

# The Glass Ceiling in the U.S. and Sweden: Lessons from the Family-Friendly Corner of the World, 1970-1990\*

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## **Abstract**

There is a dearth of women in top ranks within the professions and management often referred to as the glass ceiling. To quantify and analyze this gender rank gap, we consider the following questions: What is the effect of gender on the job rank reached? To what extent do other individual factors, such as age, education, work hours, and part- or full-time status, explain rank reached? How much of the gender rank gap can be explained by differences between men and women with reference to these other factors? Did the circumstances of women changed over the time period studied and, if so, in what way? We first examine these issues in the U.S. context. We start by using across-firm data, documenting the existence of a glass ceiling in 10 managerial, administrative, and professional occupations. This is followed by an organizational case study, illustrating some of the mechanisms that could have produced the ceiling. We then proceed to use establishment-level data on white-collar employees in the Swedish private sector over the period 1970-1990 to test our hypotheses. The findings show that there is a glass ceiling in Sweden as well. At the top levels women are less frequently represented, and this can be attributed to the empirical observation that employers recruit employees who work full-time, with a technical educational background, at the right age for top positions. Radically more men than women match this profile. In multivariate analyses, we look at the relationship between rank and the variables: age, part-time status, hours worked, and educational attainment. The results show significant birth cohort differences in the rank reached among women. The younger cohorts experienced considerably lower gender rank gaps than the older. Within a cohort, as the women became older the gender rank gap remained fairly constant, with a slight increase by age 36-50, and thereafter a slight decrease.

## 1. Introduction

When men and women today do the same work for the same employer, they are, for all practical purposes, paid the same wages, at least in the U.S., Sweden, and Norway. This source of the overall wage gap has thus probably been close to eradicated. There is nevertheless still a substantial pay gap that needs to be explained. But rather than unequal pay for equal work for the same employer, its main source lies elsewhere, namely in the segregation of men and women on occupations and establishments: women work in low-paid jobs and in establishments that pay low wages, and men work in well-paid jobs and in workplaces where pay is high.<sup>1</sup>

One particular form of sex segregation that has become much noted during the last twenty years is the dearth of women in relatively higher positions in the professions and management. Using a term coined by two U.S. reporters in the *Wall Street Journal* in 1986, the phenomenon has been attributed to a so-called glass ceiling: Within organizations there is a rank or level beyond which women typically are not promoted.<sup>2</sup>

The glass-ceiling problem might in fact be represented as the characteristic segregation problem of the contemporary period. Although women have now entered upper non-manual positions in substantial numbers (i.e., the "first gender revolution"), the upper non-manual sector still remains highly segregated, with women facing a glass ceiling that prevents them from assuming high-level positions within it. The question that therefore needs to be answered in gauging the future of gender inequality is whether there will be a "second revolution" (i.e., a withering-away of the glass ceiling) that follows the "first revolution."

The literature on this topic is extensive. Yet very little systematic knowledge is available.<sup>3</sup> An apparently solid finding is that the magnitude of the glass-ceiling problem depends, not only on potential employer discrimination, but also on broad institutional factors of a society, such as the relationship between family and work, leave policies, the relative pay in managerial positions, and more. This comes out in cross-national comparisons, documenting significant variations across Western nations in the extent of the glass ceiling. Perhaps surprisingly, it appears to be more severe in the Scandinavian countries with their generous family policies, than in the U.K., U.S., and other comparable countries.<sup>4</sup>

This study therefore undertakes an empirical investigation with a comparative angle of the glass-ceiling problem, using the term in its descriptive sense, the lack of women in top positions. We first illustrate the issues in the U.S. context. We provide an overview using firm-level data on the glass ceiling, with data from the period the coin was phrased, showing its clear existence. This analysis is followed up with an organizational case study illustrating some of the mechanisms that can generate a glass ceiling. We then turn to providing an analysis of the Swedish case, which we shortly will argue perhaps is the central test case in the Western world for many of the questions arising in connection with the glass ceiling. Beyond being a test case, for Sweden we also have access to unique data allowing us to address the topic in novel and careful ways. The data set covers all establishments in major industries in the Swedish economy, covering about 40% of employees in the private sector, and all employees of these establishments over the period 1970-1990. We focus on the white-collar employees in the data.

For the Swedish case, we address several questions. What is the effect of gender on the job rank reached? How much of the gender rank effect can be explained by individual factors such as age, education, hours worked, and part- or full-time status? Did the circumstances of women change over the time period studied and, if so, in what way?

Why is Sweden in many respects a central case for studying the glass ceiling, from which lessons for the U.S. may be taken? The central reason is well known. It is by now well understood that work-family conflicts may be one of the larger if not the largest impediment to women's success in management and the upper echelons of the professions (e.g., Waldfogel 1998). With an unequal division of labor in the home, with high divorce rates where women in the majority of cases end up being the primary parent, it may be more difficult for women than men to succeed at high levels. But Sweden has done more to alleviate work-family conflicts than almost any other country. It has extensive family policies and is often considered a model for family legislation. Over the 1970-1990 period several key legislative changes were enacted in parental-leave policies and child-care provisions.

For example, the total leave period after childbirth was 7 months at 90% pay in 1975, increased to nine months in 1978, with fathers being able to share leave periods since 1974. Fathers accounted for 7% of leaves taken in 1988 (OECD 1995; see also Haas 1991), with much lower numbers in other European countries. As England (2006, p. ?) writes, noting that this

must have an impact on gender equality: "Sweden, the state replaces a portion of a parent's pay after the birth of a child, and recently instituted a policy so that couples who have the entire leave taken by one parent receive less paid leave." Nothing comparable is available in the U.S. Prior to the 1993 FMLA period, there was only voluntary provision of maternity leave. As of 1991, only 37% of full-time employees in medium and large establishments and 18% of those in small establishments had maternity leave, of usually up to 13 weeks.

Perhaps equally important, public provision of childcare services is limited in the U.S., whereas Sweden has extensive policies (see Kamerman 1991). In 1973, 11% of preschoolers had access to public childcare, 38% in 1983, and 49% in 1988, at a subsidized rate (see Rønsen and Sundstrom 1996). Single parents pay lower fees.

Such policies should help combining work and family, and may contribute toward gender equality also at the top of organizational hierarchies. On this there is however some disagreement. What family policies undoubtedly do is to make life easier for children and parents. Whether they also are good for achieving gender equality is less clear. For example, Hakim (2000, p. 240) concludes: "In sum, Nordic women have not achieved any significant degree of equality with men in market work, in terms of access to the top jobs, occupations with authority, or higher pay." She continues (p. 243), "Some scholars are now concluding that Nordic egalitarian policies have failed, ..." and that "National policies that offer mothers substantial periods of paid and unpaid maternity leave, the right to work shorter hours, and other benefits to help reconcile work with family do have unintended side-effects."

We proceed as follows. In section two we elaborate on explanations for why there are so few women in top positions in management and the professions. In section three we present data that illustrate the issues in the U.S. context. In section four we describe the unique Swedish data set on all privately employed white-collar workers in the domain of the Swedish Employer Federation for the period 1970-1990. In section five we show that the top-ranked positions still are predominantly held by men.

In section six we address aspects of the so-called pipeline problem: sex differences in age, part time and hours worked, and in education. We document the characteristics of employees in the top positions, and how these characteristics are distributed among women and men. In section seven we address four different explanations for the sex

gap in rank: discrimination, educational choice, lifecycle, and cohort effects. Section eight concludes our analysis.

## 2. Women and Men in Top Management and the Professions

The future of the glass ceiling is best gauged by determining how it is generated. Several mechanisms operate, and each implies a distinctive future for the glass ceiling.

One mechanism is employer discrimination, what employers do to keep women out of top positions, or to include them as when affirmative action programs became important. Another mechanism is choices by employees or prospective employees in education, occupation, and family behavior. A third mechanism stems from institutional features of a given society, such as the provision of child care, leave policies, the relative size of managerial pay, and more.

In order to understand the lack of women in management and the professions it is useful to explore the role of these three mechanisms that may hinder or facilitate female success, here referred to as supply-side, demand-side, and institutional processes. If, for example, it can be shown that employer discrimination plays a small role for the lack of women in top positions, then our attention should focus elsewhere, especially on what employees and job seekers do, in their educational choices, occupational choices, and family behavior. Equally important is providing an assessment of the institutional regimes that make the glass-ceiling less of a problem. For instance, do Swedish employers behave differently than U.S. employers given the family friendly policies? Swedish employers know that women can take generous maternity and sick leaves. Will they be less prone to promote women they know are likely to take time off for family care and part time work? A substantial proportion of Swedish women take advantage of such policies as working part-time, knowing they may result in fewer promotions. In the U.S. employers know that women tend to get married, have children and then leave the work force, or stay and work full time, given the more limited access to part-time employment. U.S. women, on the other hand, may signal to an American employer her commitment to the job by not getting married and having children, hoping that the signal will be read and rewarded with promotions. An alternative interpretation of this form of female behavior is simply that in order to have a successful professional career, which can put big demands on time input, it is often very difficult at the same time to have children. There is not enough time for both. Abstaining from having children is then not a signaling behavior. It is entirely about time allocation.

### *Demand-Side Factors: Employers*

The typical explanation for the lack of women in upper management and the professions is that they simply are kept out of those jobs, usually by men higher up, the classic employer-discrimination hypothesis (see Hultin and Szulkin, 1999). A variety of reasons behind this hypothesis have been suggested. One could be purely psychological, such as a preference for men because managers prefer people who are like those who are already in similar positions, as argued by Kanter (1977, chap. 8). Another reason could be pure prejudice: Men are thought to fit better into a leadership team, perhaps because women are considered to be too emotional (Kanter 1977; Reskin and Hartmann 1986). Or perhaps men prefer to preserve their power and privileges (Reskin 1988; Acker 1990) (See empirical support for the difference in female and male manager recruitment strategies in Hultin and Szulkin, 1999). Finally, there may be statistical discrimination, if women as a group are thought to be less qualified than men to be in positions of leadership, and such reasoning is applied to individual cases without heeding the candidates' specific qualifications (Phelps 1972; Arrow 1973; Bielby and Baron 1986).

These forms of discrimination are often referred to as *demand-side factors*: They result from actions of employers when they hire, promote, and fire. But even in the absence of discrimination from the demand side, inequalities in careers could arise for other reasons, as the result of what employees and potential employees do.

### *Supply-Side Factors: Employees*

If women invest less in education (overall they do not), or undertake different kinds of education (they typically do), or have less stable careers because of withdrawals from employment in order to meet family responsibilities, or invest fewer hours at work, then an attainment gap in wages, careers, and work responsibilities will develop, given the way organizations currently operate. These sources of inequality in outcomes are referred to as *supply-side factors*: They result from the actions taken by current and prospective employees, particularly from the way men and women divide their efforts between employment and family responsibilities (e.g., Fuchs 1988; Waldfogel 1998; Henrekson 1999). These actions could arise from rational adaptation within the family, gender-specific socialization, or differences in preferences. In the context of the glass ceiling, these behaviors result in a so-

called frozen pipeline, a lack of qualified women whom employers can appoint to positions of leadership (see U.S. Department of Labor 1991).

According to the frozen pipeline hypothesis, the glass ceiling appears, then, to be largely attributable to supply-side differences in how men and women behave. To explore this further, it is useful to distinguish at least three separate frozen pipelines.

A *first* frozen pipeline comes from the domestic division of labor. The unequal division of labor in the family may for women affect the amount of education they acquire and the amount of effort subsequently allocated to market work. Many women just don't work the hours required for reaching positions of leadership.

A *second* frozen pipeline comes from potential sex segregation in educational choice. When organizations are about to appoint employees to positions of leadership, they are to a large extent constrained by the pool of entrants into the labor market 10-20 years ago. This in turn depended on the supply of men and women coming out of universities and professional schools at the time. As late as 1975-1980, for every female graduate in civil engineering in Sweden, there were about 11 male graduates, with similar educational sex segregation in the U.S. (Jacobs 1996). When organizations made their choices in the 1990s, they had an unbalanced supply from which they could draw for managerial positions.<sup>5</sup> This pipeline problem is not primarily attributable to the *amount* of human capital that women accumulate, but rather to the *type* of human capital. That is, insofar as women are not investing in the type of training, such as engineering, that is favored in recruiting managers, they will later be promoted at a lower rate.

A *third* frozen pipeline may be generated by anticipated discrimination. In this, the first and second pipeline problems are primarily adaptations to employer discrimination, where women, expecting to be discriminated against, invest in different types of education, seek different occupations, and work fewer hours. This can occur even if there in principle are no problems of unequal division of labor in the home, even if there are no gender differences in preferences for staying home to care for children, for hours worked, or for various educational specialties. Women and men just adapt to how they perceive employers will differentially reward the sexes for a given choice. There has clearly been a decline over time in actual discrimination and probably one in perceived discrimination as well, but this mechanism may still operate for some groups of women.



The relevance of this mechanism is easily seen in a short historical perspective. Women in age groups from which top managers during the last 10 years typically are recruited, say ages 45-60, started their careers in labor market environments more hostile to women. For example, Candice Krugman Beinecke, 52, one of the few female CEOs in U.S. law firms, reports that when she applied for a job at a New York law firm in 1970, she received a letter regretting to inform her that "we already have our woman lawyer," (New York Times, May 15, 1999). Such treatment could in the past, and also today, have influenced women to invest in different types or less human capital. And while probably uncommon today, remnants of these behaviors are still present in pockets of modern economies. In a recent U.S. sex discrimination case brought forward and settled by the Equal Employment and Opportunity Commission against a Wall Street firm, a female manager commented: "There are a lot of women I know who have left the street with four, five, six million in their pockets who say, I'm never going to reach the top, so I'll go do something else. That's a brain drain, so to speak." (McGeehan 2004: C7). Nevertheless, younger cohorts of women, confronting a less hostile environment, do acquire human capital. Solving the problem of anticipated discrimination does however require time and patience. The actual discrimination must first disappear, then women must react to it by making the relevant educational and work effort choices, and finally one has to wait for the currently younger women to acquire experience to become qualified for higher positions.

As is clear from the third frozen pipeline, the various mechanisms may also interact. For example, the mechanism of anticipated discrimination, coupled with the mechanism of diminished employer discrimination over time, should lead to a particular pattern of cohort differences. Diminished employer discrimination should by itself over time lead to a declining sex gap in each age group, say among 40-50 year olds, with a decrease from 1970 to 1990. But then, if women correctly perceive the reduced discrimination, one should also observe a change in educational choices, work hours and the extent of part-time work among women as one gets closer to the present, if indeed those adaptations are caused by anticipated discrimination. Thus for each birth cohort, at each given age, the sex gap in workplace achievement, in hours worked, and in education, should decline with historical time.

### *Institutional Factors*

A number of institutional factors could also explain the lack of women in management and the professions. Of major importance are the broader structural features of societies, such as its wage and income distribution, the provision of child-care services, and the educational system.

One institutional feature is associated with wage, income and wealth distribution. To reach the top of the career ladder often requires exceptional amounts of effort and time. People make these investments for a variety of reasons related to the pure enjoyment of the work, power, prestige, and more, but the economic incentives are also important. Household chores, including cleaning houses, looking after children and bringing them to and from school, preparing meals, shopping, and so on, can consume a considerable amount of time and effort.<sup>6</sup> When women bear the primary burden of these chores, the economic returns to pursuing a high rank depends on the premium between the prospective wage and the cost of hiring others to do the chores. Wage compression then discourages the pursuit of careers more for women than for men.

In this respect, the greater wage compression in Sweden compared to Britain and especially the U.S. (e.g., Fritzell 1991) could be a significant factor in women's choices. We suggest that women in Sweden have less incentive than women in the United States to pursue high-level careers because the net-return to the top jobs, translated into the difference between take-home wages and childcare costs, is smaller in Sweden. Blau and Kahn (1996) show that although the overall gender wage gap is considerably lower in Sweden and Norway than in the U.S., the percentage of women at the very bottom of the wage distribution is higher in Sweden and Norway than in the U.S. Blau and Kahn (1997) further document that even though there was a large increase in income inequality in the U.S. in the 1980s, which, *ceteris paribus*, may be detrimental to the gender wage gap, women nevertheless gained income relative to men in this period. The reason is simply that women made heavy inroads into the professions, management, and jobs requiring high skills.

A second institutional feature important for women's choices is availability of child-care services, particularly in the earlier stages of a career, when employees often have young children. The effects of this institution are not straightforward, however, because

reducing the costs of raising children may lead to increased fertility, which in turn may be detrimental to female careers. This may have happened in Sweden in the 1980s, when it had the highest fertility rate in Europe (Hoem 1993). (International comparisons of child-care policies can be found in Kamerman [1991]. See also Rønsen and Sundström [1996]).

A third institutional feature is the relationship between the educational system and the labor market and especially industry structure. Employers often seek employees with specific educational credentials, and the type of credentials that matter may change over time. In Sweden and other Scandinavian countries, but less so in the United States, the tradition in the manufacturing industry was to recruit primarily civil engineers. Not until relatively recently have people with masters degrees in economics or business administration become CEOs in publicly traded firms (see Meyerson 1992 for the case of Sweden). Women are better represented in business administration than in civil engineering. The organization of the educational system and the demand from the business sector can consequently influence occupational sex segregation.

### *Implications for the Future of the Glass Ceiling*

What do these various factors imply for the future of the glass ceiling?

With respect to employer discrimination, it is difficult to assess whether it currently is important or not. It is, however, unquestionably less important in both absolute and relative terms than 30 years ago. There has been nothing short of a massive cultural change here, from a situation where it used to be fully acceptable to keep women out of certain positions in the professions and management, to one where this is illegitimate, and where conscious attempts to keep women out will be met with opposition from coworkers, the media, and the legal system. There is every reason to expect that the role of employer discrimination will continue to diminish and perhaps even disappear in the future.

On the supply-side, the domestic division of labor suggests a less optimistic assessment of the future. Although much has changed over the last 30 years (e.g., England 2006, this volume), the division of labor in the home is likely to continue to be unequal, in part as a consequence of preference, in part due to rational adaptation, and especially due to high divorce rates that leave women with child custody, which restricts their careers further and at the same time puts pressures on divorced men to be economically successful in order to

meet child and alimony payments. In contrast to England's (2006) cautiously pessimistic assessment, derived from the still unequal distribution of labor in the family, we find Jackson's (2006, this volume) more optimistic view: a continuation and the inevitable rise of women in modern business, political and on the educational arenas, due to the logic and structure of modern bureaucratic organizations.

As for the choices women make in the types of education they acquire, the future consequences are difficult to assess. Decisions may be a function of internalized stereotypes about the skills and aptitudes that women (e.g., nurturing, service-oriented) and men (e.g., technical) have or ought to have. It is difficult to root out stereotypes that are deeply embedded in primary and secondary socialization. Others have speculated that some of the differences in occupational choice have their source in innate biological differences (Pinker 2002, chap. 18), even less amenable to change. And recent social-psychological experiments have offered yet another explanation for the lack of women in some fields, namely that men and women may behave rather differently in competitive situations, with women shying away from competition (Niederle and Westerlund 2005; see also Gneezy, Niederle, and Rustichini 2003).

Nevertheless, much change has already occurred, and will continue to occur. We predict that the role of educational sex segregation will diminish over time. It is, nevertheless, a slow-moving process, as the lag between acquiring an educational credential and becoming ready for major managerial positions is usually 20 to 30 years. Educational choices also interact with changes in industrial structure. Service-type occupations have become more important while manufacturing positions have declined. This shift favors women. It increases the number of occupations that require the type of skills that women are more likely to have such as nurturing and service-oriented skills. This will in turn increase employers' access to a larger pool of female skill. *Ceteris paribus*, demand-side factors can then play a role in dissolving the glass ceiling and gender inequality will decrease.

As for anticipated discrimination, if the supply-side differences in the amount and type of education and training that men and women accumulate and effort invested at the workplace are driven mainly by expectations of employer discrimination among women, then the frozen pipeline should melt as the decline in such discrimination becomes widely known and women accordingly have a greater incentive to invest in human capital and work long

hours. It is not clear that there is yet widespread appreciation of diminished discrimination among women who are making investment decisions. If so, anticipated discrimination will still generate pipeline problems, but presumably good information will gradually alleviate the problem.

While it seems that in recent times supply-side and institutional factors may be more critical than demand-side factors in maintaining the glass ceiling, we may ask and speculate on what are the differences in their likely impacts on its future. The domestic division of labor is most entrenched and least amenable to change, especially with high divorce rates where women in the vast majority of cases get child custody. By contrast, women are entering traditionally male educational paths in greater numbers and anticipated discrimination is also likely to diminish as women face less discrimination from employers. This suggests that the glass ceiling is likely to crack further, even as the domestic division of labor keeps it somewhat in place.

The effects of the broader institutional features---the societal wage distribution, the provision of child care, and the relationship between the educational system and the labor market---will, at a given point in time, show up in cross-national comparisons. Over time, as these perhaps improve in the favor of women, they should help extinguish the glass ceiling. But as already discussed, there may be both first and secondary effects of these, such as in the case of family-friendly policies. Providing ample and reasonable childcare also gives incentives for having children, which may be detrimental to female careers. Highly unequal wage distributions, such as in the U.S., with high wages at the top, low at the bottom, is very beneficial for women trying to break through the glass ceiling. But the more limited provision of childcare, and more limited leave policies, may work in the opposite direction.

### 3. The Glass Ceiling in the U.S.

We first use U.S. across-firm data on sex segregation in professional and managerial jobs, followed with data on such employees from a single large firm. We end by discussing whether the findings from this company may be typical of other U.S. firms, and what the future may entail.

### *Across-Firm Data*

For the across-firm data, we use the National Survey of Professional, Administrative, Technical, and Clerical (PATC) employees in 1981, collected by the Bureau of Labor Statistics (U.S. Department of Labor 1981), described in Petersen and Morgan (1995). We use data for seven professional and three administrative occupations. Each occupation is further divided into a set of ranks, corresponding to a hierarchy in terms of authority, responsibility, and required qualifications. This yields 51 occupation-by-rank groups for the professional and administrative occupations, where managerial positions are included among the higher ranks. For example, chemists, rank I is an entry-level job requiring a bachelor's degree in chemistry and no job experience, while rank VIII is a job where the incumbent “Makes decisions and recommendations that are authoritative and have far-reaching impact on extensive chemical and related activities of the company” (U.S. Department of Labor 1981a, p. 54). The data were collected from broad industries: Mining, construction, manufacturing, transportation, communication, electric, gas, sanitary services, retail trade, finance, insurance, and selected services (U.S. Department of Labor 1981a, p. 31). Information about 740,000 employees in about 2,162 establishments was collected (see U.S. Department of Labor 1981 a, table 11, p. 11).

We give segregation measures at the occupation-establishment level, separately by occupation and rank for the professional and managerial employees (from Petersen and Morgan 1995, Table 7). An occupation-establishment pair is defined as a particular occupation and rank within an occupation in a specific establishment, such as Chemist, Rank 7, working at Chiron in Emeryville, California. We have information on 16,433 occupation-establishment pairs, of which 4,036 are sex integrated. Table 1 gives a distribution of occupation-establishment pairs among professional and managerial employees in 10 occupations, showing whether they employ only men, only women, or are sex integrated. The percentages are given separately by rank in each occupation, from 1 (low) to 8. The highest rank corresponds to positions where the employee has considerable influence over management, strategy, and budgetary issues, either within the company or a division of the company.

[Table 1 about here]

Going from lowest to highest rank, the percent of occupation-establishment pairs employing only men increases strongly in all the occupations. Focusing on the last line in the table, which summarizes the situation across the 10 occupations, the percent of occupation-establishment units employing only men increases from 43.9 in rank 1 to 99.3 in rank 8. The percent of sex-integrated units drops from 24.6 in rank 1 to 8.8, 5.9, and 0.0 in ranks 6-8.

The amount of vertical sex segregation is thus very strong. At the very top rank 8, less than 1 percent of the occupation-establishment pairs employ women, and less than 10 percent of the occupation-establishment pairs do so in ranks 6-7.

### *Organizational Case Study*

How did this situation of segregation come about? Is it due to lower promotion rates for women, possibly resulting from employer discrimination? Is it due to a frozen pipeline, with too few women with the required amounts of experience and educational backgrounds? Our broad data do not allow us to explore these questions. Instead we examine an organizational case study from the same period where similar amounts of gender segregation are exhibited.

We use data from the personnel records on all external hires into managerial, administrative, and professional ranks in a large regulated firm engaged in producing and delivering services. It is a highly visible firm (for details, see Petersen and Saporta 2004). Its organizational structures and employment systems are similar to those in other large U.S. organizations across a wide array of industries (see Spilerman 1986). The data come from the period 1978-1986, when annual employment ranged from 26,000 to 31,000. Employees are assigned to four broad occupational groups: blue-collar (44 percent), clerical (20 percent), technical (8 percent), and managerial, administrative, and professional employees (28 percent).

We focus on the managerial, administrative, and professional employees. These are hired into a hierarchy of 13 job levels, from 1 (low) to 13. Few make it to the top. In 1986, with 7,329 such employees, only 42 or about half a percent were placed in level 11 or higher. A promotion occurs when a higher job level is reached, from say rank 5 to 6.

Table 2 gives the effect of being male on the promotion rate (from Petersen and Saporta 2004, Table 8). The analysis pertains to entrants into the organization in this period, and furthermore to entrants into professional, administrative, and managerial positions. This way we can compare employees who belong to roughly the same cohorts and have similar career ladders.

[Table 2 about here]

The evidence is clear. Overall, from column 1, men are promoted at about a 15 percent lower rate than women. This means that if 20 percent of the women were promoted in a given year, 17 percent of the men were. Controlling for the variables in columns 2-6, there is no sex difference in the promotion rate: the sex coefficient is close to and not significantly different from zero, except in column 2. Considering the evidence in columns 7-8, where interaction terms between sex and the currently occupied job level are included, we get a more subtle result. In the lowest level 1, men are promoted at a slightly higher rate than women. But then in levels 2 and above, with the exception of level 3 in column 7, women are promoted at a higher rate than men, and in levels 4 and above significantly so (at the .05 level). Moreover, in levels 5 and above the promotion rate is considerably higher for women than men. This corresponds to results found in other organizations (Spilerman and Petersen 1999).<sup>7</sup>

In conclusion, not taking individual characteristics into account, women are promoted at a higher rate than men. Taking such variables into account, there is no difference between men and women in promotion rates. Finally, taking into account the possibility that the promotion rates for men and women may depend on the job level, the contention put forth by the glass-ceiling hypothesis, women are promoted at a lower rate in the lowest level and at a higher rate in the higher levels, exactly opposite of what we would expect.

In terms of the employer discrimination hypothesis, there is no evidence for it when it comes to promotions in this particular case study. Note that in these analyses we have not included elaborate controls for occupational group or career ladder, distinguishing only six broad occupational groups. So even in the absence of extensive controls for particular career ladders, there are few or no differences between men and women in promotion rates.

But even with equal promotion rates, there may be discrimination at the point of hire, which may lead to a subsequent attainment gap. As Blau and Ferber (1987, p. 51) write: "Once men and women are channeled into different types of entry jobs, the normal everyday operation of the firm will virtually ensure sex differences in productivity, promotion opportunities, and pay." Observed differences in wages may thus largely be a result of differential hiring and initial placement. An overall gender wage gap will remain even with fair



promotion and wage-setting policies within firms as long as there is differential treatment in the hiring process (see also Stinchcombe 1990, p. 259).

Exploring differences at the point of hire requires paying attention to potential differences in prior work experience. Men and women may differ in the amount of experience they bring to the company. This will induce a gap at the time of hire. But as women gain experience in the company and prove to be valuable employees, the organization may compensate for the initially lower placement by higher promotion rates and higher salary increases. We have no measure of prior experience. But it clearly is correlated with age. Among younger hires, the sex differential in experience should be small, holding education constant. But among older entrants, the experience differential likely increases with age; most men will have had continuous careers while women on average will have taken more time off to care for children.

To explore this we report separate regression models for job level at time of hire, here including interaction terms between being male and age (from Petersen and Saporta 2004, Table 10). The results are given in Table 3.

[Table 3 about here]

Again, the results are clear. For job level at hire, the sex differential is strongly age dependent: No or only a small difference up until age 34, and then a steeply rising gap from age 35 to 50, to about 2.0 levels. For salary at hire, the results are similar (results not shown). The gap increases from about 5 to 50 percent as age goes from 18-24 to 50+.

This pattern of job level and salary differentials may clearly reflect differences in experience. Younger men and women will have about the same experience, but then with age, men on average accumulate more experience than women. This yields a payoff in placement at initial hire.

What about the frozen pipeline? Table 4 gives the distribution of men and women on rank in the organization, by years of seniority (from Petersen and Saporta 2004, Table 13). These are given for all the managerial, administrative, and professional employees present in 1986, not only the entrants as in Tables 2 and 3.

[Table 4 about here]

The story is very simple. There is no question that there is a glass ceiling at job level 11: Not a single woman is employed above job level 10. Furthermore, to a large extent this is due to the very small number of women with high seniority. To see why, note first that only about half a percent of the 7,329 employees are placed in job levels 11-13. Of the 42 men in those levels, 7 have seniority of 11-20 years, and 25 have seniority of 21 years or more. Of the 3,410 men with seniority of 11 years or more, 0.93 percent are placed in job levels 11-13. The number of women with seniority of 11 years or more is 299. But 70 percent of them started their careers in the organization at its very lowest level, the entry-level clerical position, whereas only 14 percent or 43 women entered the organization in managerial, administrative, and professional ranks. Very few men in the top managerial job levels 11-13 started their careers in non-managerial ranks, and of the seven (17 percent) that did, six have 26 years or more seniority in the organization.

Taking the longer time frame, then, shows that the main problem is that the pool of women with high seniority is very small. For each woman with seniority of 11 years or more, there are 11 men. For each woman with seniority of 21 years or more, there are 27 men. Had women with these levels of seniority reached the top job levels in the same percentage as men do, we should find exactly one woman in job levels 11-13. That we find zero women is within the realm of what to expect from chance. Additionally, as already mentioned, most of the pool of females with high levels of seniority entered the organization in positions from which top-level managers rarely are recruited. For the 43 women with 11 years or more seniority who started their careers in the organization in managerial, administrative, and professional positions, the average number of years spent in each job level was 9.4, whereas for the same group of 763 men it was 13.5. So there is no evidence of a slower rate of promotion for these women.

This case study thus shows no evidence of lower promotion rates for women among the managerial, administrative, and professional employees, rather a small advantage to being female, especially above rank 6. The glass ceiling in this organization appears not to arise from differential promotions rates, at least not in the 1988-1996 period. There is, however, clearly a frozen pipeline in the organization. There are very few women with high levels of seniority who qualify for promotion to the highest rank.

### *How Representative Is the Case Study?*

It is not easy to know how representative our study is as the evidence is not extensive. Some studies show that women suffer a net promotion disadvantage in lower levels of organizational hierarchies while enjoying a net advantage at higher levels (e.g., DiPrete 1989, chap. 9; Spilerman and Petersen 1999; see also Rosenfeld 1992). Similar results are found in Lewis (1986) for the federal bureaucracy and Tsui and Gutek (1984) for a large corporation, the latter using less appropriate data. Other studies, like Gerhart and Milkovich (1989) and Hartmann (1987), find little evidence of differential promotion rates between men and women, once one takes into account their jobs within an organizational hierarchy, while Mellor and Paulin (1996) report some nonsignificant negative effects for white females in a financial services firm. Butterfield and Powell (1997) find a nonsignificant female advantage in promotion to top management in a federal bureaucracy department in 1987-1994. Barnett, Baron, and Stuart (2000) report higher promotion rates for women in the California Civil Service system in 1978-1986. There are also studies that are not based on firm-level data, such as Stroh, Brett, and Reilly (1992), finding no sex differences in promotion rates. But these are less decisive. As for salary increases within organizations, much the same has been documented: few differences or women at an advantage (see Gerhart and Milkovich 1989; Tsui and Gutek 1984). Barnett, Baron, and Stuart (2000) find that at time of promotion men receive the higher increases. But since women are promoted at a higher rate, average monthly salary increases end up being identical

While the present case study perhaps goes into more detail than other studies, the results are similar. There is little evidence of differential promotion rates once comparisons are done at the establishment level, and thus possibly limited impact of employer discrimination, but big role for employee choices. There is clear evidence of a frozen pipeline.

### *Changes over Time*

The data presented above pertain to the first half of the 1980s. But what are the changes over time?

It is difficult to assemble relevant over-time data on women in upper management. The Equal Employment and Opportunity Commission (EEOC) routinely reports data, but on a much broader set of management positions than only those at the top. In the period 1978 to 1988,

the percent female in management occupations increased from 26.5 to 39.4, a remarkable change in a short period (U.S. Department of Labor 1989). Between 1990 and 2003, for a different definition of management positions, the percent females among officials and managers increased from 29.3 to 35.9, also a notable increase (U.S. Equal Employment and Opportunity Commission 2003, p. 17). It is the increase over time that is essential here, less so the actual level of the percentages. At the very top, the change has however been slower. In part, that is due a frozen pipeline, in that it often takes an MBA and 20-25 years of experience to reach the very highest levels. For appointments in 2000, one needs to look at the pools of females out MBA and similar programs in 1975-1985, a time when it was much lower than today. Progress may have been slow, but there has been progress nevertheless, and whether it has been slower than what one would expect given the pools of women with the relevant backgrounds has yet to be thoroughly investigated.

Focusing on more narrow fields, such as sciences, engineering, and academia more broadly, there has been significant progress. The percent female at each rank, including the full professor rank, in Research I academic institutions went up from 1979 to 1995 (National Research Council 2001, p. 183). Women made up 7.7 percent of faculty in 1979, 13.1 in 1989, and 16.2 in 1995. Among full professors the percent female went from 2.8 in 1979, to 6.3 in 1989, to 9.5 in 1995 (National Research Council 2001, p. 295). And while the percent of the male faculty employed at the full professor level was stable at 56-58 percent, it went up from 19.4 to 30.3 among women. There is clearly a long distance to numerical parity, but there is also significant progress here.

These developments would lead one to predict that over time the glass ceiling will diminish in importance. It is perhaps unlikely that women will reach numerical parity, given the persistence of educational segregation, and given the continued unequal distribution of work in the family, along with high divorce rates where women get child custody at much higher rates than men, but it is also unlikely that the situation for women with respect to access to upper-management positions will stop continuing to improve, given the significant emphasis in many organizations on recruiting and retaining women at those levels.

## 4. Swedish Data

We can look more closely at the question of whether there is a glass ceiling and how it is constructed when we examine the case of Sweden, with a different institutional regime, in the same period. We have access to detailed and comprehensive data covering almost all industries. In addition to assessing the extent of the ceiling, and the importance of supply-side factors, we also gain understanding of how it operates in an entirely different institutional setting.

The data we will use were collected and compiled by the Central Confederation of Employers (SAF) from their database on wage statistics, assembled from establishment-level personnel records. The data are extensive and detailed. They contain information for all white-collar workers in every industry (except the insurance and banking industries) in the private sector within the SAF domain. Member firms provided information to the database from 1970 to 1990, once or twice a year. The data were used for inputs in the annual wage negotiations, monitored not only by SAF but also by the labor unions and are of exceptionally high quality. They should be very reliable compared to the information from standard sample surveys or personal reports of pay rates, hours worked, and occupational titles.

The establishment characteristics recorded include detailed industry code, size (number of employees), region, and, area within the region. For every employee, information was obtained on sex, age, occupation, wages, hours worked, and level and type of education.

The data on occupation contain a relatively detailed description of job content, and the coding system makes it possible to compare establishments and industries. We shall refer to this job content information as occupational codes, although the data might also be described as job titles, in 1990 covering 276-285 positions altogether. This so-called BNT occupational code system consists of 51 broad occupational groups.<sup>8</sup> Within each occupational group a further distinction is made with respect to rank, with 7 ranks altogether. The rank is defined by the level of difficulty in the job, its amount of responsibility, and so forth. In the data, the rank codes run from 2 (high) to 8 (low). For our purposes we have recoded them in reverse order as 1 (low) to 7 (high). Not all occupations span the entire 7 ranks; some do not have rank 1 and some do not have the top ranks 5-7. In 1990, the cross-classification of 51 occupational groups and 7 ranks yields 276-285 occupations by rank groups.

The data cover practically the entire occupational spectrum, including managers and professionals. Company CEOs are excluded, as are the chief executive officers on the executive team. The amount of employment among white-collar employees increased substantially, from 299,154 in 1970 to 391,997 in 1990. The percentage female also increased, from 24.8 to 34.6 percent (see also Sundström, 1987).

The number of occupation-by-rank units observed each year ranged from 256 to 345. The number of occupations themselves, when one does not take into account the rank within the occupations, varied between 49 and 71. Table 5 lists the occupations for the year 1990. The data presented here cover only white-collar workers, in 1990 about 392,000 employees. But in addition these organizations in 1990 also employed about 612,000 blue-collar workers. Employment in the organizations studied is thus about one million workers, roughly 24.5 percent of all employees in Sweden and 41.2 percent of employees in the private sector of the Swedish labor market.<sup>9</sup>

[Table 5 about here]

Over time there was a striking widening of the opportunity structure at both ends of the occupational ranks. The percentage of occupations where the lowest rank (1) is available increased from 18.0 to 43.1 percent between 1970 and 1990. At the other end, the percentage of occupations where the highest rank (7) is available increased from 42.6 to 52.9 percent between 1970 and 1990. These changes in lowest and highest ranks available are a result of both changes within existing occupations and the addition of new occupations. For example, of the 36 occupations common to 1970 and 1990, five had a higher maximum rank in 1990 than 1970, while the remaining 31 had the same maximum rank in both years. Most of the occupations offer long career ladders with many ranks available. In 1970-1975, 80 percent of the occupations had four or more ranks available; from 1978 on, 94-98 percent of the occupations had four or more and 59 percent had as many as 6 or 7 ranks available.

## 5. The Glass Ceiling: Distribution of men and women on ranks

We now document the distribution of men and women on occupational rank and how it has changed over time. Table 6 shows that the mean rank for men remained constant over the 20-

year period, at slightly under 4. The mean rank for women increased every year throughout the period, from about 2 in 1970 to about 3 in 1990. This is an increase of an entire rank, on a scale where the lowest and highest ranks are 1 and 7. Thus the initial overall gap of about two ranks, or women at half the rank of men, has been closed by one rank. In 1990, women on average were only one rank below men.

[Table 6 about here]

The distribution on rank shows several noteworthy patterns. There is a concentration of women in the lower ranks and a relative lack of women in the top ranks. Over time, the percentage of the women who are in the lower ranks has declined strongly, but they are still decidedly overrepresented. At the two top ranks the representation of women is negligible, but has increased. In 1970, there were hardly any women in those ranks. For each woman in rank 6 there were about 150 men, and for each woman in rank 7 there were about 700 men. In 1990, the situation had improved: At rank 6, for each woman there were about 20 men; at rank 7, for each woman there were about 40 men. In 1990, the probability of being in rank 6 was about 10 times higher for men than women, and in rank 7 an entire 25 times higher for men. The table thus gives clear evidence of a glass ceiling.

## 6. The Pipelines: Why are there so few women at top ranks?

We turn here to the questions discussed in Section 2. That women on average are placed lower than men may be due to several factors other than employer discrimination, including differences in educational backgrounds, age, seniority, hours worked, and part-time status. We explore the effects of some of these factors by presenting descriptive statistics separately by age, part-time status, hours and education. We compare the characteristics of employees in all jobs with those in the highest ranked jobs. These statistics suggest that part of the explanation for the glass ceiling may be that so few women acquire the qualifications needed for the top jobs. The next section elaborates these results, presenting multivariate analyses with rank as the dependent variable.

### *6.1 : Pipeline 1 Problem: Few Women with the Relevant Experience and Age*

The first pipeline problem is the unequal domestic division of labor in the home. One of its manifestations is that women often withdraw from careers for shorter or longer periods. In our data, this may show up as lower average age for women than men at each occupational rank, as some proportion of the older women withdraw from careers as they progress through the occupational system and have children. So for employees in say rank 4, the vast majority of men remain employed, but some proportion of the women withdraw to take care of children, then potentially being replaced with younger women.

Focusing on the average age by rank, here only referring to the numbers, not presenting the table, it increases with occupational rank for both sexes, in all years (with two minor exceptions). Furthermore, for men and women average age is more similar at the lower than higher ranks. At the highest ranks 6 and 7, the average age is 2-7 years lower for women throughout the entire period (except for 1970). In 1990 the average age at rank 7 was 44 for women and 49 for men.

This sex difference in age by rank may reflect a number of factors. Perhaps it is due to younger women on average being somewhat better educated than older women. To the extent that organizations want women in positions of leadership, they would need to appoint those who are younger than their male counterparts in order find women with the right educational qualifications. It can also reflect the increasing labor-force participation rates for women, as the pool of younger women from which to draw leaders is much larger than the pool of older women. In 1970, the average age was 41 for men, 33 for women. 38 percent of the men were 35 or younger, while an entire 62 percent of the women were. By 1990, the age gap had dropped dramatically: the average age was 42 for men, 39 for women, and 30 percent of men were 35 or younger, while 39 percent of women were. Between 1970 and 1990, the average age thus increased 1.5 years for men, and 6.5 years for women. This increase in female age documents the increased attachment of women to the labor force, not only did they enter it, they also to a large degree stayed in it.

In, summary, treating age as a proxy for experience, it is clear that as one moves up the career ladder, the experience gap between men and women increases. In the higher occupational ranks, employers will face relatively smaller pools of females with long experience from whom to recruit into even higher positions.



### *6.2 Pipeline 1 Problem: Part-time status, Hours Worked*

Another manifestation of the unequal division of labor in the home should be higher rates of part-time employment among women and fewer hours worked. Table 7 shows that the percent full-time employed increases with occupational rank. At the highest occupational rank, only 0-10 percent of women and 0-3 percent of men worked part time. This pattern is the same throughout the period (1970 is excluded from the description, because for that year no reliable information on part-time status was available). At the two lowest ranks 1 and 2, 40 to 50 percent of women worked part time, while only 0-5 percent of men did so.

[Table 7 about here]

What is then the sex composition of full-time employees, the potential recruitment pools for managerial positions. The last line in Table 7 shows that 27.0 percent of all women worked part time in 1975. During the 1980s the figure rose dramatically to 40.0 percent, and in 1990 it was 32.0 percent. Very few men worked part time; less than half a percent in 1975 to about 3.0 percent in 1980–1990. At each level women work part-time more often than men. Reduced hours at work may result in lower access to top positions.

Another way to look at work input is to study the hours worked instead of only distinguishing between part-time and full-time status. The number of hours worked is much higher at the top ranks than at lower ones. On average, with no distinction between ranks, we find that women work fewer hours than men. In 1990 men worked on average 39.1 hours per week and women 35.5 hours; in 1975 men worked 39 hours while women worked 33.2.

Without presenting the table it is nevertheless striking that at the lower ranks women on average work many fewer hours than men; at ranks 1-3 roughly 4-5 hours less per week. In contrast, at the two top ranks 6 and 7, men and women work at about the same number of hours per week, in each of the six years. This shows that to the extent women succeed in reaching the top levels, they put in as much work effort as the men, but at lower ranks they put in fewer hours. Fewer hours probably diminishes their chances of being promoted to higher ranks. We have not investigated whether the women who made it to ranks

6 and 7 worked as many hours as the men before the promotion, but it is a good guess that they did.

In Section 2 we discussed how decreased discrimination from employers, and the realization among men and women that this has occurred, could lead to a decline in the percent of women working part time. Instead we see that the percent of women who worked part time increased between 1975 and 1985. Broader institutional factors offer likely explanations. Part-time work was made more universally available in Sweden and Scandinavia during this period. At the same time, combining family and work was made easier through an increase in the provision of childcare. These two processes may have helped to recruit women into the labor force who previously would have elected not to work. With increased availability of part-time employment and expanded childcare, they chose to enter the labor force. The net effect is higher rates of part-time employment. In Sweden part-time work has been supply-driven and a majority of the women working part-time do so because it suits them best (Båvner 2001; Sundström 1983, 1999).

### *6.3: Pipeline 2 Problem: Education*

Education is a central determinant for allocation of employees to various positions, including higher ranks within professions and management. We have access to information on both the level and type of education. For many of the employees, especially at lower occupational ranks, there is no information on education mainly because they worked in positions and establishments where educational type and level were not relevant, in which case the establishments did not provide the information.

Educational level itself is rarely central for explaining success in reaching managerial ranks. It is the type that matters. University degrees in medieval literature and accounting may well yield the same level of education but they qualify the holder for very different careers. It is probably rare for employers to be primarily interested in the number of years spent in school. Instead they may demand specific qualifications in well-defined fields such as computer science, engineering, accounting, business administration, and law.<sup>10</sup> This may especially be the case for entry-level jobs, when applicants are recently out of school, and it will definitely be the case for core tasks within an organization. But the subsequent experience an employee can expect to acquire depends strongly on the initial placement,

which in turn is determined in large measure by educational qualifications. For recruitment to higher positions, the experience acquired becomes crucial. Psychologists are not put to building bridges and classicists are not given complex programming jobs. And even though one's specific educational background may be of limited relevance in higher managerial positions, as these rarely involve operational activities, the relevant prior experience in operations and core organizational areas may be crucial. The ascent of general managers, often with MBA degrees, who presumably can manage anything, does not make those with specific experience superfluous.

Table 8 gives a distribution on type of education, first for all employees and then for those in ranks 6 and 7, with special focus on some of the most important higher educational groups from which managers were drawn: higher education in the social sciences, including economics, business, and law, and technical fields such as engineering. For both men and women information on education was missing for about 50% of employees. As mentioned above these are mostly employees with low levels of education or people working in establishments and occupations where education is of little consequence for the tasks performed. This is also borne out by the fact that among those in ranks 6 and 7, the percentage with missing education lies between 16.6 and 23.3 rather than between 52.5 and 62.6, as among all employees. Education is important and usually high for managers, therefore fewer of them have missing education data.

[Table 8]

The largest group, aside from those for whom education level was not available, is in the technical fields, such as engineering and civil engineering. But more important, the percent of employees from one of those fields is remarkably high in the top ranks. Among employees in ranks 6 and 7, for the years 1970 and 1990, respectively 36.0% and 31.6% had backgrounds in engineering or civil engineering, while only 8.4% and 7.7% had backgrounds in lower level business or civil economics. In 1990, combining all technical fields, 53.5% of the employees in ranks 6 and 7 were drawn from these, whereas only 25.9% of all employees had educations in those fields. Engineering and technical educations were very important job requirements for managerial careers in Sweden in the period considered.

Table 9 gives the distribution of men and women on the types of education and the percent female in each type of education. We see here the concentration of women with education in the social sciences, law, and administration and their relative absence in technical fields. In 1970, for each female engineer there were about 99 men, and for each female civil engineer there were about 82 men. In 1990, the corresponding numbers were 42 and 8, a tremendous improvement but still a very uneven distribution. Consider the situation for employers in 1990: for each potential female employee with an engineering background there will be 42 men. The gender segregation in higher education in technical fields is extreme. These are precisely the fields from which many managers were drawn. In business, economics, and social science fields, the situation has improved markedly over the 20-year period. For example, in 1970, for each female civil economist there were 20 men, whereas in 1990 there were only 2.

[Table 9 about here]

One may therefore conjecture that a principal reason for the lack of women in upper management is their choice of education. We have yet to investigate the joint operation of age, part-time status, hours worked, educational level, and type of education for the discrepancies between men and women in occupational rank. Women and men may achieve an equal distribution on educational types, but the women may on average be younger, which in turn typically will yield a lower placement in organizational hierarchies.

## 7. Discrimination, Life Cycle, or Cohort Effects?

In the preceding section we looked at the relationship between rank and each of four variables, age, part-time status, hours worked, and educational attainment. We found clear differences between men and women on those dimensions. In this section we explore the impact of the differences, asking the question: Do men and women with similar attributes, such as education, age, part-time status, and hours worked, occupy the same ranks? We perform a multivariate analysis of rank on age, hours worked, part-time status, and education. The estimated impact of sex on the rank occupied can be interpreted as the average difference in rank between men and women with the same age, part-time status, hours worked, and

education.<sup>11</sup> Beyond reporting the regression coefficients we here also address some conceptually more complex goals, which can be difficult to keep distinct. A brief explanation is in order.

In part we investigate aspects of the pipeline problem: (1) How the gender gap varies with educational choice and specialization, and (2) how the gender gap, in the cross-section, varies with age, whether the gap is bigger in child-rearing years than before or after?

In part we investigate whether there is evidence of employer discrimination and changing employer discrimination over time: (3) whether the gender gap disappears once controls have been made for education, part-time status, hours worked, and occupation; (4) how the gender gap varies with birth cohort, holding age constant, exploring whether there is evidence of decreased discrimination over time; and (5) how the gender gap, for a given birth cohort, evolves with age, exploring a pipeline 1 problem, the impact of the unequal distribution of work in the family, but now investigated over the life cycle of a cohort rather than across age groups in the cross section as in (2).

The objectives in (2), (4), and (5) are thus interrelated. In the cross-section, the gender gap may increase with age, as has been widely documented for wages, and as explored for rank in (2). This may be due to discrimination. But it may also be due to cohort differences, where older women entered the labor market in less hospitable periods, and continue to suffer the disadvantages they faced at career entry. This then is explored in (4). But then, within each cohort, with its given set of disadvantages at the time of career entry, there may be a specific pattern by age as it grows older, where the pattern may reflect discrimination, resulting in an increasing gap, or it may reflect life-cycle adaptations to family circumstances with an increasing gap in at least ages 30-50. This we explore in (5).

### *7.1 Overall Gender Effects*

The results are given in Table 10. The first column within each year, denoted “Short”, gives the gender effect when we control for educational level, part-time status, and hours worked, for all ages in the first line; in the consecutive lines the gender effect is estimated separately by age group. The second column, denoted “Full”, also takes into account that men and women may be in different occupations.

[Table 10 about here]

Focus on the results in the first line. In each year the gender effect is smaller when one controls for occupation, the short versus the full regressions. Without control for occupation, the gender effect in 1970 was  $-.927$ , that is, women were on average placed almost one rank below that of comparable men, but then the effect declined every year, except in 1975, to a difference in ranks of  $-.703$  in 1990. Adding the control for occupation, the gender effect in 1990 was  $-.589$ , women were on average placed half a rank below men. Taking into account the variables in the regression equations reduces the differences in rank between men and women. In 1970 the variables age, hours worked and education explain about a third of the average difference of 1.5 ranks found in Table 6: Had women and men had the same distributions on age, part time status, hours worked, and education, the difference in ranks would in 1970 be reduced from 1.5 to 1. In 1990, the average difference in ranks between men and women was 1. When the variables are taken into account, this difference gets reduced to about  $.703$  or even to  $.589$  of a rank, with controls for occupation. So age, part-time status, hours worked, and education reduce the difference in ranks by about 30-40 percent, not by as much as in 1970, but still by a considerable amount, in particular when one keeps in mind that in 1990 there was a smaller difference to reduce in the first place. Controlling additionally for occupation reduces the rank gap another 30-40%.

### *7.2 Pipeline Problem 2: Gender Effects in Three Educational Groups*

Table 11 further explores further the relationships between rank and sex within each of three educational fields, degrees in economics and business administration, in technical fields such as engineering, and in the social sciences and law. These three broad educational fields are important in management. Within each year, the first column gives the effect of being female on the rank reached, controlling for the same variables as in Table 10. The second column adds dummy variables for the occupation. Within each broad educational field, the first line gives the gender effect when all age groups are considered at the same time. The following lines give the gender effects separately by age group. The analysis has been restricted to those aged 25 and older, as most of the employees with these educations are older.

[Table 11 about here]

When we focus on more homogeneous educational groups it is clear that the effect of being female is smaller. Those with technical backgrounds provide the single most important educational group among managers, in 1990 supplying 53.5 percent of employees in ranks 6 and 7. The gender effect on rank in this group, controlling for occupation, was very low: in the  $-.3$  to  $-.4$  range in the 1970-1980 period, dropped to  $-.277$  in 1985, and finally to  $-.199$  in 1990. These coefficients were all significantly different from zero at the  $.05$  level, but by 1990 the size was negligible. On a scale from 1 to 7, the average difference in ranks between men and women was a fifth of a rank. It is still a difference but a small one.

Among those with backgrounds in economics and business administration, the gender effect also declined over the years, with some exceptions, to a level of  $-.352$  in 1990, when occupation is taken into account. This is also a small difference of a third of a rank.

In 1990, the gender effect was largest among employees with higher education in social science and law but it was still not very large, less than  $-.5$  or half a rank. (It was surprisingly low in 1970, for reasons unknown to us.) One may speculate that the gender effect is smaller in technical fields because job tasks are easier to measure and performance is evaluated in a less subjective way, less vulnerable to management impression and self-presentation.

In summary, when we study educational groups that are somewhat homogeneous and that are important for recruitment of managers, the gender effect on rank becomes much smaller. And that has been the case over the entire period. With a more equal distribution of men and women on these educational categories, women's representation in managerial ranks would also have been much closer to parity with men.

This demonstrates the role of sex segregation in educational choice. Had women had the same distribution on education as men, the sex gap in rank would, presumably, have been close to zero.

### *7.3: Pipeline Problem 1: Gender effects by Age Group*

Family obligations are often cited as one reason for the relative lack of women in management. Women with the right kinds of education and experience either do not put in the

required effort in order to be promoted or are reluctant to take a promotion if offered one, because they invest a large effort in the family sphere. Our data provide no information on family obligations, but there is nevertheless a way to approach this difficulty. As women progress in their careers and also in age, they also generally acquire more family responsibilities, especially because of young children. This fact may lead to a higher total effort across work and home, but a decrease in the amount put in at work. In turn, this may have a negative effect on career progression or at least put women at a disadvantage relative to men. The difference in job investment will show up as higher gaps as age increases, especially at ages 35 and up, the age groups where the pressure from children among highly educated women becomes strong at the same time as men's careers tend to take off.

In the regression analysis depicted in Table 10 separate effects of being female were therefore estimated for several age groups defined by five-year intervals. The results are quite straightforward. The gap is very small for the younger age groups but then increases. Controlling for occupation, the estimated differences are about a tenth of a rank for those 20-24 years old and a fifth for those 25-29 years, but then doubles to two-fifths of a rank among those 30-34 years old. This jump probably reflects the increased family obligations in those age groups. Then at higher ages, the gap no longer increases with age, probably reflecting the fact that family obligations do not become more burdensome or even taper off. In both the short and full regression the gender effects peak in four of six years in the age groups 45-49 and 50-54, reaching an average difference of about a whole rank. Some permanent damage was thus done to women's careers at ages 35-50, from which it was hard to recover fully.

For the three education groups considered in Table 11, the gender effects are considerably smaller in the younger age groups. For example, in technical fields in 1990, it is less than a tenth of a rank among those 35 and younger, and only a fifth of a rank among those 36-40 years old. The pattern is similar among those in economics and business, as well as among those in the social sciences and law, but with slightly bigger gender effects. The gender effect peaks at different ages across the years and educational fields. In technical fields it peaks at ages 46-50, where after it declines.



#### *7.4 Discussion: Discrimination, Lifecycle, and Cohort Interpretations?*

How are the results in Tables 10 and 11 to be interpreted? There are several possibilities. A first interpretation is that employers systematically discriminate: when women reach a certain age and a career stage they also reach a career plateau beyond which they do not rise. Under this interpretation there should be a widening of the gender gap with age. This is the glass-ceiling hypothesis.

A *second* interpretation, stemming from the pipeline 1 problem discussed earlier, is that life-cycle effects are operating. Women with the right kinds of education and experiences either do not put in the required effort to be promoted or are reluctant to take a promotion if offered one. The reason for refusing promotion might be the larger effort they invest in the family sphere, the area where an unequal division of labor persists. As women progress in their careers and also in age, they on average acquire more family responsibilities. If they decrease the effort put into work, they are likely to be at a disadvantage relative to men. This will again show up as higher gaps as age increases, especially in the early and late 30s. According to this argument, we should expect to find a widening of the gap in the age groups 30 to 50. Above age 50 the gap should decrease slightly, as many of these women can increase their work effort and perhaps partially recoup some of what they lost earlier. Under this interpretation the gap should increase with age, then flatten out, and perhaps subsequently decline.

A *third* interpretation is that we here see the operation of reduced discrimination over time, which shows up as distinct cohort effects. Older women entered the labor market during periods with more sex discrimination. Those women were then placed at lower ranks within their chosen occupation and workplace. They could also have experienced more limited opportunities for choosing occupations and firms. Initial placement, especially in occupation and firm, may have long-lasting effects. And this may be the case even though more opportunities opened up for women over the 20-year period. Having been denied the opportunity early in their career to run in a race that lasts for many years, women might find it difficult to reenter at a later stage, and it is too late to start over again. Thus the pattern of gender effects that we observe in the cross-section may reflect the differences that existed when an age group entered the labor market.

Under this interpretation, there should in the cross-section be an increase in the gap with age but within a given birth cohort the gap should remain more or less constant as its members get older. This pattern would then reflect diminished discrimination over time. Such a trend could also be reinforced by differential adaptations to anticipated discrimination, where the younger cohorts to a larger degree make more investment in education and work than older cohorts because they observed the decline in discrimination and hence the increased rewards to such investments.

These three interpretations---discrimination, life-cycle, and cohort effects---may all hold to some degree. To explore these, we need to report the age pattern for sex differences separately by birth cohort rather than for each cross-section as in Tables 10 and 11. At the top of Table 12, which is a rearrangement of Table 10, eleven birth cohorts are distinguished, from the birth cohort 1910-1914, who were 56-60 years old in 1970, to the birth cohort 1960-1964, who were 21-25 years old in 1985. Then in each column, for each cohort, we report the gender effect for each five-year interval from 1970 to 1990, dropping the 'off-year' 1978 from the table. This shows the evolution of the sex differential in a given cohort as its members get older. For some cohorts we get only two points of data, because they were either too young or too old to contribute more data points in the period covered, whereas we can follow other cohorts over the entire 20-year period.

[Table 12 about here]

Within a given year, say 1980, we see the clear pattern of gender effects by age in the cross-section, as already shown in Table 10: The gap increases with age, from a quarter of a rank to slightly above one and a quarter. Within cohorts, in contrast, as one reads down a column across five-year intervals, the gap stays relatively constant as a cohort grows older. But there are very big differences between cohorts. This empirical finding points to the cohort interpretation of the age effect on the gender rank gap, a pattern that probably stems from reduced discrimination over time. For most of the cohorts there is a slight increase in the gap in the early part of the career, but then a comparable slight decrease in the later part. This additional pattern, occurring within the broader pattern of large cohort effects, is consistent with a life-cycle interpretation. We see a variation in impact of age consistent with

variations in family obligations. But the cohort effects on the sex gap are more substantial than the within-cohort effects of age.

In Figure 1 we visually present the patterns in Table 12. The year 1970 is dropped, as it deviates from later years for reasons not known to us. We see the clear flat pattern of the gap in rank as a cohort grows older, in both the short and full regressions. We also see the marked cohort differences, with much larger gaps in older cohorts. This is exactly the same pattern shown for U.S. engineers by Morgan (1998, Figure 1).

[Figure 1 about here]

In conclusion, there is no question that there are very strong cohort effects. The year of birth had a strong effect on how women did relative to men, and this impact remains more or less constant over the life cycle. This is strong evidence for a decline in the extent of discrimination over the period. To distinguish between discrimination and the life-cycle effects is perhaps difficult. On balance, however, to the extent that there are effects in addition to those of cohort, the life-cycle effects seem to be prevalent. This is so because within a cohort the gender effects by age seem to follow a U-shape pattern, initially increasing slightly, whereafter a comparable slight decrease sets in. Such a pattern is what one would expect if adaptation to family circumstances is more important in female than male careers.

These considerations are essential to concerns about the glass ceiling. For further elaboration, we therefore present in Table 13 the same compilation of numbers for the three educational subfields, assembled from Table 11. Also here there are strong cohort effects. We see precisely the same pattern of age effects within a cohort. A plausible interpretation is again that the older cohorts entered more hostile labor markets, and the effects remain with them. Another is that the older cohorts of women differed in certain attributes such as experience and/or lifestyle, perhaps devoting more time to family relative to paid labor than women in younger cohorts do.

[Table 13 about here]

Beyond initial placement in occupation and firms, which certainly affects subsequent attainment, what can account for the fact that the older women remained so disadvantaged throughout their careers even as the labor market became friendlier to women? We can only speculate. One possible reason is that the promotion decisions for these women were made mostly by older men who grew up in labor-market environments hostile to women. Perhaps these men continued to act according to norms thought perfectly legitimate 20–30 years ago. Each generation may have its own set of norms and worldviews. And when the older employees tend to make many of the important decisions about younger employees, those decisions easily come to reflect the values the older employees were socialized into.

## 8. Conclusions and Discussion

### *Summary*

Starting with data from the U.S. in the 1980s, we report that there are few women at the top ranks in the professions and management, both in absolute terms and relative to women's numerical presence in organizations. In a case study of a large visible U.S. firm from the same period, we find that this glass ceiling is not due to differential promotion rates. Men and women are promoted at about the same rate. It is due rather to a "frozen pipeline" of qualified female candidates. There were very few women with both the education and experience required for reaching the top positions in the firm. For each woman with 21 years or more seniority in the company, there were 27 men.

We argued that Sweden provides an important test case for investigating the issues in connection with the glass ceiling, primarily due to its extensive family policies, with generous and universal provision of child care, leave policies, and more, which may facilitate combining family and career and thus aid women in achieving professional success. We thus turned to an investigation of the glass ceiling in Sweden, using data for a 21-year period 1970–1990.

We find that there is a glass ceiling also in Sweden: there are very few women in the top two ranks within organizations, in absolute terms and relative to women's numerical presence in the organizations. Over the last 20 years, however, the position of women has improved markedly relative to men. More women are in the next-to-top ranks within their chosen occupations.

There are several sources of this glass ceiling, stemming not only from potential employer discrimination, but also from at least three distinct pipeline problems.

As for employer discrimination, its existence and magnitude is difficult to assess. What is however clear, is that it has declined sharply over the 21-year period 1970-1990: on a ladder with 7 ranks, the gender gap dropped from an average of 2 to 1 rank, with even smaller gaps after controlling for relevant personal-level characteristics.

Looking at the evolution of the gap in rank by following birth cohorts over time gives even more striking results. In the cross-section, when investigating the gender gap in rank separately by age group, there is a consistent increase in gap with age. This could, as it often is, be interpreted as being due to employer discrimination: at a certain age and career stage, women reach a glass ceiling beyond which they cannot progress, whereas male careers continue to improve. However, when seen from the viewpoint of a birth cohort, as each cohort progresses in age, the gender gap in rank remains fairly stable. There are however large differences between birth cohorts. The gap is much smaller, at each given age, among younger cohorts. Those who were 50 years old in 1990 experienced a clearly lower gap than those who were 50 in 1970. This then points to diminished discrimination over time as each cohort enters the labor market. The finding is consistent with a cohort interpretation of the glass ceiling (see Morgan 1998): the time of entry into the labor market matters more than specific barriers that arise during a career.

As for pipeline problems, the glass ceiling clearly results in large part from the different educational choices of men and women. In the Swedish case, managers in the manufacturing firms that dominate its economy are recruited from a limited cluster of educational backgrounds, mostly technical fields such as engineering and to a lesser degree economics and business administration. Women still lack strong presence in these fields. As late as 1990 among the white-collar employees studied here, for each female civil engineer there were eight men and for each female MBA there were two men. Those numbers were dramatically more skewed in earlier years.<sup>12</sup> Within each of three broad educational fields, the gender gap in rank is quite small, especially in the important technical fields, which includes engineering, with a gap of less than a fifth of a rank in 1990. It is thus not disparate treatment of men and women within a given educational field that is the principal problem, but rather the unequal distribution of men and women on fields. Had this distribution been equal, the

gender gap in rank would also have dropped strongly, with 80% to about a fifth of a rank among the important group of engineers and civil engineers.

Another pipeline problem comes from the domestic division of labor, which results in women accumulating less experience due to career withdrawals and high rates of part-time work, both limiting their likelihood of future promotion. In the top two ranks, the average age is considerably lower for women than men, by 5-7 years, indicating that employers face pools of women who on average have less experience than men, but also that employers perhaps are willing to appoint to top positions women who are younger than men.

There is some suggestive evidence in our analysis of the impact of the domestic division of labor. It shows up in the age pattern of the gender gap in rank. As summarized above, within each birth cohort, there is a small increase in the gender gap as one goes from ages 20-25 to ages 30-50. But then, above age 50, when many women are able to increase their labor force participation again, the gap stabilizes and sometimes even declines. Family obligations, which may peak at ages 30-50, make their impact felt through more part-time work, fewer hours, and more withdrawals from careers (see, e.g., Shauman and Xie 1996).

The obvious conclusion is that the scarcity of women in the higher ranks results in large part from the dearth of women with appropriate educational backgrounds, full-time status, age and experience. They were not necessarily selected out by men higher up, but in large measure selected themselves out through educational choices and work adaptations made at earlier stages.

### *Declining Significance of Gender and the Future of the Glass Ceiling*

Is there then evidence for a declining significance of gender? To this question our data speak unambiguously. There is in Sweden a very clear declining effect of being female on the average rank reached over the 21-year period. Even more important, when we follow birth cohorts, the gap stays relatively constant with age. But the gap is much smaller, at each given age, among younger cohorts. As new cohorts enter the labor market, there is a gradual closing of the gap. There is no question that the significance of gender has declined.

For forecasting trends, it is significant that the data reveal large cohort effects, with smaller gaps in more recent birth cohorts. This is likely to continue. The role of potential employer discrimination will in all likelihood decline further.

Along with reduced employer discrimination, some pipeline problems will also be alleviated. Extending current trends, gender parity in years of education is about to occur, whereas gender segregation on educational field still is a problem. Men will probably continue to increase their share of household tasks. But high divorce rates, where women tend to get child custody, will counteract such changes. Family-friendly policies may or may not help dismantle the glass ceiling. The highly unequal wage distribution in the U.S. is certainly an advantage for professionals and especially for female professionals. In part it gives incentives for being professionally successful, in part it gives resources to outsource many domestic tasks. Women in the Scandinavian countries in this regard face larger obstacles.

The important role of women's choices in explaining the gender gap in rank calls for more attention to the factors that influence those choices. As Breen and García-Peñalosa (2002) emphasize, women's choices may be made in anticipation of future discrimination in a male-dominated labor market. They posit that even high-ability women may choose education, occupation, and hours worked based on the expectation that they will be the primary care takers of their families, as their mothers and grandmothers were.

Policies aimed at easing women's participation in the labor market can, as already mentioned, have mixed effects. Breen and García-Peñalosa point out the paradoxical empirical fact that even though the Swedish and other Scandinavian welfare states have tried to make the combination of parenting and labor market participation possible for both men and women, occupational sex segregation is still higher in Sweden than many other Western countries (see Meyersson Milgrom et al 2001; Breen and García-Peñalosa 2002 Table 1, p. 901). Alleviating the gender gap in rank may thus not solely be a matter of letting time pass and letting younger cohorts enter managerial ranks. Childcare and maternity-leave policies that make part- and reduced-time employment more attractive, especially for women, are helpful for the women affected but may nevertheless contribute to the glass ceiling, because women who choose reduced hours typically disqualify themselves from the highest ranked jobs.

As long as women bear the primary burden of home and family, a gender gap in rank is likely to persist. The top jobs in industry are largely filled by people who invest heavily in their careers, and such investments are diminished by home care responsibilities. If

this analysis is correct, then while the gender rank gap has already grown smaller, it is unlikely to disappear as long as women bear a disproportionate share of home care obligations. Differences in educational choice have the same effects. As our analysis showed, within homogenous educational groups, the gender gap in rank has practically vanished in Sweden, but with sex segregation in education a gap will persist.

In light of the results from Sweden, it seems clear that the family-friendly policies of recent years may not overcome the effects of the domestic division of labor (and indeed may possibly exacerbate them). Different measures are needed to break the glass ceiling.



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## End Notes

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<sup>1</sup> See, e.g., Meyersson Milgrom et al. (2001), Meyersson et al (1997b), Petersen et al. (1997), Petersen and Morgan (1995). One unusually careful study has challenged this conclusion (Bayard, Hellerstein, and Neumark 2003), claiming that the within-job wage gap is of the order 10-15 percent. The study does however use less ideal data. Hourly wages are imputed from annual earnings, and reported weeks and usual hours worked per week, possibly from several different jobs held at same and different times during the year. The earnings data pertain to the year prior to the measures of occupation and establishment, 1989 versus 1990.

<sup>2</sup> See, e.g., Morrison and van Glinow (1990), U.S. Department of Labor (1991), Due (1991), Davidson and Cooper (1992), Drage and Solberg (1995). According to “A Report on the Glass Ceiling Initiative” (U.S. Department of Labor 1991, p. 6). “Minorities and women have made significant gains at the entry level of employment into the first levels of management. Yet, they have not experienced similar gains into the mid- and senior levels of management notwithstanding increased experience, credentials, overall qualifications, and a greater attachment to the work force.”

<sup>3</sup> For Sweden specifically, the main focus of the present study, see the empirical studies by Albrecht, Edin and Vroman (2003), Blomquist (1994) Hultin (1996) and Jonung (1996), as well as the summaries of some current knowledge and what needs to be done in SOU (1998). See also the early and perceptive discussion concerning conditions in the 1920-1930s in Kock (1938, especially, pp. 443-444).

<sup>4</sup> A large-scale international comparison, which includes Norway and Sweden and several other countries, is found in Wright et al. (1995), elaborated in Wright (1997, chap. 12), and also summarized by Birkelund (1995). Wright et al. (1995) describe the broad patterns of cross-national variations in gender inequality at the higher levels of organizations.

<sup>5</sup> Although attained education levels for young men and women are about the same today there are still large differences in choices of education types (Jonsson, 1997a). Jonsson (1997b) shows how segregation in education choices in Sweden decreased from early cohort to later ones in (Figure 1.2, p. 20).

<sup>6</sup> Despite the fact that productivity in household tasks has increased, household hours have not changed over the last 100 years in Sweden. A household spends between 50 and 57 hours per week on household work. The composition of household tasks has changed (see Nyberg 1989). Having both parents working full time in addition to 50 hours of household work creates problems for men and women whether they are both career-oriented or not. For a discussion see Henrekson (1998). For a discussion of time-use and the division of labor see also Kitterød (1995).

<sup>7</sup> Among all managerial, administrative, and professional employees, entrants and existing ones, the annual promotion rate over the 1978-1986 period is fairly stable, ranging from 15.9 to 20.4 percent. It appears not to be affected by

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fluctuations in departures and net growth. The departure rate hovers around 4-7 percent, reaching an entire 8.5 percent in 1981. The net growth rate in employment is mostly between 5-7 percent, but reached 13.5 percent in 1980 and a low of -0.3 percent in 1986.

<sup>8</sup> The BNT code was developed first in 1955 and has been revised several times since (SOU 1993, p. 204 and Svenska Arbetsgivareföreningen 1982). Its main purpose was to aid in the collection of wage statistics. It was initially not intended for setting wages for jobs and individuals. The system of BNT codes is not very different from the salary grade level structure in use in many large U.S. organizations. A salary grade level indicates the level of responsibility and qualifications of the incumbent in the position, but without there being a strong tie between the grade level and the actual salary itself, though a clear correlation exists (Spilerman 1986).

<sup>9</sup> In 1990, there were 4.5 million economically active persons in Sweden; 4.1 million of them were employees, with 2.4 in the private sector and 1.7 million in the public sector.

<sup>10</sup> In studies of job advertisements in newspapers confirm this conjecture. When employers advertise jobs, they typically demand quite specific qualifications - not only engineers, but more specifically chemical engineers. Even different kinds of economic education have their separate niches (see Larsen, 1995).

<sup>11</sup> We also did a subset of these analyses using an ordered probit model. The substantive results were similar. The interpretation of quantities in that model is cumbersome and it requires presentation of considerably more information with no obvious gain in insight.

<sup>12</sup> A study of U.S. engineers in the period 1982-1989 found very small gender earnings differences of 1 to 4 percent among younger cohorts who graduated in 1972-1989 (Morgan 1998). The differences stayed constant or became smaller over the seven-year period, even 13-16 years after graduation. Vangsnes (1992) reports similar small differences among engineers 40 years or younger in Norway.



TABLE 1

Distribution of Occupation-Establishment Pairs That Are Segregated (Men Only and Women Only) and Integrated, By Occupation, By Occupation and Rank, and Overall for Professional and Administrative Employees, PATC Data (1981)

Occupation		By Rank in Occupation-Establishment Pair									
		Occ-Est	O-R-E	I	II	III	IV	V	VI	VII	VIII
	1	2	3	4	5	6	7	8	9	10	11
Accountants	M	45.4	59.9	33.3	41.8	59.5	73.5	82.9	91.9		
	F	4.4	9.7	21.6	15.2	8.8	4.0	3.5	1.5		
	I	50.2	30.4	45.2	42.9	31.7	22.5	13.7	6.7		
	N	(1633)	(4342)	(575)	(787)	(1317)	(979)	(549)	(135)		
Chief Accountants	M	97.5	83.4	97.8	95.9	98.9	44.7				
	F	2.1	16.3	2.2	2.7	1.1	55.3				
	I	0.4	0.4	0.0	1.4	0.0	0.0				
	N	(237)	(283)	(46)	(74)	(87)	(76)				
Aiditors	M	42.5	55.0	34.7	41.3	56.1	77.4				
	F	4.9	10.2	16.1	14.9	9.3	3.7				
	I	52.7	34.8	49.2	43.8	34.6	18.9				
	N	(391)	(844)	(118)	(208)	(301)	(217)				
Public Accountant	M	6.1	22.7	12.5	16.3	22.9	42.5				
	F	0.0	0.5	0.0	0.0	0.0	2.5				
	I	93.9	76.8	87.5	83.7	77.1	55.0				
	N	(49)	(185)	(48)	(49)	(48)	(40)				
Attorneys	M	52.6	68.4	45.0	51.7	67.1	77.9	88.4	92.2		
	F	3.4	7.2	15.3	15.6	6.6	1.8	0.7	0.0		
	I	44.0	24.5	39.6	32.7	26.4	20.3	10.9	7.8		
	N	(416)	(993)	(111)	(205)	(258)	(217)	(138)	(64)		
Chemists	M	52.2	66.2	39.3	44.6	66.0	71.0	79.2	86.5	93.3	
	F	2.2	4.8	18.9	9.9	3.3	2.6	0.5	0.0	0.0	
	I	45.5	29.0	41.8	45.5	30.7	26.4	20.3	13.5	6.7	
	N	(404)	(1262)	(122)	(202)	(303)	(269)	(202)	(104)	(60)	
Engineers	M	65.4	80.4	59.5	63.9	76.3	84.5	88.5	91.4	94.3	99.3
	F	0.2	0.5	2.2	0.9	0.5	0.2	0.0	0.0	0.0	0.7
	I	34.4	19.2	38.3	35.2	23.3	15.3	11.5	8.6	5.7	0.7
	N	(1249)	(5252)	(501)	(659)	(1045)	(1091)	(904)	(579)	(332)	(141)
Job Analysts	M	23.2	33.0	19.2	15.4	28.4	57.5				
	F	40.8	48.6	65.4	75.8	53.2	15.1				
	I	36.0	18.4	15.4	8.8	18.4	27.4				
	N	(250)	(364)	(26)	(91)	(141)	(106)				
Directors of Personnel	M	86.8	87.3	78.8	83.4	94.2	93.8				
	F	10.9	11.0	17.5	14.3	5.1	6.3				
	I	2.3	1.8	3.8	2.3	0.7	0.0				
	N	(433)	(456)	(80)	(175)	(137)	(64)				
Buyers	M	50.1	61.9	36.7	57.0	74.2	85.3				
	F	9.4	14.1	40.6	14.7	2.4	1.1				
	I	40.5	24.0	22.7	28.3	23.3	13.7				
	N	(1354)	(2452)	(458)	(932)	(784)	(278)				
All Occupations	M	54.6	67.6	43.9	53.3	67.2	77.3	85.7	90.9	94.1	99.3
	F	6.2	7.8	19.8	13.1	6.3	3.8	1.2	0.2	0.0	0.7
	I	39.2	24.6	36.4	33.6	26.5	18.9	13.1	8.8	5.9	0.0
	N	(6416)	(16433)	(2085)	(3382)	(4421)	(3337)	(1793)	(882)	(392)	(141)

*Note:* For description of data see Section 2 and U.S. Department of Labor (1981a). For description of procedures see Section 3. Column 1 gives the three segregation statuses for each occupation, where 'M' stands for male only, 'F' for female only, 'I' for integrated, and 'N' gives the number of occupation-establishment or occupation-rank-establishment pairs for which the statistics is computed. Column 2 gives, separately by occupation, the percentages of the establishments that in the given occupation, not taking into account the rank of employees within an occupation, employ only men ('M'), employ only women ('F'), and employ both men and women ('I'). Here, an occupation-establishment pair is integrated when there is at least one woman and one man in the pair, even though they may be employed at different ranks in the pair. Columns 3–10 give the same percentages for occupation-by-rank-establishment pairs, first across all ranks (col. 3, denoted 'O-R-E') and second separately for each rank (cols. 4–11) within an occupation. The bottom of the table, denoted 'All Occupations', gives the corresponding percentages across the ten occupations.

TABLE 2  
Estimates of the Effect of Sex on the Promotion Rate Within the Organization

	1	2	3	4	5	6	7	8
Male (=1)	-.158 (.038)	-.081 (.036)	-.066* (.037)	-.053* (.037)	-.014* (.038)	-.009* (.037)	.116 (.055)	.114 (.052)
Level×Male <sup>a</sup>								
2							-.311* (.219)	-.127* (.086)
3							-.072* (.088)	-.237 (.108)
4							-.212 (.111)	-.551 (.156)
5							-.523 (.158)	-.631 (.226)
6+							-.646 (.230)	-.741 (.243)

\*Not significantly different from zero at the five-percentage level (two-tailed tests).

*Note:* For description of data and results see section III. In the analyses we include only employees who entered the organization in 1978–1986 in managerial, administrative, and professional positions. The hazard-rate models predict promotions within the organization. In column 1 the exponential model is used, while in columns 2–8 the proportional hazards version of the log-logistic model is used (see Petersen 1995, Sect. 7). The role of seniority in predicting promotions is taken into account as a time-dependent covariate, updated every 12 months. The explanatory variables are as follows. In column 1, only sex and a constant term enter. Column 2 adds, to the variables in column 1, education (as four dummy variables), age (as one continuous variable), and seniority (as one continuous variable). Column 3 adds, to the variables in column 2, occupational group (five dummy variables). Column 4 adds, to the variables in column 3, the job level at hire (one continuous variable). Column 5 adds, to the variables in column 3, the current job level (as five dummy variables), but does not include as in column 4 the job level at hire. Column 6 adds, to the variables in column 3, both the job level at hire and the current level. Column 7 adds, to the variables in column 5, interaction terms between the currently occupied job level and sex, thus excluding the job level at hire. Column 8 adds, to the variables in column 6, the same interaction terms as in column 7, thus including also the job level at hire. Except for the variables sex and job level at hire, all variables may change over time.

<sup>a</sup>This gives, in columns 7 and 8, the interaction term between sex and the currently occupied job level. The reference group is job level 1, captured by the main effect of sex in line 1, with estimates of .116 and .114. The top group is job level 6 and higher, denoted ‘6+’, capturing the differential effect of being female in job level 6 and above.

TABLE 3

Estimates of the Effect of Sex (Male=1) on the Job Level Among Full-Time Employees at Time of Hire (Seniority=0), Separately for Each of Seven Age Groups  
(Estimated Standard Errors in Parentheses)

Age Group	1	2	3
18-24	-.024*(.026)	-.017*(.026)	.000*(.026)
25-29	.195 (.058)	.225 (.054)	.200 (.056)
30-34	.340 (.107)	.391 (.104)	.271 (.102)
35-39	.876 (.183)	.883 (.178)	.795 (.179)
40-44	1.515 (.356)	1.635 (.346)	1.518 (.364)
45-49	1.746 (.640)	2.260 (.585)	2.296 (.623)
50+	1.986 (.699)	1.568 (.662)	1.406 (.862)

\*Not significantly different from zero at the five-percentage level (two-tailed tests).

†Significantly different from zero at the ten-percent but not at the five-percentage level (two-tailed tests).

*Note:* For description of data see section III. The dependent variable in the three regression equations in columns 1-3 is the job level at time of hire (i.e., seniority 0 years). Each regression is estimated using ordinary least squares. An ordinary probit analysis yielded for all practical purposes the same substantive results. The regression in column 1, contains in addition to the sex effect (Male=1) and the interaction terms between sex and the six dummy variables for age, a constant term, main effects for age (six dummy variables), and the effects of hire year (as eight dummy variables). The reference group for age is 18-24 years old at time of hire. In line 1 of column 1 the number -.024 means that among 18-24 years old, men on average are hired at a job level of about a fortieth below that of women, that is, at the same level. In line 4, for age 35-39, the number .876 means that among those 35-39 years old, men are hired at almost a full job level above women. The next two regressions sequentially add more variables. The regression in column 2 adds, to those in column 1, variables for education group (four dummy variables). The regression in column 3 adds, to those in column 2, variables for occupational group (five dummy variables).

TABLE 4

Distribution (Percentages) of Managerial, Administrative, and Professional Employees on Job Level, By Seniority and Gender. All Such Employees Present in 1986

Seniority	Sex	Job Level						Sum	N
		1	2-3	4-5	6-8	9-10	11-13		
0-4	Men	19.1	60.5	15.9	3.7	0.5	0.4	100.0	1,312
	Women	36.8	51.7	9.9	1.4	0.2	0.0	100.0	573
5-8	Men	11.6	47.5	33.6	6.5	0.8	0.1	100.0	1,064
	Women	33.0	40.8	20.5	4.9	0.8	0.0	100.0	370
9-10	Men	6.6	37.8	39.0	12.0	2.9	1.7	100.0	241
	Women	35.0	45.0	13.3	5.0	1.7	0.0	100.0	60
11-15	Men	9.6	45.7	29.3	12.4	2.5	0.6	100.1	670
	Women	35.9	42.3	18.3	2.1	1.4	0.0	100.0	142
16-20	Men	7.0	44.8	30.7	14.4	2.7	0.5	100.0	848
	Women	40.7	46.5	11.6	1.2	0.0	0.0	100.0	86
21-25	Men	6.7	52.4	27.8	10.4	2.2	0.5	100.0	822
	Women	32.4	51.4	13.5	2.7	0.0	0.0	100.0	37
26-30	Men	7.6	48.9	28.0	13.2	0.9	1.4	100.0	536
	Women	18.7	49.2	24.6	6.4	1.1	0.0	100.0	18
31-35	Men	6.8	44.0	32.1	14.8	1.0	1.3	100.0	293
	Women	18.7	49.2	24.6	6.4	1.1	0.0	100.0	8
36+	Men	7.5	39.0	39.0	15.8	5.0	3.7	100.0	241
	Women	62.5	37.5	0.0	0.0	0.0	0.0	100.0	8

*Note:* For description of data see section III. For discussion of results see section VIII. Not all the percentages sum to 100.0 due to rounding errors. The job-level structure among managerial, administrative, and professional employees goes from level 1 (low) to 13. The table pertains to everyone present in managerial, administrative, and professional positions in 1986, irrespective of when they entered the organization. There were 7,329 such employees in 1986, 1,302 women and 6,027 men. The table also includes employees internally promoted to managerial, administrative, and professional positions, for example, from blue-collar jobs.

TABLE 5 Distribution of Employees on Occupations, Percent Women, and Distribution on Rank Within Occupation, in 1990. Sweden.

Occupation	On Rank Within Occupation (1-7)									
	Overall	%W	1	2	3	4	5	6	7	
	1	2	3	4	5	6	7	8	9	10
ADMINISTRATIVE WORK										
01 General analytical work	0.7	33.8	0.3	6.1	14.1	26.3	34.99	16.35	1.9	100.0
02 Secretarial work	5.8	99.1	4.1	29.5	46.0	18.8	1.5	0.1		100.0
03 Administrative efficiency improvement and devel.	0.2	21.6	1.0	11.8	37.3	38.2	10.9	0.9		100.0
04 Applied data processing, systems anal. and progr.	3.7	20.5		1.4	12.4	41.2	36.3	7.8	0.9	100.0
05 Applied data processing operation	1.1	35.5	3.4	19.5	42.9	26.1	6.8	1.2	0.1	100.0
06 Key punching	0.7	96.0	14.1	73.6	10.7	1.4				100.0
PRODUCTION MANAGEMENT										
07 Administration of local plants and branches	0.3	2.7				26.2	40.4	23.0	10.4	100.0
08 Management of production, transp. and mainten.	2.9	2.2			8.8	31.9	38.1	17.0	4.1	100.0
09 Work supervision within production, repairs, etc.	7.5	5.8		4.6	47.3	43.6	4.2	0.3		100.0
10 Work supervision within building and construction	3.0	2.0		11.7	35.7	39.4	13.1	0.3		100.0
11 Administration, prod., superv. in forestry etc.	0.3	3.4			27.4	59.0	9.9	3.5	0.2	100.0
RESEARCH AND DEVELOPMENT										
12 Mathematical work and calculation methodology	0.5	10.6	0.2	6.6	14.0	32.0	37.1	9.3	0.8	100.0
13 Laboratory work	3.8	36.2	0.7	7.5	21.8	33.5	26.5	8.7	1.3	100.0
CONSTRUCTION AND DESIGN										
14 Mechanical and electrical design engineering	7.6	9.5	0.4	3.3	14.0	43.1	31.8	7.4	1.0	100.0
15 Construction and construction programming	2.5	16.0		7.5	23.7	33.6	25.9	6.9	1.0	100.0
16 Architectural work	0.9	39.4		6.8	16.6	35.6	31.8	8.8	0.4	100.0
17 Design, drawing and decoration	0.3	49.5		16.4	38.2	33.7	10.9	0.7		100.0
18 Photography	0.1	26.0		13.2	36.4	43.0	7.4			100.0
19 Sound technology	0.0	3.8		11.5	46.2	34.6	7.7			100.0
TECHNICAL METHODOLOGY, PLANNING, CONTROL, SERVICE AND INDUSTRIAL PREVENTIVE HEALTH CARE										
20 Production engineering	2.3	8.7		7.0	16.2	50.7	22.4	3.5	0.3	100.0
21 Production planning	2.0	23.1	0.7	9.6	34.2	40.9	11.8	2.7	0.2	100.0
22 Traffic and transportation planning	1.5	43.7	1.2	39.5	38.8	14.9	4.9	0.6		100.0
23 Quality control	1.6	9.2	0.3	7.3	26.6	38.9	20.9	5.4	0.6	100.0
24 Technical service	3.3	2.6		8.1	36.1	38.5	14.4	2.5	0.3	100.0
25 Industrial preventive health care	0.5	11.2		13.1	20.9	33.4	27.0	5.4	0.2	100.0
COMMUNICATION, LIBRARY, AND ARCHIVAL WORK										
26 Information work	0.3	49.7			13.9	41.8	33.3	9.8	1.1	100.0
27 Editorial work, publishing	0.2	60.1		5.9	26.0	33.9	27.9	6.1	0.2	100.0
28 Editorial work, technical information	0.2	23.8			13.9	50.2	31.9	3.9	0.1	100.0
29 Library, archives and documentation	0.2	69.4	3.3	18.3	35.9	26.3	13.3	2.8		100.0
PERSONNEL WORK										
30 Personnel service	2.2	69.4	0.9	15.9	37.5	23.7	13.8	6.7	1.5	100.0
31 Planning of education, training and teaching	1.0	50.8		11.3	31.0	40.2	14.4	2.8	0.3	100.0
32 Medical care within industries	0.7	88.3		1.4	12.8	80.4	5.3			100.0
GENERAL SERVICES										
33 Restaurant work	0.2	79.4		54.0	31.3	14.7				100.0
BUSINESS AND TRADE										
34 Marketing and sales	15.5	19.9	0.9	11.7	30.8	34.0	16.5	5.2	0.8	100.0
35 Sales within stores and department stores	0.6	38.4			46.8	40.1	10.8	2.3		100.0
36 Travel agency work	0.9	77.6		28.8	57.2	11.1	2.9			100.0
37 Sales at exhibitions, spare part depots, etc	0.4	38.3	6.1	72.7	16.3	4.8				100.0
38 Customer service	0.0	76.1	3.7	46.0	36.2	12.9	0.6	0.6		100.0
39 Tender calculation	0.7	12.6		6.9	33.9	41.0	16.2	2.0		100.0
40 Order processing	2.2	61.7		29.0	43.6	21.5	5.3	0.6		100.0
41 Internal processing of customer requests	0.0	25.0			25.0	37.5	12.5	25.0		100.0
42 Advertising	0.4	50.8		8.9	24.3	40.8	22.9	2.9	0.2	100.0
43 Buying	2.7	38.1	0.5	16.0	28.0	34.1	17.0	4.0	0.5	100.0
44 Management of inventory and sales	2.2	16.9	8.1	40.0	35.4	12.1	3.5	0.8		100.0
45 Shipping and freight services	2.1	52.3	2.4	31.6	39.9	18.8	6.2	1.1		100.0
FINANCIAL WORK AND OFFICE SERVICES										
46 Financial administration	10.3	70.3	2.9	25.0	36.6	19.9	10.8	4.0	0.8	100.0
47 Management of housing and real estate	0.3	29.3	2.4	19.8	33.7	25.7	13.7	4.7		100.0
48 Auditing	0.7	47.2		27.2	28.6	23.1	18.1	2.8	0.2	100.0
49 Telephone work	1.4	99.3	3.4	57.2	38.5	0.9				100.0
50 Office services	1.6	55.7	23.0	55.7	14.8	4.9	1.4	0.2		100.0
51 Chauffeuring	0.0	4.3		100.0						100.0
ALL	100.0	34.6	1.6	15.7	30.5	31.4	15.8	4.3	0.7	100.0

(Continuation of Table 5 [Note to Table 5])

*Note:* For description of data and procedures see Section 3. The first column, denoted ‘Overall’, gives the distribution of employees on the 51 occupational groups. In column 1, four occupations are listed as having 0.0% of the employees. This occurred when less than 0.05% of the employees were in an occupation, namely in sound technology (no. 19), customer services (no. 38), internal processing of customer requests (no. 41), and chauffeuring (no. 51), with 26, 163, 8, and 161 employees respectively. The second column, denoted ‘%W’, gives the percent of the employees in the occupation who are women. Columns 3–9 give separately for each occupation the distribution of employees within the occupation on rank. Column 10 gives the sum of the percentages in columns 2–8. The rank variable goes from a low of 1 to a high of 7, indicating roughly the level of difficulty of the position within the broader occupational group. The empty cells in the table correspond to cases where the specific combination of occupation-by-rank does not exist. The last line in the table gives in column 1 the sum of the percentages for the 51 occupations in column 1, column 2 gives the percent of all employees who are women, while columns 3–9 give the distribution of all employees on rank, regardless of their occupation.

TABLE 6  
Distribution (Percentages) on Rank By Year and Sex and Percent Women in Each Rank

Rank	1970			1975			1978			1980			1985			1990		
	M	F	%F	M	F	%F	M	F	%F	M	F	%F	M	F	%F	M	F	%F
1	2.39	38.24	84.05	1.72	21.80	83.39	1.52	16.33	82.16	1.31	13.28	81.94	0.91	6.73	78.30	0.64	3.52	74.34
2	14.28	34.97	44.63	10.90	46.51	62.84	9.68	46.32	67.29	8.97	44.94	69.09	7.46	39.74	72.13	6.88	32.33	71.29
3	34.74	19.58	15.64	31.69	23.02	22.35	30.25	26.61	27.44	29.29	29.09	30.71	27.02	35.45	38.93	25.81	39.50	44.72
4	28.99	6.10	6.48	33.72	7.25	7.85	35.14	8.91	9.83	35.58	10.46	11.60	37.02	14.55	16.03	37.89	19.16	21.01
5	13.48	1.00	2.38	15.50	1.28	3.17	16.63	1.66	4.11	17.75	1.99	4.77	20.14	3.12	7.01	21.61	4.82	10.56
6	4.93	0.11	0.71	5.27	0.13	0.99	5.60	0.17	1.29	5.89	0.23	1.69	6.31	0.39	2.88	6.18	0.63	5.08
7	1.20	0.01	0.15	1.20	0.00	0.16	1.17	0.01	0.26	1.22	0.01	0.31	1.14	0.02	0.98	0.97	0.04	2.35
Sum	100.01	100.01		100.00	99.99		99.99	100.01		100.01	100.00		100.00	100.00		99.98	100.00	
Average	3.56	1.97	24.76	3.71	2.20	28.38	3.77	2.34	30.07	3.82	2.44	30.85	3.92	2.69	32.70	3.95	2.91	34.59

Note: The first column within each year gives the distribution of men on the ranks, while the second column gives the distribution of the women on the ranks. The third column within each year gives the percent of employees in the given rank that were female. The last line gives, for the two first columns within each year, the average rank for men and women respectively in that year. The third column, in the last line, gives the percentage of employees in that year who were women. In the table, 'M' and 'F' stand for male and female respectively.

TABLE 7  
Percent Working Part-time By Year, Sex, and Rank. Sweden

Rank	1975		1978		1980		1985		1990	
	M	F	M	F	M	F	M	F	M	F
	1	2	3	4	5	6	7	8	9	10
1	2.0	31.4	5.4	41.5	7.4	45.8	7.5	46.1	6.6	38.6
2	0.7	29.4	3.6	40.0	4.9	45.0	4.9	44.9	4.5	37.6
3	0.3	23.1	1.9	32.5	3.3	37.7	2.9	37.7	3.2	32.3
4	0.3	19.2	1.7	27.2	3.0	31.9	2.7	30.7	2.9	25.7
5	0.3	13.3	1.5	17.3	2.9	22.2	2.6	21.4	3.0	19.5
6	0.2	7.4	1.4	13.8	2.5	12.3	3.1	14.0	2.9	8.8
7	0.2	0.0	1.5	0.0	3.1	10.0	3.3	0.0	3.0	3.3
Total	0.4	27.4	2.0	36.7	3.3	41.1	3.0	39.5	3.1	32.2

Note: There are no statistics for 1970 in this table because the part-time data were deemed to be unreliable for that year. In the table, 'M' and 'F' stand for male and female respectively.



TABLE 8  
Distribution (Percentages) of Employees on Type of Education, for All Employees (All) and for Those in Ranks 6-7 (Top), By Year, Sweden

Type of Education	1970		1975		1978		1980		1985		1990	
	All	Top	All	Top	All	Top	All	Top	All	Top	All	Top
Missing	1	2	3	4	5	6	7	8	9	10	11	12
Basic	62.6	19.8	54.9	16.6	55.0	17.0	54.1	16.8	52.7	19.7	52.5	23.3
Humanities, etc.	4.9	2.1	7.3	2.4	7.1	2.2	7.2	2.4	7.3	2.5	7.0	2.9
Pedagogical	0.2	0.4	0.3	0.4	0.3	0.4	0.2	0.3	0.3	0.4	0.3	0.3
Social Sciences, Law, etc.	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.2	0.1	0.2	0.1	0.2
Miscellaneous fields	5.9	7.2	8.0	6.8	8.5	6.5	8.8	6.4	9.2	5.7	9.5	5.2
Business, lower level	0.7	2.9	0.9	3.6	0.9	3.5	0.9	3.3	0.8	2.7	0.7	2.2
Civil economists	0.6	5.5	0.8	5.5	0.8	5.6	0.9	5.7	1.3	5.8	1.5	5.5
Law, Soc. Sc., BA, MA	0.3	1.5	0.9	2.6	0.9	3.1	0.9	3.5	0.9	3.9	0.8	3.9
Law, Soc. Sc., Lic., PhD	0.0	0.1	0.0	0.1	0.0	0.2	0.0	0.1	0.0	0.2	0.0	0.2
Technical Fields												
Miscellaneous fields	11.5	18.1	13.1	19.3	13.0	18.9	13.3	18.4	14.4	17.2	15.6	16.8
Engineer	9.8	16.9	9.0	15.5	8.1	14.5	7.6	14.0	6.0	11.8	4.4	8.8
Civil Engineer	2.4	19.2	3.1	20.1	3.4	21.3	3.8	21.3	4.6	22.3	5.1	22.6
Nat. Sc., BA, MA	0.2	0.6	0.4	0.8	0.4	0.8	0.5	1.2	0.5	1.6	0.5	2.0
Nat. Sc., Lic., PhD	0.2	2.4	0.2	2.9	0.2	3.0	0.3	3.1	0.3	3.2	0.3	3.3
Transport	0.1	0.1	0.2	0.3	0.2	0.3	0.2	0.4	0.2	0.2	0.1	0.2
Health	0.2	1.5	0.2	0.9	0.3	0.9	0.3	0.9	0.6	1.0	0.8	1.3
Agriculture etc.	0.2	1.3	0.4	1.4	0.4	1.4	0.5	1.5	0.5	1.1	0.4	0.8
Service	0.2	0.3	0.3	0.6	0.2	0.5	0.2	0.7	0.2	0.6	0.2	0.6
Unclassifiable	0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.2	0.0	0.2	0.1
Sum	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Note: In the table, 'All' stands for all employees and 'Top' for employees in ranks 6-7. Within each year, the first column gives the distribution of all employees on the type of education while the second column gives the distribution of employees in ranks 6-7 on the type of education.

TABLE 9

Distribution (Percentages) of Men and Women on Types of Educations and Percent Women in Each Type of Education By Year. Sweden.

Type of Education	1970			1975			1978			1980			1985			1990		
	M	F	%F	M	F	%F	M	F	%F	M	F	%F	M	F	%F	M	F	%F
Missing	57.7	77.5	30.7	49.4	68.7	35.6	49.7	67.5	36.9	48.7	66.2	37.7	48.0	62.5	38.8	48.6	60.0	39.5
Basic	4.0	7.6	38.8	5.9	11.0	42.7	5.4	10.9	46.3	5.6	10.9	46.7	5.6	10.9	48.9	5.3	10.3	50.4
Humanities, etc.	0.1	0.3	38.0	0.2	0.5	49.6	0.2	0.5	51.0	0.2	0.4	55.5	0.2	0.5	58.8	0.1	0.5	65.6
Pedagogical	0.1	0.1	23.1	0.1	0.1	27.6	0.1	0.1	26.0	0.1	0.1	23.2	0.1	0.1	34.0	0.1	0.1	36.2
Social Sciences, Law, etc.																		
Miscellaneous fields	4.0	11.4	48.4	5.0	15.3	54.7	5.2	16.1	57.3	5.2	16.8	49.1	4.9	18.0	64.1	4.8	18.3	67.0
Business, lower level	1.0	0.1	3.8	1.2	0.2	6.8	1.2	0.3	9.4	1.2	0.3	11.4	1.0	0.5	18.4	0.8	0.5	26.7
Civil economists	0.7	0.1	4.7	1.0	0.2	6.8	1.1	0.2	8.7	1.2	0.3	10.7	1.5	0.8	20.3	1.6	1.3	30.2
Law, Soc. Sc., BA, MA	0.4	0.1	8.7	1.0	0.5	14.9	1.1	0.5	15.8	1.1	0.5	16.3	1.1	0.6	21.7	0.9	0.6	26.8
Law, Soc. Sc., Lic., PhD	0.0	0.0	14.3	0.0	0.0	17.4	0.0	0.0	18.3	0.0	0.0	13.6	0.0	0.0	14.0	0.0	0.0	18.2
Technical Fields																		
Miscellaneous fields	14.8	1.5	3.1	17.6	1.7	3.6	17.8	1.8	4.2	18.4	1.9	4.5	20.2	2.5	5.6	22.0	3.5	7.7
Engineer	12.9	0.4	1.0	12.4	0.4	1.1	11.5	0.3	1.3	10.9	0.3	1.4	8.8	0.3	1.8	6.5	0.3	2.3
Civil Engineer	3.1	0.1	1.2	4.2	0.3	2.6	4.7	0.5	4.0	5.3	0.7	5.2	6.4	1.1	7.4	6.9	1.7	11.5
Nat. Sc., BA, MA	0.2	0.2	19.3	0.4	0.3	20.8	0.5	0.3	20.5	0.5	0.4	22.2	0.6	0.4	25.3	0.6	0.4	29.2
Nat. Sc., Lic., PhD	0.2	0.0	2.8	0.3	0.0	3.0	0.3	0.0	3.7	0.4	0.0	5.4	0.4	0.1	7.6	0.4	0.1	10.6
Transport	0.1	0.0	11.2	0.2	0.1	7.8	0.3	0.1	8.1	0.2	0.1	8.5	0.2	0.0	8.8	0.2	0.0	10.1
Health	0.2	0.4	46.3	0.1	0.5	66.5	0.1	0.6	67.2	0.1	0.7	70.5	0.2	1.5	79.0	0.3	1.8	79.5
Agriculture etc.	0.3	0.0	1.7	0.5	0.0	1.7	0.6	0.0	2.3	0.7	0.1	4.4	0.7	0.1	6.9	0.5	0.2	15.2
Service	0.2	0.1	15.7	0.3	0.1	13.6	0.3	0.1	18.1	0.3	0.1	18.9	0.2	0.2	24.4	0.2	0.2	31.9
Unclassifiable	0.1	0.1	22.4	0.1	0.2	36.3	0.1	0.1	39.1	0.1	0.1	39.0	0.2	0.2	30.9	0.2	0.2	36.6
Sum	100.0	100.0	24.8	100.0	100.0	28.4	100.0	100.0	30.1	100.0	100.0	30.9	100.0	100.0	32.7	100.0	100.0	34.6

Note: The first column within each year gives the distribution of men on the types of education, while the second column gives the distribution of the women on the types of education. The third column within each year gives the percent of employees in the given type of education that were female. The third column, in the last line, gives the percentage of employees in that year who were women. In the table, 'M' and 'F' stand for male and female respectively.

TABLE 10  
Effect of Being Female on Rank from Short and Full Regressions. For All Ages and Separately By Age Group. By Year. Sweden

Age group	1970		1975		1978		1980		1985		1990	
	Short	Full	Short	Full	Short	Full	Short	Full	Short	Full	Short	Full
	1	2	3	4	5	6	7	8	9	10	11	12
All ages	-.927	-.468	-.953	-.862	-.926	-.830	-.892	-.798	-.810	-.706	-.703	-.589
20-25	-.539	-.111	-.506	-.434	-.441	-.367	-.264	-.209	-.308	-.216	-.176	-.101
26-30	-.599	-.180	-.625	-.556	-.520	-.450	-.448	-.388	-.387	-.314	-.299	-.227
31-35	-.952	-.471	-.860	-.771	-.753	-.674	-.707	-.639	-.609	-.541	-.488	-.412
36-40	-1.249	-.719	-1.172	-1.066	-1.045	-.948	-.977	-.886	-.820	-.742	-.689	-.614
41-45	-1.395	-.831	-1.312	-1.195	-1.225	-1.120	-1.197	-1.096	-.983	-.890	-.838	-.744
46-50	-1.368	-.839	-1.385	-1.264	-1.320	-1.206	-1.283	-1.185	-1.112	-.999	-.960	-.844
51-55	-1.485	-.905	-1.354	-1.247	-1.315	-1.205	-1.294	-1.180	-1.153	-1.054	-1.032	-.905
56-60	-1.349	-.830	-1.339	-1.227	-1.324	-1.221	-1.262	-1.161	-1.108	-1.051	-1.023	-.907
61+	-1.139	-.783	-1.270	-1.164	-1.231	-1.126	-1.303	-1.195	-1.157	-1.045	-1.072	-.937

All coefficients are significantly different from zero at better than the 1 percent level, in fact all of them better than at the 0.1 percent level.

*Note:* Those younger than 20 are excluded from the analysis. There were just very few of them and they can legitimately be considered as yet not having started a career among the white-collar workers. In the table, 'Short' and 'Full' stand for short and full regressions respectively. The short regression includes the variables: sex, dummy variables for age (nine age groups), part-time status (except in 1970); hours worked, and level of education (1-7). The full regression adds dummy variables for occupation to those variables. In the first line, for 'All ages', a common sex effect is estimated for all age groups and age itself is controlled by a set of dummy variables. In the regressions by age group, separate age effects are estimated for each age group. In these, the effects of the other variables in the regression equations do not vary across age groups, thus not including interaction terms between age group and the other variables.

TABLE 11  
Effect of Being Female on Rank from Short and Full Regressions. For All Age Groups and Separately By Age Group. By Type of Education. By Year. Sweden.

Type of Education	1970		1975		1978		1980		1985		1990	
	Short	Full	Short	Full	Short	Full	Short	Full	Short	Full	Short	Full
Social Sciences, Law, etc.												
All ages	-0.318	-0.142*	-0.524	-0.380	-0.535	-0.440	-0.582	-0.502	-0.506	-0.446	-0.510	-0.452
26-30	-0.114*	-0.005*	-0.464	-0.296	-0.387	-0.226	-0.231	-0.168*	-0.003*	-0.003*	0.003*	-0.001*
31-35	-0.321*	-0.408	-0.447	-0.335	-0.426	-0.353	-0.564	-0.521	-0.241	-0.284	-0.103*	-0.103*
36-40	-1.266	-0.727	-0.885	-0.885	-0.883	-0.825	-0.606	-0.520	-0.594	-0.534	-0.416	-0.422
41-45	-0.867	-0.598*	-1.172	-0.928	-0.924	-0.830	-1.004	-0.851	-0.530	-0.485	-0.606	-0.552
46-50	-0.691*	-0.406*	-1.701	-1.488	-1.142	-1.054	-0.885	-0.814	-1.018	-0.832	-0.590	-0.534
51-55	-0.247*	0.096*	-0.784*	-0.402*	-0.829	-0.347	-1.873	-1.241	-0.918	-0.842	-1.109	-0.902
56-60	0.288*	0.329*	-0.834	-0.622*	-1.265	-0.824	-1.669	-1.315	-1.760	-1.172	-0.903	-0.824
61+ <sup>a</sup>	0.705*	0.916*					-0.588*	-0.402*	-1.521	-1.289	-2.275	-1.738
Economics, Bus. Ad., etc.												
All ages	-0.787	-0.432	-0.775	-0.693	-0.617	-0.586	-0.614	-0.562	-0.534	-0.463	-0.426	-0.352
26-30	-0.536	-0.270	-0.437	-0.320	-0.260	-0.211	-0.265	-0.165	-0.175	-0.126	-0.040*	-0.010*
31-35	-0.899	-0.420	-0.676	-0.636	-0.536	-0.500	-0.466	-0.447	-0.433	-0.352	-0.322	-0.254
36-40	-1.088	-0.593	-1.204	-1.182	-0.867	-0.847	-0.831	-0.773	-0.636	-0.577	-0.567	-0.485
41-45	-0.989	-0.605	-1.297	-1.205	-0.968	-0.986	-0.984	-0.963	-0.939	-0.886	-0.714	-0.638
46-50	-1.098	-0.770	-0.897	-0.743	-1.150	-1.075	-1.161	-1.136	-0.905	-0.788	-0.833	-0.720
51-55	-0.750	-0.425*	-0.767	-0.761	-0.734	-0.734	-0.856	-0.757	-0.957	-0.908	-0.893	-0.773
56-60	-0.674	-0.249*	-1.273	-1.184	-0.801	-0.824	-0.845	-0.816	-1.099	-0.905	-0.989	-0.912
61+	0.535*	0.053*	-1.480	-1.185	-1.082	-0.957	-0.915	-0.835	-0.804	-0.732	-0.827	-0.690
Technical Fields												
All ages	-0.462	-0.356	-0.418	-0.386	-0.381	-0.358	-0.325	-0.310	-0.303	-0.277	-0.212	-0.199
26-30	-0.143	-0.109*	-0.225	-0.218	-0.134	-0.136	-0.003*	-0.002*	-0.005*	-0.004*	-0.003*	-0.002*
31-35	-0.530	-0.402	-0.413	-0.386	-0.316	-0.296	-0.301	-0.296	-0.149	-0.136	-0.101	-0.100
36-40	-0.541	-0.478	-0.602	-0.549	-0.487	-0.466	-0.405	-0.387	-0.416	-0.398	-0.232	-0.228
41-45	-0.937	-0.791	-0.692	-0.645	-0.660	-0.606	-0.661	-0.635	-0.480	-0.443	-0.427	-0.410
46-50	-1.012	-0.791	-0.955	-0.892	-1.047	-0.969	-0.965	-0.919	-0.695	-0.635	-0.443	-0.430
51-55	-0.757	-0.550	-0.892	-0.775	-0.721	-0.672	-0.872	-0.809	-0.848	-0.763	-0.541	-0.514
56-60	-0.927	-0.538	-0.501	-0.412	-0.802	-0.742	-0.658	-0.613	-0.775	-0.732	-0.720	-0.689
61+	0.379*	0.526*	0.516*	0.488*	-0.346*	-0.276*	-0.537	-0.438	-0.765	-0.703	-0.483	-0.402

\*Not significantly different from zero at the 5 percent level. The other coefficients are, and in the vast majority of cases even at the 0.1 percent level.

Note: Those younger than 25 are excluded from the analysis. There were just very few of them and they can legitimately be considered as yet not having started a career among the white-collar workers, given the kinds of educational fields they are in. In the table, 'Short' and 'Full' stand for short and full regressions respectively. The short regression includes the variables: sex, dummy variables for age (eight age groups), part-time status (except in 1970), hours worked, and type of education within educational field. The full regression adds dummy variables for occupation to those variables. In the first line, for 'All ages', a common sex effect is estimated for all age groups and age itself is controlled by a set of dummy variables. In the regressions by age group, separate age effects are estimated for each age group. In these, the effects of the other variables in the regression equations do not vary across age groups, thus not including interaction terms between age group and the other variables.

<sup>a</sup> Among employees in the Social Sciences, Law etc. there were in 1975 and 1978 not a sufficient number of women aged 61 and above to allow estimation of the sex effect for that age group.

TABLE 12  
 Effect of Being Female on Rank from Short and Full Regressions. Separately by Birth Cohort for Each Year  
 Subsequent to 1970. Sweden.

Year	Birth Cohort										
	1910	1915	1920	1925	1930	1935	1940	1945	1950	1955	1960
	-1914	-1919	-1924	-1929	-1934	-1939	-1944	-1949	-1955	-1959	-1964
	1	2	3	4	5	6	7	8	9	10	11
1970	Short	-1.349	-1.485	-1.368	-1.395	-1.249	-0.952	-0.599	-0.539		
1975		-1.270	-1.339	-1.354	-1.385	-1.312	-1.172	-0.860	-0.625	-0.506	
1980		-1.303	-1.262	-1.294	-1.283	-1.197	-0.977	-0.707	-0.418	-0.264	
1985			-1.157	-1.168	-1.153	-1.112	-0.983	-0.820	-0.609	-0.387	-0.308
1990				-1.072	-1.023	-1.032	-0.960	-0.838	-0.689	-0.488	-0.299
1970	Full	-0.830	-0.905	-0.839	-0.831	-0.719	-0.471	-0.180	-0.111		
1975		-1.164	-1.227	-1.247	-1.264	-1.195	-1.066	-0.771	-0.556	-0.434	
1980			-1.195	-1.161	-1.180	-1.185	-1.096	-0.886	-0.639	-0.388	-0.209
1985				-1.045	-1.051	-1.054	-0.999	-0.890	-0.742	-0.541	-0.314
1990				-0.937	-0.907	-0.905	-0.844	-0.744	-0.614	-0.412	-0.227

All coefficients are significantly different from zero at better than the 1 percent level, in fact all of them better than at the 0.1 percent level.

*Note:* These numbers are all taken from Table 10. They have here been reorganized so that in each column we follow a given birth cohort as they get older with five years from one period to the next, where periods are defined by 1970, 1975, 1980, 1985, 1990. In the case of 1910-1914 cohort we follow them from 1970 to 1975 when they were 56-60 and 61+ years old. In the case of the 1940-1944 cohort we follow them every five years for the entire 20-year period, from 1970 to 1990 when they in 1970 were 26-30 and in 1990 were 46-50 years old.

TABLE 13  
Effect of Being Female on Rank from Short and Full Regressions. Separately by Birth Cohort for Each Year  
Subsequent to 1970. By Type of Education. Sweden.

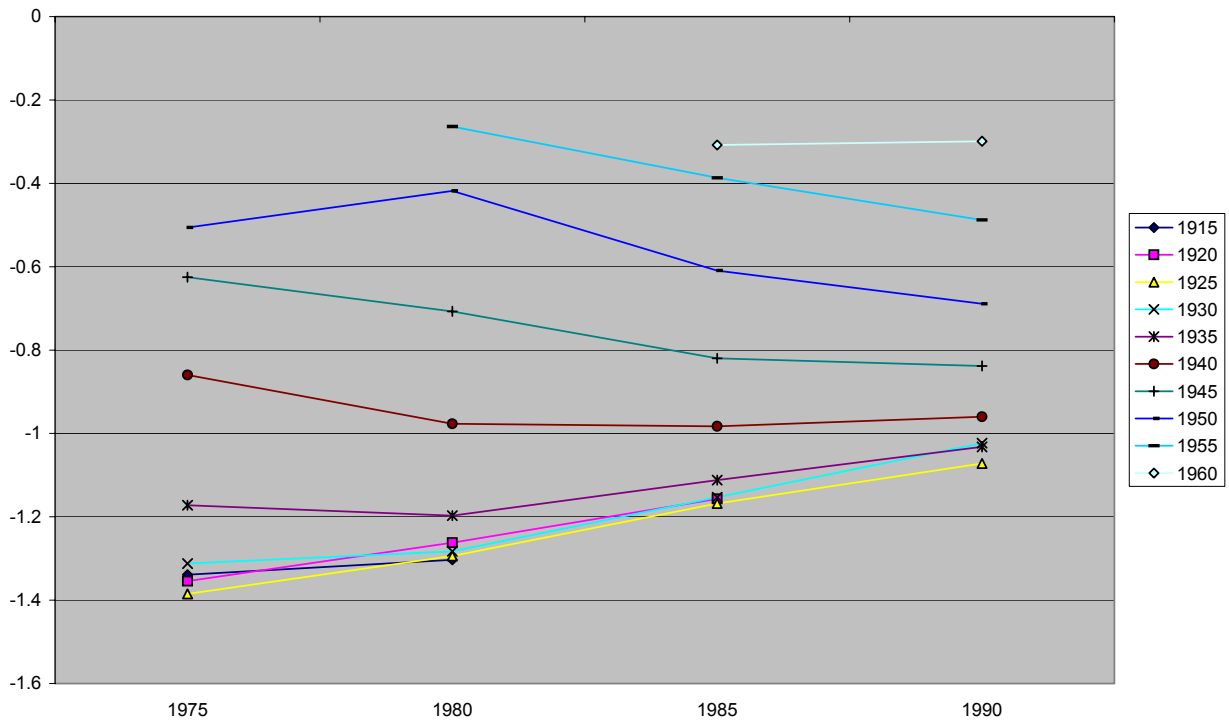
Year		Birth Cohort										
		1910	1915	1920	1925	1930	1935	1940	1945	1950	1955	
		-1914	-1919	-1924	-1929	-1934	-1939	-1944	-1949	-1954	-1959	
		1	2	3	4	5	6	7	8	9	10	
SOCIAL SCIENCES, LAW, ETC.												
1970	Short		-0.247*	-0.691*	-0.867	-1.266	-0.321*	-0.114*				
1975			-0.834	-0.784*	-1.701	-1.172	-0.885	-0.447	-0.464			
1980			-0.588*	-1.669	-1.873	-0.885	-1.004	-0.606	-0.564	-0.231		
1985				-1.521	-1.760	-0.918	-1.018	-0.530	-0.594	-0.241	-0.003*	
1990					-2.275	-0.903	-1.109	-0.590	-0.606	-0.416	-0.103*	
1970	Full		0.096*	-0.406*	-0.598*	-0.724	-0.408	-0.005*				
1975			-0.622*	-0.402*	-1.488	-0.928	-0.885	-0.335	-0.296			
1980			-0.402*	-1.315	-1.241	-0.814	-0.851	-0.520	-0.521	-0.168*		
1985				-1.289	-1.171	-0.842	-0.832	-0.485	-0.534	-0.284	-0.003*	
1990					-1.738	-0.824	-0.902	-0.534	-0.552	-0.422	-0.103*	
ECONOMICS, BUS. AD., ETC.												
1970	Short	-0.674	-0.750	-1.098	-0.989	-1.088	-0.899	-0.536				
1975		-1.480	-1.273	-0.767	-0.897	-1.297	-1.204	-0.676	-0.437			
1980			-0.915	-0.845	-0.856	-1.161	-0.984	-0.831	-0.466	-0.265		
1985				-0.804	-1.099	-0.957	-0.905	-0.939	-0.636	-0.433	-0.175	
1990					-0.827	-0.989	-0.893	-0.833	-0.714	-0.567	-0.322	
1970	Full	-0.249	-0.425	-0.770	-0.605	-0.593	-0.420	-0.270				
1975		-1.185	-1.184	-0.761	-0.743	-1.205	-1.182	-0.636	-0.320			
1980			-0.835	-0.816	-0.757	-1.136	-0.963	-0.773	-0.447	-0.165		
1985				-0.732	-0.905	-0.908	-0.788	-0.886	-0.577	-0.352	-0.126	
1990					-0.690	-0.912	-0.773	-0.720	-0.638	-0.485	-0.254	
TECHNICAL FIELDS												
1970	Short	-0.927	-0.757	-1.012	-0.937	-0.541	-0.530	-0.143				
1975		0.516	-0.501	-0.892	-0.955	-0.692	-0.602	-0.413	-0.225			
1980			-0.537	-0.658	-0.872	-0.965	-0.661	-0.405	-0.301	-0.003		
1985				-0.765	-0.775	-0.848	-0.695	-0.480	-0.416	-0.149	-0.005	
1990					-0.483	-0.720	-0.541	-0.443	-0.427	-0.232	-0.101	
1970	Full	-0.538	-0.550	-0.791	-0.791	-0.478	-0.402	-0.109				
1975		0.488	-0.412	-0.775	-0.892	-0.645	-0.549	-0.386	-0.218			
1980			-0.438	-0.613	-0.809	-0.919	-0.635	-0.387	-0.296	-0.002		
1985				-0.703	-0.732	-0.763	-0.635	-0.443	-0.398	-0.136	-0.004	
1990					-0.402	-0.689	-0.514	-0.430	-0.410	-0.228	-0.100	

\*Not significantly different from zero at the 5 percent level.

*Note:* These numbers are all taken from Table 11. They have here been reorganized so that in each column we follow a given birth cohort as they get older with five years from one period to the next, where periods are defined by 1970, 1975, 1980, 1985, 1990. In the case of 1910–1914 cohort we follow them from 1970 to 1975 when they were 56–60 and 61+ years old. In the case of the 1940–1944 cohort we follow them every five years for the entire 20-year period, from 1970 to 1990 when they in 1970 were 26–30 and in 1990 were 46–50 years old.

Figure 1

**Effect of Being Female on Rank. Short Regression.  
Separately by Birth Cohort for Each Year.**



**Effect of Being Female on Rank. Full Regression.  
Separately by Birth Cohort for Each Year.**

