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Russia's Accession to WTO: Labor Demand Story

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This work is devoted to the analyses of possible impact of Russia's entrance into the World Trade Organization on the labor market. It is originally designed to study potential changes in employment due to changes in economic circumstances, but also concerns issues of labor market liberalization. In the first time the Arellano-Bond GMM estimator and large six-year panel dataset, which covers approximately 14,000 large and medium enterprises were used to estimate labor demand elasticities in Russia. We use the obtained elasticities to estimate the possible changes in labor demand due to expected adjustments in output growth and tariffs. The employment changes are analyzed under the several scenarios of Russia's accession to WTO. Under the output changes predicted by the CGE model after Russia's accession to WTO the employment changes are found to be insignificantly different from zero. We also conclude that Russian labor market has become more competitive, in terms of increase of the labor demand elasticities, than it was earlier reported.

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Данная работа посвящена анализу влияния вступления России во Всемирную Торговую Организацию на спрос на труд. В ней исследуются возможные изменения в занятости вследствие изменения экономической ситуации, а также процесс либерализации рынка российского труда. Впервые на основе использования панельных данных по 14,000 крупных и средних Российских предприятий, с применением метода моментов Ареллано-Бонда, производится оценивание эластичности спроса на труд по выпуску, зарплате и другим переменным. Полученные эластичности используются для расчета изменений спроса на труд в результате изменения объема выпуска или тарифов. При прогнозируемых с помощью модели общего равновесия измененияx выпуска и тарифов после вступления России в ВТО мы не находим отличных от нуля изменений занятости. Кроме того, мы приходим к выводу о том, что российский рынок труда стал более конкурентным, в терминах эластичностей, чем ранее считалось.

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INTRODUCTION

Consequences of Russia's accession to the World Trade Organization are the question of current interest. There is no doubt that Russia's entrance into this world organization would have influence on different aspects of our life. On the one hand, lower trade barriers will probably increase competition at the domestic good markets, and some Russian enterprises will have to compete with foreign firms, which are likely to be more productive. On the other, some Russian enterprises will get an access to the international markets. All these changes at the good markets will modify existing labor market. So Russian firms will have to adjust the number of people employed, to become more flexible to the market signals to survive in the new environment. This changes are likely not to be the same in all regions and sectors of the economy, on the contrary they will depend on the industry and region, in which enterprise operates. Most of studies on labor market in Russia emphasize great regional differences, outline that Russian labor market is highly segmented, with unemployment varies from 5.6% in Moscow to 51.8% in the Ingush republic.[1]

Despite the large number of works devoted to the Russian labor market none of them address directly the question of impact Russia's accession to WTO on the labor demand, i.e. the number of people employed. The most of the existing papers are rather old and cover the period of early 90's or at best years 1996-1997, and pay special attention to the transition period of 1992-1994.

The two basic ways of analyzing labor demand in Russia, exploited in literature, could be outlined. The first one is based on the analyses of micro panel datasets for large and medium firms, rarely for small and MLE together such as in Konings and Lehmann (1999). Most of such studies report the labor demand elasticities at different periods of time and industries. So the labor demand elasticity with respect to output for the Russians firms was close to zero in 1993-1994, while for other transition economies, such as Poland, Hungary, Czech R. and Slovak R. this value varied from 0.3 to 0.8[2]. It increased slightly and in 1996-1997 was equal to 0.18 (Konings and Lehmann,1999), but was still very low compared to other transition.

The second approach is based on the comparisons of industries output and employment changes on the macro level, observed in the transition period.

The comparisons[3] of the unemployment and GDP changes in Russia in 90th show that percentage decrease in domestic product was much higher than increase in unemployment. While the GDP growth rates were fluctuating from –15% in 1992 to approximately 1% in 1997 the unemployment rate was steadily growing, and reached its highest point in 1998. All this facts one again reveals the existing rigidity of Russian labor market.

In this work we follow the first approach. The datasets available now allow us to examine labor demand elasticities in 1997-2000, i.e. in the period when most of the Russian enterprises experienced both

[1] See, for example, Basu, Estrin, Svejnar (1997) or Broadman and Recanatini (2001)
[2] Short run elasticities are reported here.
[3] See, for instance, "Is Russia Restructuring? New Evidence on Job Creation and Destruction" or Vishnevskaya, Gimpelson, Zaharov et.al. (2002) "Survey of Employment in Russia 1991-2000", Moscow, ТЕИС. (Н.Т. Вишневская, В.Е. Гимпельсон, С.В. Захаров, и др. «Обзор занятости в России (1991-2000 гг.)», М.: ТЕИС, 2002-352с.

drop and rise in sales, due to 1998 financial crises. This is one the first works which exploits Arellano and Bond General Method of Moments estimator on the Russian firm-level panel data to provide accurate measurement of labor demand elasticities with respect to output, own wage and to evaluate the influence of trade openness on the number of people employed. The estimation of these elasticities at the firm-level data, which covers 1995-2000 allows us, on the one hand, to answer the question whether Russian firms have become more responsive to the market changes during last years and, on the other, helps us to predict most likely short run changes in labor demand due to Russia's accession to the WTO. It also gives us instruments to examine the issue of how the short-run changes in labor demand will vary across regions and industries.

To answer the question the workers of what industry and in what region are going to lose from trade liberalization or Russia's accession into the World Trading Organization we have to understand in which of the existing industries and regions the competition would rise dramatically and examine labor demand elasticities in them. Such an approach, under the assumption that these elasticities will not change dramatically immediately after Russia's entrance to the WTO, allow us to examine influence of different shocks in output, changes in tariffs on labor demand across different industries and regions.

This work yields three main results. First, during last several years Russian labor market has become more competitive: short-run labor demand elasticities with respect to output and own wage are higher than earlier reported, and inertia of the number of people employed is lower. Second, we find only weak support to the preposition that higher trade barriers lead to the higher number of people employed. Third, under output changes predicted by CGE model after Russia's accession to WTO, the expected variations in employment are insignificantly different from zero.

This paper is organized as follows. In the first part brief literature overview is presented. The second part provides the detailed description of data used in this research. Methodology of the research with special attention to the Arellano and Bond GMM estimator, which is exploited to obtain consistent estimates of the labor demand elasticities, is discussed in Section 3. Section 4 reports the empirical results, provides its interpretation and offers some explanation of interregional and intersectoral differences. Possible changes in employment under several scenarios of output and tariff changes after Russia's accession to WTO are described in the section 5. The Section 6 concludes.

LITERATURE REVIEW

As it was already mentioned above there were many papers devoted to the analyses of changes of the labor markets in response to trade liberalization, various macroeconomic shocks. One may find works speculating on peculiarities of labor markets in transition economies, for instance, papers by Basu, Estrin, Svejnar (1997), or Konings and Lehman (1999). But not only labor markets of economies in transition were examined, so in works of Fajnzylber and Maloney (2001), J. Slaughter (1997) the impact of trade

liberalization on labor demand elasticities is analyzed. In one word most of these works found mixed evidence of trade liberalization on labor market, labor demand elasticities – more on this to follow.

The work I want to start this overview with is one by Basu, Estrin and Svejnar(1997) "Employment and wage behavior of industrial enterprises in transition economies: The cases of Poland and Czechoslovakia". It is based on the analyses of two large panel datasets, which contain information on Poland and Czechoslovakia firms during the transition period. For Czechoslovak firms article reports significant growth of labor demand elasticity with respect to output, from approximately 0.1 in 1989-1990 to 0.35 in 1991-1992. At the same time estimating the identical employment equation for Polish firms authors find that between 1988 and 1993 there was slight decrease in the labor demand elasticity from 0.34 to 0.22. The values of own wage labor demand elasticities, which are also presented in the work, are quite the same for both countries varying from –0.19 to -0.29.

Similar econometric approach was used by Konings and Lehman in the article "Going back to Basics: Marshall and Labor Demand in Russia", however their work was originally designed to test Marshall's rules of derived demand. Estimating labor demand elasticities on the data covering four regions of Russia, the have found that in 1996-1997 the short-run labor demand elasticity with respect to wage was approx. –.06 and 0.17 with respect to output. The corresponding long run labor demand elasticities were equal to –0.26 and 0.75. Trying to clarify the fact why Russian firms exhibit low labor demand elasticities authors claim that Russian product markets seem to be characterized by lower product demand elasticities.

The work by Broadman and Recanatini "Is Russia Restructuring? New Evidence on Job Creation and Destruction" unlike papers discussed above provides a variety of reasons for lower labor demand and wage elasticities and higher rigidities in labor market, despite it mainly focus on job creation and destruction issues. Among explanations of low labor demand elasticities in Russia are such as: the artificial distribution of enterprises, the responsibility of enterprises for providing not only wage, but also social benefits, slow downsizing due to protectionist institutions and policies, constrains for workers to move freely from one region to another, for instance, undeveloped housing market, and at last, soft budget constraints.

David Brown and John Earle in their paper "Gross Job flows in Russian Industry Before and After Reforms: Has Destruction Become More Creative?" emphasize that concentration of producers may influence the labor demand elasticities. Producers located in the regions with the lower concentration of firms, which operates in the same industry, constrain employers to adjust wages, holding the number of people employed constant. On contrary, the firms located in the regions with higher concentration, have more possibilities to reduce real wages, as a response to deteriorated market conditions.

Summarizing main results obtained in the articles mentioned above, it could be sad, that most of them emphasize that transition economies at different stages are characterized by labor market rigidity, which is expressed in low labor demand elasticities, in low correlation between financial indicators and labor demand, weak link between output of whole industries and number of people employed. Segmented labor market, low interregional labor force reallocation, artificial distribution of labor and enterprises, mismatching

of labor demand and labor supply are only some features outlined by most researches, studying Russia's manpower resources.

However, in the papers already discussed above the authors examined labor demand elasticities in transition economies in different periods of time, corresponding to more or less trade openness, not addressing directly the question of trade liberalization impact on them.

From common sense higher tariffs, lower quotas and weak national currency should have negative influence on labor demand elasticities[4]. The following two articles one devoted to emerging economies and the other to the US focus on this issue.

The first one "Labor Demand and Trade Reform in Latin America" by Fajnzylber, and William F. Maloney uses panel datasets for Mexico, Colombia and Chile to investigate the relationship between labor demand and variables, which measures the openness of trade and enterprise performance. They outline several channels of how trade reform might affect own wage elasticities, namely substitutability of inputs, product demand elasticities and the degree of collusion in the industry. Authors use several measures of openness such as Import penetration Index, Export content of production, Tariff rate, Real Exchange Rate, License Coverage and observed competitiveness. Using dynamic panel data model techniques they find ambiguous impacts of changes in measures of openness on the specification, i.e. mixed impact of trade liberalization on own wage labor demand elasticities.

Most of the articles discussed above examined labor demand elasticities changes in developing countries, while Matthew J. Slaughter in working paper "International Trade and Labor-Demand Elasticities" analyze own wage elasticities of both production and nonproduction labor demand in the United States in 1960-1990. Estimating the total labor demand elasticities using industry-level data at the first step, Matthew J. Slaughter then regress these estimates at the set of regressors, measuring trade openness, adding dummy variables to control for time and industry effects. The author concludes that there is no clear effect of trade on the changes in elasticities. One of the explanations of such weak influence of trade on the labor demand elasticities, which could be very important in the case Russia, offered by Slaughter, is that not actual but rather potential trade matters. He argues that factor substitutability increase from wider access to foreign factors of production even if firms do not actually do this.

All these works give us rich material for evaluation of the results obtained in this paper and make interregional and intertemporal comparisons possible.

DATA ISSUES

This section provides necessary information on the data, which have been used in this paper. As it was already stated in the introduction this work was designed to analyze possible changes in employment due to Russia's accession to WTO. To solve this problem, at the first stage we estimate the labor demand equation for the whole sample, regional and industry subsample, then making several necessary assumptions,

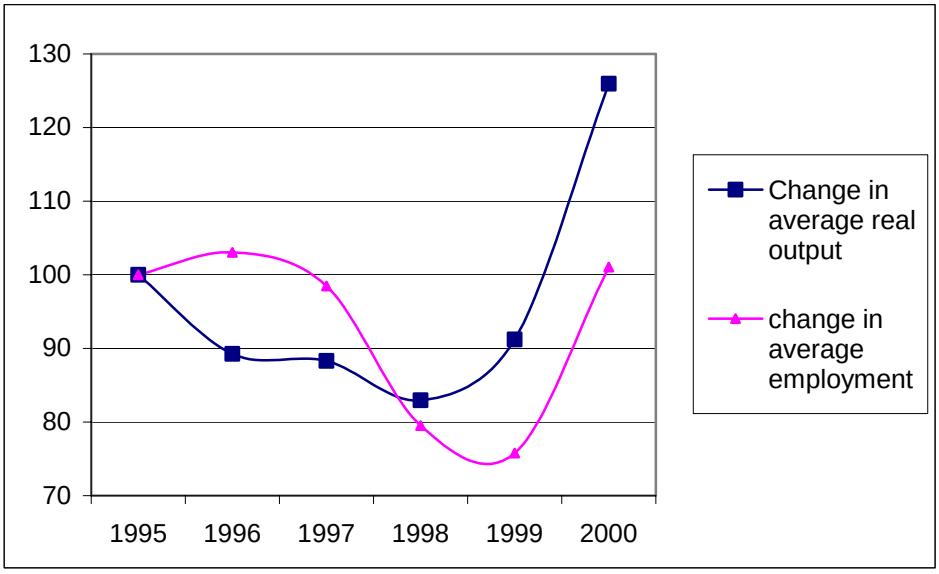
[4] i.e. making labor demand more inelastic

which are described in details later, we calculate possible changes in employment due to various shocks in output and tariffs.

In this research we use firm-level panel data for large and medium enterprises covering period from 1995 to 2000. The available data contains not less than 11000 observations for each of the years of this period and covers eight industries: power industry; metallurgy; petrochemical industry; machinery construction; timber and woodworking industry; construction materials industry; light industry; food industry. The enterprises presented in this dataset are located in all economic regions of the Russian Federation. The source of this data are enterprises balance sheets from Goskomstat[5].

From this dataset we obtain data for the sales of the firm, wage fund and average number of people employed in each of the years. The data for sales and wage funds are deflated by the industry specific producer price index. After that the real average wage at each enterprise is calculated by dividing the wage fund on the average number of people employed during the year. The Table 1 provides methodology of construction and detailed descriptive statistics for real output, real average wage per employee and number of people employed variables.

The Graph 1, given below describes changes in mean real output and mean number of people employed for the whole sample in 1995-2000 (1995=100%).



Even without paying detailed attention to the description statistics it could be seen that in last three years the mean employment and mean real output exhibited the unidirectional motion, which could be interpreted as the decrease in market rigidity.

To take into account the regional differences the Herfinfal-Hershman index is used as a proxy to the monopolistic power of the enterprise at the local labor market. This index is calculated on the basis of data for output of each firm. It is estimated in each region and in each 3-digit OKONH industry separately.

[5] As there was a denomination in 1998, and taking into account possible misprints in the data, we control it for such a kind of mistakes, treating sharp rises or drops in variables as an evidence of error.

The other large sources of data were two Goskomstat publications: “Russian Regions 2001” and “Russian Statistical Yearbook 2001”. From these publications we have obtained data for unemployment level in the regions, gross regional product per capita, industrial output index, regional average wage and regional consumer price index. As gross regional product per capita and average wage in the regions are reported in current prices, they were deflated by the regional CPI.

Using all the available data we have arranged it in the following set of regressors:

- the real output of the enterprise
- the real average wage at the enterprise
- the unemployment level in the region
- the industrial output index
- the average wage in the region
- the GRP in region/GRP in Russian Federation
- the Herfinfal-Hershman index

The Gross Regional Product in the region divided by Gross Regional Product in Russian Federation could be treated as proxy for regional economy size and is likely to have positive impact on employment. The industrial output index reflects the existing trends, i.e. allow outlining regions with growing or stagnating economies. The average wage in the region reflects the competition for workers from the other enterprises of the region.

Beside the set of the variables specified above, we also include in regression two variables to control for trade openness. The first one is import penetration index, which measures import of goods as a share of total home production. The second is the firm specific tariff level. The principal source of the data on the import tariffs is the Consultant database.

Unlike other variables it is difficult to predict *exante* what impact the tariffs will have on the employment. Higher tariff level or lower import penetration, i.e. more closed economy, on the one hand, because of import substitution could have positive impact on the number of people employed, on the other, in the absence of export orientation policy, protectionist measures could result in lower number of people employed. It also should be recognized that higher tariffs are usually introduced in the poorly developed or stagnating industries, that is why correlation between tariff rate and employment could be negative. It also could be assumed that firms do not react immediately on the changes in trade openness. Taking it all into account we include in the model the one year lagged values for the tariffs rather than current ones.

METHODOLOGY

Having collected all this data we use it to estimate the following specification of labor demand equation:

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

where $u_{i,t} = \mu_i + \upsilon_{i,t}$, $L_{i,t}$ – is the number of workers employed at the enterprise i at period t, $Q_{i,t}$ – sales of the enterprise i during the year t, and $W_{i,t}$ – an average wage at the enterprise the year t, X – is a set of other variables, d_t – time dummies.

In our case X contains such regressors as tariffs, import penetration index, unemployment level, GRP in Region/GRP in the Russian Federation, industrial output index, real regional average wage, HHI.

This is a standard labor demand equation, which could be obtained by applying Shepard's lemma to the cost function of the profit-maximizing firm. The same labor demand equations have been estimated by Arellano and Bond (1991), Konings and Lehmann(1999), Fajnzylber and Maloney (2001).

Under these notations the short run labor demand elasticity with respect to output is equal to $\frac{\partial \ln(L_{i,t})}{\partial \ln(Q_{i,t})} = \alpha_2$ and to $\frac{\partial \ln(L_{i,t})}{\partial \ln(W_{i,t})} = \alpha_3$ with respect to own wage. The long run elasticities with respect to output and wage, are calculated under the assumption that $L_i^* = L_{i,t} = L_{i,t-1}$ and are equal correspondingly to $\frac{\partial \ln(L_i^*)}{\partial \ln(Q_{i,t})} = \frac{\alpha_2}{1-\alpha_1}$ and $\frac{\partial \ln(L_i^*)}{\partial \ln(W_{i,t})} = \frac{\alpha_3}{1-\alpha_1}$. The long run elasticities reflect the impact of wage changes and output shocks on the employment after the adjustment of other factors of production. This results in that long run elasticities are expected to be higher in absolute value than the short ones.

By estimating this labor demand equation we may obtain figures for both short run and long run labor demand elasticities with respect to both wage and output and measure the influence of trade openness on the number of people employed. However, this labor demand equation suffers from correlation of regressors with error term as both $L_{i,t}$ and $L_{i,t-1}$ are a function of μ_i. Because of that OLS estimator is biased and inconsistent and the Within (Fixed Effect) estimator is consistent if T is large (>30).[6] To solve the problem of inconsistency we use the Arellano and Bond GMM estimator[7], which is based on applying General Method of Moments on the data after the first difference transformation. Under the assumption that $E(\upsilon_{i,t}) = E(\upsilon_{i,t}\upsilon_{i,s}) = 0$ for t≠s Arellano and Bond have shown that dependent variable lagged two periods or more could be used as a valid instrument. The other explanatory variables, namely their first differences, could also be used as valid instruments if they are strictly exogenous. Estimating the specified labor demand equation we also use robust estimator of the variance-covariance matrix to account for possible cross-section and time series heteroskedasticity. Such estimation techniques allow us to obtain consistent estimates of the model coefficients, however decrease the dataset because the lags have to be used as instruments.

As it was mentioned above Arellano and Bond estimation techniques requires all explanatory variables to be strictly exogenous. Still it is difficult to assume that wage is strictly exogenous in this equation. On the contrary if the number of people employed and the wage are determined in the supply-demand framework the last one is likely to be endogenous, i.e. correlated with an error term. To avoid inconsistency of estimates we employ such additional instruments for the wage as it lags.

[6] For more details see "Econometric Analysis of Panel Data" by Badi H. Baltagi.

Estimating this labor demand equation for the whole sample, for each of 2-digit OKONH industry and for each of economic regions, we obtain labor demand elasticities, with respect to output and wage, and find impact of trade liberalization on the labor demand. Then making an assumption that these elasticities will not change significantly during some period of time after Russia's accession to WTO, we are able to estimate influence of possible output shocks, tariff changes. The previous research papers, dealing with the data for both developing and developed countries, could justify this assumption. So the works by M. Slaughter and Pablo Fajnzylber, described in more details in literature overview, provide no clear evidence of trade liberalization on own wage labor demand elasticities. Then taking it all into account we use the information on the number of people employed in each of 2-dihit OKONH industries, the corresponding elasticities to find possible change in industrial employment under the different scenarios of economy development, which are in more details described in the section 5.

EMPIRICAL RESULTS

This section of the work provides description of the obtained results and offers some explanation and interpretation of these figures.

The Table 2 reports the estimated labor demand elasticities with respect to both own wage and output for the whole economy sample and for each of the nine 2-digit OKONH industries sub-samples. For the entire sample the own wage labor demand elasticity is roughly equal to –0.40 and the labor demand elasticity with respect to output equals approximately 0.22. These estimates are higher in the absolute value than that reported by Konings and Lehmann for the Russian enterprises in 1996-1997, but they are still lower, compared to elasticities, which characterized such transitions as Poland, Hungary and Czech Republic during the transition period[8]. The estimated coefficient at the lagged employment equals 0.24 and is lower than the previous findings for Russia and other transitional economies, which could be partly explained by the decreased inertia of the labor market. Such low coefficient for the lagged employment has also resulted in lower difference between long-run and short-run elasticities. The corresponding long-run labor demand elasticities are equal to 0.3 with respect to output and –0.53 with respect to the own wage. The value for the long-run own wage elasticity is approximately two times higher, while the value of the long-run output elasticity is two times lower than the figures reported by Konings and Lehmann (1999).

Such variables as lagged tariff and import penetration levels, which were included to measure the impact of trade openness on the labor demand, were found to have a significant effect. For the whole sample we have obtained negative impact of trade liberalization on the number of workers demanded by the Russian

[7] Arellano and Bond (1991)

[8] The differences in labor demand elasticities obtained in this work and elasticities reported earlier by other authors could also be partly explained by different econometric techniques and distinctions in the samples. To get more accurate intertemporal and interregional comparisons one would need to estimate labor demand elasticities by Arellano and Bond's GMM estimator for the earlier period of 1993-1997 at the same sample used in the paper. I hope to report the results in the subsequent versions of the paper.

firms. So the coefficient for the lagged tariff level was found to be positive, while the coefficient for import penetration index was negative. From the set of other variables, which were used to control for regional and time differences the Herfindahl-Hirschman index, average wage in the region, Gross Regional Product per capita over the GDP per capita in the whole country and time dummies had significant impact on employment.

All these findings allow us to conclude that on the whole the Russian enterprises became more sensitive to the changes in output, than they were in 1996-1997, which is supported by higher labor demand elasticities, lower inertia, i.e. lower than earlier reported coefficient for lagged employment. However, from the Table 2 it could be seen that labor demand elasticities, coefficients for the lagged employment vary across industries. The own wage short-run labor demand elasticities are insignificantly different from zero in the power, petrochemical, machinery construction industries, but are as high as –0.58 in wood, woodworking, pulp and paper industry and –0.61 in the light industry. The short-run output labor demand elasticities are significantly different from zero in all industries and vary from 0.12 in power and mining industry up to 0.31 in woodworking, pulp and paper industry[9]. These differences could be partly explained by Hicks and Marshall's labor demand rules. The products of light, food, and construction materials industries are likely to face more competitive markets, i.e. markets which could be characterized by higher product price elasticities, that could in turn result in higher own price demand elasticities of inputs. In those industries where we report low own wage labor demand elasticities we observe higher coefficients for lagged employment varying from 0.54 up to 0.55, which once again indicate the labor demand inertia in these industries. At the same time at the industry subsamples we find only weak support to the assumption that trade barriers, such as higher tariffs rates, have positive impact on the labor demand. In all industries except the metallurgy the coefficients at the tariff variable were found to be insignificantly different from zero. The same results have been obtained using the ratio of import goods to the domestic output. Only in the light industry the higher share of imported goods has statistically significant negative impact on the number of people employed. The low correlation between tariff level, import penetration rates and labor demand, which have been found in our regressions, does not mean, however, that trade liberalization does not have impact on the labor demand. The trade liberalization, for instance after Russia's accession to WTO, is likely to cause changes in output of the enterprises, which has significant impact on the demand for inputs.

The estimates of the model also show that enterprises located in the regions with higher unemployment or smaller economy size are likely to have the lower number of people employed. The mixed results were obtained for the industry growth variable. The higher rates of industry growth rates correspond to higher employment in power, metallurgy, machinery construction and food industries, but to lower employment in construction materials and light industry.

[9] Speaking about differences in coefficients between regions and industries we do not mean that they are not statistically identical. Some kind of poolability test is required here. However, the existing first-order autocorrelation of the residuals, which does not cause inconsistency of Arellano-Bond GMM estimator, makes it quite difficult to construct the formal test. This could be the sphere for further research.

The estimation of the labor demand elasticities show that they differ not only across industries, but also across regions. The Table 3 and Diagrams 1,2 give the estimates of the labor demand equation for each of the eleven economic regions and separately for Kalingradskaya Oblast. As in the case with industries all short-run labor demand elasticities with respect to output are significantly different from zero and vary from 0.15 in Povolgskyu Region up to 0.34 in the Severnyu Economic Region. The negative and statistically significant impact of the real wage changes on the labor demand by the firms has been found in all 12 regions analyzed. In the period of 1997-2000 the Severnyu, Vostochno-Sibirkyu Economic Regions and Kaliningradskaya Oblast experienced the highest own wage elasticities, which equals approximately –0.55, while the lowest –0.18 has been obtained for Severno-Zapadnyu Economic Region. From the Diagram 1, which represents the short-run own wage labor demand elasticities, it could be seen that Northeastern parts of the Russian Federation are characterized by the higher elasticities than its Western European parts, except Kaliningradskaya Oblast.

Brown and Earle (2001) explain interregional differences in gross job flows by the differences in the concentration of employers. At the less concentrated markets, i.e. at the markets with higher number of potential employers, the employees have more outside opportunities. This restricts firms to destroy as many jobs as if they had operated at the less competitive markets. However, in our case we obtain the reverse result, i.e. we find higher own wage labor demand elasticities in Northeastern parts of Russia. We also conclude that HHI, which reflects concentration of employers, is not significant in the most of regressions. Other possible sources of interregional differences should be taken into account. Among them we could outline distinctions in the industrial structure and variations in the degree of paternalism of regional authorities across regions[10]. The degree of paternalism in its turn could depend on the political orientation of the political leader of the region and on the level of political system development.

To take this heterogeneity into account more carefully for the Centralnyu Economic Region we estimate the labor demand equation both with the enterprises located in Moscow included and excluded, however, we did not receive any tangible difference in the coefficients.

As far as the tariff and import penetration variables included in the model to measure the trade openness effect on the labor demand, we have found positive impact of higher trade barriers on the number of people employed in several regions. In all cases, except one, when these variables are significant, the coefficient before the tariff level is positive and the coefficient before the import penetration is negative.

The autoregressive coefficient for employment, which reflects the inertia of the labor maker, as in the regressions for industries, is lower than reported in earlier works by Konings and Lehmann (1999) or Arellano and Bond (1991). This once again results in lower differences between short and long run elasticites. The latter are reported at the Diagram2.

Summing up, it could be concluded that Russian labor market is now characterized by higher short-run labor demand elasticites than in the 1996-1997 or in the beginning of the transition period. The estimated

[10] In this sense our result could be driven by less paternalism of regional authorities in the North-East of Russia as compared with the European part.

labor demand elasticites vary not only across industries, but also across regions. The influence of trade openness on the number of people could be outlined only in some industries and regions, however, in most of the cases the higher protection of the national market corresponds to the higher number of workers demanded by the firms, holding other things constant. Except for a few cases higher industry growth rates and bigger size of the regional economy also leads to the higher employment.

The observed growth in labor demand elasticities is consistent with findings for other transition economies, which have shown significant rise in elasticities during the transition period. Taking into account the obtained figures for Russia and values of elasticities for the developed economies we may conclude that process of labor market liberalization is not over.

EFFECT OF RUSSIA'S ACCESSION TO THE WTO

As it has been stated in the previous sections after estimating the labor demand elasticities we have examined possible employment changes due to various shocks in output and tariffs. This part of the work provides the description of scenarios of output and tariff shocks after Russia's accession to WTO, which we have studied, and reports the predicted changes in the employment.

The three major scenarios have been analyzed in the work. The first one assumed 1% drop of output in all industries, the second 3% decrease in output in all industries except power and petrochemical. The third scenario is based on the predictions of Computable General Equilibrium Model calculated by P. Azgaldov, D. Gvozdenko and A. Alekseev.[11]

The output drop of 1% in all industries will result in 0.19-0.29%[12] decrease in employment if no wage adjustment takes place. The 3% shock, under the same assumptions, will lead to 0.47-0.75% drop in the labor demand. Under the shocks in output predicted by the CGE model we have found approximately zero changes in employment.

These predictions are valid under the assumption that no wage adjustment mechanism will take place, i.e. that enterprises are not able to vary the real wage. This could be the case when the enterprise faces the very competitive market for employees or have to deal with trade unions. The Russian labor market, which unlike labor markets of other transitional economies during transition period did not experience sharp rise in unemployment, was characterized by the slow enterprise downsizing process, violation of the wage contracts, such as late payments, wage arrears, honorary holidays, and non-wage compensations. By delaying wage payments under the high inflation enterprises were able to diminish the real wage paid to the workers. This cost-reduction procedure allowed firms not to decrease the number of people employed right after the shocks in output. The own wage labor demand elasticities obtained in this work show that through the real wage reduction enterprises could alleviate the consequences of the tariff reduction and the output decline. In view of that, the reported responses of employment to the output and tariffs changes, under all

[11] The detailed description of the output and tariffs changes, which are used to calculate the employment changes are reported in appendix 1.

three scenarios, are likely to be weakened by the reduction in the real wage. However, in such industries as chemical, metallurgy and machinery construction, where the own wage elasticities are insignificantly different from zero such adjustment requires very sharp decline in the real wage. In other industries, for instance, in light, woodworking, pulp and paper industry, showing high own wage labor demand elasticities the drop in output could be offset by relatively low percentage change in relative wage. On the whole, the one percent drop in output could be compensated by approximately the same decrease in the real wage. With the own wage labor demand elasticities varying across regions, resulting in different possibilities through the wage adjustment, the drop in output will probably cause not the same changes in the real wage across industries. This in its turn will lead to redistribution of the labor force in the economy, but it is the issue for a separate research.

CONCLUSION

This paper analyses the consequences of Russia's accession to the World Trade Organization on the labor demand. It is based on the estimation of the labor demand elasticities with respect to output and own wage. The labor demand equation with additional variables included to control for trade openness and regional diversity, is estimated by the Arellano-Bond GMM estimator on the large firm level panel dataset.

First of all, we find that in 1997-2000 short-run own wage and output labor demand elasticities have grown significantly since the beginning of transition period and are higher than elasticities reported for the period for 1996-1997. At the same time the obtained estimates of autoregressive coefficients are lower than reputed before, which could witness that the rigidity of the Russian labor market has decreased in last years. These estimations also show that labor hoarding has become lower, i.e. the enterprises now are holding less excessive labor than during the preceding transition period. However the existing labor demand elasticities are still low compared to the developed economies, but are approximately equal to the figures reported for transition economies during the transition period. We also conclude that the own wage and output labor demand elasticities vary across regions and industries, once again outlining the existing heterogeneity.

Second, we find that the trade openness has mixed impact on the labor demand. The regressors such as import penetration and tariff level were found to be significant only for some industries and regions. In the most cases, when we have obtained significant influence of trade openness on the labor demand, the higher market protection corresponded to the higher employment. However, these findings do not mean that trade liberalization would influence the number of people employed, because of the possible output changes.

At last, we conclude that under the output shock, which is predicted by the Computable General Equilibrium model, after Russia's accession to the World Trade Organization, the change in employment is insignificantly different from zero. The hypothetical output shock of 1% could result in approximately 0.2% change in employment and even less if the real wage adjustment mechanism is taken into account.

[12] The figures depend on whether long run or short run elasticities are employed in the calculation.

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Table 1. Descriptive Statistics

Year 1997

Variable	Obs	Mean	Std, Dev,	Min	Max
emp	23290	468	1717	8,00	98499
wperemp_d	23290	7,311	8,15	0,015	382,14
outp_def	23290	40495	415931	1,34	33100000
tariff	17778	0,158	0,085	0,000	0,735
ipokpofill	17349	0,216	0,222	0,000	0,998
lnavwage	23287	2,207	0,403	1,120	3,368
unempl_level	23290	11,97	3,41	4,80	58,20
grp_r_rf	23290	0,934	0,583	0,223	4,157
ind_gr	23290	100	5,749	84,00	115,00
HHI	23290	0,096	0,121	0,009	1,000

Year 1998

Variable	Obs	Mean	Std, Dev,	Min	Max
emp	24208	378	1528	8,00	98036
wperemp_d	24208	7,89	12,66	0,03	1149,85
outp_def	24208	38068	444489	1,01	31100000
tariff	17633	0,162	0,086	0,013	0,783
ipokpofill	17181	0,200	0,215	0,000	0,994
lnavwage	24198	1,758	0,400	0,716	2,981
unempl_level	24208	13,41	3,89	4,30	50,90
grp_r_rf	24208	0,953	0,610	0,207	3,817
ind_gr	24198	97,51	5,271	74	116,00
HHI	24208	0,100	0,123	0,009	1,000

Year 1999

Variable	Obs	Mean	Std, Dev,	Min	Max
emp	24568	360	1453	8,00	98662
wperemp_d	24568	7,44	12,94	0,02	879,58
outp_def	24568	41835	543481	1,06	49500000
tariff	17414	0,167	0,100	0,021	0,814
ipokpofill	16977	0,176	0,204	0,000	0,991
lnavwage	24554	1,794	0,408	0,627	2,973
unempl_level	24568	12,99	3,83	5,60	51,80
grp_r_rf	24568	0,951	0,641	0,177	3,870
ind_gr	24568	113,51	7,616	82	171,00
HHI	24568	0,103	0,120	0,010	1,000

Table 1. Descriptive Statistics

Year 2000

Variable	Obs	Mean	Std, Dev,	Min	Max
emp	14789	480	1837	8,00	100005
wperemp_d	14789	7,43	8,88	0,05	417,82
outp_def	14789	57758	688252	1,049	53200000
tariff	11678	0,171	0,129	0,023	1,289
ipokpofill	11390	0,184	0,199	0,000	0,994
lnavwage	14785	1,943	0,391	0,885	3,143
unempl_level	14789	10,45	3,46	3,80	32,00
grp_r_rf	14789	0,905	0,764	0,231	4,43
ind_gr	14789	112,52	6,71	101	145,00
HHI	14789	0,131	0,143	0,014	1,000

NOTATIONS

emp - the number of people employed

wperemp_d - real wage per worker

outp_def - real output

tariff- tariff level

ipokpofill - import penetration by firms

lnavwage - real average wage in the region, deflated by CPI

unempl_level - level of unemployment un the region

grp_r_rf - gross Domestic product in the region over the GDP in Russia

ind_gr - industrial output index

HHI -Herfinfal-Hershman index

NOTES

wperemp_d=ln{(wage fund of the enterprise/number of people employed)/(PPI) }

Table 2	The whole sample		Power	Metallurgy	Petrochemical	Machinery	Timber	Const. Materials	Light	Food	Other
OKONH 2 digit			**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
Dependent->	lnemp	lnemp	lnemp	lnemp	lnemp	lnemp	lnemp	lnemp	lnemp	lnemp	lnemp
lnemp(-1)	**0.238**	**0.263**	**0.548**	**0.276**	**0.540**	**0.547**	**0.020**	**0.259**	**0.210**	**0.195**	**0.247**
	(8.12)***	(9.46)***	(3.71)***	(2.11)**	(4.29)***	(11.07)***	(0.30)	(2.50)**	(2.55)**	(4.31)***	(2.94)***
lnwperemp_d	**-0.401**	**-0.372**	**0.125**	**-0.080**	**-0.107**	**0.005**	**-0.576**	**-0.265**	**-0.609**	**-0.175**	**-0.311**
	(16.00)***	(16.10)***	(1,14)	(1.06)	(1.11)	(0.05)	(5.53)***	(2.99)***	(6.36)***	(6.87)***	(5.82)***
tariff_l	**0.717**	**0.651**	**-----**	**0.880**	**0.254**	**-0.426**	**1.422**	**2.618**	**-0.393**	**0.014**	**0.366**
	(5.32)***	(4.58)***	**-----**	(1.71)*	(0.34)	(0.37)	(0.97)	(1.01)	(0.61)	(0.18)	(1.33)
lnoutdef	**0.227**	**0.221**	**0.119**	**0.177**	**0.144**	**0.146**	**0.312**	**0.214**	**0.215**	**0.186**	**0.167**
	(34.11)***	(35.10)***	(6.18)***	(6.86)***	(6.22)***	(7.41)***	(15.88)***	(11.09)***	(11.43)***	(20.94)***	(10.42)***
ipokpofill	**-0.119**	**-----**	**-----**	**-0.154**	**-0.094**	**-0.033**	**-0.033**	**0.082**	**-0.977**	**-0.024**	**0.013**
	(4.73)***	-----	**-----**	(1.07)	(1.02)	(0.60)	(0.12)	(0.76)	(5.07)***	(0.65)	(0.28)
HHI	**-0.058**	**-0.055**	**-0.145**	**-0.173**	**0.027**	**0.014**	**0.320**	**-0.005**	**-0.030**	**-0.057**	**-0.034**
	(2.08)**	(2.02)**	(1,19)	(2.02)**	(0.25)	(0.18)	(1.69)*	(0.08)	(0.25)	(0.87)	(0.65)
lnavwag	**0.091**	**0.082**	**-0.107**	**-0.187**	**-0.004**	**-0.046**	**0.007**	**0.116**	**0.251**	**-0.017**	**0.024**
	(4.34)***	(3.99)***	(1,03)	(1.24)	(0.03)	(0.64)	(0.11)	(1.80)*	(3.97)***	(0.53)	(0.57)
unempl_level	**-0.001**	**-0.001**	**-0.004**	**-0.001**	**-0.003**	**0.001**	**-0.001**	**-0.002**	**-0.006**	**0.001**	**-0.001**
	(1.56)	(1.64)	(1,76)*	(0.16)	(0.61)	(0.52)	(0.23)	(1.14)	(2.98)***	(1.06)	(0.89)
grp_r_rf	**0.043**	**0.043**	**0.08**	**0.038**	**0.095**	**-0.045**	**0.058**	**0.066**	**0.059**	**0.054**	**0.016**
	(4.31)***	(4.42)***	(1,33)	(0.64)	(2.06)**	(1.68)*	(1.26)	(2.73)***	(1.94)*	(3.27)***	(0.70)
ind_gr	**0.000**	**0.000**	**0.001**	**0.004**	**-0.000**	**0.001**	**0.000**	**-0.001**	**-0.001**	**0.001**	**0.000**
	(0.81)	(0.97)	(1,87)*	(3.48)***	(0.59)	(2.48)**	(0.27)	(1.73)*	(3.47)***	(2.73)***	(1.07)
year1998	**0.093**	**0.093**	**0.012**	**0.074**	**0.040**	**0.016**	**-0.004**	**0.123**	**0.005**	**0.051**	**0.039**
	(7.90)***	(7.94)***	(0,21)	(0.86)	(0.61)	(0.27)	(0.09)	(3.18)***	(0.13)	(2.98)***	(1.60)
year1999	**0.074**	**0.085**	**0.023**	**0.138**	**0.050**	**0.048**	**-0.037**	**0.172**	**-0.132**	**0.053**	**0.005**
	(5.38)***	(6.06)***	(0,38)	(1.39)	(0.64)	(0.46)	(0.33)	(3.58)***	(1.97)**	(2.39)**	(0.15)
year2000	**0.127**	**0.139**	**0.065**	**0.352**	**0.101**	**0.085**	**0.011**	**0.182**	**-0.194**	**0.126**	**0.036**
	(8.22)***	(8.62)***	(1,07)	(3.26)***	(1.18)	(0.57)	(0.07)	(3.54)***	(2.15)**	(5.46)***	(1.02)
_cons	**-0.080**	**-0.080**	-0.062	**-0.160**	**-0.046**	**-0.056**	**-0.102**	**-0.071**	**0.010**	**-0.067**	**-0.041**
	(15.95)***	(15.17)***	(3.84)***	(6.21)***	(1.92)*	(1.06)	(2.03)**	(4.69)***	(0.30)	(11.07)***	(4.51)***
Number of obs	53817	55136	3393	899	1330	9527	6645	6095	6537	14852	6678
Number of groups	17562	17999	1260	317	407	3202	2360	1954	2128	4692	2085

Notes **1. Arellano-Bond GMM estimator is used**

2. Tariff and Wage are treated as endogenous

3. * - significant at 1%, ** - at 5%, * - at 10% level**

Notations **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

	Severnyu	Severo-Zap	Centralnyu	Cent/Mosc	Centr-Cherno	Uralskyu	Zap-Sibirsk	Vos-Sibirsk	Dalnevost	Volg-Vyat	Povolgskyu	Severo-Kavk	Kalinigr
Dependent------->	lnemp	lnemp	lnemp	lnemp	lnemp	lnemp	lnemp	lnemp	lnemp	lnemp	lnemp	lnemp	lnemp
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_l	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)	-----
_cons	-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)*
Number of obs	2647	2528	11018	9758	3564	7380	5362	3195	2358	4365	5955	5073	372
Number of groups	883	840	3474	3061	1093	2398	1766	1059	910	1405	1992	1620	122

Notes **1. Arellano-Bond GMM estimator is used**

2. Tariff and Wage are treated as endogenous

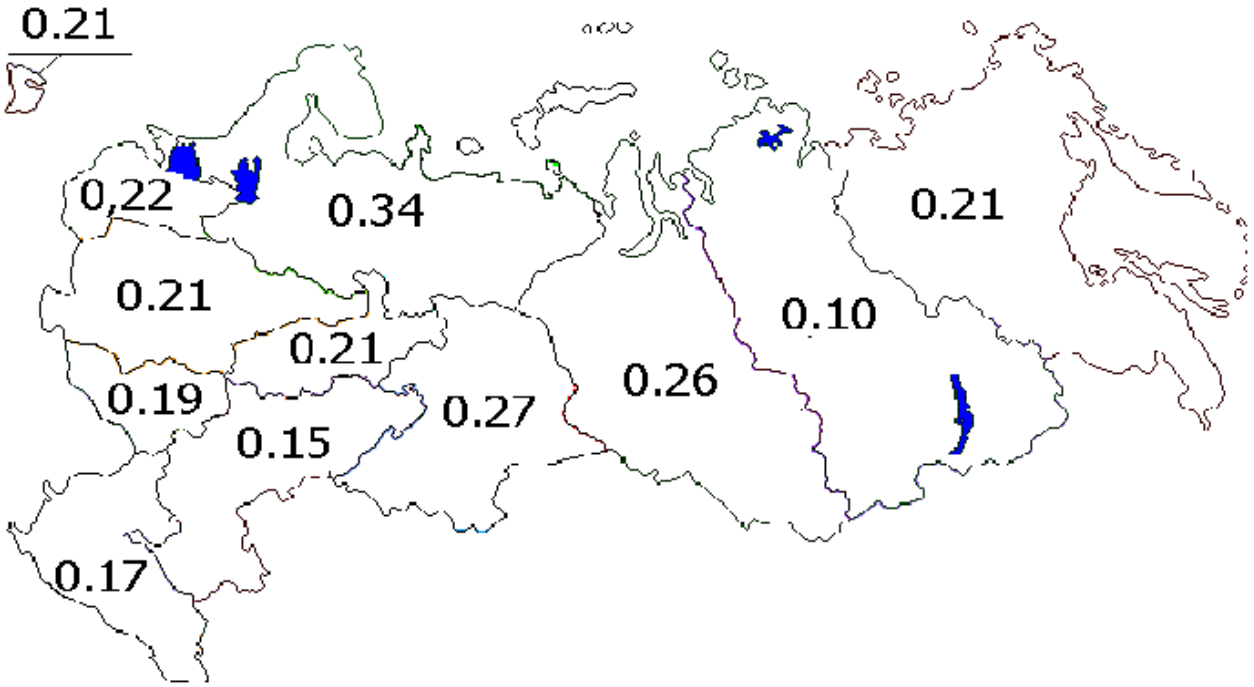
3. * - significant at 1%, ** - at 5%, * - at 10% level**

Notations **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

DIAGRAM 1 - REGIONAL VIEW

1. The short-run output labor demand elasticities



2. The short-run own wage labor demand elasticities.

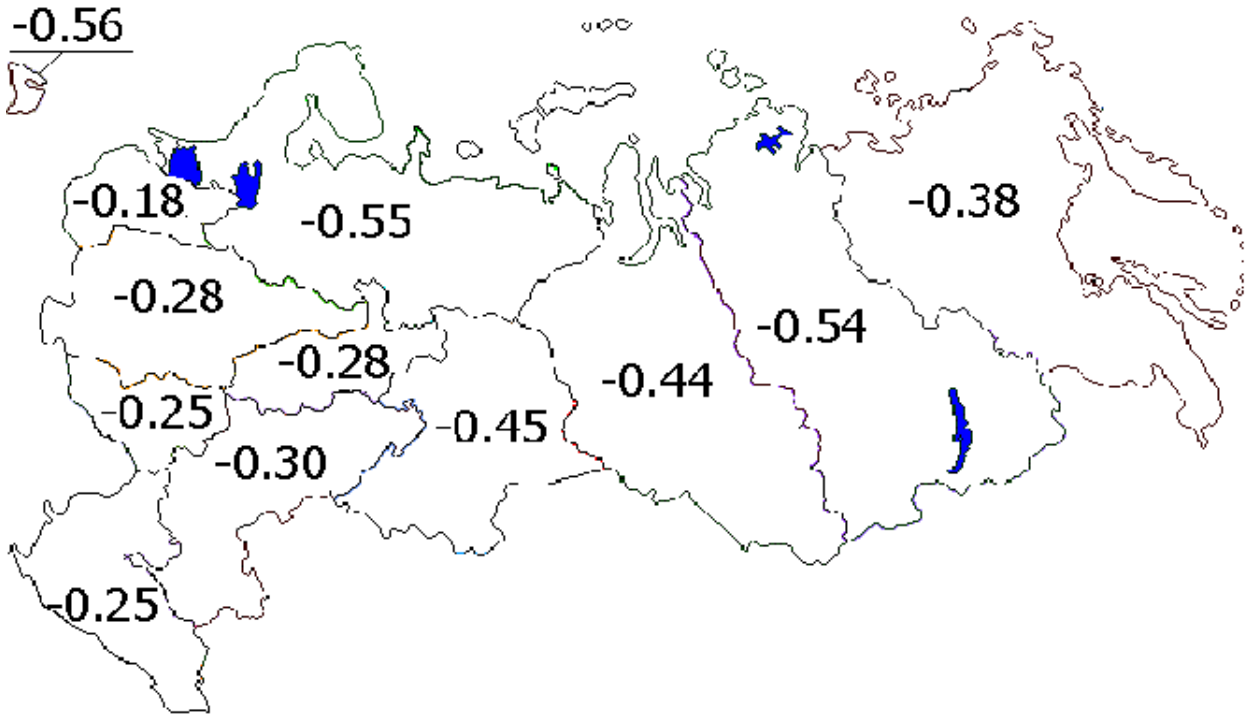
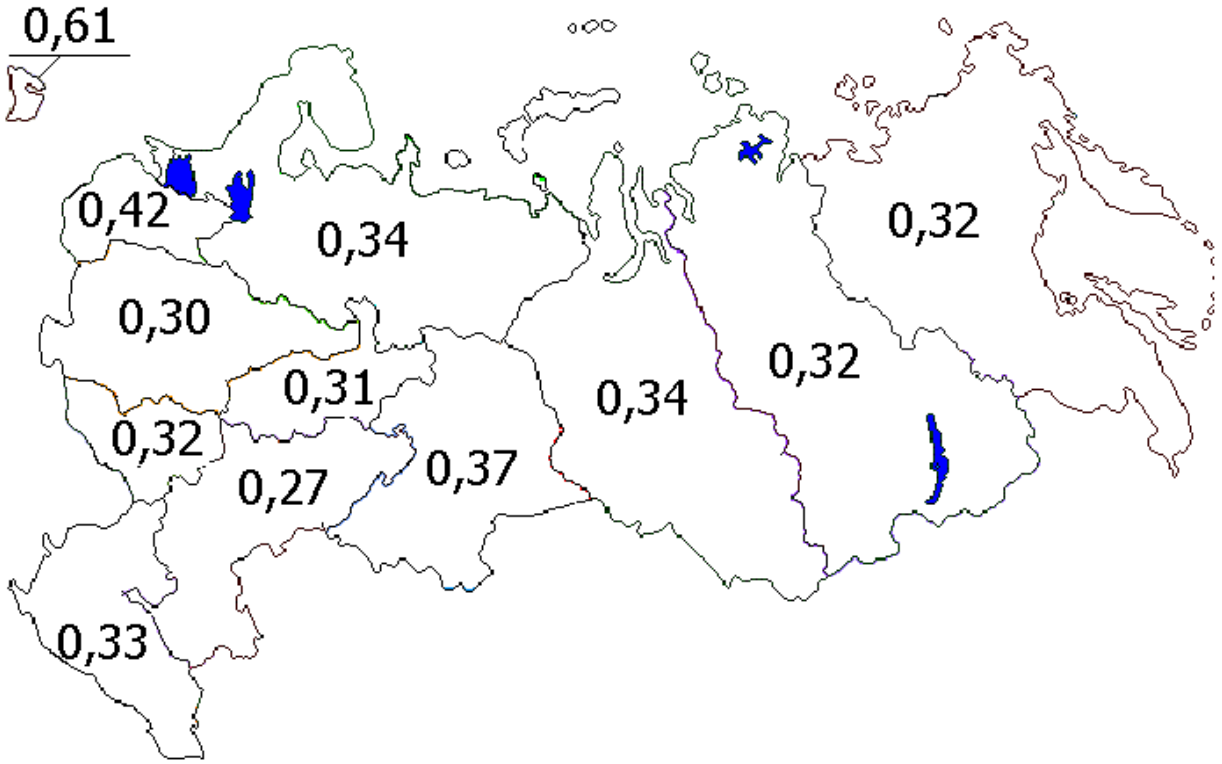
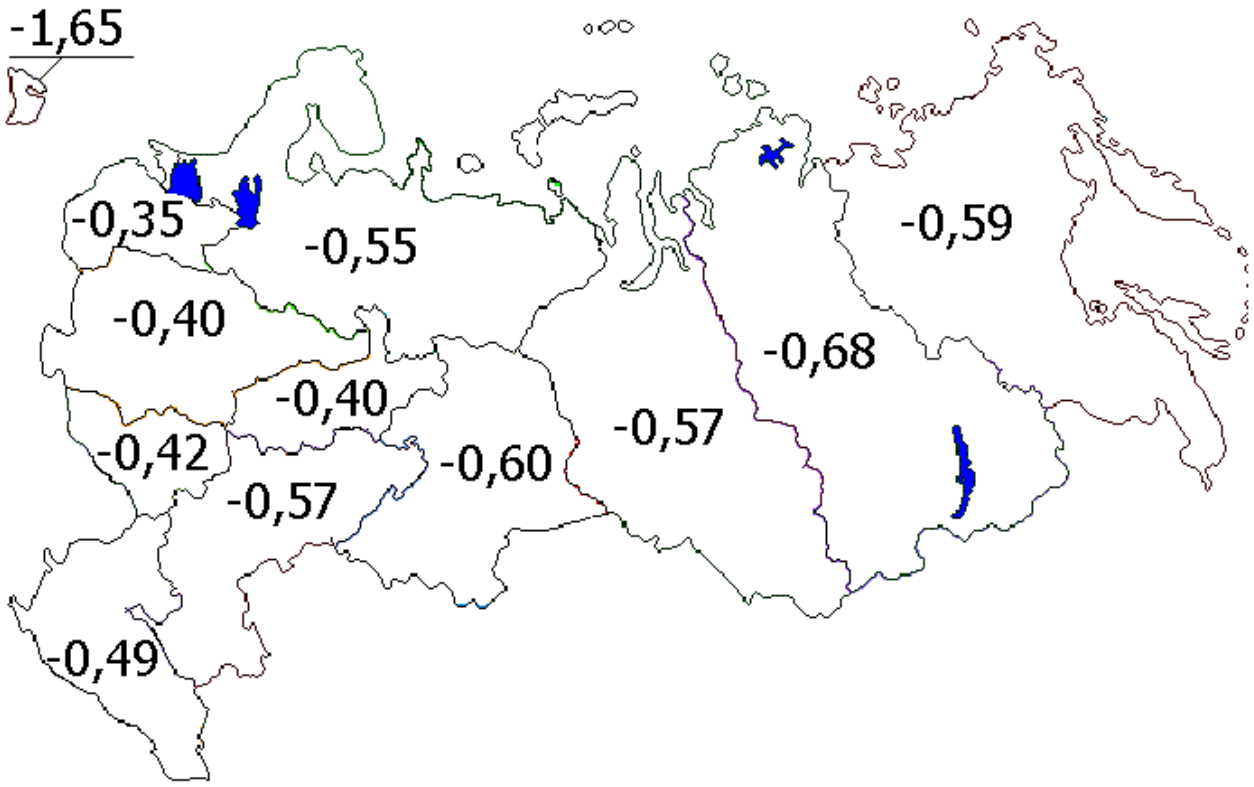


DIAGRAM 2 - REGIONAL VIEW

3. The long-run output labor demand elasticities



4. The long-run own wage labor demand elasticities.



Appendix 1

This appendix provides information on the scenario, which is used to estimate the possible changes in employment after Russia's accession to the WTO To make prediction of alterations in employment we use the results of Computable General Equilibrium model which have been constructed by P. Azgaldov, D. Gvozdenko and A. Alekseev

This CGE model analyses adjustments in output, trade and consumption after the European Union enlargement and Russia's accession to the WTO It assumes the following decrease in Russian applied tariffs:

		Applied	Proposed
1	Electricity and heat	5	5
2	Oil	5	5
3	Gas	5	5
4	Other Fuels	5	5
5	Ferrous Metallurgy	8,41	8,22
6	Nonferrous Metallurgy	8,67	8,56
7	Chemical Industry and Oil Refinery	8,82	7,28
8	Machinery and Equipment	10,78	9,19
9	Light industry	15,19	13,76
10	Food-processing Industry	9,79	9,22
11	Other Industries	11,74	9,78
12	Agriculture and Services and Forestry	10,7	10,48
13	Construction	0	0
14	Retail Trade and Catering	0	0
15	Transport & Communications	0	0
16	Other Services	20	0
17	Finance, Banking and Insurance	25	0

Under these assumption on tariff reduction and on the condition of the EU enlargement the following output changes were predicted by this CGE model:

	Industry	% change
1	Electricity and heat	-0,011
2	Oil	0,053
3	Gas	-0,016
4	Other Fuels	0,035
5	Ferrous Metallurgy	0,042
6	Nonferrous Metallurgy	0,04
7	Chemical Industry and Oil Refinery	0,037
8	Machinery and Equipment	0,003
9	Light industry	0,003
10	Food-processing Industry	-0,009
11	Other Industries	0,021

The described changes in output and tariffs were exploited to calculate variations in employment thought the estimates labor demand elasticities.

Source: Paul E. Azgaldov "Russia's WTO Accession: Trade and Welfare Effects Estimation With CGE Modeling", NES Master Thesis (2003)