

Cardoso, Ana Rute; Winter-Ebmer, Rudolf

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Ana Rute Cardoso
Rudolf Winter-Ebmer

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Ana Rute Cardoso

IZA

Rudolf Winter-Ebmer

*University of Linz, IHS Vienna,
CEPR and IZA*

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IZA

P.O. Box 7240
53072 Bonn
Germany

Phone: +49-228-3894-0

Fax: +49-228-3894-180

E-mail: iza@iza.org

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ABSTRACT

Mentoring and Segregation: Female-Led Firms and Gender Wage Policies^{*}

We explore the impact of mentoring of females and gender segregation on wages using a large longitudinal data set for Portugal. Female managers can protect and mentor female employees by paying them higher wages than male-led firms would do. We find that females can enjoy higher wages in female-led firms, the opposite being true for males. In both cases is a higher share of females reducing the wage level. These results are compatible with a theory where job promotion is an important factor of wage increases: if more females are to be mentored, less promotion slots are available for males, but also the expected chance of a female to be promoted is lower.

JEL Classification: M52, D21, J31, J16

Keywords: female entrepreneurs, wages, gender gap, matched employer-employee data

Corresponding author:

Rudolf Winter-Ebmer
Department of Economics
University of Linz
A-4040 Linz
Austria
E-mail: Rudolf.WinterEbmer@jku.at

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1 Introduction

Females get lower pay for equal work, as detected by numerous studies that looked at possible reasons for this gender wage gap. Weichselbaumer and Winter-Ebmer (2005) presented a meta-analysis of 263 international gender pay gap studies and found that females earned in the 1990s on average 26% less than males; when decomposing this earnings gap into a productivity-related component and an unexplained component, they found an unexplained gender pay gap of 19% (p. 483). This pay gap shrank in the last 40 years – taking different methods of data collection and analysis into account – only by 0.17 percentage points per year. Recent studies explain these trends to a certain degree with labor market institutions and general inequality (Blau and Kahn, 2003) as well as competition and equal treatment laws (Weichselbaumer and Winter-Ebmer, 2007).

Surprisingly, a less explored route is the role of supervisors, managers and entrepreneurs. Already Becker’s taste for discrimination theory (1957) gives the employer a paramount role: as employers set wages, looking at male and female employees would shed some light on taste-based discrimination. Recent policy measures in various countries are along these lines: while in the past equal opportunities and equal treatment laws were the main focus, more recently the imposition of gender quotas or gender parity in top positions has dominated political discussions. Promoting or hiring more females to top and influential positions is meant to break the glass ceiling¹ for females: it is expected that female decision makers might hire more subordinate females, mentor them and pay them better wages.

Despite these arguments, the empirical literature about the impact of female bosses on gender hiring and pay gaps is small. This topic has mainly been taken up by social psychologists, who distinguish between the similarity-attraction paradigm (Byrne 1971) and the self-enhancement drive (Graves and Powell, 1995). While the former claims that individuals who are similar are attracted to each other, the latter states that groups of lower status tend to identify with members of the higher status group.² We are only aware of three studies looking at wage effects of

¹Evidence on a glass ceiling (higher wage gaps at higher levels) is available in Albrecht et al. (2003) for Sweden and in Arulampalam et al. (2005) for European countries.

²Almost all studies in management and social psychology relate to hiring decisions, experiments or evaluations

female managers: Bell (2005) shows that in firms led by women (CEOs, chairs, and directors) the gender gap between men and women executives is narrowed. Cohen and Huffman (2007) use aggregate data on female managers in particular industries to look at wages of non-managerial workers; they find that industries with a higher percentage of female managers pay lower wages to both sexes. Hultin and Szulkin (2003) find for Sweden that a strong male representation among organizational managers is correlated with wider gender wage gaps.³

In this paper we focus on the impact of female leadership on the wages the firm pays to its male and female workers and investigate whether the gender of the manager of a firm has a significant impact on gender wage differences.⁴ A remarkable longitudinal matched employer-employee dataset is used, which covers the whole manufacturing and service non-public sector in Portugal for more than ten years. The longitudinal character of our data allow us to use firm-fixed effects. The impact of female managers is thus identified by a change in the gender of the manager only; uncontrollable structural firm attributes can so be eliminated.

In particular, we want to test the hypothesis that female-led firms tend to protect and mentor female employees by paying them higher wages than male-led firms would. Typically, discrimination theories would not see a role for female entrepreneurs to pay higher wages for female workers. Start for simplicity with an equilibrium where all firms consist of an equal share of males and females, but the males enjoy a higher wage. If taste-based discrimination is the reason for lower females' wages, non-discriminatory female-employers would have a clear incentive to increase the share of female workers and thus increase their profits. Considering wages, it is not clear why female-led firms should pay females wages higher than the going rate. First, it is unnecessary to attract workers from the market, second, paying higher females' wages would reduce profits. If female-

of recruiters, e.g. Graves and Powell (1995), Bon Reis et al. (1999), Heilman et al. (1988), Goldberg (2005), with mixed results. One recent extensive study by Bagues and Esteve-Volart (2007) looks at recruitment committees for Spanish public service positions and finds that female recruiters treat female candidates more unfavorably.

³Economists have studied the influence of gender on their own profession in some detail: Broder (1993) finds that female reviewers of economics proposals for National Science Foundation grants grade proposals from females lower; Blank (1991) finds no gender-difference of referees for the American Economic Review and Hilmer and Hilmer (2007) and Neumark and Gardecki (1998) investigate mentoring by economics PhD advisors: working with a female advisor relative to a male one has practically no effect on early-career outcomes of young female economists.

⁴See e.g. Bertrand and Hallock (2001), Bell (2005) or Lausten (2005) for an analysis of gender wage gaps for managers themselves and Smith et al. (2005) for effects of female managers on firm performance.

led firms would – due to e.g. fairness reasons – want to pay women above the market rate, they could only do so, if i) they do not equalize females’ wages to the male level completely and ii) increase the share of still cheaper females in their workforce; only in such a case, the total wage bill would not rise as compared to the standard of a discriminating firm. This reasoning would thus predict a higher potential for gender wage equalization in firms where the share of female workers is very high. Segregation as such is seen by many studies as a sign of bad jobs: firms with a high share of minorities or females might generally pay lower wages.

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On the other hand, mentoring (Brown and Scandura, 1994) of females in female-led firms might take the form of helping females to climb up the corporate ladder, to lead them into on-the-job training and networks. As mentoring is costly and time-consuming, it might not be possible to mentor all females equally in the firm: we would thus observe that female-led firms with a very high share of women in the workforce have a harder time to mentor and protect female workers. Moreover, if female-led firms’ mentoring is part of non-market based favoritism for female workers, we would observe that protection and mentoring of females is less possible the higher the female-share in the firm.

The paper is organized as follows. Section 2 describes the data and Section 3 presents descriptive evidence on female- and male-led firms in Portugal. Results of the econometric estimations are reported in Section 4, before concluding comments in Section 5.

2 Data set and concepts used

2.1 Data set

The study is based on a linked employer-employee dataset gathered annually by the Ministry of Employment in Portugal, which covers the population of private firms with wage-earners in manufacturing and services. The years 1987 to 2000

⁵The literature on the impact of gender segregation across firms on wages has shown mixed results. Evidence by Carrington and Troske (1995) and Bayard et al (2003) for the US shows that the concentration of women into lower-paying establishments contributes to the gender pay gap. Carrington and Troske (1995) show that a higher proportion of women in a firm is associated with lower wages, both for females and for males, whereas results by Vieira et al (2005), using data on Portugal, indicate that a higher concentration of women in a firm is associated with lower females’ wages but higher males’ wages.

are used.⁶ Given the legally binding nature of the inquiry, the response rate is extremely high.

Reported data include the firm's location, industry, employment, sales, ownership, legal setting, and the worker's gender, age, occupation, professional status, schooling, date of admission into the company, skill, monthly earnings and duration of work. For owners of the firm, labor earnings and hours of work are not reported.

Workers aged 16 to 65, full-time wage-earners or owners of the company, are the focus of attention. Firms in manufacturing and the services in mainland Portugal, employing at least 10 full-time wage-earners in any one year, were kept for analysis. The size restriction leads to dropping a large share of firms in Portugal, but a small share of the workforce, as reported in Table 6 in the appendix.

2.2 Identification of female-led firms

To identify the person(s) leading the firm, the following variables were considered:

1. Owner of the firm. The variable professional status is coded as: owner, wage-earner, unpaid family member, or member of a cooperative. Owners are reported if they are actually “performing functions in the firm”. Thus, if the owner is actively engaged working for the firm, his/her identification is straightforward.
2. Top manager. The variable occupation is coded at the six-digit level using the Portuguese Classification of Occupations version 1994. Top managers were defined as the occupations “corporate directors and chief executives” (code 121) and “directors of small firms” (code 131).
3. Middle manager. Using also the variable occupation, middle managers were defined as “other managers” (codes 122 and 123), which includes directors of production, finance and administration, marketing, sales, human resources, etc.
4. Best wage in the firm. The worker(s) with the top wage in the firm was identified.

⁶However, for 1990 no worker data are reported.

The first criterion – owner of the firm – provides an unambiguous identification of the person(s) leading the firm. Almost half the firms report information on their owner(s) and one fourth reports just one owner. In these cases, the share of females in the firm leadership was quantified using simply the gender composition of the owner(s).

Given that the dataset reports very detailed occupations, we have a clear idea of the tasks performed by each individual. Almost all owners are declared as managers of the firm (7% as top managers, i.e. corporate directors or directors of small firms, and 85% as middle rank managers), suggesting this occupation as the key one in terms of firm leadership. Note also that firms whose owner is reported working in the firm tend not to have wage-earners as top managers.⁷ Therefore, whenever the firm owner was not reported, an alternative procedure was followed to identify the firm leader(s), relying on its salaried managers. We first relied on the top manager; if the firm did not have any top managers, we progressed to consider middle rank managers.

For firms whose leadership could not be identified using either the owner or manager criteria, we have considered a third criterion, the best paid worker(s) as the one(s) leading the firm. The share of females leading the firm was then collapsed into a dichotomous classification: female- and male-led firms.⁸

To summarize, in practice the procedure was implemented as follows. Beginning with the owners, a firm was defined as female-headed if over 50% of its owners were female (similarly, as male-headed if over 50% of owners were male; and not classified if insufficient information was available, i.e. if exactly half the owners were male and half female or no owners were reported). For firms with insufficient information on the above criterion, a similar procedure was followed using the variable top management. Next, the procedure was extended to middle managers and finally, if none of the above criterion was conclusive, females among the top wage in the firm were considered. Table 1 reports the classification of firms into male- and female-led as these successive criteria were considered. Appendix B reports the results of robustness checks on our classification of firms into female- and male-led once alternative procedures are used.

⁷Just 1% of the firms with the owner present have wage-earners as top managers.

⁸Results do not change qualitatively if we use the share of female managers instead.

Firms not classified as either male- or female-led were dropped from the analysis. Moreover, some firms change classification over time. Since wage and other firm outcomes may reflect the choices of past management, specially in a regulated labor market such as the Portuguese, firms that change classification may bring noise into the analysis, a problem that is particularly acute if the firm changed classification more than once, back and forth. Therefore, in the first analysis that follows, only firms that changed classification never or only once, maintaining the same classification afterwards, were kept for analysis.⁹ This condition led to dropping 24% of the observations on male-led firms and 49% on female-led firms. As robustness checks we will report results on other alternatives for firm selection.

2.3 Wages

Gross monthly earnings are defined as monthly base-wage plus seniority-indexed components of pay and other regularly paid benefits. Wages were deflated using the Consumer Price Index (base 2000) and wage outliers have been dropped.¹⁰ Tables 7 and 8 in the appendix provide descriptive statistics on the firm and worker datasets.

3 Women-led firms and men-led firms in Portugal

Women tend to lead smaller firms, with a strong sectoral concentration in clothing, education, and health and social services. Female-led firms tend to have a younger and better educated labor force, and they employ predominantly females. Also, the leadership of female-led firms is younger and better educated (see table 7 in appendix). The share of female-led firms increased from approximately 13% in 1987 to 19% in 2000, whereas their employment share increased from 7% to 14% over the period.

Figure 1 provides a visual description of the trend in wage policies for male- and female-led firms.

⁹We will refer to this sample of firms as "all firms", in the tables and text that follow.

¹⁰Wages below half the national minimum wage or above 20 times the percentile 99 were dropped. Outliers in wage growth (log wage change below -.5 or above 1.5) led to dropping the full history of the worker, since mistakes coding the wage in one year usually lead to outliers in wage growth that carry over to the year afterwards (with opposite sign), and thus the whole history of the worker was judged unreliable, even when not captured as an outlier.

Male-led firms pay on average higher wages than female-led firms, for both, males (Panel A) and females (Panel B), which could be due to the different sectoral composition, firm size and the education of the workforce. The gap between the two types of firms seems to be larger for male workers. Panel C shows the aggregate wages in male- and female-led firms; the higher differential reflects the gender-based employment segregation: female-led firms employ females to a much larger extent. Comparing Panels A and B shows that there is a large gender wage gap. Average females' and males' wages are plotted in Panel D, which shows that the raw gender wage gap in Portugal remained roughly stable over time.

4 Gender wage differentials: can female-led firms make a difference?

To explore gender wage differentials we use augmented Mincer-type (log) wage regressions for males and females separately, concentrating in particular on the influence of the gender of the manager as well as the segregation of the workforce. Table 2 presents OLS estimates using all firms that changed ownership type only once or never. Table 3 further includes firm fixed effects to control for unobserved and unobservable firm differences which might influence wage setting. The impact of female managers is identified now only by changes in the gender of the manager within a firm. The summary tables provide a comparison of the most relevant coefficients estimated under alternative specifications. The regressions additionally include controls for age, tenure and education of the worker as well as size, industry, region, legal setting and origin of the capital of the firm, and the year.¹¹ A wider set of estimated coefficients is presented in the appendix, Tables 9 and 10, for our preferred specification (wage regression with firm fixed effects).

At first sight, females do not seem to profit from having a female boss: Column (1) in Table 2 shows a negative effect for females in female-led firms. We learn from Column (2) that this result seems to be due to the fact that female-led firms tend to have a higher share of females in the workforce. Correcting for this and looking at the interaction effect (Column (3)), we see that female-led firms do pay

¹¹Note that in such a large dataset some firms are observed changing size, major industry, region, legal setting, or the origin of their capital.

a premium to female workers of almost 5%, but this advantage becomes smaller the more females there are in the firm. If 80% of the workforce is female, women still earn a wage premium of 2% if they are led by a female boss, when compared to a male boss.

For males, the impact of a female manager is definitely detrimental. In all specifications, males earn lower wages in female-led firms than in male-led firms. Males get wages between three and seven percentage points lower in female-led firms.

On the other hand, a larger share of female co-workers is associated with higher males' wages. Our results confirm previous studies on segregation effects in Portugal (Vieira et al. 2005): females get lower wages in firms with a predominantly female workforce, whereas males enjoy higher wages, which might be interpreted as an effect of segregation in tasks. Males do get the better jobs as supervisors or middle managers: the more females there are around in the workplace, the better are the chances for the isolated males to get promoted to a supervisor position (Column 2). These effects are considerable: the male-female wage differential in an almost complete female workforce is 20% higher as compared to an almost full male workforce.

But our results in Table 2 go beyond these insights. Distinguishing between female- and male-led firms, we find (Column 3) that the overall pattern just described – a larger share of female co-workers having a positive impact on males' wages and a negative impact on females' wages – holds in male-led firms, whereas in female-led firms both males and females earn lower wages the larger the proportion of female workers. This result could be due to structural differences between firms with a male- vs. female-dominated workforce.

Combining the effect of female managers and female workforce, we see that women can get less mentoring and protection by a female boss if there are many female coworkers around. For males, the detrimental impact of a female boss is amplified if there is also a female dominance in the firm's workforce: in a firm with 50% females, males working under a female manager have 8 percent lower wages; in a firm with 80% female workforce, they lose almost 11%.

Although we do control for a wide set of variables, the OLS results might suffer

from a bias if male- and female-led firms differ according to unobserved characteristics. Therefore, we recourse to firm-fixed effects estimates. These results, in Table 3, confirm our main insights: females profit from a female boss and males lose out. Already Column 1 – disregarding the gender-composition of the workforce – shows a clear picture: females gain 2% whereas males lose 2%; thus a female boss is reducing the wage gap by 4%. Extending the analysis by considering also the composition of the workforce, we see that the results for females’ wages are almost unchanged as compared to the OLS results, whereas for males’ wages, the effects are still present, but somewhat smaller.

Our results are compatible with a model where job assignment and job promotion are important factors determining wages. If employers decide about promoting workers according to the expected duration of stay in the firm, the fear of pregnancy-related quits might lead to statistical discrimination of females (Lazear and Rosen, 1990, Winter-Ebmer and Zweimüller, 1997). As there is in general a fixed number of such supervisory jobs, the higher the number of potential candidates, the less likely it is that an individual person can get this job. This would explain the pattern that in male managed firms a higher share of females has a positive impact on males’ wages and a negative one on females’ wages: as females are discriminated against in promotion decisions, the higher the share of females, the less likely it is that one of them gets promoted; on the other hand, more females make it easier for each individual male to finish first in male-led firms.

Female managers might either have better information about expected pregnancies or about following work interruptions or they might simply want to break through this logic by mentoring females better in order to promote them to supervisory or foreman jobs. If females do protect fellow-females in promotion decisions, this would explain the positive effect of female managers on females’ wages and the negative effect on males’ wages. The consequence is that a higher female share in the firm reduces the chances for an individual woman to grab one of these rare jobs; the average wage of females must be lower. Likewise, for males, a higher share of females in the firm is increasing the competition for the remaining males and reduce their chances.

4.1 Robustness checks

Our main results from fixed effects regressions showed that female managers are indeed able to mentor and promote female workers, but the possibilities for mentorship get weaker the more female co-workers there are around. Here we report two robustness checks by changing the selection of our samples. The first concerns only new firms, whereas the second allows more time for changes in the management to take its impact on pay scales.

In Table 4 results for newly founded firms are shown. We consider one single year of observation for each firm, the year the firm was created.¹² It is highly likely that incumbent firms will have an established pay scale: if there are discriminatory aspects in these pay scales, it can be assumed that many aspects of these pay scales might be persistent – even persisting a change in management. One could assume that newly founded firms would set a pay scale which is much more reactive to current economic and social considerations, and in particular female managers may find it easier to escape traditional gender-based payment rules.

The results for newly founded firms do confirm these expectations. Whereas the main pattern is unchanged and for male workers the parameters are almost identical, female workers do profit to a much higher extent from having female bosses. Comparable female workers in newly founded female-led firms earn significantly higher wages than those in newly founded male-led firms. If half of the workforce is female, the gain is 8.5%; it is still 4% if only 20% males are among the coworkers.

In our second robustness check we included all the firms in our sample, regardless whether they changed gender of their leadership once or more often. However, given that changes implemented by the new management may take some time to have an impact, we have excluded the year the firm changed type of leadership and the subsequent year from the analysis. Results are reported in Table 5. Also in this case, results are very consistent with the ones previously reported.

¹²Note that we can only report OLS results here, since the inclusion of a firm fixed effect wipes out the dummy variable of female management.

5 Conclusion

In contrast to the textbook model of perfect competition, employers can influence pay setting and the structure of pay in non-perfect markets. This should also apply to gender-based pay. Starting with Becker (1957) economists embraced the idea that pay differences between men and women could be explained by a taste for discrimination by a part of the employers. Depending on the extent of this distaste and the number of discriminating employers, a gender wage gap will materialize in equilibrium.

In this paper we look at a potential role the gender of the employer or manager could play. Using a large longitudinal data set for Portugal we show that, indeed, a female-led firm is paying higher wages to females but lower ones to males than would be the case in a male-led firm. These results are robust to a set of specification tests: we identify the effect only by firms who changed the gender of the manager in order to control for unobserved firm-specific features; we used only start-up firms to allow for a newly decided pay structure; and we also used firms who changed management more often. Our results are consistent with a situation where job promotion is an important part of the pay scale and the number of such supervisory jobs is limited. When female managers are actively mentoring and protecting female co-workers they increase their promotion chances and thus the expected wage for females. The higher the share of females in the firm is, the lower are the promotion chances for an individual person, both female and male. This is exactly what we find. While being an important factor in the structure of male-female wages, the rise in female-led firms in Portugal is too small to contribute significantly to the development of the overall gender wage gap.

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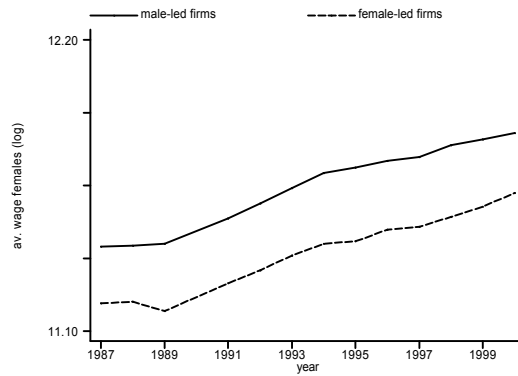
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Tables and figures

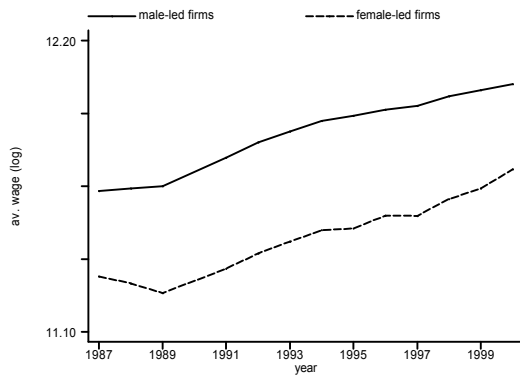
panel A, male wages



panel B, female wages



panel C, both gender



panel D

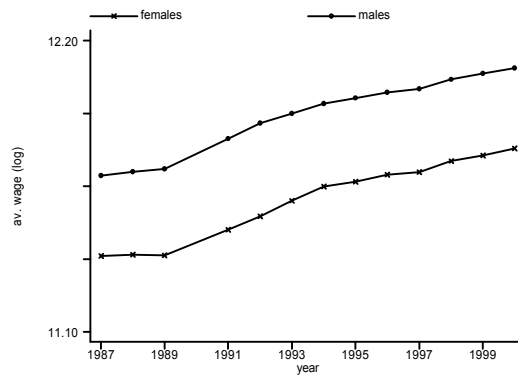


Figure 1: MONTHLY WAGES (MALE, FEMALE, AND OVERALL). Source: Computations based on Portugal, MTSS (1987-2000). Notes: Panels A to C: the average real monthly wage at the firm level (male, female, and overall) was averaged for the two groups of firms using as weights the male, female, and overall employment in the firm, respectively; log wages are plotted. Panel D: the average real monthly wage for males and females was computed; log wages are plotted.

Criterion	Female-led	Male-led	Insuf. info.(*)
Owners	23,372	131,778	231,218
Top managers	24,442	138,398	223,528
Middle managers	33,791	178,584	173,993
Top wages	83,666	298,680	4,022

Table 1: SUCCESSIVE CRITERIA USED TO IDENTIFY THE FIRM LEADERSHIP AND ITS DEGREE OF FEMALENESS. Source: Computations based on Portugal, MTSS (1987-2000). Note (*): Information on the criterion either missing or pointing exactly to half males and half females in the firm leadership.

A: Female Workers	(1)	(2)	(3)
female-led firm	-.006 (.0005)***	.021 (.0005)***	.047 (.002)***
share females		-.139 (.0009)***	-.135 (.0009)***
fem.-led * share fem.			-.033 (.002)***
Obs.	2903728	2903728	2903728
R^2	.698	.700	.700
F statistic	131355.2	130511.4	128064.6
B: Male Workers			
female-led firm	-.058 (.0008)***	-.067 (.0008)***	-.030 (.001)***
share females		.061 (.0009)***	.068 (.0009)***
fem.-led * share fem.			-.096 (.003)***
Obs.	5800455	5800455	5800455
R^2	.632	.632	.632
F statistic	195286.2	191763.3	188202.3

Table 2: SUMMARY OF WAGE REGRESSION, ORDINARY LEAST SQUARES, ALL FIRMS. Source: Computations based on Portugal, MTSS (1987-2000). Note: Includes controls for age, tenure and education of the worker, size, industry, region, legal setting, and origin of the capital of the firm, and year.

A: Female Workers	(1)	(2)	(3)
female-led firm	.022 (.0008)***	.026 (.0008)***	.054 (.002)***
share females		-.094 (.002)***	-.087 (.003)***
fem.-led * share fem.			-.039 (.003)***
Obs.	2903728	2903728	2903728
R^2	.801	.801	.801
F statistic	37258.46	36590.22	35904.98
B: Male Workers			
female-led firm	-.018 (.001)***	-.018 (.001)***	-.006 (.002)***
share females		-.0009 (.002)	.001 (.002)
fem.-led * share fem.			-.037 (.004)***
Obs.	5800455	5800455	5800455
R^2	.749	.749	.749
F statistic	82920.8	81326.16	79794.21

Table 3: SUMMARY OF WAGE REGRESSION, FIRM FIXED EFFECTS, ALL FIRMS. Source: Computations based on Portugal, MTSS (1987-2000). Note: Includes controls for age, tenure and education of the worker, size, industry, region, legal setting, and origin of the capital of the firm, and year.

A: Female Workers	(1)	(2)	(3)
female-led firm	-.005 (.003)**	.036 (.003)***	.160 (.011)***
share females		-.223 (.007)***	-.187 (.008)***
fem.-led * share fem.			-.150 (.013)***
Obs.	46183	46183	46183
R^2	.585	.594	.595
F statistic	1276.378	1299.719	1281.31
B:Male Workers			
female-led firm	-.052 (.006)***	-.057 (.006)***	-.017 (.010)*
share females		.027 (.010)***	.045 (.010)***
fem.-led * share fem.			-.104 (.020)***
Obs.	53987	53987	53987
R^2	.514	.515	.515
F statistic	1120.46	1099.208	1079.49

Table 4: SUMMARY OF WAGE REGRESSION, ORDINARY LEAST SQUARES, JUST NEW FIRMS. Source: Computations based on Portugal, MTSS (1987-2000). Note: Includes controls for age, tenure and education of the worker, size, industry, region, legal setting, and origin of the capital of the firm, and year.

A: Female Workers	(1)	(2)	(3)
female-led firm	.026 (.001)***	.031 (.001)***	.037 (.003)***
share females		-.094 (.003)***	-.092 (.003)***
fem.-led * share fem.			-.009 (.004)**
Obs.	2778685	2778685	2778685
R^2	.804	.804	.804
F statistic	36049.65	35399.9	34732.11
B: Male Workers			
female-led firm	-.017 (.001)***	-.017 (.001)***	-.008 (.003)***
share females		-.0004 (.002)	.0007 (.002)
fem.-led * share fem.			-.025 (.006)***
Obs.	5698156	5698156	5698156
R^2	.75	.75	.75
F statistic	81970.29	80393.92	78877.64

Table 5: SUMMARY OF WAGE REGRESSION, FIRM FIXED EFFECTS, EXCLUDING YEAR T WHEN FIRM CHANGED TYPE OF LEADERSHIP AND YEAR T+1. Source: Computations based on Portugal, MTSS (1987-2000). Note: Includes controls for age, tenure and education of the worker, size, industry, region, legal setting, and origin of the capital of the firm, and year.

Appendix A: Additional tables

Firm size restriction	Workers	Firms	Owners	Female owners
No size restriction	17,116,973	1,457,183	1,192,282	302,265
Firms ever larger than 10 workers	13,202,761	386,368	297,982	63,291

Table 6: INITIAL SAMPLE SIZES (NUMBER OF UNIT-YEAR OBSERVATIONS). Source: Computations based on Portugal, MTSS (1987-2000).

Variable	Male-led Firms		Female-led Firms	
	Mean	Std. Dev.	Mean	Std. Dev.
firm size (log)	2.675	1.091	2.416	0.964
firm age	23.734	19.279	22.271	36.287
share females	0.251	0.251	0.806	0.268
av. age	35.832	6.144	33.735	6.699
av. schooling (yrs)	6.276	2.346	6.919	2.521
av. age firm leader	43.181	9.816	37.713	10.221
av. schooling firm leader	8.198	4.329	9.138	4.54
firm productivity (log)	9.733	1.103	9.002	1.279
Legal setting				
sole proprietorship	0.071		0.112	
partnership	0.8		0.611	
joint stock	0.093		0.039	
other	0.036		0.238	
Ownership				
public	0.005		0.002	
foreign	0.035		0.019	
Location				
Center Coast	0.185		0.126	
Lisbon	0.354		0.35	
Inland and South	0.128		0.124	
Industry				
textiles	0.035		0.048	
clothing, leather	0.062		0.264	
wood, cork	0.072		0.018	
paper, printing	0.028		0.012	
chemicals	0.025		0.01	
stone, clay, glass	0.037		0.015	
basic metals	0.008		0.001	
metal prod, machin.	0.108		0.021	
elect., water	0.001		0	
construction	0.169		0.029	
wholesale trade	0.122		0.053	
retail trade	0.104		0.09	
restaurants, hotels	0.052		0.044	
transport, communic.	0.039		0.016	
banking, insurance	0.011		0.004	
real estate	0.02		0.02	
education	0.008		0.102	
health, social serv.	0.006		0.168	
other	0.051		0.068	
N	222966		42733	

Table 7: DESCRIPTIVE STATISTICS ON THE FIRM. Source: Own computations based on *Quadros de Pessoal*, 1987-2000. Note: Reports firms that changed ownership type once or never.

Variable	Males		Females	
	Mean	Std. Dev.	Mean	Std. Dev.
wage(log)	11.769	0.53	11.488	0.48
female-led firm	0.034	0.18	0.208	0.406
share females	0.207	0.19	0.576	0.283
age	38.104	11.64	34.116	10.421
tenure	9.989	9.509	8.214	8.388
tenure <= 1	0.127		0.138	
Education				
4 yrs	0.475		0.399	
6 yrs	0.19		0.212	
9 yrs	0.115		0.128	
12 yrs	0.126		0.165	
16 yrs	0.055		0.061	
firm size (log)	4.976	2.115	4.588	1.857
firm age	41.281	24.056	37.671	32.61
Legal setting				
sole proprietorship	0.024		0.028	
partnership	0.51		0.561	
joint stock	0.366		0.275	
other	0.032		0.107	
Ownership				
public	0.131		0.066	
foreign	0.095		0.112	
Location				
Center Coast	0.135		0.154	
Lisbon	0.482		0.413	
Inland and South	0.079		0.091	
Industry				
textiles	0.051		0.106	
clothing, leather	0.029		0.193	
wood, cork	0.048		0.033	
paper, printing	0.024		0.019	
chemicals	0.039		0.028	
stone, clay, glass	0.04		0.028	
basic metals	0.018		0.004	
metal prod, machin.	0.14		0.08	
elect., water	0.027		0.009	
construction	0.151		0.018	
wholesale trade	0.081		0.067	
retail trade	0.057		0.067	
restaurants, hotels	0.025		0.049	
transport, communic.	0.103		0.045	
banking, insurance	0.058		0.048	
real estate	0.013		0.012	
education	0.004		0.03	
health, social serv.	0.004		0.058	
other	0.045		0.051	
N	5800455		2903728	

Table 8: Descriptive statistics on the worker

	(1)	(2)	(3)
female-led firm	.022 (.0008)***	.026 (.0008)***	.054 (.002)***
share females		-.094 (.002)***	-.087 (.003)***
fem.-led * share fem.			-.039 (.003)***
age	.026 (.00008)***	.026 (.00008)***	.026 (.00008)***
age2	-.0003 (1.10e-06)***	-.0003 (1.10e-06)***	-.0003 (1.10e-06)***
tenure	.008 (.00003)***	.008 (.00003)***	.008 (.00003)***
tenure < 1	-.059 (.0004)***	-.058 (.0004)***	-.058 (.0004)***
educ: 4 yrs.	.086 (.0008)***	.086 (.0008)***	.086 (.0008)***
educ: 6 yrs.	.181 (.0008)***	.181 (.0008)***	.181 (.0008)***
educ: 9 yrs.	.306 (.0009)***	.305 (.0009)***	.305 (.0009)***
educ: 12 yrs.	.382 (.0009)***	.381 (.0009)***	.381 (.0009)***
educ: 16 yrs.	.813 (.001)***	.812 (.001)***	.812 (.001)***
firm size (log)	.012 (.0004)***	.010 (.0004)***	.010 (.0004)***
sole proprietorship	.024 (.007)***	.026 (.007)***	.026 (.007)***
partnership	.054 (.002)***	.054 (.002)***	.055 (.002)***
joint stock	.041 (.001)***	.042 (.001)***	.042 (.001)***
public	-.044 (.001)***	-.043 (.001)***	-.043 (.001)***
foreign	.001 (.001)	.0007 (.001)	.0006 (.001)
Obs.	2903728	2903728	2903728
R^2	.801	.801	.801
F statistic	37258.46	36590.22	35904.98

Table 9: WAGE REGRESSION, FIRM FIXED EFFECTS, FEMALE WORKERS, ALL FIRMS. Source: Computations based on Portugal, MTSS (1987-2000). Note: Includes controls for industry (19 dummies), year, and region (3 dummies).

	(1)	(2)	(3)
female-led firm	-.018 (.001)***	-.018 (.001)***	-.006 (.002)***
share females		-.0009 (.002)	.001 (.002)
fem.-led * share fem.			-.037 (.004)***
age	.044 (.00007)***	.044 (.00007)***	.044 (.00007)***
age2	-.0004 (8.39e-07)***	-.0004 (8.39e-07)***	-.0004 (8.39e-07)***
tenure	.008 (.00002)***	.008 (.00002)***	.008 (.00002)***
tenure < 1	-.049 (.0004)***	-.049 (.0004)***	-.049 (.0004)***
educ: 4 yrs.	.147 (.0006)***	.147 (.0006)***	.147 (.0006)***
educ: 6 yrs.	.245 (.0007)***	.245 (.0007)***	.245 (.0007)***
educ: 9 yrs.	.351 (.0007)***	.351 (.0007)***	.351 (.0007)***
educ: 12 yrs.	.440 (.0007)***	.440 (.0007)***	.440 (.0007)***
educ: 16 yrs.	.971 (.0008)***	.971 (.0008)***	.971 (.0008)***
firm size (log)	.007 (.0003)***	.007 (.0003)***	.007 (.0003)***
sole proprietorship	.027 (.006)***	.027 (.006)***	.027 (.006)***
partnership	.053 (.001)***	.053 (.001)***	.053 (.001)***
joint stock	.049 (.0009)***	.049 (.0009)***	.049 (.0009)***
public	-.024 (.0008)***	-.024 (.0008)***	-.024 (.0008)***
foreign	-.002 (.0009)**	-.002 (.0009)**	-.002 (.0009)**
Obs.	5800455	5800455	5800455
R^2	.749	.749	.749
F statistic	82920.8	81326.16	79794.21

Table 10: WAGE REGRESSION, FIRM FIXED EFFECTS, MALE WORKERS, ALL FIRMS. Source: Computations based on Portugal, MTSS (1987-2000). Note: Includes controls for industry (19 dummies), year, and region (3 dummies).

Appendix B: Alternative procedure to identify the firm leadership

We have checked the robustness of our classification of firms into male- and female-led. Whereas the first criterion used to define the firm leadership – its owner – raises no doubts, the order in which the other variables are considered may be less consensual, and one could argue for instance that the best paid worker is more likely to be the firm leader, even if (s)he is not formally called a manager. We have therefore identified the person leading the firm using the criteria in the following alternative sequence: 1. Owner of the firm; 2. Top wage in the firm; 3. Top manager; 4. Middle manager. Table 11 reports the cross-classification using the two procedures.

	Procedure 2			
Procedure 1	Male-led	Female-led	Insuf. info.	Total
Male-led	296,031	2,649		298,680
Female-led	3,810	79,856		83,666
Insuf. info.			4,022	4,022
Total	299,841	82,505	4,022	386,368

Table 11: CLASSIFICATION OF FIRMS INTO MALE- AND FEMALE-LED USING ALTERNATIVE PROCEDURES. Source: Computations based on Portugal, MTSS (1987-2000). Note: Procedure 1 uses the following ordering of variables to identify the firm leader(s): owner, manager, best wage in firm; procedure 2 uses the ordering: owner, best wage in firm, manager.

Almost all the firms (99%) classified as male-headed under procedure 1 get the same classification under procedure 2: for female-headed firms, that share is 95%. The two procedures lead to a very similar classifications of firms. Nonetheless it is more plausible that a worker reported as manager will take the crucial decisions in the company – including setting the pay scales – as compared to a specialized worker whose wage may be very high due to market constraints.¹³ Indeed, it is a standard procedure in the literature to identify the firm leadership by looking at the top executive jobs (Bell, 2005) (Smith et al, 2005) (Melero, 2004). We have therefore progressed in the analysis using the first procedure described, but results using the second procedure are very similar.

¹³In firms that have top managers, wages higher than his(hers) occur for occupations such as accountants, professionals of intermediate level in financial and commercial services, and salespersons.