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Regional Household and Poverty Effects of Russia's Accession to the World Trade Organization

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Abstract

This paper develops a seven-region comparative static computable general equilibrium model of Russia to assess the impact of accession to the World Trade Organization on these seven regions (the federal okrugs) of Russia. In order to assess poverty and distributional impacts, the model includes ten households in each of the seven federal okrugs, where household data are taken from the Household Budget Survey of Rosstat. The model allows for foreign direct investment in business services and endogenous productivity effects from additional varieties of business services and goods, which the analysis shows are crucial to the results. National welfare gains are about 4.5 percent of gross domestic product in the model, but in a constant returns to scale model they are only 0.1 percent. All deciles of the population in all seven federal okrugs can be expected to significantly gain from Russian World Trade Organization accession, but due to the capacity of their regions to attract foreign direct investment, households in the Northwest region gain the most, followed by households in the Far East and Volga regions. Households in Siberia and the Urals gain the least. Distribution impacts within regions are rather flat for the first nine deciles; but the richest decile of the population in the three regions that attract a lot of foreign investment gains significantly more than the other nine representative households in those regions.

This paper—a product of the Trade Team, Development Research Group—is part of a larger effort in the department to assess the impact of trade and foreign direct investment liberalization in business services on income growth and poverty reduction. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org. The author may be contacted at dtarr@worldbank.org.

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I. Introduction

Russia is the largest economy in the world that is not a member of the World Trade Organization (WTO), and, as of early-2008, it was among 29 countries in the long process of negotiating its accession to the WTO. Russia applied for membership in the General Agreement on Tariffs and Trade (GATT) in June 1993 and the GATT Working Party was transformed into the World Trade Organization Working Party in 1995. By early-2008, Russia had reached bilateral agreements with almost all nations on its WTO Working Party and was moving on to focus on the "multilateral" issues (including agricultural subsidies and intellectual property enforcement); but a significant dispute with Georgia remained on the issue of customs posts between the countries.[3]

In response to a request from the Government of Russia to the World Bank for a quantitative assessment of the impact of WTO accession on poverty and household effects in Russia, Rutherford and Tarr (forthcoming) examined the household and poverty effects in a national model. But since that paper was based on a national model, it assumed that factor prices were the same throughout Russia. Research has shown, however, that there are significant differences in incomes between the richest and poorest regions of Russia (for details, see World Bank, 2005). The richest Russian regions are 67 times richer than the poorest Russian regions in nominal terms and 33 times richer when price differences between the regions are taken into account. The richest regions include the European North, Moscow and the resource rich regions of Siberia and the Far East. The poorest regions include the North Caucuses, Southern Siberia and Central Russia. Persons with the same characteristics in terms of education, employment status and urbanization are three times more likely to be poor in Dagestan or Tuva Republic compared with the rich Tumen oblast or Moscow city. Clearly, to assess the poverty consequences of a major policy change like WTO accession, which is expected to impact factor incomes significantly, it is necessary to construct a model with different regions of Russia so as to allow regional differences in factor prices.

Recognizing the vast geographic and income differences of the regions, Rutherford and Tarr (2006) have assessed the impact of Russian WTO accession through the use of a a model of the regions of Russia. That model, however, contained only one representative household in each region. Despite the large differences in incomes between the regions of Russia, 90 percent of the income inequality in Russia is due to within region inequality and only 10 percent is due to between region differences in incomes (World Bank, 2005, p.xix). Thus, for an assessment of the poverty effects of WTO accession, it is necessary to incorporate the within region income diversity as fully as possible.

In this paper we develop a seven region, comparative static, computable general equilibrium model of Russia for the purpose of assessing the impacts of Russian WTO accession on households and poverty. We choose as our seven regions the seven Russian federal "okrugs." These Russian federal "okrugs" are aggregations of contiguous Russian legal jurisdictions within their geographic boundaries. We list the seven federal okrugs and the Russian jurisdictions that comprise them in table 2. Further details on the federal okrugs, including a map of Russia decomposed into the seven federal okrugs and discussions of the legal jurisdictions that comprise the okrugs may be found on Wikepedia.[4]

In order to assess impacts on poverty and income distribution we develop a model with ten representative households in each of the seven federal okrugs. Our information from households is drawn from the relatively new and now publicly available survey of 44, 529 Russian households, known at the NOBUS survey.

Jensen, Rutherford and Tarr (2007) have shown that, regarding Russian WTO accession, a model which allows foreign direct investment in business services and endogenous productivity effects from liberalization of goods and services via the Dixit-Stiglitz-Ethier productivity effect from greater varieties produces estimated welfare gains many times larger than a constant returns to scale (CRTS) model. A CRTS model will capture only the resource allocation efficiency gains from trade in goods, as well as any terms of trade gains. Given that insight, we regard it as essential to go beyond a multi-regional model of Russia based on constant returns to scale. Our model allows foreign direct investment in the business services sectors in a multi-region model of a small open economy and Dixit-Stiglitz endogenous productivity effects from liberalization of foreign direct investment in services plays a role in the interpretation of results.[5] More specifically, the structure of the model for each region of Russia is the

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[3] See Tarr (2007) for a summary of issues, accomplishments and remaining challenges for Russian WTO accession.
[4] See http://en.wikipedia.org/wiki/Federal_districts_of_Russia#Central_Federal_District.

[5] Markusen, Rutherford and Tarr (2005) developed a stylized model where foreign direct investment is required for entry of new multinational competitors in services, but they did not apply this model to the data of an actual economy and there was no foreign direct investment in the initial equilibrium of the model. Brown and Stern (2001) and Dee et al. (2003) employ three sector stylized multi-country numerical models with many of the same features of

same productive structure as in the national model of Russia of Jensen, Rutherford and Tarr; but we have constructed the regional models based on the data for the regions, including adding federal okrugs and we have incorporated data on foreign direct investment in business services in the regions of Russia.

The exogenous changes that we model as part of Russian WTO accession are (i) liberalization of barriers against multinational providers of business services; (ii) a 50 percent reduction in tariffs on goods; and (iii) an improvement in market access for Russian exports to WTO member country markets. The key messages from this paper are that it is the liberalization of barriers against multinational providers of business services that we expect to provide the greatest gains to from WTO accession, and that there is a lot more at stake in WTO accession for Russia (and we believe in trade and FDI liberalization more generally) than the Harberger triangle gains from resource reallocation effects due to tariff reduction or from the terms of trade gains due to improved market access. Liberalization of barriers against multinational providers of business services results in additional varieties of business services. Through the Dixit-Stiglitz-Ethier endogenous productivity mechanism, this leads to welfare gains that dominate the results. A traditional constant returns to scale model is not be able to capture the productivity effects of trade or FDI liberalization in services. To demonstrate this we simulate Russian WTO accession in a constant returns to scale model and find that the gains are about 4-5 percent of the estimated gains in our model with imperfect competition and FDI liberalization in services.

Partly our results derive from the fact that estimated barriers against multinational service providers are higher than tariffs on goods, but the significant cost share of business services in the production of manufacturing and agriculture is also important. At the regional level, regions vary significantly in their gains based on their capacity to attract additional multinational providers of business services. Thus, while improving its offer to foreign services providers within the context of the GATS has been one of the most difficult aspects of Russia's negotiation for WTO accession, our estimates suggest that the most important component of WTO accession for Russia and its regions in terms of the welfare gains is liberalization of its barriers against FDI in services sectors.

More specifically, our central estimates are that the overall gains to Russia from WTO accession are 8.1 percent of Russian consumption (or 4.5 percent of GDP). By region, the welfare gains as a percent of GDP range from 3.8 and 3.9 percent in the cases of Siberia and the Urals, to 5.6 percent in the Northwest region.

Markusen, Rutherford and Tarr. Results in the Brown and Stern paper depend crucially on capital flows between nations, with capital importing nations typically gaining and capital exporting nations typically losing. In Dee et al., (2003), multinationals are assumed to capture the quota rents initially. So results of liberalization depend crucially on the fact that liberalization transfers rents to capital importing countries.

We observe that the reduction in barriers to FDI alone results in an improvement in Russian welfare on average across regions of 4.0 percent of of GDP. The other exogenous changes that we assume to be part of the WTO accession scenario are improved market access for Russian exporters and Russian tariff reduction. Together these contribute to an improvement in Russian welfare by 0.8 percent of consumption or 0.5 percent of GDP. Thus, over 85 percent of the gains derive from the reduction in barriers to FDI in services.

In the sensitivity analysis, we also incorporate data on the investment potential of regions based on the investment potential rankings of Expert RA. The principal result is that the estimated gains for Volga increase. Despite smaller estimated gains in this scenario, Far East and Northwest are still estimated to receive above average gains. The results suggest that the gains for a region could vary considerably depending on whether it succeeds in creating an atmosphere conducive to investment.

Returns to skilled labor, unskilled labor and mobile capital all increase at about the same rates, although at different rates across our seven regions. Consequently, within each region, the gains of households tend to be rather similar, although they differ between regions. Owners of specific capital used by multinational service providers gain substantially more than owners of other factors, so the richest households in the regions which are able to attract a lot of foreign direct investment (Northwest, Volga and Far East) gain the most.

In goods sectors, we estimate that the ferrous metals, non-ferrous metals and chemicals sectors are the goods sectors that expand in the regions where these are important sectors. These are the sectors that export the most intensively. They also experience a terms of trade gain from improved treatment in antidumping cases. These sectors are relatively important in the Central, Urals, Volga and Siberia regions. We estimate that food, construction materials and other goods producing sectors will contract throughout the various regions. These sectors export relatively less and are relatively highly protected.

The paper is organized as follows. In section II, we describe the model and the most important data. In section III, we describe and interpret the policy scenarios and quantitatively assess the sensitivity of the results to parameter assumptions. Many of the scenarios we describe are decomposition scenarios that allow us to assess the relative importance of the various aspects that we consider important to Russian WTO accession. We provide sensitivity analysis in section IV and briefly conclude in section V.

II. Overview of the Model and Key Data

Production and Geographic Structure

There are 30 sectors in the model; these are listed in table 1. There are three types of sectors: perfectly competitive goods and services, imperfectly competitive goods sectors and imperfectly competitive business services sectors.

The geographic decomposition of our model of Russia is shown in table 2. In the first instance, we obtain data from the publication the *Regions of Russia* by Rosstat on 88 regions of Russia. The 88 regions have several names in Russian; the most common legal jurisdiction is referred to in Russian as an "oblast." Oblasts are analogous to states in the United States or provinces in Canada. But there are also jurisdictions known as territories, federal cities, autonomous districts and an autonomous region. Since we want to use the term "region" for another purpose in the model, we use the Russian term "oblast" for all of these 88 geographic areas,[6] with the understanding that they are not all oblasts in the Russian sense of the term.

The Russian Federation under President Putin has established seven federal okrugs that are aggregations of contiguous oblasts. The mapping of oblasts into federal okrugs is also shown in table 2. In this paper, we shall analyze effects at the level of the federal okrug. Descriptive data on value-added, exports and imports by sector by federal okrug are presented in tables 3-11.

We assume that firms and sectors operate at the okrug level, primary factors of production are not able to move between okrugs. Wage rates and the rental rates on capital adjust in each federal okrug so that there is no change in aggregate employment or use for any primary factor of production.

Russia as a whole, represented as an aggregate of the federal okrugs, must satisfy a typical economy-wide balance of the trade constraint. The real exchange rate adjusts to assure that any change in the aggregate value of regional imports from the rest of the world, is matched by an equal change in the value of aggregate exports to the rest of the world. Each region also has a balance of trade constraint so that any change in the value of imports (either from the rest of the world or another federal okrug within Russia) is matched by an increase in the value of exports.

[6] Several of the territories are part of oblasts, so it was necessary to adjust the data to avoid double counting of the territories.

We assume a nested CES structure of demand. Since this implies that the structure of demand is both homothetic and weakly separable, consumers and firms in a representative federal okrug r employ multiple stage budgeting for all goods.

Product Variety and Endogenous Productivity in Goods and Services

Winters et al. (2004) summarize the empirical literature by concluding that "the recent empirical evidence seems to suggest that openness and trade liberalization have a strong influence on productivity and its rate of change." A typical constant returns to scale model, however, will exhibit only very small productivity gains from trade and FDI liberalization. As Romer (1994) has argued, product variety is a crucial and often overlooked source of gains to the economy from trade liberalization. In our model, it is the greater availability of varieties that is the crucial feature that results in productivity growth.[7] Consequently, we take variety as a metaphor for the various ways increased trade can increase productivity. Some of the key articles regarding product variety are the following. Broda and Weinstein (2004) find that increased product variety contributes to a fall of 1.2 percent per year in the "true" import price index. Hummels and Klenow (2005) and Schott (2004) have shown that product variety and quality are important in explaining trade between nations. Feenstra et al. (1999) show that increased variety of *exports* in a sector increases total factor productivity in most manufacturing sectors in Taiwan (China) and Korea, and they have some evidence that increased input variety also increases total factor productivity.

In business services, because of the high cost of using distant suppliers, the close availability of a diverse set of business services may be even more important for growth than in goods. As early as the 1960s, the urban and regional economics literature argued that non-tradable intermediate goods (primarily producer services produced under conditions of increasing returns to scale) are an important source of agglomeration externalities which account for the formation of cities and industrial complexes, and account for differences in economic performance across regions. The more recent economic geography literature has also focused on the fact that related economic activity is economically concentrated due to agglomeration externalities. Evidence comes from a variety of sources. Arnold, Mattoo and Javorcik (2006) show that in the Czech Republic, services sector liberalization led to increased productivity of downstream industries, and the key channel through which reform led to increased productivity was

[7] We believe there are other mechanisms through which trade may increase productivity. Trade or services liberalization may increase growth indirectly through its positive impact on the development of institutions (see Rodrik, Subramananian and Trebbi, 2004). It may also induce firms to move down their average cost curves, or import higher quality products or shift production to more efficient firms within an industry. Tybout and Westbrook (1995) find evidence of this latter type of rationalization for Mexican manufacturing firms. We thus take variety as a metaphor for the several mechanisms through which trade and services liberalization may increase productivity.

allowing foreign entry. Ciccone and Hall (1996) show that firms operating in economically dense areas are more productive than firms operating in relative isolation. Hummels (1995) shows that most of the richest countries in the world are clustered in relatively small regions of Europe, North America and East Asia, while the poor countries are spread around the rest of the world. He argues this is partly explained by transportation costs for inputs since it is more expensive to buy specialized inputs in countries that are far away. The high cost of using far away inputs is especially true of business services that are not provided locally, as Marshall (1988) shows that in three regions in the United Kingdom (Birmingham, Leeds and Manchester) almost 80 percent of the services purchased by manufacturers were bought from suppliers within the same region. He cites studies which show that firm performance is enhanced by the local availability of producer services.. In developing countries, McKee (1988) argues that the local availability of producer services is very important for the development of leading industrial sectors.

Price Determination

There are three types of goods or services in the model. We have: (i) competitive goods and services; (ii) goods produced under increasing returns to scale which compete with imports produced abroad; and (iii) services that are produced under increasing returns to scale in Russia, where Russian firms compete with multinational firms who also produce in Russia. The mathematical structure of these sectors is described in Rutherford and Tarr (2006b).

Competitive Goods and Services Sectors

Firms in each federal okrug have three choices for sales: sell in their own federal okrug; sell to other parts of Russia; or export to the rest of the world. This is depicted in figure 1. Firms maximize revenue for any given output level based on their transformation possibilities between the three types of goods. Their transformation possibilities are defined by a constant elasticity of transformation production function. For all firms within the same federal okrug, the product they export to other parts of Russia (including other oblasts within their own federal okrug) is homogeneous. It follows from our assumptions of homogeneous demand and production outside of the own federal okrug, that for each competitive good, say good g, there will be only three prices for good g of federal okrug r: the price of good g in federal okrug r; the price of good g from federal okrug r in other parts of Russia; and the price of good g from federal okrug r in the rest of the world.

The structure of demand for goods or services from competitive sectors is shown in figure 2. In the first stage, consumers and firms decide how much to spend on any of the aggregate goods or services listed in table 1. Having decided on the value of expenditures on goods or services, consumers and firms

in a representative federal okrug r optimize their choice of expenditures on foreign goods or services versus goods or services from Russia. Subsequently they optimally allocate their expenditures between goods from other Russian federal okrugs and their own federal okrug. Finally, they optimally allocate their expenditures between goods from the other Russian federal okrugs. This structure assumes that consumers differentiate the products of producers from different federal okrugs; but, they regard as homogeneous the products of producers from different oblasts within the same federal okrug.

Goods Produced Subject to Increasing Returns to Scale

The structure of demand for goods produced under increasing returns to scale is shown in figure 3. Consumers (and firms) in RM r optimally allocate expenditures on good g among the goods available from the different federal okrugs of Russia and the rest of the world producers. Having decided how much to spend on the products from each federal okrug, consumers then allocate expenditures among the producers within each federal okrug. Since we assume identical elasticity of substitution at all levels, this is equivalent to firm level product differentiation of demand. That is, the structure is equivalent to a single stage in which consumers decide how much to spend on the output of each firm in the first stage of optimal allocation of expenditure.

We assume that imperfectly competitive manufactured goods may be produced in each region or imported. Both Russian and foreign firms in these industries set prices such that marginal cost (which is constant) equals marginal revenue in each federal okrug. There is a fixed cost of operating in each region and there is free entry, which drives profits to zero for each firm on its sales in each federal okrug in which it sells. Quasi-rents just cover fixed costs in each region in the zero profit equilibrium. We assume that all firms that produce from the same federal okrug have the same cost structure—the standard symmetry assumption.

Foreigners produce the goods abroad at constant marginal cost but incur a fixed cost of operating in each RM in Russia. The cif import price of foreign goods is simply defined by the import price. By the zero profits assumption, in equilibrium the import price (less tariffs) must cover fixed and marginal costs that foreign firms incur in each federal okrug.

Similar to foreign firms, Russian firms also produce their goods in their home regions; they incur a fixed cost of operation if each RM in which they operate. By the zero profit constraint, if they operate in a RM, the price of their product must just cover both fixed and marginal costs of operation in that RM.

In figure 4, we depict the structure of production for imperfectly competitive Russian firms. Regional firms use intermediate inputs (which can be foreign inputs, inputs from other regions of Russia or from its own region) and primary factors of production to produce output. We emphasize that business services are not part of the “other services” nest; rather business services substitute for primary factors of

production in a CES nest.[8] We show that the elasticity of substitution between business services and primary factors of production significantly impacts the results.

We assume that Russian firms do not have any market power on world markets and thus act as price takers on their exports to world markets. On the exports to the rest of the world then, price equals marginal costs. On sales to Russia, firms must use a specific factor in addition to the other factors of production. The existence of the specific factor implies that additional output or firms can only come at increasing marginal costs. Imperfectly competitive Russian goods producers sell in all of Russia; but services firms do not sell in other Russian federal okrugs.

We employ the standard Chamberlinian large group monopolistic competition assumption within a Dixit-Stiglitz framework, which results in constant markups over marginal cost. For simplicity we assume that the composition of fixed and marginal cost is identical in all firms of the same type in a sector (in both goods and services). This assumption in a Dixit-Stiglitz based Chamberlinian large-group model assures that output per firm for all firm types remains constant, i.e., the model does not produce rationalization gains or losses.

An increase in the number of varieties increases the productivity of the use of imperfectly competitive goods based on the standard Dixit-Stiglitz formulation. Dual to the Dixit-Stiglitz quantity aggregator is the Dixit-Stiglitz cost function which shows the productivity adjusted cost of using the available varieties in the federal okrug when varieties are purchased at minimum cost for a given output level. This cost function for users of goods produced subject to increasing returns to scale declines in the total number of firms in the industry. The lower the elasticity of substitution, the more valuable is an additional variety.

We have assumed that imperfectly competitive firms within a federal okrug have symmetric cost structures and face symmetric demand for their outputs. It follows from these assumptions that all imperfectly competitive firms from a federal okrug will obtain the same price in any federal okrug of Russia in which they operate, although the price will differ across federal okrugs since the fixed costs associated with entering any federal okrug varies across the federal okrugs.

Services Sectors That Are Produced in Russia under Increasing Returns to Scale and Imperfect Competition

[8] For example, firms can employ an accountant or a lawyer, or contract for accounting or legal services. They can employ a driver and buy a truck, or contract for delivery services. These examples make it evident that it is more appropriate to allow substitution between business services and primary factors of production than to assume a Leontief structure.

These sectors include telecommunications, financial services, most business services and transportation services. In services sectors, we observe that some services are provided by foreign service providers on a cross border basis analogous to goods providers from abroad. But a large share of business services are provided by service providers with a domestic presence, both multinational and Russian.[9] As shown in figure 5, our model allows for both types of foreign service provision in these sectors. There are cross border services allowed in this sector and they are provided from the firms outside of Russia at constant costs—this is analogous to competitive provision of goods from abroad. Cross border services from the rest of the world, however, are not good substitutes for service providers who have a presence within the federal okrug of Russia where consumers of these services reside.[10]

Russian firms providing imperfectly competitive business services operate at the regional level and organize production in a manner fully analogous to imperfectly competitive Russian firms producing goods. Thus, figure 4 applies to both Russian imperfectly competitive goods and services firms. Other assumptions we made for imperfectly competitive goods producers, such as entry conditions, pricing and symmetry are also apply to imperfectly competitive services providers. The only difference is that we assume that regional services providers sell only in their own federal okrug. It follows from these assumptions that there is a unique price for all Russian providers of imperfectly competitive business services in a federal okrug.

There are also multinational service firm providers that choose to establish a presence in a RM of Russia in order to compete with regional Russian firms. The decision to locate in a federal okrug by a multinational must take into account the existence of a fixed cost of operating in a federal okrug. As with imperfectly competitive goods producers, quasi-rents must cover the fixed plus marginal costs of producing in a federal okrug and we have a zero profit equilibrium.

When multinational service providers decide to establish a domestic presence in a federal okrug of Russia, they will import some of their technology or management expertise. That is, foreign direct investment generally entails importing specialized foreign inputs. Thus, the cost structure of multinationals differs from Russian service providers. Multinationals incur costs related to both imported primary inputs and Russian primary factors, in addition to intermediate factor inputs. Foreign provision of services differs from foreign provision of goods, since the service providers use Russian primary inputs. This is shown in figure 6, where we show multinationals combining imported primary inputs with inputs

[9] One estimate puts the world-wide cross-border share of trade in services at 41% and the share of trade in services provided by multinational affiliates at 38%. Travel expenditures 20% and compensation to employees working abroad 1% make up the difference. See Brown and Stern (2001, table 1).

[10] Daniels (1985) found that service providers charge higher prices when the service is provided at a distance.

of the service good from the oblasts within the federal okrug. Domestic service providers do not import the specialized primary factors available to the multinationals. Figure 4 for Russian business service providers is analogous to figure 6 for multinational service providers except for the nest for imported primary inputs. Foreign service providers also must use a specific factor to produce the output and this implies that additional output can only be obtained at increasing marginal costs. Since the structure of costs for all multinational firms that provide a service in a given region m is identical and demand is symmetric, there is a unique price for all multinationals providers of service s in federal okrug m.

For multinational firms, the barriers to foreign direct investment affect their profitability and entry. Reduction in the constraints on foreign direct investment in a region will induce foreign entry that will typically lead to productivity gains because when more varieties of service providers are available, buyers can obtain varieties that more closely fit their demands and needs (the Dixit-Stiglitz variety effect).

Factors of Production

Primary factors include skilled and unskilled labor and three types of capital; (i) mobile capital (within regions); (ii) sector-specific capital in the energy sectors reflecting the exhaustible resource; and (iii) sector specific capital in imperfectly competitive sectors. We also have primary inputs imported by multinational service providers, reflecting specialized management expertise or technology of the firm. The existence of sector specific capital in several sectors implies that there are decreasing returns to scale in the use of the mobile factors and supply curves in these sectors slope up.

The above list of primary factors exists in all regions. In the case of skilled and unskilled labor it is natural to assume that the representative agent in the region obtains the returns from these factors of production. Consistent with standard trade models, in our central model we assume that capital and labor are immobile between regions. However, this model is a regional disaggregation of a national model of Russia; consequently, it does not seem reasonable to assume that all capital in a region is *owned* by the agents in that region. Thus, in our central scenario, we allow the capital in any region to be held by all Russians. It is convenient to think of a national mutual fund that holds the capital in each region. For all three capital types, this mutual fund invests in all regions and obtains an overall return. Individual households obtain a share of the returns of this mutual fund in proportion to their own capital earnings as a share of total capital earnings based on the NOBUS data set. We do sensitivity analysis, where we allow a fraction of the capital in any region to be held by agents inside the region.

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Key Data[11]

Ad Valorem Equivalence of Barriers to Foreign Direct Investment in Services Sectors

Among the key restrictions against multinational service providers that have existed or exist in Russia are: the Rostelecom monopoly on long distance fixed-line telephone services (scheduled to be removed), affiliate branches of foreign banks are prohibited, and there is a quota on the multinational share of the insurance market. [12] Estimates of the ad valorem equivalence of these and other barriers to FDI in services are key to the results. Consequently, we commissioned 20 page surveys from Russian research institutes that specialize in these sectors and econometric estimates of these barriers based on these surveys.

These questionnaires provided us with data, descriptions and assessments of the regulatory environment in these sectors. [13] Using this information and interviews with specialist staff in Russia, as well as supplementary information we provided to them, Kimura, Ando and Fujii then estimated the ad valorem equivalence of barriers to foreign direct investment in several Russian sectors, namely in telecommunications; banking, insurance and securities; and maritime and air transportation services.[14] The process involved converting the answers and data of the questionnaires into an index of restrictiveness in each industry. Kimura et al. then applied methodology explained in the volume by C. Findlay and T. Warren (2000), notably papers by Warren (2000), McGuire and Schulele (2000) and Kang (2000). For each of these service sectors, authors in the Findlay and Warren volume evaluated the regulatory environment across many countries. The price of services is then regressed against the regulatory barriers to determine the impact of any of the regulatory barriers on the price of services. Kimura et al. then assumed that the international regression applies to Russia. Applying that regression and their assessments of the regulatory environment in Russia from the questionnaires and other information sources, they estimated the ad valorem impact of a reduction in barriers to foreign direct

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[11] Several Armington elasticities have recently been estimated for Russia by Ivanova (2005). We took these values where they were available, as explained in figures 2 and 3. Otherwise, elasticities were taken from Jensen, Rutherford and Tarr.

[12] The protocol on Russian accession signed between the European Union and Russia on May 21, 2004 calls for the termination of the Rostelekom monopoly by 2007 and allows for an increase in the upper limit on the multinational share of the Russian insurance market.

[13] This information was provided by the following Russian companies or research institutes: Central Science Institute of Telecommunications Research (ZNIIS) in the case of telecommunications, Expert RA for banking, insurance and securities; Central Marine Research and Design Institute (CNIIMF) for maritime transportation services and Infomost for air transportation services. We thank Vladimir Klimushin of ZNIIS; Dmitri Grishankov and Irina Shuvalova of ExpertRA; Boris Rybak and Dmitry Manakov of InfoMost; and Tamara Novikova, Juri Ivanov and Vladimir Vasiliev of CNIIMF. The questionnaires are available at www.worldbank.org/trade/russia-wto. The same sources provided the data on share of expatriate labor discussed below.

investment in these services sectors.[15] The results of the estimates are listed in table 2. [16] In the case of maritime and air transportation services, we assume that the barrier will only be cut by 15 percentage points, since pressure from the Working Party in these sectors is not strong.

Share of Expatriate Labor Employed by Multinational Service providers. The impact of liberalization of barriers to foreign direct investment in business services sectors on the demand for labor in these sectors will depend importantly on the share of expatriate labor used by multinational firms. We explain in the results section that despite the fact that multinationals use Russian labor less intensively than their Russian competitors, if multinationals use mostly Russian labor their expansion is likely to increase the demand for Russian labor in these sectors.[17] We obtained estimates of the share of expatriate labor or specialized technology that is used by multinational service providers in Russia, but which is not available to Russian firms, from the Russian research institutes that specialize in these sectors. In general, we found that multinational service providers use mostly Russian primary factor inputs and only small amounts of expatriate labor or specialized technology. In particular, the estimated share of foreign inputs used by multinationals in Russia is: telecommunications, 10% plus or minus 2%; financial services, 3%, plus or minus 2%; maritime transportation, 3%, plus or minus 2%; and air transportation, 12.5%, plus or minus 2.5%.

Tariff and Export Tax data

Tariff rates by sector are taken from the paper by Tarr, Shepotylo and Koudoyarov (2006). Tarr, Shepotylo and Koudoyarov estimate the tariff rates by sector in our model based on the following data and methodology. For the purpose of calculating the tariff rates, they obtained data on the quantity and value of imports for 2001, 2002 and 2003 from the electronic database of the commercial company Academy-Service.[18] This dataset provides information on the Russian tariff structure at the tariff line level, i.e., the 10-digit level. The source of information on tariff rates is the Decree of the Government of Russian Federation on import duties #830.[19] The decree is available, for example, at www.consultant.ru.

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[14] The three papers by Kimura, Ando and Fujii as well as the underlying responses to the surveys are available at www.worldbank.org/trade/russia-wto

[15] Warren estimated quantity impacts and then using elasticity estimates was able to obtain price impacts. The estimates by Kimura et al. that we employ are for "discriminatory" barriers against foreign direct investment. Kimura et al. also estimate the impact of barriers on investment in services that are the sum of discriminatory and non-discriminatory barriers.

[16] See Jensen, Rutherford and Tarr (forthcoming) for an explanation of the estimate in telecommunications.

[17] See Markusen, Rutherford and Tarr (2005) for a detailed explanation on why FDI may be a partial equilibrium substitute for domestic labor but a general equilibrium complement.

[18] http://www.ftinform.com

[19] We looked at three editions of the decree: first, dated by 11.30.2001 for 2001; the second, dated by 02.06.2003 for 2002 rates, and the third, dated by December 2003 for 2003 rates.

The average MFN tariff in Russia has increased between 2001 and 2003. On an un-weighted simple average basis it increased from 11.6% to 12.9%; on a weighted average basis it increased from 11.4% to 14.5%. This average is calculated based on MFN tariffs.

Collected tariffs are less than MFN tariffs because of several exemptions in the Russian tariff structure. Most notably, CIS imports usually enter tariff free (although there are exceptions to this rule), and personal and private imports also enter tariff free for sufficiently small values of imported shipments. We also provide estimates of the tariff rates where we adjust for zero tariff collections on CIS imports. That is, in our formulas for calculating the tariff on a tariff line, we set ad valorem and specific rates on imports from the CIS countries equal to zero to take into account the special trade regime within the CIS. *We call these calculations our estimated collected tariff rates.* We find that overall estimated collected tariff rates are lower than the MFN rates by about 1 percent.

Our overall estimated collected tariff rate was equal to 10.4% in 2001, 10.9% in 2002, and 11.5% in 2003. On the other hand, based on Ministry of Finance and Customs Committee data, the actual collected rate was 9.5% in 2001, 9.7% in 2002, and 9.8% in 2003. The difference can be attributed to the fact that we did not take into account any exemptions other than the CIS free trade zone exemption.[20]

We believe collected tariff rates more closely approximate the protection a sector receives and the incentives it faces. Using our estimated collected tariff rates, and based on a Rosstat mapping from the tariff line data of the Customs Committee to the sectors in our input output table, we calculated a weighted average tariff rate for the sectors of our model. The results of this procedure for each sector of our model are reported in table 12a.

Export tax rates are calculated from the 2001 input-output table of Rosstat and are reported in table 12a. Since we do not change export taxes in the counterfactual simulations, these parameters are considerably less important to the results than the tariff rates.

Improved Market Access

Although many in the Russian government argue that improved market access from accession to the WTO is a major reason for WTO accession, Russia has already negotiated most-favored nation (MFN) status on a bilateral basis with most of its important trading partners, so Russia's exporters will not see an immediate reduction in the tariffs they face and this effect may not be expected to be large. But Russia will have improved rights under antidumping and countervailing duty investigations in its export

[20] To calculate actual collected rate, we used the Ministry of Finance data on collected import duties as a numerator. As a denominator, we used the overall import volume less import from Belarus as reported by the Russian Customs Committee. The exclusion of the imports from Belarus is determined by the fact that the electronic dataset which we used in the calculations reported import volume without imports from Belarus.

markets. Consequently, we assume that Russian exporters in seven sectors which have been subject to antidumping actions in Russia's export market, will receive and improvement in their terms of trade by either 1.5 percent or 0.5 percent. (See table 3 for details.)[21]

Input-output Tables

The core input-output model is the 2001 table produced by Rosstat. The official table contained only 22 sectors, and importantly has little service sector disaggregation. In order to disaggregate the table, we used costs and use shares from our 35 sector Russian input-output table for 1995 prepared by expert S. P. Baranov. (For details see www.worldbank.org/trade/russia-wto.) When we broke up a sector such as oil and gas into oil, gas and oil processing, we assumed that the cost shares and use shares of the sector were the same in 2001 as they were in the 1995 table. For example, steel is an input to the oil and gas sector. Suppose in 1995, that oil purchased 55 percent of the steel used in oil and gas. Then we assume that in 2001, oil purchased 55 percent of the steel used in oil and gas.

Regional IO tables

We constructed input-output tables of the 88 oblasts that are based on data from the oblasts (described below) and the national input-output table. The input-output tables for our ten federal okrugs are aggregates of the input-output tables of the oblasts in their respective federal okrugs.

We assume that the technology of production is common across oblasts, so that the input-output coefficients from the national input-output table apply across all oblasts. As a first step, for each industrial sector, we took the national output from the national input-output table for 2001, and we used the data in Regions of Russia to allocate the shares of that output across the 88 oblasts. That is, we have, by oblast, the value of total industrial output and industry shares of oblast industrial output for the year 2000 (Regions of Russia 2001, table 13.3); thousands of tons of oil recovery, including gas condensate, for the year 2000 (Regions of Russia 2001, table 13.13); extraction of natural gas (in millions of cubic meters for the year 2000, (Regions of Russia 2001,table 13.14); thousands of tons of mined coal for the year 2000 (Regions of Russia 2001, table 13.15). This allows us to calculate the value of industry output by sector and oblast. For each industrial sector, we then proportionally scaled the value of oblast level output so that the sum of industrial output across all oblasts was equal to the value of national output of the sector from the national input-output table.

[21] WTO accession will grant an "injury determination" to Russia in antidumping cases in WTO members countries. Combined with the decision by the US and the EU to treat Russia as a market economy this will imply Russian exporters may have considerably improved rights in these cases in the US. But market economy status may be denied in particular cases, so it will be necessary to see how this is implemented in practice.

We infer oblast demand (and supply) of services, assuming that intermediate and final demand for services share a common intensity of demand in all oblasts as in the national model. For example, if telecommunications costs are x percent of the costs of nonferrous metals production in the national model, we assume that telecommunications costs are x percent of nonferrous metals costs in each of the oblasts. Demand for telecommunications from non-ferrous metals will differ across oblasts, however, since the share of total output attributable to non-ferrous metals differs across regions.

We have total external exports and imports by oblast, as well as the commodity structure of external exports and imports by oblast for the year 2001 (Regions of Russia 2001, tables 23.1 and 23.2). We also have unpublished data supplied to us by Rosstat on inter-oblast exports and imports by sector. That is, for each of over 250 key commodities, we have an 88 by 88 matrix of bilateral trade flows among the oblasts.

Supply and demand balance by oblast and by commodity requires adjustment of trade intensities. These adjustments assure that oblast exports and imports in aggregate are consistent with national import and export values, we have to adjust the oblast import and export intensities. We did this using a methodology that minimized the sum of squares of the difference between the original data on exports and imports and the adjusted exports and imports data, subject to the constraints of supply-demand balance and consistency with the national model data. Since we had greater confidence in the validity of the oblast output data than the inter-oblast trade flow matrix, in this optimization process, we fixed the output levels of the oblasts at the levels we had calculated above. We do not need to make any other adjustments, as the production technologies are assumed consistent across the regions.

Since in every step of the process, we calculated oblast shares of the national input-output table, the process yields a set of 88 regional input-output tables which portray a regional disaggregation of the national input-output table. That is, summing over all the 88 input-output tables will yield the national input-output table, including wholesale and retail distribution margins, investment demand and government expenditure. Crucially, we may aggregate the 88 oblasts into a set of non-overlapping subsets and any such aggregation will yield a set of input-output tables that is fully consistent with the national input-output table. In particular, our seven region model is consistent with the national input-output table.

FDI Shares[22]

We first employed the NOBUS survey to obtain the shares of workers working in multinationals service sectors in each business service sector in each oblast. We used this as a proxy for the share of output in each service sector in each oblast. We also obtained information from (1) our estimates from

[22] We explain the methodology further in appendix A of Rutherford and Tarr (2006a).

Russian service sector institutes of the share by sector of multinational ownership in the key services sectors; [23] (2) *Regions of Russia (2003)* by Rosstat; and (3) the "BEEPS survey. Only the NOBUS survey provides data that allows us to estimate shares of multinational ownership by both region and sector. We thus start with our calculations based on the NOBUS information.

When found, however, that when we aggregate the NOBUS shares across oblasts or sectors, the other three sources of information show considerably higher foreign ownership shares than the NOBUS survey. We believe that the NOBUS survey estimates are too small, and adjust them. We adjusted our estimates from the NOBUS to be consistent with the estimates of the service sector institutes. The estimates of the service sector institutes are lower than those from the BEEPS or *Regions of Russia,* and thus involve less adjustment of the NOBUS data. We employed least squares adjustment of the NOBUS data so that the weighted average over all of Russia in each sector is consistent with the national estimates we received from the specialist service sector research institutes in Russia. This process will give as a *structure* of ownership based on the NOBUS survey, with the economy-wide average by sector determined by the national data. Results are presented in table 4.

Household Data

Data for the households is taken from the NOBUS survey.[24] NOBUS is a cross section survey of Russian households, which was specially designed to measure the efficiency of the national social assistance programs by means of estimating the impact of social benefits and privileges on household welfare. The survey collects detailed information on household consumption and income, together with information on household demographics and labor market participation, access to health, education and social programs, and subjective perceptions of household welfare. The survey uses a random sample of 44,529 households and 117,209 people. The sample is statistically representative at the national level and at the regional level for 47 out of the 89 regions (oblasts, territories, etc.) of the Russian Federation,[25] where approximately 72 percent of the total population live. At the level of the federal okrug, a comparison of various characteristics from the NOBUS households with the national census, such as population by okrug, educational attainment, urban-rural decomposition, gender, decomposition, age profile and employment status, shows that the NOBUS survey is very close to the Russian census data

[23] We thank the service sectors institutes in Russia mentioned above for these estimates.
[24] In Rutherford and Tarr (2006a) we employed the Household Budget Survey of Rosstat. The Household Budget Survey, however, is not publicly available, and has much less information on the sources of household income.
[25] The precision of statistical estimates across the regions will be lower than for Russia as the whole due to the smaller size of the sample in comparison with the national sample. In each of the 47 representative regions from 835 to 943 households were interviewed, except for Moskovskaya oblast, where 398 households were interviewed.

(see the NOBUS website). Thus, we believe that, at the seven federal okrug level, the NOBUS survey is adequately statistically representative to assess household impacts of WTO accession. The data, questionnaires, summary statistics, descriptions and explanations of the variables and studies that use the survey are publicly available on a World Bank website.[26]

Based on the reported incomes from the NOBUS survey, for each of the seven regions, we grouped the households into deciles, from the poorest to the richest. For households within the same decile, we aggregated their data, to form ten representative households in each region, giving us 70 representative households in all. We extracted the factor shares and consumption patterns for the 70 representative households from these data as well.

Reconciliation of the National Account and Household Budget Survey Data

We have two sources of data for aggregate factor incomes: data from National Accounts and data from the NOBUS. In our Russian data, capital's share of factor income is much larger in the National Account data than in the NOBUS. This is typical. Ivanic [2004] mapped income from the Living Standards Measurement Surveys (LSMS) surveys in 14 countries into factor shares and compared factor shares with the input-output tables in these countries. On average, capital's share from the LSMS surveys was 21% of household income, but it was 52% of household income based on National Account information (based on the "GTAP" data set).

We must produce a balanced Social Accounting Matrix in order to implement our integrated model, which means we must reconcile these differences. There are biases in both the collection of National Account and Household Survey data so that neither source is clearly correct. A key problem with the factor share data from the national accounts is that capital's share is calculated residually in the input-output tables. Then in sectors where labor payments are underreported, the share of capital is biased up. On the other hand, income estimates from LSMS surveys are known to be less than income estimates from National Accounts. Deaton (2003) explains that one of the most likely explanations of the difference is that households fail to respond to the survey, and that the probability of non-response plausibly increases monotonically with income. This presumed pattern of non-response to the household survey would also help explain this difference in capital's share, since the rich are likely to have more capital than the poor.

[26] For details on the NOBUS dataset, please see: http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/ECAEXT/RUSSIANFEDERATIONEXTN/0,,contentMDK:20919706~menuPK:2560592~pagePK:1497618~piPK:217854~theSitePK:305600,00.html

We took total value added by sector from the National Accounts. We then set up a non-linear programming problem to obtain "new" factors shares for firms and households, where the new factor shares satisfy the conditions of a Social Accounting Matrix. The new factors shares for firms and households are the values that minimize the sum of the squares of the differences between original and new factor shares from the national accounts plus sum of the squares of the differences between the original and new factor shares from the household data, subject to the constraint that the new data satisfy all the constraints of a Social Accounting Matrix. In our objective function, we apply equal weights to a departure from the original national accounts data and to a departure from the household income data, although we have done sensitivity analysis where we weight either the household data or the national accounts data more heavily. .This reconciliation of the two sets of data significantly decreased the share of capital reportedly paid by firms, especially in some of the more capital intensive sectors like ferrous and non-ferrous metals.

III. Policy Results

For each of our ten federal okrugs, we first discuss our central scenario (results are in table 13a). In our central scenario, we assume that tariffs on goods are cut by 50 percent, that barriers to foreign direct investment are eliminated or reduced (depending on the sector) and that seven industrial sectors receive an improvement in their market access between 0.5% and 1.5%. See table 12a for details by sector. We present the overall welfare effects for each region, the impact on wages and returns to capital, the changes in exports and the real exchange rate and factor adjustment costs.

The gains come from a combination of effects, so we also estimate the comparative static impacts of the various components to WTO accession in order to assess their relative importance. In order to obtain an assessment of the adjustment costs, we estimate the percentage of mobile labor and capital that must change industries. Next we discuss the estimates of the impact at the level of productive sectors of the economy. In table 19, we conduct sensitivity analysis with respect to some key parameters and present these results. A key aspect of the sensitivity analysis is how the results differ across regions when we assess the ability of different regions to attract FDI based on the ranking of their investment potential. Finally, we present results for all seventy representative households in table 20.

Welfare Effects of WTO Accession—Household and Overall Results

We have 70 representative households in our model: ten representative households in each of the seven regions. We shall present welfare results for each of the 70 households, but in order to present

aggregate welfare results, we must decide how we value the welfare of the representative households, relative to each other. Given that each household in our model has a homothetic utility function (it is CES), it is possible to define a money measure of the value each household associates with WTO accession—its Hicksian equivalent variation. To arrive at a monetary value of what society as a whole places on the policy changes, what is most commonly done in applied general equilibrium is to weight all these equivalent variations equally. But this measure yields an aggregate welfare change that places no value on reduced inequality.

To allow for the possibility of a preference for less inequality, we specify a Social Welfare Function. With a Social Welfare Function, we can associate a dollar or ruble value to WTO accession that varies with society's valuation of less inequality. We choose as our social welfare function a CES function of the utility functions of all the households. The CES form of the Social Welfare Function has several advantages. The elasticity of substitution parameter in the Social Welfare Function is a measure of society's aversion to inequality. The larger the elasticity of substitution, the less society cares about an equitable distribution of income. Well known ways of measuring social welfare are special cases of the CES. At one extreme (sigma = +inf in the table), the welfare of all households is valued equally. That is, each household has a dollar (or ruble) measure which is its Hicksian equivalent variation measure, where we simply sum the equivalent variations of all households to arrive at our measure society's valuation of the policy changes. This is the so-called "utilitarian" Social Welfare Function. At the other extreme (sigma= 0), the welfare of the poorest household is the only welfare that is evaluated (the Rawlsian Social Welfare Function). Finally, with the CES, the value of the Social Welfare Function is equivalent to an equi-proportional increase in the equivalent variation of all households. (A formal derivation of this last property is shown in the appendix.)

In table 13a, we present results, where we have made several choices in this regard. Household welfare changes are reported as household equivalent variation as a percent of household income. We report the value of the Social Welfare Function as a percent of GDP. With equal weights on households (sigma infinite), we show that the estimated weighted average of the welfare gains across all regions is 4.5 percent of GDP or 8.1 percent of consumption. By region, the welfare gains as a percent of GDP range from 3.8 percent to 5.6 percent.

Our Social Welfare Function shows that the more weight we place on the poorest household, the lower is the overall welfare gain. For the sigma= 0, the gain to society is reduced to 2.4 percent of GDP. The poorest household in our data is the poorest household in Siberia. So with the Rawlsian measure of social welfare, the gain in that household's welfare is also society's valuation of the policy change. The poorest regions are also the regions that gain the least from WTO accession, i.e. the Urals and Siberia. So when we weight those households more highly, the welfare gains are less.

Factor Returns. To better understand the distributional impacts, we need to examine factor earnings. All factors are immobile between okrugs, but within okrugs we have both mobile and specific capital. Skilled and unskilled labor are fully mobile within okrugs. Real wages of skilled and unskilled labor both increase by 5.1 percent on average over the entire economy. Moreover, in all okrugs, the increase in real wages of skilled labor is very close to the increase in the real wages of unskilled labor. Averaged over the country, the returns to regionally owned mobile capital increases by 7.6 percent and nationally owned mobile capital in the regions increases by 3.9 percent. Since all capital is nationally owned in our central scenario, the average return to mobile capital increases by about 5.7 percent.[27] Thus, the average return to mobile capital is slightly greater than and the return to skilled and unskilled labor. Since the rich have a greater percentage of their incomes coming from capital, this has a slightly regressive impact on the distribution of the gains; but since the differences are not large, the impact is not sharply regressive. On the other hand, owners of specific capital used by multinational firms see the returns to their capital increase by 102.7 percent on average over the seven okrugs, and this turns out to be important for rich households in regions that see significant expansion of multinational investment.

Key to the results for returns to factors is to recognize that the Dixit-Stiglitz-Ethier endogenous productivity effect means that we escape the pessimism of Stolper-Samuelson trade liberalization—that is, the price of all factors of production may increase in real terms. Due to liberalization of barriers to FDI, the rental rate on specific capital for domestic firms declines, negatively impacting welfare across the regions. But the rental rate on specific capital for use in multinational firms increases, positively impacting welfare across regions.

Explaining Differences across Regions. The principal explanation for the differences across regions is the ability of the different regions to benefit from a reduction in barriers against foreign direct investment. Some regions may attract FDI much more easily than others. A key parameter in our model is the initial share of multinational investment in each sector in each region. Multinational firms have widely different shares of the business services sectors in the different regions. A ten percent expansion of multinational firms will be a much larger absolute amount in a region that has substantial FDI initially. Thus, larger initial shares of FDI in a region will lead to larger absolute increases in FDI in the region when the barriers against FDI are reduced.

In table 12b, we display our estimates of the shares of the industry captured by multinational firms. The two regions with the lowest welfare gains as a percent of GDP are the Urals and Siberia. But these two regions are the ones with the lowest shares of multinational investment. The Urals and Siberian

[27] Each households share of the national capital fund is the proportion of the national capital earning held by that household. See the sensitivity analysis for an alternate modeling choice.

share of FDI ranges from about 50 to 70 percent of the national average depending on the services sector. The three regions with the largest shares of multinational investment are the Northwest, Far East and Volga. The Northwest stands out as the region that gains the most, but, with estimated gains of 5.6 percent and 5.3 percent, respectively, the Far East and Volga are also among the regions we estimate to gain the most.

Regional differences in welfare as a percent of consumption will vary due to differences in regional savings rates. Consider two regions with the same or similar ratios of Hicksian equivalent variation to GDP (for example, the Urals and Siberia, or the South and the Central regions). The South (and Urals) has a higher ratio of equivalent variation to consumption than the Central (and Siberia) because the South (Urals) has a greater share of savings.

Household Effects. Unless otherwise indicated, in the remainder of this paper, when discussing aggregate welfare results across households, we shall refer to the utilitarian measure of social welfare where we simply sum the welfare changes of all households and report this as a percent of GDP. In table 20, we present welfare results for all seventy households in the model where the Hicksian equivalent variation of each household is reported as a percent of its income. The range of gains is from between 3.5 percent of income for poorest households in the Urals and Siberia to 6.1 percent for the richest household in the Northwest.[28] The primary explanation of differences across households is the region in which they live. For reasons explained above, the household that gains the least in the Northwest, gains more as a percent of its income that the household that gains the most in the Urals or Siberia. Within regions there is a slight regressive effect from the slightly greater return to capital relative to labor. But for the richest households in the Northwest and the Far East, where there is a lot of multinational investment, specific capital owners with capital for use in the multinationals gain considerably, and the richest decile in these federal okrugs gains considerably more than the average. [29]

Government Revenue and Real Exchange Rate Impacts. Due to the expansion of the economy, the government takes in additional revenue from value-added taxes and other indirect taxes,

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[28] The poorest household in the model is the poorest household in Siberia. The reader may have noticed, from table 20, that the equivalent variation gains for this household are 3.5 percent of its income. But the Rawlsian Social Welfare Function (which is based on the equivalent variation gains of the poorest household in the model) reports a welfare gain of only 2.5 percent. The reason for the difference is that the appropriate denominator for the household's own equivalent variation is its own income. While the appropriate denominator in a social welfare function evaluation for a region in the income of the region. That is, 3.5= EV(1, S)/Y(1, S), where EV(1,S) is EV of the poorest household in Siberia and Y(1,S) is income of the poorest household in Siberia. And 2.5 = EV(1,S)/Y(av, S), where Y(av, S) is average income in Siberia. Our calculations show that 2.5/3.5 = Y(1, S)/ Y(av, S).

[29] A minority of the capital in the model is specific. The return to specific capital in domestic firms declines and the return to specific capital in multinational firms increases. There is also specific capital in energy sectors. On average the return to specific capital increases more than the return to labor, which explains why the richest decile of the population in each region gains slightly more than the other households.

including export taxes. In order to hold government revenues constant, we assume that the government distributes back in a lump sum proportional manner the surplus revenue.

Each region has an aggregate balance of trade constraint. Then the regional real exchange rate depreciates until the value of the increase in regional exports equals the value of increased regional imports. The percentage change in the overall value of increased international exports is presented in the table 13a and equals 8.8 percent in our central scenario.[30] The expansion of exports to other regions of Russia across regions ranges from a low of 0.6 percent from the Urals to a high of 2.4 percent in the Northwest and Central regions.[31]

Decomposition of Welfare Impacts from Exogenous Changes. In order to assess what is causing these results we have undertaken several additional simulations in which we allow only one of the components of our WTO scenario to change, while holding others constant. First we assess **the impact of foreign direct investment liberalization in business services**. We reduce barriers against FDI in the services sectors according to the cuts in table 12a, but there is no reduction in tariffs or improved market access. Russian commitments to reduce barriers against multinational service providers will allow multinationals to obtain greater after tax returns on their investments in Russia. This will encourage them to increase foreign direct investment to supply the Russian market. Although we expect some decline in the number of purely Russian owned businesses serving the services markets, on balance there will be additional service providers. Russian users of businesses services will then have improved access to the providers of services in areas like telecommunication, banking, insurance, transportation and other business services. With equal weights of all households, we estimate that the gains to Russia from liberalization of barriers to FDI in services are about 7.3 percent of the value of Russian consumption or 4.0 percent of the value of GDP. Thus, we estimate that about 88 percent of the total gains from Russian WTO accession come from the liberalization of barriers against FDI in the business services sectors**.**

We also assess the impact of **improved market access** (according to the terms of trade improvements of table 12a), but we do not lower tariffs or barriers to FDI in services sectors, and we execute a scenario where we **lower tariffs by 50 percent**, but there is no liberalization of the barriers to FDI or improved market access. The combined estimated welfare gains of these two scenarios to the overall economy are 0.5 percent of GDP.

[30] The change in the value of international exports must equal the change in the value of international imports. Since international exports exceed international imports in the benchmark equilibrium, the percentage change in exports is smaller than the percentage change in imports.

[31] Since the initial value of exports exceeds the initial value of imports in our data set, a smaller percentage increase in exports is equal in absolute dollar value to a larger percentage increase in imports.

The gains to the economy from tariff reduction alone come about for two reasons:.(i) tariff reduction in Russia will lead to improved domestic resource allocation since tariff reduction will induce Russia to shift production to sectors where production is valued more highly based on world market prices. This impact, known as the "gains from trade" is the fundamental effect from trade liberalization and is often stressed by international trade economists; and (ii) tariff reduction will increase the profitability of exporting to Russia by imperfectly competitive foreign producers. More foreign firms will enter the Russian market until zero profits is restored. The additional varieties of foreign goods as inputs will increase Russian productivity in sectors that use these goods as inputs.

Impact on the Productive Sectors

For each region we have a balance of trade constraint and we assume that factors of production are mobile within the region with no change in aggregate employment of any factor. Consequently, the impacts on sectors are relative. That is, some sectors expand and some contract, but if employment in one sector expands, it must contract in another sector.

Expanding Manufacturing Sectors. Results for the manufacturing sectors that expand or contract depend on several industry characteristics. Sectors which are likely to expand are those that either: export a relatively large share of their output; obtain an exogenous increase in export prices as a result of WTO accession; are relatively unprotected initially compared to other sectors of the economy; or experience a significant reduction in the cost of their intermediate inputs, typically because they have a large share of intermediate inputs that come from sectors that produce additional varieties due to trade or FDI liberalization.

The manufacturing sectors that we estimate will expand their output the most are ferrous metals (27 percent output increase), chemicals (18 percent output increase) and non-ferrous metals (12 percent output increase). These sectors expand substantially in the Urals, Central, Siberia, and Volga regions, where these sectors are concentrated.[32] These sectors are among those that we assume will gain an exogenous increase in the price of its exports upon WTO accession. They are also among those that

[32] Table 5 shows that relative importance of these industries across okrugs. As a share of national value added in the sector, the Volga okrug has 40 percent of the chemicals value added; Urals has 32 percent of ferrous metals and 17 percent of non-ferrous metals; Siberia has 44 percent of non-ferrous metals; and Central has 26 percent of ferrous metals and 28 percent of chemicals value added. .

export the highest share of their output—they all export over thirty percent of the value of their output on a national basis. Export intensity is important because a reduction in tariffs depreciates the real exchange rate. Since the real exchange rate depreciates, sectors that export intensively will gain an increase in the real value of their exports.

Declining Manufacturing Sectors. The sectors that contract the most are the sectors that are the most protected prior to tariff reduction and which have a relatively small share of exports. Most notably this includes food (14 percent output decline), construction materials (8 percent output decline), and the other goods producing sector (10 percent output decline). We estimate declines in the output of all of these sectors in all regions. All of these sectors do little exporting and are among the sectors with tariff rates above ten percent. Textiles and apparel, with the highest tariff in the economy, also declines, but less significantly. But the export and import intensities vary across regions, so results differ across regions.

Business Services Sectors. Russian business and labor interests in these sectors are diverse. Our central estimates are that skilled and unskilled employment will expand in several business services sectors, most notably telecommunications, truck transportation and railway transportation services. The reason is that as a result of a reduction in the barriers to foreign direct investment in these sectors, we estimate that there will be an expansion in the number of multinational firms who locate in Russia to provide business services from within Russia, and a contraction in the number of purely Russian firms. But multinationals also demand Russian labor, even though they use Russian labor slightly less intensively than Russian firms. But as more service firms enter the market, the quality adjusted price of services falls, and industries that use services expand their quantity demanded for business services. For telecommunications, truck transportation and railway transportation services, on balance, the increase in labor demand from the increase in the demand for business services exceeds the decline in labor demand from the substitution of multinational supply for Russian supply in the Russian market. Thus, we estimate that labor in these business services sectors will gain from an expansion in foreign direct investment and multinational provision of services in Russia.

These results are not uniform, however, as in maritime and financial services sectors we estimate a decline in employment. In these sectors the fact that multinationals use Russian labor less intensively dominates the impact of the greater use of business services.

Regarding capital, as a result of the removal of restrictions, we estimate there would be significant increase in foreign direct investment and an increase in multinational firms operating in Russia. We must be careful, however, in interpreting what this means for Russian firms. We define joint ventures between Russian firms and multinationals as a multinational firm. An estimated decline in Russian firms does not mean their capital moved to other sectors or disappears. In many cases, it means the Russian firms have become joint venture partners with a multinational firm in the same sector. Multinationals will often look for Russian joint venture partners when they want to invest in Russia. Many Russian companies providing business services are likely to see this as a profitable opportunity and will form joint ventures with multinationals. These Russian companies will become part of the expanding multinational share of the business services market. The Russian firms that become part of joint ventures with foreign investors will likely preserve or increase the value of their investments. Russian capital owners in business services who remain wholly independent of multinational firms, either because they avoid joint ventures or are not desired as joint venture partners, will likely see the value of their investments decline.

This suggests that domestic lobbying interests within a service sector are very diverse regarding FDI liberalization. We estimate that labor should find it in their interest to support FDI liberalization even if capital owners in the sector oppose it. But capital owners themselves may have diverse interests depending on their prospects for acquisition by multinationals.

IV. Sensitivity Analysis

In this section we execute numerous scenarios to examine how robust the results are to specification of the parameters of the model as well as to type of model that we use. Unless otherwise indicated, we will report results only from the case where we weight all households' utility equally.

Sensitivity to Investment Potential of the Regions

In our central scenario, results differ across regions due, to a significant extent, to the inherited FDI of the regions—the greater the initial FDI, the more the regions are capable of attracting new FDI for the same elasticities. In this scenario, we augment the assessment of how regions may adapt and attract FDI based on the ranking of their investment potential. For investment potential ranking we use the rankings of Expert RA, which we explain in Appendix B of Rutherford and Tarr (2006b). We use the investment potential rankings to adjust a parameter in our model (etaf) that reflects the responsiveness (elasticity) of foreign investment supply to an increase in the price of their product in the region. We assign higher values of etaf to regions with above average investment potential rankings and conversely for low investment potential rankings. We present these results in the first row of new results in table 19, where we also indicate how the elasticity etaf varies across regions based on the investment rankings.

The principal result is that the estimated gains for Volga increase and the estimated gains for the other regions decline. Despite smaller estimated gains in this scenario, Far East and Northwest are still estimated to receive above average gains. The results suggest that the gains for a region could vary considerably depending on whether it succeeds in creating an atmosphere conducive to investment.

Sensitivity to Results to a 50% Cut in the Barriers to Foreign Direct Investment

We perform sensitivity analysis with respect to the extent of liberalization of barriers to foreign direct investment. In this scenario, we cut in the ad valorem tax equivalence of the barriers to FDI in the services sectors by 50 percent of the cut we executed in our central scenario, ,but we still allow for improved market access and a fifty percent cut in tariff barriers. The results are presented in table 13c, indicate that the gains to the economy are reduced to about 4.4 percent of consumption or 2.4 percent of GDP (with equal household weights). Northwest still has the largest estimated gains.

Constant Returns to Scale

In this scenario we evaluate the impact of WTO accession in a traditional type CGE model with constant returns to scale and no foreign direct investment in services. As in our general WTO scenario,

we reduce tariffs by 50 percent and improve the export prices of seven key sectors. Foreign direct investment in our model is based on a finite number of firms that only makes sense with imperfect competition. Thus, we know from our results above that the most important impact (liberalization of barriers against FDI in services) will be ignored in this scenario. Moreover, the productivity impact from additional varieties of goods in imperfectly competitive goods sectors will also be ignored.

We find (see table 13e) that the overall welfare gains to the economy drop to only 0.1 percent of GDP, from 4.5 percent of consumption with our full model. This demonstrates that a traditional model that focuses on Harberger triangle type resource allocation gains from trade liberalization and terms of trade effects would miss the most important aspects of the impact of WTO accession on Russia.

Calibration to the National Accounts or NOBUS Household Survey for Factor Shares

In our central scenario, when we reconciled the national accounts and the household factor share data, we choose equal weighting between the two data sources. In table 13g we reconcile to the household survey data; that is, by choice of weights in our objective function, we allow the national accounts factor payment data to change and hold the household data unchanged to the extent possible.[33] In table 13h, we present results from the opposite approach. The household data is allowed to change to be consistent with the national accounts data.

The estimated welfare gains are 4.5 percent of GDP or 8.1 percent of consumption. That is, the overall welfare impacts are virtually unaffected by the data source that is chosen.

Piecemeal Sensitivity Analysis

In table 19, we present the impact on welfare of varying the value of key parameters. In these scenarios, we retain the central value of all parameters except the parameter in question. In general, the gains to the economy (welfare gains) increase with an increase in elasticities, since higher elasticities imply that the economy is able to more easily shift to sectors or products that are cheaper after trade and FDI liberalization.[34] There are two parameters in the table that have a strong impact on the results: the elasticity of substitution between value-added and business services (esubs) and the elasticity of multinational firm supply (etaf). A liberalization of the barriers to FDI will result in a reduction in the cost of business services, both from the direct effect of lowering the costs of doing business for multinational

[33] No change in the household data was not a feasible solution, so we allowed a slight change in the household data.
[34] An increase in the elasticity of substitution between varieties reduces the welfare gain. This is because when varieties are good substitutes, additional varieties are worth less to firms and consumers.

service providers and from the indirect effect that additional varieties of business services allow users to purchase a quality adjusted unit of services at less cost. When the elasticity of substitution between value-added and business services is high (esubs = 2 in table 7), users have the greater potential to substitute the cheaper business services and this increases productivity. The elasticity of multinational and Russian firm supply (etaf, etad) is related to the share of capital that is sector specific for each firm type (foreign or domestic), but we also allow this parameter to vary with the ability of the federal okrug to attract capital. When etaf is high, a reduction in the barriers to foreign direct investment results in a larger expansion in the number of multinational firms supplying the Russian market, and hence more gains from additional varieties of business services. In addition, the share of the services market captured by multinationals has a strong effect, since a liberalization results in a larger number of new varieties introduced.

V. Conclusions

In this paper we have shown that all deciles of the Russian population can be expected to gain substantially from WTO accession. Although we estimate that all deciles of the populations in all regions of Russia will gain significantly, the results vary considerably across the regions of Russia depending on their ability to attract FDI. Their ability to attract FDI is partly related to geographic proximity to Western Europe or the Far East, as well as their policies and institutions that affect their investment climate. Households in the Northwest region gain the most, followed by households in the Far East and Volga regions. Households in Siberia and the Urals gain the least. Distribution impacts within regions are rather flat for the first nine deciles; but the richest decile of the population in the three regions that attract a lot of foreign investment gains significantly more than the other nine representative households in those regions.

These results depend crucially on our model which incorporates endogenous productivity effects from additional varieties. Then the liberalization of barriers against foreign direct investment in business services, and to a lesser extent from tariff reduction in imperfectly competitive goods sectors, induces productivity growth in sectors that use these goods and services. We have shown that a traditional constant returns to scale model, by focusing on resource allocation and terms of trade effects, would miss the most important features of the trade and FDI liberalization that accompanies Russian WTO accession.

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Table 1. List of Sectors

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1. Sectors where foreign direct investment from new multinational services providers is possible

RLW	Railway transportation
TRK	Truck transportation
PIP	Pipelines transportation
MAR	Maritime transportation
AIR	Air transportation
TRO	Other transportation
TMS	Telecommunications
SCI	Science & science servicing
FIN	Financial services

2. Sectors where new foreign firms may provide new goods from abroad

FME	Ferrous metallurgy
NFM	Non-ferrous metallurgy
CHM	Chemical & oil-chemical industry
MWO	Mechanical engineering & metal-working
TPP	Timber & woodworking & pulp & paper industry
CNM	Construction materials industry
FOO	Food industry
OTI	Other industries

3. Competitive sectors subject to constant returns to scale

HEA	Public services, culture and arts
AGR	Agriculture & forestry
COL	Coalmining
HOU	Housing and communal services
CON	Construction
ELE	Electric industry
GAS	Gas

CRU	Crude oil extraction
OIL	Oil refining and processing
OTH	Other goods-producing sectors
PST	Post
TRD	Wholesale and retail trade
CLI	Textiles and apparel

Table 2. List of Russian Federal Okrug and Oblasts

Federal Okrugs:		
nor	Northwestern Federal District	ark,nen,kgd,len,kr,ko,mur,ngr,psk,spe,vlg
cen	Central Federal District	bel,bry,iva,klu,kos,krs,lip,mow,mos,orl,rya,smo,tam,tve,tul,vla,vor,yar
sou	Southern Federal District	ad,ast,ce da,in,kb,kl,kc,kda,se,sta,ros,vgg
vol	Volga Federal District	ba,cu,kir,me,mo,niz,ore,pnz,per,kop,sam,sar,ta,ud,uly
ura	Urals Federal District	kgn,sve,tyu,khm,yan,che
sib	Siberian Federal District	al,alt,bu,chi,agb,irk,uob,kk,kem,kya,eve,tay,nvs,oms,tom,ty
far	Far Eastern Federal District	amu,yev,kam,kor,kha,mag,chu,pri,sa,sak

Administrative regions:	
AMU	Amurskaya oblast
ARK	Arkhangel'skaya oblast
AST	Astrakhanskaya oblast
BEL	Belgorodskaya oblast
BRY	Bryanskaya oblast
CHE	Chelyabinskaya oblast*
CHI	Chitinskaya oblast
IRK	Irkutskaya oblast
IVA	Ivanovskaya oblast
KGD	Kaliningradskaya oblast
KLU	Kaluzhskaya oblast
KAM	Kamchatskaya oblast
KEM	Kemerovskaya oblast
KIR	Kirovskaya oblast
KOS	Kostromskaya oblast
KGN	Kurganskaya oblast
KRS	Kurskaya oblast
LEN	Leningradskaya oblast
LIP	Lipetskaya oblast
MAG	Magadanskaya oblast
MOS	Moskovskaya oblast
MUR	Murmanskaya oblast
NIZ	Nizhegorodskaya oblast
NGR	Novgorodskaya oblast
NVS	Novosibirskaya oblast
OMS	Omskaya oblast
ORE	Orenburgskaya oblast
ORL	Orlovskaya oblast
PNZ	Penzenskaya oblast
PER	Permskaya oblast
PSK	Pskovskaya oblast
ROS	Rostovskaya oblast
RYA	Ryazanskaya oblast
SAK	Sakhalinskaya oblast
SAM	Samarskaya oblast
SAR	Saratovskaya oblast
SMO	Smolenskaya oblast
SVE	Sverdlovskaya oblast
TAM	Tambovskaya oblast
TOM	Tomskaya oblast
TUL	Tul'skaya oblast
TVE	Tverskaya oblast
TYU	Tyumenskaya oblast
ULY	Ul'yanovskaya oblast
VLA	Vladimirskaya oblast
VGG	Volgogradskaya oblast
VLG	Vologodskaya oblast
VOR	Voronezhskaya oblast
YAR	Yaroslavskaya oblast

*/ No data.

Republics:	
AD	Adygeya, Respublika
AL	Altay, Respublika
BA	Bashkortostan, Respublika
BU	Buryatiya, Respublika
CE	Chechenskaya Respublika
CU	Chuvashskaya Respublika
DA	Dagestan, Respublika
IN	Ingushskaya Respublika
KB	Kabardino-Balkarskaya Respublika
KL	Kalmykiya, Respublika
KC	Karachayevo-Cherkesskaya
KR	Kareliya, Respublika
KK	Khakasiya, Respublika
KO	Komi, Respublika Komi
ME	Mariy El, Respublika
MO	Mordoviya, Respublika
SA	Sakha, Respublika [Yakutiya]
SE	Severnaya Osetiya, Respublika [Alaniya]
TA	Tatarstan, Respublika
TY	Tyva, Respublika [Tuva]
UD	Udmurtskaya Respublika
Autonomous cities:	
MOW	Moskva
SPE	Sankt-Peterburg
Autonomous regions:	
YEV	Yevreyskaya avtonomnaya oblast
Autonomous districts:	
AGB	Aginskiy Buryatskiy avtonomnyy okrug
CHU	Chukotskiy avtonomnyy okrug
EVE	Evenkiyskiy avtonomnyy okrug
KHM	Khanty-Mansiyskiy avtonomnyy okrug [Yugra]
KOP	Komi-Permyatskiy avtonomnyy okrug
KOR	Koryakskiy avtonomnyy okrug
NEN	Nenetskiy avtonomnyy okrug
TAY	Taymyrskiy (Dolgano-Nenetskiy) avtonomnyy okrug
UOB	Ust-Ordynskiy Buryatskiy avtonomnyy okrug
YAN	Yamalo-Nenetskiy avtonomnyy okrug
Administrative territories:	
ALT	Altayskiy kray
KHA	Khabarovskiy kray
KDA	Krasnodarskiy kray
KYA	Krasnoyarskiy kray
PRI	Primorskiy kray
STA	Stavropol'skiy kray

Table 3. Value Added in 2001 by Sector and Russian Federal Okrug

(billions of 2001 rubles) [a/]

Sector [b/]	Northwest	Central	South	Volga	Urals	Siberia	Far East	Sector Total
Railway transportation	25.3	67.4	21.2	47.1	36.6	32.4	10.8	240.7
Truck transportation	11.7	39.0	12.0	23.0	22.4	14.8	5.5	128.5
Pipelines transportation	1.9	3.8	2.1	7.1	7.9	2.7	0.8	26.2
Maritime transportation	4.0	9.0	3.8	9.1	10.9	6.9	1.7	45.4
Air transportation	3.4	17.0	4.5	6.1	6.6	5.3	1.7	44.6
Other transportation	5.4	18.7	5.7	11.2	10.4	6.6	2.4	60.4
Telecommunications	8.4	32.1	8.5	16.1	14.2	10.6	4.1	93.9
Science & science servicing	9.9	31.5	8.4	21.7	18.8	11.4	5.4	107.3
Financial services	52.9	197.3	47.2	97.5	90.4	66.6	27.0	578.9
Ferrous metallurgy	19.6	30.5	5.4	11.0	37.4	12.7	0.7	117.3
Non-ferrous metallurgy	15.6	11.3	5.4	13.5	37.9	98.8	42.1	224.7
Chemical & oil-chemical industry	11.0	34.8	10.0	48.8	3.6	14.2	0.8	123.4
Mechanical engineering & metal-working	38.8	131.4	20.8	129.8	32.3	24.6	16.9	394.7
Timber & woodworking & pulp & paper industry	33.7	21.1	3.2	15.8	3.3	15.0	4.6	96.6
Construction materials industry	5.5	28.0	7.8	13.4	6.9	6.5	1.8	70.0
Food industry	47.2	105.7	35.4	42.9	13.0	24.1	21.1	289.4
Other industries	5.7	32.2	4.6	12.2	1.6	3.4	0.9	60.6
Public services, culture and arts	41.1	153.2	36.1	74.3	59.0	48.0	21.3	433.1
Agriculture & forestry	33.5	125.1	110.5	144.4	33.9	82.7	19.4	549.3
Coalmining	2.9	0.1	1.5	0.0	1.0	29.7	4.3	39.5
Housing and communal services	20.3	81.6	20.1	36.6	24.3	24.2	10.1	217.2
Construction	44.3	202.6	89.4	127.0	48.4	48.2	10.1	570.0
Electric industry	21.6	64.2	18.5	46.0	32.3	28.8	10.4	221.8
Gas	0.3		1.0	2.0	36.4	0.2	0.2	40.1
Crude oil extraction	14.8		29.5	82.5	234.2	7.7	4.1	372.7
Oil refining and processing	7.0	13.2	7.4	31.8	3.1	13.8	3.8	80.1
Other goods-producing sectors	7.1	13.6	3.9	13.9	11.9	7.3	3.1	60.9
Post	2.4	8.8	2.4	4.7	4.0	2.9	1.2	26.5
Wholesale and retail trade	211.3	646.3	196.1	417.0	505.7	266.8	103.1	2346.3
Textiles and apparel	3.3	14.1	3.4	5.7	3.5	3.8	1.6	35.6
Okrug Total	710.1	2133.7	725.6	1512.1	1352.0	920.8	341.5	

Table 4. Value-Added by Sector as a percent of the Value-Added of the Federal Okrug

(percent)

Sector [b/]	Northwest	Central	South	Volga	Urals	Siberia	Far East	Sector Total
Railway transportation	3.6	3.2	2.9	3.1	2.7	3.5	3.2	3.1
Truck transportation	1.7	1.8	1.7	1.5	1.7	1.6	1.6	1.7
Pipelines transportation	0.3	0.2	0.3	0.5	0.6	0.3	0.2	0.3
Maritime transportation	0.6	0.4	0.5	0.6	0.8	0.8	0.5	0.6
Air transportation	0.5	0.8	0.6	0.4	0.5	0.6	0.5	0.6
Other transportation	0.8	0.9	0.8	0.7	0.8	0.7	0.7	0.8
Telecommunications	1.2	1.5	1.2	1.1	1.0	1.2	1.2	1.2
Science & science servicing	1.4	1.5	1.2	1.4	1.4	1.2	1.6	1.4
Financial services	7.5	9.2	6.5	6.4	6.7	7.2	7.9	7.5
Ferrous metallurgy	2.8	1.4	0.7	0.7	2.8	1.4	0.2	1.5
Non-ferrous metallurgy	2.2	0.5	0.7	0.9	2.8	10.7	12.3	2.9
Chemical & oil-chemical industry	1.6	1.6	1.4	3.2	0.3	1.5	0.2	1.6
Mechanical engineering & metal-working	5.5	6.2	2.9	8.6	2.4	2.7	5.0	5.1
Timber & woodworking & pulp & paper industry	4.7	1.0	0.4	1.0	0.2	1.6	1.4	1.3
Construction materials industry	0.8	1.3	1.1	0.9	0.5	0.7	0.5	0.9
Food industry	6.6	5.0	4.9	2.8	1.0	2.6	6.2	3.8
Other industries	0.8	1.5	0.6	0.8	0.1	0.4	0.3	0.8
Public services, culture and arts	5.8	7.2	5.0	4.9	4.4	5.2	6.2	5.6
Agriculture & forestry	4.7	5.9	15.2	9.5	2.5	9.0	5.7	7.1
Coalmining	0.4	0.0	0.2	0.0	0.1	3.2	1.3	0.5
Housing and communal services	2.9	3.8	2.8	2.4	1.8	2.6	3.0	2.8
Construction	6.2	9.5	12.3	8.4	3.6	5.2	2.9	7.4
Electric industry	3.0	3.0	2.5	3.0	2.4	3.1	3.0	2.9
Gas	0.0		0.1	0.1	2.7	0.0	0.1	0.5
Crude oil extraction	2.1		4.1	5.5	17.3	0.8	1.2	4.8
Oil refining and processing	1.0	0.6	1.0	2.1	0.2	1.5	1.1	1.0
Other goods-producing sectors	1.0	0.6	0.5	0.9	0.9	0.8	0.9	0.8
Post	0.3	0.4	0.3	0.3	0.3	0.3	0.4	0.3
Wholesale and retail trade	29.8	30.3	27.0	27.6	37.4	29.0	30.2	30.5
Textiles and apparel	0.5	0.7	0.5	0.4	0.3	0.4	0.5	0.5
Okrug Total	9.2	27.7	9.4	19.6	17.6	12.0	4.4	

Table 5. Share of Sector Value-Added by Federal Okrug of Russia

Sector [b/]	Northwest	Central	South	Volga	Urals	Siberia	Far East	Sector total
Railway transportation	10.5	28.0	8.8	19.6	15.2	13.5	4.5	3.1
Truck transportation	9.1	30.3	9.4	17.9	17.5	11.5	4.3	1.7
Pipelines transportation	7.1	14.4	8.2	26.9	30.1	10.2	3.1	0.3
Maritime transportation	8.8	19.9	8.4	20.0	24.0	15.2	3.8	0.6
Air transportation	7.7	38.2	10.0	13.6	14.7	12.0	3.9	0.6
Other transportation	8.9	31.0	9.5	18.5	17.2	11.0	4.0	0.8
Telecommunications	8.9	34.2	9.1	17.1	15.1	11.3	4.4	1.2
Science & science servicing	9.2	29.4	7.9	20.3	17.5	10.6	5.1	1.4
Financial services	9.1	34.1	8.1	16.8	15.6	11.5	4.7	7.5
Ferrous metallurgy	16.7	26.0	4.6	9.4	31.8	10.9	0.6	1.5
Non-ferrous metallurgy	7.0	5.0	2.4	6.0	16.9	44.0	18.7	2.9
Chemical & oil-chemical industry	8.9	28.2	8.1	39.6	2.9	11.5	0.7	1.6
Mechanical engineering & metal-working	9.8	33.3	5.3	32.9	8.2	6.2	4.3	5.1
Timber & woodworking & pulp & paper industry	34.8	21.9	3.3	16.3	3.4	15.5	4.8	1.3
Construction materials industry	7.9	40.0	11.2	19.2	9.9	9.2	2.6	0.9
Food industry	16.3	36.5	12.2	14.8	4.5	8.3	7.3	3.8
Other industries	9.5	53.1	7.5	20.1	2.7	5.6	1.5	0.8
Public services, culture and arts	9.5	35.4	8.3	17.2	13.6	11.1	4.9	5.6
Agriculture & forestry	6.1	22.8	20.1	26.3	6.2	15.0	3.5	7.1
Coalmining	7.3	0.3	3.8	0.1	2.6	75.0	11.0	0.5
Housing and communal services	9.3	37.6	9.3	16.8	11.2	11.1	4.7	2.8
Construction	7.8	35.5	15.7	22.3	8.5	8.5	1.8	7.4
Electric industry	9.7	28.9	8.3	20.8	14.6	13.0	4.7	2.9
Gas	0.7		2.5	4.9	90.8	0.5	0.6	0.5
Crude oil extraction	4.0		7.9	22.1	62.8	2.1	1.1	4.8
Oil refining and processing	8.7	16.5	9.3	39.7	3.9	17.3	4.7	1.0
Other goods-producing sectors	11.7	22.3	6.4	22.8	19.6	12.0	5.2	0.8
Post	9.2	33.1	9.0	17.7	15.2	11.1	4.5	0.3
Wholesale and retail trade	9.0	27.5	8.4	17.8	21.6	11.4	4.4	30.5
Textiles and apparel	9.4	39.6	9.5	16.1	9.9	10.8	4.6	0.5
Market total	9.2	27.7	9.4	19.6	17.6	12.0	4.4	

Table 6: Exports by Product and by Federal Okrug (in billions of 2001 rubles)

Sector [b/]	Northwest	Central	South	Volga	Urals	Siberia	Far East	Sector total
Railway transportation	8.8	13.9	5.5	14.7	8.8	14.1	3.9	69.7
Truck transportation	1.2	2.2	0.8	1.6	1.0	1.3	0.6	8.7
Pipelines transportation	1.1	0.1	2.3	6.4	19.6	0.7	0.4	30.6
Maritime transportation	7.3	11.2	5.8	16.1	18.0	9.7	3.1	71.2
Air transportation	6.1	25.1	6.4	10.8	7.9	7.2	3.1	66.5
Other transportation	1.2	2.8	1.0	2.9	1.9	1.6	0.5	11.9
Telecommunications	0.9	3.2	0.9	1.7	1.4	1.1	0.4	9.5
Science & science servicing	0.6	1.7	0.5	1.3	1.0	0.6	0.3	6.0
Financial services	0.7	2.5	0.6	1.3	1.1	0.8	0.4	7.4
Ferrous metallurgy	25.2	39.4	7.1	10.9	46.9	15.3	0.7	145.5
Non-ferrous metallurgy	21.2	15.3	7.7	19.8	51.6	116.3	36.7	268.6
Chemical & oil-chemical industry	13.6	25.3	8.3	54.6	5.0	20.4	0.3	127.5
Mechanical engineering & metal-working	27.4	87.1	15.5	54.2	20.3	31.6	10.5	246.7
Timber & woodworking & pulp & paper industry	27.0	2.8	0.9	6.3	1.1	19.2	9.0	66.3
Construction materials industry	0.6	2.1	0.6	1.3	1.1	1.0	0.1	6.7
Food industry	9.4	22.0	13.6	5.4	1.6	3.4	10.3	65.8
Other industries	2.1	12.0	1.7	4.5	0.6	1.3	0.3	22.6
Public services, culture and arts	0.3	1.0	0.2	0.5	0.4	0.3	0.1	2.8
Agriculture & forestry	0.6	2.4	2.1	2.7	0.6	1.6	0.4	10.4
Coalmining	1.5	0.1	0.8	0.0	0.5	15.3	2.2	20.5
Housing and communal services	0.3	1.1	0.3	0.5	0.3	0.3	0.1	3.0
Construction	2.5	11.3	5.0	7.1	2.7	2.7	0.6	31.8
Electric industry	0.9	2.7	0.8	2.0	1.4	1.2	0.4	9.4
Gas	0.2		0.7	1.3	25.0	0.1	0.2	27.5
Crude oil extraction	14.4		28.7	80.2	227.8	7.5	4.0	362.5
Oil refining and processing	16.8	31.7	17.8	76.5	7.5	33.3	9.1	192.7
Other goods-producing sectors	1.3	2.5	0.7	2.5	2.2	1.3	0.6	11.1
Post	0.3	1.2	0.3	0.7	0.6	0.4	0.2	3.8
Wholesale and retail trade	63.7	81.2	46.0	124.4	414.7	93.7	32.4	856.1
Textiles and apparel	1.5	6.2	1.5	2.5	1.6	1.7	0.7	15.7
Okrug Total:	258.8	410.4	183.9	514.5	874.0	405.3	131.7	

Table 7. Sector Exports as a Percent of Total Exports of the Federal Okrug

Sector [b/]	Northwest	Central	South	Volga	Urals	Siberia	Far East	Sector total
Railway transportation	3.4	3.4	3.0	2.9	1.0	3.5	2.9	2.5
Truck transportation	0.5	0.5	0.4	0.3	0.1	0.3	0.4	0.3
Pipelines transportation	0.4	0.0	1.2	1.2	2.2	0.2	0.3	1.1
Maritime transportation	2.8	2.7	3.2	3.1	2.1	2.4	2.4	2.6
Air transportation	2.4	6.1	3.5	2.1	0.9	1.8	2.4	2.4
Other transportation	0.5	0.7	0.6	0.6	0.2	0.4	0.4	0.4
Telecommunications	0.3	0.8	0.5	0.3	0.2	0.3	0.3	0.3
Science & science servicing	0.2	0.4	0.3	0.2	0.1	0.2	0.2	0.2
Financial services	0.3	0.6	0.3	0.3	0.1	0.2	0.3	0.3
Ferrous metallurgy	9.7	9.6	3.9	2.1	5.4	3.8	0.6	5.2
Non-ferrous metallurgy	8.2	3.7	4.2	3.8	5.9	28.7	27.8	9.7
Chemical & oil-chemical industry	5.3	6.2	4.5	10.6	0.6	5.0	0.2	4.6
Mechanical engineering & metal-working	10.6	21.2	8.4	10.5	2.3	7.8	8.0	8.9
Timber & woodworking & pulp & paper industry	10.4	0.7	0.5	1.2	0.1	4.7	6.8	2.4
Construction materials industry	0.2	0.5	0.3	0.3	0.1	0.3	0.1	0.2
Food industry	3.6	5.4	7.4	1.1	0.2	0.8	7.8	2.4
Other industries	0.8	2.9	0.9	0.9	0.1	0.3	0.2	0.8
Public services, culture and arts	0.1	0.2	0.1	0.1	0.0	0.1	0.1	0.1
Agriculture & forestry	0.2	0.6	1.1	0.5	0.1	0.4	0.3	0.4
Coalmining	0.6	0.0	0.4	0.0	0.1	3.8	1.7	0.7
Housing and communal services	0.1	0.3	0.1	0.1	0.0	0.1	0.1	0.1
Construction	1.0	2.8	2.7	1.4	0.3	0.7	0.4	1.1
Electric industry	0.4	0.7	0.4	0.4	0.2	0.3	0.3	0.3
Gas	0.1		0.4	0.3	2.9	0.0	0.1	1.0
Crude oil extraction	5.5		15.6	15.6	26.1	1.8	3.1	13.0
Oil refining and processing	6.5	7.7	9.7	14.9	0.9	8.2	6.9	6.9
Other goods-producing sectors	0.5	0.6	0.4	0.5	0.2	0.3	0.4	0.4
Post	0.1	0.3	0.2	0.1	0.1	0.1	0.1	0.1
Wholesale and retail trade	24.6	19.8	25.0	24.2	47.4	23.1	24.6	30.8
Textiles and apparel	0.6	1.5	0.8	0.5	0.2	0.4	0.6	0.6
Okrug Total:	9.3	14.8	6.6	18.5	31.5	14.6	4.7	

Table 8. Export Intensities by Federal Okrug

Sectoral Exports as a Percentage of Production

Sector [b/]	Northwest	Central	South	Volga	Urals	Siberia	Far East
Railway transportation	24.5	14.6	18.3	21.8	17.1	30.8	25.0
Pipelines transportation	21.5	1.2	37.3	31.7	89.8	9.4	15.1
Maritime transportation	81.8	63.0	76.1	79.9	91.1	73.9	82.1
Air transportation	48.3	45.9	45.9	48.3	43.1	44.9	48.8
Other transportation	11.7	7.6	9.2	13.1	9.2	12.7	10.0
Telecommunications	6.9	6.8	6.7	6.9	6.6	6.7	6.9
Science & science servicing	2.7	2.6	2.6	2.7	2.6	2.6	2.7
Financial services	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Ferrous metallurgy	39.0	40.3	43.3	31.1	37.6	36.2	34.6
Non-ferrous metallurgy	53.7	56.5	57.6	57.8	52.9	46.0	34.6
Chemical & oil-chemical industry	41.1	25.3	26.8	34.8	50.8	46.9	20.4
Mechanical engineering & metal-working	29.1	27.4	29.7	15.6	24.4	47.2	24.1
Timber & woodworking & pulp & paper industry	31.9	5.9	12.2	16.0	13.6	48.8	71.7
Construction materials industry	4.4	3.0	3.0	3.9	6.2	6.4	2.8
Food industry	6.4	6.6	11.7	3.9	3.8	4.4	14.8
Other industries	14.3	14.3	14.3	14.3	14.3	14.3	14.3
Public services, culture and arts	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Agriculture & forestry	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Coalmining	23.0	23.0	23.0	23.0	23.0	23.0	23.0
Housing and communal services	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Construction	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Electric industry	1.7	1.7	1.7	1.7	1.7	1.7	1.7
Gas	26.8		26.8	26.8	26.8	26.8	26.8
Crude oil extraction	55.9		55.9	55.9	55.9	55.9	55.9
Oil refining and processing	32.1	32.1	32.1	32.1	32.1	32.1	32.1
Other goods-producing sectors	11.5	11.5	11.5	11.5	11.5	11.5	11.5
Post	9.3	9.3	9.3	9.3	9.3	9.3	9.3
Wholesale and retail trade	21.6	9.0	16.8	21.3	58.7	25.1	22.5
Textiles and apparel	11.4	11.4	11.4	11.4	11.4	11.4	11.4

Table 9: Imports by Product and by Federal Okrug (in x 2001 rubles)

Sector [b/]	Northwest	Central	South	Volga	Urals	Siberia	Far East	Sector total
Railway transportation	0.1	0.4	0.1	0.3	0.2	0.2	0.1	1.5
Truck transportation	0.4	1.3	0.4	0.8	0.8	0.5	0.2	4.3
Pipelines transportation								
Maritime transportation								
Air transportation	0.3	1.2	0.3	0.5	0.4	0.3	0.1	3.1
Other transportation	0.1	0.5	0.1	0.3	0.3	0.2	0.1	1.5
Telecommunications	0.7	2.7	0.7	1.4	1.2	0.9	0.4	8.0
Science & science servicing	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.3
Financial services	1.6	5.8	1.4	3.0	2.6	1.9	0.8	17.1
Ferrous metallurgy	4.3	16.7	6.1	6.8	3.1	2.0	1.2	40.2
Non-ferrous metallurgy	3.4	11.0	3.1	4.6	2.8	1.2	0.7	26.7
Chemical & oil-chemical industry	12.3	49.1	6.6	14.0	9.3	14.2	4.7	110.4
Mechanical engineering & metal-working	58.0	192.9	26.0	35.7	30.6	13.9	14.5	371.5
Timber & woodworking & pulp & paper industry	5.3	21.2	3.1	1.2	0.8	0.5	0.5	32.4
Construction materials industry	3.0	12.9	2.3	3.6	1.7	2.9	0.6	27.0
Food industry	31.3	78.3	11.9	16.3	9.6	11.1	5.6	164.2
Other industries	0.8	2.5	0.9	1.7	1.1	1.0	0.4	8.4
Public services, culture and arts	1.0	3.8	0.9	1.8	1.5	1.2	0.5	10.7
Agriculture & forestry	3.7	12.5	4.4	6.4	3.0	3.9	1.8	35.8
Coalmining	0.6	1.2	0.4	0.7	0.8	1.3	0.3	5.1
Housing and communal services	3.5	14.2	3.5	6.4	4.2	4.2	1.8	37.9
Construction	9.8	23.3	9.0	16.9	20.9	8.6	5.6	94.0
Electric industry	0.3	0.9	0.3	0.6	0.4	0.4	0.1	3.0
Gas	0.1	0.3	0.1	0.2	0.3	0.1	0.0	1.2
Crude oil extraction	1.1	2.2	1.2	5.2	1.1	2.2	0.6	13.6
Oil refining and processing	3.5	10.5	3.5	7.4	5.4	4.1	1.5	36.0
Other goods-producing sectors	1.6	5.4	1.5	3.3	3.0	2.0	0.8	17.6
Post	0.1	0.2	0.1	0.1	0.1	0.1	0.0	0.7
Wholesale and retail trade	1.0	3.4	1.0	2.1	2.1	1.3	0.5	11.5
Textiles and apparel	25.9	108.8	26.0	44.4	27.3	29.7	12.7	274.8
Okrug Total:	174.0	583.1	115.1	185.8	134.5	109.6	56.3	

Table 10. Sector Imports as a Percent of Total Imports of the Federal Okrug

Sector [b/]	Northwest	Central	South	Volga	Urals	Siberia	Far East	Sector total
Railway transportation	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.1
Truck transportation	0.2	0.2	0.3	0.4	0.6	0.4	0.3	0.3
Pipelines transportation								
Maritime transportation								
Air transportation	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.2
Other transportation	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1
Telecommunications	0.4	0.5	0.6	0.8	0.9	0.8	0.6	0.6
Science & science servicing	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Financial services	0.9	1.0	1.2	1.6	1.9	1.8	1.5	1.3
Ferrous metallurgy	2.5	2.9	5.3	3.7	2.3	1.8	2.2	3.0
Non-ferrous metallurgy	1.9	1.9	2.7	2.5	2.1	1.1	1.2	2.0
Chemical & oil-chemical industry	7.1	8.4	5.8	7.5	6.9	13.0	8.4	8.1
Mechanical engineering & metal-working	33.3	33.1	22.6	19.2	22.7	12.6	25.8	27.4
Timber & woodworking & pulp & paper industry	3.0	3.6	2.7	0.7	0.6	0.4	0.8	2.4
Construction materials industry	1.7	2.2	2.0	1.9	1.3	2.7	1.1	2.0
Food industry	18.0	13.4	10.3	8.8	7.2	10.1	10.0	12.1
Other industries	0.4	0.4	0.8	0.9	0.8	0.9	0.7	0.6
Public services, culture and arts	0.6	0.6	0.8	1.0	1.1	1.1	0.9	0.8
Agriculture & forestry	2.1	2.2	3.8	3.4	2.2	3.6	3.3	2.6
Coalmining	0.3	0.2	0.3	0.4	0.6	1.1	0.5	0.4
Housing and communal services	2.0	2.4	3.0	3.4	3.2	3.8	3.1	2.8
Construction	5.6	4.0	7.8	9.1	15.5	7.8	9.9	6.9
Electric industry	0.2	0.1	0.2	0.3	0.3	0.4	0.3	0.2
Gas	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1
Crude oil extraction	0.7	0.4	1.1	2.8	0.9	2.0	1.0	1.0
Oil refining and processing	2.0	1.8	3.1	4.0	4.0	3.7	2.7	2.6
Other goods-producing sectors	0.9	0.9	1.3	1.8	2.2	1.8	1.4	1.3
Post	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1
Wholesale and retail trade	0.6	0.6	0.9	1.1	1.6	1.2	1.0	0.8
Textiles and apparel	14.9	18.7	22.6	23.9	20.3	27.1	22.6	20.2
Okrug Total:	12.8	42.9	8.5	13.7	9.9	8.1	4.1	

Table 11. Sector Import Intensities by Federal Okrug

Regional Imports of the Sector as a Percent of Regional Consumption of the Product

Sector [b/]	Northwest	Central	South	Volga	Urals	Siberia	Far East
Railway transportation	0.3	0.4	0.4	0.4	0.4	0.3	0.4
Truck transportation	1.6	1.7	1.7	1.7	1.7	1.7	1.7
Pipelines transportation							
Maritime transportation							
Air transportation	2.8	2.8	2.8	2.8	2.8	2.8	2.8
Other transportation	1.1	1.2	1.1	1.1	1.2	1.1	1.2
Telecommunications	5.6	5.6	5.6	5.6	5.6	5.6	5.6
Science & science servicing	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Financial services	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Ferrous metallurgy	20.7	24.1	31.3	11.0	12.1	9.1	13.6
Non-ferrous metallurgy	18.2	21.2	25.2	11.4	11.5	8.7	10.0
Chemical & oil-chemical industry	37.0	45.7	21.2	20.4	19.7	36.3	30.2
Mechanical engineering & metal-working	50.6	57.6	22.6	17.2	15.7	11.5	24.4
Timber & woodworking & pulp & paper industry	28.7	32.2	16.3	3.3	3.5	2.3	6.0
Construction materials industry	17.6	18.7	8.5	8.4	8.3	15.6	11.3
Food industry	36.0	21.0	12.8	10.6	9.8	10.6	12.7
Other industries	5.4	5.4	5.4	5.4	5.4	5.4	5.4
Public services, culture and arts	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Agriculture & forestry	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Coalmining	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Housing and communal services	7.9	7.9	7.9	7.9	7.9	7.9	7.9
Construction	7.6	7.6	7.6	7.6	7.6	7.6	7.6
Electric industry	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Gas	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Crude oil extraction	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Oil refining and processing	8.1	8.1	8.1	8.1	8.1	8.1	8.1
Other goods-producing sectors	16.7	16.7	16.7	16.7	16.7	16.7	16.7
Post	1.9	1.9	1.9	1.9	1.9	1.9	1.9
Wholesale and retail trade	0.4	0.4	0.4	0.4	0.3	0.4	0.4
Textiles and apparel	62.1	62.1	62.1	62.1	62.1	62.1	62.1

Table 12a. Tariff Rates, Export Tax Rates, Market Access and Ad Valorem Equivalence of Barriers to FDI

ad-valorem equivalent, %

	Tariff rates	Export tax rates	Change in World Price	Base Year	Post-WTO Accession
Railway transportation				33.0	
Truck transportation				33.0	
Pipelines transportation				33.0	
Maritime transportation				95.0	80.0
Air transportation				90.0	75.0
Other transportation				33.0	
Telecommunications				33.0	
Science & science servicing		0.1		33.0	
Financial services				36.0	
Ferrous metallurgy	5.9	2.6	0.5		
Non-ferrous metallurgy	8.5	5.1	0.5		
Chemical & oil-chemical industry	7.5	3.6	0.5		
Mechanical engineering & metal-working	10.7	2.4			
Timber & woodworking & pulp & paper industry	13.5	11.0			
Construction materials industry	12.0	6.3			
Food industry	14.1	2.9	0.5		
Other industries	14.6	1.1	0.5		
Public services, culture and arts		0.1			
Agriculture & forestry	8.4	2.3			
Coalmining	2.2	2.1			
Housing and communal services					
Construction		0.3			
Electric industry	2.6	6.2			
Gas	5.0	38.7			
Crude oil extraction		21.2			
Oil refining and processing	4.5	28.6			
Other goods-producing sectors	14.6	1.1	0.5		
Post					
Wholesale and retail trade		0.7			
Textiles and apparel	16.8	3.7			

Source: Tarr, Shepotylo and Koudoyarov (2005) for tariff rates; Kimura et al. (2004a,b,c) for barriers to FDI; Roskomstat for export tax rates; authors' estimates for change in world market prices.

Table 12b. Shares of Business Services Sectors in the Regions of Russia Captured by Multinational Firms

ad-valorem equivalent, %

Sector	Northwest	Central	South	Volga	Urals	Siberia	Far East	National Average
Railway transportation	6.0	3.1	3.8	6.0	1.7	2.2	6.0	3.0
Truck transportation	10.0	6.5	6.2	10.0	3.1	4.7	10.0	5.0
Pipelines transportation	6.0	4.8	4.6	6.0	1.8	3.4	6.0	3.0
Maritime transportation	70.0	40.6	45.6	70.0	15.1	28.3	70.0	35.0
Air transportation	50.0	34.8	29.9	50.0	15.5	26.2	50.0	25.0
Other transportation	8.0	5.3	5.0	8.0	2.5	4.0	8.0	4.0
Telecommunications	30.0	19.8	18.8	30.0	8.8	15.1	30.0	15.0
Science & science servicing	20.0	8.9	10.0	20.0	7.0	8.8	20.0	10.0
Financial services	20.0	9.3	9.0	20.0	3.8	6.6	20.0	10.0

Table 13a. Impact of WTO Accession on Federal Okrugs

change from base year, %

	Overall average	Northwest	Central	South	Volga	Urals	Siberia	Far East
Social Welfare Indices (ev/GDP)								
sigma=0	2.4	3.7	2.8	2.7	2.6	1.8	2.5	3.7
sigma=1	3.8	4.8	3.8	3.8	3.8	2.7	3.1	4.5
sigma=4	4.3	5.4	4.2	4.3	4.6	3.6	3.6	4.9
sigma=+inf	4.5	5.6	4.4	4.5	4.9	3.9	3.8	5.1
ev/C	8.1	10.6	7.0	8.1	9.1	9.6	6.4	10.0
Aggregate trade								
Regional terms of trade (% change)	3.5	4.7	3.5	2.5	3.3	1.7	1.7	3.6
Regional exports (% change)	1.8	2.4	2.4	1.6	1.9	0.6	1.3	2.3
Real exchange rate (% change)	2.6	3.3	2.8	2.6	2.7	1.9	1.7	2.9
International exports (% change)	8.8	12.3	16.2	10.2	12.3	2.7	8.6	9.6
Return to primary factors (% change)								
Unskilled labor	5.1	6.7	5.0	5.0	5.4	4.2	4.2	6.3
Skilled labor	5.1	6.8	4.9	5.0	5.7	4.2	4.3	6.3
Aggregate capital earnings	3.9	4.6	4.0	3.9	3.9	3.2	3.0	4.1
Regional mobile capital	7.6	11.0	9.1	7.3	8.2	4.9	6.4	8.8
Energy sector resources	3.0	6.0	15.6	4.9	5.2	1.4	7.7	8.5
Specific capital in domestic firms	-25.7	-26.0	-27.7	-27.4	-25.8	-22.7	-22.3	-25.5
Specific capital in multinational firms	102.7	66.7	73.7	126.2	147.0	184.7	164.8	121.0
Factor adjustments								
Unskilled labor (% changing sectors)	2.3	3.0	2.2	1.7	2.6	2.1	2.2	2.4
Skilled labor (% changing sector)	2.7	3.3	2.8	2.1	2.7	2.8	2.5	2.8

Source: Authors' calculations.

Table 13b. Impact of Full Foreign Direct Investment Liberalization in Services

change from base year, %

	Overall average	Northwest	Central	South	Volga	Urals	Siberia	Far East
Social Welfare Indices (ev/GDP)								
sigma=0	2.9	3.7	3.2	3.1	3.6	1.9	3.1	3.8
sigma=1	3.7	4.3	3.6	3.6	4.3	2.3	3.4	4.2
sigma=4	4.0	4.7	3.8	3.8	4.7	2.7	3.7	4.5
sigma=+inf	4.0	4.8	3.9	3.9	4.9	2.9	3.8	4.6
ev/C	7.3	9.1	6.2	7.1	9.1	7.1	6.5	9.1
Aggregate trade								
Regional terms of trade (% change)	2.0	2.5	1.8	1.4	2.2	1.4	1.3	2.3
Regional exports (% change)	1.8	2.0	1.9	1.6	1.5	1.6	1.9	2.3
Real exchange rate (% change)	1.2	1.5	1.0	1.1	1.4	0.9	1.1	1.6
International exports (% change)	2.6	3.8	3.8	1.4	3.6	1.6	1.9	3.4
Return to primary factors (% change)								
Unskilled labor	4.1	5.2	3.7	3.8	5.3	2.4	3.6	5.5
Skilled labor	2.7	4.1	2.3	2.5	4.0	1.4	2.3	4.0
Aggregate capital earnings	1.9	2.3	1.8	1.8	2.2	1.7	1.9	2.3
Regional mobile capital	4.6	6.1	5.2	4.6	5.4	2.9	3.7	5.5
Energy sector resources	3.2	4.6	7.8	3.4	4.2	2.5	6.4	6.6
Specific capital in domestic firms	-21.6	-20.3	-22.6	-23.6	-20.7	-22.3	-19.9	-21.6
Specific capital in multinational firms	88.5	60.3	64.5	102.9	128.1	153.7	138.1	103.7
Factor adjustments								
Unskilled labor (% changing sectors)	1.3	1.6	1.2	1.1	1.4	1.3	1.6	1.9
Skilled labor (% changing sector)	1.9	2.2	1.8	1.5	2.0	1.8	2.1	2.6

Source: Authors' calculations.

Table 13c. Impact of Partial Foreign Direct Investment Liberalization in Services

change from base year, %

	Overall average	Northwest	Central	South	Volga	Urals	Siberia	Far East
Social Welfare Indices (ev/GDP)								
sigma=0	1.1	1.8	1.4	1.4	0.8	1.0	1.1	1.8
sigma=1	2.0	2.6	2.1	2.0	1.6	1.7	1.5	2.3
sigma=4	2.3	2.9	2.4	2.4	2.1	2.2	1.8	2.5
sigma=+inf	2.4	3.0	2.5	2.5	2.2	2.4	1.9	2.6
ev/C	4.4	5.7	4.1	4.5	4.2	6.0	3.3	5.1
Aggregate trade								
Regional terms of trade (% change)	2.1	3.2	2.3	1.4	1.8	0.6	0.6	2.1
Regional exports (% change)	0.9	1.5	1.5	0.8	1.2	-0.3	0.2	1.1
Real exchange rate (% change)	1.8	2.3	2.1	1.9	1.8	1.3	1.0	1.8
International exports (% change)	7.0	10.4	12.8	8.6	10.5	1.5	6.9	7.9
Return to primary factors (% change)								
Unskilled labor	2.0	2.9	2.1	2.2	1.6	2.2	1.4	2.3
Skilled labor	2.4	3.1	2.4	2.4	2.1	2.6	2.0	2.7
Aggregate capital earnings	2.6	3.1	2.8	2.6	2.6	2.0	1.8	2.6
Regional mobile capital	4.8	7.5	6.2	4.5	4.9	3.0	4.0	5.8
Energy sector resources	0.6	2.8	9.2	2.3	2.5	-0.6	2.6	3.5
Specific capital in domestic firms	-12.1	-14.2	-13.4	-12.2	-14.0	-6.5	-8.8	-13.0
Specific capital in multinational firms	43.1	29.2	30.0	55.2	66.9	66.5	66.3	57.2
Factor adjustments								
Unskilled labor (% changing sectors)	2.1	2.6	2.0	1.5	2.3	1.8	2.3	2.3
Skilled labor (% changing sector)	2.1	2.6	2.1	1.5	2.0	2.2	2.2	2.4

Source: Authors' calculations.

Table 13d. Impact of Improved External Market Access

change from base year, %

	Overall average	Northwest	Central	South	Volga	Urals	Siberia	Far East
Social Welfare Indices (ev/GDP)								
sigma=0	-0.3	-0.1	-0.1	0.0	-0.1	0.2	-0.4	-0.2
sigma=1	0.0	-0.1	0.0	0.0	0.0	0.3	-0.3	-0.1
sigma=4	0.0	0.0	0.0	0.1	0.0	0.4	-0.3	-0.1
sigma=+inf	0.0	0.0	0.1	0.1	0.0	0.4	-0.3	-0.1
ev/C	0.1	0.0	0.1	0.1	0.0	1.0	-0.5	-0.1
Aggregate trade								
Regional terms of trade (% change)	0.0	0.2	0.2	0.0	0.0	-0.2	-0.2	0.0
Regional exports (% change)	-0.1	0.0	0.1	0.0	0.0	-0.8	-0.3	-0.3
Real exchange rate (% change)	-0.6	-0.6	-0.5	-0.5	-0.6	-0.5	-0.9	-0.6
International exports (% change)	0.5	1.1	1.4	0.5	1.0	-0.3	1.0	-0.6
Return to primary factors (% change)								
Unskilled labor	-0.1	-0.2	0.0	0.0	-0.1	0.5	-0.6	-0.4
Skilled labor	0.3	0.2	0.3	0.3	0.2	0.9	0.0	0.1
Aggregate capital earnings	0.1	0.1	0.1	0.1	0.0	0.1	-0.2	0.1
Regional mobile capital	0.4	0.9	0.7	0.4	0.5	-0.1	0.6	0.4
Energy sector resources	-2.6	-2.0	0.3	-2.0	-2.3	-2.9	-1.9	-1.8
Specific capital in domestic firms	-0.2	-0.6	-0.6	-0.3	-0.4	1.4	0.0	0.4
Specific capital in multinational firms	1.7	0.5	0.7	3.0	2.0	5.2	4.5	2.4
Factor adjustments								
Unskilled labor (% changing sectors)	0.7	0.9	0.5	0.4	0.6	1.0	1.2	1.0
Skilled labor (% changing sector)	0.8	0.9	0.5	0.4	0.6	1.4	1.2	1.3

Source: Authors' calculations.

Table 13e. Impact of Tariff Reductions

change from base year, %

	Overall average	Northwest	Central	South	Volga	Urals	Siberia	Far East
Social Welfare Indices (ev/GDP)								
sigma=0	-0.2	0.1	-0.3	-0.3	-0.9	-0.3	-0.2	0.1
sigma=1	0.1	0.6	0.2	0.2	-0.4	0.1	0.0	0.4
sigma=4	0.3	0.8	0.4	0.4	-0.1	0.4	0.2	0.5
sigma=+inf	0.4	0.8	0.5	0.5	0.0	0.5	0.2	0.5
ev/C	0.7	1.6	0.8	0.8	0.0	1.2	0.4	1.0
Aggregate trade								
Regional terms of trade (% change)	1.4	2.0	1.5	0.9	0.9	0.4	0.4	1.0
Regional exports (% change)	0.2	0.3	0.3	0.0	0.4	0.0	-0.4	0.2
Real exchange rate (% change)	2.1	2.4	2.3	2.1	2.0	1.5	1.5	1.7
International exports (% change)	5.5	7.2	10.1	7.5	7.3	1.5	5.7	7.6
Return to primary factors (% change)								
Unskilled labor	1.0	1.7	1.3	1.1	0.1	1.0	1.2	1.2
Skilled labor	1.8	2.3	2.1	2.0	1.4	1.5	1.9	2.1
Aggregate capital earnings	1.8	2.1	2.0	1.8	1.7	1.2	1.2	1.5
Regional mobile capital	2.4	3.7	2.9	2.1	2.1	2.1	2.0	2.8
Energy sector resources	2.4	3.4	6.1	3.6	3.5	1.9	2.3	2.5
Specific capital in domestic firms	-3.5	-4.4	-4.1	-3.0	-4.3	-1.6	-2.0	-4.2
Specific capital in multinational firms	10.6	4.7	7.2	17.3	14.2	21.2	19.5	13.4
Factor adjustments								
Unskilled labor (% changing sectors)	1.2	1.4	1.1	1.1	1.5	1.0	1.3	1.9
Skilled labor (% changing sector)	1.0	1.0	1.0	0.7	1.1	0.7	0.9	1.5

Source: Authors' calculations.

Table 13f. Impact of FDI Liberalization, Market Access and Tariff Reform in a CRTS Framework

change from base year, %

	Overall average	Northwest	Central	South	Volga	Urals	Siberia	Far East
Social Welfare Indices (ev/GDP)								
sigma=0	-0.4	-0.1	-0.4	-0.4	-0.7	-0.4	-0.4	-0.2
sigma=1	-0.1	0.3	0.0	-0.1	-0.3	0.0	-0.2	0.0
sigma=4	0.1	0.4	0.1	0.0	-0.1	0.3	-0.1	0.1
sigma=+inf	0.1	0.4	0.1	0.1	0.0	0.4	0.0	0.2
ev/C	0.2	0.8	0.2	0.2	0.0	0.9	-0.1	0.3
Aggregate trade								
Regional terms of trade (% change)	1.1	1.3	1.0	0.6	0.6	0.3	0.3	0.5
Regional exports (% change)	-0.1	-0.1	0.0	-0.1	0.0	-0.1	-0.3	-0.2
Real exchange rate (% change)	1.3	1.5	1.4	1.3	1.2	1.1	1.0	1.1
International exports (% change)	2.2	2.7	4.7	3.2	3.0	0.5	2.2	2.4
Return to primary factors (% change)								
Unskilled labor	1.3	1.7	1.5	1.2	0.9	1.2	1.2	1.2
Skilled labor	1.6	1.9	1.8	1.5	1.3	1.3	1.5	1.5
Aggregate capital earnings	1.4	1.6	1.5	1.4	1.4	1.2	1.2	1.2
Regional mobile capital	1.8	2.6	2.3	1.7	1.6	1.6	1.6	1.9
Energy sector resources	1.1	1.4	2.8	1.6	1.6	0.9	1.3	1.1
Specific capital in domestic firms	-0.6	-0.7	-0.8	-0.5	-1.0	0.2	0.1	-0.4
Specific capital in multinational firms	1.0	0.3	0.4	2.3	1.5	2.7	1.8	1.3
Factor adjustments								
Unskilled labor (% changing sectors)	0.5	0.5	0.5	0.4	0.5	0.4	0.6	0.6
Skilled labor (% changing sector)	0.4	0.4	0.4	0.3	0.4	0.4	0.4	0.5

Source: Authors' calculations.

Table 13g. Impact of WTO Accession on Federal Okrugs (calibration to household factor shares)

change from base year, %

	Overall average	Northwest	Central	South	Volga	Urals	Siberia	Far East
Social Welfare Indices (ev/GDP)								
sigma=0	2.3	4.6	4.1	3.1	2.7	1.9	2.5	4.2
sigma=1	4.0	5.4	4.5	3.8	3.8	2.6	2.8	4.6
sigma=4	4.4	5.9	4.7	4.2	4.4	3.3	3.1	4.9
sigma=+inf	4.5	6.0	4.7	4.3	4.6	3.5	3.2	5.1
ev/C	8.1	11.3	7.6	7.8	8.7	8.6	5.5	10.0
Aggregate trade								
Regional terms of trade (% change)	3.5	4.7	3.3	2.4	3.3	1.6	1.8	3.6
Regional exports (% change)	1.8	2.6	2.5	1.6	1.8	0.7	1.2	2.3
Real exchange rate (% change)	2.6	3.3	2.9	2.6	2.6	1.8	1.6	2.8
International exports (% change)	8.9	12.0	16.8	10.1	12.1	3.0	9.1	9.3
Return to primary factors (% change)								
Unskilled labor	6.3	8.4	7.4	5.8	5.7	4.8	4.5	7.3
Skilled labor	5.4	7.1	5.6	5.2	5.8	4.4	4.1	6.4
National capital	2.1	2.8	2.4	2.1	2.1	1.3	1.1	2.3
Regional mobile capital	7.3	12.4	10.0	7.6	8.5	4.6	6.7	9.7
Energy sector resources	3.0	6.1	16.0	4.8	5.0	1.5	7.8	8.2
Specific capital in domestic firms	-25.8	-26.3	-27.9	-27.5	-25.6	-22.8	-22.2	-25.3
Specific capital in multinational firms	103.1	67.0	74.3	126.8	147.0	185.2	164.5	121.4
Factor adjustments								
Unskilled labor (% changing sectors)	2.0	2.8	1.6	1.6	2.5	2.0	2.1	1.9
Skilled labor (% changing sector)	2.7	3.5	2.7	2.0	2.6	2.9	2.5	2.8

Source: Authors' calculations.

Table 13h. Impact of WTO Accession on Federal Okrugs (calibration to input-output factor shares)

change from base year, %

	Overall average	Northwest	Central	South	Volga	Urals	Siberia	Far East
Social Welfare Indices (ev/GDP)								
sigma=0	2.4	3.6	2.8	2.8	2.6	1.7	2.5	3.6
sigma=1	3.8	4.7	3.9	3.8	3.8	2.7	3.1	4.4
sigma=4	4.3	5.3	4.3	4.3	4.5	3.5	3.6	4.8
sigma=+inf	4.5	5.4	4.5	4.5	4.8	3.8	3.8	5.0
ev/C	8.1	10.3	7.2	8.1	8.9	9.4	6.5	9.8
Aggregate trade								
Regional terms of trade (% change)	3.4	4.6	3.4	2.5	3.3	1.8	1.7	3.5
Regional exports (% change)	1.8	2.5	2.4	1.6	1.9	0.6	1.3	2.3
Real exchange rate (% change)	2.7	3.4	3.0	2.7	2.7	1.9	1.8	2.9
International exports (% change)	8.9	13.0	16.6	10.4	12.4	2.6	8.6	9.9
Return to primary factors (% change)								
Unskilled labor	5.0	6.6	4.9	5.0	5.3	4.1	4.1	6.3
Skilled labor	5.2	7.1	5.0	5.2	5.8	4.1	4.5	6.5
National capital	4.3	5.0	4.5	4.2	4.3	3.5	3.3	4.5
Regional mobile capital	7.0	9.6	7.4	6.6	7.8	4.9	6.1	8.0
Energy sector resources	3.1	6.6	15.9	5.1	5.4	1.4	7.6	8.7
Specific capital in domestic firms	-25.7	-26.1	-27.7	-27.4	-25.8	-22.6	-22.2	-25.5
Specific capital in multinational firms	103.2	67.0	74.2	126.9	147.4	185.2	165.4	121.4
Factor adjustments								
Unskilled labor (% changing sectors)	2.3	2.9	2.2	1.7	2.5	2.0	2.2	2.5
Skilled labor (% changing sector)	2.6	3.3	2.7	2.0	2.6	2.6	2.5	2.9

Source: Authors' calculations.

Table 14a. Decomposition of Regional Welfare Impacts for the Federal Okrugs - WTO Scenario

Component effects on utilitarian SWF

	Overall average	Northwest	Central	South	Volga	Urals	Siberia	Far East
Skilled wages	1.1	1.6	0.9	1.0	1.4	1.0	1.0	1.3
Unskilled wages	1.4	2.0	1.3	1.5	1.6	1.0	1.1	1.6
Capital Earnings								
Mobile capital	2.9	2.9	3.1	2.8	2.6	2.7	2.6	3.2
Regional energy rents	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.2
Specific capital in domestic firms	-2.2	-2.0	-2.3	-2.1	-1.9	-2.3	-2.3	-2.3
Specific capital in multinational firms	1.2	1.1	1.2	1.1	1.1	1.2	1.2	1.3
Tax and Terms of Trade Effects								
Change in lumpsum taxes	0.4	0.4	0.5	0.4	0.4	0.3	0.4	0.4
Total Welfare Change (% income)	4.9	6.2	4.9	4.9	5.3	4.1	4.1	5.6
		-9.E-08	-8.E-09	-6.E-08	1.E-07	2.E-08	8.E-08	-2.E-08

Source: Authors' estimates

Table 14b. Decomposition of Average Decile Welfare Impacts - WTO Scenario

Component effects on utilitarian SWF		**Decile**							
	Average	10	20	30	40	50	60	70	80
Skilled wages	1.1	0.0	0.2	0.3	0.5	0.6	0.8	0.9	0.9
Unskilled wages	1.4	3.4	3.1	3.0	2.7	2.4	2.1	1.9	1.7
Capital Earnings									
Mobile capital	2.9	1.0	1.2	1.4	1.7	2.0	2.2	2.4	2.7
Regional energy rents	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2
Specific capital in domestic firms	-2.2	-0.9	-1.1	-1.2	-1.4	-1.6	-1.8	-1.9	-2.2
Specific capital in multinational firms	1.2	0.5	0.5	0.6	0.7	0.9	0.9	1.0	1.2
Tax and Terms of Trade Effects									
Change in lumpsum taxes	0.4	0.6	0.6	0.6	0.5	0.5	0.5	0.4	0.4
Total Welfare Change (% income)	4.9	4.6	4.7	4.7	4.8	4.8	4.8	4.9	4.8
		-1.E-07	-7.E-09	-2.E-08	1.E-07	1.E-08	3.E-08	-2.E-08	-2.E-07

Source: Authors' estimates

Table 15. Impact of WTO Accession on Output by Sector and Federal Okrug

change from base year, (%)

Sector	National Average	Northwest	Central	South	Volga	Urals	Siberia	Far East
Railway transportation	1.7	2.4	1.4	1.1	1.9	3.3	0.2	0.6
Truck transportation	7.6	11.4	8.0	7.2	11.4	1.5	5.4	11.6
Pipelines transportation	-3.7	-4.8	-4.2	-3.6	-3.7	-2.7	-5.1	-5.0
Maritime transportation	-5.5	-4.4	-5.0	-6.8	-3.6	-4.2	-11.6	-3.4
Air transportation	-2.0	-0.6	-2.8	-1.9	1.9	-3.4	-5.6	0.8
Other transportation	-7.6	-1.5	-7.1	-7.5	-1.6	-17.5	-11.0	-1.5
Telecommunications	9.7	17.4	9.7	9.2	17.2	-2.4	4.7	17.3
Science & science servicing	2.2	5.2	0.1	0.1	6.8	-0.8	1.5	4.7
Financial services	-6.3	-5.8	-6.3	-5.8	-6.1	-6.6	-6.6	-6.3
Ferrous metallurgy	27.2	27.5	36.1	46.0	23.7	23.6	12.6	22.2
Non-ferrous metallurgy	11.7	4.7	25.8	34.7	23.7	28.7	5.7	2.9
Chemical & oil-chemical industry	17.8	23.4	8.4	11.0	20.3	56.8	23.1	1.3
Mechanical engineering & metal-working	-2.8	-0.4	-2.3	0.1	-5.0	-3.4	0.1	-1.3
Timber & woodworking & pulp & paper industry	-3.5	-4.5	-11.5	-9.5	-0.3	0.1	-4.4	28.0
Construction materials industry	-7.8	-10.7	-8.7	-5.3	-5.6	-5.6	-11.6	-7.1
Food industry	-13.7	-16.4	-15.9	-10.9	-11.5	-8.0	-12.8	-11.6
Other industries	-2.9	-2.7	-1.4	-2.4	-6.1	-2.0	-6.5	-4.8
Public services, culture and arts	1.5	1.8	1.5	1.8	1.4	1.3	1.1	1.7
Agriculture & forestry	-3.6	-8.3	-3.5	-2.2	-4.2	1.5	-4.2	-5.4
Coalmining	4.7	6.6	6.6	6.5	6.9	6.2	4.1	6.4
Housing and communal services	1.8	2.2	1.5	2.3	1.7	2.4	1.0	2.4
Construction	0.5	-0.8	2.5	0.3	-0.9	-0.5	-1.6	-0.8
Electric industry	2.2	2.5	1.3	2.0	2.5	4.3	1.8	0.9
Gas	-1.6	-2.7		-1.6	-1.5	-1.6	-2.6	-1.9
Crude oil extraction	1.1	1.6		1.4	1.8	0.9	0.9	1.7
Oil refining and processing	0.9	-1.2	0.6	2.2	3.1	0.1	-3.6	2.2
Other goods-producing sectors	-9.6	-11.9	-4.3	-7.5	-11.5	-10.2	-12.7	-12.0
Post	1.3	1.6	1.7	1.9	1.5	-0.3	0.6	2.0
Wholesale and retail trade	3.6	5.5	4.4	4.1	5.0	0.0	4.0	4.8
Textiles and apparel	-3.0	-4.6	-2.6	-2.3	-3.0	-2.0	-5.1	-2.5

Table 16. Impact of WTO Accession on Skilled Employment by Sector and Federal Okrug

change from base year, (%)

Sector	National Average	Northwest	Central	South	Volga	Urals	Siberia	Far East
Railway transportation	1.5	2.0	1.1	1.0	1.9	3.2	0.3	0.3
Truck transportation	7.0	10.4	7.3	6.5	10.6	1.2	5.0	10.6
Pipelines transportation	-4.1	-4.5	-3.4	-4.0	-4.4	-3.6	-5.2	-5.8
Maritime transportation	-6.5	-6.0	-6.2	-7.8	-4.9	-4.9	-12.1	-4.9
Air transportation	-3.3	-2.2	-3.9	-3.0	0.2	-4.1	-6.5	-0.7
Other transportation	-8.0	-2.3	-7.8	-8.0	-2.3	-17.9	-11.2	-2.5
Telecommunications	9.8	17.4	9.5	9.3	17.4	-2.4	5.1	17.2
Science & science servicing	1.7	4.4	-0.3	-0.4	6.3	-1.0	1.3	4.0
Financial services	-9.1	-9.6	-9.0	-8.7	-9.8	-8.7	-8.9	-10.1
Ferrous metallurgy	28.3	27.6	36.1	46.0	23.8	23.5	13.0	21.9
Non-ferrous metallurgy	12.2	5.5	26.6	35.2	24.3	28.7	6.3	3.2
Chemical & oil-chemical industry	17.3	23.7	8.4	11.2	20.5	56.8	23.6	1.2
Mechanical engineering & metal-working	-4.0	-2.3	-3.5	-1.1	-6.5	-4.3	-0.6	-3.0
Timber & woodworking & pulp & paper industry	-3.9	-5.2	-11.9	-9.9	-0.7	-0.1	-4.3	27.4
Construction materials industry	-8.1	-10.8	-9.0	-5.3	-5.5	-5.7	-11.3	-7.3
Food industry	-13.7	-16.0	-15.6	-10.6	-11.0	-7.9	-12.2	-11.3
Other industries	-3.0	-3.3	-1.6	-2.7	-6.4	-2.1	-6.6	-5.1
Public services, culture and arts	1.1	1.4	1.0	1.5	1.1	1.1	1.0	1.3
Agriculture & forestry	-2.6	-6.9	-2.1	-1.4	-3.2	1.7	-3.3	-4.5
Coalmining	6.9	9.5	10.3	10.0	10.1	10.1	5.9	9.1
Housing and communal services	2.5	3.2	2.4	2.9	2.4	2.5	1.7	3.0
Construction	0.4	-1.2	2.1	0.1	-1.1	-0.7	-1.5	-1.1
Electric industry	2.3	2.8	1.5	2.2	2.7	4.2	2.2	1.0
Gas	-16.5	-27.2		-18.4	-20.5	-16.1	-23.2	-22.5
Crude oil extraction	-0.5	-1.3		0.2	0.1	-0.7	-1.5	-0.5
Oil refining and processing	2.0	0.3	1.9	3.1	4.2	0.3	-2.6	3.1
Other goods-producing sectors	-10.1	-12.9	-5.1	-8.2	-12.3	-10.7	-13.1	-12.9
Post	-0.9	-1.0	-0.5	-0.4	-1.2	-2.1	-1.2	-0.9
Wholesale and retail trade	3.7	5.6	5.0	3.6	4.2	-0.8	3.9	3.9
Textiles and apparel	-3.0	-4.6	-2.6	-2.3	-3.0	-2.0	-4.9	-2.5

Source: Authors' calculations.

Table 17. Impact of WTO Accession on Unskilled Employment by Sector and Federal Okrug

change from base year, (%)

Sector	National Average	Northwest	Central	South	Volga	Urals	Siberia	Far East
Railway transportation	1.5	2.1	1.0	1.0	2.1	3.2	0.5	0.2
Truck transportation	7.1	10.5	7.2	6.5	10.9	1.2	5.1	10.6
Pipelines transportation	-4.0	-4.4	-3.5	-4.0	-4.1	-3.6	-5.1	-5.8
Maritime transportation	-6.5	-5.9	-6.3	-7.8	-4.7	-4.9	-12.0	-5.0
Air transportation	-3.3	-2.1	-4.0	-3.0	0.5	-4.1	-6.4	-0.8
Other transportation	-7.8	-2.2	-7.9	-8.0	-2.0	-17.9	-11.1	-2.5
Telecommunications	10.0	17.5	9.3	9.3	17.8	-2.4	5.2	17.1
Science & science servicing	1.7	4.6	-0.5	-0.4	6.6	-1.0	1.5	4.0
Financial services	-9.1	-9.5	-9.1	-8.7	-9.5	-8.7	-8.8	-10.1
Ferrous metallurgy	28.8	27.7	35.9	46.0	24.2	23.5	13.1	21.9
Non-ferrous metallurgy	12.3	5.6	26.4	35.2	24.7	28.7	6.5	3.1
Chemical & oil-chemical industry	17.0	23.8	8.3	11.2	20.9	56.8	23.8	1.2
Mechanical engineering & metal-working	-3.9	-2.2	-3.6	-1.1	-6.2	-4.2	-0.5	-3.1
Timber & woodworking & pulp & paper industry	-3.9	-5.0	-12.0	-9.9	-0.4	-0.1	-4.2	27.4
Construction materials industry	-8.1	-10.7	-9.1	-5.3	-5.3	-5.7	-11.2	-7.3
Food industry	-13.7	-15.9	-15.7	-10.6	-10.7	-7.8	-12.1	-11.3
Other industries	-3.0	-3.1	-1.7	-2.7	-6.2	-2.1	-6.5	-5.2
Public services, culture and arts	1.2	1.5	0.9	1.5	1.4	1.1	1.2	1.2
Agriculture & forestry	-2.5	-6.8	-2.2	-1.4	-2.9	1.7	-3.1	-4.6
Coalmining	6.8	9.7	10.2	10.0	10.4	10.1	6.1	9.1
Housing and communal services	2.5	3.4	2.3	2.9	2.7	2.5	1.9	2.9
Construction	0.4	-1.1	1.9	0.1	-0.8	-0.7	-1.4	-1.2
Electric industry	2.3	3.0	1.4	2.2	3.0	4.3	2.3	0.9
Gas	-16.5	-27.1		-18.4	-20.2	-16.1	-23.1	-22.5
Crude oil extraction	-0.4	-1.2		0.2	0.3	-0.7	-1.4	-0.5
Oil refining and processing	2.2	0.4	1.8	3.1	4.5	0.3	-2.5	3.1
Other goods-producing sectors	-10.1	-12.8	-5.2	-8.2	-12.0	-10.7	-13.0	-13.0
Post	-0.9	-0.9	-0.6	-0.4	-0.9	-2.1	-1.0	-1.0
Wholesale and retail trade	3.8	5.7	4.9	3.6	4.5	-0.8	4.0	3.9
Textiles and apparel	-3.0	-4.5	-2.7	-2.3	-2.7	-2.0	-4.8	-2.5

Source: Authors' calculations.

Table 18. Impact of WTO Accession on Exports by Sector and Federal Okrug

change from base year, (%)

Sector	National Average	Northwest	Central	South	Volga	Urals	Siberia	Far East
Railway transportation	-3.2	-4.3	-1.0	-2.9	-4.4	-1.4	-6.5	-5.8
Truck transportation	6.7	8.9	8.7	7.0	10.1	0.1	2.4	9.6
Pipelines transportation								
Maritime transportation	-5.2	-4.2	-2.9	-5.9	-2.3	-5.6	-14.4	-2.5
Air transportation	-1.2	-0.7	-1.7	-0.6	4.2	-3.9	-7.1	2.2
Other transportation	-7.3	-2.6	-5.1	-6.8	-1.7	-17.8	-13.2	-1.8
Telecommunications	17.0	28.0	17.5	14.5	29.9	-1.0	5.7	29.2
Science & science servicing	30.7	47.0	23.4	23.4	48.9	16.5	19.4	46.3
Financial services	6.1	10.0	6.8	6.3	9.5	0.8	0.9	8.8
Ferrous metallurgy	53.8	53.2	65.3	78.6	52.9	48.4	30.6	50.1
Non-ferrous metallurgy	21.7	10.2	36.9	47.7	33.8	42.1	12.3	11.4
Chemical & oil-chemical industry	43.8	46.2	32.0	36.1	46.6	88.3	42.2	23.5
Mechanical engineering & metal-working	7.1	8.9	7.8	10.3	5.4	5.1	5.5	8.9
Timber & woodworking & pulp & paper industry	4.7	1.2	-3.3	-1.3	7.4	5.2	-4.3	35.2
Construction materials industry	2.9	0.0	3.7	7.2	7.9	2.9	-6.1	5.8
Food industry	-6.7	-9.7	-8.6	-3.1	-4.7	-1.8	-10.4	-5.3
Other industries	4.2	4.9	7.1	5.1	-1.8	3.9	-3.3	0.7
Public services, culture and arts	-0.7	-1.7	1.5	0.0	-2.4	-1.1	-3.2	-2.4
Agriculture & forestry	3.0	-2.3	3.3	6.0	5.2	6.0	-4.1	2.7
Coalmining	2.7	7.6	6.8	7.6	10.3	1.8	1.1	9.1
Housing and communal services	-3.1	-5.9	-2.2	-1.6	-4.1	-0.9	-5.3	-4.0
Construction	1.7	-1.0	6.4	1.5	-1.5	-0.6	-3.4	-1.1
Electric industry	0.8	-1.1	1.1	1.7	1.0	3.6	-1.4	-1.1
Gas	-12.8	-57.2		-19.3	-28.4	-11.2	-37.1	-34.9
Crude oil extraction	1.2	1.4		1.7	2.2	0.8	1.3	1.8
Oil refining and processing	4.6	1.3	4.0	6.7	8.3	2.4	-3.2	6.8
Other goods-producing sectors	-11.1	-15.2	-3.2	-7.6	-13.9	-11.4	-16.1	-15.2
Post	0.8	-1.4	2.6	2.4	1.4	-1.5	-2.3	1.1
Wholesale and retail trade	-4.3	-7.1	-4.6	-2.3	-2.9	-4.5	-4.8	-4.1
Textiles and apparel	11.7	7.8	13.0	13.6	12.6	12.6	6.7	12.2

Source: Authors' calculations.

Table 19. Piecemeal Sensitivity Analysis -- Welfare Impacts as a percent of GDP by Region

change from base year, (%), utilitarian SWF

Sector		National	Northwest	Central	South	Volga	Urals	Siberia	Far East
Reference Case:		**4.5**	**5.7**	**4.2**	**4.5**	**5.1**	**3.6**	**4.1**	**5.1**
Regional investment potential variation[c]		4.8	5.6	4.6	4.5	6.2	3.9	3.8	5.0
Elasticity of substitution in consumer demand (1.0)	esubc=1.5	4.8	6.1	4.5	4.8	5.5	3.7	4.4	5.4
	esubc=0.5	4.2	5.4	3.9	4.3	4.8	3.6	3.9	4.8
Elasticity of substitution between value-added and business services (1.25)	esubs = 2.0	5.9	7.5	5.5	5.8	7.0	4.5	5.3	6.7
	esubs = 0.5	3.5	4.5	3.3	3.6	3.6	3.0	3.3	4.1
"Armington" elasticity of substitution between imports and domestic goods in CRTS sectors (3.0)	sigmadm = 4	4.5	5.7	4.2	4.6	5.1	3.6	4.1	5.1
	sigmadm = 2	4.5	5.7	4.2	4.5	5.1	3.6	4.1	5.1
Elasticity of multinational service firm supply with respect to price of output (15)	etaf = 17.5	5.4	6.7	5.2	5.5	6.1	4.4	5.0	5.8
	etaf = 12.5	3.9	5.2	3.7	3.9	4.5	3.1	3.5	4.6
Elasticity of Russian service firm supply with respect to price of output (7.5)	etad = 10	4.7	6.0	4.5	4.5	5.1	3.6	4.2	5.5
	etad = 5	4.2	5.3	3.7	4.3	5.1	3.7	4.0	4.5
Elasticity of substitution between firm varieties in imperfectly competitive sectors (3)	esub = 4	4.4	5.4	4.1	4.5	5.0	3.7	4.1	4.9
	esub = 2	4.3	6.0	4.1	4.3	5.0	3.1	3.6	5.2
Elasticity of substitution in sectoral value added (1)	esubva=1.3	4.5	5.7	4.2	4.5	5.1	3.6	4.1	5.1
	esubva=0.7	4.5	5.7	4.2	4.6	5.1	3.6	4.1	5.2
Elasticity of transformation, domestic output versus exports (5)	etadx = 7	4.5	5.7	4.2	4.5	5.1	3.6	4.1	5.1
	etadx = 3	4.5	5.7	4.2	4.5	5.1	3.7	4.2	5.2

Source: Authors' calculations.

Notes:

a. The piecemeal sensitivity analysis employs central values for all parameters (see below) other than the tested parameter and lump sum tax replacement.

b. Hicksian equivalent variation as a percent of the value of consumption in the benchmark equilibrium.

c We vary etaf by region as follows: North = 10; Central = 12.5; South = 11.5; Volga=18; Urals = 14.3; Siberia = 10.8; Far East = 10.8.

Table 20. Welfare Impact as % of Income

change from base year, %

	National	Northwest	Central	South	Volga	Urals	Siberia	Far East
Average	4.5	5.6	4.4	4.5	4.9	3.9	3.8	5.1
10	4.1	5.5	4.0	4.0	4.0	3.5	3.5	4.8
20	4.2	5.4	4.0	4.2	4.3	3.6	3.8	4.0
30	4.2	5.4	4.0	4.2	4.2	3.6	3.6	4.8
40	4.3	5.3	4.2	4.1	4.4	3.6	3.7	4.8
50	4.3	5.6	4.2	4.3	4.5	3.5	3.7	4.7
60	4.4	5.4	4.4	4.3	4.4	3.6	3.6	4.5
70	4.4	5.4	4.5	4.4	4.4	3.6	3.6	4.6
80	4.4	5.5	4.3	4.3	4.7	3.6	3.8	4.9
90	4.4	5.2	4.4	4.4	4.6	3.7	3.7	4.9
100	4.6	6.1	4.4	4.8	5.3	4.1	3.8	5.7

Source: Authors' calculations.

Figure 1. Sales for Constant Returns to Scale Sectors: Determined by Constant Elasticity of Transformation Production Structure

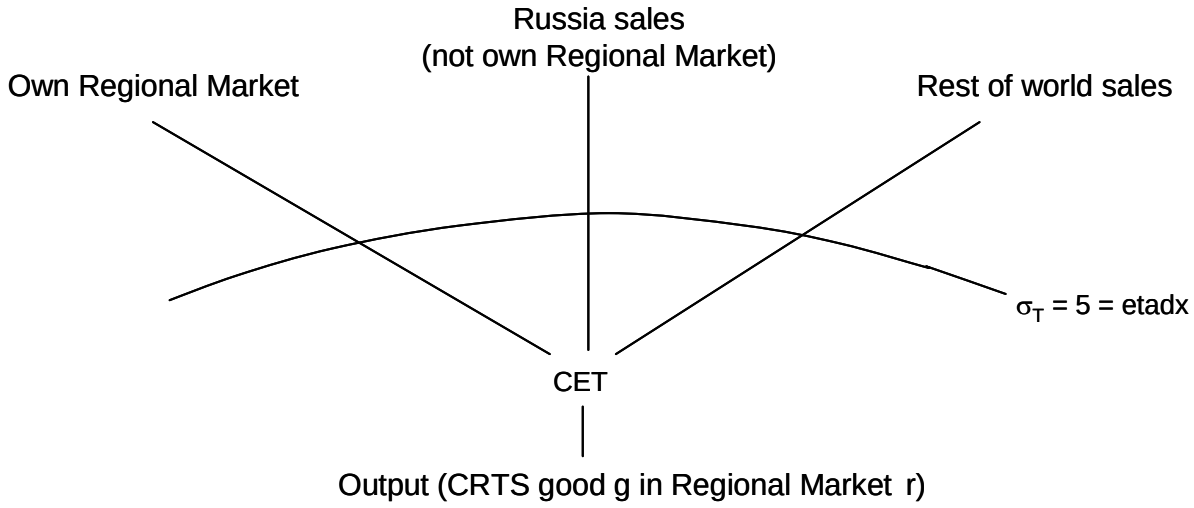
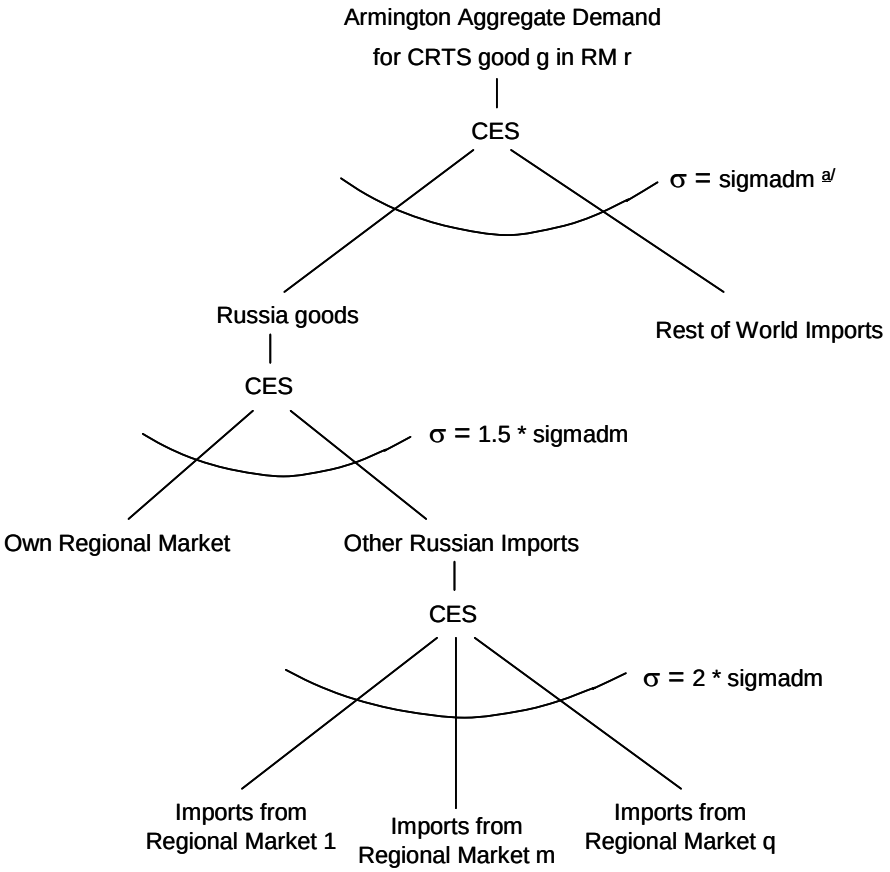
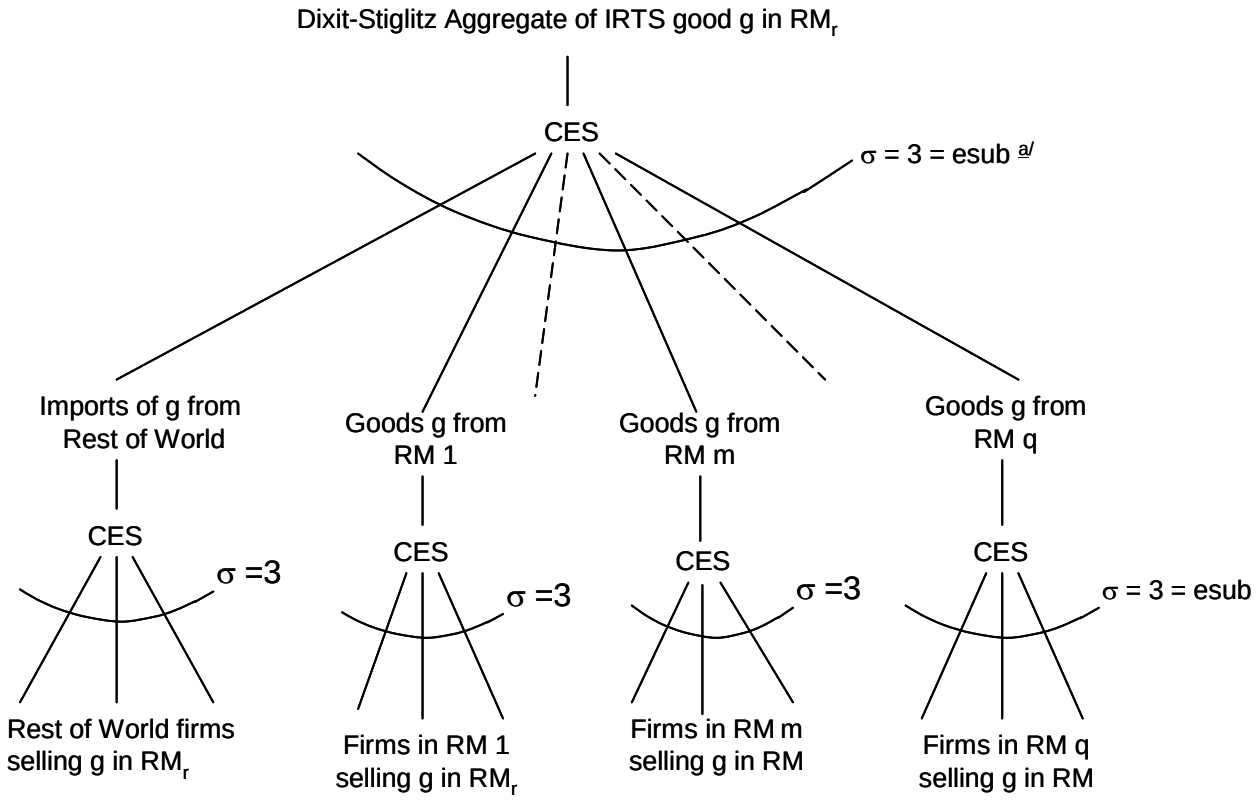


Figure 2. Demand for Representative CRTS good g in Regional Market r



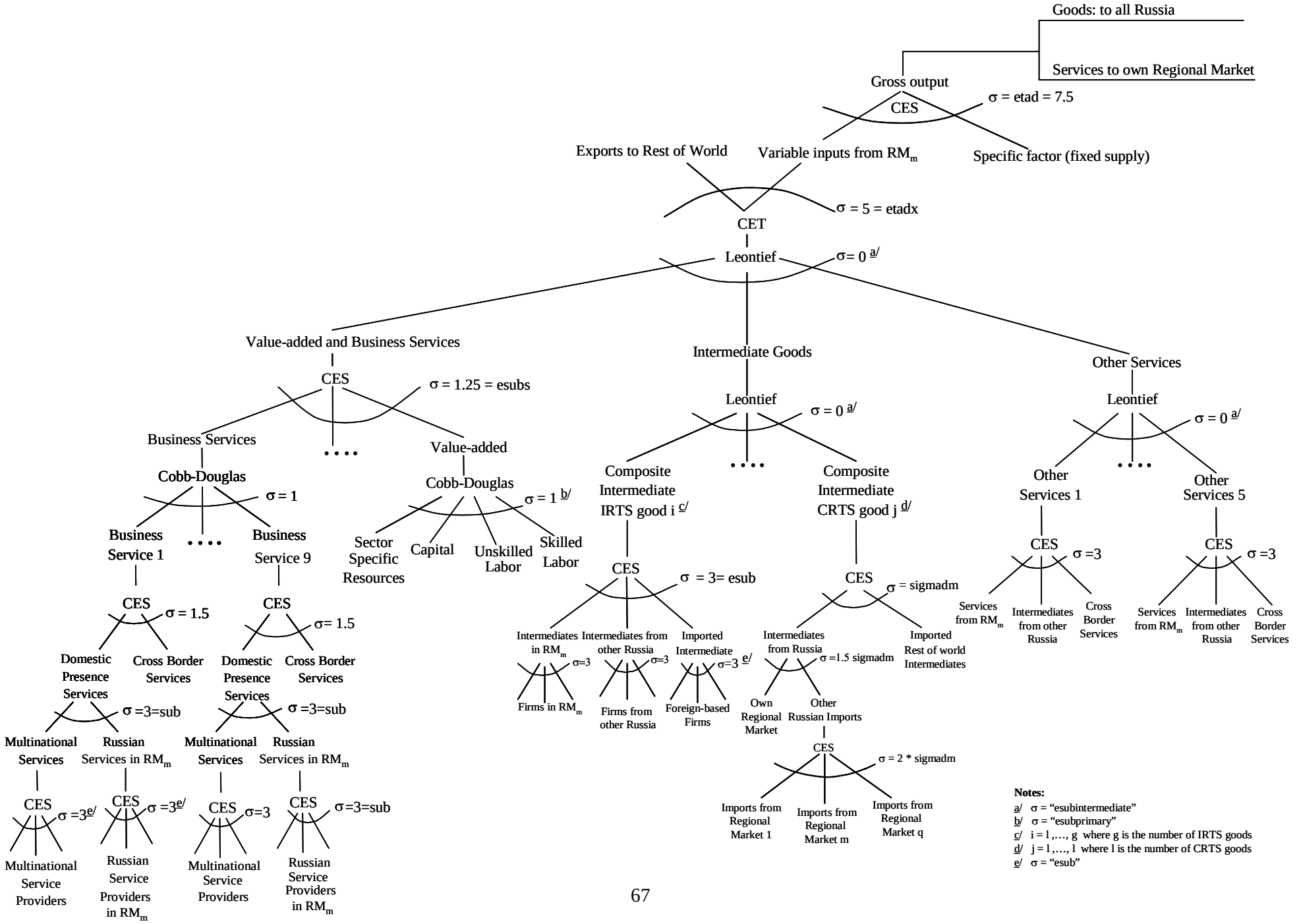
a/ sigmadm = 3 in CRTS sectors, except in OTH (other goods producing sectors). For OTH we rely on estimates from Ivanova (2005).

Figure 3. Demand for Representative Dixit-Stiglitz (IRTS) good g in Regional Market r



a/ We take σ = 3, except based on Ivanova (2005), we take σ = 3.1 in MWO; σ = 2.6 in TPP; σ = 2.5 in CNM; and σ = 1.8 in OTI.

Figure 4. Structure of Production for Increasing Returns to Scale Russian Firms: Representative Good or Service in a Representative Regional Market (RM) m



Notes:

a/ σ = "esubintermediate"
b/ σ = "esubprimary"
c/ i = 1,…, g where g is the number of IRTS goods
d/ j = 1,…, l where l is the number of CRTS goods
e/ σ = "esub"

Figure 5. Demand for Representative Business Service *s* (Dixit-Stiglitz) Sectors in Regional Market (RM) m

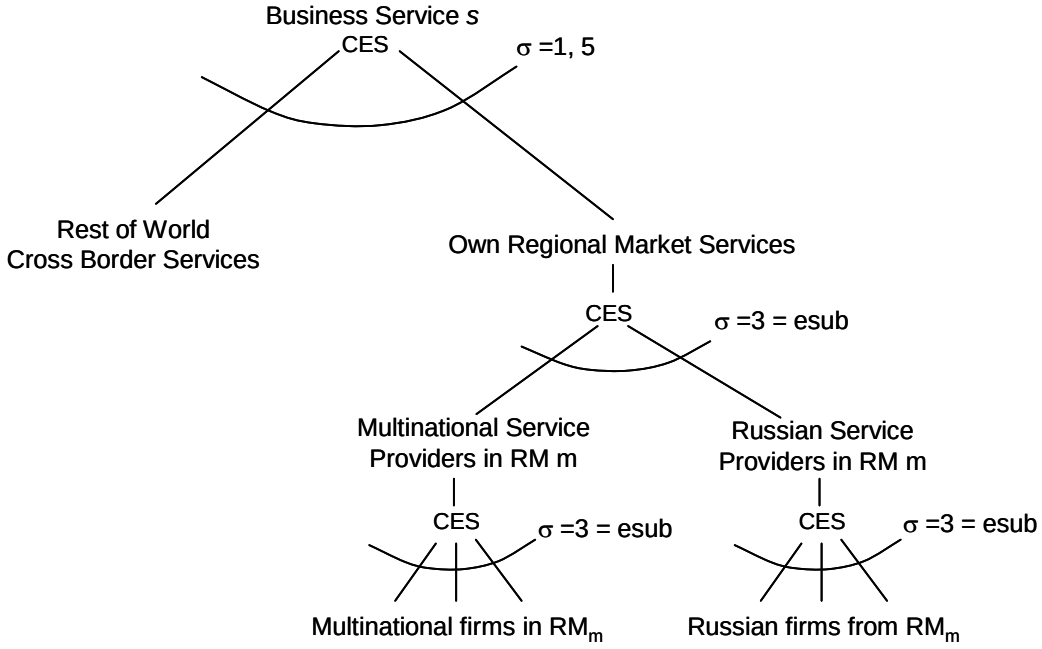
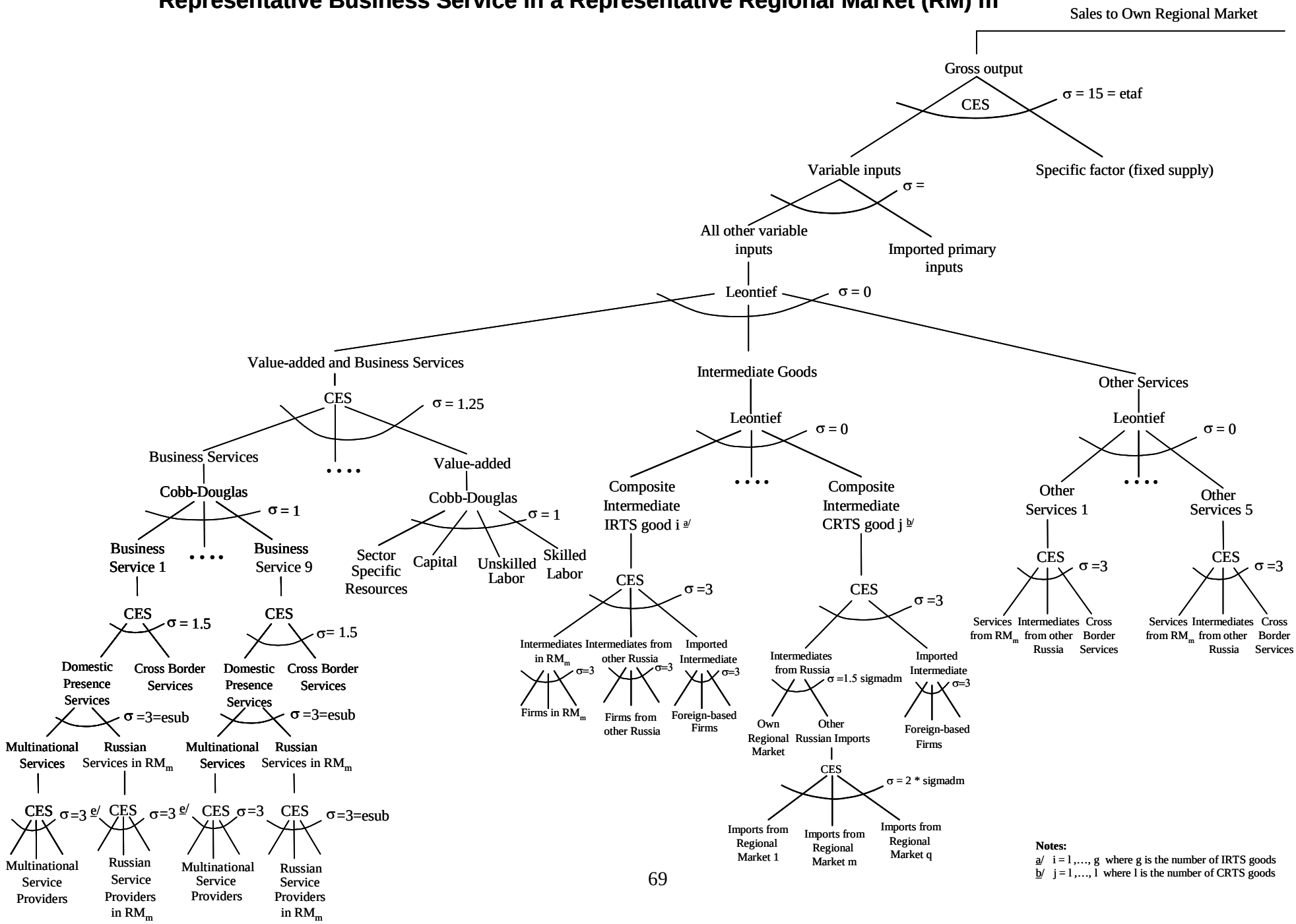


Figure 6. Structure of Production for Increasing Returns to Scale Multinational Business Service Firms: Representative Business Service in a Representative Regional Market (RM) m



Notes:
a/ i = 1,…, g where g is the number of IRTS goods
b/ j = 1,…, l where l is the number of CRTS goods

Money-Metric Social Welfare

June 1, 2007

When we work with a general equilibrium model in which there are multiple households, we can define a social welfare metric which reflects aversion so inequality, e.g.

$$SWF(u_h) = \left(\sum_h n_h u_h^{1-1/\nu} \right)^{1/(1-1/\nu)}$$

in which n_h is the number of individuals represented by household type h and $u_h()$ is the utility function for household h. In this social welfare function ν is a measure of inequality aversion. When $\nu \to 0$, the social welfare function is *Rawlsian*, and the only changes which matter are those of the least well off household. When $\nu \to +\infty$, the social welfare function is *utilitarian*, and equivalent money-metric welfare impacts on poor and right households are valued identically in terms of social welfare.

One challenge involved in working with a social welfare function is defining appropriate utility indices for individual households. If household utility functions are not identical, the definition of $SWF()$ is problematic. In order to deal with this logical problem we express household welfare using *money-metric* welfare indicies. This is only possible with household welfare indices are homothetic or quasi-homothetic. For example, if welfare for household h is a constant-elasticity aggregate, e.g.

$$u_h(c_h) = \left(\sum_i \theta_{ih} c_{ih}^{\rho_h} \right)^{1/\rho_h}$$

then utility is a linear function of income. That is, if we solve

$$\max u_h(c_h) \quad \text{s.t.} \quad p^T c_h = M_h$$

then the indirect utility function has the form:

$$V_h(p, \lambda, M_h) = \frac{M_h}{\left[\sum_i \theta_{ih} \left(\frac{p_i}{\theta_{ih}} \right)^{1-\sigma_h} \right]^{1/(1-\sigma_h)}}$$

where $\sigma_h = 1/(1-\rho_h)$. Notably, a one percent change in M_h is equivalent to a one percent change in V_h.

In turn, a proportional change in household incomes produces an equiproportional change in SWF, i.e.

$$\begin{aligned} SWF(p, \lambda M_h) &= \left(\sum_h \frac{n_h(\lambda M_h)^{1-1/\nu}}{\phi_h(p)}\right)^{1/(1-1/\nu)} \\ &= \left(\lambda^{1-1/\nu} \sum_h \frac{n_h(M_h)^{1-1/\nu}}{\phi_h(p)}\right)^{1/(1-1/\nu)} \\ &= \lambda \left(\sum_h \frac{n_h(M_h)^{1-1/\nu}}{\phi_h(p)}\right)^{1/(1-1/\nu)} \\ &= \lambda \;\; SWF(p, M_h) \end{aligned}$$

Hence, when household utility functions are homothetic, it is possible to discuss changes in social welfare as *equivalent variations in aggregate expenditure*. In a computational model this result permits us to describe a given policy shock as $EV_{swf}(\nu)$, i.e. a proportional change in aggregate expenditure which depends on the degree of aversion to inequality.

Let illustrate using concrete example. Assume that we have reference per-household consumption levels, $\bar{c}_{ih}$ at reference prices, $\bar{p}$. We then could define reference social welfare as:

$$\overline{swf} = \left(\sum_h n_h \bar{M}_h^{1-1/\nu}\right)^{1/(1-1/\nu)}$$

where $\bar{M}_h = \bar{p}^T \bar{c}_h$ is the reference income level of household h.

A policy shock might then lead to household consumption levels $\hat{c}_h$, and weould could then compute the equivalent change in social welfare as:

$$\begin{aligned} EV_{swf} &= 100 \times \left[\frac{\hat{swf}}{\overline{swf}} - 1\right] \\ &= 100 \times \left[\left(\frac{\sum_h n_h(\hat{M}_h)^{1-1/\nu}}{\sum_h n_h(\bar{M}_h)^{1-1/\nu}}\right)^{1/(1-1/\nu)} - 1\right] \end{aligned}$$

where

$$\hat{M}_h = \bar{M}_h \frac{u_h(\hat{c}_h)}{u_h(\bar{c}_h)}$$