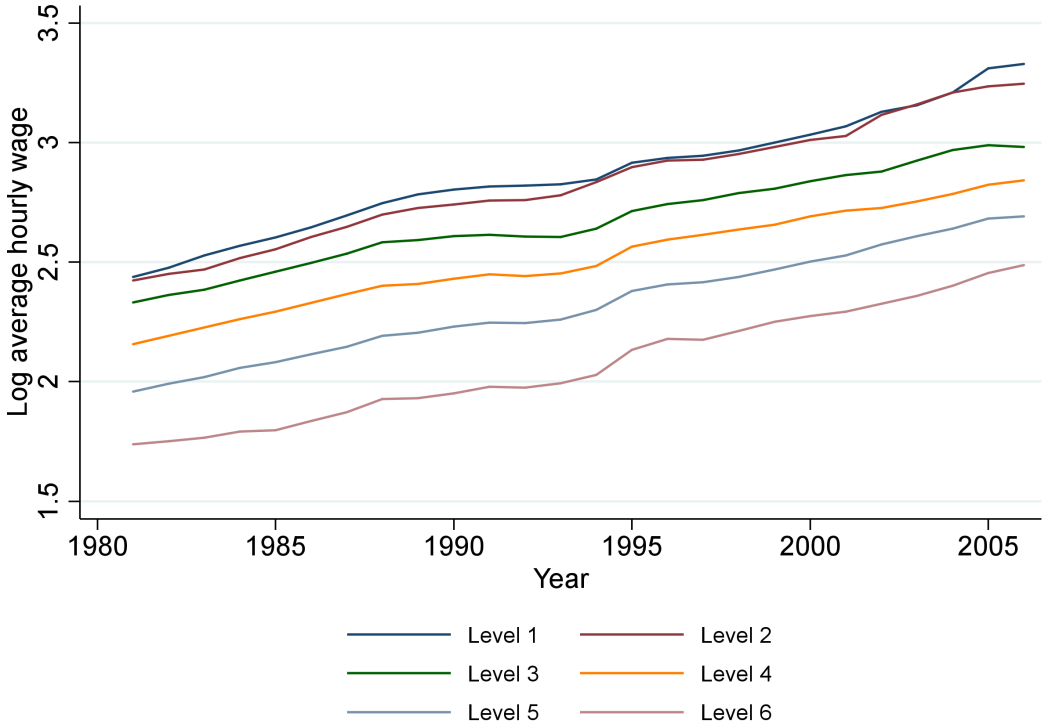
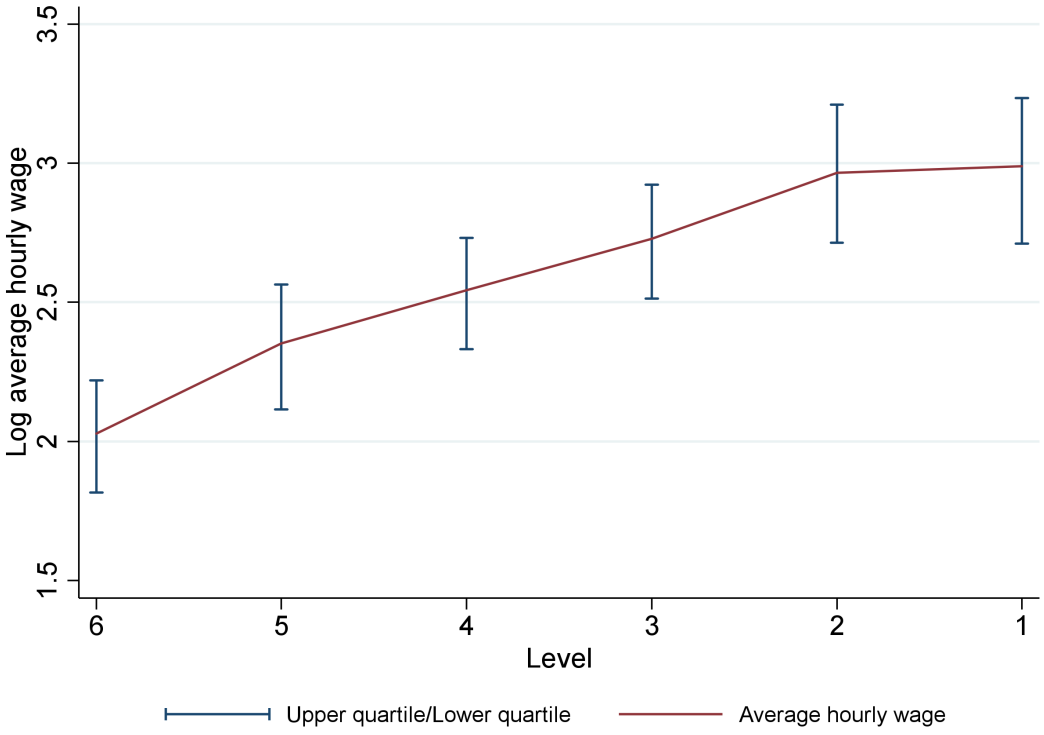


Figure 2 Hourly wage ranges by hierarchical level



5 The nature of entry-level segregation

It has been typical for the previous studies on gender differences in careers to focus on later career events, like promotions, and ignore gender segregation in starting positions. However, as was discussed in Section 2, paying attention to initial assignment might be important in understanding differences in subsequent career progression between men and women. Therefore in this section, we investigate gender differences in selection into the different hierarchical levels among those entering the labour market for the first time. As mentioned in Section 4.1, over 81 000 individuals started their careers during the observation period. Given the ordinal nature of the hierarchy, we analyse gender differences in entry positions by estimating an ordered probit model. Three different specifications are estimated. The first one controls only for gender and year. This is a benchmark model showing the raw differences in entry positions between male and female white-collar workers. The second specification adds age and the years and field of education to the model. This gives us information on the extent to which gender differences in starting positions reflect gender differences in educational choices. Finally, to check whether gender segregation by industry and firm is important in explaining gender differences in entry positions, the third specification includes industry and firm size dummies in the model.

Table 2 reports the results for the female dummy.[7] The raw differences in the starting positions between men and women are quite remarkable. Women are 13.1 percent more likely than men to start their career from the bottom of the hierarchy and 23.2 percent more likely to enter into the second lowest step of the ladder. However, once we account for the gender differences in pre-labour market human capital investments, gender gaps in entry positions fall dramatically, although they remain statistically significant at all hierarchical levels. Adding controls for industry and firm size has only negligible effects on the results after educational background has been taken into account.

Table 2 Ordered probit estimation of initial position

	Level 6	*Level 5*	*Level 4*	*Level 3*	*Level 2*	*Level 1*
Specification I:						
Female	0.131	0.232	-0.088	-0.163	-0.084	-0.027
	[84.87]	[102.43]	[-70.84]	[-98.29]	[-70.71]	[-38.43]
Specification II:						
Female	0.024	0.123	-0.054	-0.069	-0.020	-0.004
	[31.5]	[37.01]	[-34.42]	[-36.56]	[-32.82]	[-23.16]
Specification III:						
Female	0.024	0.125	-0.055	-0.070	-0.020	-0.003
	[31.19]	[36.78]	[-34.22]	[-36.34]	[-32.45]	[-22.7]

Notes:
1. Table 2 reports marginal effects and t-statistics.
2. Specification I controls for gender and year. Specification II adds age, age^2, years of education, years of education^2, and field of education (9 categories) to the model. Specification III also controls for industry (56 categories) and firm size (7 categories).
3. The marginal effects are computed with the Stata meoprobit command.

[7] Results for the other variables used in the estimations are available from the authors upon request.

The results in Table 2 are in line with those of Cabral et al. (1981), Pekkarinen and Vartiainen (2006), and Ransom and Oaxaca (2005), who found that women tend to enter into lower hierarchical ranks than men at labour market entry. Our estimates also indicate that a large part of the gender segregation in entry positions can be attributed to gender differences in educational choices. In our data, men are clearly overrepresented in technology whereas women tend to choose fields such as social sciences and humanities more often than men. Based on this finding, men's and women's careers start to differ well before labour market entry.

6 Gender differences in promotion rates

In the previous section, we found evidence that male white-collar workers start their careers from higher hierarchical levels than their female colleagues. Next, we examine later career development by investigating gender differences in promotion rates. Do women catch up with men in hierarchical positions or do they lag even further behind?

We investigate gender differences in promotions by estimating the linear probability model for promotion[8]. The dependent variable takes a value of one if an individual is at a higher hierarchical level in year t+1 than in year t and zero otherwise. We explain promotions by using a very large set of background variables. The *human capital-related variables* include age and its square, years of education and its square, field of education, and tenure and its square. Prior studies show that such human capital variables affect the probability of promotion, and thus it is important to control for them (e.g. McCue 1996). We also account for *earlier career development* by controlling for years spent so far in the current hierarchical level and job title[9], the number of career breaks[10], and the number of prior job titles. The impact of these variables on promotion rates has been established by, e.g., DeVaro and Waldman (2007). The set of *firm characteristics* consists of size and industry. In addition, rather uniquely, we also have information on the *characteristics of the co-workers*. These characteristics include years of education, tenure, and gender. To our knowledge, no existing study on gender differences in careers has had access to this kind of information. Data on co-workers might be important because the probability of promotion may depend on the pool of candidates, and in many cases, co-workers form a substantial part of the candidate pool. Finally, *other variables* accounted for are current hierarchical level and field of job title, year, and gender, which is the main variable of interest.

We also examine promotion probability by work experience. This is motivated by the previous findings from the gender wage gap literature. We intend to check whether gender differences in promotion patterns might provide yet another explanation for the early-career gender wage gap. Based on the observed development of the male-female wage differences, we expect that the gender gap in promotion probability is higher immediately after labour market entry compared to the later career.

[8] We are mainly interested in average marginal effects, and thus, using the linear probability model instead of a non-linear model such as the probit is of little practical importance (see e.g. Angrist and Pischke 2009).

[9] Accounting for the time spent at the current level should control for the "fast track effect", that is the stylized fact made in the internal labour market literature according to which an early promotion increases the probability of future promotions.

[10] Because the effects of career breaks on the promotion probability may vary by the length of the career break, we distinguish between career breaks that last less than a year and career breaks that last longer than a year.

In the literature, there has been a lot of discussion about the role of labour supply factors as determinants of gender differences in career and wage dynamics. Bertrand et al. (2010) for instance present evidence that much of the increase in the early career gender wage gap among young professionals in the financial and corporate sectors in the US can be explained by gender differences in career interruptions and in weekly working hours associated with motherhood. Unfortunately, our dataset does not contain information on children, and thus we are unable to investigate the importance of child-related career breaks in accounting for gender differences in careers directly. However, in order to provide some information on the potential relevance of career discontinuity in this context, we also examine gender differences in promotions by restricting our sample to those who have only one spell in the data lasting at least 5 years. If career interruptions are the main driving force behind gender differences in promotion probability, then we would expect smaller gender differences in this respect when we use the restricted data consisting of individuals highly attached to labour market.

Panel A in Table 3 reports the results for the female-dummy from a promotion regression where the dependent variable is all promotions, i.e. Panel A does not distinguish between internal promotions and promotions associated with employer changes. From the first column, we see that even after a host of different background characteristics have been controlled for, women are 2.4 percentage points less likely to be promoted than men. However, as the other columns show, this overall gap in promotion probability hides significant variation with work experience. The gender gap in promotion probability is highest during the first 5 years in the labour market, when the gap is greater than 3 percentage points. Among those with 6 to 10 years of experience, the gap drops to 2.1 percentage points, and for white-collar workers with more than 10 years of experience the gap is only 0.8 percentage points, although it remains statistically significant. Also, if we look at the predicted promotion probabilities, we notice that the gender gap in the likelihood of promotion is most profound during the first years in the labour market: the predicted promotion probability for men is as much as 63.5 percent higher than for women among white-collar workers with 2–5 years of experience, whereas the corresponding number for those with 10 years of experience or more is 21.1 percent. The observed pattern of the gender gap in promotion probability is thus consistent with the findings of the earlier literature indicating a substantial increase in the average male-female wage gap during the early-career period.

Table A 2 in the appendix presents the results for the other variables used in the estimations. They are mostly in line with the theory and earlier empirical findings. For example, an individual has better chances for promotion if he works in a large firm, is highly educated, has not spent too long at his current hierarchical level, has gained experience from different jobs, and has low-educated co-workers with little job tenure. Somewhat surprisingly, the gender of the co-workers does not seem to matter with respect to an individual's likelihood of being promoted.

As mentioned above, Panel A in Table 3 does not distinguish between within-firm and between-firms promotions. The few existing studies that have made the distinction between within-firm and between-firms mobility have concluded that lumping different types of mobility together might hide important information on gender differences in career development (e.g. Booth and Francesconi 2000). Therefore, in Panel B we focus exclusively on within-firm promotions using the same set of explanatory variables used in Panel A. The results indicate that women have 1.9 percentage points lower overall probability of being promoted within a

Table 3 Linear probability model of promotion

Panel A: All promotions					
	All	***Exp 0-2***	***Exp 2-5***	***Exp 6-10***	***Exp>10***
Female	-0.024***	-0.031***	-0.033***	-0.021***	-0.009***
	[0.001]	[0.003]	[0.002]	[0.003]	[0.002]
R-squared	0.040	0.064	0.041	0.033	0.028
Number of observations	482 759	121 931	131 139	107 288	122 401
Predicted probability: male	0.0733	0.0946	0.0847	0.0658	0.0463
Predicted probability: female	0.0489	0.0635	0.0522	0.0448	0.0371
Panel B: Internal promotions					
	All	***Exp 0-2***	***Exp 2-5***	***Exp 6-10***	***Exp>10***
Female	-0.019***	-0.023***	-0.025***	-0.017***	-0.008***
	[0.001]	[0.002]	[0.002]	[0.002]	[0.002]
R-squared	0.033	0.053	0.035	0.029	0.026
Number of observations	482 759	121 931	131 139	107 288	122 401
Predicted probability: male	0.0600	0.0740	0.0686	0.0552	0.0407
Predicted probability: female	0.0408	0.0508	0.0431	0.0383	0.0324
Panel C: All promotions, attached workers					
	All	***Exp 0-2***	***Exp 2-5***	***Exp 6-10***	***Exp>10***
Female	-0.022***	-0.025***	-0.029***	-0.016***	-0.009**
	[0.002]	[0.004]	[0.004]	[0.004]	[0.004]
R-squared	0.040	0.059	0.044	0.034	0.027
Number of observations	186 215	42 149	60 837	45 055	38 174
Predicted probability: male	0.0710	0.0907	0.0819	0.0619	0.0427
Predicted probability: female	0.0492	0.0653	0.0524	0.0455	0.0341

Notes:
1. Cluster robust t-statistics are given in brackets; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
2. Results for the other variables used in the estimations are presented in Table A 2 and Table A 3 in the appendix.
3. Attached workers are employees who have only one spell in the data and the spell lasts at least 5 years.

firm than men do, whereas the gender gap for all promotions was somewhat higher, 2.4 percentage points (Panel A). However, if we look at the relative gender differences in promotion probabilities, we notice that there is no notable variation in the gender gap by promotion type. The predicted probability of within-firm promotion is 6 percent for men and 4.1 percent for women, suggesting that men are 46.3 percent more likely to be promoted within firms than women are. When all promotions are considered, men have a 49.0 percent higher probability of being promoted than women do, with the predicted probabilities of promotion being 7.3 percent for men and 4.9 percent for women. In addition, if we look at the results for the different experience groups, the relative gender gaps in promotion probability are very similar between within-firm promotions and promotions in general. Furthermore, a comparison of Tables A2 and A3 in the appendix shows that the effects of the other background characteristics on the promotion probability differ surprisingly little according to the type of mobility.

We thus conclude that in our data the mechanisms behind promotions do not vary depending on whether the promotion takes place within a firm or is associated with an employer change.

Panel C reports the results for a case where we have restricted the sample to individuals having only one spell in the data, lasting at least 5 years. As expected, gender gap in promotion probability is smaller for the sample consisting of white-collar workers highly attached to labour market, although the difference in the results between the full data (panel A) and the restricted data is quite small. Moreover, our earlier finding that the gender gap in promotion probability is highest during the first years in the labour market holds true also for the restricted sample. Therefore, in our data gender differences in promotions cannot be easily explained by labour supply factors.

As a final examination of gender differences in promotions, we estimate the probability model by an individual's current position in the hierarchy.[11] There are at least two reasons why this might be of interest. First, gender differences in promotion rates are likely to be smaller when we compare men and women with the same initial standings. This is because individuals sharing the same initial position face identical potential future career paths. Second, according to the glass ceiling hypothesis, women's careers progress well at the lower ranks of the hierarchy, but they face difficulties in ascending further when trying to enter the most demanding jobs. If this indeed is the case, then we should expect to see the gender gap in promotion rates increase at the upper end of the organisational ladder.

Table 4 reports the results for the female dummy. Even though we focus on men and women working at the same initial position, a significant gender gap in promotion probability remains. Furthermore, there is considerable variation in the size of the gap between positions. In accordance with the glass ceiling hypothesis, the gender gap in the predicted promotion probability increases as we move from the lower positions to the top of the hierarchy. For example, at level 4, men are 25.4 percent more likely to be promoted than women are, whereas at level 2 men's advantage is nearly 62 percent. However, the gap does not increase monotonous-

Table 4 Linear probability model of promotion by hierarchical level, all promotions

	Level 6	*Level 5*	*Level 4*	*Level 3*	*Level 2*
Female	0.017	-0.039***	-0.016***	-0.023***	-0.015***
	[0.013]	[0.003]	[0.003]	[0.002]	[0.002]
R-squared	0.036	0.058	0.048	0.024	0.031
Number of observations	16 929	151 337	110 827	104 345	69 054
Predicted probability male	0.114	0.0969	0.0828	0.0693	0.0384
Predicted probability female	0.130	0.0582	0.0668	0.0463	0.0234

Notes:
1. Cluster robust t-statistics are given in brackets; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
2. Results for the other variables used in the estimations are presented in Table A 4 in the appendix.

[11] We have also made the same analysis by restricting the previous level to starting level. The reason for this robustness check is that in the cases where previous level is not the starting level there might be some selection issues involved. Furthermore, this selection process might be gender specific. However, replacing the previous level with the starting level has no effects on the conclusions.

ly throughout the hierarchy. In fact, it is largest at level 5, being 65.5 percent in men's favour. Therefore, the results are at least as supportive of the sticky floor model, according to which the gender gap in promotion probability widens at the bottom end of the hierarchy, as they are of the glass ceiling hypothesis.

7 Gender differences in starting wages and returns to promotions

7.1 Gender wage gap in starting wages

So far, this paper has focused on gender differences in starting position and promotion probability. However, one's position in the hierarchy and changes thereof are only one, albeit important, part of a career. Another relates to wages and returns to changes in hierarchical position. Understanding the processes behind the gender wage differentials requires examination of both of these aspects. Therefore, the rest of the paper investigates wages. We start by examining the gender differences in starting wages, after which we turn to gender differences in wage changes associated with mobility between hierarchical levels.

Table 5 presents the OLS results for entry wage regressions. The sample again consists of white-collar workers observed in the labour market for the first time (as in Table 2). Specification I shows the raw gender gap in starting wages including only female dummy and year as controls. As can be seen, there is a considerable wage gap among white-collar workers, with men's starting wages being an average of 25.3 percent higher than those of their female colleagues.[12] Much of this gap can be explained by gender differences in educational choices: adding controls for the years and field of education more than halves the gender gap in starting wages (specification II). Specification III, which adds industry, firm size, and job title to the model, shows that labour market segregation also contributes to the gender gap in entry wages. Once we take segregation into account, the gender wage gap decreases from 10.5 percent to 6.2 percent but remains highly significant.

Table 5 Gender differences in entry wages

	I	*II*	*III*
Female	-0.253***	-0.105***	-0.0624***
	[0.002]	[0.001]	[0.001]
R-squared	0.403	0.719	0.782
Number of observations	81 163	81 163	79 895

Notes:
1. Dependent variable is the log of total hourly wage.
2. Cluster robust t-statistics are given in brackets; * p < 0.05, ** p < 0.01, *** p < 0.001.
3. Specification I controls only for gender and year. Specification II adds age, age^2, years of education, years of education^2, and field of education (9 categories) to the model. Specification III also controls for industry (56 categories), firm size (7 categories) and job title (75 categories).

[12] The average gender wage gap in starting wages decreased significantly during the investigation period. In the early 1980s, the gap was over 30 percent, whereas by 2006 it had decreased to 11 percent.

7.2 Gender differences in the returns to changes in hierarchical position

The last issue that we consider is the impact of position changes on wages and whether women gain as much from mobility as men do. Several studies have provided evidence that employer changes account for a significant part of early-career wage growth (e.g. Topel and Ward 1992). In addition, promotions within firms have turned out to be an important source of wage growth (e.g. McCue 1996). However, careers comprise not only employer changes and promotions but also demotions. Furthermore, many studies have shown that demotions are in fact fairly common events (relative to promotions) and that they have significant negative effects on wage development (e.g. Lima and Pereira 2003). Therefore, we consider the wage effects of the following set of mobility events describing an individual's career: i) promotion in the current firm, ii) employer change with promotion, iii) demotion in the current firm, iv) employer change with demotion, v) employer change without a change in the hierarchical level, vi) same employer and same hierarchical level (omitted group).

Otherwise, the wage model specification is familiar from the existing literature. We control for a set of human capital-related variables and firm characteristics. These are the same variables that we used in Tables 3 and 4. We also control for the number of prior job changes. This is because earlier studies have shown that the current wage rate reflects not only the effects of recent mobility events but also the worker's more distant mobility history (e.g. Keith and McWilliams 1995). Furthermore, we control for the previous hierarchical level because the tournament theory of careers suggests that the rewards from mobility depend on one's position in the hierarchy. Finally, to account for the heterogeneity of wages between occupational groups, we include the field of job title in the model.[13]

Table 6 reports the fixed-effects estimates for the mobility variables separately for men and women. As expected, promotions, both internal and external, are good for wage development. Moving upwards in the internal hierarchy increases men's hourly wages by 3 percent and women's slightly more, by 3.2 percent. However, this difference is not statistically significant.[14] Returns to promotions with an employer change are, however, about 1.5 percentage points lower for women than for men. Similarly, women gain less from moving to a new firm without a change in the hierarchical level. These results are line with earlier studies showing that women in general benefit less from employer changes than men do (e.g. Loprest 1992). Our results also illustrate the importance of distinguishing between within-firm and between-firms promotions when gender differences in wage returns to promotions are analyzed. For example, Booth et al. (2003) found using the British Household Panel Survey that women receive lower returns to promotions than men. Our estimates on the other hand suggest that his hold true for promotions with an employer change only. Table 6 also shows that not all types of job changes are good for wage growth. Both men and women suffer significant wage losses due to downward mobility, the penalty being about 4.5 percent in within-firm demotions. In addition, with employer changes, demotions cause wage losses that are much greater for women than for men.

[13] We experimented with numerous model specifications, but the main conclusions were not sensitive to the choice of explanatory variables.

[14] We ran a pooled regression where all explanatory variables were interacted with gender. This reproduces the above results and facilitates testing of equality of coefficients.

Table 6 The effects on mobility on hourly wages – fixed effects estimates for men and women

	Men	*Women*
Promotion in current firm	0.029***	0.033***
	[0.001]	[0.002]
Promotion in new firm	0.055***	0.042***
	[0.002]	[0.004]
Demotion in current firm	-0.044***	-0.045***
	[0.002]	[0.002]
Demotion in new firm	-0.026***	-0.043***
	[0.003]	[0.005]
Same level in new firm	0.019***	0.010***
	[0.002]	[0.002]
R-squared	0.795	0.804
Number of observations	299 414	186 259
Number of individuals	37 654	28 178

Notes:
1. Dependent variable is the log of total hourly wage.
2. Cluster robust t-statistics are given in brackets; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
3. Other control variables are age, age^2, tenure, tenure^2, years of education, years of education^2, fields of education (9 categories), previous hierarchical level, current field of job title (4 categories), cumulative career breaks, the number of prior job changes, industry (56 categories), firm size (7 categories), and year. Results for the other variables used in the estimations are available from the authors upon request.

To examine, whether gender differences in the returns to different career moves vary by career phase, Table 7 investigates the wage effects of mobility by work experience. The results show that there is indeed variation in the returns between experience groups. For example, our earlier finding of men's higher returns to promotions with an employer change is driven by gender differences in returns among the least experienced workers. Similarly, women's advantage over men in the returns to within-firm promotions is highest among workers just entered the labour market. In addition, the gender gap in the negative effects of between-firms demotions is also mostly due to the gender differences in wage penalties among those with less than six years of work experience. On the other hand, when it comes to gender differences in the returns to horizontal mobility between firms, no clear pattern with work experience can be found.

To sum up, our results indicate that gender differences in the returns to different career moves are not that clear-cut than what the previous literature on the topic suggests. On the contrary, it turned out to be difficult to make any general conclusions about whether men benefit more from promotions than women as found for example by Booth et al. (2003), or whether it is actually women who have an advantage over men in the returns to promotions as concluded for example by Cobb-Clark (2001). This is because the results depend in a crucial way on the type of promotion, that is, whether the promotion takes place within a firm or with an employer change. Also career phase seemed to matter. Our results show that gender differences in the returns to different career moves are typically highest among those in their early careers.

Table 7 The effects of mobility on hourly wages – fixed effects estimates for men and women by experience

	Exp 0-2		*Exp 2-5*		*Exp 6-10*		*Exp>10*	
	Male	*Female*	*Male*	*Female*	*Male*	*Female*	*Male*	*Female*
Promotion in current firm	0.012***	0.022***	0.017***	0.019***	0.014***	0.015***	0.017***	0.020***
	[0.004]	[0.003]	[0.002]	[0.002]	[0.002]	[0.003]	[0.002]	[0.003]
Promotion in new firm	0.041***	0.026***	0.040***	0.038***	0.030***	0.027***	0.018***	0.010
	[0.006]	[0.006]	[0.003]	[0.005]	[0.004]	[0.007]	[0.006]	[0.008]
Demotion in current firm	-0.024***	-0.023***	-0.028***	-0.029***	-0.024***	-0.019***	-0.028***	-0.028***
	[0.004]	[0.004]	[0.002]	[0.003]	[0.003]	[0.003]	[0.003]	[0.004]
Demotion in new firm	0.014*	-0.016**	-0.005	-0.021***	-0.023***	-0.028***	-0.042***	-0.031***
	[0.007]	[0.008]	[0.004]	[0.006]	[0.004]	[0.010]	[0.006]	[0.008]
Same level in new firm	0.012**	0.016***	0.016***	0.005*	-0.005**	-0.003	0.004	0.000
	[0.005]	[0.003]	[0.002]	[0.003]	[0.002]	[0.004]	[0.003]	[0.004]
R-squared	0.605	0.591	0.568	0.544	0.497	0.491	0.626	0.693
Number of observations	39 459	38 259	92 908	55 621	75 917	42 457	91 130	49 922
Number of individuals	23 942	19 612	31 550	20 431	22 611	13 552	16 595	9 558

Notes:

1. Dependent variable is the log of hourly wage.
2. Cluster robust t-statistics are given in brackets; * p < 0.05, ** p < 0.01, *** p < 0.001.
3. Other control variables are age, age^2, tenure, tenure^2, years of education, years of education^2, fields of education (9 categories), current field of job title (4 categories), cumulative career breaks, the number of prior job changes, industry (56 categories), firm size (7 categories), and year. Results for the other variables used in the estimations are available from the authors upon request.

8 Conclusion

In this paper, we examine gender differences in careers among white-collar workers by utilising a large linked employee-employer data from the Finnish manufacturing sector covering the period of 1981–2006. The main findings of the paper are, first, that men start their careers at higher hierarchical ranks than women do. Although a large part of the gender difference in entry positions can be explained by men's and women's different educational choices, some of the gap remains unexplained. We also find, in contrast for example to Booth et al. (2003) who used data from the British Household Panel Survey, that even after accounting for a large set of background characteristics, men are more likely to be promoted than women are. The gender gap in promotion rates is highest among those in their early careers. Gender differences in education or career breaks do not affect this result.

The results for wage analysis show that women have 6.2 percent lower starting wages than men after gender differences in age, education, industry, firm size, and job title have been controlled for. On the other hand, gender differences in wage premiums to changes in hierarchical position are less clear-cut. Men experience higher returns to promotion with employer changes, whereas internal promotions lead to similar wage gains. Wage reductions following within-firm demotions are roughly of the same size for men and women, but women suffer larger wage losses from demotions with an employer change. Furthermore, gender differences in the returns to different career moves were found to be highest during the first years in the labour market.

Our results show that the gender wage gap emerges right in the beginning of career and differences in career progression and returns to career progression exacerbate the gender wage gap. Men tend to fare better in both respects, especially in the early career. In particular, the results show that it is important to distinguish between the different types of promotions and demotions and to pay attention to a career phase, issues that are mostly ignored in the earlier literature on gender differences in career and wage dynamics.

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Appendix

Table A 1 Summary statistics

Variable	*Observations*	*Mean*	*Std. Dev.*	*Min*	*Max*
Log hourly wage	641 874	2.589	0.415	1.295441	4.651987
Promotion (all)	511 817	0.075	0.264	0	1
Promotion in current firm	513 097	0.064	0.244	0	1
Promotion in new firm	524 162	0.011	0.105	0	1
Demotion in new firm	563 023	0.007	0.084	0	1
Demotion in current firm	551 958	0.032	0.177	0	1
Same level in new firm	530 308	0.031	0.173	0	1
Same level in current firm (reference category)	519 243	0.838	0.368	0	1
Female	641 878	0.396	0.489	0	1
Years of education	641 878	15.212	2.092	9	25
Years of education squared/100	641 878	2.358	0.661	0.81	6.25
General (reference category)	641 878	0.049	0.217	0	1
Educational science	641 878	0.001	0.032	0	1
Humanities	641 878	0.013	0.114	0	1
Social sciences	641 878	0.318	0.466	0	1
Natural sciences	641 878	0.023	0.150	0	1
Technology	641 878	0.573	0.495	0	1
Agriculture and forestry	641 878	0.009	0.092	0	1
Health and welfare	641 878	0.010	0.098	0	1
Services	641 878	0.005	0.068	0	1
Tenure	641 878	4.849	4.761	0	25
Tenure squared/100	641 878	0.462	0.798	0	6.25
Age	641 878	31.961	6.706	18	53
Age squared/100	641 878	10.665	4.577	3.24	28.09
Organizational level 1	638 011	0.064	0.244	0	1
Organizational level 2	638 011	0.144	0.351	0	1
Organizational level 3	638 011	0.211	0.408	0	1
Organizational level 4	638 011	0.224	0.417	0	1
Organizational level 5	638 011	0.318	0.466	0	1
Organizational level 6	638 011	0.039	0.194	0	1
Title field: Innovation	638 011	0.326	0.469	0	1
Title field: Implementation	638 011	0.282	0.450	0	1
Title field: Production	638 011	0.202	0.401	0	1
Title field: Administration	638 011	0.190	0.392	0	1
Female share in same jobtitle and firm	641 878	0.379	0.390	0	1
Mean tenure in same jobtitle and firm	641 878	5.368	3.590	0	25
Mean level of education at level in same jobtitle and firm	641 878	14.408	1.892	9	25
Years at level so far	641 878	4.327	3.905	1	26
Years at title so far	641 878	3.749	3.386	1	26
Number of prior titles	641 878	1.048	1.276	0	11
No Cumulative gaps (refence category)	641 878	0.667	0.471	0	1
Cumulative gaps 1 year	641 878	0.116	0.320	0	1
Cumulative gaps more than 1 year	641 878	0.217	0.412	0	1
Firm size <51	641 878	0.127	0.333	0	1
51–100	641 878	0.095	0.293	0	1
101–200	641 878	0.122	0.328	0	1
201–500	641 878	0.190	0.392	0	1
501–1000	641 878	0.120	0.325	0	1
1001–2000	641 878	0.103	0.305	0	1
>2000	641 878	0.242	0.428	0	1

Notes:
1. To avoid unnecessarily lengthy tables, only a subset of variables used in the estimations is presented above. Results for the excluded variables are available from the authors upon request.

Table A 2 Linear probability model of all promotions, full table

	All	*Exp 0-2*	*Exp 2-5*	*Exp 6-10*	*Exp>10*
Female	-0.024***	-0.031***	-0.033***	-0.021***	-0.009***
	[0.001]	[0.003]	[0.002]	[0.003]	[0.002]
Years of education	0.038***	0.074***	0.070***	0.048***	0.014***
	[0.002]	[0.004]	[0.005]	[0.004]	[0.003]
Years of education squared	-0.075***	-0.161***	-0.156***	-0.105***	-0.022***
	[0.005]	[0.012]	[0.015]	[0.013]	[0.008]
Educational science	-0.045***	-0.060***	-0.031	-0.033*	-0.026
	[0.010]	[0.022]	[0.021]	[0.019]	[0.020]
Humanities	-0.064***	-0.077***	-0.064***	-0.058***	-0.033***
	[0.004]	[0.008]	[0.008]	[0.008]	[0.007]
Social sciences	-0.040***	-0.047***	-0.035***	-0.026***	-0.025***
	[0.002]	[0.005]	[0.005]	[0.004]	[0.004]
Natural sciences	-0.032***	-0.027***	-0.030***	-0.025***	-0.019***
	[0.003]	[0.007]	[0.007]	[0.006]	[0.006]
Technology	-0.036***	-0.036***	-0.032***	-0.023***	-0.026***
	[0.002]	[0.005]	[0.005]	[0.005]	[0.004]
Agriculture and forestry	-0.040***	-0.042***	-0.043***	-0.020**	-0.031***
	[0.005]	[0.011]	[0.009]	[0.009]	[0.008]
Health and welfare	-0.047***	-0.057***	-0.039***	-0.038***	-0.015*
	[0.004]	[0.008]	[0.008]	[0.008]	[0.008]
Services	-0.026***	-0.021	-0.026**	-0.013	-0.017*
	[0.006]	[0.014]	[0.011]	[0.012]	[0.009]
Age	0.001***	0.009***	0.006***	0.001	0.000
	[0.000]	[0.002]	[0.001]	[0.001]	[0.000]
Age squared	0.003**	-0.130***	-0.041**	0.000	0.000
	[0.001]	[0.040]	[0.016]	[0.007]	[0.002]
Tenure	0.007***	-0.005	-0.028***	-0.010	0.002
	[0.001]	[0.008]	[0.008]	[0.007]	[0.002]
Tenure squared	-0.011***	0.013	0.045***	0.013	-0.004
	[0.001]	[0.016]	[0.014]	[0.011]	[0.003]
Hierarchical level 3	0.053***	0.059***	0.060***	0.056***	0.045***
	[0.001]	[0.002]	[0.002]	[0.002]	[0.002]
Hierarchical level 4	0.086***	0.112***	0.097***	0.088***	0.057***
	[0.001]	[0.003]	[0.003]	[0.003]	[0.002]
Hierarchical level 5	0.114***	0.169***	0.129***	0.103***	0.068***
	[0.002]	[0.004]	[0.003]	[0.003]	[0.002]
Hierarchical level 6	0.199***	0.290***	0.218***	0.159***	0.101***
	[0.003]	[0.006]	[0.006]	[0.007]	[0.006]
Title field: Implementation	-0.012***	-0.031***	-0.011***	-0.004	-0.009***
	[0.001]	[0.003]	[0.002]	[0.002]	[0.002]
Title field: Production	-0.000	0.016***	0.001	-0.000	-0.008***
	[0.001]	[0.003]	[0.002]	[0.002]	[0.002]
Title field: Administration	-0.020***	-0.030***	-0.019***	-0.016***	-0.014***
	[0.002]	[0.003]	[0.003]	[0.003]	[0.003]
Female share in same job title and firm	-0.001	0.000	-0.002	0.002	-0.006*
	[0.002]	[0.004]	[0.004]	[0.004]	[0.003]
Mean tenure in same job title and firm	-0.004***	-0.006***	-0.006***	-0.004***	-0.002***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]

	All	*Exp 0-2*	*Exp 2-5*	*Exp 6-10*	*Exp>10*
Mean level of education at level in same job title and firm	-0.002***	-0.004***	-0.003***	-0.002**	-0.000
	[0.000]	[0.001]	[0.001]	[0.001]	[0.001]
Years at level so far	-0.002***	-0.012***	-0.004***	-0.002***	-0.002***
	[0.000]	[0.002]	[0.001]	[0.000]	[0.000]
Years at title so far	0.000	0.008***	0.003***	0.001*	0.000**
	[0.000]	[0.002]	[0.001]	[0.000]	[0.000]
Number of prior titles	0.005***	0.014***	0.010***	0.007***	0.004***
	[0.000]	[0.002]	[0.001]	[0.001]	[0.001]
Cumulative gaps 1 year	-0.000	-0.005	-0.000	0.004*	0.003
	[0.001]	[0.005]	[0.002]	[0.002]	[0.002]
Cumulative gaps longer than 1 year	0.000	-0.009	-0.001	0.003*	0.003*
	[0.001]	[0.007]	[0.003]	[0.002]	[0.001]
Firm size 51–100	-0.004**	-0.002	-0.001	-0.003	-0.007***
	[0.002]	[0.003]	[0.003]	[0.003]	[0.002]
101–200	-0.002	-0.005	-0.000	-0.001	-0.001
	[0.001]	[0.003]	[0.003]	[0.003]	[0.002]
201–500	-0.002*	-0.003	0.002	-0.001	-0.004**
	[0.001]	[0.003]	[0.003]	[0.003]	[0.002]
501–1000	0.002	0.011***	0.005*	0.004	-0.003
	[0.001]	[0.003]	[0.003]	[0.003]	[0.002]
1001–2000	0.001	-0.003	0.002	0.006*	0.013***
	[0.002]	[0.003]	[0.003]	[0.003]	[0.003]
>2000	0.022***	0.012***	0.024***	0.027***	0.029***
	[0.001]	[0.003]	[0.003]	[0.003]	[0.002]
R-squared	0.040	0.064	0.041	0.033	0.028
Number of observations	482 759	121 931	131 139	107 288	122 401
Number of individuals	65 717	60 290	46 032	32 926	23 921

The omitted categories are: general education, title field: innovation, hierarchical level 2, no gaps, firm size <50.

Notes:
1. Cluster robust t-statistics are given in brackets, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
2. Control variables also industry (56 different categories) and year.

Table A 3 Linear probability model of promotion, within-firms promotions

	All	*Exp 0-2*	*Exp 2-5*	*Exp 6-10*	*Exp>10*
Female	-0.019***	-0.023***	-0.025***	-0.017***	-0.008***
	[0.001]	[0.002]	[0.002]	[0.002]	[0.002]
Years of education	0.030***	0.056***	0.053***	0.039***	0.012***
	[0.002]	[0.004]	[0.005]	[0.004]	[0.003]
Years of education squared	-0.059***	-0.123***	-0.117***	-0.084***	-0.018**
	[0.005]	[0.011]	[0.014]	[0.012]	[0.008]
Educational science	-0.032***	-0.035*	-0.013	-0.034*	-0.031**
	[0.010]	[0.021]	[0.021]	[0.018]	[0.014]
Humanities	-0.047***	-0.056***	-0.047***	-0.044***	-0.025***
	[0.004]	[0.007]	[0.007]	[0.007]	[0.006]
Social sciences	-0.030***	-0.033***	-0.023***	-0.020***	-0.021***
	[0.002]	[0.004]	[0.004]	[0.004]	[0.003]
Natural sciences	-0.024***	-0.015**	-0.020***	-0.022***	-0.016***
	[0.003]	[0.007]	[0.006]	[0.006]	[0.006]
Technology	-0.029***	-0.028***	-0.026***	-0.020***	-0.023***
	[0.002]	[0.005]	[0.004]	[0.004]	[0.004]
Agriculture and forestry	-0.031***	-0.030***	-0.031***	-0.021**	-0.025***
	[0.004]	[0.009]	[0.008]	[0.008]	[0.007]
Health and welfare	-0.032***	-0.041***	-0.020***	-0.027***	-0.010
	[0.004]	[0.007]	[0.007]	[0.008]	[0.008]
Services	-0.018***	-0.005	-0.016	-0.011	-0.017*
	[0.006]	[0.013]	[0.010]	[0.012]	[0.009]
Age	0.002***	0.010***	0.008***	0.003***	0.001***
	[0.000]	[0.002]	[0.001]	[0.001]	[0.000]
Age squared	-0.003**	-0.124***	-0.049***	-0.007	-0.003*
	[0.001]	[0.037]	[0.015]	[0.006]	[0.002]
Tenure	0.005***	-0.006	-0.024***	-0.010	0.002
	[0.001]	[0.007]	[0.007]	[0.007]	[0.002]
Tenure squared	-0.008***	0.014	0.038***	0.014	-0.004
	[0.001]	[0.014]	[0.013]	[0.010]	[0.003]
Hierarchical level 3	0.043***	0.045***	0.048***	0.047***	0.038***
	[0.001]	[0.002]	[0.002]	[0.002]	[0.002]
Hierarchical level 4	0.068***	0.083***	0.074***	0.071***	0.047***
	[0.001]	[0.003]	[0.002]	[0.002]	[0.002]
Hierarchical level 5	0.091***	0.132***	0.101***	0.082***	0.056***
	[0.001]	[0.003]	[0.003]	[0.003]	[0.002]
Hierarchical level 6	0.166***	0.237***	0.182***	0.134***	0.085***
	[0.003]	[0.005]	[0.006]	[0.006]	[0.005]
Title field: Implementation	-0.011***	-0.029***	-0.012***	-0.004*	-0.008***
	[0.001]	[0.003]	[0.002]	[0.002]	[0.002]
Title field: Production	-0.000	0.011***	-0.001	0.000	-0.007***
	[0.001]	[0.003]	[0.002]	[0.002]	[0.002]
Title field: Administration	-0.019***	-0.030***	-0.019***	-0.016***	-0.013***
	[0.001]	[0.003]	[0.003]	[0.003]	[0.002]
Female share in same job title and firm	0.000	0.002	-0.002	0.003	-0.003
	[0.002]	[0.004]	[0.004]	[0.004]	[0.003]
Mean tenure in same job title and firm	-0.004***	-0.005***	-0.006***	-0.004***	-0.002***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]

	All	*Exp 0-2*	*Exp 2-5*	*Exp 6-10*	*Exp>10*
Mean level of education at level in same job title and firm	-0.002***	-0.003***	-0.003***	-0.002***	-0.001*
	[0.000]	[0.001]	[0.001]	[0.001]	[0.001]
Years at level so far	-0.002***	-0.011***	-0.003***	-0.002***	-0.002***
	[0.000]	[0.002]	[0.001]	[0.000]	[0.000]
Years at title so far	0.000**	0.006**	0.002***	0.001*	0.001***
	[0.000]	[0.002]	[0.001]	[0.000]	[0.000]
Number of prior titles	0.005***	0.011***	0.009***	0.006***	0.004***
	[0.000]	[0.002]	[0.001]	[0.001]	[0.000]
Cumulative gaps 1 year	-0.001	-0.009**	-0.003	0.001	0.003
	[0.001]	[0.004]	[0.002]	[0.002]	[0.002]
Cumulative gaps longer than 1 year	-0.001	-0.009	-0.002	0.002	0.001
	[0.001]	[0.006]	[0.003]	[0.002]	[0.001]
Firm size 51–100	-0.004***	0.000	-0.004	-0.006**	-0.006***
	[0.001]	[0.003]	[0.003]	[0.003]	[0.002]
101–200	-0.003**	-0.005	-0.003	-0.004	-0.002
	[0.001]	[0.003]	[0.003]	[0.003]	[0.002]
201–500	-0.003**	-0.002	0.001	-0.005*	-0.004**
	[0.001]	[0.003]	[0.002]	[0.002]	[0.002]
501–1000	0.002	0.013***	0.004	-0.000	-0.003
	[0.001]	[0.003]	[0.003]	[0.003]	[0.002]
1001–2000	0.003*	0.001	0.003	0.003	0.013***
	[0.001]	[0.003]	[0.003]	[0.003]	[0.003]
>2000	0.023***	0.015***	0.024***	0.025***	0.030***
	[0.001]	[0.003]	[0.003]	[0.003]	[0.002]
R-squared	0.033	0.053	0.035	0.029	0.026
Number of observations	482 759	121 931	131 139	107 288	122 401
Number of individuals	65 717	60 290	46 032	32 926	23 921

The omitted categories are: general education, title field: innovation, hierarchical level 2, no gaps, firm size <50.

Notes:
1. Cluster robust t-statistics are given in brackets, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
2. Control variables also include industry (56 different categories), and year.

Table A 4 Linear probability model of promotion by hierarchical level, all promotions

	Level 6	*Level 5*	*Level 4*	*Level 3*	*Level 2*
Female	0.017	-0.039***	-0.016***	-0.023***	-0.015***
	[0.013]	[0.003]	[0.003]	[0.002]a	[0.002]
Years of education	-0.003	-0.002	0.031***	0.028***	0.006**
	[0.017]	[0.006]	[0.009]	[0.004]	[0.003]
Years of education squared	0.083	0.079***	-0.025	-0.049***	-0.005
	[0.069]	[0.021]	[0.030]	[0.012]	[0.009]
Educational science	-0.110	-0.070**	-0.084**	-0.052**	-0.038***
	[0.069]	[0.028]	[0.036]	[0.023]	[0.009]
Humanities	-0.130***	-0.084***	-0.104***	-0.073***	-0.028***
	[0.024]	[0.006]	[0.010]	[0.010]	[0.009]
Social sciences	-0.015	-0.034***	-0.068***	-0.050***	-0.027***
	[0.010]	[0.003]	[0.007]	[0.007]	[0.007]
Natural sciences	-0.016	0.027**	-0.075***	-0.059***	-0.026***
	[0.056]	[0.011]	[0.010]	[0.008]	[0.008]
Technology	-0.018	-0.021***	-0.074***	-0.061***	-0.020***
	[0.020]	[0.003]	[0.008]	[0.007]	[0.007]
Agriculture and forestry	0.095	-0.054***	-0.063***	-0.058***	-0.033***
	[0.138]	[0.010]	[0.015]	[0.011]	[0.009]
Health and welfare	-0.110***	-0.048***	-0.096***	-0.057***	-0.016
	[0.040]	[0.008]	[0.009]	[0.009]	[0.012]
Services	-0.020	-0.014*	-0.053***	-0.037**	-0.003
	[0.028]	[0.008]	[0.013]	[0.016]	[0.018]
Age	-0.010***	-0.003***	0.001**	0.005***	0.001***
	[0.002]	[0.001]	[0.001]	[0.001]	[0.001]
Age squared	0.058***	0.022***	0.004	-0.015***	-0.004
	[0.011]	[0.003]	[0.003]	[0.003]	[0.003]
Tenure	0.010**	0.014***	0.010***	0.010***	0.005***
	[0.004]	[0.001]	[0.002]	[0.002]	[0.002]
Tenure squared	-0.020***	-0.022***	-0.016***	-0.016***	-0.008***
	[0.006]	[0.002]	[0.002]	[0.002]	[0.002]
Title field: Implementation	0.008	-0.048***	-0.025***	-0.001	-0.005**
	[0.006]	[0.003]	[0.004]	[0.002]	[0.002]
Title field: Production		-0.021***	-0.012***	0.049***	0.021***
		[0.004]	[0.003]	[0.006]	[0.002]
Title field: Administration		-0.048***	-0.043***	-0.007**	-0.018***
		[0.003]	[0.005]	[0.003]	[0.003]
Female share in same job title and firm	-0.006	0.003	0.011*	0.009**	0.007**
	[0.023]	[0.004]	[0.006]	[0.004]	[0.003]
Mean tenure in same job title and firm	-0.004***	-0.004***	-0.004***	-0.005***	-0.001***
	[0.001]	[0.000]	[0.000]	[0.000]	[0.000]
Mean level of education at level in same job title and firm	-0.001	0.001	-0.002*	-0.002***	-0.001**
	[0.003]	[0.001]	[0.001]	[0.001]	[0.001]
Years at level so far	-0.006***	-0.001***	-0.001	-0.001**	0.001
	[0.002]	[0.000]	[0.001]	[0.000]	[0.000]
Years at title so far	0.003*	-0.001***	0.001	0.000	-0.000
	[0.002]	[0.000]	[0.001]	[0.001]	[0.000]
Number of prior titles	0.006	0.006***	0.007***	0.009***	0.006***
	[0.004]	[0.001]	[0.001]	[0.001]	[0.001]

	Level 6	*Level 5*	*Level 4*	*Level 3*	*Level 2*
Cumulative gaps 1 year	0.020**	-0.001	0.004	0.000	-0.001
	[0.009]	[0.002]	[0.003]	[0.003]	[0.002]
Cumulative gaps longer than 1 year	0.010	0.002	0.002	0.002	0.000
	[0.009]	[0.002]	[0.003]	[0.003]	[0.002]
Firm size 51–100	0.002	-0.008***	0.003	-0.013***	-0.008**
	[0.010]	[0.003]	[0.003]	[0.003]	[0.004]
101–200	0.022**	-0.009***	0.003	-0.003	-0.012***
	[0.009]	[0.003]	[0.003]	[0.003]	[0.003]
201–500	0.004	-0.003	-0.004	-0.004	-0.014***
	[0.009]	[0.002]	[0.003]	[0.003]	[0.003]
501–1000	0.029**	-0.002	0.006*	0.003	-0.020***
	[0.012]	[0.003]	[0.003]	[0.003]	[0.004]
1001–2000	0.011	0.003	0.000	0.002	-0.018***
	[0.011]	[0.003]	[0.004]	[0.004]	[0.004]
>2000	0.056***	0.024***	0.019***	0.024***	0.003
	[0.011]	[0.003]	[0.003]	[0.003]	[0.003]
R-squared	0.036	0.058	0.048	0.024	0.031
Number of observations	16 929	151 337	110 827	104 345	69 054
Number of individuals	65 717	60 290	46 032	32 926	23 921

The omitted categories are: general education, title field: innovation, hierarchical level 2, no gaps, firm size <50.

Notes:
1. Cluster robust t-statistics are given in brackets, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
2. Control variables also include industry (56 different categories), and year.

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