The gender earnings gap inside a russian firm: first evidence from personnel data - 1997 to 2002

The Gender Earnings Gap inside a Russian Firm: First Evidence from Personnel Data – 1997 to 2002*

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Using unique personnel data from one Russian firm for the years 1997 to 2002 we study the size, development and determinants of the gender earnings gap in an internal labor market during late transition. The estimated gender earnings gap at the firm level falls from about 38 percent in 1997 to 18 percent in 2002. Gender earnings differentials are largest for production workers, who constitute the largest employee group in the firm. Various decompositions show that these differentials and their dynamics remain largely unexplained by observable characteristics at the mean and across the wage distribution. Our analysis also reveals that the earnings differentials for production workers largely stem from job assignment, as women are predominately assigned to lower-paid jobs. Earnings gaps within job levels are small and almost fully explained by observed characteristics. The convergence of male and female earnings is largely driven by an increase in the rewards for women, which is most pronounced in the lower part of the distribution.

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Contents

1 Introduction

Research on the gender wage gap in labor markets in transition is part of a more general agenda that focuses on the question of whether transition has caused a worsening of the position of women in the labor market or whether they have benefited from the liberalization of the economic system. In this paper, we analyze the size, development and determinants of the gender earnings gap within a large Russian firm.

In Soviet times gender equality was one of the tenets of the regime's ideology. The labor market participation of women was high and discrimination in pay formally absent. However, socialist reality was somewhat less rosy for women, as they were confronted with the difficult task of combining work in the household with the job in the enterprise and as they found themselves predominantly in "female" occupations that commanded lower wages. Occupational segregation thus led to the existence of a gender wage gap under socialism, part of which was unexplained by observed productivity characteristics (Malceva and Roshchin 2006).

With the onset of the transition from a centrally planned to a market economy the socio-economic structures in Russia saw dramatic changes that had more pronounced effects for women: a collapsing welfare system and a substantial reduction in childcare facilities were accompanied by a sharp increase in open unemployment, but also the possibility to specialize in home production as an alternative to market work for the first time in generations. In addition, the restructuring of many privatized enterprises and the increase in competition in product markets through trade liberalization as well as the entry of de novo private firms had a profound impact on developments in the Russian labor market. For the most part, these developments have changed the situation of women for the worse; in particular they have drastically reduced life-long employment opportunities in large firms and have made labor market attachment for women in general more tenuous. This overall change in the position of women in the Russian labor market needs to be kept in mind when analyzing the issue of gender earnings differentials in that country.

One strand of the literature on the gender wage gap (GWG) in transition countries compares the GWG just before the transition to the gap in the early years of transition. In this literature, the initial regime switch is perceived as a quasi-natural experiment that presumably enables researchers to establish a causal effect of transition on the gender wage gap in former Socialist economies. As stressed by Jurajda (2005) and Brainerd (2000), there are above all three forces simultaneously determining the dynamics of the GWG pre- and post-transition. On the one hand, a dramatic widening of the wage distribution, as happened for example in Russia and Ukraine, can increase the gap since women are predominately located in the lower part of the wage distribution (Brainerd 2000). On the other hand, if low-skilled women leave employment on a large scale, as was observed for East Germany by Hunt (2002) and for Slovenia by Orazem and Vodopivec (2000), and if this effect dominates, the gap can be reduced. A second determinant potentially lowering the wage gap after the regime switch are increasing returns to educational attainment and other productivity characteristics after the liberalization of the labor market. Brainerd (2000) provides convincing evidence that these higher returns reduce the GWG in several Central European transition countries since their female workforces are on average better educated than their male counterparts.

The few studies which are specifically about gender differentials in the Russian labor market all use household survey data. In contrast to Brainerd's results, Reilly (1999) finds a stable monthly earnings differential of about 37 percent – and an hourly wage gap of roughly 25 percent – for the years 1992 to 1996. He establishes, though, that the "unexplained" part grows over the reported period. The research by Ogloblin (1999), also covering the early years of the Russian transition (1994 to 1996), suggests that occupational segregation explains most of the gender wage gap. Using panel data, the study by Kazakova (2007) covers a more mature stage of the Russian transition and, using a panel with full wage data, finds that the GWG decreases from 35 percent in 1996 to 16 percent in 2002.

Our paper employs personnel panel data of a large Russian manufacturing firm and analyzes the gender earnings gap (GEG) within this firm for the years 1997 to 2002.[1] This is the first study not only for Russia, but for any transition economy, that uses personnel data to look at gender differentials within a firm. Our analysis of gender differentials with the help of personnel data contributes in several ways to the literature on gender discrimination in transition economies in general, and in Russia in particular.

First, we can establish whether the substantial Russian earnings gap that researchers find with household level data "survives" when we look at the in-

[1] We look at the gender earnings gap and not at the gender wage gap because we do not have precise information on hours worked in our data.

ternal labor market of a large Russian firm. It could well be that most of the earnings gap observed with household data comes about because of productivity differences between men and women and their sorting into firms which pay high wages and those which pay low wages (Kremer 1993). Our estimates of the gender earnings gap inside the firm are very similar to estimates of the gender earnings gap obtained from household data with wages paid in full. Second, we explore changes in the gender earnings gap. Again, we find that the development of the gender earnings gap at firm level mirrors the economy-wide development of the gender earnings gap in Russia: in line with the results of Kazakova (2007) we establish a large reduction in the gender differential from around 38 to 18 percent. Third, given that the earnings differential "survives" within a large privatized firm like ours – one should bear in mind that a large proportion of the Russian workforce is still employed in such firms – we investigate at the mean and across the entire distribution how much of the differential is explained by observed characteristics. Fourth, we test several hypotheses about the determinants of the unexplained part of the gap. For example, we test whether women are willing to receive lower wages in return for larger bonuses, whether female employees are willing to trade off wages for employment security, or whether segregation of women within the firm into low job levels provides an explanation for the gap.[2] Finally, we investigate the determinants of the gender earnings gap and changes therein. Employing methods introduced by Juhn, Murphy and Pierce (1991) and Machado and Mata (2005) we explore various factors influencing the changes in gender differentials cited above, namely changes in earnings inequality, changes in the composition of the workforce and changes in the returns to productivity characteristics. While the exploration at the means provides some new insights about the causes of the reduction in the gender gap, the analysis across the entire distributions is new for Russia and of particular interest as it shows that the driving force behind the reduction in the earnings gap is brought about by changes in the lower part of the earnings distributions.

The analysis of the gender earnings gap with the help of personnel data can be considered an important complementary exercise also for methodological reasons. Recent work with matched employer-employee data for Western economies has shown that firm-specific effects constitute an important determinant of gender differentials (see e. g. the evidence for the United States by Bayard et al. 2003, and for Germany by Heinze and Wolf 2006 and 2007). If one is unable to control for segregation at the level of the establishment, as is the case with household survey data, one overstates the role of occupational and/or sector segregation in the economy. Using matched data one can provide evidence of within-establishment and within-occupation segregation. The use of such data might also reduce the bias from unobserved heterogeneity by focusing on selected samples of more homogeneous groups of workers (Kunze 2008). Employing personnel data in the analysis of the GEG might have the advantage of reducing unobserved heterogeneity to a greater degree than can be done with other types of data because of the likely more homogeneous nature of the workforce within one particular firm. With personnel data it is also better possible, as Kunze (2008) notes, to "more credibly investigate whether wage gaps still exist when job characteristics and rank are controlled for." While personnel data from one firm can never be truly representative of a sector or the economy on the whole, it permits us to explore internal labor markets in large organizations from a gender perspective and pin down those factors that contribute to differential treatment of men and women within such organizations. Due to data scarcity only few studies on the gender gap within large firms exist; however, their results certainly shed additional light on the causes of gender differentials. For example, Barnet-Verzat and Wolff (2008) analyze personnel data on executives of a French firm and document that the GEG is rather small, ranging from 2 to 5 percent across the entire distribution, once hierarchical levels are controlled for, but they do find evidence of a "glass ceiling" effect.[3]

Data scarcity has made it difficult for economists to test implications for the gender earnings gap that derive from theoretical approaches. Two models come especially to mind. Lazear and Rosen (1990) assume that women have a higher expected value of time spent at home, which implies that they have a higher separation probability and require a higher ability threshold in order to be promoted. Two important predictions arise from this model: promotion rates (and thus wages) do not differ by gender at very high levels of ability, and female wages on average are lower within a firm since they are underrepresented in highly paid jobs. Booth, Francesconi and Frank (2003) moot that even if the same number of women were promoted as men, this might not automatically attenuate the gender earnings gap. If women have fewer market opportunities

[2] Ransom and Oaxaca (2005) find that such segregation in a regional grocery chain in the United States goes a long way towards explaining the earnings gap.

[3] See also Ransom and Oaxaca (2005) for gender differences in pay, mobility and promotion opportunities within a U.S. firm and Jones and Makepeace (1996) for evidence from a U.K. firm.

outside the firm upon promotion, they might be promoted to the same degree or might even have a higher promotion rate, but they receive lower wage increases than men after promotion has occurred. Since we can identify managers in our firm, i. e. high ability employees, we can provide an additional data point to test the predictions of these two models, albeit in a partial fashion.

The remainder of the paper is organized as follows: the next section briefly describes the firm: the position in its product market, the ownership structure as well as its wage and employment policies. Section 3 describes the personnel data and measurement issues associated with gender differentials. Section 4 introduces the methods used to analyze them. Section 5 presents the results in three parts. First, we describe the gender earnings gaps and their decompositions in explained and unexplained parts at the means and across the distributions. Then we explore the various determinants of the gaps, which we enumerated above. A third part looks at changes in the gaps and which of the factors cited above can help explain these changes. A final section provides some tentative conclusions.

2 The firm and its wage and employment determination

The particular firm for which we have data is located in a provincial city in Russia and operates in the sector "machine building and metal works." After having converted the production lines from Soviet times "nearly one hundred percent", according to the director general of the firm (CEO)[4], it produces well equipment for gas and oil production and smith-press equipment. More than ninety percent of its production is destined for the Russian market. It has no competitors locally, but nationally it has to compete with more than five firms, among them firms from the European Union that export oil equipment to Russia. Nevertheless, being a supplier for the Russian oil industry it has been benefiting from the continuous robust growth which this industry has experienced since the aftermath of the financial crisis.[5] At any rate, real output, capacity utilization and profits were all in a trough in 1998, recovered slightly in 1999 and then took off dramatically after the year 2000.[6]

How representative is this firm as far as the sector "machine building and metal works" and Russian industry on the whole is concerned? Many privatized large firms in the sector and in Russian industry were shedding labor while our firm slightly increased its workforce over the reported period. The CEO is considered one of the successful managers in Russian industry as, early on in the transition, he initiated the conversion of production from military hardware to equipment serving the Russian oil industry. In our opinion, therefore, this firm is representative of a perhaps small but in economic terms important number of industrial firms that have managed the transition to a market-based economy well and which are leaders in their sectors with a brighter future than the average large privatized Russian industrial firm.

The employees in this firm do not seem to influence wage and employment determination in ways that can partially shape gender earnings gaps within Russian firms. Employees could have this influence above all through two routes. First, corporate governance structures related to privatization and the distribution of shares have an impact on the process of how wages and employment are determined. The firm was founded in the early 1950s and privatized in 1992. A decade later, in 2002, more than half of the shares were owned by managers and employees still working in the firm. From published annual financial statements we know, however, that employees with shares have no voting rights and that the CEO and a few

[4] Source: First interview with the director general of the firm in the spring of 2002.

[5] During the financial crisis and in its aftermath, we observe the following monthly inflation rates: August '98 19 %, September '98 39 %, October '98 5 % and April '99 3 %. Using the standard definition, where we speak of hyperinflation when the monthly inflation exceeds 50 percent, it is clear that we cannot speak of a hyperinflationary episode in the Russian economy in 1998 and 1999. Moreover, there is a rapid decline of monthly rates.

[6] Some additional remarks about the economic environment in which the firm operates are in order. The years 1997 to 2002 include the financial crisis of August 1998 when the rouble was drastically devalued and Russia defaulted on its debt. For our purposes, the crisis is important in so far as it marks a hiatus in the Russian transition process. Before the crisis we have a period of great turmoil and excessive turnover in the labor market, with a large proportion of the workforce experiencing wage arrears and being forced to take unpaid leave (Lehmann, Wadsworth and Acquisti 1999, and Earle and Sabirianova 2002). In the aftermath of the crisis, robust growth started to lift the Russian economy out of its trough, to raise productivity and wages and to reduce the extent and incidence of wage arrears. While the financial crisis had some severe consequences in the form of an upsurge in inflation and a collapse of a large part of the private banking sector, these consequences were very short-term and had little influence on the real economy. We should also stress that the short-lived nature of the crisis prevented the inflationary upsurge in August and September 1998 from being transformed into persistent inflationary pressures and prevented the crisis from leading to a major reallocation of resources employed by the economy. In actual fact, in our firm but also in many other firms in industry we observe an increase in the capacity utilization of existing resources (Kapeliushnikov 2005).

leading managers have a large enough proportion of voting shares to dominate all aspects of firm decision making, including wage and employment policies. There is also the possibility that large dividend payments, paid to a subset of employees and varying over time, could cause differential wage payments across the workforce. However, from the same published statements of the firm we can infer that annual dividend payments to employees are miniscule relative to total annual compensation. In essence, corporate governance structures in this firm neither give employees any direct influence over the wage setting process nor do they confound the levels and the differentiation of wages.

Second, labor market institutions, in particular collective wage bargaining, might have a large impact on wage levels and wage differentials. So, how important are trade unions in this firm? From a second interview with the CEO, which took place in April 2007, and from discussions with the director of human resources that took place earlier we can gather that, while there is collective bargaining at the firm on paper, trade union representatives have virtually no influence on wage policy.[7]

Our discussion consequently implies that wages are set unilaterally by top management, which is, however, influenced in its wage policies by local labor market conditions and the need to keep worker turnover at optimizing levels (Dohmen, Lehmann and Schaffer 2007). Given the dominance of top management it therefore seems only natural to ask the CEO directly how he sees the wage determination process. When asked what determines wages, the CEO pointed to the following determinants: (a) the employee's qualification level; (b) work tenure/seniority and experience; (c) wage level in the region; (d) wage level in the sector; and (e) price of the order to which the worker is assigned. From the CEO's declaration it transpires that there is no taste for discrimination on the part of this employer, and a female employee with the same qualification level, tenure and experience as her male counterpart should earn the same wage or receive the same total compensation. As we shall see, this is far from the case in this firm.

3 Data and measurement issues

We created an electronic file based on records from the personnel archive of the firm, and constructed a year-end panel data set for the years 1997 to 2002. We have records of all employees who were employed at any time during this period, except for top managers, whose information is discarded for reasons of confidentiality. The data contain information on individuals' demographic characteristics such as gender, age, marital status and number of children, on their educational attainment, retraining and other skill enhancement activities before joining the firm and during tenure at the firm. We also know the exact date when each employee started work at the firm as well as his/her complete employment history before that date. In addition, we know whether someone worked full-time or part-time as well as a full week or not. For those who separated from the firm we can distinguish between a voluntary quit, transfer to another firm, individual dismissal, group dismissal and retirement.

In Russian firms the workforce is often divided into five employee categories: administration (i.e. management), which we label "managers"; accounting and financial specialists, whom we label "accountants"; engineering and technical specialists (including programmers), whom we subsume under the term "engineers"; primary and auxiliary production workers, whom we label "production workers"; and finally, service staff. The distribution of the workforce across these employee categories is shown in table 1 as are the shares of female workers in each category. We should note here that in this firm employees dealing with financial issues, i.e. "accountants", are all female apart from 2 persons, which means, of course, that we do not analyze an earnings gap for this employee category. It is also worth mentioning that, apart from the declining proportion of female service staff, the shares of female employees remain fairly constant between 1997 and 2002.

For the years 1997 to 2002 we have monthly wages averaged over the year, and information on the three types of bonuses paid to the workforce: (1) a monthly bonus amounting to a fixed percentage of the wage; (2) an extra annual bonus whose level depends on "the results of the year" (i.e. this bonus is a form of profit sharing); (3) an annual bonus labeled "other bonus". While production workers never receive a monthly bonus, the bonus labeled "other bonus" is paid to production workers only. Wages are reported by the firm as the employee's average monthly wage in roubles for the year (or fraction of the year if not employed for the full 12 months), with no adjustment for inflation. The monthly bonus is reported as a percentage of the average monthly wage, and the corresponding rouble figure is recovered by applying the percentage to the nominal monthly wage. The other two bonuses are reported in nominal roubles. The in-

[7] The fact that employees as shareholders or through their trade union lack influence over wage setting can, for example, imply that discrimination against females based on employees' tastes (Becker 1957) does not come into play in this firm.

Table 1
Composition of workforce (as %), 1997 to 2002

Year	Service staff	Engineers	Production workers	Accountants	Managers	Total	Number of employees
1997	4.8 (40.7)	26.7 (55.0)	61.6 (30.8)	2.6 (97.3)	4.2 (17.1)	100 (38.9)	2,898
1998	4.6 (35.3)	26.0 (55.0)	62.5 (29.1)	2.5 (97.2)	4.4 (19.2)	100 (37.4)	2,937
1999	4.8 (35.3)	26.7 (53.7)	62.1 (31.8)	2.3 (97.0)	4.2 (20.0)	100 (38.8)	2,863
2000	5.1 (34.2)	27.1 (54.2)	61.4 (30.3)	2.2 (96.9)	4.2 (21.0)	100 (38.1)	2,866
2001	5.0 (34.2)	26.4 (53.5)	62.1 (31.0)	2.5 (97.3)	4.0 (21.0)	100 (38.3)	2,962
2002	5.2 (32.5)	25.7 (52.9)	63.1 (30.9)	2.2 (96.9)	3.9 (21.4)	100 (37.7)	2,974

Notes: Final sample includes individuals working full-time and full-week only and those with non-missing wages and explanatory variables used in the regressions. Numbers in parentheses are shares of females in employee category (as percentages).

flation rate in Russia during this period was irregular and sometimes quite high – the price level more than doubled between the start of the financial crisis in July 1998 and April 1999, and was 0–2 % per month before and after – so some care is required to construct appropriate deflators. Because the nominal average monthly wage and the nominal monthly bonus are averages for the year, they are deflated into 1997 constant roubles using an annual average CPI, i. e. the average price level for the year relative to the average price level in 1997. The other two bonuses are paid around the end of the year, and so these are converted into 1997 constant roubles using the CPI price level for December of the corresponding year, i. e. the December price level in that year relative to the average 1997 price level.[8] The shares of the monthly total compensation components are presented in table 2.

The careful approach to generating real earnings outlined above and the fact that the earnings data are taken from the personnel records of the firm lead us to surmise that any measurement error is minimal in these earnings data. At any rate, it is highly unlikely that there are systematic differences in the accuracy of the earnings data across the two genders that are responsible for the estimated gender earnings differentials.

Within the firm's workforce, production workers are subdivided into levels, primary production workers having eight and auxiliary production workers having six levels. Since we have these levels only for the cross-section of 2002, we perform decompositions for this cross-section in order to see whether segregation into levels might be an important driving force of earnings and total compensation gaps in this firm.

In the data set at hand no hours of work are recorded, hence we cannot calculate an hourly wage. The gap that we can identify is thus a gap in monthly wage earnings, most of which could be driven by differences in hours worked. To ensure that the earnings differential does not just reflect differences in hours worked we only include employees who were always full-time employees and worked a full week every week throughout 1997–2002. This leads to the exclusion of 14 percent of the firm's employees from our

[8] We have available monthly data on CPI inflation in Russia overall and in the oblast where the firm is located. In this paper we work primarily with average monthly wages, and so we compare average annual inflation in the oblast with national rates. This shows that inflation in the oblast is very similar to national inflation:

	Russia	Oblast
1997	15.4	14.0
1998	38.1	38.7
1999	98.6	97.9
2000	20.8	20.4
2001	21.6	19.1
2002	16.0	14.5.

These indices are based on average monthly price levels calculated using monthly inflation rates. Over the 1997–2002 period the cumulative price indices diverge by less than 3 %. Results using wages and bonuses deflated by the national CPI are therefore essentially identical to those using the oblast CPI. We use the former in what follows.

Table 2
Shares of monthly total compensation components

Year	Monthly wage	Monthly bonus	Extra bonus	Other bonus	Average monthly compensation
1997	0.830	0.080	0.051	0.039	1.635
1998	0.916	0.059	0.000	0.025	1.559
1999	0.870	0.066	0.043	0.021	1.131
2000	0.854	0.066	0.042	0.038	1.165
2001	0.797	0.081	0.098	0.025	1.315
2002	0.776	0.095	0.088	0.041	1.395

Notes: Whole initial sample. Monthly bonus is a fixed percentage of the wage, which is not paid to workers. Extra bonus is a premium paid to all employees, which depends on the results of the year. Other bonus is paid to workers only, for special effort and overtime. Monthly wage and monthly bonus are deflated into 1997 constant roubles using an annual average CPI, extra bonus and other bonus are converted into 1997 constant roubles using the CPI price level for December of the corresponding year. Average monthly compensation is given in thousands of 1997 roubles.

analysis, but also increases our confidence that the identified earnings gap is not spurious.[9]

4 Methods

In order to document and analyze the firm-level gender earnings gap in a Russian firm, we use well-known decomposition techniques. The decompositions that we perform for mean earnings are standard fare and are therefore only briefly mentioned.

We start with the traditional Oaxaca-Blinder decomposition (Oaxaca 1973; Blinder 1973), which relies on estimating separately two Mincerian log earnings equations by gender. As is well known, the Oaxaca-Blinder decomposition is subject to the so-called "index number problem" and requires the use of either the male or female earnings structure as a non-discriminatory benchmark. To remedy this problem, Neumark (1988) and Oaxaca and Ransom (1994) advocate a pooled model for both genders using a weighted average of the female and male earnings structures.[10]

Decomposing the earnings gap at different quantiles of the earnings distribution using the Oaxaca-Blinder method can produce biased results. Their methodology is based on the OLS property that mean earnings conditional on average characteristics is equal to unconditional mean earnings, an assumption that does not hold in the context of quantile regression.[11] In order to decompose the gender earnings gap at different quantiles we use the quantile decomposition technique proposed by Machado and Mata (2005). Denote by $Q^{\theta}(\ln w \mid X)$ the log of earnings of individual i with characteristics X who leaves behind a fraction θ of individuals with the same characteristics (Koenker and Basset 1978). The earnings gap can then be decomposed as follows:

$$Q^{\theta}(\ln w^{m}) - Q^{\theta}(\ln w^{f}) = [Q^{\theta}(X^{m}\hat{\beta}^{m\theta}) - Q^{\theta}(X^{f}\hat{\beta}^{m\theta})] + \\ + [Q^{\theta}(X^{f}\hat{\beta}^{m\theta}) - Q^{\theta}(X^{f}\hat{\beta}^{f\theta})] + residual \qquad (1)$$

The first difference on the right-hand side shows the contribution of the differences in characteristics between males and females to the earnings gap at the quantile θ, and the second difference presents the contribution due to differences in coefficients. The residual should disappear asymptotically as the sample is generated randomly. Note also that the usual "index number problem" is present in this decomposition and we use the earnings structure of males as the non-discriminatory benchmark.

Practical implementation of this decomposition requires making B independent random draws of percentiles θ and estimating B quantile regressions (here B = 10,000) for each percentile θ and for males and females separately: $Q^{\theta}(\ln w \mid X) = X\,\beta^{\theta}$. Then, a random sample of size B is created from covariates X for each gender. Finally, the counterfactual earnings distributions are generated for different combinations of genders. That is, the counterfactual earnings density $\ln w = X^{f}\hat{\beta}^{m\theta}$ shows the log

[9] The existence of overtime, which is only recorded indirectly in our data, does not allow us to impute hourly wages.
[10] We use Stata 9 routines to perform these decompositions, in which standard errors are calculated as in Jann (2005).
[11] See Felgueroso et al. (2007).

of earnings arising if women had their own characteristics but were paid as men, while $\ln w = X^m \hat{\beta}^{f\theta}$ shows a counterfactual earnings density that would arise if individuals were given males' characteristics but were paid as females. Using the generated coefficients and characteristics, we estimate the earnings gaps at different quantiles of the constructed earnings distributions.

Finally, we also decompose changes in the earnings gap over the period 1997–2002. First we perform the decompositions at the mean, exploiting the well-known methodology originally proposed by Juhn, Murphy and Pierce (1991) and applied by Brainerd (2000) and Reilly (1999) when analyzing changes in the Russian wage gap in the early years of transition. Second, we perform similar decompositions at the quantiles of the earnings distributions, generating intertemporal counterfactuals based on the methodology of Machado and Mata (2005).[12]

5 Results

5.1. The gender earnings gap inside the firm: description

The aftermath of the financial crisis saw a substantial rise in the consumer price index and a fall in real wages, both across the country and within our firm (Dohmen, Lehmann and Schaffer 2007). Inspection of figure 1 leads to two obvious conclusions: (1) mean male earnings are higher than their female counterparts, and the mean earnings gap seems to decline as the probability mass linked to higher male earnings is reduced in 2002; (2) the gender-specific earnings distributions for all employees and for workers are shifted to the left over the period 1997 to 2002 and the distributions are more compressed in 2002.[13] When we discuss the reasons for the decline in the earnings gap below, it is relevant that inequality already falls as early as 1998 and that the values of the Gini are always highest for the entire workforce and the employee categories in 1997.

Figure 2 traces the raw GEG for four employee categories and all employees in our firm over the years 1997 to 2002. Recalling that production workers make up roughly two thirds of all employees, it is clear from the figure that their GEG is driving the overall gender earnings differential. Apart from the years at the beginning and the end of the period, engineers have the second highest earnings gap, which is, however, roughly 30 percentage points lower than that of production workers in most years. The earnings gap of service workers exhibits a U-shaped curve, with gaps of roughly 20 percent in 1997 and 2002 but hovering around zero during the rest of the period. Finally, managers have a very small raw gender earnings differential whose adjusted variant is not significant in any year.[14] This result is in line with the predictions of Lazear and Rosen's (1990) model that women, once finding themselves in high positions within the same firm, will not experience different treatment from that of men.

The regressions on which the adjusted gender earnings gaps of figures 3 and 4 are based are shown for the years 1997 and 2002 in table 3. These regressions point to the determinants of log real earnings at the mean and at several quantiles in the distributions. Apart from the gender dummy, which has a large and highly significant impact throughout, tenure and educational attainment as well as training outside the firm increase earnings, while studying in the firm and within-firm mobility, which is predominantly of a horizontal nature, depress them. Service workers have substantially lower, engineers somewhat lower earnings than production workers, while managers and accountants command an earnings premium on average. Another specification includes an additional indicator variable which takes the value one for females with children (see columns (2) and (7)). This indicator variable is included in order to allow for a differential treatment of females with children by the tax authorities; but the variable may also pick up mothers' propensity to trade more flexible working conditions for lower earnings. For the year 1997 (as well as for the years 1998 to 2001, which are not shown) this dummy is not significant, while in 2002 women with children encounter an average wage penalty of 10 percentage points. The adjusted earnings gap is lowered by precisely this amount in this year.

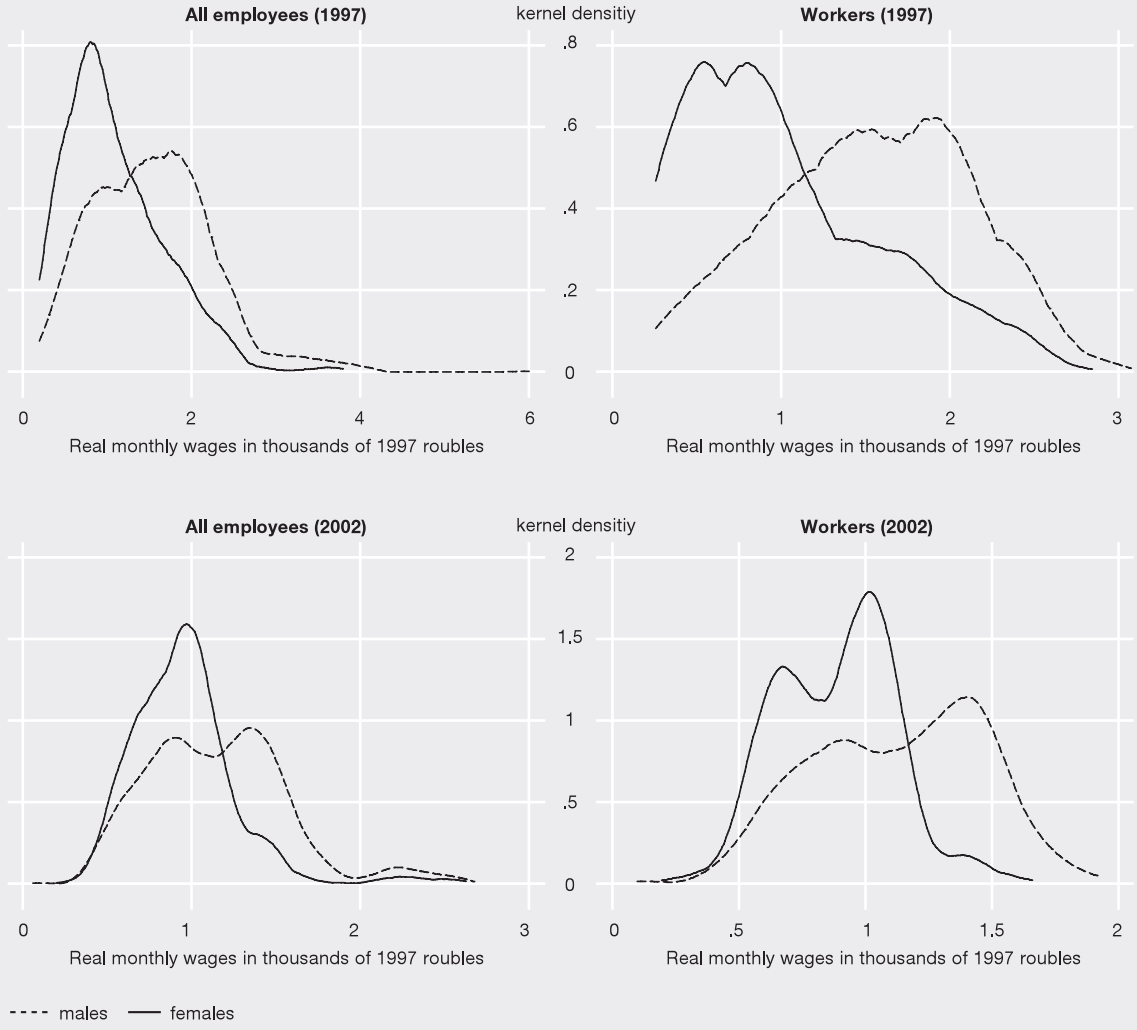
The total gender earnings gap in figure 3 rises slightly between 1997 and 1998, when it reaches roughly 40 percent, and then falls continuously to the level of around 18 percent in 2002. An Oaxaca-Blinder de-

[12] In a transition context, the Machado-Mata (2005) methodology was also employed by Ganguli and Terrell (2005), who analyze the gender wage gap in Ukraine both within years and across time.

[13] The reduction in earnings inequality is reflected in falling Gini coefficients of monthly wages and total compensation as shown in Dohmen, Lehmann and Schaffer (2008). The Gini coefficients reported in that paper corroborate the decline in inequality of monthly wages and total compensation for the entire workforce as well as for the five employee categories in the aftermath of the financial crisis.

[14] The regressions which generate adjusted gender earnings gaps are not shown here but are available on request from the authors.

Figure 1
Kernel densities of real earnings by gender, 1997 and 2002

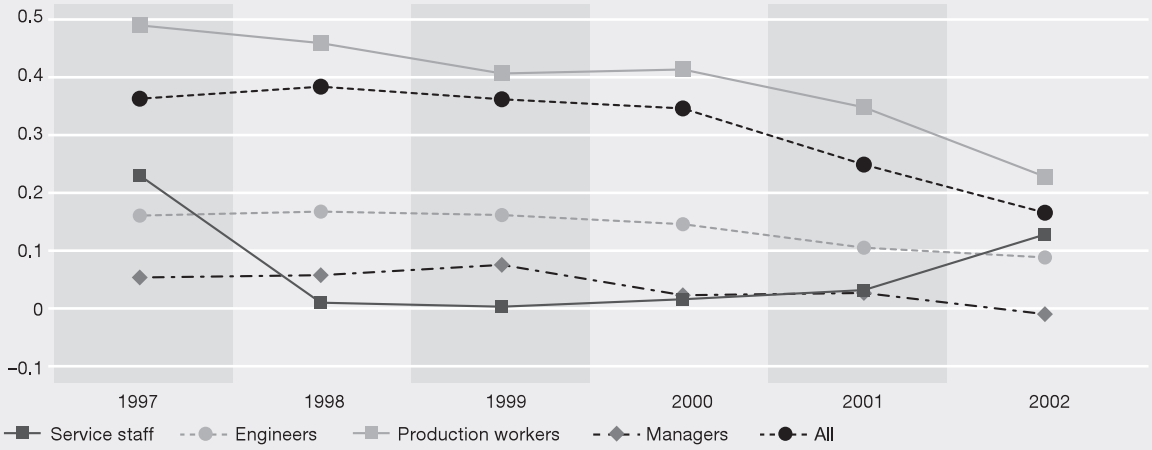


Source: Earnings records from personnel data set.
The smoothed density function of the distribution of female and male wages, estimated using a Gaussian kernel, is plotted.
The bandwidth is chosen to minimize the mean integrated squared error if the data were Gaussian.

composition[15] also produces the result that most of the GEG at the mean remains unexplained. The regressions by gender underlying the decompositions at the means as well as quantile regressions by gender at selected quantiles are shown for the years 1997 and 2002 in the appendix (tables A1 and A2). In many instances, they show inter-gender differences in the returns to many of the productivity measures employed in our regressions. To address the concern that the gender earnings gap might above all be a reflection of differences in hours worked, we also perform a "robustness check" by decomposing the GEG for workers using two earnings measures. As stated above, workers receive an "other bonus"; this bonus is paid to workers for additional effort ("completion of work ahead of plan"), but also in return for overtime work and work during holidays and on days which would otherwise have been free. The first measure is based on monthly wage earnings alone, while the second one includes in addition the imputed monthly proportion of the "other bonus" that could also reflect differences in productivity in a better way. The two decompositions of the GEG, based on these two measures, are virtually identical. We are thus led

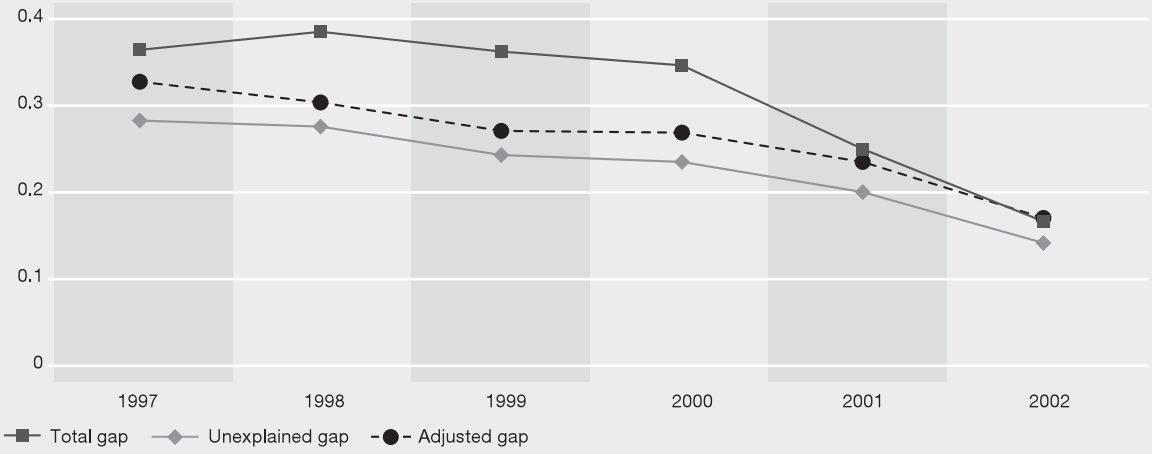
[15] We also performed Neumark (1988) and Oaxaca-Ransom (1994) decompositions in the earlier version of this paper. In general, the results were very similar to the Oaxaca-Blinder decomposition and we decided to report the latter.

Figure 2
Raw gender earnings gap by employee category



Note: The raw gender earnings gaps are derived by regressing log earnings on a male dummy without including other controls. The coefficient on the male dummy in each regression is the reported raw gender earnings gap.

Figure 3
Oaxaca-Blinder decomposition of gender earnings gap



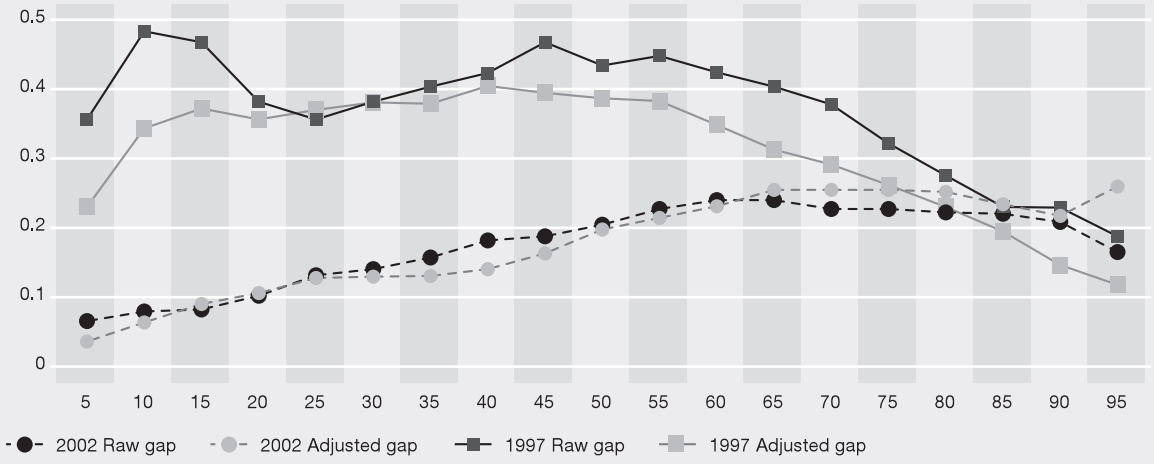
Notes: "Total gap" is the mean total earnings differential between males and females and the "unexplained gap" is the part of the earnings differential due to the difference in coefficients from the Oaxaca-Blinder decomposition. "Adjusted gap" is the coefficient on the male dummy in regressions where we have included controls. These controls are a cubic in tenure, a cubic in age, education dummies, marital status, dummies for having one or more than one child, dummies for training outside the firm, internal mobility, within-firm training as well as employee category dummies.

to believe that the GEG is not confounded by differences in hours worked across gender.

The raw and adjusted earnings gaps across the distribution, shown for the year 1997 in figure 4, are representative for the gaps in the years 1997 to 2001, which are not shown here, i.e. they show large differentials in the lower part of the distribution while in the upper part these differentials decline. In contrast to previous years, the gender earnings gap in 2002 increases over the distribution from close to zero to about 20 percent.[16]

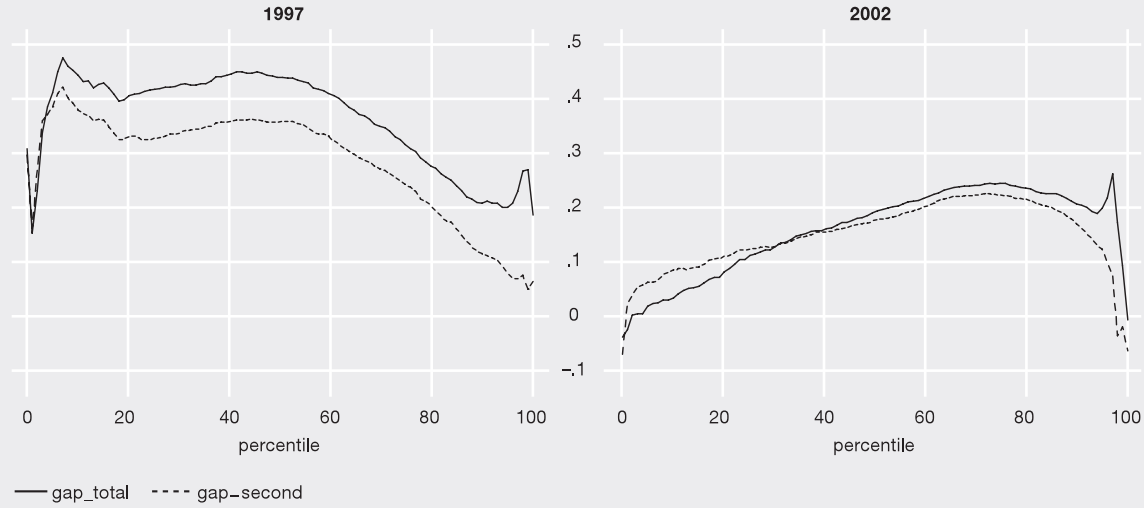
[16] Results that are based on the specification with the interaction term female-children are very similar to those in figure 4, although the adjusted gap at several quantiles is somewhat lower. These results are not shown here but are available on request.

Figure 4
Raw and adjusted earnings gaps at quantiles: 1997 and 2002



Notes: Coefficients on male dummies are reported from the quantile regressions without controls ("raw gap") and with controls ("adjusted gap"), respectively. Controls include a cubic in tenure, a cubic in age, education dummies, marital status, dummies for having one or more than one child, dummies for training outside the firm, internal mobility, within-firm training as well as employee category dummies.

Figure 5
Machado-Mata earnings gap decompositions at quantiles: 1997 and 2002



Notes: Machado-Mata (2005) decomposition results are reported here. "Gap_total" is the total simulated earnings differential between males and females, "gap_second" is the part of the earnings differential due to the difference in coefficients.

What is also striking from this figure is that the gap is approximately 15–20 percent at the highest quantiles in both years even after having controlled for employee type. However, we observe a "glass ceiling" effect in 2002, which is not present in 1997 because of the high differential in the lowest part of the distribution in 1997 ("sticky floor") that disappears by 2002.

The decline of the GEG at the lower quantiles of the distribution is explored in more detail in Section 5.3. The potential explanation is likely to be the change in the composition of the workforce (i.e. change in characteristics) together with the change in returns to productivity characteristics. Other factors that determine changes in the differential at the bottom of the distribution have been highlighted

Table 3

Determinants of log real earnings: 1997 and 2002

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	1997					2002				
	OLS		Quantile Regressions			OLS		Quantile Regressions		
			10th	50th	90th			10th	50th	90th
Female	–0.328***	–0.300***	–0.344***	–0.388***	–0.144***	–0.170***	–0.069*	–0.076***	–0.203***	–0.207***
	(0.021)	(0.081)	(0.048)	(0.020)	(0.016)	(0.012)	(0.041)	(0.020)	(0.013)	(0.014)
Tenure	0.029***	0.029***	0.033*	0.029***	0.026***	0.017***	0.017***	0.011	0.010**	0.006
	(0.008)	(0.008)	(0.017)	(0.008)	(0.007)	(0.005)	(0.005)	(0.008)	(0.005)	(0.005)
Tenure squared/100	–0.146**	–0.146**	–0.116	–0.146**	–0.158**	–0.074**	–0.074**	–0.062	–0.023	–0.013
	(0.071)	(0.071)	(0.139)	(0.069)	(0.064)	(0.037)	(0.037)	(0.053)	(0.036)	(0.039)
Tenure cubed/1000	0.028	0.027	0.017	0.025	0.029*	0.014**	0.014**	0.017*	0.003	0.002
	(0.017)	(0.017)	(0.030)	(0.016)	(0.016)	(0.007)	(0.007)	(0.010)	(0.007)	(0.008)
Age	0.030	0.031	0.019	0.062	0.009	0.080***	0.080***	0.119***	0.052**	0.055**
	(0.043)	(0.043)	(0.085)	(0.040)	(0.038)	(0.021)	(0.021)	(0.037)	(0.024)	(0.023)
Age squared/100	–0.015	–0.018	0.018	–0.090	0.024	–0.176***	–0.176***	–0.275***	–0.101*	–0.118**
	(0.113)	(0.114)	(0.230)	(0.106)	(0.103)	(0.053)	(0.053)	(0.092)	(0.060)	(0.058)
Age cubed/1000	–0.002	–0.002	–0.005	0.003	–0.005	0.013***	0.013***	0.021***	0.006	0.009*
	(0.010)	(0.010)	(0.020)	(0.009)	(0.009)	(0.004)	(0.004)	(0.007)	(0.005)	(0.005)
Basic professional	0.019	0.019	0.031	0.005	0.001	0.040**	0.040**	0.078**	0.007	0.041*
	(0.033)	(0.033)	(0.070)	(0.031)	(0.025)	(0.020)	(0.020)	(0.032)	(0.020)	(0.021)
General secondary	0.074**	0.074**	0.177***	0.049*	0.040*	0.046**	0.047**	0.056*	0.040**	0.012
	(0.031)	(0.031)	(0.067)	(0.029)	(0.024)	(0.019)	(0.019)	(0.030)	(0.020)	(0.021)
Secondary professional	0.083**	0.084**	0.212***	0.027	0.024	0.058***	0.059***	0.116***	0.040*	0.007
	(0.034)	(0.034)	(0.073)	(0.032)	(0.026)	(0.021)	(0.021)	(0.033)	(0.021)	(0.023)
Higher incomplete	0.174***	0.175***	0.322**	0.162**	0.074	0.064	0.064	0.075	0.051	0.041
	(0.063)	(0.063)	(0.159)	(0.072)	(0.055)	(0.040)	(0.040)	(0.067)	(0.050)	(0.051)
Higher	0.094**	0.094**	0.118	0.088**	0.050	0.077***	0.076***	0.085**	0.075***	0.062**
	(0.040)	(0.040)	(0.090)	(0.040)	(0.031)	(0.024)	(0.024)	(0.040)	(0.026)	(0.027)
Single	0.028	0.028	–0.183	0.039	0.114*	–0.006	0.057	–0.034	–0.047	0.132***
	(0.077)	(0.077)	(0.158)	(0.072)	(0.060)	(0.034)	(0.041)	(0.057)	(0.043)	(0.042)
Divorced or widowed	0.012	0.012	0.097	–0.030	–0.015	–0.062***	–0.060***	–0.040	–0.062***	–0.022
	(0.032)	(0.032)	(0.084)	(0.037)	(0.030)	(0.021)	(0.021)	(0.034)	(0.023)	(0.024)
One child	–0.013	0.001	–0.135	0.024	0.042	0.037	0.120***	–0.027	0.045	0.072*
	(0.056)	(0.065)	(0.121)	(0.054)	(0.045)	(0.028)	(0.043)	(0.054)	(0.037)	(0.037)
More than one child	0.050	0.063	–0.034	0.098*	0.047	0.049	0.131***	–0.057	0.084**	0.110***
	(0.059)	(0.067)	(0.129)	(0.058)	(0.048)	(0.032)	(0.045)	(0.060)	(0.040)	(0.041)
Training outside firm	0.175***	0.176***	0.033	0.185***	0.136***	0.108***	0.107***	0.062	0.097***	0.056*
	(0.036)	(0.036)	(0.099)	(0.045)	(0.036)	(0.025)	(0.025)	(0.044)	(0.028)	(0.029)
Mobility in the firm	–0.019	–0.019	0.035	–0.041*	–0.023	–0.059***	–0.060***	–0.103***	–0.051***	–0.011
	(0.020)	(0.020)	(0.048)	(0.021)	(0.016)	(0.013)	(0.013)	(0.023)	(0.015)	(0.016)
Training in the firm	–0.063***	–0.063***	–0.106**	–0.037	–0.061***	–0.172***	–0.170***	–0.180***	–0.197***	–0.124***
	(0.024)	(0.024)	(0.053)	(0.023)	(0.019)	(0.013)	(0.013)	(0.023)	(0.015)	(0.015)
Service staff	–0.759***	–0.759***	–0.747***	–0.782***	–0.845***	–0.656***	–0.654***	–0.534***	–0.779***	–0.517***
	(0.044)	(0.044)	(0.097)	(0.043)	(0.035)	(0.029)	(0.029)	(0.041)	(0.027)	(0.028)
Engineers	–0.097***	–0.097***	0.043	–0.106***	–0.170***	–0.074***	–0.072***	–0.014	–0.123***	0.003
	(0.030)	(0.030)	(0.071)	(0.032)	(0.025)	(0.018)	(0.018)	(0.033)	(0.021)	(0.022)
Accountants	0.335***	0.334***	0.635***	0.334***	0.022	0.063*	0.067*	0.080	0.055	0.128***
	(0.050)	(0.050)	(0.138)	(0.064)	(0.050)	(0.035)	(0.035)	(0.072)	(0.044)	(0.043)
Managers	0.598***	0.597***	0.930***	0.530***	0.434***	0.626***	0.628***	0.930***	0.546***	0.564***
	(0.038)	(0.038)	(0.109)	(0.054)	(0.042)	(0.023)	(0.024)	(0.051)	(0.036)	(0.039)
Female* child		–0.030					–0.108**			
		(0.082)					(0.043)			
Constant	–0.571	–0.598	–1.187	–0.892*	0.270	–1.164***	–1.257***	–1.975***	–0.765**	–0.567*
	(0.510)	(0.519)	(1.003)	(0.469)	(0.452)	(0.263)	(0.271)	(0.461)	(0.297)	(0.290)
Observations			2898					2974		
R-squared	0.34	0.34				0.47	0.47			

*Notes: Robust standard errors in parentheses. * significant at 10 %; ** significant at 5 %; *** significant at 1 %.*

in the literature.[17] First, childcare provisions and parental leave policies may have an impact and they may have changed in the firm during this period. For example, women may have chosen to work in less demanding and thus lower-paid occupations in exchange for the childcare provided by the firm. Indeed, like other large enterprises, this firm used to have its own kindergarten, which, however, became the property of the municipality in the mid-1990s. Although not conclusive, this may suggest that in 1997 women were still influenced by the existence of childcare facilities that were no longer available in 2002. Second, minimum wages (or high relative wages at the bottom of the distribution) might lower the differential in that part of the distribution. However, in the Russian context minimum wages are not a binding constraint. A third factor often mentioned is collective bargaining. As discussed above, the trade union in this firm is weak and does not influence wage policies throughout the reported period.

Figure 5, which reproduces results from Machado-Mata decompositions of the gender earnings differentials across the 1997 and 2002 distributions indicates that differences in returns to characteristics and not the characteristics themselves contribute to the GEG across the whole distributions. Note also that while the GEG is lower in 2002 than in 1997, the proportion of the unexplained part is larger in 2002 across almost the whole distribution.

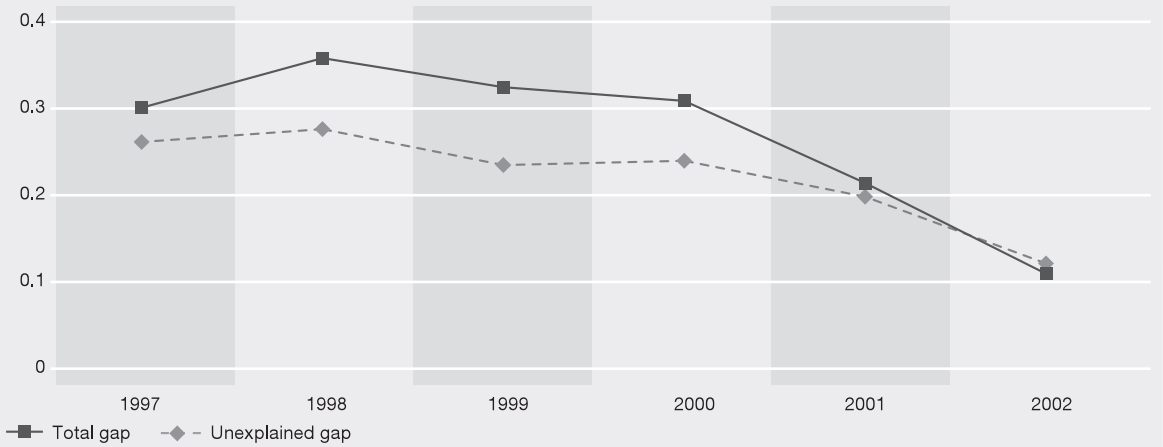
5.2 The gender earnings gap inside the firm: potential explanations

Having described the size of the gender earnings gap both at the mean and at various quantiles, and having explored the development of the gender earnings gap over time we now turn to the question of what can explain the gender earnings gap inside our firm. The data that we have at our disposal allow us to look at the following three potential explanations: the trade-off between premia and wage earnings, the trade-off between secure jobs and wages and segregation into job levels for workers in the year 2002. Of course, discrimination or selection may also serve as potential reasons.

It is conceivable that as premia make up a substantial part of total earnings, women are willing to accept lower wages in return for larger premia. Comparing figure 6, where we show the Oaxaca-Blinder decomposition of total compensation, with the decomposition of wage earnings in figure 3 it is quite clear, though, that the magnitudes and the evolution over time of the two gaps are fairly similar. Also in both cases most of the gap remains unexplained. A second explanation for different pay for female and male employees with similar observable characteristics could

[17] There is a growing recent literature on the "glass ceiling" effect (see for example, Albrecht et al. 2003, for Sweden; Hübler 2005, for Germany; Arulampalam et al. 2006, for Western European countries and Ganguli and Terrell 2005, for Ukraine).

Figure 6
Oaxaca-Blinder decomposition of gender gap in total compensation: 1997 to 2002



Notes: "Total gap" is the mean differential in total compensation between males and females and the "unexplained gap" is the part of the differential due to the difference in coefficients from the Oaxaca-Blinder decomposition. Controls include a cubic in tenure, a cubic in age, education dummies, marital status, dummies for having one or more than one child, dummies for training outside firm, internal mobility, within-firm training as well as employee category dummies.

Table 4

Earnings and segregation into levels of production workers by gender for 2002

	Males	Females	Gap
Auxiliary 1	n.a.	0.459 (0.118)	n.a.
[1.00]			
Auxiliary 2	n.a.	0.642 (0.218)	n.a.
[1.00]			
Auxiliary 3	0.738 (0.172)	0.726 (0.143)	0.012 (0.029)
[0.85]			
Auxiliary 4	0.796 (0.154)	0 .795 (0.159)	0 .001 (0 .059)
[0.90]			
Auxiliary 5	1.028 (0.147)	1.020 (0.128)	0.008 (0.021)
[0.83]			
Auxiliary 6	1.260 (0.475)	1.267 (0.335)	–0.007 (0.324)
[0.67]			
Primary 1	0.466 (0.075)	n.a.	n.a.
[0]			
Primary 2	0.803 (0.205)	0.857 (0.146)	–0.054 (0.065)
[0.04]			
Primary 3	1.053 (0.248)	1.143 (0.207)	–0.090 (0.056)
[0.04]			
Primary 4	1.284 (0.223)	1.131 (0.343)	0.153*** (0.056)
[0.08]			
Primary 5	1.429 (0.148)	1.326 (0.153)	0.103* (0.062)
[0.03]			
Primary 6	1.605 (0.153)	n.a.	n.a.
[0]			
Primary 7	1.622 (0.167)	n.a.	n.a.
[0]			
Primary 8	1.630 (0.035)	n.a.	n.a.
[0]			

*Notes: "Auxiliary" and "primary" refer to the hierarchical job levels of production workers in the firm. The table reports unconditional means (and their standard deviations) of monthly wages in each level by gender, differences of these means (and their standard errors) across gender and the proportion of women in each level [in square brackets]. * difference is significant at 10 %; *** difference is significant at 1 %.*

lie in the fact that women trade job security for lower wage earnings. Probit regressions that estimate the probability of quitting or being laid off, which are not shown here, demonstrate, however, that women have a 3-percentage-point higher probability of quitting and are also slightly more likely to be laid off by the firm, evidence that contradicts the hypothesis of a trade-off between wages and job security.

Table 5

Probability of production workers being in a primary level in 2002 and Fairlie decomposition

Total difference	**0.836**			
Explained part	**0.091 [10.89 %]**			
	Probit, marginal effects			**Contribution of**
Female	–0.836*** (0.017)	–0.900*** (0.057)	–0.923*** (0.024)	
Tenure	0.005 (0.013)	0.005 (0.014)	–0.001 (0.014)	0.002 (0.009)
Tenure squared/100	0.242** (0.116)	0.239** (0.117)	0.303** (0.123)	0.176*** (0.019)
Tenure cubed/1000	–0.062*** (0.024)	–0.062** (0.024)	–0.073*** (0.025)	–0.152*** (0.023)
Age	–0.121** (0.056)	–0.127** (0.059)	–0.117** (0.058)	0.388*** (0.041)
Age squared/100	0.288** (0.140)	0.301** (0.147)	0.277* (0.145)	–0.140*** (0.013)
Age cubed/1000	–0.022** (0.011)	–0.023** (0.012)	–0.021* (0.012)	–0.249*** (0.035)
Basic professional	0.141*** (0.032)	0.142*** (0.032)	0.135*** (0.042)	0.007 (0.005)
General secondary	0.260*** (0.028)	0.262*** (0.028)	0.253*** (0.039)	0.017*** (0.004)
Secondary professional	0.184*** (0.029)	0.185*** (0.030)	0.170*** (0.041)	–0.002 (0.002)
Higher incomplete	0.168*** (0.030)	0.168*** (0.031)		
Higher	0.188*** (0.041)	0.192*** (0.041)	0.023 (0.089)	0.00002 (0.002)
Single	0.263*** (0.028)	0.268*** (0.030)	0.281*** (0.029)	0.050** (0.020)
Divorced or widowed	0.120*** (0.038)	0.119*** (0.039)	0.127*** (0.042)	–0.002* (0.001)
One child	0.681*** (0.099)	0.667*** (0.112)	0.703*** (0.089)	0.029** (0.012)
More than 1 child	0.324*** (0.030)	0.325*** (0.033)	0.346*** (0.031)	–0.031** (0.014)
Training outside firm	0.208*** (0.039)	0.211*** (0.040)	0.224*** (0.037)	
Mobility in the firm	–0.097** (0.048)	–0.094* (0.048)	–0.101** (0.051)	–0.001 (0.001)
Training in the firm	0.107*** (0.031)	0.105*** (0.032)	0.120*** (0.033)	
Female* Child		0.138 (0.137)		
Female* Basic professional			0.138* (0.073)	
Female* Secondary professional			0.167*** (0.064)	
Female* General secondary			0.177*** (0.062)	
Female* Higher			0.255*** (0.021)	
Observations	1876	1876	1861	

*Notes: Robust standard errors in parentheses. * significant at 10 %; ** significant at 5 %; *** significant at 1 %.*

As shown above, production workers make up the bulk of the firm's workforce and also experience by far the largest gender earnings gap. It is therefore worthwhile taking a closer look at the issue of whether female workers are segregated into low-paid job levels while men find themselves in levels of higher pay. Unfortunately, we currently have information on levels only for the year 2002 and can only ascertain the position of a production worker in the level structure at the end of the period.

Table 4 provides evidence of female production workers being predominantly confined to the lower job levels in the firm. Nearly all female production workers find themselves in the auxiliary levels. Only in the job level primary 4 can we observe a statistically significant gender earnings gap (in the level primary 5 it is significant at the 10 % level), while in all other job levels average pay is the same for female and male production workers. So, women finding themselves in the same job levels as men generally do not seem to be discriminated against in terms of pay.[18]

The GEG for production workers in 2002 of roughly 30 percent, however, comes about because women have an overwhelmingly lower probability of finding themselves in primary job levels even when we control for observable productivity characteristics. This is made abundantly clear in table 5: in the most parsimonious specification women have a probability of being in a primary job level that is 84 percentage points lower than that of their male counterparts. Even women with university education are far less likely to be in a primary job level if they happen to be engaged in production on the shop floor. In addition, the Fairlie decomposition shows that only 11 percent of the difference in the predicted probabilities of being in a primary level is explained by observed characteristics.[19]

Table 6

Oaxaca-Blinder decompositions of production workers' earnings and total compensation with levels included: 2002

Monthly Wages	
Total difference	0.228***
	(0.016)
Explained	0.222***
	(0.025)
Unexplained	0.007
	(0.026)
Total compensation	
Total difference	0.196***
	(0.017)
Explained	0.199***
	(0.028)
Unexplained	-0.003
	(0.028)

*Notes: "Total difference", "explained" and "unexplained" refer to the total differential and its parts due to the characteristics and coefficients, respectively. Standard errors for the total gap, the explained and the unexplained parts are reported in parentheses and are calculated in the Stata 9 routine using the method proposed by Jann (2005). ***significant at 1 %.*

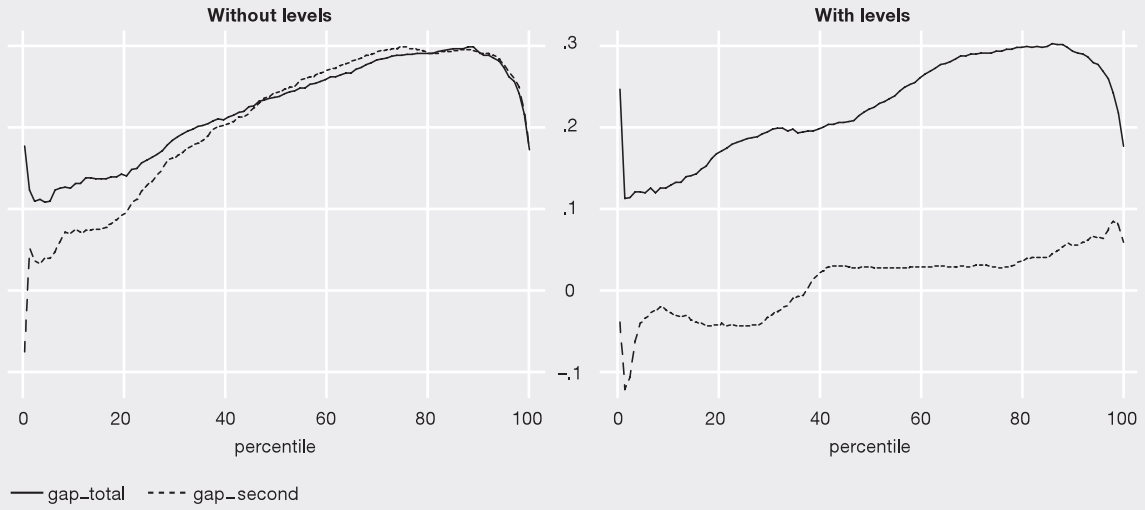
Wage earnings and job levels are, of course, highly correlated. This high correlation can be seen when we perform Oaxaca-Blinder decompositions of gender earnings and total compensation gaps. When we condition on job levels, the entire gaps are explained now (table 6). Thus, there is no scope for gender discrimination within a job level. Comparing Machado-Mata decompositions of gender earnings differentials at the quantiles with and without conditioning on job levels leads to the same conclusion: earnings differentials across job levels are large, and little of the earnings differential is explained by characteristics, while earnings differentials within job levels are much smaller and are explained almost entirely by observed characteristics at all quantiles (see figure 7). Of course, we are aware of the endogeneity of job levels in the determination of earnings and consequently do not suggest that job levels have a causal impact on the gender earnings differential.[20] Nevertheless, our descriptive exercise points to the remark-

[18] Since potentially there are differences in observed characteristics within levels, differences in unconditional means might be affected by this. No differences in unconditional means, therefore, does not necessarily mean that there is no "discrimination", since we could have the situation that women are paid the same wages as men even though they have better characteristics. Unfortunately, small sample sizes within levels do not allow us to calculate regression-adjusted gaps. One way to see whether this potential bias arises is to regress log earnings on a gender dummy, individual characteristics and levels for 2002. The results of these regressions, which are not reported here for brevity, lead us to believe that this bias might be minor, since the coefficient on the gender dummy is not significant. In addition, performing Oaxaca-Blinder and Machado-Mata decompositions with job levels included point to no discrimination since the entire gaps become explained (see below in the text).

[19] This evidence is consistent with Ransom and Oaxaca (2005), who find that within job levels in a US grocery store men and women are paid the same, but the lower job assignment of women could not be completely explained by individual characteristics.

[20] It is possible that the gender difference in occupational distribution partly reflects employment discrimination or unequal occupational access. If it does, then it cannot be used to "explain" the GWG (see, for example, Kidd and Schannon 1996 and Rodgers 2006). However, the results with no levels in the regressions can be viewed as an upper bound for the extent of "discrimination", and the results with levels as a lower bound (Arulampalam et al. 2006).

Figure 7
Machado-Mata decompositions for workers



Notes: Machado-Mata (2005) decomposition results for workers are reported. "Gap_total" is the total simulated earnings differential between males and females, "gap_second" is the part of the earnings differential due to the difference in coefficients. The left panel shows the results without workers' job levels and the right panel shows the results with workers' job levels included in the regressions.

able fact that there is such a large earnings differential in spite of a seemingly gender-neutral wage policy of the top management in this firm, which arises because overwhelming numbers of women are placed in low-paid job levels (cf. Ransom and Oaxaca 2005). So far, we only observe the job level of each production worker at the end of the reported period and can thus only point to the high correlation of placement into job levels and gender earnings differentials. In future work, once we have data on the evolution of job levels for each production worker, we will analyze whether there are important gender differences in promotion rates and in entry-level jobs.

5.3 Changes in the gender earnings gap over time and their potential reasons

The 20-percentage-point decrease in the mean gender wage gap between 1997 and 2002 is decomposed using the Juhn, Murphy and Pierce (1991) decomposition. The results of this decomposition are presented in the discussion paper version of this paper (Dohmen, Lehmann, and Zaiceva 2008). As we show there, about 28 percent of the decrease can be explained by observables, with changes in observed characteristics being about four times as important as changes in observed prices. The unobserved factors are almost of equal importance. About 6 points of the reduction in the gap comes about because women improve their position in the male residual wage distribution while about 8 points are due to a narrowing of this distribution. While this last factor has the most weight, the other factors are jointly more important.[21] The fact that the increase or decrease in inequality has little impact on movements of the gender earnings gap in our firm can also be seen by the above-mentioned fact that the gap grew between 1997 and 1998 while inequality decreased between the two years.

In table 7 we compare the earnings gaps of 2002 and 1997 across the distribution and perform several counterfactual exercises over time, following Ganguli and Terrell (2005). This enables us to document whether changes in the characteristics of men and women or changes in the returns to these characteristics at specific points in the distributions contributed to the decrease in the gap between 1997 and 2002. As we can see from row (3) the raw gap declined more at the bottom than at the top of the distribution (see also Figure 4). The first counterfactual, denoted gap 1, asks what the gap would have been if women in 2002 had the characteristics of the female group that we observe in 1997. Row (6) shows that the gap would have decreased at the bottom but would have remained almost the same throughout the rest of the distribution. Hence, women's characteristics at the

[21] In contrast, in the early years of transition, when the Russian gender wage gap increased dramatically, Brainerd (2000) finds that the widening of the residual male wage distribution completely overwhelms and cancels out the first three factors, which all have a slightly negative impact on the change of the wage differential in the data that she analyzes.

Table 7
Machado-Mata intertemporal counterfactuals: 1997 to 2002

Gap	10	25	50	75	90
Actual					
(1) Actual gap 2002[1]	0.060	0.125	0.196	0.254	0.216
(2) Actual gap 1997[1]	0.485	0.375	0.436	0.322	0.228
(3) actual 2002/actual 1997	0.124	0.350	0.450	0.789	0.947
Counterfactual for women					
(4) Gap 1 = $\beta^{m02} X^{m02} - \beta^{f02} X^{f97}$	0.045	0.117	0.195	0.245	0.232
(5) (4) / (2)	0.093	0.328	0.447	0.761	1.018
(6) (5) / (3)	*0.750*	*0.936*	*0.995*	*0.965*	*1.074*
(7) Gap 2 = $\beta^{m02} X^{m02} - \beta^{f97} X^{f02}$	0.364	0.238	0.103	–0.073	–0.187
(8) (7) / (2)	0.751	0.667	0.236	–0.227	–0.820
(9) (8) / (3)	*6.067*	*1.904*	*0.526*	*–0.287*	*–0.866*
Counterfactual for men					
(10) Gap 3 = $\beta^{m02} X^{m97} - \beta^{f02} X^{f02}$	0.062	0.122	0.193	0.240	0.217
(11) (10) / (2)	0.128	0.342	0.443	0.745	0.952
(12) (11) / (3)	*1.033*	*0.976*	*0.985*	*0.945*	*1.005*
(13) Gap 4 = $\beta^{m97} X^{m02} - \beta^{f02} X^{f02}$	0.102	0.291	0.498	0.608	0.620
(14) (13) / (2)	0.210	0.815	1.142	1.888	2.719
(15) (14) / (3)	*1.700*	*2.328*	*2.541*	*2.394*	*2.870*

Note: [1] The actual gap is the coefficient on the male dummy in the quantile regressions without covariates.

bottom of the distribution were better in 1997 than they were in 2002, but this does not hold in the rest of the distribution. The deteriorating characteristics at the bottom do not help us explain the decreasing gap, though.

The second counterfactual experiment (gap 2) asks what the gap would have looked like if in 2002 the returns to women's characteristics had been those of 1997 (row 7). Under this counterfactual scenario, the gap would have been negative at the top, i. e. women would have fared better than men, and would have risen a lot at the bottom (row 9). Thus a large increase in the "prices" of women's characteristics at the bottom is an explanation of the larger decline in the gender earnings gap at the bottom of the distribution. We perform the same counterfactual experiments for men. Their results can be briefly summarized as follows. At the 10th decile men's characteristics were slightly better in 1997 than in 2002 and the deterioration of these characteristics contributed to a decrease in the gap to a small extent. Returns to men's characteristics, on the other hand, declined between 1997 and 2002 and contributed to the reduction in the gap throughout the distribution, although this reduction was higher in the upper part. The upshot of table 7 is, at any rate, that a substantial increase in the rewards for women's characteristics at the bottom – together with a slight deterioration of male characteristics – generates the larger reduction of the gender earnings gap in this part of the distribution.

Another possible reason behind the evolution of the gender earnings gap in Russia pointed out in the literature is wage arrears. Kazakova (2007) and Gerry, Kim and Li (2004) moot that because of social considerations by firms low-paid female employees see an improvement in the payment culture relative to low-paid male employees, thus the gap increases. In our firm data, we only have wage arrears at the end of 1998 when they were at a peak. However, relative to the country as a whole wage arrears were of minor importance in the firm and workers, where we see the largest GEG, actually had on average only 0.05 months of 1997 wages withheld while in the Russian economy as a whole the average worker was confronted with a stock of wage arrears amounting to 2 months of 1997 wages (Lehmann and Wadsworth 2007). Furthermore, Dohmen, Lehmann and Schaffer (2008) find no gender difference in the incidence of wage arrears for all employees, while they find a lower incidence for male production workers and for female engineers. This latter fact helps explain the increase in the earnings

Table 8

Oaxaca-Blinder decompositions of earnings for whole sample (including those with wage arrears) and those paid in full: 1998

	Whole sample	Paid in full
All employees		
Total difference	0.386*** (0.017)	0.444*** (0.032)
Explained	0.110*** (0.012)	0.089*** (0.018)
Unexplained	0.276*** (0.017) [71.50 %]	0.355*** (0.032) [79.95 %]
Workers		
Total difference	0.461*** (0.023)	0.445*** (0.032)
Explained	0.053*** (0.010)	0.091*** (0.017)
Unexplained	0.409*** (0.023) [88.72 %]	0.353*** (0.033) [79.33 %]

*Notes: "Total difference", "explained" and "unexplained" refer to the total differential and its parts due to the characteristics and coefficients, respectively. Standard errors for the total gap, the explained and the unexplained parts are reported in parentheses and are calculated in the Stata 9 routine using the method proposed by Jann (2005). ***significant at 1 %. Percentage unexplained is in square brackets.*

gap that we observe in table 8 when we go from the whole workforce to the sub-sample of employees paid in full and the small decrease when we proceed in the same way with production workers only. Table 8 also shows similar decomposition results for the entire groups and the sub-samples of those paid in full. It is clear at any rate that the decrease across the entire period has nothing to do with wage arrears, since after 1999 this firm had no problems in paying all its employees in full and on time.

A decreasing gender earnings gap could be caused by the withdrawal of poorly qualified and low-paid female employees as was demonstrated by Hunt (2002) for former East Germany. We therefore perform probit regressions that estimate the probability of separations. Controlling for a large number of observable characteristics, employees who find themselves in low deciles of the employee category specific earnings distribution at the beginning of the reported period have the highest propensity to separate from the firm. However, females finding themselves in the lower part of these distributions are actually less likely to separate from the firm. Thus changes in the composition of the female workforce do not seem to be behind the declining gender earnings gap. We should note that this result also holds in the specification that includes a female-children interaction dummy.[22]

Thus far we have only looked at separations in order to explain the change in the composition of the workforce throughout the distribution. For a complete assessment it is important also to characterize new entrants into the firm. Since we have no information about the population from which these new entrants are drawn, we cannot perform regressions that estimate the probability of being hired. Cross tabulations, however, can be used to compare the characteristics of new entrants with the characteristics of incumbent employees. These tabulations[23] show that in all years, for males and females alike, the new entrants have slightly "poorer" characteristics (e. g. they are slightly less well educated) than the incumbent employees. We can take this as evidence that the average "quality" of the stock of female employees does not improve over time because of new hires. In addition, the tabulations show that the change in the composition that we stipulate for male employees in the lower part of the distribution is not driven by hirings, either.

In summary, the only explanation that seems to hold up comes from the inter-temporal counterfactuals that are based on the Machado-Mata method: male employees with relatively good characteristics finding themselves in the lowest part of the distribution at the beginning of the period seem to have separated more frequently from the firm. But most importantly, an increase in the returns to female characteristics, which is particularly prevalent in the lower part of the distribution, seems to be the main driving force behind the shrinking gender earnings gap.

6 Conclusions

We have analyzed the size of the gender earnings gap and its determinants and development over time using data from a large Russian firm. Observed characteristics that are related to individual productivity only explain a small fraction of the gender earnings gap. The narrowing of the gap at firm level is driven to a minor degree by gender differences in separation patterns. In particular, men who are in the lower part of the earnings distribution but have relatively favorable observed characteristics are more likely to sepa-

[22] The results of these probit regressions are not shown here but are presented in table 11 of Dohmen, Lehmann, and Zaiceva (2008).
[23] They are not shown here but are available upon request.

rate, most probably because they face better outside alternatives. Women at the lower end of the earnings distribution have lower separation rates. This is likely the result of an increase in the returns to female characteristics, which is particularly prevalent in the lower part of the distribution. Our estimates indicate that this increase in the rewards for women is the main driving force behind the decreasing gender earnings gap.

Equally importantly, our analysis reveals that the gender earnings gap is largely driven by job assignment rather than by earnings differentials within a particular job level. For production workers, we have shown that earnings differentials conditional on the job level are small to start with and almost entirely explained by observed characteristics related to productivity. Future work has to clarify whether gender differences in job assignment stem from differences in unobserved productivity differences or from discrimination in initial job assignment or subsequent promotion opportunities.

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Appendix

Table A1

OLS and quantile regressions by gender, 1997

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Males				Females			
	OLS	Quantile Regressions			OLS	Quantile Regressions		
		10th	50th	90th		10th	50th	90th
Tenure	0.023**	0.024	0.016*	0.028***	0.017	–0.031*	0.034*	0.016*
	(0.010)	(0.023)	(0.009)	(0.006)	(0.014)	(0.017)	(0.020)	(0.009)
Tenure squared/100	–0.100	–0.047	–0.073	–0.159***	–0.101	0.472***	–0.166	–0.157*
	(0.079)	(0.179)	(0.074)	(0.048)	(0.144)	(0.147)	(0.190)	(0.083)
Tenure cubed/1000	0.016	0.001	0.014	0.025**	0.026	–0.142***	0.021	0.047**
	(0.017)	(0.038)	(0.017)	(0.011)	(0.039)	(0.033)	(0.048)	(0.019)
Age	–0.040	–0.022	0.017	–0.024	0.151*	0.038	0.161	0.144**
	(0.055)	(0.125)	(0.047)	(0.036)	(0.084)	(0.074)	(0.105)	(0.061)
Age squared/100	0.170	0.144	0.039	0.110	–0.357	–0.079	–0.388	–0.305*
	(0.145)	(0.330)	(0.123)	(0.095)	(0.232)	(0.206)	(0.295)	(0.170)
Age cubed/1000	–0.018	–0.017	–0.008	–0.012	0.029	0.006	0.032	0.021
	(0.012)	(0.028)	(0.010)	(0.008)	(0.021)	(0.019)	(0.027)	(0.015)
Basic professional	–0.009	–0.013	–0.022	0.011	0.079	0.052	0.117	0.010
	(0.039)	(0.085)	(0.033)	(0.023)	(0.061)	(0.071)	(0.080)	(0.038)
General secondary	0.057	0.116	0.020	0.046**	0.072	0.016	0.062	0.037
	(0.035)	(0.078)	(0.031)	(0.021)	(0.064)	(0.074)	(0.081)	(0.039)
Secondary professional	0.012	0.020	–0.027	0.030	0.228***	0.195***	0.204**	0.169***
	(0.039)	(0.088)	(0.034)	(0.023)	(0.065)	(0.073)	(0.086)	(0.043)
Higher incomplete	0.113	0.228	0.075	0.065	0.334***	0.192	0.406**	0.309***
	(0.075)	(0.163)	(0.085)	(0.054)	(0.103)	(0.133)	(0.159)	(0.057)
Higher	0.032	–0.041	0.005	0.014	0.277***	0.130	0.329***	0.333***
	(0.050)	(0.122)	(0.045)	(0.031)	(0.069)	(0.084)	(0.099)	(0.045)
Single	0.136	–0.167	0.017	0.198***	–0.049	–0.153	–0.054	0.110
	(0.102)	(0.205)	(0.087)	(0.059)	(0.111)	(0.132)	(0.154)	(0.079)
Divorced or widowed	–0.035	–0.024	–0.063	–0.051*	0.078	0.069	0.111	0.014
	(0.039)	(0.098)	(0.039)	(0.027)	(0.053)	(0.084)	(0.095)	(0.045)
One child	0.089	0.055	0.036	0.071	–0.129	–0.190*	–0.120	–0.057
	(0.071)	(0.149)	(0.063)	(0.043)	(0.087)	(0.108)	(0.122)	(0.063)
More than one child	0.148**	0.133	0.083	0.082*	–0.084	–0.069	–0.106	–0.041
	(0.074)	(0.157)	(0.067)	(0.046)	(0.095)	(0.120)	(0.136)	(0.068)
Mobility in the firm	–0.015	0.027	–0.026	–0.001	–0.000	0.032	–0.004	0.024
	(0.024)	(0.058)	(0.023)	(0.015)	(0.035)	(0.048)	(0.053)	(0.023)
Training outside firm	0.172***	0.021	0.189***	0.089**	0.162***	0.132	0.198*	0.085*
	(0.047)	(0.125)	(0.054)	(0.040)	(0.053)	(0.092)	(0.102)	(0.046)
Training in the firm	–0.033	–0.019	–0.047*	–0.053***	–0.167***	–0.131**	–0.093	–0.136***
	(0.026)	(0.061)	(0.024)	(0.016)	(0.052)	(0.056)	(0.065)	(0.031)
Service staff	–0.824***	–0.872***	–0.871***	–0.850***	–0.640***	–0.517***	–0.616***	–0.773***
	(0.054)	(0.120)	(0.048)	(0.032)	(0.075)	(0.091)	(0.103)	(0.048)
Engineers	–0.180***	–0.118	–0.226***	–0.160***	–0.090*	0.323***	–0.121	–0.369***
	(0.041)	(0.102)	(0.038)	(0.026)	(0.053)	(0.064)	(0.078)	(0.035)
Accountants	–0.086	0.573***	–0.316	–0.485***	0.281***	0.760***	0.269**	–0.237***
	(0.066)	(0.211)	(0.208)	(0.057)	(0.065)	(0.106)	(0.114)	(0.053)
Managers	0.557***	0.888***	0.485***	0.426***	0.767***	1.466***	0.677***	0.207**
	(0.044)	(0.122)	(0.055)	(0.039)	(0.071)	(0.127)	(0.178)	(0.087)
Constant	0.239	–0.759	–0.321	0.655	–2.254**	–1.427*	–2.356**	–1.543**
	(0.669)	(1.500)	(0.564)	(0.442)	(0.963)	(0.840)	(1.197)	(0.679)
Observations	1772	1772	1772	1772	1126	1126	1126	1126
R-squared	0.30				0.29			

*Notes: Robust standard errors in parentheses. * significant at 10 %; ** significant at 5 %; *** significant at 1 %.*

Table A2

OLS and quantile regressions by gender, 2002

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Males				Females			
	OLS	Quantile Regressions			OLS	Quantile Regressions		
		10th	50th	90th		10th	50th	90th
Tenure	0.026***	0.039***	0.012**	0.018***	–0.001	–0.016	–0.013*	0.003
	(0.008)	(0.012)	(0.006)	(0.006)	(0.008)	(0.012)	(0.008)	(0.010)
Tenure squared/100	–0.130***	–0.228***	–0.060	–0.095**	0.031	0.133	0.136**	0.022
	(0.050)	(0.083)	(0.040)	(0.039)	(0.073)	(0.088)	(0.064)	(0.088)
Tenure cubed/1000	0.023***	0.044***	0.011	0.015**	–0.003	–0.028	–0.029**	–0.001
	(0.009)	(0.017)	(0.008)	(0.007)	(0.018)	(0.019)	(0.015)	(0.021)
Age	0.090***	0.057	0.091***	0.033	0.013	0.059	–0.024	0.033
	(0.029)	(0.054)	(0.027)	(0.024)	(0.031)	(0.065)	(0.039)	(0.036)
Age squared/100	–0.196***	–0.115	–0.172***	–0.058	–0.015	–0.136	0.068	–0.081
	(0.070)	(0.134)	(0.066)	(0.061)	(0.079)	(0.163)	(0.101)	(0.094)
Age cubed/1000	0.014**	0.008	0.011**	0.004	0.000	0.010	–0.006	0.006
	(0.006)	(0.011)	(0.005)	(0.005)	(0.007)	(0.013)	(0.008)	(0.008)
Basic professional	0.050*	0.110**	0.000	0.036	0.002	0.010	–0.009	–0.042
	(0.028)	(0.047)	(0.023)	(0.022)	(0.025)	(0.047)	(0.029)	(0.035)
General secondary	0.025	0.053	–0.002	–0.021	0.066**	0.024	0.033	0.033
	(0.026)	(0.041)	(0.022)	(0.022)	(0.030)	(0.047)	(0.030)	(0.036)
Secondary professional	0.027	0.081*	0.008	–0.033	0.098***	0.133***	0.057*	0.033
	(0.029)	(0.047)	(0.024)	(0.024)	(0.027)	(0.050)	(0.031)	(0.036)
Higher incomplete	0.032	0.036	0.019	0.021	0.110**	0.192**	0.035	0.044
	(0.064)	(0.120)	(0.062)	(0.048)	(0.047)	(0.094)	(0.063)	(0.070)
Higher	0.043	0.029	0.018	–0.028	0.141***	0.136**	0.084**	0.168***
	(0.033)	(0.061)	(0.031)	(0.028)	(0.033)	(0.061)	(0.036)	(0.043)
Single	0.194***	0.037	0.246***	0.069	–0.020	0.026	0.023	0.073
	(0.068)	(0.151)	(0.081)	(0.076)	(0.042)	(0.085)	(0.055)	(0.057)
Divorced or widowed	–0.065***	–0.029	–0.108***	–0.050*	–0.042	–0.060	–0.020	0.016
	(0.025)	(0.048)	(0.026)	(0.026)	(0.036)	(0.049)	(0.032)	(0.037)
One child	0.221***	0.067	0.315***	0.050	0.054	0.045	0.129***	0.124**
	(0.059)	(0.137)	(0.074)	(0.071)	(0.036)	(0.066)	(0.042)	(0.052)
More than one child	0.211***	0.028	0.331***	0.067	0.090**	0.027	0.156***	0.157***
	(0.061)	(0.140)	(0.075)	(0.073)	(0.042)	(0.075)	(0.048)	(0.058)
Mobility in the firm	–0.061***	–0.081**	–0.056***	–0.021	–0.048**	–0.099***	–0.017	0.022
	(0.017)	(0.033)	(0.017)	(0.016)	(0.021)	(0.036)	(0.021)	(0.027)
Training outside firm	0.131***	0.060	0.104***	0.075**	0.088*	0.089	0.138***	0.027
	(0.027)	(0.059)	(0.034)	(0.035)	(0.047)	(0.061)	(0.038)	(0.039)
Training in the firm	–0.157***	–0.197***	–0.148***	–0.117***	–0.210***	–0.193***	–0.288***	–0.155***
	(0.016)	(0.032)	(0.016)	(0.015)	(0.022)	(0.037)	(0.024)	(0.028)
Service staff	–0.686***	–0.589***	–0.845***	–0.413***	–0.578***	–0.438***	–0.672***	–0.673***
	(0.041)	(0.057)	(0.030)	(0.028)	(0.030)	(0.064)	(0.042)	(0.049)
Engineers	–0.125***	–0.055	–0.164***	–0.056**	–0.022	0.004	–0.082***	0.030
	(0.024)	(0.049)	(0.025)	(0.023)	(0.026)	(0.049)	(0.030)	(0.035)
Accountants	–0.181***	0.225*	–0.286**	–0.416***	0.065	0.091	0.014	0.024
	(0.037)	(0.116)	(0.143)	(0.054)	(0.042)	(0.081)	(0.046)	(0.052)
Managers	0.582***	0.887***	0.511***	0.442***	0.782***	1.032***	0.754***	0.596***
	(0.027)	(0.069)	(0.037)	(0.037)	(0.035)	(0.096)	(0.062)	(0.078)
Constant	–1.540***	–1.398**	–1.650***	–0.284	–0.428	–1.209	0.130	–0.440
	(0.367)	(0.711)	(0.348)	(0.310)	(0.384)	(0.819)	(0.483)	(0.442)
Observations	1853	1853	1853	1853	1121	1121	1121	1121
R-squared	0.46				0.48			

*Notes: Robust standard errors in parentheses. * significant at 10 %; ** significant at 5 %; *** significant at 1 %.*