Wage policies of a Russian firm and the financial crisis of 1998: Evidence from personnel data – 1997 to 2002*

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Abstract

We use a rich personnel data set from a Russian firm for the years 1997 to 2002 to analyze how the financial crisis in 1998 and the resulting change in external labor market conditions affect the wages and the welfare of workers inside a firm. We provide evidence that large shocks to external conditions affect the firm's personnel policies, and show that the burden of the shock is not evenly spread across the workforce. The firm takes advantage of a high-inflationary environment and of a fall in workers' outside options after the financial crisis and cuts real wages. Earnings are curbed most for those who earned the highest rents, resulting in a strong compression of real wages. The fact that real wages and real compensation levels never recovered to pre-crisis levels even though the firm's financial situation was better in 2002 than before the crisis and the differential treatment of employee groups within the firm can be taken as evidence that market forces strongly influence the wage policies of our firm.

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1. Introduction

Observing how a firm adjusts its personnel policies in response to a large shock can yield vital insights about the nature of adjustment processes in labor markets. We analyze a rich personnel data set from a Russian firm for a period (1997 to 2002) that spans the Russian financial crisis in 1998, in order to shed light on crucial, but largely unresolved questions about the functioning of labor markets in general. For example, do firms adapt their wage policy to changes in labor market conditions? And if so, are all workers affected in the same way, or are incumbent workers shielded from external labor market shocks as early theoretical work on internal labor markets suggests (see Doeringer and Piore, 1971)?[1]

In particular, we investigate how the firm adjusts wages and other components of pay in response to the crisis, and study how the burden of the crisis is spread across the workforce. Such an analysis is important for at least two reasons: First, despite some attempts in the literature to assess the costs of economic crises on workers and on households (see, for example, Fallon and Lucas, 2002), we know virtually nothing of how these costs are distributed among employees inside firms during such dramatic macroeconomic upheavals. Since our firm is in manufacturing, the empirical analysis of wages and employment gives us insights that can possibly be generalized to workers in the tradable sector of any developing country undergoing a macroeconomic shock.[2] Second, although several studies have explored to what

[1] Doeringer and Piore (1971, p. 2) argue that workers in jobs that are filled by promotion or transfer from within are "shielded from the direct influence of competitive forces in the external market", but that the internal and external labor markets are connected at the ports of entry.

[2] Fallon and Lucas (2002) assess the impact of financial crises on labor markets and household income and record the different experiences of workers in the traded and non-traded sector during a financial crisis and its aftermath in their sample of developing countries. In these countries agriculture is the main traded sector, while in Russia manufacturing also belongs to this sector.

extent internal labor markets cushion incumbent workers from external labor market shocks (e.g., Baker et al., 1994, Lazear, 1999; Lazear and Oyer, 2004), it is still not well understood how workers' welfare is affected by firm performance over the business cycle. The picture that emerges in the empirical literature suggests (1) that hiring wages track industry wages, but (2) that differences in hiring wages are persistent; indicating that market induced variations in marginal productivity are not fully reflected in wages of incumbent workers.

The empirical literature has found it difficult so far to establish a direct link between shocks to (external) labor market conditions and changes of firm's personnel policies. This is because shocks have typically been small in most advanced Western economies during the last decades, which makes it difficult to identify a close link between single shocks when firms adjust to accumulated shocks due to fixed adjustment costs (Hamermesh and Pfann, 1996). Therefore, there is much insight to be gained by assessing how firms react to larger exogenous macroeconomic shocks, such as the financial crisis that occurred in Russia in 1998.[3] This crisis had severe consequences, leading to a substantial devaluation of the Ruble, a collapse of a large part of the private banking sector, a surge in inflation and interest rates, and liquidity problems, which adversely affected demand in the goods market.

Our results show that these changes in economic conditions strongly influence the personnel policies of our firm. While employment levels at the firm remained rather stable, the firm, which was a high-wage firm prior to 1998, makes use of the high inflation that manifests during the financial crisis in order to extract rents from

[3] Large macroeconomic shocks are more frequently observed in developing and emerging economies. Other examples include the financial crises in Latin America and Asia in the 1990s.

employees.[4] Real wages and real compensation fell substantially in the aftermath of the financial crisis in the firm. The downward adjustment of earnings leads to persistent welfare losses among employees since real wages and real compensation levels had not recovered to pre-crisis levels by 2002, even though the firm's financial situation was then better than before the crisis. These welfare losses were, however, not spread evenly across all employees. In fact, employees at the top of the earnings distribution tend to take the highest real wage cuts in relative terms, which is in part driven by external labor market conditions that limit the scope for cutting wages of employees at the bottom end of the firm's wage distribution. This results in a tremendous compression of real wages.[5]

The findings on real wage changes also contribute to the literature on wage rigidity. Our evidence suggests that intentions to maintain real wage levels are weak: although the firm is reluctant to cut nominal wages, it does not refrain from substantially cutting real wages, taking advantage of a high-inflationary environment. Furthermore, we also complement the existing literature on real wage rigidity since we can – knowing the exact time period in which the 1998 financial crisis in Russia manifests – establish a direct link between the inflation shock and real wage adjustments at the firm.

The remainder of the paper is organized as follows. The next section introduces the firm under study and gives a brief account of how it fared during the

[4] A policy that relies on "price" rather than "quantity" adjustments in response to adverse shocks is certainly typical for the Russian economy in early transition (see Boeri and Terrell, 2002; Lehmann, Wadsworth and Acquisti, 1999; Earle and Sabirianova, 2002).

[5] Our findings also indicate that employees with long tenure have lower nominal wage growth, but face fewer wage arrears. Wage arrears in the reported period are, however, so small that they can have only a negligible impact on the wage policies of our firm. Dohmen, Lehmann and Schaffer (2008) show that in 1998, the only year when employees in the firm experienced some wage arrears, median arrears amounted to one tenth of monthly 1997 wages while median wage arrears in the Russian labor market at large reached about two monthly 1997 wages. Because of their insignificance wage arrears they are not analyzed in this paper.

financial crisis and in its aftermath, while section 3 describes the personnel data set. Section 4 presents the main results of our analysis and establishes some robust evidence about the evolution of wages and total compensation in the firm over the period that encompasses the financial crisis. We also show to what extent local labor market conditions have an impact on the evolution of wages and total compensation. A final section concludes.

2. The firm and the financial crisis

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 production lines from Soviet times "nearly one hundred percent", according to the director general of the firm (CEO)[6], 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 locally no competitors, but nationally it has to compete with more than 5 firms, among them importers from the European Union. The firm was founded in the early fifties of the last century and privatized in 1992. A decade later, in 2002, more than half of the shares were owned by managers and workers, about twenty percent by former employees and roughly a quarter by other Russian entities. While there is collective bargaining at this firm on paper, trade union representatives have virtually no influence on wage policy, and wages are set unilaterally by top management.[7] Real output, capacity utilization and profits were all

[6] Source: Interview with the director general of the firm in the spring of 2002.

[7] From published annual financial statements we also know that employees with shares have no voting rights and that the CEO and a few leading managers have a large enough chunk 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 annual total compensation. In essence, corporate governance structures in this firm neither give

at a trough in 1998, recovered slightly in 1999 and then took off dramatically after the year 2000.

How representative is this firm as far as the sector "machine building and metal works" and Russian industry at large 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 as Table 1 demonstrates. The CEO is considered one of the successful managers in Russian industry as he early on in the transition 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 numerically maybe small but economically important number of industrial firms that have managed the transition to a market-based economy well.

In November 1997 and during 1998 the Russian economy was confronted with two speculative attacks on the ruble. While the Central Bank of Russia was able to successfully defend the ruble in the first episode, in August 1998 financial meltdown occurred and on August 17, 1998 the Russian government devalued the ruble, defaulted on domestic debt, and declared a 90 days moratorium on payment to foreign creditors. [89] The financial crisis had severe short-term consequences, leading to an upsurge of inflation, a collapse of a large part of the private banking sector and a virtual stop of economic activities for some weeks. After this period, however, rising oil prices, a real depreciation of the ruble and a large fall in real wages set the Russian economy on a growth path, which is still ongoing. One main reason why the collapse of the private banking sector had little effect on the real economy after the meltdown

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employees some direct influence over the wage setting process nor do they confound the levels and the differentiation of wages.

[8] For lucid discussions of the Russian financial meltdown, see Chiodo and Owyang (2002) and Kharas et al. (2001) and Summer's and Williamson's (2001) comments on the latter paper.

can be explained by the fact that private banks pre-crisis played mainly in the stock and bond markets and provided little lending capital to enterprises. In the run-up to and during the crisis, probably only few firms suffered because of decreased access to capital; however, firms did suffer because the overall lack of liquidity in the economy and a collapse in confidence of consumers and producers initiated a temporary standstill in economic activity and a reduction in demand for the products of firms.

How was our particular firm affected by the financial crisis? Leading up to the crisis there was a sharp drop in oil prices. The ensuing drop in oil production affected the demand for its oil equipment negatively. In addition, even before the fall in oil prices the real appreciation of the ruble made it difficult for the firm to compete with importers. From the interview with the firm's director general it is clear that the shortage of lending capital was less relevant for this firm than the drop in oil production and the high real exchange rate of the ruble. The devaluation of the ruble on August 17, 1998 brought a brief respite to the industry. This is also evident from Figure 1, which shows both the profitability of our firm and the profitability of the sector, in which the firm operates. According to the director general, the "[firm] became competitive in terms of price". Dramatically falling real wages, not mentioned by the top manager, did certainly also their part, as we will see in what follows. By the spring of 2002 (the time of the interview), this advancement in competitiveness had evaporated, and EU firms had increased their market share in the market segment, in which the firm operates. Due to the high oil price demand for oil drilling equipment has, however, remained strong, which explains why profits and capacity utilization rates remained high at our firm even after 1999.

Figure 2 compares average real monthly wages paid by our firm during the period from 1997 to 2002 to real monthly wages in the local labor market, the sector

our firm belongs to and to wages in the Russian economy. While wage trends in the sector, region (oblast) and nationwide economy are similar, our firm pays initially substantially higher wages. In the aftermath of the crisis we see a precipitous fall of the real wage in our firm, while real wages in the economy at large, the region and the sector show a more moderate fall. In the years following the crisis average real wages remain virtually unchanged in our firm but rise continuously for the three aggregates. By 2003 the average real wage in the economy and the sector exceed that in our firm. It is noteworthy, though, that the average regional wage remains below the firm's average wage even in 2003.

3. The personnel dataset

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. In addition we also know whether someone worked full-time or part-time. For those who separated from the firm we can distinguish between 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.[10]

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 rubles 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 ruble figure is recovered by applying the percentage to the nominal monthly wage. The other two bonuses are reported in nominal rubles. The inflation 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 - and so some care is required to construct appropriate deflators. Because nominal average monthly wage and the nominal monthly bonus are averages for the year, they are deflated into 1997 constant rubles 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

[10] Only production workers are subdivided into levels, primary production workers having eight and auxiliary production workers having six levels.

constant rubles 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.[11]

4. Results

Wage structure

Figure 3 plots kernel density estimates of the real wage distributions for different employee categories in 1997. It is immediately obvious that there is substantial heterogeneity in wages within employee categories. Moreover, real wage distributions for different employee categories overlap, so that many high paid production workers, for example, earned at least as much as lower paid managers. Service staff had the lowest mean wages in 1997 followed, somewhat surprisingly, by engineers, then production workers and accountants. Managers had the highest wages on average. This ranking of employee group-specific wage distributions remains unchanged throughout the observation period.

[11] 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 monthly wages averaged over the year, and so we compare average annual inflation rates in the oblast with national rates. This comparison shows that inflation (in percent) 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 entire period of 1997 to 2002, the cumulative price indices diverge by less than 3 percent. Consequently, results using wages and bonuses deflated by the national CPI are virtually identical to those using the oblast CPI. We use the national CPI in what follows.

Estimates from OLS regressions of log wages in 1997, reported in Table 2, show that service staff earn on average 52 percent less than production workers, while the latter earn around 6 percent more than engineering staff. Accountants and managers earn approximately 50 and 95 percent more than production workers (see column (1)). The estimated coefficients from the augmented Mincer wage regression in column (1) also illustrate that workers with longer tenure and more education receive higher wages. Women earn significantly less than men, while marital status and the number of children do not have a significant impact on wages. The mentioned factors significantly determine the wage structure throughout the observation period, but the size of the effects is attenuated over time. For example, while employees with university degree earned about 13 percent higher wages than employees with only basic education (conditional on employee category) in 1997, their wage mark-up falls to only 11 percent in 2002 (see Table A1 in the Appendix). It is also striking that wage tenure profiles are much flatter in 2002 than in 1997. In addition, the gender wage gap is reduced between 1997 and 2002 from 27 to 15 percent, and, with the exception of managers, wage differences between employee categories have diminished as well by 2002, an issue to which we return later. Columns (2) to (6) show wage regressions for the different employee categories.

Quantile regressions (reported in Table A2 in the Appendix) show that the effect of tenure on wages is similar across the entire wage distribution in 1997. As far as the impact of educational attainment is concerned, we see two results. Employees with higher education (university graduates) have a positive relative return throughout the distribution, while for the other educational groups the highest premia are in the lowest deciles. The gender wage gap is substantially larger in the lower half of the distribution and especially attenuated in the 9-th decile. Relative to production

workers service staff encounter a growing "wage penalty" as one goes from lower to higher deciles. It is noteworthy that engineers earn the same as production workers if they find themselves in the lower tail of the distribution but earn less from the third decile onwards. For accountants the "mark-up" over production workers falls from 90 percent in the 1st decile to 20 percent in the 8th decile, while for managers the mark-up falls from 185 percent in the 1st decile to 59 percent in the 9th decile. The results of quantile regressions for 2002[12], though qualitatively in line with the results for 1997, show attenuated differences in the impact of the above discussed covariates on log wages across the wage distribution. This is not surprising given the strong compression of the wage distribution during the studied period.

Real total compensation at our firm developed similarly, since the share of wages, unsurprisingly, made up the lion share of total income in all years as Table 3 shows.[13] In the crisis year of 1998, the wage share rose to more than 90 percent of total income and then declined to slightly more than three quarters of total income in 2002. The shares of all bonus components fell in the crisis year but then more than recovered in the remaining years.

Nominal and real rigidity

The literature on wage rigidity has documented compelling evidence that managers intentionally refrain from cutting nominal wages (Bewley, 1999). The resulting

[12] These results are not shown here but are available on request from the authors.

[13] The estimates of the quantile regressions on log total real compensation are also very similar to the results for the quantile wage regressions. Several difference are, however, worth commenting on: When bonus payments are added to wages, engineering staff and production workers have nearly the same mark-ups over service staff in 1997. This convergence is, however, reversed in the year 2002. The mark-ups of managers, on the other hand, are larger in both polar data points when total compensation is estimated.

nominal rigidity is borne out in personnel data (e.g., Baker et al., 1994; Wilson, 1996 and 1999; Altonji and Devereux, 2000; Dohmen, 2004). Clearly, nominal rigidity brings about real rigidity when there is zero inflation. In fact, Fehr and Goette (2005) provide evidence from personnel records showing that nominal rigidity even persists in a low growth environment with very low inflation, where it limits a firm's discretion to adjust real wages downwards. This indicates that motives for not cutting wages are strong and important. However, it is less clear that real rigidity would also stem from strong intentions for preserving real wages.[14]

An inspection of the data reveals that the firm never cuts nominal wages.[15] Real wages, however, fall markedly in the aftermath of the financial crisis in 1998. Figure 4 shows that real wages in the upper half of the respective distribution fell most, both in absolute and in relative terms, and recovered least in post crisis years. As a result, kernel density estimates of the wage distributions in 2002, which are not shown here , are to the left of the real wage distributions in 1997, for all employee categories. The real wage distributions also seem more compressed.[16]

The same evolution can be observed for real monthly compensation (measured as the sum of real monthly wages and the monthly share of all real bonus payments for the year).

[14] It is still controversial to what extent real wages are downward rigid. Card and Hyslop (1997) and Bauer et al. (2003) provide evidence for real wage rigidity using administrative micro data on wages. Baker et al. (1994) and Dohmen (2004) do not find that real wages are downward rigid in their analyses of personnel data.

[15] Sources close to the firm's top management told us that the firm never contemplated to cut nominal wages since such cuts might have resulted in even higher quit rates than the ones observed before the crisis.

[16] Since we are interested in the wage policies of our firm, ideally we would like to deflate nominal wages by a product-specific deflator, which we alas do not have. We do not use the national PPI instead of the CPI for two reasons: first, one of the foci of the paper is the welfare of the firm's employees, for whom real consumption wages are the relevant unit; second, the national PPI is based on a basket of many industrial products, whose price movements might or might not track the price movements of the products of our firm.

Who bears the burden of the shock? Individual wage mobility

Even though average real wages fall, not all employees are affected by the crisis in the same way. This becomes evident from Figure 5 which plots the kernel density estimate of the distribution function of real wage growth between 1997 and 2002. These heterogeneous real wage growth rates cause substantial relative wage mobility inside the firm as transition rates between quintiles of the wage distribution in 1997 (the origin state) and in 2002 (the destination state), calculated for the balanced panel of those who were continuously employed during the entire period, in Table 4 reveal.[17] For example, only 35 percent of all employees who found themselves in the third quintile of the wage distribution in 1997 remain there in 2002, while 41 percent move up in the wage distribution and 24 percent move down. This pattern is observed for all employment groups, but is particularly marked for production workers.[18] The transition patterns are also very similar albeit slightly stronger for total compensation. Thus, the firm substantially realigned real wages and total compensation during the inflationary period following the financial crisis, especially for the core group of the firm, the production workers.

In order to assess whether particular characteristics systematically determine relative wage growth, we regress the growth rate of real wages between 1997 and 2002 on various individual characteristics and job characteristics. We restrict the sample to full-time employees who were continuously employed during the entire observation period.

We perform this regression using three different specifications of the wage growth equation. Specification (1) estimates wage growth as a function of a cubic in

[17]Some scholars studying Russian labor markets in the first half of the 1990's maintained that there was substantial relative wage mobility in the economy at large (see, e.g. Commander et al., 1995).
[18] Transition matrices showing wage and compensation dynamics for different employee categories are available from the authors on request.

tenure and age, dummies for highest educational attainment, and demographic dummies. This specification assumes that wage growth does not depend on an individual's position in the firm-level wage distribution in 1997. The tenure-wage growth profile looks as follows: tenure and wage growth are inversely related up to approximately 20 years, between 21 and 30 years of tenure wage growth remains flat at roughly minus 22 percent and then turns slightly more negative for longer-tenured employees.[19] On this measure, the firm seemed to favor those employees who have been hired more recently. Holding other factors constant, female employees earn a substantial premium if the results of model specification 1 are to be believed.

Specification (2) adds dummies for the employee's position in the firm-level wage distribution in 1997. This model might still be too simplistic, since it assumes that all employees were confronted with the same wage distribution in 1997. As we have seen, though, the locations and the spreads of the wage distributions for the 5 employee categories were very different in 1997. To take account of this, specification (3) adds controls for the location in the employee category-specific wage distribution and dummies for employee categories. The results of specifications (2) and (3) are similar, and we concentrate our discussion on the results of specification (3).

The impact of tenure, while somewhat attenuated, remains negative throughout the tenure distribution. Secondary professional and higher educational attainment imply higher wage growth, while female employees experience smaller wage growth than their male counterparts. The latter result, reversing the estimated wage growth premium for female employees in specification (1), can be explained by

[19] The regression results are not shown here but available from the authors on request.

the fact that women find themselves in 1997 in employee and wage segments that exhibit the highest growth throughout the reported period.

The coefficients on the decile dummies strongly confirm our contention that employees positioned in 1997 in the lower deciles of their respective wage distribution experienced relative gains in the reported period. Location in the lower four deciles implies stronger wage growth than for those employees who were positioned in 1997 in the median decile. These relative gains are monotonically decreasing as we go from the bottom to the 4th decile. In contrast, employees positioned in 1997 in the highest four deciles of their wage distribution are confronted with relative wage losses. Relative to production workers, service staff and engineers have wage gains over the period, while accountants and managers have wage losses albeit of a small order.

In Table 5 we relax the assumption that wage growth is equiproportionate for each quantile across all employee categories, and estimate wage growth regressions for each employee category separately. The results show clear differences in the returns to the various deciles for the five employee categories. In particular, the relative returns for service staff show a much larger spread across the wage distribution than for other employee categories. In addition, production workers experience positive wage growth higher up in the wage distribution than other employees. Overall the result is, however, very clear, no matter what the employee category: employees who find themselves in 1997 in the lower part of their respective wage distribution experience substantially higher wage growth than those who are located in the upper part.[20]

[20] The estimated effect of all of these determinants on the growth of total compensation are very similar, which is not surprising, given that the different bonus payments only account for a small share of total compensation.

We use the sub-sample of those remaining in the firm between 1997 and 2002 in our wage growth regressions, which might raise the issue of sample selection bias. If unobserved factors that influence workers' decisions to remain in the firm are correlated with unobserved determinants of wage growth, our results would be biased. Furthermore, since, in the years 1997 to 1999, workers from the lowest and highest wage deciles leave the firm more frequently than other workers, the observed compression of real wages might be caused predominantly by workers selecting themselves out of the firm. In order to check the robustness of our wage growth results and to see that our story of relative wage gains in the lower part of the distribution is not mainly driven by selection, we proceed in two ways. We estimate annual wage growth models, where selection should be less of a problem, and we estimate wage growth between 1997 and 2002 using Heckit (Tobit II) models that try to correct explicitly for self-selection.

The results of the annual real wage growth regressions, which are not presented here[21], are very much in line with the results of the regressions that span the entire period. The covariates that have an impact on wage growth between 1997 and 2002 also influence annual wage growth. What is especially encouraging is the fact that workers who found themselves in the lower deciles of the origin wage distributions have disproportional wage growth also in the annual regressions, even if this effect is somewhat attenuated.

The estimates of the Heckit models are presented in table A3 in the Appendix. The three specifications discussed above are replicated with self-selection explicitly modeled. A comparison of the factors determining wage growth in the regressions spanning the entire period and in the Heckit regressions finds the same signs and

[21] The results are available upon request from the authors.

virtually always the same level of significance for the coefficient estimates. The coefficients on the deciles of both the firm-level wage distribution and the employee category specific wage distribution show hardly any differences between the previously discussed estimates and the Heckit estimates. So, our main result still holds: controlling for other factors and controlling for selection, employees in the lower (upper) part of the wage distribution experience relative gains (losses) over the reported period. It is, finally, also noteworthy that the selection term is insignificant in the third specification, i.e., once we condition on location in the employee category specific wage distribution, unobserved factors determining wage growth are not any longer correlated with unobserved factors affecting "participation."

The relative wage gains of employees in the lower part of the wage distribution translate into falling wage inequality that we analyze in detail elsewhere (see Dohmen, Lehmann and Schaffer, 2009). Gini coefficients and alternative measures of inequality like general entropy indices corroborate the decline in inequality of wages and total compensation for the entire workforce.[22]

Wage and compensation inequality falls also within all employee categories in the aftermath of the financial crisis. However, this process of wage and compensation compression is not monotonic for all employee categories. For example, inequality fell to very low levels for service staff and managers in 2001, but rises again thereafter. The compression in total compensation is less pronounced than the compression in wages, not least because the Gini coefficients of bonuses were far

[22] The general entropy index can also be additively decomposed into the within and between parts of inequality. This decomposition reveals that inequality within employee categories dominate overall wage inequality in 1997, while in 2002 within and between group inequality are of roughly equal magnitude.

higher than the Gini coefficients of wages (see Dohmen, Lehmann and Schaffer, 2009).[23]

Employment and Turnover

Table 1 shows that employment grew steadily from 3032 employees to 3221 employees from January 1997 until December 2002, with the exception of the post-crisis year 1999. Yet, the composition of the workforce hardly changed throughout the period. There is a small increase in the share of workers compensated by negligible falls in the shares of service staff, engineers and accountants, with managers retaining the same share of 3.8 percent throughout.

Turnover rates, calculated as the sum of hires and separations during a given year normalized by the stock at the beginning of the year, were particularly large in 1997 and 1998 (see Table 6a). After the crisis they fell quite dramatically, in 2002 reaching less than half the level of 1997. This secular pattern holds for all employee categories, but turnover was especially turbulent for accountants, production workers and service staff and much more modest for engineering staff throughout the period. In addition, while there was a large turnover of managers in the crisis year, there are few managers who enter or leave the firm after 1998.

Is the large hiring that occurs before the crisis replacement hiring, i.e., did the firm react to large separations by maintaining exceptionally high recruitment levels? To answer this question, we first plot monthly inflows and outflows of employees in Figure 6. The graph suggests that the inflow of workers reacts to the outflow of workers in previous months, i.e. that hiring can largely be described as replacement hiring. This is confirmed by the pattern of correlations between contemporaneous and

[23] Bonuses contributed little to overall inequality for two reasons. First, their shares were small relative to the share of wages. Second, the rank correlations of all bonus payments with the distribution of total income were far weaker than the nearly perfect rank correlation of wages

lagged outflow and inflow rates: The correlation between inflow in a particular month and the outflow in the previous month is strongest. In an ARIMA model, in which contemporaneous inflow is regressed on contemporaneous outflow and two lags of inflow and outflow, contemporaneous outflow is insignificant whereas lagged outflow is highly significant (p-value<0.001) and the second lag of outflow is marginally significant (p-value=0.1), while lagged values of inflow are not significantly related to contemporaneous inflow. The conjecture that separations trigger hiring is corroborated by the fact that contemporaneous and lagged inflow of employees is not significantly related to contemporaneous outflow in an ARIMA model. VAR models whose final specifications include two lags of inflow and outflow[24] indicate that outflow Granger causes inflow, but that inflow does not Granger cause outflow.[25]

The fall in turnover rates after the crisis year of 1998 comes about because of a fall in separation *and* hiring rates (see Table 6a). The bulk of the separations (about 80 percent) throughout the period are voluntary quits. Therefore the fall in the separation rate in the post-crisis year suggests that the financial crisis restrained many employees from quitting. The firm's employees seem to have been continuously confronted with a more limited array of outside options compared with the situation before the crisis.[26]

Additional evidence that lends support for the conjecture that workers' outside options worsened during the crisis comes from turnover statistics in a sample of 37

[24] The results of a Granger causality test depend crucially on two things, the set of variables included in the VAR model and the lag structure (see, e.g. Granger and Newbold, 1992). The first issue does not cause any problems here since we are confined to two variables at any rate. To minimize the bias of the test, we start out with VAR models of 12th order and test them down thus arriving at 2nd order VAR models.

[25] We can establish Granger causality here and not causality per se, i.e. we find that outflows singificantly lead inflows and not vice versa.

[26] Many workers in our firm saw these outside opportunities in the "suitcase trade", travelling between Russia and, e.g., China or Turkey and buying and selling certain types of goods informally. Such opportunities were severely reduced after the crisis, resulting in a dramatic fall of the number of "suitcase traders" throughout Russia (Eder, Yakovlev and Çarkoglu, 2003).

industrial firms located in the same city as our firm.[27] Table 6b reveals that the turnover patterns in this regional sample are similar to those for the firm in the years 1998 to 2001. In particular, separation rates fall by similar percentages for all employee categories, while the fall in inflows is more pronounced for our firm than for the regional sample. If we take the turnover rate as an indicator of local labor market conditions, we can infer that outside opportunities have diminished in a substantial fashion for all employee types compared to the period before the crisis. These diminished opportunities can also be seen by the movements of the unemployment rate in the given oblast. Being substantially lower in the pre-crisis years 1995-1997 than the average rate in the Russian Federation, it shot up by roughly five percentage points between 1998 and 1999, and then showed a cumulative fall of one percentage point in the years 2000 and 2001. While the local unemployment rate was roughly six percentage points lower than the Russian average in 1998, it was two percentage points higher in 2001. The described trends and relative magnitudes of the unemployment rate as well as the presented turnover patterns estimated from a regional sample of industrial firms demonstrate that local labor market conditions were decisively worse after the crisis year of 1998 and did not recover as rapidly as in the Russian Federation in general.[28]

In order to see what drives separation rates, we estimate Cox proportional hazard models in which we specify calendar time as the duration variable (cf. Dohmen and Pfann, 2004) and assume the same baseline hazard for all five employee

[27] We have a balanced panel of 37 firms that represent roughly 15 percent of industrial employment in this city only for these four years. The data of our firm are included in this panel as we want to estimate local labor marker turnover rates.

[28] The sample of firms is not representative in terms of development of total employment in the region, since we have a balanced panel. However, the estimated inflow and outflow rates are indicative of falling outside opportunities after the crisis.

specific categories.[29] We employ two specifications, one without and one with controls for the position in the employee category specific wage distribution. In order to assess whether the determinants of the hazard rate differ during years of high turnover (1997-1999) and the period of low turnover (2000-2002), we also estimate the Cox proportional hazard models separately for the two sub-periods.[30]

Tenure plays a minor role as far as separations from the firm are concerned. Employees with tenure up to two years and those who have been with the firm between 25 and 30 years have substantially lower hazard rates than workers in the reference category who are in their 10^{th} year of employment at the firm; otherwise the tenure hazard profiles are rather flat. It is also noteworthy that the highlighted tenure effects are only significant in the first sub-period. In this period of high turnover educational attainment only weakly affects the separation hazard, while between 2000 and 2002 employees with more than basic education have a higher propensity to leave the firm than those employees with lowest educational attainment, indicating that external labor market options play a role in separation decisions. The very young and those who have reached retirement age have a much higher separation rate than those employees who are between 30 and 35 years of age. The age hazard profiles are also striking insofar as workers over the age of 45, but still far from retirement, have a substantially lower propensity to separate from the firm than other age groups. Female employees have higher separation rates than their male counterparts, especially in the period of high labor turnover. On the other hand, employees with children are more reluctant to leave the firm. In both periods, service staff and engineers remain more

[29] An extension of these models allows for employee category specific baseline hazards. The estimates of such models, available on request, are virtually identical to the estimates of the presented models in the time invariant part of the Cox model. Also the estimated secular patterns of the various baseline hazards in the extended model are very similar to each other. We, therefore, stick to our simple specifications of the Cox model.

[30] The results are available in tabular form on request.

with the firm than production workers and accountants. [31] When turnover is high, hazard rates are highest for those employees located in the polar deciles, while in the second period only persons in the lowest decile have a higher propensity to leave. The years leading up to the crisis, 1997 and 1998, saw the largest turnover by far in the firm. As a robustness check, we, therefore, repeat our hazard rates estimations for these two years. The results, again not shown here but available on request, are in line with the results for the periods discussed above as far as the signs of the coefficients are concerned and strengthened since some previously insignificant covariates gain predictive power. In particular, the result that workers from the polar deciles of the employee category specific wage distribution have the highest hazard rates in the period 1997 to 1999 comes through even stronger since the proportional hazards are 13 percentage points larger for the lowest decile and 8 percentage points larger for the highest decile in the regression that is limited to the years 1997 and 1998. In summary, while most of the action took place in these two years, the presented results that cover the period 1997 to 1999 seem to reflect well the factors driving separations in our firm before and in the immediate aftermath of the crisis.

Extraction of rents and approaching the outside option

As we have seen, local labor market opportunities seem to have worsened substantially after the crisis year of 1998. The firm reacts to the falling threat point of its employees and erodes their rents that had built up before the crisis, taking advantage of high inflation which allows the firm to lower real wages without having to cut nominal wages. Table 7 shows that the large positive differences between mean wages in the firm and mean wages in the sample of industrial firms located in the

[31] In the years 2000 to 2002 there is only one manager who exits.

same local labor market observed in the years 1997 to 1999 turned either negative towards the end of the period or were tremendously reduced. The convergence of average wages in the firm towards average wages in the local labor market started after 1999 when employees' rents peaked. The extraction of rents during the period of real wage adjustment was quite relentless as a comparison of the entries for 1999 and the entries for 2002 reveals.

If we link these relative wage movements to the information that we provided about local labor market conditions, it seems obvious that local labor market conditions are a key element in the wage policy of the top management of the firm. This conjecture is confirmed by the CEO when asked directly about the determination of wage levels. According to him, three dimensions are relevant for wage determination: the characteristics of a worker, i.e., her/his qualification, tenure, seniority and work experience in general; labor market conditions, in particular the wage level in the region and the wage level in the sector; and the price of the order in whose production the employee is engaged.

In sum, given our evidence on the time patterns of regional turnover, the nature of hiring as replacement hiring, the regional unemployment rate, declining relative wage gaps and the statement by the CEO of the firm, we are confident that local labor market conditions are of paramount importance in the calculus of top management when it comes to wage setting. It is also our conjecture that in this Russian firm the causal effect runs from turnover to wages and not vice versa. This might seem counterintuitive as one would surmise that high wages would cause a fall in turnover. However, the efficiency wage models that explain the causal effect going from wages to turnover (see, e.g., Salop, 1979) are embedded in a mature capitalist economy that finds itself in a steady state. The Russian labor market in the 1990s was

clearly not in a steady state but in great turmoil with a tremendous amount of labor reallocation taking place. The CEO of our firm paints the following picture of this dramatic period when explaining the development of wages in the firm: "Higher than regional wages contributed to retaining and attracting highly qualified personnel after difficult crisis years in the beginning of the 1990s, when episodes of forced downsizing due to the output decline took place. Later, in 1995-1996, the firm started to receive orders, production growth began, and there was a need for qualified personnel. Since economic improvement happened all over the country, the only way to retain and attract personnel was to pay high wages. After the 1998 crisis, it was economically expedient to stabilize wages at the regional level."[32] In the final analysis market forces work in the case of our Russian firm and that in a relentless fashion.

5. Conclusions

Having a rich personnel data set of one Russian firm for the years 1997 to 2002 at our disposal, we can trace out the evolution of wages, total compensation and employment in a period that included the financial crisis of 1998. The observed evolution points to "price" rather than "quantity" adjustment within the firm during the crisis as employment remained stable but real wages and real compensation fell substantially. Our evidence thus shows that the firm does not refrain from substantially cutting real wages, taking advantage of a high-inflationary environment.

The downward adjustment of earnings leads to persistent welfare losses among employees since real wages and real compensation levels had not recovered to pre-crisis levels by 2002, even though the firm's financial situation was then better than before the crisis. The firm, which was a high-wage firm prior to 1998, makes use

[32] Cited from the interview of April 2007.

of the high inflation that manifests during and in the aftermath of the financial crisis in order to extract rents from employees. These welfare losses were, however, not spread evenly across all employees, since the firm curbs earnings most for those who earned the highest rents, which results in a tremendous compression of real wages. Wage growth regressions spanning the years 1997 to 2002 show disproportionate wage growth for those employees located in the lowest four deciles of the wage distribution in 1997 while employees positioned in the highest four deciles are confronted with relative wage losses. Relative to production workers, service staff and engineers have wage gains over the period, while accountants and managers have small wage losses.

The firm was in a position to extract rents from its employees because of a fall in outside opportunities in the local labor market as evidenced by dramatically falling separation rates after 1999. At the bottom end of the firm's wage distribution there are, however, few rents before the crisis and the firm seems to pay a wage close to the opportunity cost for employees at that end of the distribution throughout the reported period.

Our analysis thus shows that the costs of the crisis are unevenly distributed across the firm's workforce and that the firm tries to shelter those workers whom it values most from the fallout of the crisis. All in all, though, we take the differential treatment of employee groups within the firm as evidence that market forces strongly influence the wage policies of our firm.

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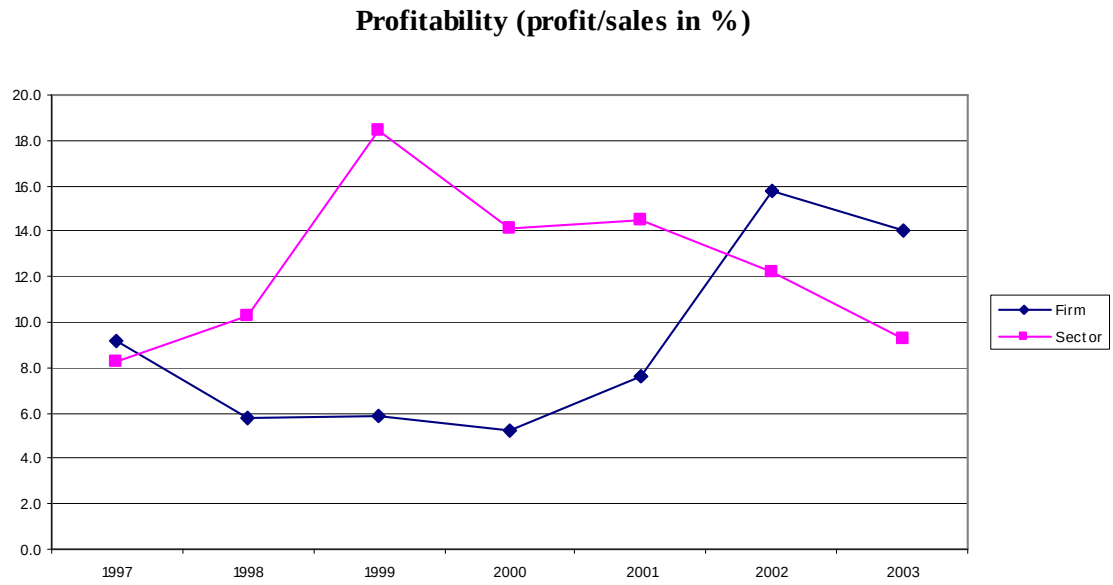
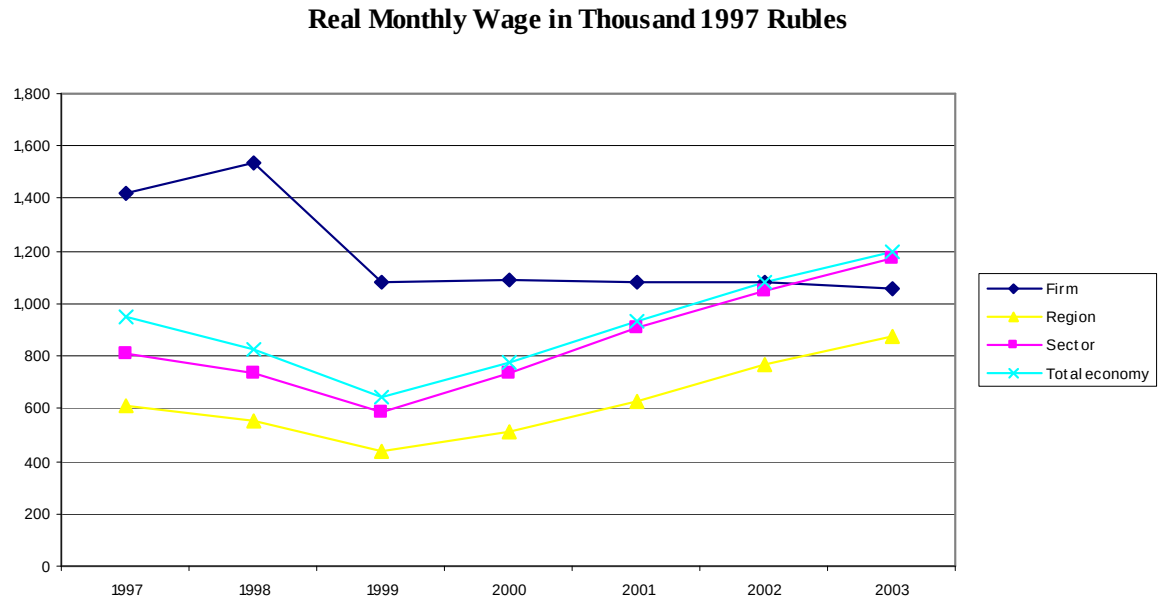
FIGURES

Figure 1



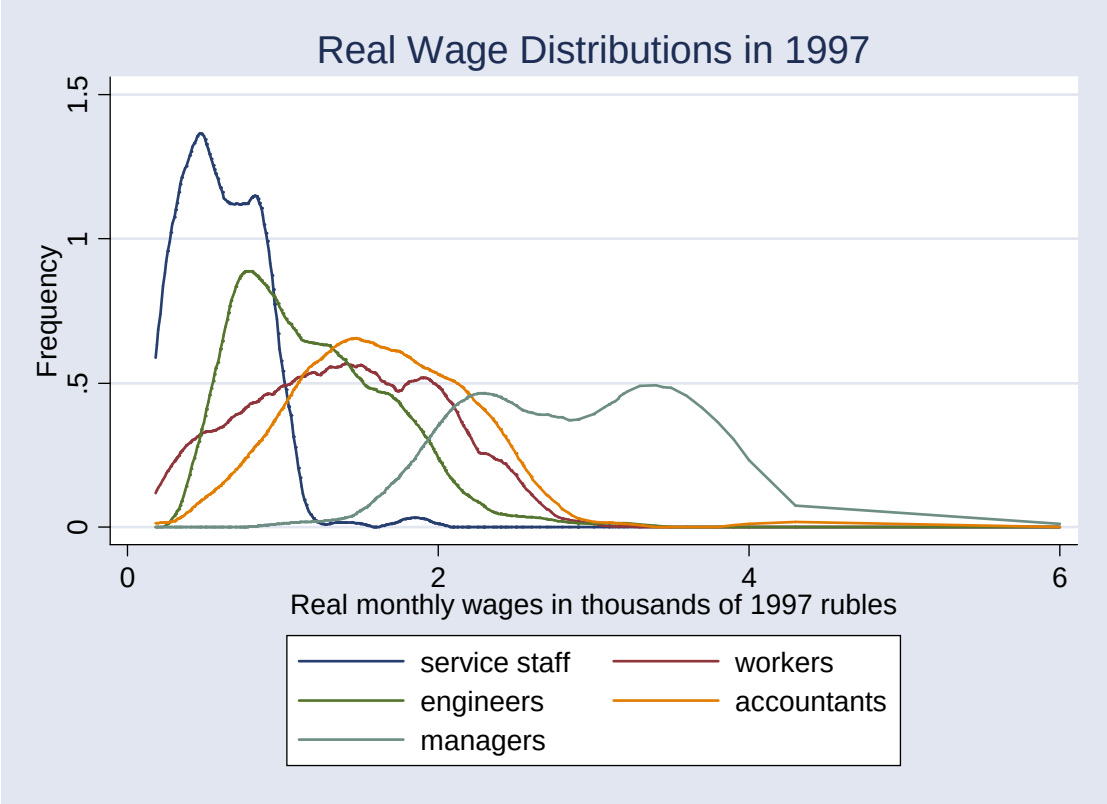
Notes: The figure shows the percentage of profits relative to sales for the firm and the average percentage of profits to sales for the machine building and metal working sector.
Source: Rosstat, authors' calculations.

Figure 2



Notes: The figure shows average real monthly wages in thousands of 1997 rubles for the firm, the region in which the firm is located, the machine building and metal working sector and the entire Russian economy.
Source: Rosstat, authors' calculations.

Figure 3



Notes: The figure plots the smoothed density functions of the real wage distributions in 1997 for the five employee categories in 1997 rubles, estimated using a Gaussian kernel. The bandwidth is chosen to minimize the mean integrated squared error under the assumption that data are Gaussian.
Source: Personnel records of the firm, national CPI deflator from Rosstat, authors' calculations.

Figure 4 Distribution of basic real wage in rubles - all employees

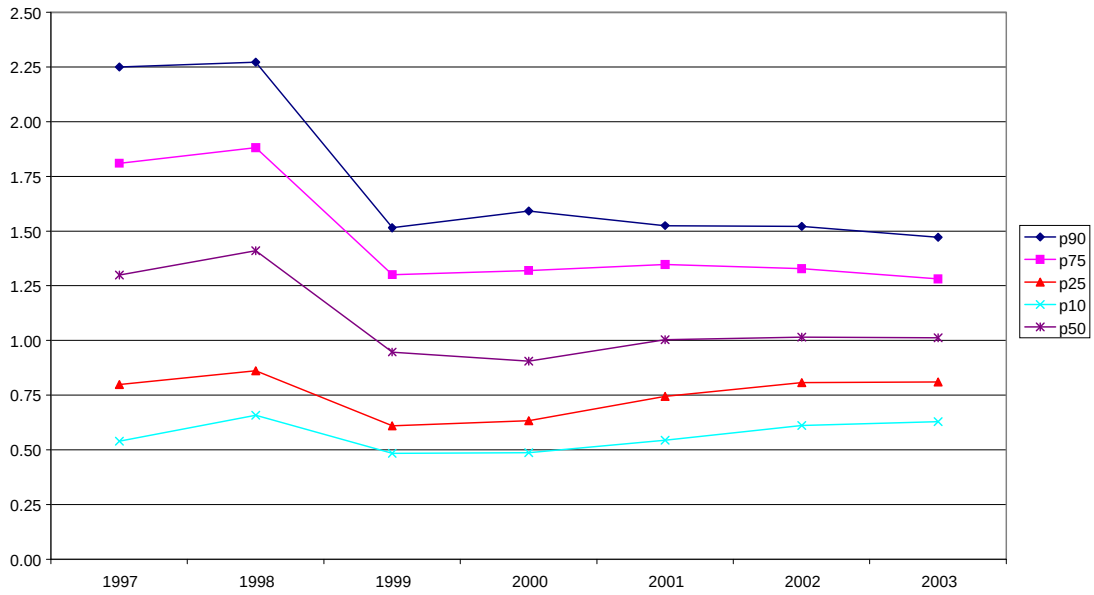
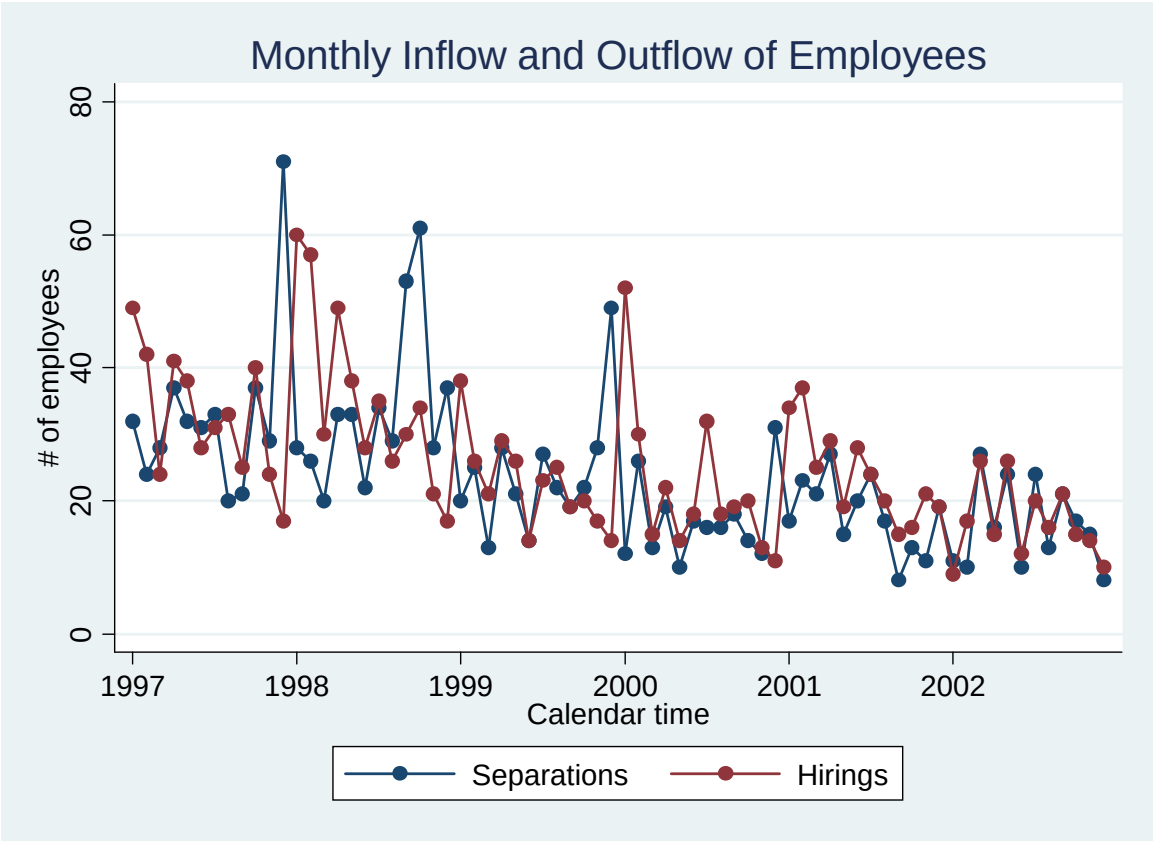


Figure 5

Notes: The figure plots the smoothed density functions of the distribution of real wage growth between 1997 and 2002 for the all employees who stayed with the firm during the entire period. Wages were deflated using the national CPI The density function is estimated using a Gaussian kernel. The bandwidth is chosen to minimize the mean integrated squared error under the assumption that the data are Gaussian.
Source: Personnel records of the firm, CPI deflator from Rosstat, authors' calculations.

Figure 6



Note: The figure shows the number of employees who leave and enter the firm in a particular month during our observation period.
Source: Personnel records of the firm, authors' calculations.

TABLES

Table 1: Composition of Workforce (in %), 1997 to 2002

Year	Service staff	Engineers	Production workers	Accountants	Managers	Total	Absolute number of employees
1997	7.1	24.8	62.1	2.2	3.8	100	3032
1998	7.0	24.4	62.6	2.1	3.8	100	3081
1999	6.9	24.6	62.6	2.1	3.8	100	3077
2000	7.0	24.4	62.8	2.1	3.8	100	3110
2001	6.9	24.0	63.2	2.0	3.8	100	3175
2002	6.9	23.7	63.6	1.9	3.8	100	3221

Notes: The table shows the composition of the workforce in terms of the five employee categories in percentages. The absolute number of employees is displayed in the rightmost column.
Source: Personnel records of the firm, authors' calculations

Table 2: Determinants of wages, 1997

	Dependent Variable: log(real wage) in 1997					
	All employees (1)	Service staff (2)	Engineers (3)	Production workers (4)	Accountants (5)	Managers (6)
Tenure in years	0.028***	0.020	0.026*	0.030***	0.027	0.007
	[0.007]	[0.028]	[0.014]	[0.010]	[0.041]	[0.026]
Tenure squared/100 in years	-0.136**	-0.269	-0.188	-0.119	-0.471	0.021
	[0.067]	[0.251]	[0.134]	[0.089]	[0.481]	[0.237]
Tenure cube /1000 in years	0.025	0.083	0.04	0.014	0.171	-0.007
	[0.016]	[0.055]	[0.033]	[0.021]	[0.152]	[0.058]
Age in years	0.034	0.013	0.012	-0.005	-0.479	-0.588
	[0.038]	[0.176]	[0.074]	[0.049]	[0.290]	[0.424]
Age squared/100 in years	-0.033	-0.009	-0.001	0.08	1.579*	1.541
	[0.103]	[0.469]	[0.198]	[0.133]	[0.819]	[1.059]
Age cube /1000 in years	-0.001	-0.001	-0.002	-0.01	-0.162**	-0.131
	[0.009]	[0.041]	[0.017]	[0.012]	[0.075]	[0.087]
Basic professional	0.037	0.014		0.036		
	[0.029]	[0.087]		[0.033]		
Secondary general	0.079***	-0.027		0.076**		
	[0.028]	[0.089]		[0.032]		
Secondary professional	0.097***	0.028	-0.123	0.100***	0.615	
	[0.030]	[0.104]	[0.277]	[0.036]	[0.390]	
Higher incomplete	0.164**	-0.088	-0.065	0.180	1.406**	0.035
	[0.069]	[0.469]	[0.284]	[0.114]	[0.559]	[0.167]
Higher	0.122***	0.187	-0.073	0.110	0.977**	-0.042
	[0.038]	[0.273]	[0.277]	[0.069]	[0.396]	[0.053]
1 if female	-0.319***	-0.236***	-0.155***	-0.428***	0.584**	-0.044
	[0.019]	[0.071]	[0.030]	[0.027]	[0.284]	[0.060]
1 if single	0.021	0.476	-0.038	0.074	0.109	
	[0.070]	[0.467]	[0.167]	[0.093]	[0.236]	
1 if divorced or widowed	-0.009	0.014	-0.081	-0.005	0.004	-0.056
	[0.035]	[0.093]	[0.074]	[0.050]	[0.132]	[0.071]
1 if 1 child	-0.011	0.434	-0.064	0.035	0.078	0.418
	[0.053]	[0.507]	[0.086]	[0.071]	[0.207]	[0.253]
1 if more than 1 child	0.042	0.487	-0.055	0.080	0.052	0.444*
	[0.057]	[0.498]	[0.096]	[0.076]	[0.236]	[0.254]
Service staff	-0.731***					
	[0.034]					
Engineers	-0.064**					
	[0.030]					
Accountants	0.401***					
	[0.060]					
Managers	0.662***					
	[0.051]					
Constant	-0.622	-1.281	-0.015	-0.252	3.422	7.886
	[0.456]	[2.150]	[0.924]	[0.583]	[3.383]	[5.539]
Observations	3040	213	790	1838	76	123
R-squared	0.35	0.1	0.06	0.24	0.49	0.16

OLS Estimates. Standard errors in brackets * significant at 10%; ** sign. at 5%; *** sign. at 1%.

Table 3 Distribution of components of average real monthly compensation

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 out to workers. Extra bonus is a premium paid out to all employees, which depends on the results of the year. Other bonus is paid out to workers only, for special effort and overtime. Monthly wage and monthly bonus are deflated into 1997 constant rubles using an annual average CPI, extra bonus and other bonus are converted into 1997 constant rubles using the CPI price level for December of the corresponding year. Average monthly compensation is given in thousand of 1997 rubles.

Table 4: Transition probabilities between quintiles of real wages in 1997 and 2002 (in %); all continuous employees

		Quintile in real wage distribution (2002)					
		1	2	3	4	5	N (1997)
Quintile in real wage distribution (1997)	1	**57.89**	*30.47*	*8.59*	*1.39*	*1.66*	361
	2	28.5	**34.35**	*25*	*10.28*	*1.87*	428
	3	4.81	19.24	**34.87**	*35.27*	*5.81*	499
	4	0.73	5.13	12.96	**49.39**	*31.78*	409
	5	0	0.49	4.62	22.38	**72.51**	411

Source: Personnel records of the firm, authors' calculations.

Table 5: Real wage growth 1997-2002 by employee category

	Service staff	Engineers	Production workers	Accountants	Managers
	(1)	(2)	(3)	(4)	(5)
Tenure in years	-0.143**	0.013	-0.027**	-0.239	-0.025
	[0.069]	[0.011]	[0.013]	[0.157]	[0.024]
Tenure squared/100 in years	0.982*	-0.082	0.141*	1.683	0.093
	[0.553]	[0.066]	[0.075]	[1.089]	[0.142]
Tenure cube /1000 in years	-0.209	0.015	-0.019	-0.335	-0.008
	[0.134]	[0.012]	[0.013]	[0.231]	[0.025]
Age in years	-0.234	-0.02	0.046	-0.532	0.914*
	[0.148]	[0.033]	[0.055]	[1.170]	[0.468]
Age squared/100 in years	0.55	0.042	-0.103	1.08	-1.978*
	[0.348]	[0.076]	[0.132]	[2.834]	[1.029]
Age cube /1000 in years	-0.042	-0.003	0.007	-0.071	0.141*
	[0.027]	[0.006]	[0.010]	[0.225]	[0.075]
Basic professional	0.058	-0.460***	-0.018		
	[0.050]	[0.146]	[0.023]		
Secondary general	0.004		-0.001		
	[0.052]		[0.019]		
Secondary professional	0.057	-0.012	0.028	0.172	-0.066
	[0.063]	[0.026]	[0.024]	[0.447]	[0.068]
Higher incomplete	-0.029		0.053	-0.011	
	[0.235]		[0.103]	[0.813]	
Higher	0.125	-0.005	-0.039	0.337	-0.025
	[0.163]	[0.026]	[0.047]	[0.483]	[0.068]
1 if female	-0.036	0.006	-0.111***	-0.29	-0.015
	[0.041]	[0.011]	[0.021]	[0.427]	[0.028]
1 if single	-0.247	0.031	0.139		
	[0.230]	[0.075]	[0.087]		
1 if divorced or widowed	-0.101*	-0.016	-0.025	-0.441**	0.002
	[0.056]	[0.029]	[0.026]	[0.192]	[0.028]
1 if 1 child	-0.066	-0.028	0.232***	0.067	-0.013
	[0.051]	[0.035]	[0.073]	[0.166]	[0.020]
1 if more than 1 child		-0.012	0.219***		
		[0.039]	[0.074]		
Position in employee category specific wage distribution:					
1st decile	0.617***	0.403***	0.674***	0.466	0.419***
	[0.085]	[0.022]	[0.032]	[0.294]	[0.041]
2nd decile	0.287***	0.213***	0.270***	0.264	0.278***
	[0.080]	[0.022]	[0.029]	[0.275]	[0.047]
3rd decile	-0.037	0.161***	0.202***	-0.003	0.254***
	[0.082]	[0.022]	[0.034]	[0.363]	[0.043]
4th decile	0.259***	0.085***	0.137***	0.052	0.103**
	[0.088]	[0.022]	[0.030]	[0.286]	[0.043]
6th decile	-0.083	-0.087***	0.086**	0.107	-0.147***
	[0.083]	[0.023]	[0.035]	[0.310]	[0.045]
7th decile	-0.314***	-0.140***	-0.033	-0.175	-0.116***
	[0.084]	[0.022]	[0.031]	[0.262]	[0.043]
8th decile	-0.550***	-0.186***	-0.162***	-0.043	-0.123***
	[0.085]	[0.023]	[0.034]	[0.344]	[0.039]
9th decile	-0.621***	-0.189***	-0.086***	0.042	-0.158***
	[0.084]	[0.022]	[0.030]	[0.274]	[0.050]
10th decile	-0.761***	-0.287***	-0.241***	-0.096	-0.268***
	[0.084]	[0.023]	[0.032]	[0.295]	[0.044]
Constant	4.054*	0.224	-1.018	8.929	-14.044**
	[2.070]	[0.438]	[0.733]	[16.054]	[7.005]
Observations	151	611	934	36	92
R-squared	0.83	0.75	0.53	0.69	0.9

Standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 6a: Hiring and Separation Rates (in %), 1997-2002

	Service staff			Engineers			Production workers			Accountants			Managers			All Employment		
Year	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total
1997	13.7	14.2	27.8	7.8	7.8	15.5	16.4	15.2	31.5	19.1	23.5	42.6	10.8	9.9	20.7	13.9	13.2	27.1
1998	13.3	13.3	26.5	6.3	5.8	12.1	18.0	16.1	34.1	20.0	23.1	43.1	16.1	13.4	29.5	14.7	13.5	28.2
1999	7.6	5.7	13.3	5.3	4.9	10.3	11.8	11.8	23.7	11.1	14.3	25.4	4.3	4.3	8.7	9.6	9.5	19.1
2000	9.3	7.4	16.7	6.4	5.7	12.1	10.7	7.6	18.3	8.2	0.0	8.2	3.5	0.0	3.5	9.2	6.7	15.9
2001	7.8	6.8	14.6	5.7	5.1	10.8	11.5	7.4	19.0	13.6	19.7	33.3	5.0	1.7	6.7	9.6	6.5	16.2
2002	5.4	3.6	9.0	2.9	3.0	5.9	8.7	7.8	16.5	8.1	9.7	17.7	0.0	0.0	0.0	6.7	6.1	12.8

Source: Personnel records of the firm, authors' calculations; In=hiring rate; Out=separation rate; Total=turnover rate.

Table 6b: Hiring and Separation and Turnover Rates (in %) in sample of industrial firms in the region - 1998-2001

	Service staff			Engineers			Production workers			Accountants			Managers			All Employment		
Year	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total
1998	9.2	21.6	30.8	10.8	13.0	23.8	11.3	12.8	24.1	3.1	4.4	7.5	2.1	5.4	7.5	10.9	12.6	23.5
1999	13.2	15.5	28.7	8.6	7.5	16.1	13.1	13.1	26.2	4.1	3.9	8.0	3.6	4.2	7.6	11.5	11.2	22.7
2000	10.1	13.4	23.5	8.3	9.3	17.6	13.1	10.1	23.2	4.7	4.5	9.2	2.6	0.1	2.7	11.2	9.8	21.0
2001	7.2	10.1	17.3	9.1	5.3	14.4	10.9	8.2	19.1	1.8	1.2	3.0	1.7	1.4	3.1	10.2	7.5	17.7

Source: CERT Regional Data Base, authors' calculations; In=hiring rate; Out=separation rate; Total=turnover rate.

Table 7: Differences between average wages in firm and average wages in sample of industrial firms in the region in 1997 rubles: 1998-2002

Year	Service workers	Engineers	Workers	Accountants	Managers
1998	100	133	379	792	1468
1999	346	391	803	805	1898
2000	123	-28	261	223	1056
2001	81	-82	195	279	805
2002	-61	-24	119	150	551

Source: Personnel records of the firm and CERT Regional Data Base, authors' calculations.

Appendix

Table A1: Determinants of wages, 2002

	Dependent Variable: log(real wage) in 2002					
	All employees	Service staff	Engineers	Production workers	Accountants	Managers
	(1)	(2)	(3)	(4)	(5)	(6)
Tenure in years	0.010**	0.04	0.035***	0.003	0.027	0.002
	[0.004]	[0.026]	[0.009]	[0.006]	[0.028]	[0.013]
Tenure squared/100 in years	-0.039	-0.534*	-0.174***	0.008	-0.184	-0.049
	[0.033]	[0.287]	[0.063]	[0.043]	[0.261]	[0.081]
Tenure cube /1000 in years	0.008	0.158*	0.027**	0.000	0.045	0.015
	[0.007]	[0.087]	[0.013]	[0.009]	[0.069]	[0.015]
Age in years	0.111***	0.067	-0.100**	0.142***	-0.671***	0.935***
	[0.022]	[0.084]	[0.044]	[0.028]	[0.232]	[0.196]
Age squared/100 in years	-0.248***	-0.183	0.245**	-0.319***	1.781***	-1.935***
	[0.054]	[0.207]	[0.108]	[0.070]	[0.597]	[0.447]
Age cube /1000 in years	0.018***	0.015	-0.019**	0.024***	-0.152***	0.132***
	[0.004]	[0.017]	[0.009]	[0.006]	[0.050]	[0.034]
Basic professional	0.056***	0.094	-0.406	0.033		
	[0.018]	[0.059]	[0.259]	[0.020]		
Secondary general	0.056***	0.062		0.041**		
	[0.017]	[0.060]		[0.019]		
Secondary professional	0.087***	0.085	-0.011	0.073***	0.711**	-0.024
	[0.019]	[0.070]	[0.046]	[0.022]	[0.301]	[0.062]
Higher incomplete	0.096**	0.34		0.044	1.152***	
	[0.045]	[0.305]		[0.080]	[0.422]	
Higher	0.107***	0.271	0.026	0.066*	0.984***	0.002
	[0.023]	[0.218]	[0.046]	[0.038]	[0.304]	[0.061]
1 if female	-0.170***	-0.152***	-0.082***	-0.228***	0.292	0.004
	[0.012]	[0.049]	[0.018]	[0.016]	[0.204]	[0.019]
1 if single	-0.032	-0.165	0.063	-0.073	0.153	
	[0.039]	[0.307]	[0.088]	[0.050]	[0.215]	
1 if divorced or widowed	-0.072***	0.011	-0.059	-0.085***	-0.23	-0.017
	[0.020]	[0.063]	[0.051]	[0.026]	[0.144]	[0.024]
1 if 1 child	0.015	-0.379	0.023	0.017	0.563*	-0.044
	[0.034]	[0.330]	[0.052]	[0.045]	[0.324]	[0.062]
1 if more than 1 child	0.027	-0.388	0.084	0.014	0.568*	-0.032
	[0.037]	[0.325]	[0.061]	[0.049]	[0.331]	[0.063]
Service staff	-0.516***					
	[0.021]					
Engineers	-0.014					
	[0.018]					
Accountants	0.152***					
	[0.040]					
Managers	0.679***					
	[0.032]					
Constant	-1.655***	-0.953	1.170**	-2.032***	6.433**	-14.020***
	[0.269]	[1.094]	[0.568]	[0.339]	[2.807]	[2.822]
Observations	3104	213	781	1929	64	117
R-squared	0.42	0.21	0.1	0.24	0.56	0.47

OLS Estimates. Standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Table A2: Quantile wage regressions

	Dependent variable: log(real wage) in 1997								
	10th percentile	20th percentile	30th percentile	40th percentile	50th percentile	60th percentile	70th percentile	80th percentile	90th percentile
Tenure in years	0.026	0.016	0.022*	0.025**	0.031***	0.031***	0.029***	0.024***	0.024***
	[0.016]	[0.015]	[0.012]	[0.011]	[0.010]	[0.007]	[0.008]	[0.006]	[0.007]
Tenure squared/100 in years	-0.072	-0.003	-0.088	-0.114	-0.154*	-0.169***	-0.186**	-0.139**	-0.121*
	[0.135]	[0.133]	[0.108]	[0.096]	[0.086]	[0.063]	[0.075]	[0.055]	[0.063]
Tenure cube /1000 in years	0.01	-0.003	0.016	0.022	0.027	0.030**	0.037**	0.026**	0.018
	[0.029]	[0.032]	[0.026]	[0.023]	[0.020]	[0.015]	[0.018]	[0.013]	[0.016]
Age in years	0.075	0.003	0.002	0.021	0.034	0.054	0.071	0.04	-0.006
	[0.082]	[0.072]	[0.061]	[0.055]	[0.050]	[0.037]	[0.045]	[0.033]	[0.039]
Age squared/100 in years	-0.136	0.048	0.055	0.014	-0.031	-0.077	-0.119	-0.051	0.064
	[0.223]	[0.195]	[0.165]	[0.149]	[0.134]	[0.100]	[0.120]	[0.089]	[0.104]
Age cube /1000 in years	0.008	-0.008	-0.009	-0.006	-0.001	0.003	0.006	0.001	-0.008
	[0.019]	[0.017]	[0.014]	[0.013]	[0.012]	[0.009]	[0.010]	[0.008]	[0.009]
Basic professional	0.077	0.092	0.03	0.026	0.02	0.01	0.04	0.027	0.016
	[0.066]	[0.058]	[0.048]	[0.042]	[0.038]	[0.028]	[0.032]	[0.023]	[0.025]
Secondary general	0.203***	0.08	0.102**	0.063	0.061*	0.028	0.038	0.066***	0.050**
	[0.064]	[0.055]	[0.046]	[0.040]	[0.036]	[0.027]	[0.031]	[0.022]	[0.024]
Secondary professional	0.266***	0.197***	0.108**	0.067	0.056	0.038	0.036	0.037	0.04
	[0.069]	[0.060]	[0.049]	[0.044]	[0.039]	[0.029]	[0.034]	[0.024]	[0.026]
Higher incomplete	0.354**	0.191	0.176	0.118	0.135	0.089	0.099	0.130**	0.103*
	[0.140]	[0.132]	[0.112]	[0.099]	[0.088]	[0.065]	[0.075]	[0.052]	[0.054]
Higher	0.151*	0.127*	0.084	0.106*	0.128***	0.117***	0.129***	0.116***	0.093***
	[0.086]	[0.075]	[0.062]	[0.055]	[0.049]	[0.036]	[0.042]	[0.029]	[0.031]
1 if female	-0.366***	-0.360***	-0.355***	-0.401***	-0.369***	-0.335***	-0.277***	-0.223***	-0.126***
	[0.047]	[0.039]	[0.031]	[0.027]	[0.024]	[0.018]	[0.021]	[0.015]	[0.016]
1 if single	-0.087	-0.008	-0.079	0.014	0.014	0.115*	0.1	0.036	0.106*
	[0.153]	[0.136]	[0.113]	[0.100]	[0.090]	[0.067]	[0.078]	[0.056]	[0.061]
1 if divorced or widowed	0.097	0.052	0.025	-0.003	-0.036	-0.03	-0.06	-0.065**	-0.046
	[0.081]	[0.069]	[0.058]	[0.051]	[0.046]	[0.034]	[0.039]	[0.028]	[0.029]
1 if 1 child	-0.078	0.023	-0.032	0	0	-0.009	-0.01	-0.035	0.015
	[0.119]	[0.105]	[0.087]	[0.077]	[0.069]	[0.051]	[0.059]	[0.043]	[0.046]
1 if more than 1 child	0.002	0.137	0.046	0.056	0.07	0.046	0.017	-0.044	-0.002
	[0.127]	[0.113]	[0.093]	[0.082]	[0.074]	[0.055]	[0.063]	[0.046]	[0.049]
Service staff	-0.596***	-0.679***	-0.760***	-0.812***	-0.803***	-0.758***	-0.783***	-0.785***	-0.803***
	[0.077]	[0.066]	[0.055]	[0.049]	[0.044]	[0.032]	[0.038]	[0.026]	[0.029]
Engineers	0.079	-0.025	-0.087*	-0.085**	-0.100***	-0.110***	-0.138***	-0.159***	-0.159***
	[0.069]	[0.059]	[0.048]	[0.043]	[0.038]	[0.028]	[0.033]	[0.023]	[0.025]
Accountants	0.644***	0.492***	0.498***	0.459***	0.406***	0.349***	0.271***	0.188***	0.05
	[0.140]	[0.121]	[0.099]	[0.088]	[0.078]	[0.056]	[0.065]	[0.044]	[0.050]
Managers	1.046***	0.845***	0.726***	0.602***	0.595***	0.541***	0.528***	0.513***	0.464***
	[0.110]	[0.098]	[0.082]	[0.073]	[0.065]	[0.048]	[0.056]	[0.040]	[0.042]
Constant	-1.895**	-0.679	-0.375	-0.504	-0.526	-0.672	-0.76	-0.196	0.452
	[0.964]	[0.844]	[0.724]	[0.655]	[0.589]	[0.440]	[0.528]	[0.392]	[0.461]
Observations	3040	3040	3040	3040	3040	3040	3040	3040	3040

Quantile regression estimates. Standard errors in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%

Table A.3 Wage Growth Regressions – Heckit model

	(1)		(2)		(3)	
	Real Wage Growth	Selection Equation	Real Wage Growth	Selection Equation	Real Wage Growth	Selection Equation
Tenure in years	-0.053***		-0.005		-0.009*	
	[0.007]		[0.005]		[0.005]	
Tenure squared/100 in years	0.347***		0.051		0.07	
	[0.064]		[0.042]		[0.045]	
Tenure cube /1000 in years	-0.064***		-0.009		-0.012	
	[0.015]		[0.010]		[0.010]	
Age in years	-0.003		0.03		0.004	
	[0.042]		[0.028]		[0.027]	
Age squared/100 in years	0.011		-0.099		-0.015	
	[0.113]		[0.076]		[0.073]	
Age cube /1000 in years	-0.001		0.01		0.001	
	[0.010]		[0.007]		[0.006]	
Basic professional	-0.124***	-0.452***	0.017	-0.451***	0.003	-0.449***
	[0.031]	[0.082]	[0.020]	[0.085]	[0.022]	[0.086]
Secondary general	-0.015	-0.063	0.02	0.009	0.012	0.012
	[0.027]	[0.077]	[0.017]	[0.082]	[0.016]	[0.082]
Secondary professional	0.050**	-0.194**	0.114***	-0.387***	0.041**	-0.355***
	[0.026]	[0.077]	[0.016]	[0.088]	[0.021]	[0.090]
Higher incomplete	0.09	-0.139	0.123***	-0.312	0.063	-0.245
	[0.064]	[0.183]	[0.040]	[0.205]	[0.040]	[0.207]
Higher	0.080***	-0.075	0.138***	-0.398***	0.056**	-0.327***
	[0.028]	[0.093]	[0.017]	[0.111]	[0.024]	[0.113]
1 if female	0.008	-0.166***	-0.024*	-0.547***	-0.036**	-0.533***
	[0.018]	[0.054]	[0.012]	[0.058]	[0.015]	[0.059]
1 if single	-0.058	-0.035	-0.047	0.133	-0.052	0.114
	[0.082]	[0.202]	[0.054]	[0.213]	[0.052]	[0.212]
1 if divorced or widowed	0.071**	0.444***	-0.056***	0.528***	-0.051**	0.496***
	[0.032]	[0.100]	[0.020]	[0.108]	[0.020]	[0.109]
1 if 1 child	0.261***	0.596***	0.004	0.655***	0.045	0.646***
	[0.064]	[0.156]	[0.043]	[0.165]	[0.044]	[0.165]
1 if more than 1 child	0.252***	0.800***	0.001	0.900***	0.045	0.879***
	[0.067]	[0.165]	[0.045]	[0.177]	[0.047]	[0.176]

Position in firm-level wage distribution:					
1st decile	-1.302***	0.670***	-0.346***		-0.394***
	[0.098]	[0.026]	[0.116]		[0.133]
2nd decile	-0.626***	0.267***	-0.001		-0.08
	[0.088]	[0.023]	[0.113]		[0.114]
3rd decile	-0.301***	0.080***	-0.057		-0.129
	[0.081]	[0.023]	[0.109]		[0.114]
4th decile	-0.087	-0.005	-0.028		-0.108
	[0.078]	[0.023]	[0.108]		[0.115]
6th decile	0.327***	-0.160***	0.250**		0.242**
	[0.074]	[0.021]	[0.103]		[0.109]
7th decile	0.258***	-0.165***	0.270**		0.307**
	[0.085]	[0.024]	[0.120]		[0.120]
8th decile	0.384***	-0.257***	-0.027		-0.014
	[0.078]	[0.023]	[0.111]		[0.113]
9th decile	0.367***	-0.245***	0.004		0.087
	[0.078]	[0.023]	[0.115]		[0.113]
10th decile	0.381***	-0.345***	-0.386***		-0.305**
	[0.081]	[0.024]	[0.122]		[0.122]
Position in employee category specific wage distribution:					
1st decile				0.569***	
				[0.024]	
2nd decile				0.291***	
				[0.022]	
3rd decile				0.158***	
				[0.021]	
4th decile				0.118***	
				[0.022]	
6th decile				-0.057***	
				[0.022]	
7th decile				-0.113***	
				[0.020]	
8th decile				-0.204***	
				[0.020]	
9th decile				-0.234***	
				[0.022]	

10th decile			-0.300***	
			[0.022]	
Service staff	0.712***	0.329***	0.223***	0.583***
	[0.078]	[0.109]	[0.019]	[0.103]
Engineers	0.218***	1.016***	0.082***	1.045***
	[0.072]	[0.092]	[0.027]	[0.091]
Accountants	0.045	0.274*	-0.124***	0.269
	[0.105]	[0.161]	[0.039]	[0.169]
Managers	0.086	1.020***	-0.092***	0.753***
	[0.115]	[0.158]	[0.029]	[0.166]
ten1	-0.490***	-0.757***		-0.673***
	[0.076]	[0.100]		[0.108]
ten2	-0.631***	-0.994***		-0.939***
	[0.081]	[0.101]		[0.114]
ten3	-0.566***	-0.660***		-0.615***
	[0.079]	[0.095]		[0.099]
ten4	-0.932***	-1.195***		-1.180***
	[0.092]	[0.112]		[0.118]
ten5	-0.961***	-1.319***		-1.258***
	[0.114]	[0.149]		[0.157]
ten6	-1.153***	-1.407***		-1.417***
	[0.104]	[0.127]		[0.131]
ten7	-0.825***	-0.789***		-0.804***
	[0.123]	[0.145]		[0.151]
ten8	-0.896***	-0.969***		-0.905***
	[0.129]	[0.162]		[0.171]
ten9	-0.678***	-0.734***		-0.618***
	[0.168]	[0.206]		[0.219]
ten10_	-0.798***	-0.763***		-0.709***
	[0.101]	[0.115]		[0.120]
ten15_	-0.865***	-0.761***		-0.731***
	[0.105]	[0.123]		[0.126]
ten20_	-0.732***	-0.883***		-0.816***
	[0.116]	[0.140]		[0.148]
ten25_	-0.768***	-0.706***		-0.628***
	[0.147]	[0.180]		[0.188]
ten30_	-0.789**	0.091		0.213

		[0.388]		[0.498]		[0.518]
ten35		-1.126***		-0.448		-0.479
		[0.435]		[0.518]		[0.537]
old15_		-0.271		-0.790**		-0.771*
		[0.294]		[0.394]		[0.410]
old20_		-0.032		-0.093		-0.08
		[0.088]		[0.101]		[0.104]
old25_		0		-0.071		-0.061
		[0.065]		[0.083]		[0.087]
old35_		0.148**		0.221**		0.240***
		[0.066]		[0.087]		[0.091]
old40_		0.182***		0.240***		0.228**
		[0.070]		[0.086]		[0.089]
old45_		0.310***		0.430***		0.434***
		[0.079]		[0.093]		[0.095]
old50_		0.285***		0.348***		0.363***
		[0.102]		[0.123]		[0.128]
old55		-0.157		-0.415**		-0.408**
		[0.143]		[0.177]		[0.180]
Constant	-0.472	0.216	-0.323	0.369*	-0.204	0.301
	[0.494]	[0.189]	[0.327]	[0.209]	[0.312]	[0.213]
Lambda	0.369***		- 0.122***		-0.033	
	[0.011]		[0.021]		[0.034]	
Observations	3103	3103	3103	3103	3103	3103

Standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%