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Luca Paolo Merlino, Pierpaolo Parrotta and

Dario Pozzoli

Department of Economics – Porcelænshaven 16A, 1. DK-2000 Frederiksberg

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Luca Paolo Merlino † Pierpaolo Parrotta ‡ Dario Pozzoli§

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Abstract

In this paper, we investigate the sorting of workers in firms to understand gender gaps in labor market outcomes. Using Danish employer-employee matched data, we find strong evidence of glass ceilings in certain firms, especially after motherhood, preventing women from climbing the career ladder and causing the most productive female workers to seek better jobs in more female-friendly firms in which they can pursue small career advancements. Nonetheless, gender differences in promotion persist and are found to be similar in all firms when we focus on large career advancements. These results provide evidence of the sticky floor hypothesis, which, together with the costs associated with changing employer, generates persistent gender gaps.

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Keywords: Sorting, Assortative Matching, Gender Gap, Glass Ceiling, Sticky Floor.

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†F.R.S.-FNRS and ECARES, Solvay Brussels School of Economics and Management, Université libre de Bruxelles; 50, Av. Jeanne CP 144/04, 1050 Bruxelles, Belgium. Email: lmerlino@ulb.ac.be.

‡Department of Economics, School of Business and Economics, Maastricht University, 6200 MD Maastricht, Netherlands. E-mail: p.parrotta@maastrichtuniversity.nl.

§*Corresponding Author*: Copenhagen Business School, Department of Economics, Porcelnshaven 16 A, 1.salDK-2000 Frederiksberg.

1 Introduction

Recent studies report that wage gaps for male and female workers arise as a result of segregation in lower-paying occupations, in less productive establishments and in lower-paying occupations within establishments (Bayard, Hellerstein, Neumark and Troske, 2003; Hellerstein and Neumark, 2008). Understanding such segregation is crucial to proposing policies that alleviate gender gaps. However, because a great deal of wage heterogeneity arises from unobservable skills, estimating the extent to which good workers are employed in good firms is problematic.

In this paper we study career advancements to understand how the matching profile arises. This study enables us to investigate whether there are gender differences in the strength and direction of sorting that induce segregation. In particular, we analyze how job-to-job transitions and promotions are affected by worker types and how this relationship differs for male and female workers.

We exploit within-firm variation in wages to rank workers, we use profits to rank firms, and use information on occupational level within firms to identify promotions. This methodology allows us to identify gender differences in sorting patterns and their source.

Using Danish employer-employee matched data, we are then able to trace whether better-performing workers are more likely to move to better firms (i.e. firms with higher profits), or to get promoted. This exercise is particularly relevant because different theories of gender gaps have different implications in terms of the career advancements of workers. Hence, we are able to assess their relevance based on the patterns that we observe.

Although we find evidence of a general tendency for positive assortative matching in job-to-job transitions, the strength of this positive sorting in those transitions is much stronger for female workers. On the contrary, when we examine career advancement within firms, higher-performing women are less likely to be promoted than men, especially in firms that have few white-collar female workers, which we label *not female-friendly* firms.

Because career advancement is difficult for women in these firms, especially after a woman's first child is born, good female workers pursue career advancements primarily by finding a different employer. Furthermore, these women tend to switch to female-friendly firms whose promotion policies do not exhibit a gender bias.

Overall, our findings support a refined version of the glass ceiling hypothesis. There are firms both with and without glass ceilings: because the former have gender-biased promotion policies, good female workers seek jobs in firms without glass ceilings to advance in their careers. Interestingly, these female-friendly firms report higher profitability than those firms in which good female workers have fewer opportunities to climb the occupational ladder. Because only the best female workers can pursue career advancements via job-to-job transitions and because significant career advancement occurs more slowly for women in all firms, segregation and gender gaps emerge.

Our empirical analysis of several aspects of both internal and external labor market transitions considerably extends previous investigations on this topic, as to the best of

our knowledge, no other work has provided such a clear and comprehensive description and explanation of gender differences in sorting.

According to the Global Gender Gap Report of Hausmann, Tyson, Bekhouche and Zahidi (2013) Denmark is ranked eight (out of 134 countries) on the overall Gender Gap Index, but it occupies 80th place in terms of female representation among legislators, senior officials and managers. Our findings are consistent with this ranking: even in a context characterized by a flexible labor market and generous family-friendly schemes, such as Denmark or Sweden, there still exists a persistently large gender gap in top job positions and promotions, and this gap seems to be related with motherhood (Smith, Smith and Verner, 2013; Albrecht, Björklund and Vroman, 2003).

Several studies have pointed out different mechanisms for the emergence of gender differences in labor market outcomes. These mechanisms have different implications for the career development of women, and this pattern of distinctions allows us to make sense of our empirical findings.

For example, if there are glass ceilings, a term first used by Gay Bryant (Frenkiel, 1984), women are promoted neither within nor across firms; hence, we should find no (or a weaker) tendency for women towards positive assortative matching in all transitions. There are "sticky floors" (Booth, Francesconi and Frank, 2003) when women do not confront discrimination in promotions, but they receive smaller wage improvements than men following promotions. If this is true, although women do not encounter discrimination in small career advancements, they are less likely than men to pursue major career advancements because their market opportunities are worse than those available to men. If women were to have better non-market opportunities than men (Lazear and Rosen, 1990), they should be less likely to be promoted than men in all firms but more likely to receive higher wages if promoted and more likely to quit to pursue non-market opportunities. Finally, gender gaps emerge because of biological differences (Ichino and Moretti, 2009): since women rate of absenteeism is higher than that of men, the former are less productive (or, their productivity is less observable) at the beginning of their careers. If that were the case, gender gaps should be smaller for older workers at the top of the wage distribution.

Our estimation strategy is then aimed at detecting how sorting behavior of men and women differ along their career. Differently from previous studies though (Booth et al., 2003; Manning and Swaffield, 2008), we have information both on workers and firms. This allows us to exploit within-firm wage variations conditional on observables to rank workers. Then, we use this ranking to predict: *(i)* how likely a worker is to quit the current firm; *(ii)* how likely it is to go to a better firm conditional on switching firm (being a *mover*); and , *(iii)* how likely it is to get promoted to a better occupational level conditional on staying employed in a given firm (being a *stayer*).

Given that one's outside option is increasing in his type, we expect that the probability of a job-to-job transition to a better firm has a U-shaped relationship with a worker position in the within-firm rank: while bad workers are likely to be replaced, best workers are likely to switch to better firms. As proposed by Bartolucci and Devicienti (2012) (henceforth BD), we consider profits as a measure of firm "quality".[1]

[1]Because accounting profits are a noisy measure, different definitions of quality are used in the

Similarly, we expect that a worker is more likely to be promoted the better her type.

This methodology allows us to provide an overall assessment of labor market transitions for different categories of firms and workers, and to compare to what extent female and male workers transitions are affected by their type. As discussed in Section 3, this method is based on two main identifying assumptions: the monotonicity of agents' payoffs in their own types and the existence of mismatches in the equilibrium distribution of workers and firms.

We exploit the richness of the Danish register data on individuals and companies to empirically estimate the existence and extent of gender differences in sorting. The Danish data, which are described in Section 4, are particularly appropriate because they provide information on the universe of workers who are employed in all firms and occupations for a long period of time. In addition, the assortativity between firms and workers in Denmark is not influenced by rigidities that are imputable to labor market institutions (Subsection 4.3).

Overall, we find evidence of positive sorting in job-to-job transitions. Our key finding is a sizable and significant difference in positive sorting in job-to-job transitions in favor of women. This difference is stable, as it arises in a number of different specifications and tests. In particular, gender differences are stronger in certain firms, which have a lower than average share of female workers in white-collar positions, and they disappear when transitions are not voluntary (e.g. when they are driven by a firm's closure).

In fact, women encounter significant glass ceilings in internal promotions in all firms but in those which have a greater than average share of female workers in white-collar positions (*female-friendly firms).* These findings do not depend on their age, education, occupation or industry. Hence, the promotion patterns allow us to understand how it is possible to observe gender gaps even if women have a strong tendency toward positive assortative matching in job-to-job transitions.

These findings can be interpreted as follows. Since good female workers are not as likely as good male worker to be promoted, they attempt to overcome these gender barriers by searching for better jobs in fairer firms. Consistently with this view, we find that negligible gender differences arise when we look at promotion patterns in those firms in which good female workers tend to find jobs, at least in terms of small career advancements. Such firms are also highly profitable, which suggests that the best firms are those with non-discriminatory policies.[2]

Glass ceilings in non-female-friendly firms appear to emerge especially after workers become parents, which emphasizes the role of motherhood as a career impediment in those firms. Again, this impediment is not observed in female-friendly firms.

empirical implementation. In particular, we use the profit differential between sending and receiving firms of at least 10 percentage points, the average profits across time, the past average profitability, total factor productivity and added value. All indicators are calculated both in levels and per worker. All these definitions yield qualitatively similar results.

[2]There may be several reasons that less profitable discriminatory firms could survive competition from non-discriminatory firms. First, social enforcement might result in less lost profit in discriminatory firms. Second, certain firms may have clients with discriminatory tastes. Third, search frictions may facilitate social enforcement.

The structure of the article is as follows: Section 2 reviews the related literature. Section 3 describes the econometric routes that we follow to measure gender-based differences in sorting. Section 4 briefly describes the data and the institutional background; Section 5 reports the main results and Section 6 offers concluding remarks.

2 Literature review

Our work connects the literature on assortative matching to the one on gender differences in labor market outcomes by empirically investigating gender differences in sorting to assess the causes of gender differences in labor market outcomes.

From the seminal contribution of Becker (1973), several studies have investigated whether good workers move to good firms, i.e. whether positive assortative matching arises. This literature indicates that different equilibrium matching patterns are possible, depending on the supermodularity of the production function, the transferability of utility, and the heterogeneity and endogeneity of search costs (Sattinger, 1995; Shimer and Smith, 2000; Legros and Newman, 2002; Atakan, 2006). In particular, Merlino (2012) shows that the degree of assortativity can be lower when there are disadvantaged workers and two-sided heterogeneity and that the interaction between discrimination and heterogeneity is important to understand how wage and unemployment gaps can emerge in equilibrium.

However, a number of difficulties arise when these models are brought to the data: because observable characteristics only partially explain the wage distribution, the task of defining "good workers" is not straightforward.[3] A central study in this context is that of Abowd, Kramarz and Margolis (1999) (henceforth, AKM), who evaluate assortativity by examining the correlation between the estimated individual worker and firm fixed effects. In fact, AKM find a small or negative correlation, which has been interpreted as evidence of no role or of a negative role of sorting in the labor market. Subsequently, similar studies have been conducted for different countries. Some of them appear to be consistent with AKM's conclusions (Abowd, Creecy and Kramarz, 2002), whereas others do not (Abowd and Kramarz, 2003; Woodcock, 2008).

However, the fixed effects approach has relevant shortcomings, as their identifying assumptions eliminate the possibility of key mechanisms, such as endogenous search intensity. This mechanism can induce sorting in models with production function complementarities (Bagger and Lentz, 2008). More importantly, the correlation between worker and firm fixed effects is biased as a result of the non-monotonicity of wages in different types of firms that can emerge because of frictions that arise between competing firms in job creation (Cahuc, Postel-Vinay and Robin, 2006) or in the hiring process (Eeckhout and Kircher, 2011).

To the best of our knowledge, the most interesting recent contribution on how to estimate the nature of sorting is the test provided by BD.[4] These authors provide an

[3] See Christensen, Lentz, Mortensen, Neumann and Werwatz (2005) for a survey of the literature.

[4] Other recent contributions are those of Eeckhout and Kircher (2011) and Lopes De Melo (2009). However, both of these approaches are limited in that, although they can detect the strength of sorting,

estimation strategy that is grounded on agents' payoff monotonicity among their (own) types and the presence of some mismatches between workers and firms in the equilibrium distribution. The latter condition is crucial, as perfect sorting would make both sources of heterogeneity empirically indistinguishable. Using an employer-employee data set, BD exploit within-firm variations in wages to rank worker types (within firms), and they utilize profits to rank firm types. First, we enrich their analysis by looking also at promotions. Second, and most importantly, we document important gender differences in sorting patterns in different types of transitions.

Groes, Kircher and Manovskii (conditionally accepted) use a similar approach to rank workers, but within occupations. They document a U-shaped and directional pattern for occupational mobility: both low and high wage earners within an occupation are more likely to leave their occupation, and the high earners tend to switch to new occupations with higher average wages. Our work complements those findings since, on the one hand, we find similar patterns regarding positive sorting in job-to-job transitions and promotions and, on the other, we extend the analysis to female workers.

To the best of our knowledge, this paper is the first to use such an empirical strategy to study gender differences in sorting. We are clearly not the first though to study career developments to disentangle different theories of gender gaps. Most notably, Booth et al. (2003) find support for their model of sticky floors, in which men and women are equally likely to be promoted but women receive lower wage increases. Manning and Swaffield (2008) find that job mobility explains little of the gender gap that emerges 10 years after entry in the labor market. Yet, they do not look separately at transitions within and across employers. More importantly, these authors did not have access to detailed information on firms or job-to-job transitions. Hence, our study represents a significant advancement with respect to theirs. While Bayard et al. (2003) and Hellerstein and Neumark (2008) study gender differences matching patterns using matched employees-employer data, they examine only segregation patterns (i.e. the static matching profile). In our paper, we directly test job-to-job transitions by examining both career paths and a wide range of transitions; in other words, we study how the matching profile arises. In addition, we take advantage of the high degree of flexibility of the Danish labor market and the completeness of our data.

The work of Gayle, Golan and Miller (2012) is the most closely related to our study. These authors focus on CEOs of publicly listed firms to trace the careers of top CEOs, and they find that women are more likely to exit their occupations but more likely to become CEOs when they have not exited. Our findings that women who pursue career advancements are a very selected sample are somehow consistent with these results. However, we do not restrict our attention to CEOs. Most importantly, we provide some descriptive evidence that women are excluded from career advancements because of gender bias in promotions in certain firms.

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they cannot detect its sign.

3 The Estimation Strategy

To study how gender differences in job-to-job transitions can be recovered using data on wages and profits, we propose a simple theoretical framework with four building blocks: mismatch, learning, on-the-job search and promotions. While the model we propose extends Eeckhout and Kircher (2011) introducing promotions, we simplify some aspects of their model: we refer the interested reader to that paper for a more in-depth analysis.

3.1 Theoretical Framework

The framework is the following. There is a unit mass of workers, half of which are males and the rest females, and a mass 1 of firms, a proportion $1-\delta(>1/2)$ of which are female-friendly—it will be explained shortly in which sense. Workers and firms are heterogeneous in terms of their productivity. Workers draw their type e independently of their gender, from a distribution $\Gamma(e)$ with smooth density $\gamma(e)$ on $(0,1/\tau]$, $\tau\in(1,\bar{\tau}]$. Firms draw their type f from distribution $\Upsilon(f)$ independently of their female-friendliness, with a smooth density $\nu(f)$ on $[0,1]$.

When types e ad f form a match, they produce an output $Y(e,f)\geq 0$ while having an outside option of remaining unmatched, in which case they obtain a payoff of zero. Hence, since output is non-negative, all agents will prefer to match. We assume that workers and firms can be ranked according to their productivity, i.e. $Y_e>0$ and $Y_f>0$. Then, it is without loss of generality to index a worker by its *rank* in terms of productivity, i.e. by the fraction of workers that are less productive than her. Similarly, we can identify each firm by its rank in the distribution of firm productivity. This means that the distributions $\Gamma(\cdot)$ and $\Upsilon(\cdot)$ are uniform.

We assume the following production function that induces positive sorting:[5]

$$Y(e,f) \;=\; \alpha e^{\theta} f^{\theta}, \tag{1}$$

where $\alpha>0$ and $\theta>0$ are parameters that indicate the strength of the complemetarities. We denote an assignment of workers to firms as μ. Since the production function is with complements, i.e. $Y_{ef}>0$, it induces positive assortative matching in a frictionless economy, i.e. $\mu(e)=f$ (Becker, 1973).

There are two periods. During the first period, workers and firms are randomly matched after their respective types have been realized. Once a match is created, production takes place and wages are paid.

A worker who in the first period is of type e in a match (e,f) in the second period becomes of type τe, if $e\geq f$. This is a reduced form way to introduce learning, which can be interpreted as learning-by-doing or learning one's type. According to the first interpretation, during the first period, workers acquire relevant experience that

[5]For a more general formulation, we refer the reader to Eeckhout and Kircher (2011), since they formally study the general case beyond this example, although in a model without promotions. While the results that we derive do not depend on the particular example chosen, this enables us to keep the analysis concise.

improves their skills as long as $e \geq f$. In other words, there are skill requirements (Albrecht and Vroman, 2002; Merlino, in press): only agents that are sufficiently qualified understand the technology enough to improve it. As a result, in the second period workers are more productive, i.e. they increase their type. According to the second interpretation, it takes time and work experience for agents to learn their type (Groes et al., conditionally accepted), and they need to work in a job that is challenging enough to acquire relevant information.

However, not female-friendly firms do not allow female workers to express their acquired potential: for example, the suggestions they make to improve the productivity of the current match are not listened to, or they are not assigned better tasks within the firm. Formally, the output of such match in the second period remains the same, i.e. $\alpha e^{\theta} f^{\theta}$, while female workers employed in female-friendly firms and all male workers produce $\alpha(\tau e)^{\theta} f^{\theta}$. We will label with P those matches in which promotions could take place, that is, all matches but those in which a female worker is employed in a not female-friendly firm.

In the second period, before production takes place each pair can decide whether to stay together or to search for a better partner. Those pairs that decide not to stay together incur a constant search cost of c, as in Atakan (2006), and are then matched according to the frictionless allocation. Only then, production takes place and wages are paid.

We assume that workers in the first period do not know whether the firm they are matched with is female-friendly or not. This is known only in the second period, once the firm actually promotes a good female worker, or doesn't. Furthermore, in the first period agents cannot search. This is to embed the idea that some time is needed before quitting their current job and move to another one, as it is reasonable for new entrants in the labor market.[6]

Wages are determined by a bargaining model with inside options, see Muthoo (1999). This is equivalent to saying that the wage is negotiated every period where, in each period, the worker (respectively the firm) makes a take-it-or-leave-it offer with probability 1/2. If the firm (or the worker) rejects the offer, in the first period they enjoy a payoff equal to zero.[7]

Given this wage determination protocol, first period wages (and profits) in a given match (e, f) are equal to $Y(e, f)/2$. Hence,

Remark 1 *In the first period, wages in a given firm provide us a correct ranking of workers' types.*

This observation simply follows from the fact that, conditional on the firm productivity f, wages are increasing in the worker type e, as implied by (1).

[6] As it will be clear below, such an assumption is made not to deal with distribution of workers types between stayers and movers across periods. Allowing for costly search in the first period would nonetheless lead the same results, since wages would still provide a correct ranking of workers' types.

[7] Since workers do not observe the firm type in the first period, Nash bargaining with outside options would not be an ideal solution concept to determine wages given that there does not exist an axiomatization of this solution concept in games with asymmetric information.

In period 2, wages in the frictionless allocation are given by

$$\max_{e} Y(e,f) - w_2(e),$$

which, since $\Gamma(\cdot) = e$ and $\Upsilon(\cdot) = f$, yields[8]

$$w^\star(e) \;=\; \int_0^e \frac{\partial Y(\tilde{e}, \mu(\tilde{e}))}{\partial e} d\Gamma(\tilde{e}) = \frac{\alpha}{2} e^{2\theta}, \tag{2}$$

and

$$\pi^\star(f) = \int_0^f \frac{\partial Y(\mu^{-1}(\tilde{f}), \tilde{f})}{\partial \tilde{f}} d\Upsilon(\tilde{f}) = \frac{\alpha}{2} f^{2\theta}.$$

A worker e who stays matched with a firm f in period 2 receives a wage that depends on his inside option, which now is the match in the instantaneous frictionless allocation. Hence,

$$w_2(e,f) \;=\; \frac{1}{2}\left[Y(e,f) - \pi^\star(f)\right] + \frac{1}{2} w^\star(e) \tag{3}$$

Given such payoffs, a pair will remain matched if both the worker and the firm involved in the match prefer to stay together rather than to pay c and get matched with their optimal type in the frictionless allocation. In other words, the worker or the firm will not sever the match whenever the surplus generated $S(e,f)$ is positive.

In period 2, a firm hence is more likely to retain workers that are not too mismatched. Furthermore, since female workers employed in not female-friendly firms do not get promoted, they are hence more likely to search than others because they have very attractive outside options.

In particular, the surplus of a match (e,f) in which $e \geq f$ is

$$S(e,f) = \begin{cases} \alpha(\tau e)^\theta f^\theta - \frac{\alpha}{2}(\tau e)^{2\theta} - \frac{\alpha}{2} f^{2\theta} + 2c & \text{if } (e,f) \in P, \\ \alpha e^\theta f^\theta - \frac{\alpha}{2}(\tau e)^{2\theta} - \frac{\alpha}{2} f^{2\theta} + 2c & \text{if } e \geq f \text{ and } (e,f) \notin P, \end{cases}$$

As a result, a match $(e,f) \in P$ will not be destroyed if $e \in A_2^P(f)$ where[9]

$$A_2^P(f) = \left[\left(f^\theta - 2\sqrt{\frac{c}{\alpha}} \right)^{1/\theta}, \frac{1}{\tau} \left(f^\theta + 2\sqrt{\frac{c}{\alpha}} \right)^{1/\theta} \right]. \tag{4}$$

[8]Since in period 2, workers' and firms' types are realized, in the frictionless allocation female workers that improved their type will get matched with female-friendly firms. Our assumptions make sure that there are always enough female friendly firms so that female workers who decide to search can always find such a firm.

[9]For sake of brevity, we are abstracting here from boundaries conditions resulting from the fact that for low types surplus might not exceed the total search cost of $2c$. In order to avoid keeping track of endogenous entry, we assume that people will search even if that is the case.

From this acceptance set, it is easy to see that $\left(f^\theta + 2\sqrt{c/\alpha}\right)^{1/\theta}/t$ is always bigger than f, i.e. there will be some promotions, if $\tau < \bar{\tau}$, where $\bar{\tau} = \left(2\sqrt{c/\alpha}\right)^{1/\theta}$. A match $(e, f) \notin P$ instead will not be destroyed if $e \in A_2^D$, where

$$A_2^D(f) = \left[\left(f^\theta - 2\sqrt{\frac{c}{\alpha}}\right)^{1/\theta}, \bar{e}\right]. \tag{5}$$

Substituting (2) into $w_2(e, f)$ for those matches which are acceptable, the following observations immediately follow.

Remark 2 *In the second period, wages and profits are increasing in own type. Wages are non-monotonic in firm type.*

Remarks 1 and 2 imply that we can rank workers using their position in the wage distribution in a given firm. BD show that this is true also in more general frameworks. However, since wages are non-monotonic in firm type, it is not possible from wage data alone to detect sorting using only data from this period. Eeckhout and Kircher (2011) show that, because of this, also the fixed effects approach developed by AKM does not guarantee identification.

More than that, Proposition 2 in BD, which shows that mean payoffs conditional on being matched are increasing in agents' own types, applies in our framework. Hence, on average, we can rank firms using profits. Since different firms might have different pools of workers, it could be that a good firm matched with bad agents has worse profits than a bad firm matched with a good agent. Nonetheless, the possibility of search puts bounds on the degree of mismatch that can arise, allowing for a correct ranking of firms.

BD show that looking at job-to-job transitions it is possible to identify the sign and strength of sorting. So, we can test whether a function that induces positive sorting as the one we assumed is appropriate.[10]

Given the acceptance sets of the different types of firms, we can now state the empirical predictions of the theoretical analysis.

Empirical Predictions. *Assume production is given by (1) and $\tau < \bar{\tau}$. Consider e_m and e_f such that e_m is male, e_f is female and $e_m = e_f$. Then,*

(i) the higher e_m or e_f, the higher the probability of moving to a better firm;

(ii) the probability of moving to a better firm with respect to other workers of the same gender is higher for e_f;

(iii) the probability of being promoted with respect to other workers of the same gender is higher for e_m.

These results follow immediately from the fact that $\bar{e} < \left(f^\theta + 2\sqrt{c/\alpha}\right)^{1/\theta}/t = \bar{\bar{e}}$, so that there will be more job-to-job transitions from D matches than from P matches.

[10] An example of a function that induces negative assortative sorting is $\frac{\alpha}{2}(1-f)^{2\theta} + g(f)$, where $g(\cdot)$ is an increasing function. See Eeckhout and Kircher (2011) for further details.

In other words, female workers that are not promoted in not female-friendly firms are more likely to move to better firms if they are good enough, while good male workers are more likely to be promoted in the firm where they are currently employed. Hence, $\int_{\bar{f}}^{\bar{e}} w(e,f)de < \int_{\bar{f}}^{\bar{e}} w(e,f)de$ and $\int_{\bar{e}}^{\tau} w(e,f)de > \int_{\bar{e}}^{\tau} w(e,f)de$. In other words, the association between the probability of moving to a better firm and wages should be higher for female workers, while the association between the probability of being promoted and wages should be stronger for male workers. These are the predictions that we will test in our empirical exercise.

Furthermore, we can now use the theoretical framework we developed to understand the implications for gender differences in labor market transitions of other theories of gender gaps. For example, if all firms were not female-friendly, female workers would not have better outside options in female-friendly firms, so that they would not be more likely to move to better firms than males. A similar implication would be true if women had better non-market opportunities, but because they would be more likely to quit rather than to pursue job-to-job transitions to better firms. On the contrary, if all firms were female-friendly, we should not observe any gender differences in any transitions. This would be true even if female workers types were drawn from a worse distribution, since in that case the outside option for them would not be relatively more attractive than for men.

Conversely, if all firms displayed sticky floors but no glass ceilings, female workers would be treated in the same way in all firms, implying that there should not be a gender biased in small promotions in any firm. If female workers learned more slowly than men to produce more or their own type, we would expect that females are less likely to be promoted and more likely to move to other firms in all firms with respect to men, but equally likely conditionally on their respective type. Finally, if gender gaps were driven by biological differences due to age, we should not observe gender difference in promotions in the second period, or when workers get older, at least in regressions that are run separately across genders.

To conclude, let us stress that our estimation strategy for detecting gender differences in sorting is grounded on agents' payoff monotonicity among their own types and the presence of some mismatches between workers and firms in the equilibrium distribution. The former assumption is a natural assumption that is consistent with a large family of models, well beyond the particular model studied here. The latter condition is crucial, as perfect sorting would make both sources of heterogeneity empirically indistinguishable because no transitions would be observed. Yet, even in a flexible labor market, such as the Danish labor market, mismatches and frictions are likely to arise for a variety of reasons.[11]

[11]Search models rely on the assumption that time and effort are needed for workers to change jobs because they possess imperfect information about the labor market. However, even with full information and no mobility costs, firms may have monopsony power if jobs are differentiated as a result of, for example, commuting distances or non-monetary factors. Rents in the employment relationship may also arise as a result of specific wage-setting mechanisms, such as efficiency wages, or the accumulation of specific human capital. For a recent review of the theory and empirical work on imperfect labor markets, see Manning (2011).

3.2 Basic Empirical Approach

Based on our theoretical analysis, we estimate the following linear probability model, which is conditional on workers' movements (i.e. for the sample of movers):

$$\begin{aligned} move\_up_{ijrt} &= \alpha_0 + \alpha_1 wage_{t-1}(e_i, f_j) + \alpha_2 (wage_{t-1}(e_i, f_j) * gender_i) \\ &\quad + \alpha_3 gender_i + x'_{ijt-1}\beta + z'_{jt-1}\gamma_1 + z'_{rt}\gamma_2 + z_t + u_j + \epsilon_{it} \end{aligned} \tag{6}$$

where $move\_up_{ijrt}$ is a dummy variable that is equal to 1 if employee i, who has worked in the sending firm j, moves to a "better" receiving firm r at time t. The term $wage_{t-1}(e_i, f_j)$ is the log of the wage earned in sending firm j by employee i, which is increasing in her own type e_i, and f_j is the employer type. As there are many worker characteristics that may influence wages and mobility, such as demographic characteristics, and it is unclear to what extent the monotonicity assumption on payoffs is fulfilled when comparing co-workers in different occupations, we augment equation (6) with the vector x_{ij}. This vector consists of relevant worker characteristics, such as age, tenure, work experience, ethnicity, marital status, parental status, education, occupation and a family network dummy (i.e. a dummy that records whether a worker has had at least one parent employed as a manager). The vectors z_j and z_r include the share of white-collar women, which is a proxy of the female-friendliness of a firm, and the size of the sending and receiving firm, respectively while the vector z_t represents time fixed effects. Finally, u_j captures the fixed effects of firm j and ϵ_{it} is an mean zero error term.[12]

Also, in the theoretical model, transitions to firms with higher profits are always associated with higher wages. Yet, in the main analysis, we use the former route to identify sorting in job-to-job transitions. Better working conditions beside wages. In any case, in the empirical section we will also provide robustness checks using transitions to better firms that also entail higher wages. In order to alleviate the problem related to the measure of profits, we apply alternative definitions and measures of a firm's quality.[13]

In particular, the extent and sign of sorting in job-to-job transitions are tested by

[12]We estimate equation 6 with OLS after we have centered both the dependent and independent variable using a within-firm transformation, to control for firm fixed effects. While such an approach is not obviously inferior to a logit model, at least if the "right" non-linear model is unknown (Angrist and Krueger, 2001), its results are straightforward to interpret, it eases the comparability of the coefficients and it allows an easy implementation of hypothesis testing on the difference between coefficients estimated across all sub-samples considered. Specifically, we estimate the following demeaned equation:

$$\begin{aligned} \tilde{move\_up}_{ijrt} &= \tilde{\alpha_0} + \alpha_1 \tilde{wage}_{t-1}(e_i, f_j) + \alpha_2 (\tilde{wage}_{t-1}(e_i, f_j) * \tilde{gender}_i) \\ &\quad + \alpha_3 \tilde{gender}_i + x_{ij\tilde{t-1}}{}'\beta + z_{j\tilde{t-1}}{}'\gamma_1 + \tilde{z_{rt}}{}'\gamma_2 + \tilde{z_t} + \tilde{\epsilon_{it}} \end{aligned} \tag{7}$$

where the *tilde* reflects the within-firm transformed data in which the firm mean has been removed from each individual observation and which removes the term u_j.

[13]Some of these definitions are time-dependent, whereas others are not. The results using alternative definitions of firm quality, including value added and TFP, are available in an Online Appendix.

investigating whether coefficient α_1 is different from zero. More specifically, if $\alpha_1 > 0$, then there is evidence of positive sorting because the positive sign indicates that better workers (i.e. those workers who receive higher wages in a given firm after controlling for observables) are more likely to move to firms that earn higher profits. Hence, a more positive coefficient indicates a relatively stronger tendency towards positive assortative matching.

The focus of this paper is to test whether the degree and sign of sorting in job-to-job transitions vary according to gender using two strategies: first, by estimating the coefficient α_2 and, second, by estimating equation (6) separately by gender and testing whether α_1 significantly varies across the female and male sub-samples. We will focus mostly on the second approach, which accounts for the concern that the rankings may be biased across genders because the wages of women are typically not directly comparable with those of men.

With regard to the sample of stayers and their probability of being promoted, a similar model is implemented:

$$\begin{aligned} prom_{ijt} &= \alpha_0 + \alpha_1 wage_{t-1}(e_i, f_j) + \alpha_2 (wage_{t-1}(e_i, f_j) * gender_i) \\ &\quad + \alpha_3 gender_i + x'_{ijt-1}\beta + z'_{jt}\gamma + z_t + z_i + u_j \end{aligned} \tag{8}$$

where $prom_{ijt}$ is a dummy variable that is equal to 1 if employee i, who has worked within a specific occupation in firm j, is promoted to a higher occupational level.[14] The term u_j captures within firm fixed effects. As in the previous model, the vector x_{ijt-1} and z_{jt} include worker and firm characteristics while the vectors z_t and z_i are time and industry dummies.[15]

4 Data and institutional background

The key features of our data are that they cover the universe of employees and firms, and that they match employees and firms records. Both of these features make these data particularly suitable for our purposes, as they enable us to detect moving workers in each year and their sending and receiving firms (Parrotta and Pozzoli, 2012).

We use Danish data mainly for two reasons. First, a big and complete sample of both firms and workers is available for Denmark. This is crucial for our empirical methodology since we want to keep track of workers career advancements. Second, Denmark has a very flexible labor market, similar to the one of the U.S.[16]. Hence, we expect our analysis to be relevant beyond the case of Denmark studied here.

[14] Three main occupational groups are considered: managers, middle-managers and blue-collar workers.

[15] As in equation 6, we estimate equation 8 with OLS on the transformed data.

[16] Groes (2010) documents that the relationship between occupational tenure and wages and the hazard rates of leaving an occupation are similar in Denmark and in the U.S.

4.1 Data

The data set, provided by Statistics Denmark, is a merged employer-employee unbalanced panel sample of Danish firms observed over the 1996-2005 period.

The firm-level data[17] includes sales, employment, value added, materials, profits, fixed assets and a two-digit NACE identifier. All the companies in the sample have more than 20 employees and are private firms, i.e. not part of the public sector.[18] All firms with imputed accounting variables are omitted from the analysis.

The individual-level data, available from 1980 onward, cover the working age population. These data include wage, age, gender, marital status, the number of children, experience, tenure, highest completed education, occupation and information on the family background characteristics. Apart from deaths and permanent migration, there is no attrition in the data set. The labor market status of each person as of the last week in November is recorded as the relevant datum for each person for that year. Therefore, if a worker changes jobs, then we observe only the year in which this change occurred.[19] However, we can observe whether a worker experiences unemployment and the duration (in weeks) of the overall unemployment period in a calendar year.

In the analysis that follows, we include only individuals with a positive annual salary[20] and individuals younger than 60. Furthermore, apprentices and part-time employees are excluded from the main analyses.

Most of the empirical estimations are based on two samples. The first sample considers only those workers who, within the 1996-2005 period, switched at least once from one firm (the sending firm, according to our terminology) to another firm (the

[17]Firm-level statistics have been gathered by Statistics Denmark in several ways. All firms with more than 50 employees or with profits higher than a given threshold have been surveyed directly. The other firms are recorded in accordance with a stratified sample strategy. The surveyed firms can choose whether to submit their annual accounts and other specifications or complete a questionnaire. To facilitate responses, the questions are formulated similarly to those in the Danish annual accounts legislation. The final sample includes the following industries: the manufacturing of food, beverages and tobacco; the manufacturing of textiles and leather; the manufacturing of wood products and printing; the manufacturing of chemicals and plastic products; the manufacturing of other non-metallic mineral products; the manufacturing of basic metals and fabricated metal products; the manufacturing of furniture; manufacturing n.e.c.; construction; the sale and repair of motor vehicles, the sale of automotive fuel; wholesale except for motor vehicles; the retail trade of food; department stores; the retail sale of pharmaceutical goods and cosmetic articles; the retail sale of clothing and footwear; other retail sale and repair work; hotels and restaurants; land transport and transport via pipelines; water transport; air transport; supporting transport activities; post and telecommunications; finance; insurance; activities auxiliary to finance; real estate activities; the renting of transport equipment and machinery; computer and computer-related activities; research and development; consultancy activities; and cleaning activities.

[18]As our empirical strategy involves examining job-to-job transitions by comparing movers, our estimation strategy uses only those firms from which there are at least two movers over the sample period; hence, we omitted from the sample firms with fewer than 20 employees, as they do not have a sufficient number of transitions. Furthermore, because we rank firms based on their profits, we exclude public firms for which profits are not a stated objective.

[19]For individuals with multiple jobs, only the main occupation is considered.

[20]We exclude from the original sample the extreme observations of the annual salary, i.e. those lower than the $1th$ percentile and higher than the $99th$ percentile of the salary distribution.

current or receiving firm) in the data set within the 1996-2005 period. An important challenge regarding this data set is that, because of changes of firms' ownership, there appears to be some false transitions in the data. To minimize miscoded transitions, transitions involving more than 50 percent of the size of the same sending firm are excluded from the final sample. Furthermore, because we want to focus on voluntary transitions, we exclude from the sample of switchers those workers who changed jobs after a firm closure. In total, our sample includes 479,161 yearly observations of 357,487 job switchers (i.e. 10 percent of the original sample) and approximately 17,000 firms. The second sample excludes the switchers and consists of 4,658,374 observations, 617,513 "stayers" and nearly 18,000 firms.

4.2 Descriptive Analysis

Table 1 lists the descriptive statistics for both samples separately according to gender, measured at both the worker and firm levels.

[Insert Table 1 around here]

The average male job switcher is 39 years of age and has 16 years of experience, whereas the average female job switcher is 38 years of age and has 14 years of experience. The average tenure for both women and men is approximately three years. The majority of workers have secondary or post-secondary diplomas, and 6 percent of male job changers have at least a university degree, whereas 30 percent have completed only primary education. In addition, 7 percent of female job changers have at least a university degree, and 37 percent have a primary education. Most men and women are classified as blue-collar workers (72 percent), followed by middle managers (24-26 percent). Significantly more male switchers have managerial jobs compared with their female counterparts (4 percent versus 2 percent, respectively). For both genders, approximately 5 percent are foreigners, nearly 15 percent have at least one child at 0-3 years of age, and approximately 4 percent have at least one parent working as a manager at the time of the job transition or before. Hence, 4-5 percent of job switchers have what we refer to as a"family network" (i.e. having at least one parent employed as a manager). In comparison, the average stayer is approximately two years older and has two more years of tenure, with a slightly lower educational and occupational level. The average stayer is also more likely to be married and less likely to have a child between 0 and 3 years of age, regardless of the gender of the individual. The percentage of foreigners is reasonably comparable across the two samples. During the period covered by our sample, the wage of an average male and female job switcher was approximately 250 and 200 thousand Danish Krones, respectively, or approximately 34 and 26 thousand Euros per annum, respectively. The salary of an average stayer was approximately 10 percent above that figure. Turning to the firm-level characteristics, we find that the average firm size is fairly similar across the two samples, although the share of white-collar women and profits per worker are higher in the sample of switchers, regardless of the gender of the employee.

Table 2 includes the mean of the main outcome-dependent variables used in our empirical analysis. For the sample of job switchers, we calculate an indicator function that takes the value of one (zero) if a worker moves to a receiving firm that is of higher (lower) quality than the sending firm. The quality of firms instead is primarily defined in terms of their profits. Given that the measure of profits is firm-specific and might be affected by measurement error, we calculate a set of indicator variables that are based on alternative improvements in profits (i.e. the profit differential between sending and receiving firms is at least either 5 or 10 percent). The means of these outcome variables, also reported in Table 2, allow us to conclude that women have higher probabilities of moving to a receiving firm of higher quality, regardless of the definition of firm quality that we utilize.[21] In addition, for the sample of stayers, we examine the probability of promotion to a higher occupational level and to a managerial position; these probabilities are additional outcome variables. It turns out that women are generally less likely to be promoted than men.

[Insert Table 2 around here]

Interesting evidence of wage gaps between men and women in the sample period is reported in Figure 1. Examining the wage development of stayers and switchers (Panel 1(a)), we can observe that whereas a somehow decreasing gender wage gap characterizes the latter category of workers, the former group presents a stable wage differential between men and women over time. More importantly, the wage developments have almost identical slopes across gender, suggesting that men's and women's career profiles are very likely to start with very similar initial conditions and quality of matches at the beginning of their career. A clearer picture of the different wage patterns between stayers and switchers can be drawn when plotting wage developments by education and by occupation (Panels 1(b) and 1(c)). Women earn substantially less than their male peers in both worker categories, but differences are particularly marked for the sample of stayers.

[Insert Figure 1 around here]

Thus, our *prima facie* evidence suggests that more productive women tend to switch workplaces with the aim of achieving higher wages and promotion rates. Female stayers are instead more prone to accept larger and persistent wage differentials over their careers, irrespectively of their educational and occupational level.[22]

[21] Alternative indicators identified are calculated on the basis of past average profitability, profit measures per worker, firms' value added in levels and per worker and firms' total factor productivity (TFP, henceforth). Firm's TFP is separately estimated for each two-digit industry using the algorithm suggested by (Ackerberg, Caves and Frazer, 2006), as in Parrotta and Pozzoli (2012). The results obtained from these alternative outcome-dependent variables will be reported in the Web Appendix together with their means.

[22] To check that this evidence is not mainly driven by the gender composition, in the Web Appendix we plot the shares of women and men across working population age and over time for stayers and switchers). Gender composition of the workforce is fairly stable for differently aged workers and increases over time.

4.3 Institutional Background

As institutional constraints may hamper the degree of assortativeness and sorting in job-to-job transitions in the labor market, we outline the main features of the Danish labor market, which are represented by the combination of high flexibility and social security, the role of family-friendly policies and decentralized wage settings.

Cornerstones of the Danish "flexicurity" model are a high level of labor mobility and generous social security schemes. In particular, the absence of severance pay legislation lowers hiring and firing costs, reduces frictions in the labor market and facilitates the efforts of firms to adjust the quality and size of their workforce. Moreover, although workers are not protected by stringent employment rules, they bear relatively low costs of changing employers and have easy access to unemployment insurance or social assistance benefits. In fact, Danish replacement ratios are among the most generous in the world. Therefore, a notable part of the observed labor mobility is also associated with wage mobility (Eriksson and Westergaard-Nielsen, 2009).

A further key feature of the Danish labor market is the wide coverage of publicly provided childcare, which, combined with the length and flexibility of parental leave schemes, has favored female labor market participation and full-time employment without dramatic consequences on the fertility rate (OECD, 2005). In fact, Denmark and the other Nordic countries (Finland, Iceland, Norway and Sweden) have traditionally been considered forerunners in designing family-friendly policies. In these countries, female participation has been correlated with the expansion of the welfare state. While initially many of the jobs held by women have been part-time occupations in the public sector, today a notable proportion of women is employed in the private sector and works full-time. Manning and Saidi (2010) find that gender differences in attitude towards competition do not explain much of the gender gaps in the UK. Nonetheless, descriptive statistics show that women in the private sector earn a 5 percent higher wage and are slightly more educated compared to their counterparts in the public sector. These statistics may suggest that the sample used in this study is a relatively selected one, consisting of slightly more motivated and career-oriented women. Therefore any indication of glass-ceiling or sticky-floor phenomena obtained from this study should be interpreted as a lower bound evidence.

For the purposes of our analysis, a brief description of wage bargaining in the Danish private sector is important. Similar to other OECD countries, Denmark experienced a shift in wage bargaining from a highly centralized system to a considerably decentralized system. Since the early 1980s, an increasing share of wage bargaining descended to the firm (individual employee) level, which increased the weight of employer and employee roles in the resulting internal firm wage structure. As found in Shaw and Lazear (2008), the within-firm wage variability in Denmark represents more than 80 percent of the total variability observed among all workers.

Given the key characteristics of the Danish institutions, we can reasonably affirm that the evidence of gender gap outcomes arising from our empirical analysis may present strong external validity because they may be lower-bound estimates of male-vs-female sorting in the labor market.

5 Results

Given the large volume of results, we discuss them in two separate sub-sections. The first sub-section describes the main results of sorting in job-to-job transitions and promotion patterns, while the second sub-section discusses some complementary analysis and alternative specifications. Each sub-section complements the other one and provides support for the proposition that female workers encounter glass ceilings in some firms.

5.1 Main Results

The first prediction of our theoretical model is that, conditional on observables, the probability of leaving the current firm is high for workers with low and high wages, while it is lower for workers that are ranked neither too high nor too low in the wage distribution of the firm. Furthermore, such probability should be higher for women, for whom outside options are more attractive. Hence, we plot the probability of leaving the current firm for men and women as a function of the residual estimated from a mincerian log-wage equation in a given firm. The results are reported in Figure 2, which yields support for both predictions. In particular, we find that high wages increase the probability of leaving the firm to a higher extent than low wages, and this is particularly true for female workers.

[Insert Figure 2 around here]

The U-shape of job-to-job mobility resembles the relationship found for occupational mobility by Groes et al. (conditionally accepted). An interesting difference is that we find a more asymmetric relationship: high earners are more likely to quit than low earners. This is consistent with the existence of skill-requirements: learning occurs only if workers are qualified enough.

In order to further understand such mobility patterns, we now investigate which workers are more likely to move to a better firm conditional on leaving the firm, and which workers are more likely to be promoted conditional on staying in the current firm, again depending on the residuals of a mincerian log-wage equation. In line with our theoretical framework, Figure 3 shows that workers that switch firm are more likely to move to a better firm the higher their rank in the sending firm. Furthermore, good female workers are more likely to leave the current firm. The relationship is significantly stronger for female workers than for male workers. Similar results are valid for promotions, as shown in Figure 4, although in that case good male workers are more likely to be promoted than good female workers.

[Insert Figures 3 and 4 around here]

This strongly indicates that women switch firms because they are less likely to pursue career advancements within the current firm. In order to understand why these patterns emerge, we now present the results of the estimation of linear probability

model (6). This approach has the advantage to allow for an analysis of the different factors driving gender differences in sorting and how they change for different subsamples of the population.

The main results pertaining to job-to-job transitions to better firms are reported in the upper panel of Table 3. The first two columns of Table 3 include the baseline results with and without a gender-wage interaction term. In both cases, there is a significantly positive association between the logarithm of the past wage that was earned in the previous firm and the probability of moving to a better firm, conditional on moving to another firm. Our results are consistent with the findings of Bagger, Sørensen and Vejlin (2013), who document a strong trend of positive assortative wage sorting in Denmark, largely driven by high-wage workers being increasingly likely to transition to high-wage firms.[23] This confirms the appropriateness of our theoretical framework. Hence, we can now turn our attention on the other empirical predictions.

Interestingly, although on average women are as likely as men to move to better firms, they display a substantially stronger tendency toward positive sorting in job-to-job transitions than men, as indicated by the estimated coefficient on the interaction term. These empirical associations suggest that better ranked women are more likely to move to companies that are characterized by higher profits than in less profitable companies with respect to men. Additional results not reported in this table indicate that transitions to better firms are more likely for workers who are married, parents or native citizens, or for those who hold tertiary education. The relationship with age and tenure appears to be weak and insignificant; thus, there is limited evidence of the hypothesis of biological differences proposed by Ichino and Moretti (2009), at least in job-to-job transitions. Finally, having a parent with past managerial experience is not found to be significantly correlated with sorting.

These coefficients could be biased as they are based on a restrictive model, where the estimated associations of the other explanatory variables do not vary across gender. Hence, to appropriately account for gender heterogeneity and to appropriately test the empirical predictions of our theoretical framework, we run separate regressions for women and men (reported in the third and fourth columns of Table 3). As predicted, we observe notable differences in sorting patterns in favor of women. Furthermore, hypothesis testing that is reported in the table confirms that the coefficient that is associated with women lagged wages is statistically higher than that associated with men wages for job-to-job transitions, while it is lower for promotions.

[Insert Table 3 around here]

Our estimates show that there is a general positive sorting in job-to-job transitions tendency between workers which is stronger for women than for men and it is interesting to note that the share of white-collar women in the sending firms has opposite effects in the two sub-samples: this share decreases the probability of moving for female workers, whereas it increases the corresponding probability for men. Overall, there appears to be little support for the classical version of the glass ceiling hypothesis, which would imply that positive sorting is weaker for women than for men in all transitions.

[23] A similar trend has been documented for Germany by Card, Heining and Kline (2013).

Let us now turn our attention to career advancements within the firm (bottom part of Table 3). Again, we find a general positive relationship between the lagged wage of a stayer and her probability of being promoted.[24] Being a woman reduces the conditional probability of promotion, and the parameter of the interaction between past wages and the female dummy is significantly negative.

This evidence is in line with our theoretical model and is able to account for the fact that better female workers that face difficulties in career advancements in their current firm are more likely to search and then move to better firms.

These findings regarding the gender differences in promotions are confirmed when we separately investigate sorting in promotion for the sample of men and women. Interestingly, a greater share of women is associated with an average higher conditional probability for both women and men. This correlation suggests that the share of female workers *per se* is not an indication of unbiased promotion policies.

Furthermore, gender differences in promotions in favor of men persist and are similar in all firms when we focus on large career advancements (i.e. promotions to positions at the managerial level), which provides evidence of the sticky floor hypothesis (see Table 4). These results pertaining to promotions also qualify the findings according to which the share of white-collar women in sending firms has a negative correlation with the probability of moving to a better firm for women: because women are more likely to be promoted in female-friendly firms, i.e. firms with many white-collar female workers, they are less likely to seek a job elsewhere if the sending firm is female-friendly. Furthermore, men have fewer incentives to seek a job outside of their current firm, especially in non-female-friendly firms, and this lack of incentives drives the stronger positive sorting for women in job-to-job transitions.

[Insert Table 4 around here]

Overall, the set of empirical results we presented so far are consistent with the view that women do not have better non-market opportunities, which differs from the assumptions of Lazear and Rosen (1990), as women's career advancement opportunities do not appear to be better than those of men (they are less likely to be promoted and are more likely to move to a better firm when career advancements are not too difficult to achieve). In fact, the evidence on gender differences in promotion suggests that women who cannot climb the occupational ladder within a firm because of discriminating promotion policies attempt to overcome these gender barriers by searching for better jobs offered by fairer firms in which they can pursue small career advancements.[25] By contrast, greater career advancements tend to be easier for men than for women in all firms, as we will see in the next section.

[24] Although the coefficients are not reported in the table, a worker's native status, marital status, higher education and family networks are also positively associated with the likelihood of being promoted conditional on staying at the same firm.

[25] Indeed, we will identify in the data such firms in the analysis below.

5.2 Robustness Checks

While the main results are consistent with empirical predictions of the theoretical framework we propose, in this section we further provide evidence of the robustness of the sorting patterns we have just highlighted, and of the mechanisms that generate them.

Alternative Definitions of Job-to-job Transitions. Our results for job-to-job transitions are not sensitive to the particular definition of firm quality we used (i.e. firms with profits at least five percent higher than one's previous firm).

We address this issue in different ways. First, we strengthen the conditions on profits by defining a transition to a better firm as a transition to a firm whose profits are at least 10 percent higher than profits of the sending enterprise. The results are reported in the first two columns of the upper panel of Table **??** and they corroborate the findings of the main specification.

As a further robustness check to our analysis on job-to-job transitions, we restrict the definition of job-to-job transitions to a better firm to observe how the results change. Specifically, if we impose the condition that switchers also earn higher wages after a transition to a better firm (last two columns of the upper panel of Table **??**), then the gender difference in sorting is observed to be stronger than in the baseline model.

Furthermore, we separately study transitions to the same or to a better occupational level. The results show that the transitions to the same occupational level are those with stronger gender differences in sorting across firms. This finding is in line with the fact that small career advancements for women are easier than more significant career advancements lending additional support to the sticky floor hypothesis (Booth et al., 2003).

[Insert Table 5 around here]

Qualitatively similar results to those reported in Table 5 are obtained using: average profits over the sample period; past profits that were made before the job-to-job transition occurred; total factor productivity; profits per worker; value added; transitions without periods of unemployment between jobs; all transitions, including those motivated by a firm's demise; transition to better firms, but to the same occupational level; transition to the same and to a different industry. Furthermore, we replace the past log of the level of wage that was earned with employee fixed effects that are estimated from a gender-specific wage equation à la AKM. The findings reveal that the conditional probability of being recruited by a better firm is also positively correlated with worker fixed effects, and as in the main specification, this correlation is stronger for women, implying that both the sign of sorting and the gender effect are confirmed when using the alternative definition of worker rankings suggested by AKM.[26]

Firm Exit. Quite interestingly, when we focus solely on transitions from a firm's closure (last two bottom columns of Table 5), we find gender differences in sorting

[26]The results obtained from these alternative definitions of firm's quality and of the dependent variable are reported in the on-line Appendix.

in job-to-job transitions in favor of men (although not always significant), as these mobility patterns do not completely reflect the voluntary choices and career concerns of employees. Indeed, in that situation, men are also forced to seek jobs outside of their current firms. These results lend additional support to our theoretical framework, since the latter predicts that gender differences in sorting in favor of women should emerge only when we consider voluntary transitions.

Results by Cohort. Given the potential bias due to the changes in age composition of the workforce population under analysis over the sample period, we analyzed gender differences in sorting selecting workers aged 25-30, 30-40, 40-50, or 50-60 in 1995 and following them separately along the sample period.

In Table 6 we present results by cohorts for switchers involved in job-to-job transitions. There, we find strong positive sorting parameters for women and large differences between genders for younger cohorts (25-20; 30-40), while weak evidence of sorting is found for workers 40-50 years old. Negative or negligible parameters are found for women and men in the oldest age cohorts. These results, together with the gender-specific wage developments reported in Figure 1, allow us to rule out the surmise that the gender differences in sorting patterns found in the main analysis are merely driven by a gap in the initial conditions across gender, due to a higher extent of mismatches at the beginning of women's career compared to their male counterparts. However, the case of switchers aged 50-60 is very peculiar because a large share of this workers was likely approaching early-retirement, which at that time was strongly supported by generous public programs.[27]

[Insert Table 6 around here]

Table 7 instead investigates the promotion probability of stayers by cohorts for men and women, separately. Running separate regressions for each age cohort, we find that parameters on the previous wage are similar between men and women for the youngest cohort but they start diverging and enlarging sensibly with the individuals' cohort ages: the coefficient for males is twice (one and a half) larger than the one for females for the cohort 50-60 (40-50).

[Insert Table 7 around here]

Table 8 looks at promotions to managerial level: gender differences are significant in all cohorts, although the probability of getting promoted for men is much higher for better workers when we look at older cohorts. Hence, contrary to the biological differences hypothesis, sticky floors turn out to actually be stronger for experienced workers.

[27] Voluntary early retirement pensions were easily accessed before 1999. Since the introduction of a labor market policy program for early retirement in 1979, the transition from ordinary full-time jobs to retirement was facilitated. Workers had the possibility of retiring without having to fulfil formal health requirements (Larsen and Pedersen, 2008). This scheme was adopted during a period of high unemployment to accommodate young workers on the labor market.

[Insert Table 8 around here]

Results by age. The discrepancies between men and women in job-to-job transitions are confirmed in the sub-samples that refer to three age groups: under 35, between 35 and 50, and above 50 (Table 9). Positive sorting is stronger for women and gender differences in sorting seem to enlarge with age.

[Insert Table 9 around here]

As already emerged in the analysis by cohort, considering the results on promotions to better occupation by age group, in Table 10 we find that the discrepancy in the sorting parameter increases with the age of workers. Since this difference is in favor of men, the pattern appears to be consistent with the idea that women tend to climb the career ladder at a slow pace than men; hence, women exhibit an increasing gap with respect to men. This pattern lowers a woman's probability of reaching top-level positions at a given age.[28]

[Insert Table 10 around here]

Overall, the analysis by age groups and cohorts yields limited support to the hypothesis that biological differences explain gender gaps, as found in the case study by Ichino and Moretti (2009). Indeed, while gender differences are more important when career advancements mostly take place, i.e. for workers aged between 35 and 50 years, in line with our baseline results, such differences are in favor of women in job-to-job transitions, and in favor of men in promotions.

Female-friendliness of Firms. Our theoretical framework presumes the existence of certain firms that have no, or smaller, gender biases in promotions. We will now investigate if such firms indeed exist.

We will look at female-friendly firms, defined as companies characterized by a large share of women in white-collar positions, i.e. higher than the industrial median. Furthermore, we define "female-sought" firms as female-friendly firms that are destinations in the job-to-job transition of at least one female worker coming form a worse firm.

Table 11 shows that the sorting parameter in job-to-job transitions to female friendly firms is larger. Hence, the stronger positive sorting for female job switchers is mainly due to transitions to female-friendly firms.

[Insert Table 11 around here]

We now investigate whether gender unbiased promotion policies in such firms are the determinants of these flows. First of all, note that, in line with this interpretation, there are smaller and less significant differences between genders in terms of transitions to firms which are not female-friendly.

[28]The analysis by age groups of promotions to managerial occupations yields similar results. It is available in the on-line appendix.

Furthermore, we find evidence that the strength of positive sorting in promotions is stronger for women when we examine promotions to a higher occupational level in female oriented firms, i.e. female-friendly and female-sought firms (Table 12). On the contrary, the difference is consistent with the baseline results, but stronger, in firms that are not sought after by females. These findings strongly indicate that good female workers seek career advancements in female-friendly firms because promotion opportunities in these firms do not depend on gender.

[Insert Table 12 around here]

Nonetheless, gender differences in favor of men for promotions to managerial positions seems to emerge in all firms, providing further support for the sticky floor hypothesis (Table 12).

[Insert Table 13 around here]

According to our empirical strategy, female-friendly firms are by construction more profitable than sending firms. We explicitly test the correlation between profitability and female-friendliness by estimating a productivity equation with fixed effects and several control variables, among others a dummy that takes the value of 1 if the firm is "female-sought". We find in fact a positive and significant correlation between non-discrimination and firm profitability, as reported in Table 14.[29]

[Insert Table 14 around here]

Parenthood. Parenthood *per se* does not appear to be relevant to job-to-job transitions. Indeed, not only do gender differences in sorting emerge for both workers with and without children and for workers both before and after the first child, but the coefficients are also similar in all these sub-samples.[30]

Yet, Table 15 reports the results by firm type (female-, not female-friendly, female- and not female-sought companies) for the sub-samples before and after the first child is born. Interestingly, female-friendly firms show no gender differences for promotions to better occupations before the first child is born, while a small bias in favor of females emerge after the first child is born. However, women who work in other firms encounter a significant penalty in promotions, especially after bearing a child.

[Insert Table 15 around here]

Looking at promotions to managerial positions, again gender differences appear in all firms independently on parenthood. However, the penalty of parenthood seems to be harsher in not female-sought and not female-friendly after the first child is born.

[29] A reason behind this finding is that wage gaps resulting from poor matching opportunities of disadvantaged workers may induce those firms that employ these workers to adopt suboptimal technologies. Indeed, Merlino (2012) shows that the interplay among matching opportunities and firms' investments is crucial to understand gender gaps in unemployment and wages.

[30] These results are reported in the on-line Appendix since they are in line with the baseline results.

[Insert Table 16 around here]

Overall, this set of results provides evidence of an interplay between motherhood and the glass ceiling phenomenon in certain firms.

Further Checks. In an on-line appendix, we provide additional results that show that the main findings are robust when we study workers with different educational attainments, with or without family networks, employed in given sectors and in firms of different sizes.

In particular, we show that gender gaps in job-to-job transitions emerge also when we sub-sample by occupation and by education: men generally show weaker positive sorting patterns in job-to-job transitions, and the difference between genders is larger for blue-collar workers and for workers with primary education, whereas the difference weakens for the more educated workers or for those with better occupations.

Manning (2003), Ch. 7, documents that women in the UK are more constrained in their opportunities to change job. In order to understand how much the costs associated with job mobility affect our results, we focus on transitions without a change of residence and for single women, since for these samples we expect such costs to be lower. In these cases, we find that sorting in job-to-job transitions is stronger for women although slightly less than in baseline regression. This suggests that our main results may not entirely depend on the costs associated with switching employer, but rather on career concerns. Conversely, the reductions in the labor supply that are represented by shifts from full-time to part-time employment are not associated with positive sorting, as changes in the number of hours worked are likely to be triggered by family considerations. Further, the finding that the sorting coefficient in movements across firms is significantly higher for women with a family network might reflect the importance of having good job contact networks for women.

Finally it does not appear to be relevant whether firms conduct business in the same industry or in a different industry relative to that of the sending firm, stressing that the results are not driven by women self-selecting themselves in particular industries.[31]

Regarding promotions, we show that the results of the estimations that are conducted separately by education interestingly suggest that gender differences in promotion are lower for workers with mandatory and tertiary educations compared to workers with secondary education. Results by industry indicate that the same pattern generally emerges in all sectors.

To complement the description of the mechanisms driving such sorting patterns provided in this paper, we have also examined the gender differences in transitions to unemployment and self-employment, which are also reported in the on-line appendix. The analysis of job-to-unemployment and job-to-self-employment transitions provides

[31]The fact that we find that differences in positive sorting in job-to-job transitions in favor of females do not depend on firm size or industry lands additional support of this. The exceptions are the construction sector, which is not a female-oriented sector, and the financial and business services sector, in which the degree of positive sorting for men is closer to that for women, in line with the findings of Ngai and Petrongolo (2014) for the US. All these additional results are reported in the on-line appendix.

evidence of significant differences between men and women with respect to the propensity to become self-employed or to experience open unemployment in favor of women. Our results reveal a generally lower willingness of employers to retain women compared with men, especially with respect to women who work in firms that are not female-oriented and who have had at least one child. These findings suggest that women have fewer career opportunities than men in such firms.

Overall, our empirical evidence generally suggests that the degree of positive sorting is higher for women than for men in voluntary job-to-job transitions. However, this result does not hold for all types of transitions and women, as their degree of sorting may be severely affected by the extent of career advancements, reductions in the labor supply and attitudes toward female workers in receiving firms. These findings may initially appear puzzling, as they do not appear to support any well-known theory of gender gaps in the labor market and do not seem to be consistent with gender gaps in the labor market. Examining promotion patterns more closely though help us to clarify the reasons and mechanisms behind these gender differences in sorting.

Indeed, the higher degree of positive sorting for females in job-to-job transitions is consistent with the finding that strong female workers experience glass ceilings in the average firm; hence, such women pursue (mild) career advancements in firms with lower glass ceilings for women.

These gender differences in sorting are widely consistent also with an overall gender gap in labor market outcomes and an under-representation of women in top positions, as observed in the case of Denmark, which should be even more severe in countries with less flexible labor markets.

6 Conclusions

In this paper, we measure sorting in different labor market transitions for female and male workers using Danish employer-employee matched data to study how gender gaps in labor market outcomes emerge. In particular, we study the relationship between a worker's ability, which is measured by one's position in the wage hierarchy of the firm for which (s)he works, and the probability of moving to a better firm or the probability of being promoted.

The detailed account of gender differences that emerges provides support to the hypothesis that female workers encounter glass ceilings in some firms, especially after motherhood. This obstacle leads good female workers to seek firms that will reward their talents in a fair manner. As a result, good female workers are more mobile than male workers in the direction of better firms, but it is easier for good male workers to be promoted in their firms. Nonetheless, gender differences in promotion persist and are similar in all firms when we focus on large career advancements.

Our findings suggest that, although the Nordic model, which is characterized by a flexible labor market and generous public family-friendly schemes, has succeeded in maintaining a high rate of female employment, some unintended boomerang effects appear to have emerged and impeded women who become mothers from progressing

in their careers in firms that are not female-friendly. These hurdles may be associated with the significant generosity of parental leave policies, as suggested by Datta Gupta, Smith and Verner (2008) and Smith, Smith and Verner (2011). Thus, it is important to conduct further research to determine why these effects emerge and why only in some firms.

Finally, it would be interesting to study gender differences in occupational mobility along the lines of Groes et al. (conditionally accepted), and to relate it to gender differences on career advancements within and across firms. This is in our current research agenda.

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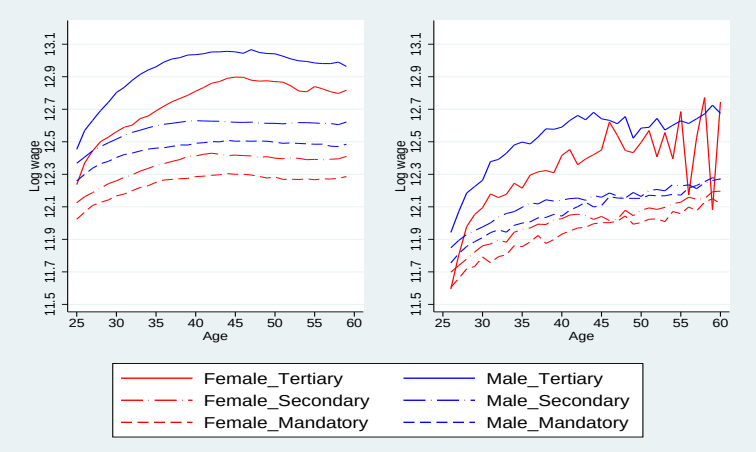
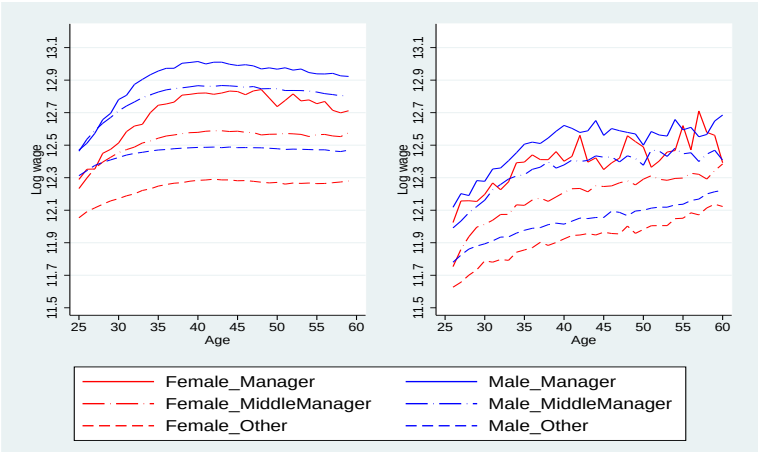
(a) Stayers (left panel) and switchers (right panel), by gender



(b) Stayers (left panel) and switchers (right panel), by gender and education.



(c) Stayers (left panel) and switchers (right panel), by gender and occupation.

Figure 1: Wage development of stayers and switchers aged 25-60. *Source:* Statistics Denmark.

Table 1: The main descriptive statistics

Variables	**Sample of switchers**				**Sample of stayers**			
	Women		**Men**		**Women**		**Men**	
	Mean	*S.d.*	*Mean*	*S.d.*	*Mean*	*S.d.*	*Mean*	*S.d.*
log(wage_sending)	12.206	0.506	12.430	0.522	12.293	0.429	12.542	0.426
age	37.748	9.055	38.594	9.345	39.819	9.281	40.983	9.554
tenure	3.561	3.795	3.487	3.809	5.567	4.877	5.931	5.126
labor market experience	14.118	8.358	16.602	9.152	15.638	8.278	18.884	9.161
manager	0.024	0.155	0.041	0.199	0.018	0.131	0.046	0.208
middle manager	0.260	0.438	0.239	0.427	0.299	0.458	0.258	0.437
blue collar	0.716	0.451	0.719	0.449	0.683	0.465	0.697	0.460
with at least a child (0-3)	0.149	0.356	0.148	0.355	0.125	0.331	0.125	0.331
primary (1, if with primary education)	0.366	0.482	0.300	0.458	0.380	0.485	0.292	0.455
secondary (1, if with secondary and post-secondary education)	0.561	0.496	0.644	0.479	0.552	0.497	0.650	0.477
tertiary (1, if with tertiary education)	0.073	0.260	0.056	0.230	0.068	0.252	0.058	0.233
foreigner	0.051	0.220	0.049	0.216	0.048	0.213	0.046	0.209
family network (1, if father or mother is manager)	0.050	0.217	0.041	0.198	0.049	0.217	0.041	0.199
married or cohabiting	0.740	0.439	0.732	0.443	0.783	0.412	0.767	0.423
share of white-collar women in the sending firm	0.091	1.772	0.065	1.637	-	-	-	-
share of white-collar women in the current firm	0.186	2.864	0.109	1.617	0.031	0.050	0.017	0.036
sending firm size less than 50 employees	0.118	0.323	0.166	0.372	-	-	-	-
sending firm size between 51 and 100 employees	0.102	0.303	0.131	0.338	-	-	-	-
sending firm size more than 100 employees	0.780	0.415	0.703	0.457	-	-	-	-
current firm size less than 50 employees	0.140	0.347	0.188	0.391	0.147	0.354	0.194	0.395
current firm size between 51 and 100 employees	0.112	0.315	0.139	0.346	0.117	0.321	0.144	0.351
current firm size more than 100 employees	0.748	0.434	0.673	0.469	0.736	0.441	0.662	0.473
sending firm profit per worker	86.292	288.338	87.682	278.075	-	-	-	-
current firm profit per worker	100.746	482.845	96.862	440.232	71.103	3288.197	87.630	2311.018
Obs	126,676		294,073		1,329,800		2,773,928	
Number of individuals	97,502		218,542		368,810		663,237	
Number of firms	16,764				18,034			

Notes: All the variables are averages from 1995 to 2005.

Table 2: Mean of the main dependent variables

Statistics of dependent variables		
	Sample of switchers	
Variables	**Women**	**Men**
Prob(profits of current firm>profits of previous firm by 5%)	0.401	0.378
Prob(profits of current firm>profits of previous firm by 10%)	0.356	0.349
Obs	126,676	294,073
	All sample without observations with switching	
Promotion (better occupation)	0.030	0.032
Promotion (manager)	0.033	0.035
Obs	1,329,800	2,773,928

Notes: All the dependent variables are expressed as time averages from 1995 to 2005.

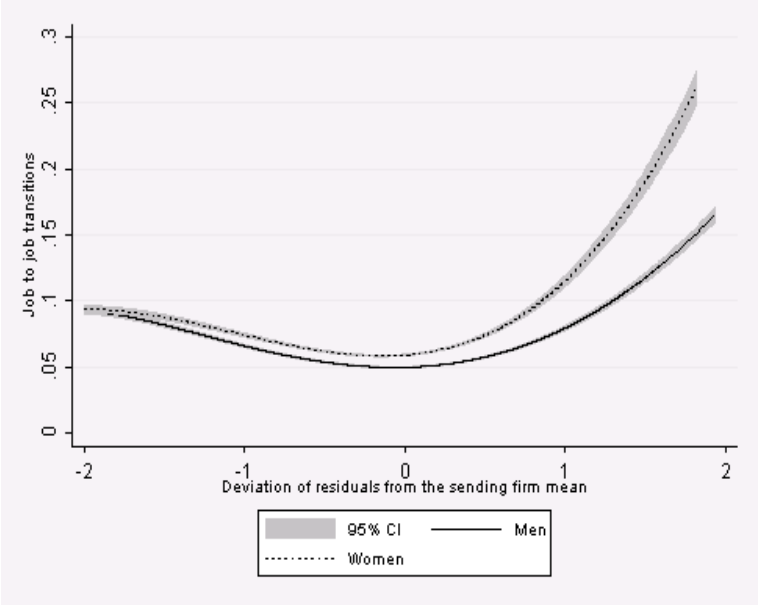


Figure 2: Probability of switching firm as a function of the deviation of the residuals in wages in the sending firm.

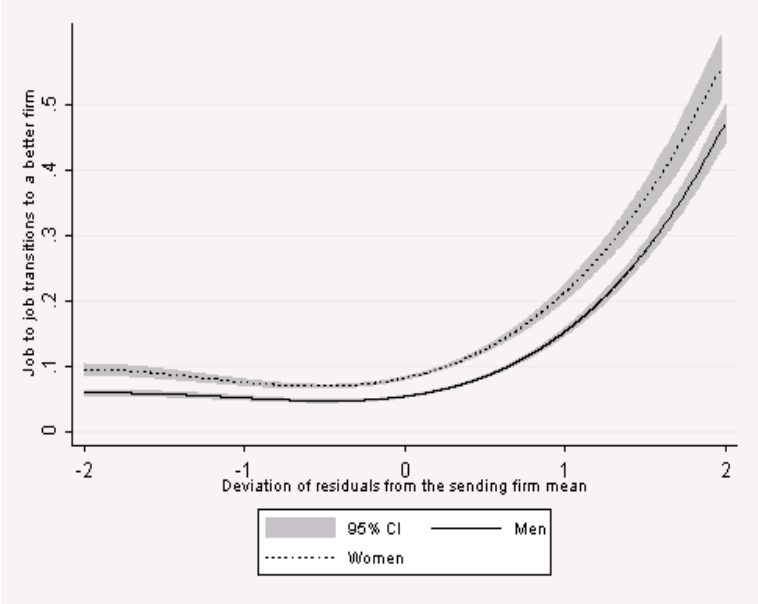


Figure 3: Probability of switching to a better firm as a function of the deviation of the residuals in wages in the sending firm conditional on switching firm.

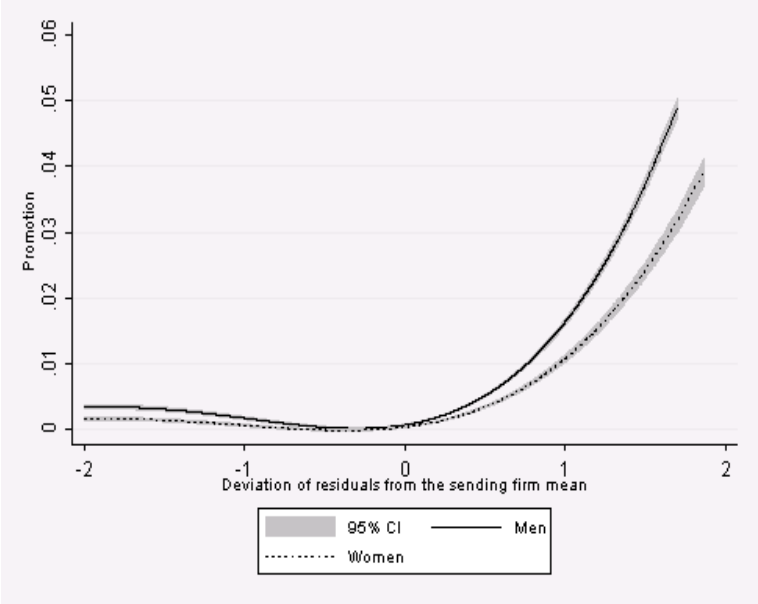


Figure 4: Probability of switching firm as a function of the deviation of the residuals in wages in the current firm conditional on not switching firm.

Table 3: Gender Differences in Sorting, main results

	Sorting in job-to-job transitions			
	Total	Total	Women	Men
log(wage_sending)	0.009**	0.009**	0.016***	0.007***
	(0.001)	(0.001)	(0.000)	(0.001)
female	-0.002	-0.002		
	(0.001)	(0.001)		
log(wage_sending)*female		0.002**		
		(0.001)		
percentage of white-collar women in sending firm	0.002***	0.001***	-0.078***	0.097***
	(0.000)	(0.000)	(0.000)	(0.000)
percentage of white-collar women in receiving firm	0.002*	0.001*	0.062**	0.091
	(0.000)	(0.000)	(0.000)	(0.000)
N	420,749	420,749	126,676	294,073
R-sq	0.127	0.127	0.124	0.130
Hypothesis test [χ^2; p-value]**:** $\alpha_1^{women} = \alpha_1^{men}$	-	-	149.50; 0.000	
	Promotions			
	Total	Total	Women	Men
log(wage_sending)	0.019***	0.019***	0.013***	0.023***
	(0.003)	(0.003)	(0.002)	(0.003)
female	-0.008***	-0.008***	-	-
	(0.001)	(0.001)	-	-
log(wage_sending)*female	-	-0.012***	-	-
	-	(0.001)	-	-
share of white-collar women in the firm	0.727***	0.727***	0.780***	0.676***
	(0.025)	(0.025)	(0.039)	(0.021)
N	4,103,728	4,103,728	1,329,800	2,773,928
R-sq	0.021	0.021	0.019	0.021
Hypothesis test [χ^2; p-value]**:** $\alpha_1^{women} = \alpha_1^{men}$	-	-	110.78; 0.000	

Notes: For job-to job transitions, the dependent variable is a dummy that takes the value of one, if the worker moved to a firm whose profits are at least 5% higher than those of the previous firm. For promotions, the dependent variable is a dummy that takes the value of one, if the worker is, within the same firm, promoted to a better occupational level. All specifications include age and age squared, tenure and tenure squared, marital status, having children, education level, family network, a dummy for foreigners, experience and experience squared, firm fixed effects, firm size dummies (both receiving and sending firm in the regressions regarding job-to-job transitions), year and occupational dummies. The standard errors are reported in parentheses and are clustered at the sending firm level and at the individual level. *Statistically significant at the 0.10 level, **at the 0.05 level, and ***at the 0.01 level.

Table 4: Promotion to managerial occupation models estimated for all sample and separately for men and women, main results

	Total		Women	Men
log(wage_sending)	0.006***	0.006***	0.002***	0.007***
	(0.000)	(0.000)	(0.000)	(0.000)
female	-0.001***	-0.001***	-	-
	(0.000)	(0.000)	-	-
log(wage_sending)*female	-	-0.006***	-	-
	-	(0.000)	-	-
share of white-collar women in the firm	0.032***	0.032***	0.017***	0.041***
	(0.002)	(0.002)	(0.003)	(0.004)
N	4,103,728	4,103,728	1,329,800	2,773,928
R-sq	0.009	0.010	0.004	0.011
Hypothesis test [χ^2; p-value]**:** $\alpha_1^{women} = \alpha_1^{men}$	-	-	323.27; 0.000	

Notes: The dependent variable is a dummy that takes the value of one, if the worker is, within the same firm, promoted to a managerial occupational level. All specifications include age and age squared, tenure and tenure squared, marital status, having children, education level, family network, a dummy for foreigners, experience and experience squared, firm fixed effects, size dummies of the receiving firm, and a full set of industry and year dummies. The standard errors are reported in parentheses and are clustered at the sending firm level and at the individual level. *Statistically significant at the 0.10 level, **at the 0.05 level, and ***at the 0.01 level.

Table 5: Sorting in job-to-job transitions estimated separately for men and women, results by type of transitions

	Profits > 10%		**With a wage improvement**	
			Profits > 5%	Profits > 10%
	All	*Women*	*Women*	*Women*
log(wage_sending)	0.007***	0.014***	0.020***	0.015***
	(0.001)	(0.000)	(0.003)	(0.003)
female	-0.002			
	(0.001)			
log(wage_sending)*female	0.003***			
	(0.001)			
N	420,749	126,676	50,943	50,943
R^2	0.127	0.122	0.204	0.202
		Men	*Men*	*Men*
log(wage_sending)	-	0.005***	0.009***	0.007***
	-	(0.001)	(0.002)	(0.001)
N	-	294,073	97,662	97,662
R^2	-	0.130	0.169	0.171
Hypothesis test [χ^2; p-value]: $\alpha_1^{women} = \alpha_1^{men}$	-	67.72; 0.000	47.08; 0.000	22.44; 0.000
	Transition to a better occupational level		**Transition from a firm exit**	
	Profits > 5%	Profits > 10%	Profits > 5%	Profits > 10%
		Women		
log(wage_sending)	0.017***	0.017***	0.009***	0.009***
	(0.001)	(0.001)	(0.000)	(0.001)
N	17,520	17,520	26,083	26,083
R^2	0.112	0.111	0.084	0.083
		Men		
log(wage_sending)	0.003***	0.001	0.011***	0.010***
	(0.001)	(0.001)	(0.000)	(0.002)
N	39,878	39,878	57,820	54,904
R^2	0.118	0.119	0.117	0.119
Hypothesis test [χ^2; p-value]: $\alpha_1^{women} = \alpha_1^{men}$	250.99; 0.000	5935.24; 0.000	11.05; 0.000	2.11; 0.146

Notes: All specifications include age, age squared, tenure, tenure squared, work experience, work experience squared, foreigner status, marital status, parental status, education, occupation, a family network dummy, sending firm fixed effects, share of women, size dummies of the receiving and sending firms, and a full set of year dummies. The standard errors are reported in parentheses and are clustered at the sending firm level and at the individual level. *Statistically significant at the 0.10 level, **at the 0.05 level, and ***at the 0.01 level.

Table 6: Sorting in job-to-job transitions estimated separately for men and women, results by cohort

	Cohort 25-30		**Cohort 30-40**	
	Profits > 5%	Profits > 10%	Profits > 5%	Profits > 10%
		Women		
log(wage_sending)	0.026***	0.019***	0.029***	0.028***
	(0.001)	(0.001)	(0.004)	(0.004)
N	2,876	2,876	3,679	3,679
R^2	0.143	0.143	0.142	0.142
		Men		
log(wage_sending)	0.002***	0.003***	0.009***	0.009***
	(0.001)	(0.001)	(0.002)	(0.002)
N	11,124	11,124	16,982	16,982
R^2	0.153	0.154	0.142	0.165
Hypothesis test [χ^2; p-value]: $\alpha_1^{women} = \alpha_1^{men}$	1046.97; 0.000	461.35; 0.000	92.37; 0.000	79.16; 0.000
	Cohort 40-50		**Cohort 50-60**	
	Profits > 5%	Profits > 10%	Profits > 5%	Profits > 10%
		Women		
log(wage_sending)	0.005***	0.005***	-0.020***	-0.021***
	(0.001)	(0.002)	(0.000)	(0.000)
N	1,945	1,945	630	630
R^2	0.134	0.168	0.211	0.215
		Men		
log(wage_sending)	-0.001	0.003*	-0.001***	-0.000
	(0.001)	(0.002)	(0.000)	(0.000)
N	9,133	9,133	4,027	4,027
R^2	0.129	0.131	0.123	0.121
Hypothesis test [χ^2; p-value]: $\alpha_1^{women} = \alpha_1^{men}$	8.49; 0.000	0.70; 0.402	683.65; 0.000	1047.55; 0.000

Notes: All specifications include age, age squared, tenure, tenure squared, work experience, work experience squared, foreigner status, marital status, parental status, education, occupation, a family network dummy, sending firm fixed effects, share of women, size dummies of the receiving and sending firms, and a full set of year dummies. The standard errors are reported in parentheses and are clustered at the sending firm level and at the individual level. *Statistically significant at the 0.10 level, **at the 0.05 level, and ***at the 0.01 level.

Table 7: Promotion to better occupation models estimated separately for men and women, results by cohort

	Cohort 25-30	**Cohort 30-40**	**Cohort 40-50**	**Cohort 50-60**
			Women	
log(wage_sending)	0.018***	0.029***	0.039***	0.044***
	(0.001)	(0.002)	(0.002)	(0.002)
N	121,018	199,285	175,239	52,682
R^2	0.025	0.030	0.033	0.032
			Men	
log(wage_sending)	0.018***	0.041***	0.059***	0.091***
	(0.002)	(0.001)	(0.002)	(0.003)
N	271,866	477,224	451,131	169,002
R^2	0.024	0.037	0.047	0.062
Hypothesis test [χ^2; p-value]: $\alpha_1^{women} = \alpha_1^{men}$	0.01; 0.90	25.50; 0.000	34.18; 0.000	102.02; 0.000

Notes: The dependent variable is a dummy that takes the value of one, if the worker is, within the same firm, promoted to a better occupational level. All specifications include age, age squared, tenure, tenure squared, work experience, work experience squared, foreigner status, marital status, parental status, education, occupation, a family network dummy, firm fixed effects, receiving firm share of women, size dummies, and a full set of industry and year dummies. The standard errors are reported in parentheses and are clustered at the sending firm level and at the individual level. *Statistically significant at the 0.10 level, **at the 0.05 level, and ***at the 0.01 level.

Table 8: Promotion to managerial occupation models estimated separately for men and women, results by cohort

	Cohort 20-30	**Cohort 30-40**	**Cohort 40-50**	**Cohort 50-60**
			Women	
log(wage_sending)	0.002***	0.005***	0.007***	0.007***
	(0.000)	(0.000)	(0.000)	(0.001)
N	121,018	199,285	175,239	52,682
R^2	0.004	0.015	0.011	0.007
			Men	
log(wage_sending)	0.003***	0.013***	0.019***	0.038***
	(0.000)	(0.000)	(0.000)	(0.003)
N	271,866	477,224	451,131	169,002
R^2	0.005	0.025	0.024	0.035
Hypothesis test [χ^2; p-value]: $\alpha_1^{women} = \alpha_1^{men}$	15.09; 0.000	169.49; 0.000	123.23; 0.000	72.21; 0.000

Notes: The dependent variable is a dummy that takes the value of one, if the worker is, within the same firm, promoted to a managerial occupational level. All specifications include age, age squared, tenure, tenure squared, work experience, work experience squared, foreigner status, marital status, parental status, education, occupation, a family network dummy, firm fixed effects, receiving firm share of women, size dummies, and a full set of industry and year dummies. The standard errors are reported in parentheses and are clustered at the sending firm level and at the individual level. *Statistically significant at the 0.10 level, **at the 0.05 level, and ***at the 0.01 level.

Table 9: Sorting in job-to-job transitions estimated separately for men and women, results by age

	Under 35 years		**Between 35 and 50 years**		**More than 50 years**	
	Profits > 5%	Profits > 10%	Profits > 5%	Profits > 10%	Profits > 5%	Profits > 10%
			Women			
log(wage_sending)	0.014***	0.011***	0.020***	0.018***	0.019***	0.012***
	(0.000)	(0.001)	(0.000)	(0.001)	(0.005)	(0.004)
N	60,289	60,289	51,052	51,052	15,335	15,335
R^2	0.113	0.111	0.137	0.135	0.203	0.198
			Men			
log(wage_sending)	0.005***	0.004***	0.009***	0.007***	0.006***	0.004**
	(0.001)	(0.000)	(0.000)	(0.001)	(0.002)	(0.002)
N	130,451	130,451	120,984	120,984	42,638	42,638
R^2	0.130	0.131	0.131	0.164	0.156	0.157
Hypothesis test [χ^2; p-value]**:** $\alpha_1^{women} = \alpha_1^{men}$	58.33; 0.000	24.71; 0.000	321.64; 0.000	171.20; 0.000	18.36; 0.000	9.09; 0.003

Notes: All specifications include age, age squared, tenure, tenure squared, work experience, work experience squared, foreigner status, marital status, parental status, education, occupation, a family network dummy, sending firm fixed effects, share of women, size dummies of the receiving and sending firms, and a full set of year dummies. The standard errors are reported in parentheses and are clustered at the sending firm level and at the individual level. *Statistically significant at the 0.10 level, **at the 0.05 level, and ***at the 0.01 level.

Table 10: Promotion to better occupation models estimated separately for men and women, results by age

	Under 35 years	**Between 35 and 50 years**	**More than 50 years**
		Women	
log(wage_sending)	0.006***	0.017***	0.019***
	(0.001)	(0.002)	(0.002)
N	444,075	619,177	233,307
R^2	0.018	0.020	0.018
		Men	
log(wage_sending)	0.007***	0.028***	0.038***
	(0.001)	(0.003)	(0.003)
N	823,517	1,277,564	596,934
R^2	0.016	0.025	0.038
Hypothesis test [χ^2; p-value]**:** $\alpha_1^{women} = \alpha_1^{men}$	7.68; 0.005	78.41; 0.000	232.05; 0.000

Notes: The dependent variable is a dummy that takes the value of one, if the worker is, within the same firm, promoted to a better occupational level. All specifications include age, age squared, tenure, tenure squared, work experience, work experience squared, foreigner status, marital status, parental status, education, occupation, a family network dummy, firm fixed effects, receiving firm share of women, size dummies, and a full set of industry and year dummies. The standard errors are reported in parentheses and are clustered at the sending firm level and at the individual level. *Statistically significant at the 0.10 level, **at the 0.05 level, and ***at the 0.01 level.

Table 11: Sorting in job-to-job transitions estimated separately for men and women, results based on female friendliness of firms

	Transition to female-friendly firms		**Transition not to female-friendly firms**	
	Profits > 5%	Profits > 10%	Profits > 5%	Profits > 10%
			Women	
log(wage_sending)	0.023***	0.019***	0.006***	0.005***
	(0.003)	(0.003)	(0.002)	(0.000)
N	77,383	77,383	49,293	49,293
R^2	0.098	0.095	0.165	0.162
			Men	
log(wage_sending)	0.005***	0.003***	0.007***	0.005***
	(0.000)	(0.000)	(0.002)	(0.000)
N	157,585	157,585	136,488	136,488
R^2	0.109	0.107	0.150	0.153
Hypothesis test [χ^2; p-value]: $\alpha_1^{women} = \alpha_1^{men}$	27.51; 0.000	28.69; 0.000	0.02; 0.897	0.00; 0.94

Notes: All specifications include age, age squared, tenure, tenure squared, work experience, work experience squared, foreigner status, marital status, parental status, education, occupation, a family network dummy, sending firm fixed effects, share of women, size dummies of the receiving and sending firms, and a full set of year dummies. The standard errors are reported in parentheses and are clustered at the sending firm level and at the individual level. *Statistically significant at the 0.10 level, **at the 0.05 level, and ***at the 0.01 level.

Table 12: Promotion to better occupation models estimated separately for men and women, results based on the female-friendliness of firms

	Female-friendly firms	**Non-female-friendly firms**	**Female-sought firms**
		Women	
log(wage_sending)	0.015***	0.011**	0.014***
	(0.003)	(0.001)	(0.003)
N	459,405	870,395	391,628
R^2	0.019	0.009	0.027
		Men	
log(wage_sending)	0.012***	0.025***	0.009***
	(0.003)	(0.003)	(0.002)
N	574,378	2,199,550	449,077
R^2	0.023	0.022	0.033
Hypothesis test [χ^2; p-value]: $\alpha_1^{women} = \alpha_1^{men}$	31.57; 0.000	134.60; 0.000	62.82; 0.000

Notes: The dependent variable is a dummy that takes the value of one, if the worker is, within the same firm, promoted to a better occupational level. All specifications include age, age squared, tenure, tenure squared, work experience, work experience squared, foreigner status, marital status, parental status, education, occupation, a family network dummy, firm fixed effects, receiving firm share of women, size dummies, and a full set of industry and year dummies. The standard errors are reported in parentheses and are clustered at the sending firm level and at the individual level. Female-friendly firms are those with a share of white-collar women that is higher than the industrial mean. Female-sought firms only include the destination firms of the job to job transitions model, whose share of white-collar women is higher than the industrial mean that hired at least one woman in the sorting model. *Statistically significant at the 0.10 level, **at the 0.05 level, and ***at the 0.01 level.

Table 13: Promotion to managerial occupation models estimated separately for men and women, results based on the female-friendliness of firms

	Female-friendly firms	**Not female-friendly firms**	**Female-sought firms**
		Women	
log(wage_sending)	0.003***	0.002***	0.003***
	(0.000)	(0.000)	(0.000)
N	459,405	870,395	391,628
R^2	0.005	0.003	0.005
		Men	
log(wage_sending)	0.007***	0.007***	0.006***
	(0.000)	(0.000)	(0.000)
N	574,378	2,199,550	449,077
R^2	0.009	0.012	0.009
Hypothesis test [χ^2; p-value]**:** $\alpha_1^{women} = \alpha_1^{men}$	69.26; 0.000	376.79; 0.000	93.37; 0.000

Notes: The dependent variable is a dummy that takes the value of one, if the worker is, within the same firm, promoted to a managerial occupational level. All specifications include age, age squared, tenure, tenure squared, work experience, work experience squared, foreigner status, marital status, parental status, education, occupation, a family network dummy, firm fixed effects, receiving firm share of women, size dummies, and a full set of industry and year dummies. The standard errors are reported in parentheses and are clustered at the sending firm level and at the individual level. Female-friendly firms are those with a share of white-collar women that is higher than the industrial mean. Female-sought firms only include the destination firms of the job to job transitions model, whose share of white-collar women is higher than the industrial mean that hired at least one woman in the sorting model. *Statistically significant at the 0.10 level, **at the 0.05 level, and ***at the 0.01 level.

Table 14: Firm profitability and female-friendliness

	FE(1)	**FE(2)**	**FE(3)**
Female-sought firm	0.034**	0.033**	0.027**
	(0.012)	(0.012)	(0.012)
log of capital stock		0.027***	0.038***
		(0.004)	(0.004)
average age of employees			0.000
			(0.001)
average tenure of employees			0.001
			(0.002)
average experience of employees			-0.002*
			(0.001)
share of managers			-0.040
			(0.032)
share of middle managers			-0.012
			(0.014)
share of employees with secondary education			0.019*
			(0.011)
share of employees with tertiary education			-0.005
			(0.030)
share of women			0.041
			(0.071)
N	62,599	62,596	62,596
R^2	0.013	0.014	0.025

Notes: The dependent variable is the log of profits per employee. All specifications include firm fixed effects, firm size dummies, and a full set of industry and year dummies. *Statistically significant at the 0.10 level, **at the 0.05 level, and ***at the 0.01 level.

Table 15: Promotion to better occupation models estimated separately for men and women, results by female friendliness of firms before and after children

	Before Child		**After Child**	
	Female-friendly firms	Not female-friendly firms	Female-friendly firms	Not female-friendly firms
			Women	
log(wage_sending)	0.001	0.007***	0.016***	0.008***
	(0.002)	(0.002)	(0.003)	(0.000)
N	26,911	45,141	50,562	85,368
R^2	0.036	0.010	0.024	0.010
			Men	
log(wage_sending)	-0.002	0.016***	0.014***	0.019***
	(0.003)	(0.001)	(0.004)	(0.003)
N	35,508	117,046	64,697	210,860
R^2	0.043	0.020	0.010	0.011
Hypothesis test [χ^2; p-value]**:** $\alpha_1^{women} = \alpha_1^{men}$	1.36; 0.243	23.75; 0.000	3.61; 0.091	27.12; 0.000
	Before Child		**After Child**	
	Female-sought Firms	Not female-sought firms	Female-sought Firms	Not female-sought firms
			Women	
log(wage_sending)	0.004	0.008***	0.027***	0.009
	(0.004)	(0.003)	(0.006)	(0.001)
N	6,134	13,525	10,123	22,970
R^2	0.026	0.020	0.009	0.007
			Men	
log(wage_sending)	0.013***	0.015***	0.021***	0.018***
	(0.003)	(0.005)	(0.007)	(0.003)
N	15,652	57,017	26,358	94,273
R^2	0.033	0.014	0.023	0.012
Hypothesis test [χ^2; p-value]**:** $\alpha_1^{women} = \alpha_1^{men}$	5.92; 0.014	7.18; 0.007	6.59; 0.012	14.80; 0.000

Notes:The dependent variable is a dummy that takes the value of one, if the worker is, within the same firm, promoted to a better occupational level within the same firm. All specifications include age, age squared, tenure, tenure squared, work experience, work experience squared, foreigner status, marital status, parental status, education, occupation, a family network dummy, firm fixed effects, receiving firm share of women and size and a full set of industry and year dummies. Standard errors are reported in parentheses and are clustered at the sending firm level and at the individual level. Female-friendly firms are those with a share of white-collar women higher than the industrial mean. Female-sought firms only include the destination firms of the job to job transitions model whose share of white-collar women is higher than the industrial mean that hired at least a woman in the sorting model. *Statistically significant at the 0.10 level, **at the 0.05 level, ***at the 0.01 level.

Table 16: Promotion to managerial occupation models estimated separately for men and women, results based on the female-friendliness of firms before and after children

	Before Child		**After Child**	
	Female-friendly firms	Not female-friendly firms	Female-friendly firms	Not female-friendly firms
			Women	
log(wage_sending)	0.003***	0.001***	0.002***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
N	26,911	45,141	50,562	85,368
R^2	0.004	0.001	0.003	0.002
			Men	
log(wage_sending)	0.004***	0.004***	0.005***	0.004***
	(0.000)	(0.000)	(0.001)	(0.000)
N	35,508	117,046	64,697	210,860
R^2	0.007	0.009	0.004	0.004
Hypothesis test [χ^2; p-value]: $\alpha_1^{women} = \alpha_1^{men}$	2.74; 0.098	18.72; 0.000	4.77; 0.029	26.30; 0.000
	Before Child		**After Child**	
	Female-sought Firms	Not female-sought firms	Female-sought Firms	Not female-sought firms
			Women	
log(wage_sending)	0.004**	0.001***	0.004**	0.001**
	(0.002)	(0.000)	(0.001)	(0.000)
N	6,134	13,525	10,123	22,970
R^2	0.009	0.003	0.008	0.003
			Men	
log(wage_sending)	0.008***	0.004***	0.003**	0.003***
	(0.001)	(0.000)	(0.001)	(0.000)
N	15,652	57,017	26,358	94,273
R^2	0.011	0.008	0.004	0.005
Hypothesis test [χ^2; p-value]: $\alpha_1^{women} = \alpha_1^{men}$	3.29; 0.069	51.43; 0.000	0.25; 0.61	8.90; 0.002

Notes:The dependent variable is a dummy that takes the value of one, if the worker is, within the same firm, promoted to a managerial occupational level within the same firm. All specifications include age, age squared, tenure, tenure squared, work experience, work experience squared, foreigner status, marital status, parental status, education, occupation, a family network dummy, firm fixed effects, receiving firm share of women, size dummies, and a full set of industry and year dummies. The standard errors are reported in parentheses and are clustered at the sending firm level and at the individual level. Female-friendly firms are those with a share of white-collar women that is higher than the industrial mean. Female-sought firms only include the destination firms of the job to job transitions model, whose share of white-collar women is higher than the industrial mean that hired at least one woman in the sorting model. *Statistically significant at the 0.10 level, **at the 0.05 level, and ***at the 0.01 level.