HUMAN CAPITAL PRICES AND WAGE INEQUALITY IN RUSSIA 1985 – 2004

By

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ABSTRACT

Using data collected between 1992 and 2004 by the Russian Monitoring Longitudinal Survey, this paper examines the contribution of different factors to wage inequality changes in Russia. Addressing separately male and female wage distributions the study initially focuses on the general tendencies in wage inequality over years. Additional information reconstructed for wages in 1985 and 1990 allowed this survey to find a period of wage inequality expansion (till 2000) reaching 17 and 19 percent gap between the 90^{th} and 10^{th} percentiles in comparison with 1985 levels for male and female wage distributions correspondingly. The following years show overall inequality compression, which decreases the gap to 7 and 9 percent by 2004 for male and female workers correspondingly. Further analysis based on returns to education, experience and unobserved skills reveals two major connections between changing wage inequality and the "prices" of skills: returns to unobserved skills prove to be the dominating force for inequality dispersion in women's wages; while men are found to be substantially affected by changing returns to experience.

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INTRODUCTION

Many people believe that wage inequality variation is an inevitable consequence for transitional countries. The introduction of market forces revealed serious economic distortions of communistic times, which stimulated reallocation of labor force to more productive sectors of economy through wage differentials. In addition to that, higher level of flexibility of working conditions (e.g. part-time work, unemployment possibility, etc.) and the corresponding shifts in the labor supply enforced further dispersion of wages. Moreover, natural economic distortions in the form of macroeconomic shocks, business cycle movements or technological innovations may also change the structure of wages and consequently affect redistribution.

At the same time wage inequality is shown to be not only a temporary transitional or macroeconomic phenomenon, but also a complicated mechanism connecting human capital characteristics, such as education level and working experience, with the corresponding wage rewards. Therefore, both in times of unstable and sustainable economic environment many people are curious to know which of the worker's characteristics would be affecting their wages more. Today young population has to choose between higher level of education and additional years of working experience, so it is important for them to know which would bring higher returns.

This study addresses all these interesting questions and searches for all possible explanations. Above the already mentioned suggestions, a number of additional characteristics of labor force can also lead to wage differentiation: those can be gender, geographical location, industry, occupation, etc. Numerous studies have found these characteristics to be possible reasons for wage dispersion and therefore they can play important roles in wage inequality as well.

The Russian labor force market as the particular case for this study is very specific. It has been the leader in income stratification among all transitional countries losing only to Brazil, Chili and Mexico, so that the poorest ten percent of Russian population accounted for less than two percent of the national income volume, while the richest ten percent enjoyed about forty percent (Kislitsyna O., 2003:4). Looking at the dynamics of wage inequality in Russia since the end of communistic regime till nowadays can reveal the driving forces which could be common for other transitional economies, but could not be distinguished with their datasets because of lower magnitudes of inequality variation.

The aim of this paper is to examine the wage inequality changes in Russia between 1985 and 2004, and to evaluate comprehensively the possible explanations. According to human capital theory, returns to skills should be expected to be the most important driving force, but at the same time tremendous changes that took place in Russia during the transition should be expected to be of critical importance.

At the same time Russian labor force market analysis has also certain limitations. Surprisingly, official data sources have very restricted access, while only few alternative resources have high representation of the data. This study uses the Russian Longitudinal Monitoring Survey and considers all the waves of the data collection available at that time, which makes it possible to look at the period from 1985 till 2004.

In pursuing the goal this study explores not only the typical conceptual methods to examine general trends and to evaluate traditionally expected inequality reasons, but also a relatively new method of residual variance decomposition developed by Thomas Lemieux (2002), which has not been applied in the literature addressing wage inequality in Russia, but gives an excellent opportunity to evaluate the influence of unobserved/unmeasurable characteristics of workers on the wage inequality variation.

The paper is organized as follows. Chapter 1, following this introduction, reviews the related literature and discusses main results found in other studies. Chapter 2 describes the dataset and relevant measurement issues. The analysis starts in Chapter 3 and examines overall inequality changes. Chapter 4 decomposes inequality variation with respect to human capital and estimates the contribution of various characteristics of labor force to the general trends. Chapter 5 evaluates the role of unobserved qualities of workers. Finally, the conclusion summarizes.

1. LITERATURE REVIEW

This study begins with a summary of the main achievement in this area of research. The first section reviews the theoretical and methodological issues introduced and developed in economic literature and formulate a general approach for a typical wage inequality survey. The second section makes an overview of the empirical studies in Russia and discusses the main findings and specific for this country inequality trends.

1.1 Theoretical Issues

Over the last 25 years wage inequality has been an area of intensive study for the US researchers, which created a recognizable set of various approaches and techniques for analysis. Hundreds of papers introduced and developed different measures of overall wage inequality and mostly agreed on the basic facts and general trends which took place in the US during the twentieth century. However, there is still no consensus on the underlying economic explanations of these changes, which leaves space for further innovative research.

Wage inequality analyses carried out in transition countries (including Russia) experience much shorter period for studies, therefore it is less examined and sometimes inconsistent between the studies. Despite the fact that the researchers exploit practically the same methodology, the results may deviate substantially as a result of differences in treating the measurement problems (discussed in Chapter 2 below). On the whole, the conception framework of surveys addressing wage inequality in Russia follows the ideas revealed in the US studies – this is why it makes sense to look at their evolution in detail.

Almost every empirical study of wage inequality uses the human capital earnings function developed by Jacob Mincer (1974) as their starting point:

$$\ln earn = c + \alpha \cdot sch + \beta_2 \cdot exper + \beta_2 \cdot exper^2 + u,$$

where ***earn*** is earnings (also could be hourly/weekly wage), ***c*** – constant, ***sch*** – years of schooling, ***exper*** – years of labor experience, ***u*** – error term. Numerous studies have estimated this equation and almost all of them concluded that the returns to schooling have a significant positive effect ($\alpha > 0$), while returns to labor market experience represent a concave function ($\beta_1 > 0$ and $\beta_2 > 0$). The equation shows that earnings become an outcome of the process when individuals invest in two types of human capital:[1] education and on-the-job training. In the context of studies ***Schooling*** and ***Experience*** are considered as the 'quantity' of human capital, while α, β_1, β_2 are the 'prices' or returns to human capital.

Later studies considerably developed Mincer's concept. To see the main contributions, one can address to the summary of the literature carefully examined by Thomas Hyclak (2000). He identified several directions of the further analyses, among the most important could be listed the following:

1. Introduction of Additional Skill and Environment Variables[2]

The idea that there should be a range of other relevant skills apart for education and experience came into minds of many labor economists. Many of them started analyzing the wage effects with respect to additional measures of skills which could be changing wage inequality for a given level of education: the studies examined skills acquired prior entering to college together with skills relevant for college majors (results of SAT, mathematics and other courses tests), the effects of the job training courses, demographic (gender, race, marital status, etc.) and job specific characteristics (company size, industry, occupation, etc.). The obtained results showed that changes in returns to skills are more complex: not only the classic estimates of the return on schooling and on-the-job training, but all of these individual

[1] The concept of human capital was originally developed by Gary Becker (1964) and discusses that *human capital* is basically a stock of productive skills and technical knowledge embodied in labor. Therefore, human capital constitutes a means of production, when additional investment into human capital yields additional output. It is substitutable, but not transferable like other means of production – land, labor or fixed capital.

[2] For more details about the exact contributions of the underlying studies in this area see chapter 1 in Hyclak (2000).

characteristics, obtained skills and the environment proved to be important determinants of the wage distribution.

2. Wage Instability

The idea that changes in earnings can be explained by changes in the economic situation of individual workers was given careful consideration through late 1980s and 1990s and suggested that increased worker or/and job turnover can be an important factor explaining the changes in measured wage inequality in a turbulent labor market. A large contribution in this area of research was made by Peter Gottschalk and Robert Moffitt (1994) who looked at the changes in the variances of wages and decomposed them into permanent and transitory components. The permanent component reflects the long-run effects and therefore captures the fundamental changes in the wage structure, while the transitory fraction is subject to year-to-year earnings volatility.

3. Skill-Biased Technological Change

Certain papers have argued that the behavior of wages and returns to schooling can be explained by the technical changes, which in the nutshell have been skill-biased over the last decades. Although it is quite difficult to measure technological changes, certain studies provide evidence (e.g. Krueger A., 1993; Acemoglu D., 2000) that technical advancement give wage advantages to workers with higher education and skills. These statements therefore should be given careful consideration and could be a serious factor accounting for measurement issues.

4. Minimum Wage

Some researchers focused on the role of minimum wage in the changing wage inequality. Since the minimum wage installs the legal lower bound for the wage distribution, a fall in its real value would lead to a greater inequality especially at the low end of the distribution. The size of the effect can be quite considerable: as shown by John DiNardo,

Nicole Fortin and Thomas Lemieux (1996) it accounted for 25 percent of the change in wage inequality for US market in the 1980s, while David Card and Thomas Lemieux (1997) found that the Canadian minimum wage effect accounted for two thirds of the change.

5. Within/Between-Group Inequality

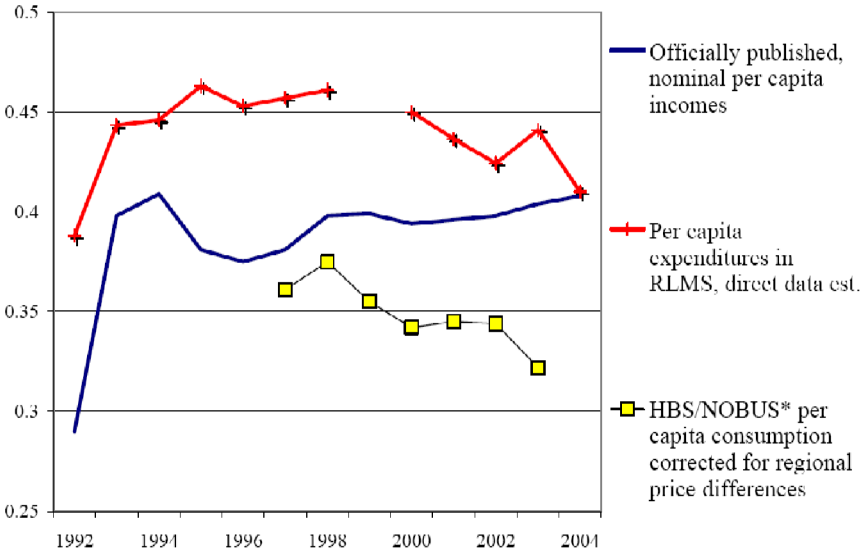
While different studies were finding evidence for changing wage returns on schooling, experience and other observable forms of worker skills and characteristics, the variation of wages among workers with a given skill has been interpreted by Chinhui Juhn, Kevin Murphy and Brooks Peirce (1993) as the consequence of the changing returns to the unobservable/immeasurable skills. They introduced a method to measure the changing 'quantities' and 'prices' of human capital within a given group while keeping the unobservable/immeasurable skills fixed. Their method became a starting point for further residual analysis. In 1996 DiNardo, Fortin and Lemieux introduced a semi-parametric procedure of reweighting the kernel densities of wages, which allowed obtaining distributions of counterfactual wages and consequently estimating the size of compositional effects. Both of these methods became the background for the residual variance decomposition developed few years later by Lemieux (2002), who created the possibility to estimate within and between-group changes using the counterfactual distributions of wages calculated through the reweighting procedure. This advanced method will further be discusses and applied in Chapter 5.

1.2 Surveys in Russia

In contrast with the comprehensive economic research in the U.S., Russia has rather limited number of surveys exploring wage inequality. There are simple reasons for that – limited access to "official" statistical sources and a short coverage period of alternative monitoring surveys. Pradeep Mitra and Ruslan Yemtsov (2006) found substantial inconsistency between the studies conducted by state statistical offices and the limited number

of independent researchers. As shown in Figure 1, depending on the data source Russia could be classified as moderate to high inequality country, as well as the country with rising or falling inequality.

Figure 1 Evolution of GINI index from various sources, 1992-2004



Source: Mitra and Yemtsov, 2006, p.7

Based on this comparison results, Mitra and Yemtsov (2006) concluded that wage inequality estimates could be quite dispersed because of the following reasons:

1. Different data sources rely on different procedures of imputations and adjustments, which make the estimates incomparable.
2. The inequality results are likely to be underestimated due to the panel attrition and under-sampling of richer households, who tend to be missing from the sampling surveys. There is also an issue of non-response which is usually solved by arbitrary assignment of the estimates from macroeconomic sources income levels.
3. There is no reliable methodology of regional adjustment in Russia, which creates distortions in wage distribution and the forthcoming measurement errors in estimations.

Although no consensus has been reached on the direction of changes in inequality gap in recent years, there is a pattern of convergence in results examining the first years of

transition in Russia. As summarized by Anna Lukyanova (2003), the period of 1990-1996 is characterized by a significant increase in wage inequality for both men and women. She concludes that the most important contributions are by Elizabeth Brainerd (1998), John Flemming and John Micklewright (1999), Hartmut Lehmann and Johathan Wadsworth (2001).

The general patterns of wage inequality in Russia have been identified by Flemming and Micklewright (1999), who registered a sharp increase in all inequality measures of wages: the GINI index jumped from 0.22 in late 1980s to 0.5 in 1996, while 90-10 percentile difference rose from 3.3 to 10 over the same period. Based on the aggregate official data they found the largest inequality rise between 1992 and 1994, while the following period showed remarkable stability.

The structural analysis carried out by Brainerd (1998) helped to distinguish the possible reasons standing behind this wage inequality rise. She showed that the bottom half of the distribution expanded much faster than the top half and found that returns to education were rising during 1991-1994, while returns to experience were surprisingly following the opposite direction. Additionally Brainerd (1998) looked at the gender differentials and witnessed a decrease in relative wages of women compared to men in all percentiles of distribution.

In their turn Lehmann and Wadsworth (2001) have studied the growing wage inequality with respect to wage arrears. Their counterfactual estimates of the wage distribution in the absence of arrears indicate that on average earnings could be 20 to 50 percent higher, while the wage dispersion could be lower by the same amount if the workers were paid in full. Based on the counterfactual distributions of wages gender gaps would be 10 percent higher, while the returns to tertiary education would be compressed by 15 percent if everyone were fully paid.

The wage setting mechanisms existed in state and private sectors were shown by Brainerd (2000a) to be another relevant issue for the years of privatization and in the following time. She provides empirical evidence of higher wage setting behavior in private companies, which however did not result from productivity increases,[3] but from rent-sharing organized by inside-owned managers to buy the collusion of workers.

These papers demonstrate the importance of certain specific measurement issues which should be taken into account in this area of research. Bearing this in mind, Lukyanova (2003) extended the period of study till 2003 and carried out a detailed analysis of the sources of changes in wage inequality. She finds an increasing inequality gap till 1998, where in the after crisis years wage inequality remained the same till 2002, which became a starting point for a reverse trend. The structure of inequality was not significantly changing between 1994 and 2003 and mainly resulted from demographic variables (gender and region) which accounted for 15 percent of the wage dispersion.

Surprisingly small effects were explained by human capital characteristics (about 8 percent of total variation), while the ownership variables followed similar pattern and demonstrated growing importance of schooling in determining wages in both private and state sectors. The instability of wages analysis carried out by Lukyanova (2003) showed that macroeconomic differences were permanent rather than temporary, which seems to be not surprising considering that the period of 1990s was full of economic uncertainty and instability.

Summarizing over the studies of wage inequality in Russia it can be concluded that this area of research remains understudied. There is limited number of papers explaining how transition macroeconomic shocks and privatization were affecting wage inequality, while

[3] David Brown, John Earle and Almos Telegdy (2005) showed that privatization did not bring substantial productivity increases to the converted companies in Russia. Moreover their model of fixed effects with random firm trend allowed them to show some negative impact of privatization on the wage bill (-3 to -5 percent).

gender differences are only measured but not explained. Little attention has been paid to the period of stabilization and growth (after the crisis of 1998). The current study attempts to cover these areas using the most recent empirical techniques. The following chapter discusses the data used for analysis and deals with specific measurement problems attributed to the estimation of wage inequality in Russia.

2. DATA DESCRIPTION AND MEASUREMENT PROBLEMS

Before starting the analysis it is important to address possible estimation problems and to adjust the data in order to avoid possible measurement errors. In this respect, Section 2.1 discusses the data used in this study and the restrictions imposed in order to obtain accurate results. The following section deals with the specific for Russia substantial regional differences, while the final section elaborates on the alternative measurement indicators and their relevance for this survey.

2.1 Sample Selection

This project uses data from the 1992-2004 waves of the Russian Longitudinal Monitoring Survey (RLMS), which represent approximately 3-4 thousand active workforce participants annually.[4] The sample covers both men and women and is restricted by working age (excludes workers younger than 16 and retired – older than 60 for men and 55 for women). The sample is then stratified into four educational groups (high school dropouts; high school graduates; college dropouts; college graduates)[5] and four experience groups (1 to 10 years; 11 to 20 years; 21 to 30 years; 31+ years). The working age population was further restricted to those who reported employment as their major activity. Thus the sample excludes working students and pensioners, mothers on maternity leave, self-employed and unemployed with income from casual work, farmers and entrepreneurs.

The construction of the RLMS questionnaires provides certain benefits and disadvantages for a researcher. The information collected in years 2000 and 2001 also made it possible to reconstruct the wage structure in retrospective for years 1985 and 1990, which gives an excellent opportunity to account for wage distribution before transition period in Russia even

[4] There was no data collection during 1997 and 1999; therefore, these years are missing in this survey.

[5] One can also distinguish between vocational and technical schooling in Russia, however these categories are usually poorly represented and therefore not considered in this survey.

started. However, the RLMS does not contain any information about schooling or experience prior to 1993; this is why most part of the analysis is concentrated on 1993-2004. At the same time the database does not have information about hourly wages that are normally used in wage inequality studies, but only about monthly wages received after tax payments, which potentially leads to measurement errors. Another problem associated with this database is that individual observations do not contain any information about industry distribution of the sample,[6] while certain studies show that between-industry shifts due to better wage or better working conditions could be one of the major driving forces of wage changes in transition countries (e.g. Mitra and Yemtsov, 2006). The ISCO four-digit occupation codes used in the RLMS made it possible to stratify the working population into 10 groups:[7]

1. Legislators, Senior Managers, Officials
2. Professionals
3. Technicians and Associate Professionals
4. Clerks
5. Service Workers and Market Workers
6. Skilled Agricultural and Fishery Workers
7. Craft and Related Trades
8. Plant and Machine Operators and Assemblers
9. Elementary (Unskilled) Occupations
10. Army[8]

The sample for each year is further on restricted for possible outliers: those who either received wages below minimum wage level or above 200 times the minimum wages level in their corresponding years were excluded from the survey.[9]

[6] The questionnaire used for RLMS started to control for industry since 2004 (round XIII).

[7] The paper followed the recommendation from http://www.cpc.unc.edu/projects/rlms/data/occupationalcoding.html

[8] No workers from the army sector were included into the sample.

2.2 Regional Differences and Inflation

Russia experiences enormous differences in the economic, social and political life of its regions, which creates itself large imbalances of income distribution among working population. The constituting regions are subject to their own disequilibrium price shocks, general price dispersion and vast territorial disparities in the costs of living. Konstantin Gluschenko (2005) shows that half of the regions demonstrate the dynamics of convergence of prices from 1993 to 2003, while most the 1990s still remain quite disintegrated. In terms of overall wage inequality, between-regional factors as estimated by Yemtsov (2003) remain the key driver of the change in inequality between 1995 and 2000, accounting for about a third of the overall gap by the year 2000.

In order to obtain the real values of various monetary indicators a most common way would be to use monthly regional CPI as deflator. However empirical evidence shows that implementing Russian CPI leads to substantial estimation biases (Lukyanova, 2003). Gluschenko (2006) explains this by regional fragmentation which creates differences in access and in preferences of the populating regions to the basket of goods used by the statistical offices for comparison. He finds that nominal prices have a better fit with the "perfect" distribution patterns, while spatial comparison in real terms is only adequate after 2002.

For the purpose of this study spatial price adjustment follows the procedure proposed by Lukyanova (2003) and goes in two steps. First, the wages are divided by the ratio of regional minimal costs of living to the value of the national average indicator. This adjustment uses the information about minimum subsistence level for the period of 1992-1998, and the values of a fixed basket of goods and services for 2000-2004.[10] At the second stage wages are deflated by the aggregate monthly CPI taking 1985 as 100 percent, while the

[9] This excluded annually some 100-200 people at the lower end and 1-2 persons at the upper end, which seems feasible for this study.

[10] There was a change of Goskomstat methodology in 1999. For details see Lukyanova (2003).

period between 1985 and 1990 is assumed to have zero inflation.[11] The technical information included in RLMS allowed grouping the observations into eight regions: Moscow and St. Petersburg; Northern and North Western; Central and Central Black-Earth; Volga-Vyatski and Volga Basin; North Caucasian; Ural; Western Siberian; Eastern Siberian and Far Eastern.

2.3 Measurement Issues

The transition period in Russia has another very important peculiar feature – a very substantial history of wage arrears. According to John Earle and Klara Sabirianova (2002) delays in wage payments reached their significant amounts in 1993 and continued to grow, accounting for about 50 trillion rubles by 1998.

Lehmann and Wadsworth (2001) analyzed the scope of wage arrears effect on the wage distribution and measures of wage inequality and imputed several methods to adjust initial measures for wage arrears. Their results shown in Figure 2 below suggest that conventional measures of earnings dispersion could be 20 to 30 percent lower in the absence of arrears, which suggests that accounting for the wage arrears is crucial for a wage inequality analysis.

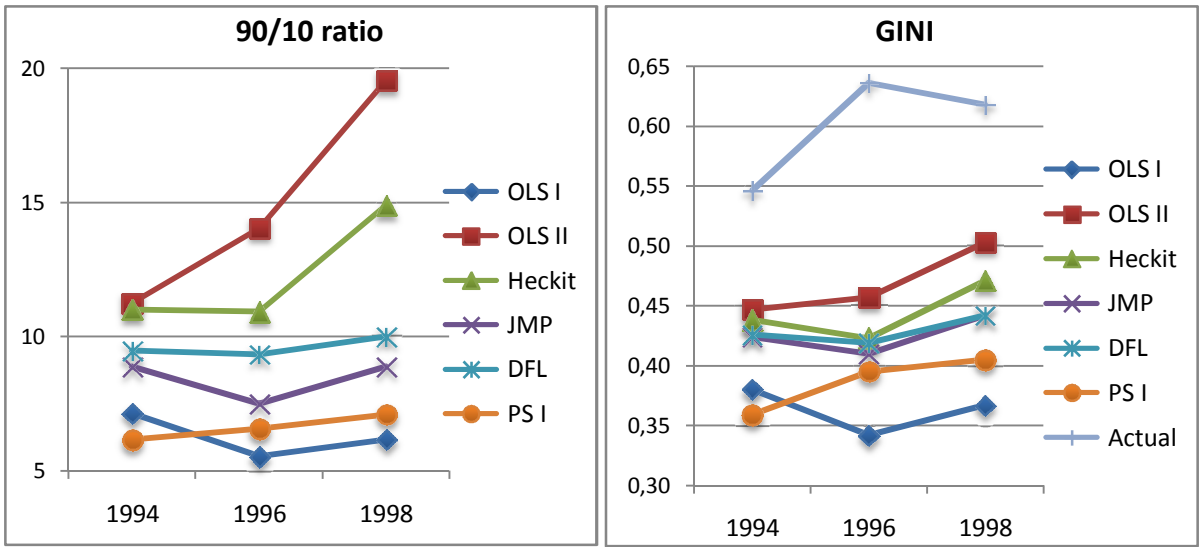
As summarized by Lukyanova (2003) one can consider several definitions of wages in order to get closer to the true population parameters with respect to possible wage arrears:

1. *Actual wages*. Actual wage is a tax-free wage received by a respondent in cash during the last 30 days. This category has a great deal of missing or zero reported information as a result of wage arrears. The proportion of workers affected by wage arrears in the sample varied as follows: 33 percent in 1994; 20 – in 1995; 30 – in 1996; 26 – in 1998; finally since 2000 the amount became negligible. A feasible study could be based on those workers not in

[11] According to the Decree of the Council of Ministers of Russian Soviet Federative Socialist Republic (RSFSR) from December 29, 1990 "On the transition to a new system of wholesale prices and tariffs in RSFSR" there were created a new statistical office responsible for monitoring the level of prices and tariffs on the territory of RSFSR starting from 1991. This was the beginning of inflation history in Russia; all the previous periods were subject to fixed prices and therefore had zero inflation.

arrears; however it is highly difficult to distinguish these monthly payments from one-time bonuses or payments received as late dues.

Figure 2 Actual and Counterfactual Real Wage Distributions, 1994-1998



Source: build based on Lehmann and Wadsworth, 2001, p. 32

Note: OLS I is OLS estimate without residuals; OLS II includes residuals; JMP is based on Juhn, Murphy and Pierce decomposition method; DFL is using DiNardo, Fortin and Lemieux counterfactual densities; PS I is estimated based on propensity score without conditioning on pre-treatment history.

2. *Average wages*. Since 2000 the RLMS started collecting data on the after-tax averaged over the last 12 months wages. Using this information one would obtain the closest to the true values measure of wages. The limited years of observation at the same time do not allow us to use it in this particular survey.

3. *Contractual wages*. Following Earle and Sabirianova (2002) one can construct the estimate of wages which would be obtained by workers if all the payments were done in full and on time. The measure of contractual wages for each worker is calculated by dividing the accumulated amount of wages due over the period of non-payment. For those workers not affected by wage arrears the measure is equal to actual wage. On the whole, contractual wages is a feasible method of approximation for this study.

4. *Total compensation*. In addition to wage arrears some workers also experienced in-kind payments given in goods available to their company in lieu of wage payment for their

labor. The number of people affected by these payments is equal to 8 percent in 1994 and 1995; 10.5 in 1996; 13.5 in 1998; 5.5 in 2000; 5 in 2001; 4 in 2002; less than 3 percent in 2003 and 2004. During the non-payment crisis years in-kind payments accounted for more than a half of total payments, which demonstrates their importance for wage analysis.

Table 1 Descriptive statistics of real wages for female and male working population in the sample, 1985-2004 (1985-1990 taken as 100 percent)

year	Female			Male		
	# obs.	Mean	Std. Deviation	# obs.	Mean	Std. Deviation
1985	1777	166.71	90.39	1669	255.06	160.58
1990	1881	252.27	186.42	1810	370.82	294.91
1992	6394	364.33	535.30	6308	518.69	1027.75
1993	5092	342.51	308.92	4707	483.78	436.20
1994	1728	310.98	290.26	1808	477.0409	414.88
1995	1579	294.31	299.97	1662	456.9042	474.88
1996	1499	341.34	353.46	1466	503.3727	491.51
1998	1492	210.74	221.20	1374	327.9039	328.43
2000	1694	266.17	270.79	1566	419.74	427.52
2001	1930	345.34	350.39	1769	561.56	627.37
2002	2027	390.23	335.85	1888	603.85	578.39
2003	2104	432.60	378.15	1959	656.71	579.62
2004	2250	453.12	384.55	2135	699.95	557.42

When choosing the appropriate definition of wages one should therefore account both for possible arrears and in-kind compensations. This study constructs the measure for earnings as contractual wages for workers facing wage arrears and sums the actual wages with the in-kind benefits for working population paid in full. Table 1 summarizes the real wages by gender for the period covered by the sample. It can be seen that on average real wages of men are higher and more dispersed, which allows us to expect higher inequality in male wages.

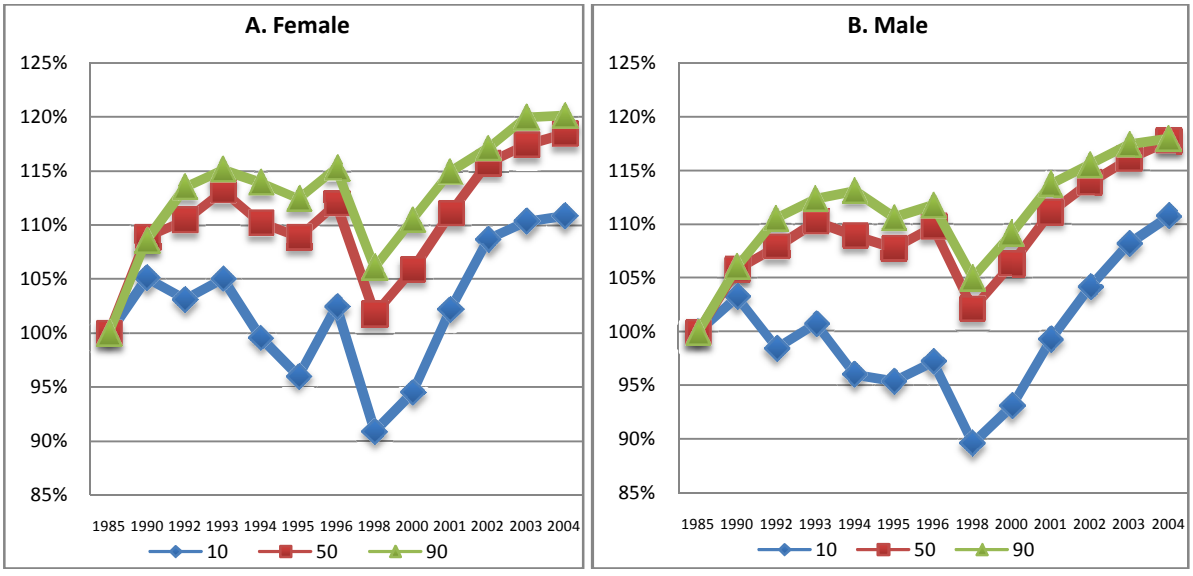
Having adjusted for the possible measurement errors, the study now moves to the analysis which is disclosed in the following chapters.

3. MEASURING THE OVERALL INEQUALITY

It is reasonable to start the discussion with general overview and simple decompositions which reveal the change in skill differentials defined along certain dimensions of skills. In this chapter skills are defined generally in a way that the worker's position in the wage distribution is considered to be a measure of her/his skill. Thus the 90th percentile of wage distribution corresponds to the high skilled workers, while the 10th to the least skilled ones. Later in Chapter 4 the study associates skills with observable characteristics of education and experience levels, and examines returns to skills with respect to gender and company ownership differentials.

The overall inequality in Russia has changed dramatically since 1985 as shown in Figure 3 below. The dynamics of wage returns in the 10th, 50th (the median) and 90th percentiles has very much in common between female and male workers. First of all, there is significantly higher dispersion in wages of the least skilled workers comparing to the median and high skilled ones. Many studies find the 10th percentiles to be more sensitive to macroeconomic changes (e.g. Bonnell, 1998; Brainerd, 1998).

Figure 3 Indexed Real Log Monthly Wages by Year for Female and Male workers, 1985-2004 (1985 as 100 percent)



Secondly, the gap between 90th and 10th percentiles is expanding for both genders from 1985 till 2000, where it reverses and compresses to about 9 and 7 percent difference for female and male workers correspondingly by 2004. The dynamics completely follows the general pattern of the economic, political and social development of Russia during this period. The flourishing entrepreneurship encouraged by "*perestroika*" in 1987-1988 created many new working places and as result initiated wage inequality expansion. The increasing number farming and manufacturing cooperatives offering higher wages stimulated further dispersion of wage distribution for both genders throughout late 1980s – early 1990s. The dramatic inequality changes took place in the following years: first in 1992, as a result of hyperinflation and imperfect wage indexation; [12] then in 1994, with the mass privatization and unemployment rise, which resulted in another jump in wage inequality and the beginning of negative dynamics in real wages for both genders. Further expansion followed in 1995, when unemployment reached its peak of 10 percent level (12 percent by some estimation) and was hand in hand with a banking crisis. The gap did not change in 1996, while the real wages somewhat improved. Finally, the triple crisis of 1998[13] forced real wages down but the inequality gap remained at approximately the same level of 15 percent difference for both women and men. Since 2000 the dynamics demonstrate compression in wage inequality and positive changes in real wages.

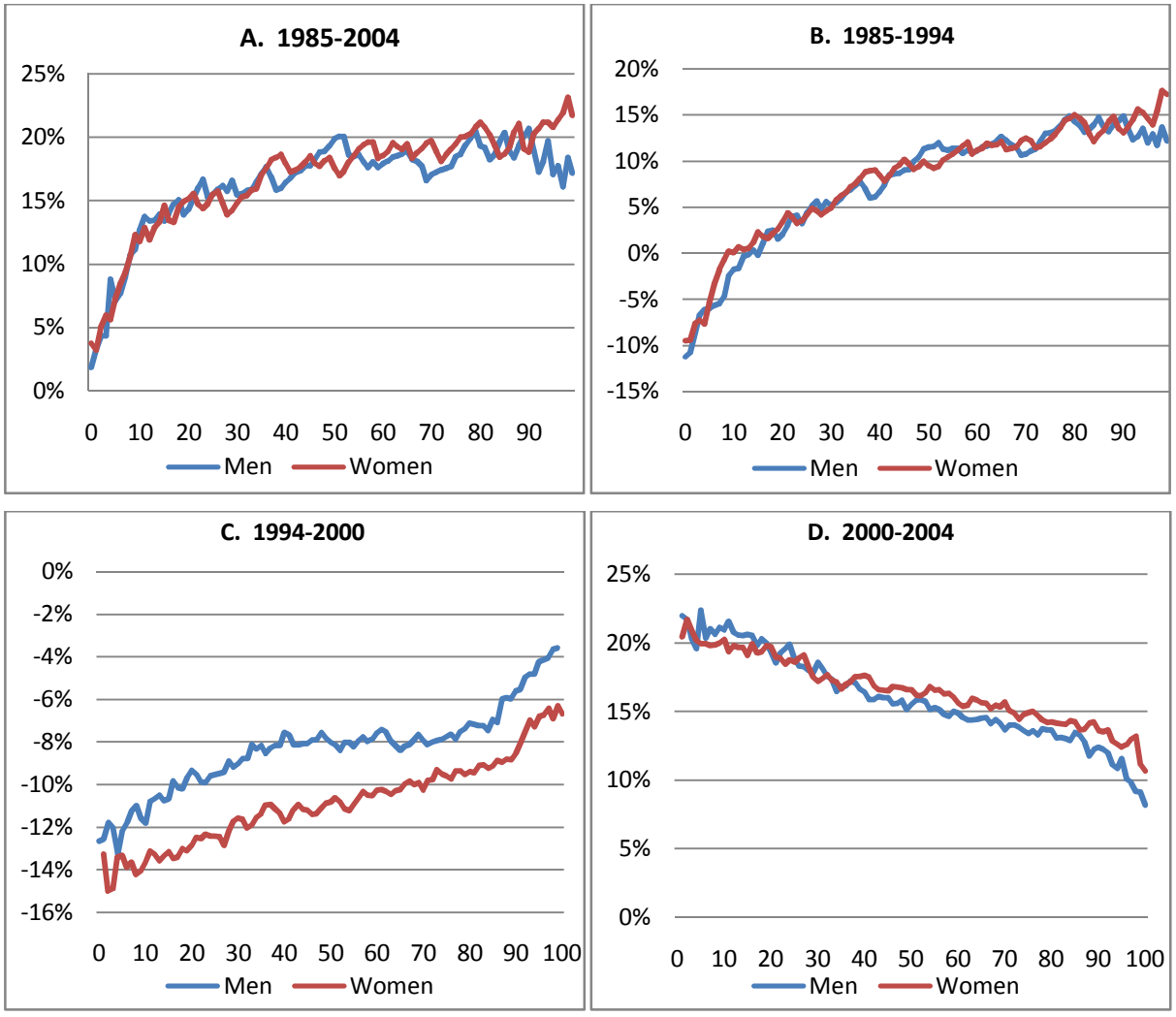
One can also identify two years when the dynamics for genders substantially differed. In 1991-1994 the negative dynamics of the 10th percentile of men was much sharper, which demonstrated relative gain of the low skilled female workers in real wages. This fact has also been discovered by Brainerd (2000b), who showed however that most of this relative gain had been upset by the later changes in the female wage structure. Another moment of relative gain

[12] As suggested by Brainerd (1998), it could have been that wages of skilled workers were adjusted more frequently comparing to unskilled workers.

[13] The crisis of 1998 is unique as Russia experienced currency, banking and fiscal crises simultaneously.

of least skilled female workers can be seen in 1996. It has also been documented by Kazakova (2005), and accounts for approximately 6 percent improvement in real wage for women and only 2 percent rise for men comparing to the level of the previous year. However the relative positive dynamics is completely offset by the crisis in 1998.

Figure 4 Log Real Wage Change by Percentile for Men and Women in 1985-2004 (in percent compared to the level of 1985)



A decomposition of the wage distribution into sub-periods can give a more vivid representation of the wage inequality dynamics. It seems reasonable to divide the period at the borders of the dramatic changes discussed above. In this respect the period from 1985 till 1994 corresponds to sharp expansion, the period from 1994 till 2000 – faces general poor economic conditions, but keeps inequality stable; finally the period from 2000 till 2004

demonstrates compression of inequality accompanied by general recovery and economic growth. The graphs shown in Figure 4 above illustrate the change in wage differentials by skill level (percentile) during the whole period and the chosen constituting parts.

Each of the panels suggests that for both men and women the changes of the wage distribution are pervasive across all percentiles. The overall change in wage distribution (panel A) shows very similar trends for both genders: growing inequality increase from the 10^{th} percentile to the median; however the upper half of the distribution demonstrates slow growth in returns to skills of women, while remaining stable for men. The sub-period differentials, which decomposed the general trend, presented very interesting results. During 1985-1994 nearly the whole distribution was facing rising returns to skills in real wages for both genders, higher skilled workers enjoyed better dynamics which resulted in expanding inequality with the 90/10 percentiles difference of about 11-13 percent. In the next period there is a dramatic fall in real wages for both genders, and wage inequality increases leaving male workers in relatively better conditions and resulting in 90/10 gap increase of another six percent. The closing period of 2000-2004 substantially compresses the 90/10 gap by around 10 percent, and both genders almost equally enjoy the real wage growth.

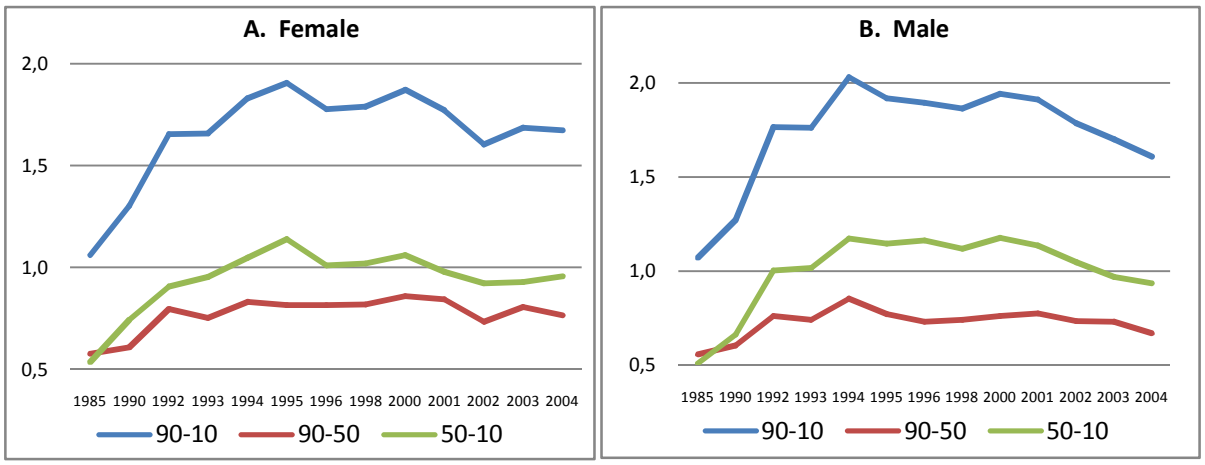
Table 2 Inequality Measures for Log Monthly Real Wages of Female and Male workers, 1985-2004

	1985	1990	1992	1993	1994	1995	1996	1998	2000	2001	2002	2003	2004
A. Female													
std. deviation	0.462	0.592	0.794	0.713	0.788	0.822	0.768	0.766	0.818	0.770	0.709	0.721	0.714
percentile differentials													
90-10	1.012	1.253	1.604	1.607	1.782	1.857	1.727	1.740	1.821	1.721	1.555	1.637	1.623
90-50	0.526	0.560	0.747	0.702	0.782	0.766	0.767	0.770	0.810	0.793	0.683	0.757	0.715
50-10	0.486	0.693	0.858	0.906	1.000	1.090	0.960	0.971	1.011	0.928	0.872	0.880	0.908
B. Male													
std. deviation	0.509	0.600	0.847	0.766	0.844	0.849	0.849	0.832	0.874	0.859	0.780	0.749	0.730
percentile differentials													
90-10	1.070	1.273	1.764	1.760	2.029	1.917	1.895	1.862	1.940	1.912	1.785	1.702	1.609
90-50	0.560	0.608	0.761	0.743	0.855	0.772	0.732	0.741	0.764	0.776	0.736	0.731	0.672
50-10	0.511	0.665	1.003	1.018	1.175	1.145	1.164	1.121	1.176	1.136	1.049	0.971	0.937

The inequality changes can be further quantified through several inequality measures as shown in Table 2. It can be seen that standard deviation of log monthly wages of women is crawling between 1985 and 1994 from 0.462 to 0.788, which result in a remarkable 70 percent increase. Men exhibit a 68 percent increase over the same period and a following 28 percent drop after 2000. The compression of wages of female workers account for about 23 percent fall within 2000-2004, showing that overall inequality rise was much higher for women during 1985-2004.

The relative differentials given in Table 2 and illustrated in Figure 5 below suggest that the lower half of the distribution (50-10 percentiles) is responsible for the largest part of inequality effects. The initial and the final values of the estimates are practically the same between the genders, however there are several differences in the dynamics between these values. It can be seen that in general the 50-10 and 90-10 percentile effects were higher for men, rather than women. The peak of inequality hits in 1994 for male workers and become a complementary result of both 90-50 and 50-10 movements, while female inequality reaches its highest point in 1995, being led by sharp inequality rise in 50-10 percentiles.

Figure 5 Percentile Differentials by Years, 1985-2004



It is hard to explain why inequality peaked in 1994-1995, but several scholars expressed an idea that privatization could be the cornerstone for this dramatic increase (e.g.

Brainerd, 2000a; Jovanovic B. and Lokshin M., 2004). It is reasonable therefore to look at the wage differentials between state and private enterprises. Unfortunately the RLMS did not collect information about ownership structure of the companies in 1990, while in 1985 there were no private companies in principle, thus the following part of the analysis focuses on the period from 1992 to 2004, where all the necessary information is available.

The changes during the mass privatization years (1992-1994) are the most diversified as can be seen from Figure 6 below. For both genders the deviations in real wages are negligible for the most percentiles in state sector, except for the least skilled workers (10^{th} percentile), who lost 3 to 5 percent; while the private sector demonstrates some growth in real wages. The female workers gain 3 to 6 percent for almost the whole distribution (between 10^{th} and 90^{th} percentiles).

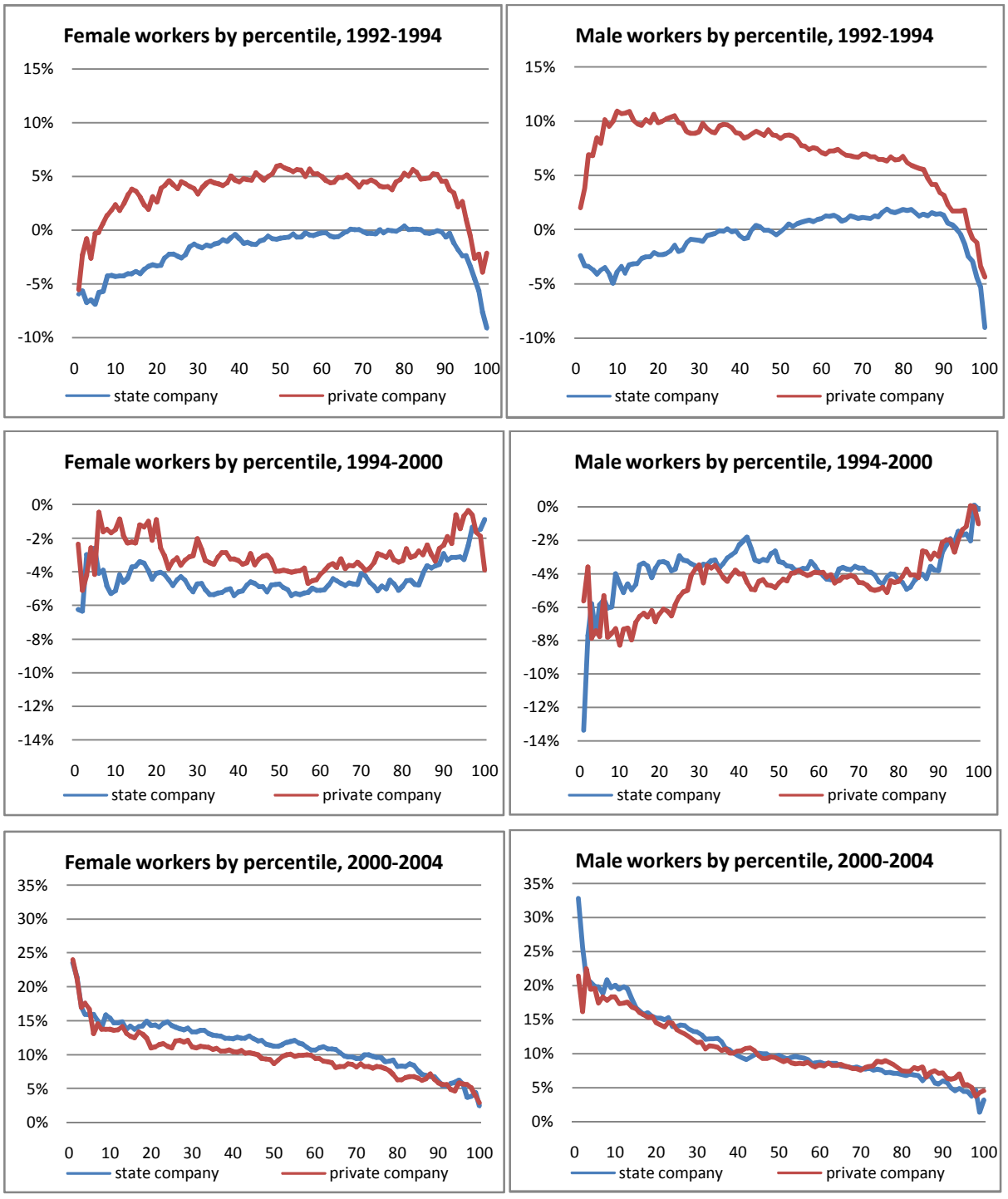
On the other hand, the lower skilled half of male workers (10^{th} to median) enjoys about 10 percent rise, while the higher skilled (median to 90^{th}) enjoy diminishing returns from 9 to 2 percent increase. In general this tendency is consistent with the findings of Brainerd (2000a) and can be explained by her theory of rent-sharing discussed in Chapter 1.

The following years (1994-2000) the trend of real wage dynamics reverses, but having a job in private companies still suggests 2-3 percent higher wages for women, and somewhat higher real wage for the lower half of men. The final period on the opposite favors state working women by some 2 percent rise in real wage, and does not discriminate between male workers in state and private sectors.

The wage inequality changes in their turn vary a lot between genders, sectors and sub-periods. Between 1992 and 1994 women working in both sectors are subject to an increasing gap, while men experience confronting effects: the wage inequality in state sector expands, while the private sector compresses. The next period male wage distribution somewhat equally expands in both sectors, while the parts of the women's wage distribution go in the

opposite directions in both sectors: the lower half (10th to median) compresses and the upper half expands. Nothing unexpected happened during 2000 and 2004: both genders in both sectors face compressing wage inequality.

Figure 6 Log Real Wage Change of Female and Male Workers in State and Private Companies by Percentile, 1992-2004



Among other possible causal effects for wage inequality variation as suggested by Mitra and Yemtsov (2006) could be the occupational movements of workers. If workers respond to higher wages and shift from one occupation to another, inequality would expand. Appendix 1, however, shows no evidence for such effect: there is practically no variation in occupations between years while the variation of mean wages is extremely dispersed. Workers do not show any willingness to follow high wages and leave occupations with negative wage trends. This means that either occupation shifts are uncorrelated with wages which is rather unlikely from the theoretical point of view, or there is a sample selection bias and the RLMS agents were not interviewing people randomly.

To summarize, the overall wage inequality followed major economic, political and social events: it was expanding between 1985 and 2000 when Russia was moving through a period of destabilization, reforms and privatization, and was compressing in the following years. The mechanism of these changes remains unclear as general returns to skills cannot explain many effects, including gender differentials, which differ between various indicators, and private/state wage differentials, which are vital to be clarified in terms of why workers choose to seek employment in one sector rather than another. In the next chapter these questions are addressed according to the human capital theory, assessing the overall changes with structural movements between and within education and experience groups.

4. DECOMPOSING WAGE INEQUALITY

Decomposition of wage inequality is an essential tool as it enables to look inside wage inequality and see the contribution of particular characteristics to the overall trend. Traditionally human capital is considered to have the leading role and therefore it is discussed on the first place in Section 4.1. Fields decomposition following after in Section 4.2 assesses the influence of all possible factors and suggests the most relevant ones for Russia in the examined period.

4.1 Returns to Human Capital

Human capital theory defines returns to skills as narrow categories according to the educational and experience levels of the workers. This chapter analyzes human capital differentials and their contribution to wage inequality represented by sixteen education-experience cells.[14]

As shown in a number of empirical studies, increasing returns to education and experience can be the driving force for rising inequality, while decreasing returns to skills correspondingly could be forcing compression. Based on the results of the previous Chapter, one should expect different returns to skills for men and women placed in the state and private sectors and therefore consider their estimates separately. In order to obtain these values of returns to skills one can run the following OLS regression:

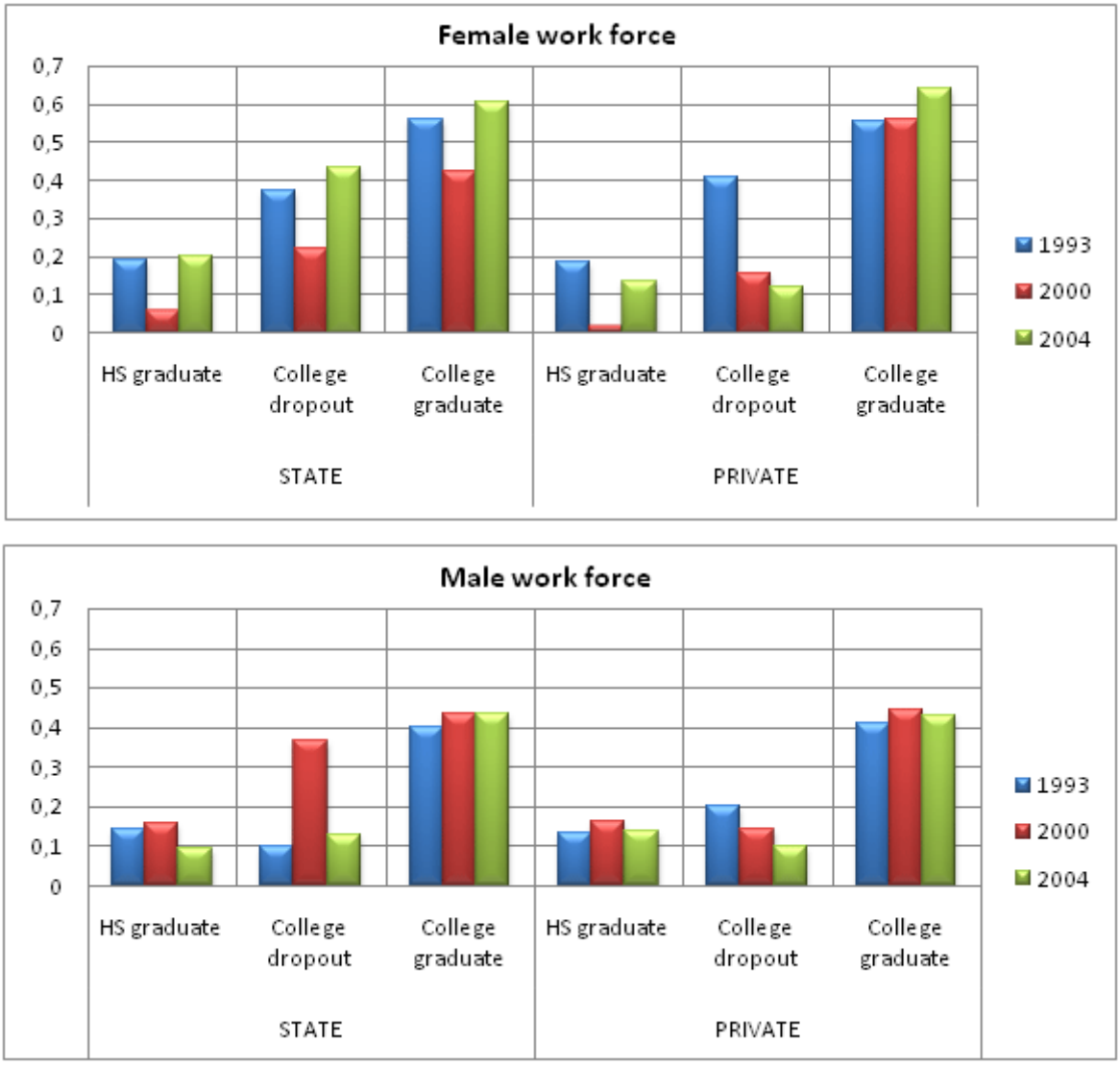
$$(1) \qquad Ln\, w_{it} = \alpha_t + \sum_{e=2}^{4} \beta_{et} Educ_{iet} + \sum_{x=2}^{4} \gamma_{xt} Exper_{ixt} + \sum_{r=2}^{8} \delta_{rt} Region_{irt} + u_{it},$$

where $Ln\, w_{it}$ is log monthly wage of an individual ***i*** in year ***t***; $Educ_{iet}$ - a set of dummies for education groups; $Exper_{ixt}$ - dummies for experience groups; $Region_{irt}$ - dummies for geographical regions; finally, u_{it} is the error term. As a reference group this model uses 'High

[14] The cells are formed as the combination of four education types multiplied by four experience groups.

School Dropouts', who have '31+' years of experience and live either in Moscow or in St. Petersburg. The results of the estimations are given in Figures Figure 7 and Figure 8 below.[15]

Figure 7 Returns to Education of Female and Male Working Population in State and Private Sectors, 1993-2004



The estimates of returns to education are insignificant for 90 percent confidence interval for the category of 'College dropouts' for both genders in both sectors, and therefore should not be treated as reliable. The rest part of the histograms given in Figure 7 show several interesting points: in general women have higher returns to education than men, and also the

[15] Unfortunately either education or experience information was not recorded for years prior 1993, this is why starting from this Chapter the study concentrates on the period from 1993 to 2004, dividing it into expansion sub period of 1993-2000 and compression period 2000-2004.

private sector provides higher returns for both genders. One can also observe that higher returns are associated with higher skills, which generally goes along with the human capital theory.

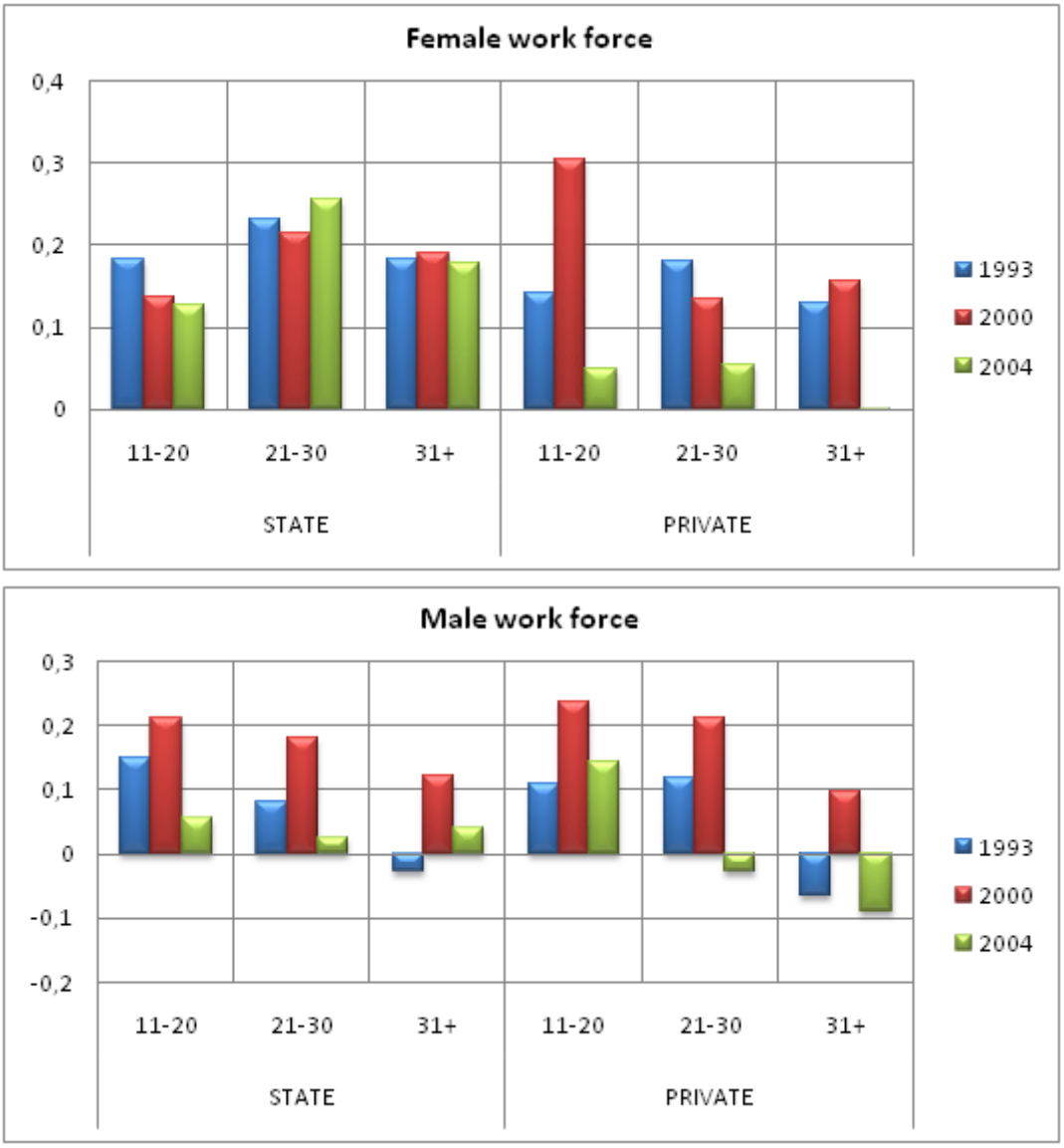
At the same time, there are several substantial differences both between genders and across sectors: with the exception of 'College graduates' in private sector each of the educations groups in both sectors of women follows the opposite direction comparing to the inequality trend: sharp drop in returns during the years of 1993-2000, when inequality gap increases; and the rise in the returns accompanies by general economic growth between 2000 and 2004, when the wage inequality was falling. The 'College graduates' in their turn followed the same pattern shown by the male work force – relatively small changes in returns to schooling over time. Surprisingly, in general the measures either move in the opposite from expected direction, or do not explain the wage inequality variations at all.

The estimates of returns to experience shown in Figure 8 below are insignificant for women in the private sector and for the category of '31+' years of experience in both male sectors. In contrast with the previous figure, it is now the returns to experience of men which seem to follow the inequality trend: from 1993 to 2000 the returns are increasing together with the rising inequality, and afterwards they fall together with the general gap convergence. Unlike men, returns to experience of women remain rather stable in state sector, while private sector estimates are unreliable and difficult to interpret.

The histograms also reveal some other interesting facts. Firstly, it can be seen that women have higher returns to skills than men. Secondly younger male workers have higher returns to experience than the most experienced cohort. This effect of shifting demand against older cohorts has also been noticed by Brainerd (1998) who explained it as the ability of younger workers for better adaptation to new working conditions and economic environment, compared to older workers expressing hard problems with learning new skills. Another reason for the effect could be seen in the falling life expectancy of the workers: by 1994 male life

expectancy fell to 57.7 years (which is below retirement age of 60), while female dropped to 71.3 (Brainerd, 1998:1108). Thus, older male cohorts had shorter time horizons and therefore would express lower incentives to acquire new skills.

Figure 8 Returns to Experience of Female and Male Working Population in State and Private Sectors, 1993-2004



To summarize, it seems that returns to education play a more important role in explaining wage inequality of women, while returns to experience is a more powerful indicator for men. It is difficult to assess although to what extent the variation of all the effects discussed above contributes to the overall wage dispersion. This question however can

be answered following the methodology developed by Gary S. Fields (2002), which makes it possible estimate directly how each of the components attributes to the wage inequality variation.

4.2 Fields Decomposition

The function of wages defined in Model 1 can be further expanded to include other variables which may have casual effects on the wage inequality: as personal, demographic, firm specific characteristics. Under the six axioms enumerated in Appendix 2 the decomposition of wage inequality can be given by

$$S_j(\ln w) = \frac{\mathrm{cov}(a_j Z_j, \ln w)}{\sigma^2(\ln w)} = \frac{a_j \cdot \sigma(Z_j) \cdot corr(Z_j, \ln w)}{\sigma(\ln w)},$$

where S_j is the proportion of inequality change which is explained by ***j***-th explanatory variable.

Table 3 Fields Decomposition Results, %

		1993	2000	2004
	Gender	4.78	5.64	5.69
	Region	0.54	1.54	2.01
Demographics		***5.32***	***7.18***	***7.70***
	Education	3.96	4.05	3.17
	Experience	-0.34	-0.37	-0.18
	Experience^2	1.08	1.23	0.65
Human Capital		***4.70***	***4.91***	***3.64***
	Ownership type	2.36	3.24	2.66
	Stake in company	0.23	0.10	0.25
	Occupation	n.a.	4.88	4.27
	Log Firm Size	0.00	0.10	0.23
Firm Characteristics		***2.59***	***8.32***	***7.41***
Residuals		***87.13***	***79.58***	***81.58***

Note: There is no comparable occupational information for 1993, therefore the estimate is not reported.

Results of the estimation given in Table 3 surprisingly shows that inequality changes are better explained by demographic and firm characteristics, rather than human capital variables. The largest contribution to wage inequality among observed characteristics attributes to gender, occupation and education variables which account on average for 5.4, 4.6

and 3.7 percent correspondingly. One can also observe rising estimates of gender and region variables, which suggests that male/female and regional differentials become more important in determining the wage gap with years.

At the same time the largest part (around 80.5 percent on average when accounting for the occupations) of wage inequality remains unexplained, which suggests that unobserved characteristics (Residuals) play a more important role in the wage dispersion. Therefore it could be expected that the role of unobserved characteristics could be even more important in explaining wage dispersion. In this regard the next chapter applies the method of residual variance decomposition developed by Lemieux (2002), which makes it possible to examine the contribution of returns to unobserved characteristics to the residual wage inequality.

5. LEMIEUX VARIANCE DECOMPOSITION

5.1 Methodology

It is usually difficult to interpret what is standing behind the changing residual inequality. On the one side, it could result from simple measurement errors, on the other, as Juhn, Murphy and Pierce (1993) believe, it could be that workers have different levels of unobservable skills which are resulting from school quality, interpersonal abilities, effort, etc. Therefore, if the "prices" for such skills are increasing, as Juhn, Murphy and Pierce (1993) shows for the US during 1980s, some growth in residual wage inequality would inevitably follow. Following discussion in Lemieux (2006) there could be some other possible connections: the dispersion of skills that cannot be observed or measured can be growing with time and result in a composition effect linked to aging and educational improvements of the labor force; otherwise the measurement error itself may be growing from year to year.

Following Lemieux (2004) one can look at a standard Mincer's wage equation[16] and consider the residuals as the product of some unobserved skills $\boldsymbol{e_{it}}$ with the return to unobserved skills $\boldsymbol{p_t}$:

$$u_{it} = e_{it} p_t + v_{it}.$$

Correspondingly the residual variance can be written as:

$$Var(u_{it}) = p_t^2 Var(e_{it}) + Var(v_{it}). \quad (2)$$

Leaving aside the measurement error, equation (2) shows that both the "prices" and the variance of unobserved skills effect the residual variance. Then if one considers a case when the observed skills $\boldsymbol{Z_{it}}$ are divided into finite number of cells – $\boldsymbol{j}$, the unconditional variance of unobserved skills $Var(e_{it})$ can be linked to conditional σ_{jt}^2 by the following formula:

[16] Following Lemieux (2006) the study uses schooling years, years of experience and years of experience squared as the explanatory variables for the regressions in this chapter.

$$Var(e_{it}) = \sum_j \theta_{jt} \sigma_{jt}^2,$$

where θ_{jt} is the share of work force in a particular education-experience cell ***j*** at time ***t***. When wages are homoskedastic (σ_{jt}^2 is constant for all ***j***) changes in shares θ_{jt} will change the unconditional variance even if σ_{jt}^2 are constant over time. However Lemieux (2006) finds several cases of empirical evidence for heteroskedasticity in wages, when σ_{jt}^2 increases as the function of education and experience – in other words composition effect takes place.

If one assumes for a while that unconditional variation is constant over time:

$$\sigma_{jt}^2 = \sigma_j^2,$$

then in the absence of measurement error, the residual variance of wages $Var(u_{it})$ can be expressed as following:

$$Var(u_{it}) = p_t^2 \sum_j \theta_{jt} \sigma_j^2 .$$

According to this equation increasing residual variance can be a direct result of growing "prices" if the skill composition of workers θ_{jt} is kept constant. This conclusion became the breakthrough point for Lemieux (2002) to find a straightforward solution for holding the composition effects constant over time. If one rewrites the residual variance as a function of the variances of wages:

$$Var(u_{it}) = \sum_j \theta_{jt} V_{jt},$$

where V_{jt} - variance of wages within a skill group j, such that $V_{jt} = p_t^2 \sigma_j^2$; there could be found such θ_{jt}^* that would hold the composition effects and give the counterfactual residual variance:

$$V_t^* = \sum_j \theta_j^* V_{jt} .$$

Therefore, the overall residual variance for a base period ***s*** and end period ***t*** can be decomposed:

$$V_t - V_s = \sum_j (\theta_{jt} V_{jt} - \theta_{js} V_{js}) = \sum_j \theta_{js} (V_{jt} - V_{js}) + \sum_j (\theta_{jt} - \theta_{js}) V_{jt},$$

where the first term, $\sum_j \theta_{js} (V_{jt} - V_{js})$, is the weighted average of the within-group variance changes; and the second, $\sum_j (\theta_{jt} - \theta_{js}) V_{jt}$, is the composition effect, which results in a spurious growth when changes in the weights are positively correlated with the within-group variances.

Following Lemieux (2002) by reweighting the residuals with estimates from a logit regression the distribution of skills could be kept constant over time. The logit regression is constructed as following: the dependent variable is a dummy variable for the end year, while the explanatory variables come from the usual wage regression. The predicted values of this regression correspond to the probabilities of a worker having certain skills to be in the end year, and could be used as following to construct the new weights for observations:

$$w_{it}^* = (\frac{1 - p_i}{p_i}) w_{it,}$$

where $\boldsymbol{p_i}$ – is the estimated probability. The counterfactual variance therefore can be obtained by multiplying the weights, w_{it}^*, with the squared residuals, r_{it}^2:

$$V_t^* = \sum_i w_{it}^* r_{it}^2.$$

Having the counterfactual variances one can estimate free from the composition effects results.

5.2 Findings

Based on the findings in the previous chapters, the decompositions were estimated separately for men and women in two consecutive periods, corresponding to the overall

inequality diverging and converging behavior. The within-group variances and between group movements of the labor force for the 16 defined cells are presented in Tables 4 and 5 below.[17]

Panel A.1 in Table 4 shows that during 1993-2000 within-groups changes of female work-force were not uniformly large and positive. Six out of the sixteen changes appear to be greater than the average residual variance which is equal to 0.144. All of these changes are also significant at 5 percent level and demonstrate a certain pattern: the magnitude of change is increasing as a function of education, which is the opposite comparing to trend of changing returns to education suggesting converging variance during the years of expansion as discusses in Chapter 4. Hence education on the whole is likely to be the most important characteristic in defining female wages, and at the same time unobserved skills dominate over observed ones.

In 1993 variance increases as a function of experience for college graduates and dropouts, but shows to be a decreasing function of experience for high school graduates and dropouts, which in 2000 holds only for college dropouts. The shares exhibit positive changes of around 2-3 percent in cases of significant positive changes of variances, while at the same time the proportion of female workers decreased as a whole in the group of high school dropouts and grew for college graduates.

The situation with male work force shown in panel A.2 follows a pattern of decreasing variation as a function of experience with an exception of high school dropouts. This tendency is also consistent with the observable returns to human capital for men. On the whole the within-groups changes are also dispersed and have cases of both positive and negative magnitude changes. There are only two cells where the residual change was significant and greater than the average residual variation: 21-30 experienced high school

[17] Estimates indicated by '*' are significantly different from zero at 95 percent confidence interval (based on the standard errors reported in parentheses), within-group variance changes highlighted in bold are larger (or smaller correspondingly) than the average change calculated using actual shares (shown in panel B).

Table 4 Residual Variance Decomposition Results, 1993-2000

A.1 Within-group variance of wages by Experience-education cell for women, 1993 and 2000

	Within-group variance			Work-force share		
Experience	1993	2000	Change	1993	2000	Change
	HS dropouts					
1-10	0.663	0.803	**0.140***	0.036	0.036	0.000
	(0.052)	(0.14)				
11-20	0.471	0.561	0.090*	0.065	0.053	-0.012
	(0.046)	(0.11)				
21-30	0.566	0.581	0.016	0.111	0.074	-0.037
	(0.041)	(0.099)				
31+	0.477	0.614	0.136	0.128	0.076	-0.051
	(0.036)	(0.099)				
	HS graduates					
1-10	0.446	0.590	**0.144***	0.063	0.083	0.020
	(0.035)	(0.069)				
11-20	0.475	0.557	0.083	0.184	0.112	-0.073
	(0.024)	(0.066)				
21-30	0.451	0.616	**0.165***	0.203	0.234	0.032
	(0.023)	(0.05)				
31+	0.392	0.590	**0.198***	0.072	0.088	0.017
	(0.035)	(0.077)				
	College dropouts					
1-10	0.519	0.720	0.201	0.004	0.024	0.020
	(0.141)	(0.122)				
11-20	0.419	0.773	0.353	0.005	0.015	0.011
	(0.125)	(0.192)				
21-30	0.564	0.418	-0.146	0.004	0.013	0.009
	(0.153)	(0.152)				
31+	0.593	0.485	-0.108	0.001	0.002	0.001
	(0.344)	(0.402)				
	College graduates					
1-10	0.389	0.657	**0.268***	0.018	0.039	0.021
	(0.048)	(0.082)				
11-20	0.460	0.704	**0.244***	0.046	0.071	0.025
	(0.036)	(0.071)				
21-30	0.448	0.556	0.108	0.040	0.065	0.024
	(0.039)	(0.069)				
31+	0.514	0.612	0.098	0.020	0.015	-0.005
	(0.061)	(0.145)				

B.1 Weighted average (using alternative shares)

	1993	2000	Change
Actual shares	0.468	0.612	0.144
1993 shares	0.468	0.603	0.135
2000 shares	0.460	0.612	0.152

A.2 Within-group variance of wages by Experience-education cell for men, 1993 and 2000

	Within-group variance			Work-force share		
Experience	1993	2000	Change	1993	2000	Change
	HS dropouts					
1-10	0.513	0.645	**0.132**	0.062	0.065	0.004
	(0.044)	(0.105)				
11-20	0.636	0.477	-0.160	0.093	0.085	-0.007
	(0.047)	(0.094)				
21-30	0.622	0.503	-0.119	0.164	0.076	-0.088
	(0.039)	(0.114)				
31+	0.567	0.972	**0.405***	0.174	0.093	-0.081
	(0.038)	(0.145)				
	HS graduates					
1-10	0.569	0.654	0.085	0.052	0.081	0.028
	(0.043)	(0.081)				
11-20	0.511	0.579	0.068	0.148	0.120	-0.028
	(0.028)	(0.075)				
21-30	0.564	0.967	**0.403***	0.143	0.166	0.023
	(0.032)	(0.088)				
31+	0.478	0.632	**0.154**	0.050	0.100	0.050
	(0.05)	(0.092)				
	College dropouts					
1-10	0.721	0.952	**0.231**	0.002	0.023	0.021
	(0.195)	(0.156)				
11-20	0.654	0.605	-0.049	0.005	0.012	0.008
	(0.159)	(0.142)				
21-30	0.263	0.477	**0.214**	0.004	0.010	0.006
	(0.112)	(0.218)				
31+	0.241	0.144	-0.097	0.004	0.004	0.000
	(0.127)	(0.19)				
	College graduates					
1-10	0.629	0.699	0.069	0.012	0.031	0.019
	(0.07)	(0.095)				
11-20	0.609	0.614	0.005	0.034	0.058	0.024
	(0.047)	(0.081)				
21-30	0.438	0.515	0.077	0.026	0.055	0.030
	(0.049)	(0.082)				
31+	0.394	0.563	**0.168**	0.028	0.021	-0.007
	(0.045)	(0.139)				

B.2 Weighted average (using alternative shares)

	1993	2000	Change
Actual shares	0.558	0.685	0.127
1993 shares	0.558	0.689	0.131
2000 shares	0.551	0.685	0.134

Table 5 Residual Variance Decomposition Results, 2000-2004

A.1 Within-group variance of wages by Experience-education cell for women, 2000 and 2004

	Within-group variance			Work-force share		
Experience	2000	2004	Change	2000	2004	Change
	HS dropouts					
1-10	0.803 (0.14)	0.541 (0.102)	**-0.261***	0.033	0.036	0.003
11-20	0.561 (0.11)	0.262 (0.057)	**-0.299***	0.044	0.067	0.023
21-30	0.581 (0.099)	0.441 (0.089)	-0.140	0.053	0.044	-0.009
31+	0.614 (0.099)	0.405 (0.071)	**-0.209***	0.044	0.050	0.006
	HS graduates					
1-10	0.590 (0.069)	0.487 (0.072)	-0.102	0.093	0.059	-0.034
11-20	0.557 (0.066)	0.479 (0.058)	-0.078	0.114	0.110	-0.004
21-30	0.616 (0.05)	0.458 (0.044)	-0.158*	0.211	0.176	-0.035
31+	0.590 (0.077)	0.392 (0.054)	**-0.198***	0.068	0.081	0.013
	College dropouts					
1-10	0.720 (0.122)	0.488 (0.083)	**-0.232**	0.031	0.040	0.008
11-20	0.773 (0.192)	0.586 (0.18)	**-0.186**	0.018	0.013	-0.005
21-30	0.418 (0.152)	0.662 (0.166)	0.244	0.014	0.017	0.002
31+	0.485 (0.402)	0.461 (0.277)	-0.023	0.002	0.004	0.002
	College graduates					
1-10	0.657 (0.082)	0.500 (0.055)	-0.157	0.063	0.089	0.026
11-20	0.704 (0.071)	0.551 (0.064)	-0.153*	0.107	0.092	-0.015
21-30	0.556 (0.069)	0.434 (0.052)	-0.122	0.087	0.106	0.019
31+	0.612 (0.145)	0.256 (0.081)	**-0.356***	0.018	0.017	-0.001

B.1 Weighted average (using alternative shares)

	2000	2004	Change
Actual shares	0.616	0.456	-0.161
2000 shares	0.616	0.463	-0.154
2004 shares	0.615	0.456	-0.159

A.2 Within-group variance of wages by Experience-education cell for men, 2000 and 2004

	Within-group variance			Work-force share		
Experience	2000	2004	Change	2000	2004	Change
	HS dropouts					
1-10	0.645 (0.105)	0.644 (0.088)	0.000	0.053	0.067	0.014
11-20	0.477 (0.094)	0.538 (0.075)	0.062	0.060	0.094	0.035
21-30	0.503 (0.114)	0.513 (0.097)	0.010	0.045	0.058	0.013
31+	0.972 (0.145)	0.595 (0.114)	**-0.377***	0.047	0.042	-0.005
	HS graduates					
1-10	0.654 (0.081)	0.471 (0.074)	**-0.183***	0.092	0.069	-0.022
11-20	0.579 (0.075)	0.617 (0.078)	0.038	0.117	0.103	-0.014
21-30	0.967 (0.088)	0.560 (0.071)	**-0.407***	0.146	0.118	-0.029
31+	0.632 (0.092)	0.426 (0.074)	**-0.206***	0.078	0.072	-0.006
	College dropouts					
1-10	0.952 (0.156)	0.433 (0.088)	**-0.519***	0.034	0.043	0.009
11-20	0.305 (0.142)	0.373 (0.144)	0.068	0.017	0.018	0.001
21-30	0.477 (0.218)	1.161 (0.381)	0.685	0.012	0.009	-0.003
31+	0.144 (0.19)	0.500 (0.25)	0.356	0.004	0.008	0.004
	College graduates					
1-10	0.699 (0.095)	0.368 (0.058)	**-0.331***	0.067	0.089	0.022
11-20	0.614 (0.081)	0.379 (0.068)	**-0.235***	0.107	0.084	-0.023
21-30	0.515 (0.082)	0.416 (0.072)	-0.100	0.091	0.085	-0.005
31+	0.563 (0.139)	0.615 (0.12)	0.052	0.031	0.041	0.010

B.2 Weighted average (using alternative shares)

	2000	2004	Change
Actual shares	0.670	0.506	-0.164
2000 shares	0.670	0.506	-0.163
2004 shares	0.655	0.506	-0.149

graduates and most experienced high school dropouts. The share changes for man are likely to follow the basic trend of women: there is a significant decrease in the proportion of high school dropouts accompanied by a rising share of college graduates.

The correlation coefficients between the within-group variance change and the share change is 0.25 for women and -0.37 for men, which would suggests minor relevance of the composition effects for the labor force. The exact magnitudes of the composition effects can be seen from panels B.1 and B.2. When the shares are held at the level of 1993, the size of the composition effect for women reaches 0.009 (calculated as difference: 0.144-0.135), while the corresponding effect for men is negative and even smaller in value – it is equal to -0.004. The effects become somewhat different if the shares of 2000 are used: 0.008 and 0.007 correspondingly for women and men.

Table 5, reproducing the results for the period from 2000 to 2004, demonstrates quite different tendencies. One can see general contraction in variances in 2004 for both genders, which results in negative changes in residual variance. The average residual variance for women reaches the amount of -0.161, while male average is -0.164. There are seven cells in women variation changes where the effect is larger than the average change, only five of them are significant and does not seem to correspond to a certain pattern. The changes in male residual variances are significant and larger than the average in seven cases, but do not show any systematic pattern as well.

The changes in shares do not exceed 3.5 percent for both genders. The character of the share changes is similar: there are about 6-7 percent drops in the proportion of high school graduates and some smaller increases in the proportions of high school dropouts.

The correlations between the within-group variance change and the share change in this period are -0.15 for women and 0.18 for men, which shows decreasing relevance of composition effects over time. In absolute values holding the shares equal to 2000 these

effects reach -0.007 for women and -0.001 for men; while the share of 2004 transform them to -0.002 and -0.015 correspondingly.

To summarize, Lemieux variance decomposition for 1993-2000 showed evidence for the certain systematic trends connected to the returns to observable skills. During the overall inequality expansion women demonstrated rising returns to unobserved skills, while men enjoyed higher returns to experience, but surprisingly the function of residual variance was decreasing with experience, suggesting that younger cohorts of male workers were in higher demand. This correspondence, however, did not follow in the period of inequality contraction, when general decrease in residual variation did not show any particular patterns. The role of composition effects showed to be low for both genders over the whole period of analysis, suggesting that residual variance changes were almost not affected by any spurious effects.

CONCLUSION

This paper has examined how wage inequality changed in Russia over the last decades and looks for the possible reason explaining the changes. The analysis showed that wage inequality expanded between 1985 and 2000, so that each percentile of the distribution of wages was effected until the gap reached its peak in 1994 for men and 1995 for women accounting for a 11-13 percent rise in the 90/10 percentiles' gap in comparison to the 1985 level. After the peak the temp slowed down and increased the gap by another six percent, while the workers of both genders lost significant amounts in real wages. After 2000 each percentile was following the trend of inequality compression, which by 2004 was equal to seven and nine percent gaps between the 90^{th} and 10^{th} percentiles for man and women correspondingly.

Lukyanova (2003) has shown that despite the macroeconomic instability, the general trends in inequality changes were permanent and only slightly affected by temporary disturbances. Her findings allowed this study to consider the underlying reasons for wage inequality as persistent and therefore important for policy implications.

Keeping in mind possible gender discrimination the study separately examined the samples of men and women. In addition to that, the observations were differentiated between state and private companies which made it possible to observe that during the transition private companies provided better returns to skills, which created labor force movements and therefore generated wage inequality growth. Contrary to the initial expectations, no occupational movements were found, which may be erroneous due to the data limitations of the RLMS. It is also likely that the overall level of inequality is underestimated in this paper because of under-sampling of the higher skilled workers in the data source.

Human capital analysis demonstrated consistently higher benefits in the private sector and showed higher returns to education for women, which surprisingly changed against the inequality trend: so that the returns decreased in the years of inequality expansion and increasing in later times. Returns to education for men did not show relevant variation in time, while returns to experience in contrast followed the diverging and converging behavior of the inequality gap. In addition to that, younger workers were more valuable at the market, suggesting that inequality gap is an invert function of experience for men.

The decomposition methods applied in this paper have shown excessive importance of unobserved characteristics and gave the opportunity for this study to make a significant contribution to inequality research in Russia. The paper found two remarkable mechanisms assisting wage inequality changes. Wage inequality of women was shown to be an inverse function of returns to education. However, the role of observed skills was dominated by unobserved characteristics which prices were increasing in the times of inequality expansion and decreasing during gap compression. In its turn wage inequality of men was found to be consistently dominated by the changing prices for both observed and unobserved skills. In this case wage inequality was shown to be an inverse function of experience, which therefore can be considered the main driving force of wage inequality of men.

At the same time the preciseness of the results demonstrated in this paper can be somewhat improved with a better represented data sources. As this study has shown certain education groups (as ‘college dropouts’ and sometimes ‘high school dropouts’) are subject to insignificant estimation results.

The findings of this paper present an important criterion for studies considering gender differentials in Russia, and hence should account for the different nature of gender effects in respect to returns to skills. The results of the estimations could also be of significant interest for policymaking decisions addressing social inequality.

APPENDICES

Appendix 1 Changes in Real Wages and Employment Shares of Female and Male Workforce in State and Private Sectors by Occupation, 1994-2004 (prices of 1985 taken as 100 percent)

A. Female

Occupation	STATE				PRIVATE			
	Wage change		Share change		Wage change		Share change	
	1994-2000	2000-2004	1994-2000	2000-2004	1994-2000	2000-2004	1994-2000	2000-2004
Legislators, Senior Managers, Officials	-34.2%	151.0%	3.85%	-1.80%	-56.2%	129.6%	3.54%	1.26%
Professionals	-25.6%	66.6%	-0.22%	6.10%	3.1%	60.2%	-6.49%	10.95%
Technicians and Associate Professionals	-8.5%	47.6%	-0.12%	2.66%	-12.8%	36.1%	-4.66%	20.42%
Clerks	-19.7%	80.1%	-2.58%	1.12%	-0.1%	97.0%	1.30%	10.74%
Service Workers and Market Workers	-39.5%	50.5%	1.33%	-0.69%	-27.8%	53.6%	0.71%	18.53%
Skilled Agricultural and Fishery Workers	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Craft and Related Trades	-14.6%	21.7%	-2.03%	0.34%	5.8%	36.0%	-2.74%	6.11%
Plant and Machine Operators and Assemblers	-12.8%	43.1%	1.98%	-1.12%	-23.8%	60.6%	3.28%	7.37%
Elementary (Unskilled) Occupations	-28.8%	64.9%	-2.04%	0.43%	-19.9%	51.0%	4.84%	8.63%

B. Male

Occupation	STATE				PRIVATE			
	Wage change		Share change		Wage change		Share change	
	1994-2000	2000-2004	1994-2000	2000-2004	1994-2000	2000-2004	1994-2000	2000-2004
Legislators, Senior Managers, Officials	-10.6%	103.8%	1.70%	-1.21%	-19.8%	64.9%	6.91%	4.69%
Professionals	-15.7%	69.1%	-7.21%	1.30%	-18.0%	87.8%	-7.41%	8.15%
Technicians and Associate Professionals	-19.0%	75.6%	0.00%	2.11%	-24.3%	99.9%	7.16%	14.07%
Clerks	-57.9%	143.6%	-0.16%	0.24%	-33.9%	174.9%	0.99%	2.72%
Service Workers and Market Workers	-36.7%	69.1%	0.00%	1.21%	-30.6%	155.5%	-1.23%	2.72%
Skilled Agricultural and Fishery Workers	-51.0%	50.1%	0.16%	-0.08%	93.9%	-62.7%	-0.25%	-0.49%
Craft and Related Trades	-24.4%	66.2%	-12.55%	-0.40%	-27.6%	71.2%	13.33%	29.14%
Plant and Machine Operators and Assemblers	-5.9%	36.3%	-9.55%	1.62%	-4.6%	41.4%	21.98%	29.63%
Elementary (Unskilled) Occupations	-6.0%	84.1%	-0.49%	-0.16%	-33.2%	102.5%	5.68%	21.98%

Appendix 2 Conditions of the Fields' Decomposition

Condition 1: (Number of Components) The inequality measure *I(Y)* is to be divided into *K* components, one for each income factor, denoted $S_k\,(Y^1, \ldots, Y^K; K)$.

Condition 2: (a) (Continuity) Each S_k is continuous in Y^k.

(b) (Symmetric Treatment of Factors) If $\pi 1, \ldots, \pi k$ is any permutation of 1, ..., K, $S_k\,(Y^1, \ldots, Y^K; K) = S_{\pi k}\,(Y^{\pi 1}, \ldots, Y^{\pi k}; K)$.

Condition 3: (Independence of the Level of Disaggregation) The amount of inequality accounted for by any one factor S_k does not depend on how the other factors are grouped.

Condition 4: (Consistent Decomposition) The contributions S_k sum to the overall amount of inequality, $\sum_k S_k(Y^1,\ldots,Y^k,K) = I(Y)$.

Condition 5: (a) (Population Symmetry) If P is any (n x n) permutation matrix,

$S(Y^k P, Y P) = S(Y^k, Y)$;

(b) (Normalization for Equal Factor Distribution) If all income recipients have the same value for the k'th factor, then the share of inequality accounted for by that factor $S(\mu_k e, Y) = 0$ for all μ_k.

Condition 6: (Two Factor Symmetry) Suppose the distribution of factor 2 incomes Y^2 is simply a permutation of that for factor 1, Y^1. Then if those were the only two sources of income, Y^1 and Y^2 should receive the same value in the decomposition. Thus, for all permutation matrices P,

$$S(Y^1, Y^1 + Y^1P) = S(Y^1P, Y^1 + Y^1P).$$

These six conditions generate the factor inequality weights s_k given in the text by

$$s_k = \frac{\mathrm{cov}(Y^k, Y)}{\sigma^2(Y)}, \text{ such that } \sum_k S_k = 1.$$

Source: Fields, 2002, p.41-42.

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