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Abstract

The paper investigates adjustment costs of trade liberalization in Russia by estimating the influence of tariff policy in the 90-ies on the level and volatility of employment and wages. In particular, we study the labor demand and labor supply channels and address the following issues. *First*, how does labor demand by firms respond to trade shocks? *Second*, what is the effect of trade developments on wage dispersion across sectors? *Third,* what is the effect of trade changes on the wage gap between skilled and unskilled workers?

We use balance sheets of Russian large and medium enterprises for 1995-2001 to estimate labor demand equations and to calculate possible changes in employment due to various shocks in output and tariffs. Our sample comprises of more than 53 thousand enterprises and is nationally and industry-level representative. The analysis of the labor supply channel is based on Russian Longitudinal Monitoring Survey (RLMS), years 1995-2002, matched with sectoral indicators of trade liberalization. RLMS is a nationally representative panel survey of households' members on a large number of issues.

We find low magnitudes of responsiveness of the labor demand to trade shocks, both through the indirect effect of output changes and directly through the influence of tariffs and import penetration. This suggests that the adjustment costs to *expected* trade liberalization in the form of changes in industrial labor demand should not be high.

We also find that trade liberalization does not have a significant effect on wages. It is likely that tariff reduction and trade liberalization would lead to only slight increase in the wage differentials between skilled and unskilled labor. It is obtained that there is no significant effect of tariffs on wages and wage premiums. Therefore, no significant evidence for the claim that "workers in more protected industries earn relatively more" is found. The latter implies that workers would not lose much after further trade liberalization provided they could move to trade exposed industries.

The increase in tariff levels is likely to be associated with the increase in wage gap between skilled and unskilled labor. But the evidence for this conclusion is not very strong, because the industry affiliation does not explain much of the wage variation between skilled and unskilled workers.

Overall, the adjustment costs of anticipated trade liberalization are likely to be much smaller than expected as the analysis of the influence of previous trade shocks on the Russian economy shows.

JEL Classification: J31, F16

Keywords: Labor Market, Trade Liberalization, Labor Demand, Wage Premiums, Employment Flows

Introduction

Trade reforms, including the liberalization related to WTO accession, having long-run benefits, have at least short-run costs. In particular, the expected resource reallocation is not costless: some transitional unemployment and loss of output could be experienced when some inefficient enterprises are shut down. Moreover, the costs and benefits are unlikely to be uniformly distributed. Hence, in the short-run, there are going to be winners and losers. In the long run, however, there is evidence that countries that experienced trade-led growth also experienced income growth of the poor that was in line with the average income growth thus reducing absolute poverty.

One of the questions of interest for policy makers is how large the adjustment costs of trade liberalization are, i.e. how strong are the potentially disadvantageous short-run outcomes that result from trade liberalization. The paper studies adjustment costs of trade developments in Russia in the 90-ies.

There is significant body of literature in the area. Matusz and Tarr (2000) provide a profound survey of studies on adjustment costs of trade liberalization in developing countries. They state that generally in most studies manufacturing employment increases after trade liberalization. The estimations of adjustment costs suggest that they tend to be of moderate size. Another strand of literature is related to the distributional aspects of trade liberalization. Goh and Javorcik (2004) find for Poland that a decrease in an industry tariff is associated with higher wages in the industry. Milanovic and Squire (2005) show that tariff reduction is correlated with higher inter-occupational and inter-industry inequality in poorer countries and the reverse in richer ones.

A significant portion of potential costs is related to the influence of trade reforms on the *labor market*.

There are several potential channels of influence of trade shocks on the labor market. Free trade is expected to change relative prices, and hence redistribute resources to more efficient use. That would affect output composition, and in turn, demand for labor. Changes in demand for labor transmitted through labor market would shift employment and income distribution between sectors.

In addition to this indirect influence, changes in relative prices could affect employment and incomes directly: changes in relative prices of inputs would affect labor demand, while adjustment of relative prices of consumer goods is expected to affect labor supply. Being transmitted trough the labor market this direct effect will also change sectoral distribution of employment and incomes.

The total outcome of the resource reallocation and the magnitude of adjustment costs depend both on the characteristics of external shocks and on degree of rigidity and flexibility of internal markets. The degree of flexibility of labor market reflected, among others, by regional and sectoral mobility, determines the speed of transition of workers from unemployment to employment or from old jobs to new jobs, thus shaping the size of adjustment costs.

The paper attempts to estimate responsiveness of Russian labor market with respect to international trade parameters using the experience of trade policies during the 90-ies.

One needs to mention here that the 90-ies are characterized by a series of external and internal shocks that affected the economic outcome of the Russian economy. First, there was a large systemic transformation shock comprised of the change from supply-determined to demand-determined markets, deep changes in the distorted structure of relative prices following their liberalization, disruption of economic coordination during the movement from the central planning system to the one based on market signals, including the collapse of old command linkages between enterprises and the disintegration of the old incentive system. In addition, two other macro shocks were experienced during the same period: the external trade shock from the dismantling of the Council for Mutual Economic Assistance (CMEA) and the dissolution of the USSR, which diminished both demand for products and input availability; and the post-Cold-War shock, which changed the structure of domestic demand following demilitarization.

With respect to foreign trade, two simultaneous processes were going on in Russia in the 90-ies. First, the Russian economy went through the policy-related shock of the increased openness of the country, resulting in a significant increase in import competition by Russian producers and enlarged opportunities for exporting sector. Trade was liberalized dramatically in the 90-ies as compared to the planning system era. Second, market-based measures to protect domestic producers were introduced, including the rise of tariffs for the majority of imported goods.

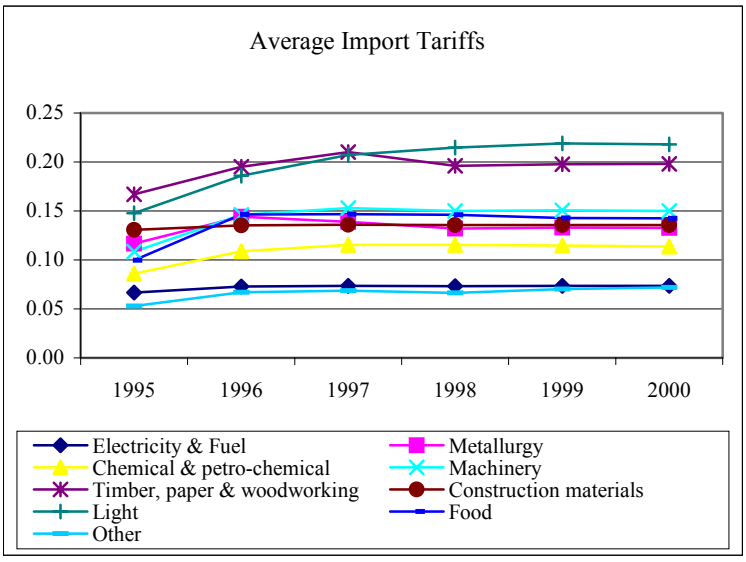
Foreign trade was highly centralized and regulated under the planning system. In 1988 foreign trade was partly decentralized. In particular, enterprises-exporters were granted a limited autonomy in using part of their earnings for imports (mainly of consumer goods). Some steps towards current account convertibility were made: a foreign exchange retention scheme, together with a system of differentiated exchange coefficients, was introduced, and foreign currency auctions with limited transactions started.

Exports continued to be regulated after 1992: about 70% of exports, mainly energy products and raw materials, remained subjected to quotas. From the middle of 1992 licensing for

the so-called strategic exports[1] was introduced. Additionally, the government, in an effort to ensure the supply of goods to the domestic market and keep domestic prices below world market prices, maintained export quotas on energy resources and important raw materials. Imports licensing was abolished in 1992, thus liberalizing imports operations, though a large share (40% of total imports from outside the former Soviet Union (FSU) in 1992) of it continued to be centralized, and thus subsidized[2]. In July 1992 the government introduced a unified market-based exchange rate[3] for the Ruble against hard currencies, and current account convertibility was introduced in November 1992. The capital account continued to be closed. Trade liberalization resulted in significant growth of foreign trade in spite of the production decline.

At the same time, the policy of domestic industry protection resulted in significant changes of the level of import tariffs during the period (Diagram 1). Tariff levels increased in all industries during the period of 1994-1998, except for those in building materials, and stabilized afterwards. Wood processing and light industries were those with persistently high tariffs, while chemical industries and fuel and energy industries had relatively low tariffs throughout the period.

Diagram 1. *Tariff dynamics in Russian industry, 1995-2000*



Source: CEFIR calculations

Overall, the result of the developments in foreign trade in the 90-ies was the switch from non-market interventions in the form of state monopoly on the majority of operations in the area to market based governmental interventions in the form of increased import tariffs, implying a

[1]In 1993 strategic exports comprised about three-quarters of Russia's exports to outside the former Soviet Union countries (Christensen (1994): p.8).
[2]The imports were distributed at highly subsidized prices to enterprises: enterprises paid only 5-10% of the import value in domestic currency. It was financed mainly by external credits from foreign governments and by the use of official foreign exchange reserves (Christensen (1994): p.8).
[3]Until 1994 multiple exchange rates (lower than the official) were applied to some transactions, for example, to the so called "critical imports" (imports of the goods of priority economic importance).

dramatic overall liberalization. It is a challenging exercise to disentangle the influence of each of the aforementioned shocks on the economy, and on enterprises in particular. At the same time, the difference in the timing of the shocks seems to allow identifying the influence of some of the shocks. In particular, most of the aforementioned shocks happened in 1992 and are likely to have exercised their power on the economy by 1995 – the year our analysis starts with. Tariff changes, however, happened later, after 1994. Hence the difference in timing is likely to allow us to identify the influence of tariff policy changes – the increase of tariffs, i.e. the inverse of trade liberalization – on the Russian economy. One needs to be aware, though, that adjustment to other shocks may partially be captured by the subsequent analysis.

The analysis of responsiveness of Russian enterprises to the observed tariffs' increase during 1994-2000[4] would provide the baseline estimations to evaluate the labor market adjustment to the *expected* trade liberalization following the anticipated WTO accession[5], provided the firms' reaction is symmetric to tariff rise and reduction[6].

In what follows we look at several channels of the influence of trade shocks on the labor market by estimating the influence of tariff policy on the level and volatility of employment and wages. In particular, we address the four issues. *First*, how does labor demand by firms respond to the inverse of trade liberalization? *Second*, what is the effect of trade developments on wage dispersion across sectors? *Third,* what is the effect of trade changes on the wage gap between skilled and unskilled workers?

The paper is organized as follows. Labor demand elasticity with respect to output and to wages is estimated and the influence of tariff changes on demand for labor is examined in Section 2. Determinants of sectoral wage premiums are analyzed in Section 3, while wage differentials between skilled and unskilled labor are considered in Section 4. Section 5 concludes.

We find low magnitudes of responsiveness of the labor demand to trade shocks, both through the indirect effect of output changes and directly through the influence of tariffs and import penetration. This suggests that the adjustment costs to *expected* trade liberalization in the form of changes in industrial labor demand should not be high. Moreover, one should take into account the effects of the shift from industrial employment to employment in services that are to dampen the effect of trade shocks.

We also find that trade liberalization does not have a significant effect on wages. It is likely that tariff reduction and trade liberalization would lead to only slight increase in the wage

[4] It is worth noticing the relative stability of basic labor market institutions in Russia throughout the period.
[5] The latter is to eventually diminish the tariff protection levels.
[6] It is worth mentioning that the response may be non-symmetric, so that the impact of a positive shock could be more or less pronounced as compared to the impact of a negative shock. We can not identify the difference with the data available.

differentials between skilled and unskilled labor. It is obtained that there is no significant effect of tariffs on wages and wage premiums. Therefore, no significant evidence for the claim that "workers in more protected industries earn relatively more" is found. The latter implies that workers would not lose much after further trade liberalization provided they could move to trade exposed industries.

The increase in tariff levels is likely to be associated with the increase in wage gap between skilled and unskilled labor. But the evidence for this conclusion is not very strong, because the industry affiliation does not explain much of the wage variation between skilled and unskilled workers.

Overall, the adjustment costs of anticipated trade liberalization are likely to be much smaller than expected as the analysis of the influence of previous trade shocks on the Russian economy shows.

2. Estimation of Labor Demand Elasticities

In this section we analyze changes in employment as of labor demand side due to changes in trade policy since 1994. Labor demand, and in particular, the elasticity of labor demand with respect to output is the key determinant of employment on the labor market. The increased openness of an economy is likely to result in an increased demand for labor by exporting sectors and in a decrease in labor demand in import-competing sectors. Domestic industry protection measures and tariff increase in particular, would bring the opposite results.

Trade liberalization affects labor demand and the speed of its changes through two basic channels. First, the more open the economy is the more shocks it is exposed to. Hence, one would expect that shocks are more frequent, and their magnitudes are larger in open economies. Second, the increased competition which comes now not only from domestic firms but from foreign firms operating on product markets makes firms in an open economy country to increase the speed of adjustment so that to minimize their costs and to increase profits. As a result, one would expect elasticities to become larger after liberalization. One would also see higher elasticities in more liberalized, or open to trade, sectors as compared to less open to trade sectors.

Another way to measure effect of further trade liberalization due to expected WTO accession is to estimate the influence of tariffs, direct and through output, on labor demand for various industries. The idea behind this approach is that if there is a significant influence of tariffs on labor demand, one should expect significant changes after their cancellation. This is provided the reaction is symmetric.

We use balance sheets of Russian large and medium enterprises for 1995-2000 to estimate labor demand equation and to calculate possible changes in employment due to various

shocks in output and tariffs. Our sample comprises of more than 53 thousand enterprises and is nationally and industry-level representative.

We estimate the following form of labor demand equation[7]:

$$\ln(L_{ti}) = \alpha_1 * \ln(L_{t-1,i}) + \alpha_2 * \ln(Q_{t,i}) + \alpha_3 * \ln(W_{t,i}) + \beta * X_{i,i} + \sum_{t=1998}^{2000} \lambda_t * d_t + \mu_i + \upsilon_{i,t}$$

where $L_{i,t}$ – is the number of workers employed at the enterprise at period t, $Q_{i,t}$ – sales of enterprise i during year t, and $W_{i,t}$ – average wage at enterprise i in year t, X – is a set of other variables, d_t – time dummies[8]. In our case X contains such regressors as tariffs, import penetration index, unemployment level, GRP over GDP in the Russian Federation, industrial output index, real regional average wage, concentration index (HHI).

We exploit the industrial structure of the data so that to analyze the two abovementioned dimensions of trade shocks in the 90-ies. In particular, we analyze the effects of tariff increase on the economy as a whole. At the same time, since industries are not homogeneous with respect to trade openness, we utilize the variation to study the difference across industries in responsiveness to various shocks. We group the 5-digit industries[9] into four groups according to the level of their exposure to foreign trade: export oriented (with export share more than 30%, import share less than 30% and a low intra-industry trade index); import competing (with import share more than 30%, export share less than 30% and a low intra-industry trade index); with high intra-industry trade (IIT index more than 50%); and non-traded.

Part of the differences in responsiveness across the industries could be attributed to the distinctions in foreign trade exposure. At the same time we can't reject the influence of other industrial characteristics, technology, e.g., on the observed variation in inter-industrial responsiveness.

Table 1 reports the obtained labor demand elasticities with respect to both wage and output for the whole economy sample and for each of the 4 groups of industry sub-samples.

It turns out that the wage labor demand elasticity is equal to –0.40 for the entire sample implying that a 10% increase in real wage would diminish labor demand by 4%. The labor demand elasticity with respect to output equals 0.22 that means that a 10% increase or decrease in output would cause a 2.2% increase or decrease in labor demanded.

The estimates of labor demand elasticities we obtain are higher in absolute value than those reported by Konings and Lehmann (1999) for the Russian enterprises in 1996-1997, but they are still lower than elasticity in Poland, Hungary and Czech Republic during the transition period and than respective elasticity in developed countries. The low levels of output and wage

[7] Arellano-Bond estimation procedure is used. Tariffs and wage are treated as endogenous.
[8] Time dummies are to capture the effect of the real exchange rate depreciation observed within the period.
[9] According to OKONH classification.

elasticities of labor demand suggest rather moderate response *in terms of employment* to changes in output composition due to various shocks, including the trade shock[10].

The speed of adjustment to the shocks are reflected by the estimated coefficient for employment inertia (lagged employment). The estimated coefficient is 0.24 that is lower than reported for earlier Russia and other transitional economies. This is a sign of the accelerated adjustment and decreased inertia of the Russian labor market in the second half of the 1990-ies.

In addition to getting an idea of the overall influence of trade changes on labor demand, it is worth distinguishing between the responsiveness of sectors more exposed to trade shocks (those with high share of exports or import competing sectors) and those less exposed to trade shocks. One may expect more employment volatility in industries exposed to trade shocks.

Labor demands for the four abovementioned groups of industries were estimated (Table 1). It is clear from the table that the industries are not homogeneous, and there is significant variation in all the relevant coefficients. First, employment inertia varies across industries, with being 0.41 in the group of industries with high intra-industry trade, and 0.39 on import-competing industries. The lowest inertia is found in the group producing non-traded good, and it is only 0.28 in export-oriented. The latter is a sign of higher employment volatility in export-oriented sectors while the other group of industries exposed to trade shocks – import-competing – are less flexible in this sense. One could attribute the difference to the influence of protectionist measures, and import tariffs in particular.

The estimates of wage responsiveness are in line with the interpretation as well: the wage labor demand elasticities are insignificantly different from zero in industries with high intra-industry trade (those with the highest employment inertia), but are as high as 0.33, 0.31 and 0.25 in non-traded, import competing and export oriented industries. This reflects much higher responsiveness of the latter industries to changes in wages, implying higher employment volatility pattern for those industries.

Hence, less exposed to trade shocks industries are likely to be more conservative in terms of employment adjustment.

The output labor demand elasticities are significantly different from zero in all industries and vary from 0.15 in industries with high intra-industry trade up to 0.20 and 0.23 in the other three groups. The variation is in line with the basic intuition and the Hicks and Marshall's labor demand rules: the products of the three groups are likely to face more competitive markets, external and internal, i.e. markets characterized by higher product price elasticities. This in turn results in higher own price demand elasticities of inputs, including labor.

[10] It is widely acknowledged that the adjustment to shocks on the Russian labor market went mainly through real wage reduction, including in the form of holding wage arrears, which is in contrast to the adjustment pattern of most Eastern European countries.

In addition to the influence through output contraction or expansion, trade shocks could affect demand for labor directly. To capture the effect, we estimated the sensitivity of demand for labor to trade openness indicators by including (lagged) tariff and import penetration levels in labor demand equations. It turns out that both indicators are statistically significant for the whole sample, with higher import tariffs being associated with higher (lagged) demand for labor and higher import penetration – with lower demand for labor[11]. Hence, a positive impact of trade barriers and a negative impact of trade liberalization on the number of workers demanded by the Russian industry as a whole are obtained. The magnitude of the influence is not high, however, again implying moderate adjustment costs.

It is instructive that the overall impact is mainly due to the influence of tariffs and import penetration ratio on import-competing sectors, with the influence being statistically insignificant for the other three industrial groups. The low correlations between tariff level, import penetration rates and labor demand for the three groups does not mean, however, that trade liberalization does not have impact on the labor demand in the industries since trade liberalization affects industrial structure and output in the industries, which in turn affects demand for labor. Hence, we find strong evidence on the direct influence of domestic protectionism measures on labor demand in import-competing industries with no direct influence of the measures on the three other sectors.

Another interesting dimension to study is the variation in adjustment costs across regions that may arise from regional differences in industrial structure, including degree of industry concentration, and/or differences in elasticity of final demand for products. The estimation of labor demand elasticities (Table 2) show that they very not only across industries, but also across regions. Overall, we find higher labor demand elasticities in the northeastern parts of Russia. The differences seem to arise from differences in industrial structure, including degree of industry concentration, on the one hand, and from differences in elasticity of final demand for products, on the other hand. Let us consider for example, two regions: the Northern and the North-Western regions. Our estimates clearly show that the Northern region has higher elasticities as compared to the North-Western region: 0.34 as opposed to 0.22 for output labor demand elasticity, and –0.55 as compared to –0.18 for wage responsiveness. We believe that the difference is driven by a significantly larger share of industries exposed to trade shocks, and hence, those with more volatile employment industries in the Northern region: the share of metallurgy, petrochemical and timber industries in the region amounted to 58% in 1999, with another 16% being fuel

[11] Herfindal-Hershman index, average wage in the region, GRP per capita over the all-Russia GDP per capita and time dummies were used to control for regional and time differences and turned to be significant.

industry, while the respective shares in the North-western region were 19.4% and 6.2% respectively[12].

A part of the explanation for the regional variation could come from the difference in industrial concentration. At the least concentrated markets, i.e. at markets with higher number of potential employers, the employees have more outside opportunities which, first, makes firms behave more as wage-takers (as opposed to wage-setters as it is in more concentrated and more monopolized markets), and second, restricts firms to destroy job places in response to temporary shocks in expectation of competition for employees. The first tendency would imply that in less concentrated markets adjustment to shocks, including trade shocks, is done mainly through employment rather than wages, while the second tendency would counteract and put restriction on adjustment through employment. We find higher wage labor demand elasticities in northeastern parts of Russia (including the Northern region) known for higher concentration, and hence, labor markets with a significant degree of monopsony. The result seems to be in support of the second tendency: in more monopsonized labor markets employment tends to be more volatile.

Turning to the tariff and import penetration variables included to measure the effect of trade openness on labor demand, we found positive impact of higher trade barriers on the number of employed in several regions. In all cases, except one, when these variables are significant, the tariff level coefficient is positive and the import penetration coefficient is negative. This implies the effectiveness of domestic industry protection measures on regional level.

Summing up, it could be concluded that the Russian labor market is characterized by rather low labor demand elasticity with respect to output and wages. Those are higher though than at the beginning of the transition period implying that on the whole Russian enterprises became more sensitive when operating in an open economy[13]. The latter is supported by higher labor demand elasticity with respect to output and wages and lower inertia. Moreover, our sectoral analysis shows that the elasticities are higher in more exposed to trade sectors than in less exposed ones.

We find strong evidence on the direct influence of domestic protectionism measures on labor demand in import-competing industries, with the effect of the measures on employment in other industries being insignificant. In most of the cases higher protection corresponds to higher number of workers demanded by firms, holding other things constant. With exception of some

[12] Russian Regions (2000), Table 13.3, p.372-373, Goskomstat

[13] One should be careful in attributing the effect to the increased openness only since other shocks are likely to have affected the enterprise behaviour as well.

cases higher industry growth rates and bigger size of the regional economy also lead to higher employment. This implies that potential employment losses from further trade liberalization in the form of tariff reduction should be anticipated in the protected industries. The magnitudes of elasicities are not high on international standards, however, implying the moderate size of losses.

Overall, the found low *magnitudes* of responsiveness of the labor demand to trade shocks, both through the indirect effect of output changes and directly through the influence of tariffs and import penetration, suggests that the adjustment costs to *expected* trade liberalization in the form of changes in industrial labor demand should not be high. Moreover, one should take into account the effects of the shift from industrial employment to employment in services which are to dampen the effect of trade shocks.

3. The influence of changes in sectoral production structure on sectoral wage distribution

Trade shocks affect not only employment structure of an economy but earning profiles as well. The latter influences earnings and income inequality, and hence, poverty. The section presents an empirical study of correlation between trade parameters and wage distribution. In particular, we study whether there are wage premiums, positive or negative, in more exposed to trade industries as compared to less exposed ones. The issue of wage responsiveness to changes in import tariffs in recent period is also addressed.

The analysis is based on Russian Longitudinal Monitoring Survey (RLMS), rounds 6-11, matched with sectoral indicators of trade liberalization. RLMS is a nationally representative panel survey of households' members on a large number of issues. It is publicly available at http://www.cpc.unc.edu/project/rlms. The number of households surveyed fluctuate around 4,000. The data contains detailed information on education and labor market history of adult household members, as well as on the composition of households.

Several procedures to estimate sectoral wage premiums and the responsiveness of wages to the changes in tariffs were used. The first approach is, following Goldberg and Pavcnik (2001), a two-step procedure with wage premiums due to industrial affiliation of workers being estimated at the first stage (controlling for observable differences in individual characteristics), and then the premiums being regressed on tariffs in fixed effect panel framework.

First-stage: $\ln(w_{ij}) = H_{ij}\beta_H + I_{ij} * wp_j + \varepsilon_{ij}$,

where i – worker, j – industry, w_{ij} - worker i's wages, H_{ij} – a vector of worker i's characteristics (age; age squared; gender; two education type dummies, skill type dummies[14]), region (Moscow

[14] Education type dummies include school education, secondary professional and high (institute or university) education. Skill type classification is the following: unskilled, low-skilled, skilled and high-skilled labor. Legislators, senior managers, officials and professionals are defined as high-skilled workers. Skilled workers include technicians, associate professionals, clerks, service

region dummy, region unemployment level, gross regional product) and firm type dummies (foreign or Russian, government or private), I_{ij} - industry indicators that reflect worker i's industry affiliation[15], wp_j – industry wage premium.

Second-stage: $wp_{jt} = T_{jt}\beta_T + D_{jt}\beta_D + u_{jt}$,

where wp_j – industry wage premium, T_{jt} - the vector of tariffs, import, export, import and export ratios, D_{jt} - time indicators. Various specifications were tried at the first stage[16] . The second stage equation is estimated using industry fixed effects panel model. The results are summarized in Tables 3.1 and 3.2.

The results show that workers in Fuel & Energy industries earned from 40% to 180% (in different years) more than workers in retail and wholesale trade industries with the same observable characteristics. In contrast, workers in Agriculture always earn 50-60% less than workers in retail and wholesale trade industries with the same observable characteristics.

Not all coefficients are statistically different: the test for coefficient equality for 1994 year shows that industry wage premiums can be divided into four groups relative to the wage premiums in retail and wholesale trade industry. The first group of industries with the largest wage premiums includes fuel & energy and metal industries. The second group consists of light, food and construction materials industries which tend to have lower wage as compared to the reference group in most years. The third group is agriculture with the consistently negative wage premiums as compared to the reference group. The rest of the industries are in the third group almost indistinguishable of each other. The results suggest that the highest wage premiums tend to be in export-oriented sectors, and hence prompt for the composition of winners due to trade liberalization[17].

The results of the second step of the procedure reveal that, if treated as exogenous, import tariffs are negatively correlated with wage premiums. If treated as endogenous and instrumented (by either lagged tariffs or lagged import penetration ratios), the effect disappears. We believe it is important to instrument tariffs. Industrial wage premiums are likely to be a result of competition, external and internal, at the industry level. The fact that more exposed to trade

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and market workers, skilled agricultural and fishery workers, plant and machine operators, and assemblers. Craft and related trades workers are defined as low-skilled workers.

[15] Industry indicators I_{ij} include dummies for the following industry groups: Fuel & Energy industries (I_11), Metal industries (I_12), Chemical industries (I_13), Machine-building industries (I_14), Wood-processing industries (I_15), Building materials industries (I_16), Light industry (I_17), Food industry (I_18), Others (not mentioned above) (I_19), Agriculture (I_20).

[16] OLS and Heckman procedure to correct for selection bias in the wage equation; for males and females separately.

[17] Again, one should notice that only a part of the differences between sectors could be attributed to the distinctions in foreign trade exposition. Variation in other industrial characteristics, technology, e.g., are behind the result as well.

shocks industries are likely to have less wage premiums *due to* competition make them be active in lobbying for industry protection measures, and higher tariffs in particular.

Therefore, it cannot be concluded that workers in more protected industries had larger wage premiums. It is rather a mixture of differences in market structures across the industries (variation in concentration ratios and exposure to domestic and international competition) that drive the differences in wage premiums rather than protection per se. This in turn implies that workers would not lose much after further trade liberalization provided they could move to trade exposed industries.

We also tried another approach which directly estimates whether affiliation with export-oriented industries, import-competing industries, or industries with high inter-industry trade (versus industries with high share of non-tradables) influence wages. It turned out that workers in import competing industries earned less than workers with the same observable characteristics in other industries. There is also a positive, although insignificant, effect of being affiliated with export-oriented industries.

Finally, we analyzed how tariffs and volumes of import and export affect wages by applying fixed effect panel. A positive, although insignificant, effect of import tariffs on wages is revealed.

To summarize, the main result of this section is that wages are not necessarily higher in protected industries implying that workers would not lose much after further trade liberalization provided they could move to trade exposed industries.

Our analysis shows that wage premiums in export orientated fuel & energy and metal industries are high. The industries are known to have relatively low tariff levels and large share of skilled workers[18] employed, as well as large profits and increasing demand for labor. The industries are situated in the remote regions, where the supply of labor is limited due to worker's low mobility. Therefore, employers in fuel & energy and metal industries seem to use the increased opportunities to compete for employees by paying the high wage premiums.

Wage premiums in food and light industries and agriculture, which have a large proportion of low skilled labor, are low. Firstly, the industries are not as profitable as fuel & energy and metal industries and the employers cannot pay large wage premiums. Second, the large share of low skilled workers decreases the worker's ability to capture rents, and hence decreases the pressure for industrial wage premiums. The similar result was obtained for Mexican firms (Revenga (1997)).

[18] We do not control for the difference in composition of skills across industries in our regression analysis except for panel data estimations where the difference is a component of a fixed effect.

We found no significant effect of tariffs on wages and wage premiums. This result is in line with the fact that there is no unique relation between wages and trade protection for every country: some countries show a negative relation between wages and trade protection, whereas others exhibit a positive relation. Hence, domestic industry protection reveals to be effective in terms of higher labor demand, as discussed in section 2, but does not bring higher wages.

4. *Wage differentials between skilled and unskilled labor*

One of the effects of trade on economic and social development is its influence on the wage gap between skilled and unskilled labor. Theoretically the issue of the effects of trade on the wage gap is not clear, and the question for each country is left for empirical analysis. The issue is of particular interest in the Russian case given that it is a relatively low income/ low wage country but with a large endowment of skilled labour. The section studies the wage gap in both statics and dynamics, with the special attention to the factors which determine the gap. Russian Longitudinal Monitoring Survey (RLMS) is used.

The wage gap between skilled and unskilled labor[19] is analyzed employing Oaxaca-Ranson decomposition. The technique suggests that wage equations for skilled and unskilled workers separately for each year are estimated, and then the estimates are used to identify the input of various factors to the wage differential between the skill groups. This could be thought of as a 'static' decomposition of the wage gap. To identify the factors behind the dynamics of the wage gap, separate regressions for 1995 and 2002 years for each type of worker (skilled and unskilled) are run, and the corresponding decomposition, which could be named a 'dynamic' one, is made. The results of both exercises are presented in Table 4.

The static – between skilled and unskilled for each year - wage gap decomposition leads to the results presented in the first columns of Table 4. It shows that the wage gap between skilled and unskilled workers was at the level of 20% in the two years. It is these differences in wages which are decomposed in the static exercise into the influence[20] of observable characteristics of a worker and his job - education, experience, place of residence, sectoral affiliation of the job the worker holds – and the unobservable characteristics which we can not control for but which are likely to affect wages (such as motivation, time preferences,

[19] The skilled workers will include legislators, senior managers, officials, professionals, technicians, associate professionals, clerks, service and market workers, skilled agricultural and fishery workers, plant and machine operators, and assemblers. Craft and related trades workers, sweepers, garbage collectors will be regarded as unskilled workers.

[20] The influence of a factor could be proactive or counteractive. This is reflected by the signs of the effects (positive or negative) that may coincide with the sign of the overall difference, and thus be proactive, or have the opposite sign, and thus be counteractive.

discrimination, etc.). Provided the variation in preferences across individuals is not overwhelming, the not-explained variation could be attributed to the differences in returns to the individual characteristics thus revealing a degree of discrimination against the unskilled in the labor market.

Among observables, it is education which has the largest explanatory power: all else being equal, observable differences in education accounted for 20-30% of the skilled/unskilled gap in 1995 and 50% of the gap in 2002.

Additionally, it turns out that, work in manufacturing industries, except metal industry, tend to increase the wage gap between skilled and unskilled workers while work in metal sector decreases the gap. Metal sector is one of the exposed to trade shocks sectors of the economy, and we find that it modestly dampen the wage gap between skilled and unskilled. At the same time the overall contribution of industry affiliation is more than modest.

The last two columns of Table 4 summarize results of dynamic wage differential decomposition. Both skilled and unskilled wages increased during the period. The decomposition of the increase into contributing factors show that electricity and fuel and metal sector affiliation, as well as working in agriculture, contributed a lot to the increased wages for both skilled and unskilled. Working in light, food and construction materials industries seem to counteract the general trend (as of reflected by the trend in the reference group of retail and wholesale trade). Gender wage differentials favored males: the wages of males increased more than the wages of females during the period of observation both for skilled and unskilled workers.

Overall, it turns out that the wage gap between skilled and unskilled increased by about 20% from 1995 to 2001. Taking into account the increase in tariff levels during the period, it seems that it is likely to be associated with the increase in wage gap between skilled and unskilled labor. But the evidence for this conclusion is not very strong, because the industry affiliation does not explain much of the wage variation between skilled and unskilled workers. This result coincides with that of obtained for Mexico (Cragg, Epelbaum (1996)): industry dummies did not explain much of the wage gap between skilled and unskilled labor.

We also find that work in manufacturing industries, except metal industry, tend to increase the wage gap between skilled and unskilled workers while work in metal sector decreases the gap. It seems that trade shocks operating mainly through manufacturing sector contributed to an increase of wage gap between skilled and unskilled.

Conclusions

The paper looks at several channels of the influence of trade shocks on the labor market by estimating the effects of trade on the level and volatility of employment and wages using the experience during the 90-ies. In particular, we estimate wage and output labor demand elasticities; study the influence of import tariffs and import competition on labor demand; study factors of inter-sectoral and inter-skill wage differentiation.

We find low magnitudes of responsiveness of the labor demand to trade shocks, both through the indirect effect of output changes and directly through the influence of tariffs and import penetration. This suggests that the adjustment costs to *expected* trade liberalization in the form of changes in industrial labor demand should not be high. Moreover, one should take into account the effects of the shift from industrial employment to employment in services which are to dampen the effect of trade shocks.

We also find that trade liberalization does not have a significant effect on wages. It is likely that tariff reduction and trade liberalization would lead to only slight increase in the wage differentials between skilled and unskilled labor. It is obtained that there is no significant effect of tariffs on wages and wage premiums. Therefore, no significant evidence for the claim that "workers in more protected industries earn relatively more" is found. The latter implies that workers would not lose much after further trade liberalization provided they could move to trade exposed industries.

The increase in tariff levels is likely to be associated with the increase in wage gap between skilled and unskilled labor. But the evidence for this conclusion is not very strong, because the industry affiliation does not explain much of the wage variation between skilled and unskilled workers.

Overall, the adjustment costs of anticipated trade liberalization are likely to be much smaller than expected as the analysis of the influence of previous trade shocks on the Russian economy shows.

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Table 1. Estimation of labor demand – sectoral differences

Dependent	Total sample	Total sample	Export-oriented	Import-Competing	Non-traded	High intra-industry trade
Ln (employment)	0.238	0.263	0.283	0.394	0.185	.413
	(8.12)***	(9.46)***	(3.32)***	(11.17)***	(3.96)***	(2.29)**
real wage per worker (first difference)	-0.401	-0.372	-0.248	-0.312	-0.329	-.137
	(16.00)***	(16.10)***	(4.02)***	(10.16)***	(9.31)***	(1.85)*
import tariffs (lagged)	0.717	0.651	-0.151	0.479	-0.096	.856
	(5.32)***	(4.58)***	(0.34)	(4.57)***	(0.37)	(0.9)
Ln (real output)	0.227	0.221	0.203	0.193	0.235	.156
	(34.11)***	(35.10)***	(11.21)***	(23.51)***	(24.11)***	(7.58)***
import penetrations by firms	-0.119		-0.165	-0.098	-0.045	-.135
	(4.73)***		(1.9)*	(3.28)***	(1.12)	(1.12)
Herfindal-Hershman index	-0.058	-0.055	-0.027	-0.004	-0.086	-.023
	(2.08)**	(2.02)**	(0.39)	(.09)	(2.14)**	(0.18)
Ln (real average wage in the region)	0.091	0.082	0.122	0.046	0.056	-.032
	(4.34)***	(3.99)***	(1.56)	(1.42)	(1.93)*	(0.33)
regional unemployment level	-0.001	-0.001	-0.003	-0.001	-0.001	.002
	-1.56	-1.64	(1.11)	(1.29)	(0.81)	(0.62)
GRP over Russian GDP	0.043	0.043	-0.008	0.032	0.047	.077
	(4.31)***	(4.42)***	(0.17)	(2.26)**	(3.45)***	(1.62)
industrial output index	0	0	-0.001	0.000	0.000	.000
	-0.81	-0.97	(1.18)	(0.16)	(2.22)**	(0.01)
year1998	0.093	0.093	0.113	0.052	0.069	.017
	(7.90)***	(7.94)***	(2.49)**	(2.98)***	(4.31)***	(0.24)
year1999	0.074	0.085	0.097	0.043	0.047	.042
	(5.38)***	(6.06)***	(1.69)*	(2.13)**	(2.05)**	(0.39)
year2000	0.127	0.139	0.143	0.086	0.074	.119
	(8.22)***	(8.62)***	(2.14)**	(4.06)***	(2.34)**	(0.81)
constant	-0.08	-0.08	-0.067	-0.064	-0.055	-.082
	(15.95)***	(15.17)***	(3.91)***	(10.35)***	(5.69)***	(1.62)
Number of obs.	53817	55136	3264	23488	25380	1562
Number of groups	17562	17999	1164	7496	8322	487

*Note: Dependent variable is log employment. Arellano-Bond GMM estimator is used. Import tariffs and Wage are treated as endogenous. Absolute values of t-statistics are in parentheses. *** - significant at 1%, ** - significant at 5%, * - significant at 10%,*

Table 2.2. Estimation of labor demand – regional differences.

	Northern	North-Western	Central	Cent/Mosc	Centr-Chernoz	Uralskiy	West-Siberian	East-Siberian	Far Eastern	Volg-Vyat	Povolgskiy	North-Caucasian	Kaliningrad
lnemp(-1)	-0.036	0.476	0.296	0.325	0.403	0.251	0.238	0.19	0.350	0.315	0.455	0.486	0.659
	[0.40]	[5.07]***	[5.38]***	[6.08]***	[4.53]***	[4.58]***	[2.79]***	[1,83]*	[4.48]***	[4.29]***	[7.18]***	[6.50]***	[3.45]***
lnwperemp	-0.548	-0.182	-0.283	-0.262	-0.253	-0.452	-0.435	-0.548	-0.382	-0.276	-0.308	-0.253	-0.562
	[7.02]***	[2.26]**	[6.58]***	[6.34]***	[2.70]***	[8.58]***	[6.14]***	[6.10]***	[4.79]***	[4.03]***	[4.71]***	[3.29]***	[3.00]***
tariff_1	2.507	-0.175	0.342	0.170	-0.154	0.675	0.397	1.579	1.405	-0.096	0.933	-0.213	3.571
	[3.55]***	[0.23]	[1.12]	[0.55]	[0.32]	[2.18]**	[0.95]	[2.42]**	[3.21]***	[0.31]	[2.45]**	[0.82]	[1.78]*
lnoutdef	0.340	0.218	0.208	0.206	0.193	0.274	0.261	0.259	0.206	0.214	0.149	0.172	0.207
	[13.22]***	[9.00]***	[16.63]***	[16.22]***	[7.09]***	[16.51]***	[11.81]***	[10.52]***	[10.78]***	[11.74]***	[11.17]***	[8.27]***	[4.05]***
ipokpofill	-0.424	-0.002	-0.093	-0.069	-0.003	-0.043	-0.202	-0.448	-0.228	0.059	-0.219	0.153	-0.416
	[2.83]***	[0.02]	[2.01]**	[1.37]	[0.03]	[0.73]	[1.98]**	[3.63]***	[1.65]*	[0.93]	[2.79]***	[2.26]**	[1.12]
HHI	0.290	0.060	-0.174	-0.192	-0.050	0.002	0.081	0.024	-0.149	-0.177	0.052	-0.045	0.113
	[2.40]**	[0.40]	[1.71]*	[1.62]	[0.54]	[0.03]	[0.49]	[0,17]	[1.81]*	[1.61]	[0.60]	[0.62]	[0.61]
lnavwag	-0.026	-0.428	0.448	0.429	-0.555	0.144	0.308	0.044	0.373	0.012	-0.325	0.087	
	[0.53]	[1.48]	[5.50]***	[5.55]***	[2.05]**	[1.89]*	[3.46]***	[0,33]	[2.27]**	[0.20]	[3.46]***	[1.28]	
unempl_level	-0.003	0.013	-0.005	-0.006	0.010	-0.001	-0.006	0,000	-0.007	0.001	0.001	-0.001	
	[0.66]	[2.20]**	[3.66]***	[4.02]***	[3.61]***	[0.28]	[2.48]**	[0,06]	[1.78]*	[0.51]	[0.51]	[0.78]	
grp_r_rf	-0.064	0.110	0.053	-0.050	0.238	0.037	-0.002	0.147	0.054	-0.169	0.067	0.005	3.571
	[0.68]	[0.77]	[3.83]***	[1.00]	[2.04]**	[0.68]	[0.06]	[1,76]*	[1.06]	[1.76]*	[1.23]	[0.06]	[2.93]***
ind_gr	-0.000	0.002	0.001	0.001	-0.000	-0.001	0.001	-0.001	0.001	0.000	0.003	-0.000	0.002
	[0.25]	[1.81]*	[2.61]***	[2.98]***	[0.43]	[1.49]	[2.45]**	[1,01]	[0.96]	[0.08]	[6.69]***	[0.94]	[0.63]
year1998	0.019	-0.235	0.333	0.327	-0.205	0.124	0.175	0.051	0.170	0.006	-0.074	0.032	0.218
	[0.47]	[1.50]	[5.85]***	[6.09]***	[1.86]*	[2.71]***	[3.69]***	[0,75]	[2.11]**	[0.17]	[1.57]	[0.93]	[4.04]***
year1999	0.005	-0.253	0.341	0.322	-0.179	0.081	0.082	0.022	0.155	-0.026	-0.090	0.006	
	[0.07]	[1.44]	[5.46]***	[5.48]***	[1.55]	[1.54]	[1.53]	[0,27]	[1.64]	[0.65]	[1.72]*	[0.16]	
year2000	0.091	-0.121	0.369	0.335	-0.023	0.101	0.038	0.058	0.153	-0.016	0.068	-0.005	
	[1.00]	[0.75]	[5.20]***	[4.92]***	[0.23]	[2.04]**	[0.64]	[0,71]	[1.54]	[0.31]	[1.44]	[0.13]	
constant	-0.114	-0.010	-0.118	-0.110	-0.041	-0.047	-0.051	-0.107	-0.101	-0.020	-0.105	-0.010	-0.144
	[3.89]***	[0.26]	[5.52]***	[5.25]***	[1.81]*	[3.82]***	[2.88]***	[3.97]**	[3.79]***	[1.25]	[6.32]***	[0.84]	[1.94]*
Obs.	2647	2528	11018	9758	3564	7380	5362	3195	2358	4365	5955	5073	372
Groups	883	840	3474	3061	1093	2398	1766	1059	910	1405	1992	1620	122

*Notes: Dependent variable is log employment. Arellano-Bond GMM estimator is used. Tariff and Wage are treated as endogenous. t-statistics are in parentheses. *** - significant at 1%, ** - at 5%, * - at 10% level. lnwperemp - real wage per worker, tariff_1 - one year lagged tariff level, lnoutdef - real output, ipokpofill - import penetration by firms, HHI -Herfinfal-Hershman index, lnavwage - real average wage in the region, deflated by CPI, unempl_level - level of unemployment in the region, grp_r_rf - gross Domestic product in the region over the GDP in Russia, ind_gr - industrial output index, year1998-year2000 - time dummies. Cent/Mosc - regression for the central economic region without Moscow*

Table 3.1 Wage premiums (omitted category - (retail) trade)

	1995	*1996*	*1998*	*2000*	*2001*	*2001*
Electricity & Fuel	0.32	0.48	1.03	0.91	0.66	0.57
Metallurgy	0.10	0.29	0.38	0.48	0.50	0.35
Chemical & Petro-chemical	0.06	0.06	0.39	0.36	0.16	0.19
Machinery	-0.24	-0.40	0.14	0.20	0.14	0.06
Timber, Paper & Woodworking	-0.15	-0.14	0.21	-0.03	0.01	-0.12
Construction Materials	-0.10	-0.19	0.11	0.14	-0.01	0.24
Light	-0.13	-0.26	-0.15	-0.26	-0.19	-0.29
Food	-0.25	0.27	0.05	-0.07	-0.06	-0.13
Other industries	-0.21	0.07	0.19	0.26	0.13	0.03
Agriculture	-0.80	-0.94	-0.67	-0.76	-0.77	-0.68
	1995	***1996***	***1998***	***2000***	***2001***	***2001***
Electricity & Fuel	38%	61%	180%	148%	93%	77%
Metallurgy	11%	34%	47%	61%	65%	41%
Chemical & Petro-chemical	6%	6%	48%	43%	18%	21%
Machinery	-21%	-33%	15%	22%	15%	6%
Timber, Paper & Woodworking	-14%	-13%	23%	-3%	1%	-11%
Construction Materials	-9%	-17%	12%	14%	-1%	27%
Light	-13%	-23%	-14%	-23%	-18%	-25%
Food	-22%	31%	5%	-7%	-6%	-12%
Other industries	-19%	7%	21%	30%	14%	3%
Agriculture	-55%	-61%	-49%	-53%	-54%	-50%

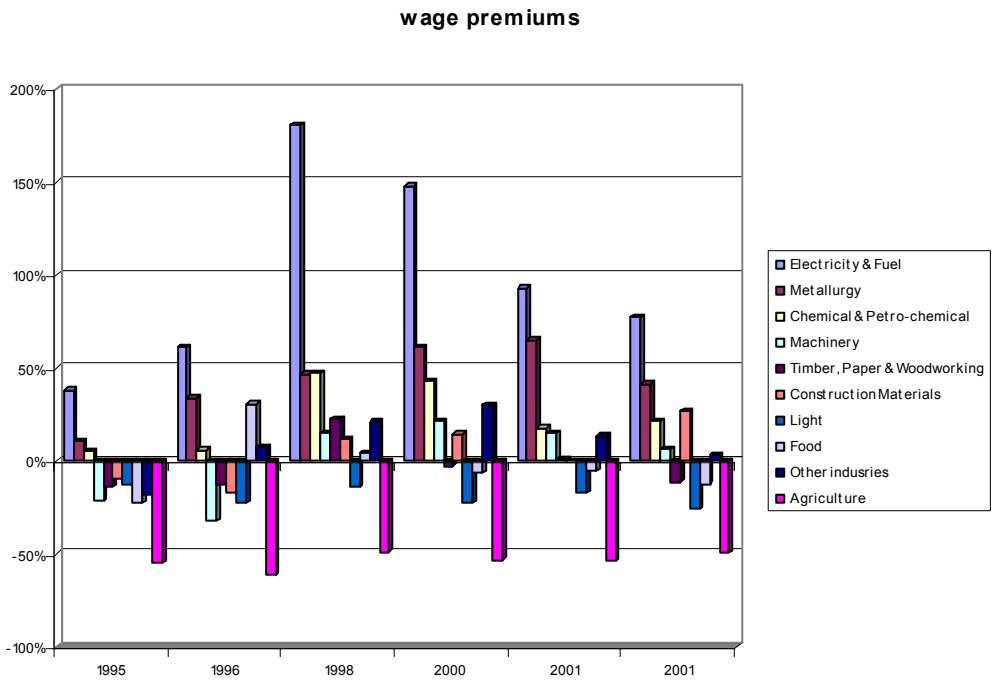
wage premiums
200%
150%
100%
50%
0%
-50%
-100%
1995
1996
1998
2000
2001
2001
Electricity & Fuel
Metallurgy
Chemical & Petro-chemical
Machinery
Timber, Paper & Woodworking
Construction Materials
Light
Food
Other indusries
Agriculture

Table 3.2 Second stage estimation: determinants of wage premiums

	fe, lagged tafiffs	fe, lagged import penetrations	fe, instrumented tariffs
lagged import tariffs	-0.181		-2.546
	[2.77]**		[1.90]
lagged import penetrations		-0.098	
		[2.45]*	
year==1996	0.025	0.034	0.067
	[2.49]*	[3.21]**	[2.45]*
year==1998	0.337	0.346	0.465
	[32.10]**	[28.13]**	[6.33]**
year==2000	0.331	0.335	0.47
	[31.17]**	[29.64]**	[5.88]**
year==2001	0.267	0.271	0.414
	[25.00]**	[24.16]**	[4.93]**
year==2002		0.225	
		[17.82]**	
Constant	-0.097	-0.106	0.13
	[10.31]**	[14.57]**	[1.01]
Observations	1850	2231	1849
Number of ind5d	370	372	370
R-squared	0.59	0.56	

Absolute value of t statistics in brackets
* significant at 5%; ** significant at 1%

Table 4. Static and Dynamic Decomposition of Hourly Wage Differences

	Static Decomposition				***Dynamic Decomposition***			
	1995		**2002**		**Skilled**		**Unskilled**	
	Upper bound (Unskilled' weight)	*Lower bound (Skilled' weight)*	*Upper bound (Unskilled' weight)*	*Lower bound (Skilled' weight)*	*Upper Bound (1995 weight)*	*Lower Bound (2002 weight)*	*Upper bound (1995 weight)*	*Lower bound (2002 weight)*
Total wage differential, %	**23**	**23**	**21**	**21**	**428**	**428**	**434**	**434**
of which								
Attributable to difference in observable characteristics, %	*88*	*62*	*55*	*-16*	*-6*	*-7*	*-3*	*-5*
including								
Age	-6	7	-18	15	-54	-21	-24	23
Age squared	0	0	43	0	87	0	0	0
Gender	-36	-30	-49	65	4	3	6	6
Education	30	23	48	-106	5	5	10	6
Moscow & St. Petersburg	-12	-23	0	7	-5	-26	12	-9
Unemployment level	1	1	5	20	-21	32	30	16
Real GRP per capita	60	78	1	-4	33	73	-10	-18
Dummy for firms with state ownership	8	-8	9	-7	-17	-13	-10	17
Dummy for firms with foreign ownership	0	1	0	0	-1	0	-10	-3
Wage premiums in Fuel & Energy industries	0	2	-3	11	21	4	35	12
Wage premiums in Metal industries	-3	-8	-3	23	3	2	39	11
Wage premiums in Chemical industries	1	-4	0	56	0	-1	6	1
Wage premiums in Machine building	2	1	-1	15	2	-6	20	-2
Wage premiums in Wood processing	2	4	1	9	1	1	4	-2
Wage premiums in Building materials	1	1	-4	37	2	-1	-8	1
Wage premiums in Light industry	1	1	5	0	-3	-1	0	-1
Wage premiums in Food industry	2	4	6	27	2	2	-14	12
Wage premiums in other industries	2	-2	1	15	1	4	-11	-6
Wage premiums in Agriculture	48	52	58	-84	40	42	26	34
Attributable to difference in unobservable characteristics, %								