Board of Governors of the Federal Reserve System

International Finance Discussion Papers

Number 618

August 1998

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Abstract: We study the effects of trade barriers and the persistence of past linkages on trade flows in the former Soviet Union (FSU). Estimating gravity equations on 1987-1996 trade among and between nine Russian regions and fourteen FSU republics, we find that Russian regions traded 60 percent more with each other than with republics in the reform period (1994-96). In contrast, they did not trade significantly more with each other than with republics in the pre-reform period (1987-90). Estimating a richer model, we find that trade barriers are primarily responsible for the current domestic bias. However, the existing infrastructure stock has significantly limited the recent reorientation in trade. Finally, we find evidence of anticipatory adjustment during the transition to independence.

Keywords: infrastructure, trade, and adjustment costs

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1 Introduction

While a growing literature has established that borders significantly influence trade flows, the reasons behind the effect remain largely unknown. Since the counter-factual (absence of borders) is typically not observable, researchers have not been able to determine whether the border effect is the result of trade barriers, past linkages, or is natural–i.e. the result of comparative advantage or tastes. The disintegration of the Soviet Union provides a unique opportunity to test these competing hypotheses since one can observe trade flows between the same partners, both in the presence and absence of borders.

This paper offers three contributions. First, we document the adjustment in trade flows in response to the erection of new borders in the Soviet Union and quantify the border effect. We examine bilateral trade flows among nine Russian regions and fourteen republics of the former Soviet Union (FSU) before and after the Union dissolved. Estimating a gravity equation we find that regions did not trade more with each other than with republics in the pre-reform period. In the reform period, however, Russian regions traded about 60 percent more with each other than with the republics, with the domestic bias increasing over time. Thus, the disintegration of the Soviet Union has already led to a significant domestic reorientation in trade.

Second, we distinguish the primary causes of the border effect. To do so we develop a broader analytic framework using a model of differentiated goods, which includes tariffs, other transport and transactions costs (associated with the stock of infrastructure), and costs of adjusting infrastructure.[1] Starting from the pre-reform (free trade) equilibrium, tariffs are imposed on goods shipped across borders. The reorientation in trade, as a result of the tariff, implies that the return

[1]We use the word *infrastructure* broadly to include highways, rail systems, legal and regulatory institutions, business networks, consumer networks, and telcommunications systems.

to infrastructure for domestic trade rises relative to the return to infrastructure for international trade. Thus, infrastructure for trade will also be reoriented domestically. With convex adjustment costs, the reorientation of infrastructure will be gradual. We show that while tariffs serve to increase the domestic bias in trade, the stock of a highly integrated infrastructure for trade limits the bias in the short run.

Estimating the richer model, we find that the importance of the Russian border is primarily the result of trade barriers. The inclusion of tariffs in the estimation reduces the bias to where it is insignificantly different from zero. When heterogeneity across countries is allowed, we find that trade flows between Russian regions and countries which signed a free trade agreement with Russia remain similar to intra-Russian trade in the reform period, implying that borders alone have not diverted trade flows in the FSU.

Our results also suggest that the slow adjustment in infrastructure has limited trade reorientation. Using past trade to instrument for the stock of infrastructure we find that it significantly influences current trade. In the long run, as linkages with other republics atrophy, the domestic trade bias will probably increase to well over the 60 percent we estimate currently.

Still, some linkages have already started deteriorating. For example, business networks across regions and republics have changed as a result of manager turnover. We find that manager turnover rates significantly reduce trade, suggesting that business networks are important determinants of trade flows. We also find some evidence that the reorientation of physical infrastructure has begun. Using passenger train speed as a proxy for infrastructure, we find that trains traveling within Russia have become faster since 1989, however trains travelling between Russia and the republics have slowed. Moreover, we find that the travel time between two points is positively related to the tariff level, even after controlling for incomes, distance, and the border.

Third, we look for evidence of anticipatory adjustment during the transition to independence. With convex adjustment costs, the movement of infrastructure will commence before policy changes are experienced, leading to a corresponding reorientation in trade. We find that in 1991, trade was reoriented domestically in Russia and towards the areas most likely to grow, as proxied by future GDP and percent of the population with higher education.

Our estimate of the border effect is significantly lower than similar estimates using OECD data, despite greater trade barriers in the FSU. Using inter-provincial and province-state trade data, McCallum (1995) and Helliwell (1996) find that in 1990 Canadian provinces traded about twenty times more among themselves than with U.S. states. More recently, Helliwell (1998) estimates the bias to be twelve by 1996 following the preferential trading agreement (PTA) between the two countries. Wei (1996) and Helliwell (1998) estimate that the domestic trade bias among OECD countries ranges from three to twelve.[2] One explanation that is consistent with both sets of results is that a slowly changing stock of infrastructure has led to a continued domestic orientation in trade in the OECD, despite falling trade barriers, and sustained integration in the FSU in spite of rising trade barriers.

The paper is organized as follows. Section 2 reviews the literature on the border effect. Section 3 presents the theoretical framework. Section 4 discusses the empirical specification and results. Section 5 concludes. Appendix A shows the full derivation of the model while Appendix B describes the data sources.

[2]Wei (1996) develops a technique to estimate the domestic bias in trade using input-output tables to estimate internal trade for countries without regional data. He assumes that internal trade distances are one-quarter the distance between a country and its nearest trade partner, to estimate the border effect. One problem with this method is that the border estimate is proportional to the assumed internal trade distance.

2 Why do borders matter?

Empirical studies on the effects of borders are uniform in finding a high domestic bias in trade.[3] It remains a puzzle as to why borders matter so much. Three hypotheses have been put forward in the literature: (i) international trade barriers, (ii) natural partners, and (iii) historical linkages. Trade barriers will discourage cross-border trade by increasing the relative price of foreign goods. A tariff places a wedge between the domestic terms of trade and the world terms of trade, and leads to a consumption bundle biased towards domestically produced goods. Non-tariff barriers also increase the relative price of imported goods and discourage cross-border trade.

Alternatively, borders may be endogenous. Owing to comparative advantage, tastes, or technology, regions within a border may simply be natural trade partners. Borders tend to be formed around populations that are to some extent homogeneous, have similar tastes, and in which the regional economies are linked. Regions may create borders to protect themselves from outside shocks.

Finally, cross-border trade may be relatively small because past isolation has led to domestically oriented infrastructure. For example, highways, rail systems, legal and regulatory institutions, business networks and consumer networks, and telecommunications systems all differ across countries and thus may increase the costs of international trade relative to domestic trade. Assuming infrastructure is costly to adjust, a history of isolation will depress trade while historical linkages to other nations will help promote current trade. Similarly, if capital adjustment across industries is costly then an economy with primarily domestically oriented industry will adjust slowly to external pressure.

[3] Another way to evaluate the border effect is with price data. Engel and Rogers (1996) examine the relative price variability of similar goods among cities in Canada and the United States. They find that relative price variability between cities is significantly greater when a border is crossed.

A growing empirical literature finds that historical linkages are important determinants of trade. Frankel, Stein and Wei (1995) show that countries with colonial links and countries with common language trade more with each other than the gravity model predicts. Frankel (1997) surveys the literature on the dissolution of (British and French) colonial links and the breakup of federations (the Austro-Hungarian Empire, the Malay Federation, Czechoslovakia, the former Soviet Union) and finds "a tendency for established bilateral trade ties to change relatively slowly" (p.126). He notes, however, the tenuous nature of these findings derived from trade intensity ratios which do not control for the effects of distance and income.

Also indicative of the importance of historical linkages, Eichengreen and Irwin (1998) find that lagged bilateral trade is significant in determining current bilateral trade, after controlling for income and distance. In addition, Freund (1998) finds that the founding members of the European Union created a well-integrated market among themselves and then maintained stronger trade links with each other than with countries that joined later. There was no evidence of a bias in trade towards the original members before the common market was formed.

Firm level evidence also supports this view. Tybout and Roberts (1997) find that past export decisions are highly significant in influencing current export decisions and interpret this as evidence that sunk costs are required to entry into the export market. This suggests that domestic distribution channels are distinct from international channels.

3 The theoretical framework

In this section we illustrate the effect of trade barriers and infrastructure on trade flows by modifying the differentiated goods model to include costs of trade associated with the stock of infrastructure. The simple model shows that tariffs lead to an immediate domestic reorientation of trade, but slow

adjustment of the stock of infrastructure limits their impact in the short run. In the long run, tariffs elicit an infrastructure response which increases their impact.[4]

The basic intuition is that a tariff on foreign goods leads to a decline in their consumption relative to domestic goods. This increases the return to domestic infrastructure and decreases the return to infrastructure for international trade. Convex adjustment costs imply that infrastructure will gradually move out of the international sector and into the domestic sector. The stock of infrastructure for international trade will decline and the stock of infrastructure for domestic trade will gradually expand until the new steady state is reached.

We outline a simple model of infrastructure adjustment to highlight the effect of tariffs and trade on infrastructure and then the feedback of infrastructure into trade. We assume $R(F_t)$ is the return to infrastructure in the domestic sector and $R^*(F_t^*)$ is the return to infrastructure in the international sector, the two types of infrastructure are not substitutable, and $R'(F) > 0$ and $R''(F) < 0$ (similarly for $R^*(F^*)$). We further assume that a tariff increases the volume of trade on domestic infrastructure and increases the marginal return to domestic infrastructure. If the marginal returns to each type of infrastructure were equal before the tariff was installed, then the tariff will cause the marginal return to the stock of domestic infrastructure to rise above that for international, that is $R'(F_{t-1}) > R^{*\prime}(F_{t-1}^*)$.

Following Mussa (1986), we assume convex adjustment costs associated with transferring infrastructure from the foreign to the domestic sector, where $c(M)$ is the cost of moving infrastructure, $c(0) = 0$, $c'(M) > 0$, $c''(M) > 0$, and M is the infrastructure that is moved from the international sector to the domestic.[5] As more infrastructure is relocated in any period, the marginal cost of

[4]We could think of a model in which capital moves across sectors resulting in production reallocation as a result of a change in trade policy as in Mussa 1986. The conclusions in that case would be very similar.

[5]We could also allow for new investment and depreciation without changing the qualitative findings.

moving infrastructure expands.

We assume that the government chooses infrastructure in each sector optimally, over an infinite horizon.[6] The government chooses M_t in each period to maximize the present discounted value of infrastructure less the cost of adjustment:

$$\max \sum_{t=T}^{\infty} (R(F_t) - R^*(F_t^*) - c(M_t))\delta^{t-T}$$
$$\text{s.t. } F_t = F_{t-1} + M_t,\ F_t^* = F_{t-1}^* - M_t,\ F_t^* \geq 0, \text{ and } F_t \geq 0.$$

where δ is the discount rate, Maximizing over M_t and M_{t+1} and combining equations we have:

$$R'(F_t) - c'(M_t) \geq R^{*\prime}(F_t^*) - \delta c'(M_{t+1}). \tag{1}$$

Equation (1) holds in equality when some infrastructure moves in each period.[7] On the optimal adjustment path for infrastructure, it must be the case that the marginal return to infrastructure in the domestic sector less the marginal cost of moving it there today (the left hand side of equation 1) equals the marginal value of infrastructure in the foreign sector less the cost of moving it tomorrow (the right hand side of equation 1). Put another way, in equilibrium, the gain from moving an additional unit of infrastructure into the domestic sector today must equal the value of waiting and moving it there tomorrow.

There are two implications of equation (1). (i) With convex adjustment costs, the adjustment towards infrastructure with the higher marginal return will occur gradually. And (ii), the adjustment will commence as soon as the future change in policy is announced. Next we show that if the stock of infrastructure affects the costs of trade, the reorientation in infrastructure will feed back

[6] At the firm level, a similar reorientation may take place with firms expanding their domestic marketing and decreasing their international marketing.

[7] All infrastructure will move in one period if the left hand side is strictly greater than the right hand side. We assume that the return does not increase so much that it is optimal to move all infrastructrue to the domestic sector.

into trade patterns.[8]

The remainder of the model appeals to the standard model of differentiated goods (Dixit-Stiglitz 1977, Krugman 1980). We assume there is no saving and that consumers and producers take trade costs and tariffs as given. This implies the problem is separable over time and that consumers and producers do not incorporate the influence of quantities and prices on infrastructure.

A representative consumer maximizes utility in each period, U:

$$U = \left(\sum x_i^{\alpha}\right)^{1/\alpha}, \quad \alpha < 1, \tag{2}$$

where $1/(1-\alpha)$ is the elasticity of substitution between goods. The budget constraint is:

$$I = \sum p_i d_i t_i x_i, \tag{3}$$

where I_t is disposable income in period t, d_i is an "iceberg" cost of trade, and t_i is one plus the ad valorem tariff rate. We assume the cost of trade, d, is a decreasing function of the stock of infrastructure, F, that exists. $d'(F_t) < 0$ and $d''(F_t) > 0$, where F_t is infrastructure for domestic trade and F^* is infrastructure for international trade at time t.

The consumer maximizes utility (equation (2)) subject to the income constraint (equation (3)) taking the price inclusive of the trade cost and the tariff as given. Demand for good i is:

$$x_i = \frac{I(p_i t_i d_i)^{-\sigma}}{P^*} \tag{4}$$

where P^* is an aggregate price index, specifically $P^* = \sum (p_i t_i d_i)^{\frac{\alpha}{\alpha-1}}$.

We assume an increasing returns to scale production function of the form, $L_i = a + bx_i$, for all goods, where L_i is labor employed in the production of good i and a and b are constants. With

[8] A richer model would assume the governments incorporates the interaction of trade policy and infrastructure into its objective function. Developing such a model is beyond the scope of this paper.

free entry, it is straightforward to solve for total imports from a country k, M_{kj}:

$$M_{jk} = q\sum_i x_i = \frac{Y_j Y_k w_k^{\sigma-1}(\frac{b}{\alpha} d_k t_j)^{-\sigma}}{L_i P_k^*}, \tag{5}$$

where q is the number of consumers in country j and Y_i is national income in country i (see the appendix for a detailed solution).

Referring back to equation (5) and recalling that trade costs are a function of the stock of infrastructure, we have (in logs):

$$\ln M_{kj} = C_k + \ln Y_k + \ln Y_j - \sigma \ln d_j(F_j^*) - \sigma \ln t_k, \tag{6}$$

where C_k is a constant which captures the country-specific w_k and P_k^*. Equation (6) provides the basis for our empirical estimation below. A tariff on goods from country j causes imports from j to decline. If adjustment costs are steep, then infrastructure will change little in the short run and trade costs will change only partially in the short run. Over time, as infrastructure is reoriented across sectors, international trade costs will rise, further accentuating the decline in imports from j.

How does equation (6) compare to the standard model? The gravity model that is typically used to estimate the trade bias is:

$$\ln M_{kj} = C_k + \beta_0 \ln Y_k + \beta_1 \ln Y_j - \beta_2 \ln DIST + \beta_3 dummy \tag{7}$$

which is similar to Equation (6). Distance ($DIST$) is used to proxy for transport costs. A dummy variable, which is one whenever trade is between certain partners, is used to estimate their possible excess trade. The question is how to interpret the coefficient on the dummy variable. The model illustrates that it could be picking up other parts of trade costs, d, besides transport or it could be picking up trade barriers. In addition, an alternative theoretical framework would suggest the dummy may represent differences in factor endowments, tastes, or technology.

The FSU provides a unique case study because in the pre-reform period trade costs and technology were uniform across regions and republics and there were no trade barriers. Hence if we find a domestic trade bias in the pre-reform period it is likely to be the result of endowments or tastes. In the reform period, while trade costs and technology are likely to be slow to change, large tariffs are in place and new currencies have been established. We can thus isolate the effect of tariffs on trade–given similar infrastructure and technology.

4 Empirical specification and findings

We examine trade among 9 regions in Russia and 14 former republics of the Soviet Union before and after disintegration. The trade data are from the Russian State Statistical Committee and the World Bank and include bilateral trade flows among regions and republics, in U.S. dollars. Income figures are from the World Bank and are also in U.S. dollars. Distance is taken from the Russian Ministry of Transport tables as the shortest road distance in kilometers between regional and/or republican centers. Train schedules for 1989 and 1996 are from the National Railways archives in Moscow. Unweighted average ad-valorem tariff rates are published by the EBRD. Population figures are from the World Bank. Education rates are from Goscomstat 1989 and manager turnover is from Djankov 1998. (See Appendix B for a detailed description of the data and a map of the region.)

Figure 1 shows each country's share of total exports that go to FSU countries. FSU export shares have declined for all but three former members—Azerbaijan, Belarus, and Uzbekistan. This suggests that some reorientation of trade away from FSU countries has occurred since the disintegration of the FSU.

Our interest, however, lies primarily with the domestic reorientation of trade within Russia.

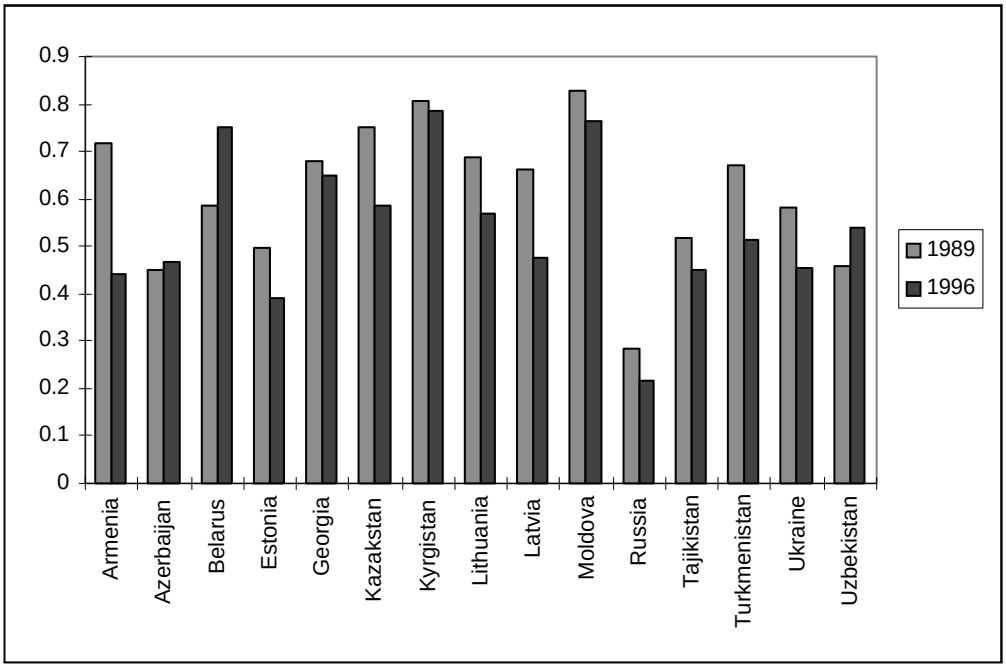

Figure 1: Exports to other FSU countries relative to total exports

Next, we look at the share of total FSU trade for each region and each republic that is with Russia. In the pre-reform period, on average 65 percent of the regions' trade with the FSU countries was with other Russian regions and trade shares were flat (Figure 2). In the reform period, the share of trade that is inter-regional rises to about 80 percent, for all regions. The republics' share of FSU trade with the Russian regions is about 50 percent in the pre-reform period and fairly constant (Figure 3). In the reform period, regional trade shares change dramatically.

While the movement in trade shares over time is suggestive of an increasing domestic bias in trade, shares alone do not tell us whether regions trade relatively more among themselves, we need to control for standard determinants of trade. Next, we use a benchmark specification which is comparable to the models in McCallum (1995) and Helliwell (1996, 1998) to estimate the extent of domestic bias in trade. After estimating the benchmark model, we allow for country specific

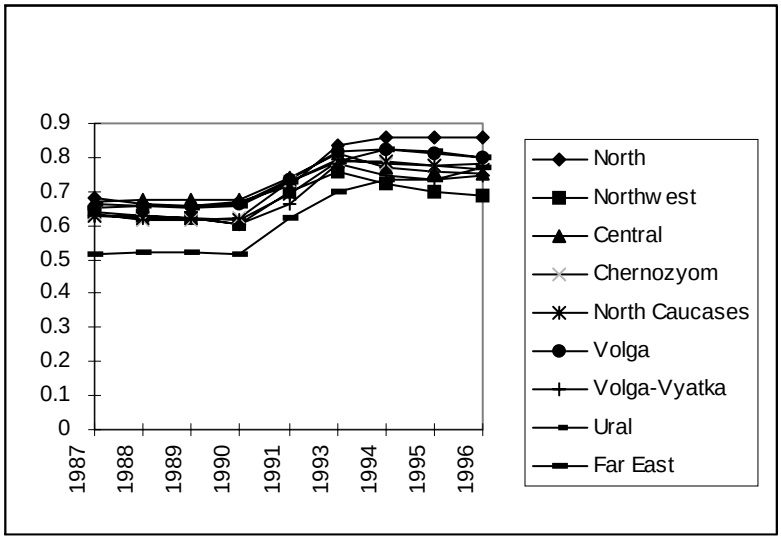

Figure 2: Share of total FSU trade with Russia by region

effects, tariffs, and infrastructure, in an attempt to get closer to the analytic framework developed above.

4.1 The benchmark specification

In this section we estimate a simple gravity equation on 1987-1990 and 1994-1996 trade flows among and between 9 Russian regions and the 14 republics of the Soviet Union. The gravity equation says that trade between two parties is proportional to the product of their income divided by the distance between the two. The regression equation for each year is:

$$x_{ij} = \alpha + \beta_0 Y_i + \beta_1 Y_j + \beta_2 DIST_{ij} + \beta_3 RUSSIA + u_{ij} \tag{8}$$

where x_{ij} is the log of shipments from region i to region j, Y_i and Y_j are the logs of gross regional product in regions i and j respectively, $DIST_{ij}$ is the log of the distance from i to j, $RUSSIA$ is a dummy equal to one for intra-Russian trade and zero for region to republic trade, and u_{ij} is the error term, which we assume is uncorrelated across observations. The $RUSSIA$ variable pools all

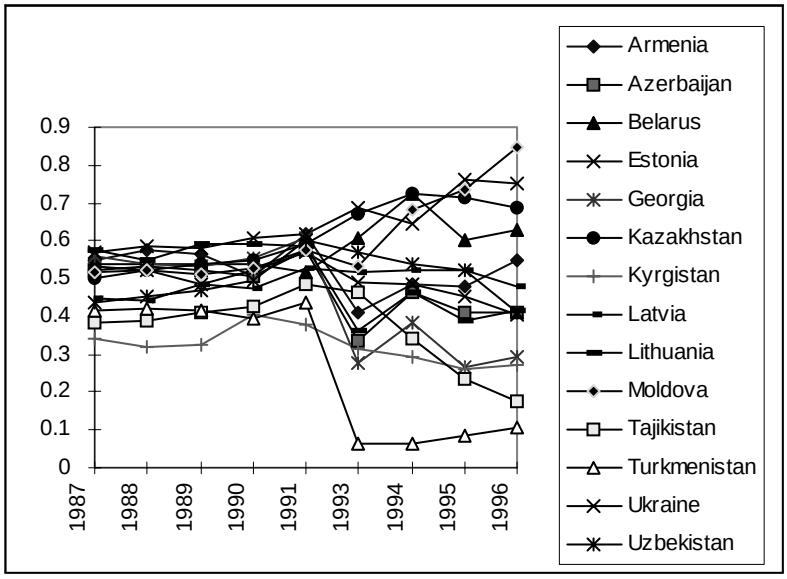

Figure 3: Share of total FSU trade with Russia by republic

effects that make cross-border trade different from domestic trade (Table 1).

The coefficient on the $RUSSIA$ dummy rises noticeably from the pre-reform period to the reform period. The coefficient of 0.46 on $RUSSIA$ in 1996 is highly significant and implies that Russian regions traded 58 percent more with each other than is predicted by the model (exp $0.46 = 1.58$). In the pre-reform period, the regions did not trade more with each other. In fact, though not significant, the coefficient is negative in each year. Figure 4 documents the estimated bias towards intra-national trade in Russia over time as calculated from the estimated coefficient on $RUSSIA$ in the benchmark model. Russian trade displays an increasing domestic bias after 1994. The insignificant (and negative) bias in trade between Russian regions in the pre-reform period is not consistent with the natural economic disintegration explanation.

Next we organize the data into two panels, a pre-reform period (1987-1990) and a reform period (1994-1996). The regression is based on equation (8), with an added time dimension (Table 2).

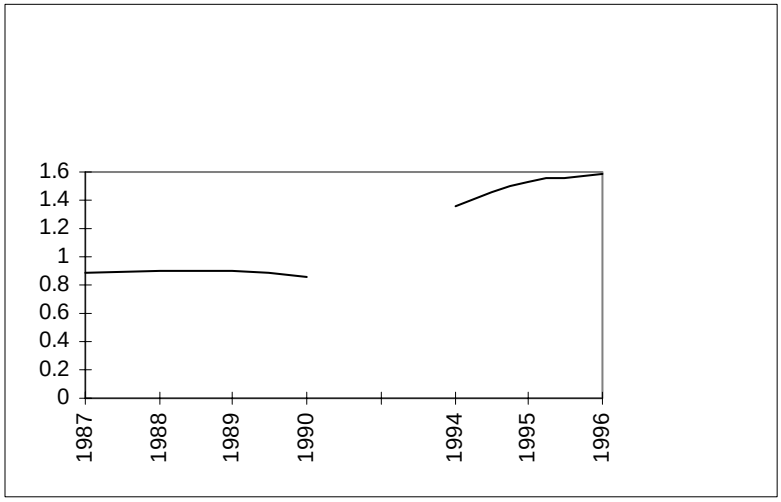

Figure 4: Domestic bias in Russian trade

The panel estimation supports the view that trade in Russia has been diverted domestically in the reform period. With random effects in the panel regressions, for example, the coefficient on $RUSSIA$ is close to zero and insignificant in the pre-reform period. In the reform period, the coefficient on $RUSSIA$ in the benchmark specification is 0.47, suggesting the regions trade about 60 percent more with each other.

The move away from central planning is noticeable in the change in the coefficients on other variables, from the pre-reform to the reform period. In all specifications we find that the elasticity of trade with respect to income and distance increases after disintegration. For example, the coefficient on distance more than doubles in magnitude from -0.42 to -1.16. This change is hardly surprising - pre-reform trade over long distances was heavily subsidized. The coefficients in the reform period are much closer to the coefficients typically found on estimates of the gravity model.[9]

[9]Most comparable is the Canada U.S. study since trade in North America is also land-based trade. McCallum 1995 and Helliwell 1998 find the elasticity of trade to distance on Canada-U.S. data is between -1.23 and -1.62. Helliwell finds the elasticity on OECD trade to be between -0.87 and -1.02 in 1992.

4.2 Allowing for heterogeneity across countries

The model allows for differences in wages and prices across regions and republics which may affect trade. In addition, non-tariff barriers and currency variability may also influence trade flows. To allow for this possible heterogeneity, we use country fixed effects in the estimation. We exclude inter-republic trade from the sample and estimate (9) separately for the pre-reform and reform periods,

$$x_{ij,t} = \alpha_t + \beta_0\gamma_{ij} + \beta_1 Y_{it} + \beta_2 Y_{jt} + \beta_3 DIST_{ij} + u_{ij}, \tag{9}$$

where γ_{ij} is a country dummy. The dummy for Armenia, for example, is one when Armenia is either an exporter or an importer. Since inter-republic trade is excluded and all republics are dummied out, the coefficient on the Armenia dummy represents how much more or less Armenia trades with the Russian regions relative to how much the Russian regions trade among themselves. In the pre-reform period, the Russian bias against Armenia is 0.73 ($1/exp(0.31) = 0.73$), implying the regions trade about 27 percent less with each other as compared to Armenia. In the reform period, they trade 70 percent more with each other than with Armenia (a bias of 1.7). A coefficient of zero means that there is no bias (the bias equals 1). The results are reported in Table 3. Figure 5 shows graphically the bias against each former republic in both periods. In the pre-reform period, seven of the republics trade significantly more with Russia than is predicted by the model, three do not trade significantly more or less, and the remaining four trade significantly less.

Earlier results suggested that the Russian regions did not trade more with each other in the pre-reform period, yet traded more with each other than with other FSU members in the reform period. This is confirmed here, with no single country driving the results.[10] Trade between the Russian regions and all republics, except Kazakstan, fell from the pre- to the reform period. The

[10]We perform further robustness tests by looking at trade with other regions versus trade with republics for each region. Each regression is run on a region's trade with all of its trading partners. For all regions we find that trade

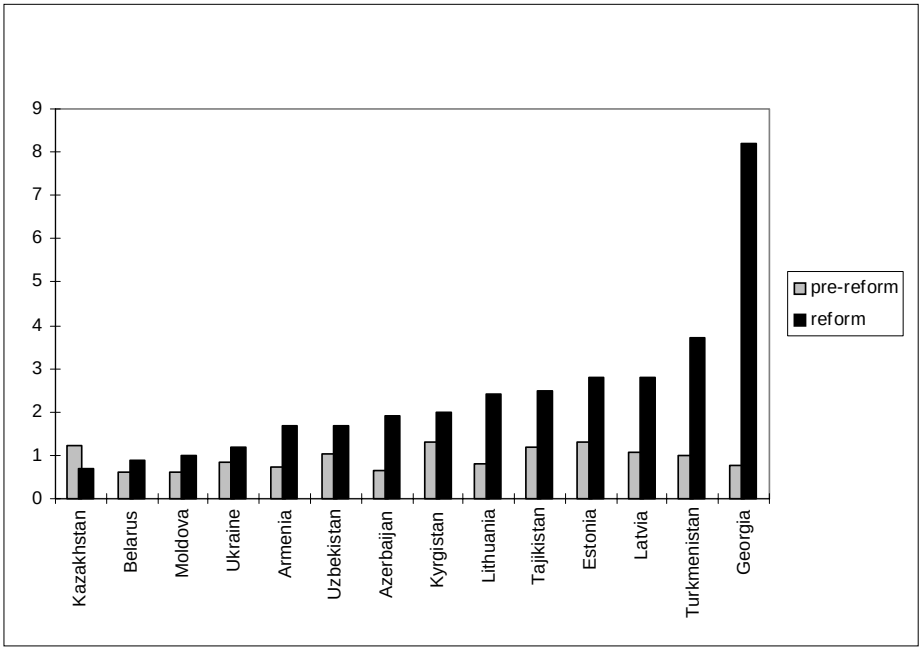

Figure 5: Russian bias against former republics

countries that experienced the most drastic declines in trade with the Russian regions are Georgia, Turkmenistan, Lithuania, Latvia, Azerbaijan and Armenia, in that order. Located directly south of Chechnya, Georgia, Armenia, and Azerbaijan suffered as a result of the Chechen war. Lithuania and Latvia have consciously followed a policy of integration into Western Europe.

The coefficients on Belarus and Kazakstan are both positive in the reform period, suggesting that both countries still trade at least as much with Russian regions as regions trade among themselves. This further bolsters our earlier results that the Russian bias in trade is primarily a result of trade barriers and not borders or nationhood.

with the other regions relative to the republics expanded - no single region is driving our results.

4.3 Estimating the effect of tariffs and adjustment costs

We next use the model specification as derived in equation (6). We estimate the following equation:

$$\ln M_{ij} = C + \beta_0 \ln Y_i + \beta_1 \ln Y_j + \beta_2 \ln DIST_{ij} + \beta_3 \ln TARIFF_j + \beta_4 \ln PTRADE_{ij} + \beta_5 RUSSIA + u_{ij}. \tag{10}$$

Exporter and importer income enter equation (6) explicitly. We use distance ($DIST$) and past trade ($PTRADE$) to proxy for trade costs. We assume distance is positively correlated with transport costs and thus reduces trade. We also assume that past trade is positively correlated with the current stock of infrastructure, thus reducing transport costs and leading to higher current trade. We next use population (POP) to proxy for the stock of infrastructure since trade was centrally planned to a large extent according to population size. We incorporate tariff levels directly as the log of one plus the ad-valorem tariff rate ($TARIFF$). Two PTAs were ratified in the reform period: one between Russia, Kazakstan, and Belarus and another between Estonia, Latvia, and Lithuania, so the ad valorem tariff is zero whenever trade is between any of these country pairs or among regions. The bias towards Russian goods, either as a result of non-tariff barriers, preferences, or price and wage differentials is now controlled for by the $RUSSIA$ dummy.

The results are reported in Table 4. The inclusion of the tariff variable eliminates the significance of $RUSSIA$. This suggests that trade policy is the main cause of lower trade among regions and republics.

The regressions with proxies for infrastructure are reported in the final six columns of Table 4. The significance of 1987 trade in the regression equation for 1996 implies that a great deal of current trade is still determined by past trade patterns. Since past trade was not Russia biased, this suggests that the bias of 60 percent is a short run phenomenon. Past linkages limit the bias

on current trade.[11]

Using 1987 trade as an independent variable in a regression on current trade may be problematic because past trade may be correlated with unobservable and persistent comparative advantage variables.[12] This is likely to be less of an issue in our data where trade in the pre-reform period was centrally planned and not based on comparative advantage. In addition, the countries in our study were trade partners by default–trading little with countries outside the Union. Therefore, disintegration implies that the set of countries over which comparative advantage is determined is greater. In addition, economies have changed dramatically since 1992, some economies have grown while others have shrunk, countries now have different currencies, and prices are no longer equalized across regions and republics.

Still, as a robustness check we use importer and exporter population as instrumental variables for trade costs. Other studies which use population in similar regression equations, albeit for different reasons, typically find a negative coefficient on population. The logic is that population may influence trade because larger countries generally have more resources and are less dependent on trade. Additionally, including population in the regression is equivalent to including per-capita income, since GDP is already in the equation and the variables are in logs. There are several reasons why per-capita income may influence trade positively (i.e. also a negative influence of population), for example, richer countries have better infrastructure for trade, or countries liberalize as they grow. The same would be true in the differentiated goods model if some foreign goods are luxury items. In contrast, we expect the coefficient on population to be positive since trade was planned

[11]We also include the fitted values from the 1987 regression in order to correct for possible auto-correlation. The estimates of the the coefficients of interest do not change significantly (not reported).

[12]Wonnacott (1998) highlights this problem in his discussion of Eichengreen and Irwin's (1998) paper on trade flows, which was the first to incorporate past trade into the gravity equation.

largely according to population size and thus infrastructure for trade was planned along those lines. Population size is thus a good proxy for the stock of infrastructure in the pre-reform period.

The first three columns of Table 5 show the results when population is included. In the reform period, the positive and significant coefficient on population suggests that past ties, created as a result of central planning, still influence trade. The coefficient of 0.66 implies a bias in trade of nearly 100 percent (exp 0.66=1.93). The inclusion of $TARIFF$, however, reduces the coefficient on the $RUSSIA$ dummy by two-thirds and renders it insignificant.

4.3.1 Persistence of business networks

We identify one type of linkage which has changed—business networks. To test for the importance of personal contacts we include changes in managers of exporters and importers from 1990 to 1996 ($MANAGER_i$ and $MANAGER_j$, respectively). We expect the coefficients on $MANAGER_i$ and $MANAGER_j$ to be negative, since stronger past networks imply that past trade patterns are likely to persist.

We find that changing managers significantly reduces trade. Moreover, including manager turnover leads to a further reduction in the intranational bias. One caveat is that manager turnover is probably piking up another effect besides networks. Countries with greater manager turnover are also rapid reformers, and hence the quickest to move away from old trade partners, perhaps finding new partners in the west. For example, the countries the Baltics show very high rates of turnover (around 50 percent).

4.3.2 Trade policy and infrastructure

The model in section two suggests that tariffs and trade will influence infrastructure maintenance and development. In this section, we explore the extent to which this process has begun. Using

passenger train speed as a proxy for infrastructure, we look for a Russian bias in 1989 and 1996. We find that while trains within Russia in general got faster from 1989 to 1996, international trains slowed (Table 6). The largest increase was from Uzbekistan to Chernoyzm, it took nearly 50 percent longer to travel between the two capitals in 1996 than in 1989.

Next, we control for other factors which may affect time of travel and look for a link to trade policy. Time of travel should be a function of the distance between two points and their incomes. The regression equation we estimate is:

$$TIME_{ij} = C + \beta_0 \ln Y_i + \beta_1 \ln Y_j + \beta_2 \ln DIST_{ij} + \beta_3 RUSSIA + \mu_{ij},$$

where $TIME$ is the log of the time in minutes of travel between i and j and the other independent variable are the same as defined above. Table 7 reports the results for 1989 and 1996. There is no bias within Russia in 1989. In 1996, after controlling for income and distance, travel times within Russia are significantly shorter than travel outside Russia.[13] To look for effects of trade policy we also include $TARIFF$ in the regression equation (columns 3 and 4). We find that a ten percent increase in the tariff level leads to a 4 percent increase in the time of travel. The final column reports the regression in changes. As expected GDP growth leads to a decline in travel time. Even after controlling for travel between Russia, tariffs have led to greater increases in travel times.

Our results suggest that infrastructure is being reoriented domestically. At present this process is likely show up in only marginal improvements or neglect of existing infrastructure. Still, building of new domestically oriented infrastructure has commenced in most FSU countries. One striking example is the move of the Kazak capital from Almaty (in the south) to Astana (in the north) and the construction of a highway and a railroad to link the two cities. Latvia and Estonia are also

[13]The increases is probably in part due to the result of waiting at the border for passport checks. We also included dummy variables to control for the numer of borders crossed. They were not significant.

building a fast train link between their capitals. Those projects will likely affect trade patterns in the FSU in the years to come.

4.4 Anticipation

We use data from the beginning of the transition period, 1991, to test for anticipatory behavior. Specifically, we include $RUSSIA$ and 1996 GDP in the regression equation on 1991 trade flows. Since sovereign borders materialized only in 1992, any intra-national bias in 1991 is likely to be the result of expectation about the future. We include 1996 GDP in the regression because regions and republics probably had foresight as to which ones would grow and started adjusting their trade and infrastructure accordingly. Because future GDP may be a noisy indicator of expectations, we also use percent of population who have completed higher education (EDU) as an instrumental variable for areas most likely to grow.

The results are reported in Table 8. Both $RUSSIA$ and future exporter and importer GDPs are positive and significant in 1991, suggesting that anticipatory re-adjustment was taking place. Moreover, the signs on $RUSSIA$ and future GDP were negative in all of the years 1987-1990 (not reported). In the benchmark specification, $RUSSIA$ is 0.61, implying a domestic bias of 84 percent. The estimated bias is probably higher than in 1994-1996 because of many political conflicts during 1991, which led to a decline in cross-border FSU trade.[14] When EDU is included to proxy expectations, the coefficients are positive and significant as expected. Moreover, only in 1991 are the signs on importer and exporter education positive and significant. While the significance of

[14]In early 1991, before the break-up of the Soviet Union, Russia imposed trade sanctions on Georgia and Turkmenistan following a refusal by the Georgian and Turkmeni administrations to pay taxes to the central government. Russia imposed similar sanctions on Estonia and Lithuania for failures to pay their gas bills. The sanctions exacerbated the collapse of bilateral trade flows during the year.

RUSSIA can be attributed to anticipation, conflict, or both, the significance of future GDP and *EDU* is highly suggestive of anticipatory behavior.

5 Conclusions

In the days of the Soviet Union, trade links between regions and republics were very strong and the regions did not trade more with each other than with the republics. An increasing bias towards domestic trade in Russia, however, has developed since the disintegration of the Soviet Union. Specifically, our benchmark regression shows that Russian regions traded 60 percent more with each other than with former republics in 1996. This bias is primarily due to the erection of tariff barriers on trade with the former republics. However, the intra-national bias has been mitigated through strong historical linkages that Russian regions have to former Soviet republics and costs of adjustment to redirecting trade and building new infrastructure.

The border effects we estimate are lower than in previous studies because infrastructure and production have not been domestically reorganized in the short period since the collapse of the Soviet Union. The erection of political borders, however, will likely be followed by the development of new economic borders. Already manager turnover has significantly reduced FSU trade. In addition, most of the former republics have also begun rebuilding domestic infrastructure. New physical infrastructure projects will further influence future trade patterns in the FSU.

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6 Appendix A:

The following draws on Helpman and Krugman 1989. Consumers equate marginal utility to marginal cost, implying that there the first order condition for good i is:

$$x_i^{\alpha-1}[\sum x_i^{\alpha}]^{\frac{1-\alpha}{\alpha}} = \lambda p_i d_i t_i \tag{A1}$$

where λ is Lagrange multiplier, which represents the marginal utility of income. Demand for good i in country j is:

$$x_{ij} = \frac{I(p_i d_i t_i)^{-\sigma}}{P^*} \tag{A2}$$

where P^* is the aggregate price index, specifically:

$$P^* = \sum (p_i d_i t_i)^{\frac{\alpha}{\alpha-1}} \tag{A3}$$

We assume increasing returns to scale production:

$$L_i = a + bx_i \tag{A5}$$

where L_i is labor employed in the production of x_i, and a and b are constants. Producers set marginal revenue equal to marginal cost:

$$\alpha = \frac{wb}{p_i} \tag{A6}$$

where w is the wage. By free entry average cost is equal to price:

$$p_i = \frac{w(a + bx_i)}{x_i} \tag{A7}$$

implying that total production of x_i is:

$$x_i = \frac{\alpha a}{(1-\alpha)b} \tag{A8}$$

and by symmetry the number of goods produced in a region is:

$$n = L/L_i \tag{A9}$$

where L is the total amount of labor and from equations (A5) and (A9) L_i is a constant. If q is the number of consumers in country j, Then total exports from country k to country j are :

$$M_{kj} = qnx_i = \frac{Y_i \frac{L}{L_i} (\frac{wb}{\alpha}_i d_i t_i)^{-\sigma}}{P^*} = \frac{Y_i Y_i w^{\sigma-1} (\frac{b}{\alpha}_i d_i t_i)^{-\sigma}}{L_i P^*} \tag{A10}$$

7 Appendix B: Data

7.1 Trade Flows

The data requirements for studying the effect of borders on trade flows are difficult to fulfill since few countries collect information on trade between regions within the country, and between regions and other trading partners. The Soviet Union is, however, an exception - data on inter-regional and inter-republican trade flows was gathered initially to help central planners decide on the further development and integration of Soviet industry during the pre-reform period.[15]

Although such data were collected consistently starting in 1964, they only became publicly available after 1986 following Gorbachev's appointment as Secretary of the Communist Party and the politics of glasnost he introduced. After the collapse of the Soviet Union in 1992, the Russian State Statistics Committee (Goskomstat) continued the collection and publication of inter-republican trade flow data. We construct these data from Statistika Vneshnei Torgovli v SSSR i gosudarst-

[15] We do not include countries from the rest of the world in the analysis due to lack of net trade flows data between Russian regions and countries outside the former Soviet Union. This may lead to an over-estimate of the effect of intra-Russian trade (thus biasing the coefficient on the Russia dummy upward) since the former republics have re-oriented part of their trade towards other countries. This re-orientation is, however, also due to comparative advantage, not only to the effect of new borders between them and Russia.

vach preeemnikach (World Bank, various issues). Inter-regional data on net trade flows for Russia are published in the Regionii v Rossii yearbook, starting in 1987. Gross trade flow data for the regions are only available from internal Goskomstat publications.

All data are available for 1987-1996, with the exception of 1992. We use the 1991 data only in the analysis of anticipatory behavior, since it does not belong to either the pre-reform or reform periods. By the end of 1991, most FSU republics had already declared political independence, but in the framework of an integrated Commonwealth of Independent States (CIS) market. Economic disintegration occurred only in 1992-1993. We exclude 1993 from the analysis data because 40 percent of the observations were missing and trade flows were only reported in each former republic's newly introduced currency, which made conversion to US dollars difficult. The 1987-91 data were reported in Russian rubles and converted into US dollars using the black market exchange rate for 1990-1 ruble equaled 0.38 $U.S.–as reported in World Bank (1994). The 1994-96 data were reported in U.S. dollars. The data contained 14 former republics and nine Russian regions.[16]

Two possible biases exist in the data: one related to barter transactions, and one related to unrecorded trade. Both lead to an upward bias on the parameter estimate of intra-Russian trade. Barter transactions are recorded in a special section of the customs declarations (for cross-border trade) and supplier invoices (for intra-Russian trade). Suppliers are required to price their merchandise at the prevailing market price in the country of origin plus a price premium as a penalty for non-cash payment. The price premia are included in the invoice. There is an incentive to report lower values of the merchandise in both intra-Russian and cross-border trade to avoid payment of value-added taxes. The incentive is, however, stronger in cross-border transactions since consignments are levied with customs duties and an additional 20 percent value-added tax.

[16]Two Russian regions (East and West Siberia) were excluded from the dataset due to many missing values in the 1994-96 period.

A companion paper (Djankov, 1998) reports anecdotal evidence from (confidential) interviews with enterprise managers in six Russian regions and six former republics on the under-reporting bias. In particular, invoices of intra-Russian trade underreport the value of merchandise by 14 percent on average, while invoices for exports have a 26 percent downward bias (this includes exports to and from Russia). The cross-border trade flows are further biased downward due to unrecorded trade, i.e., shipments which cross the border but whose owners avoid payments of duties and taxes by bribing customs officials.

In his study on the breakup of federations, Frankel (1997) argues that the partial reliance on barter transactions in the FSU reduces trade with other partners and hence serves to maintain the domestic bias in trade. This argument only applies to outward trade, i.e. trade with non-FSU partners. Barter trade would reduce the intra-Russian domestic bias in our sample only if it were more pervasive in cross-border trade between Russian and say Ukranian enterprises than in trade between enterprises in different Russian regions. This is, however, not consistent with the enterprise survey evidence (Djankov, 1998). Barter transactions were more common within Russia, which following Frankel's logic should lead to a further upward bias in intra-Russian trade.

7.2 Income Data

The GDP data for republics come from World Bank (various years). Again, as in the trade data, 1987-90 values are reported in Russian rubles and converted to US dollars using the 1990 black market exchange rate. The 1994-96 numbers are reported in both local currencies and US dollars. We use Rossiiskii Statisticheskii Ezhegodnik (Goskomstat, various years) to complement our republican data with data for the nine Russian regions.

The income data display significant changes over the sample period, with a precipitous initial drop and a subsequent steady increase in the reform period. In contrast, the pre-reform period

was marked by stagnant income growth. By 1996, four republics (Estonia, Kazakstan, Latvia, and Lithuania) and five Russian regions (North, Northwest, Central, Volga, and Ural) had reached GDP levels (in dollar terms) higher than in 1987. At the opposite extreme, Armenia, Azerbaijan, Moldova, and Tajikistan fell to half of their 1987 levels by 1996.

7.3 Distance and train schedules

We use the road travel guide (Ministerstvo Transporta, 1990) to construct a distance matrix. Distance is measured in kilometers and covers the shortest distance between two regional or republican centers. This measure is superior to by-air distance since it accounts for the level of development of Soviet infrastructure. The longest distance between two economic centers is 9,687 kilometers from Latvia to the Fareast region of Russia.

Passenger train data for 1996 and 1989 are from the national railways archive (unpublished data).

7.4 Trade barriers

While a dozen different PTAs have been negotiated between and among former Soviet republics (EBRD, 1997), only two such agreements - between Estonia, Latvia, and Lithuania; and Belarus, Kazakstan, and Russia - were ratified by the respective parliaments and implemented. The average unweighted tariff levels between the other republics ranges between 4 and 30 percent ad valorem, with Estonia, Armenia, and Lithuania being the most open and Azerbaijan, Tajikistan, and Turkmenistan having the highest protection.

Non-tariff barriers are pervasive among the former republics. Interviews with managers of exporting firms done by the authors during visits to ten of the republics identified several types of such barriers. Long delays at the border and onerous paper requirements by customs officers

can be (and often are) avoided by means of bribes. This adds to the cost of the consignment between 1 percent (Kyrgyz customs officials being the cheapest) and 6 percent (in Uzbekistan) on average. Transit transport through a country, or even through a region within the same country can also increase costs substantially. Interviews with Kazak businessmen reveal that their trucks are routinely stopped and fined several times when entering Uzbekistan. Moldovan businessmen report that transit transport through Ukraine and into Russia is levied with a deposit, equal to 100 percent of the consignment value, on the Moldovan-Ukrainian border. The payment has to be made in Ukrainian currency. Foreigners cannot, however, own Ukrainian currency above certain limits and hence they have to exchange money at the border, and then exchange money back when entering Russia. In the currency exchange process, an average of 7 percent of the value of the consignment is added to costs. Djankov (1998) finds that exporting Moldovan wine to Moscow is more expensive than exporting Australian wine to Moscow, even though the travel distance is eight times smaller. Similar deposits (at 50 percent of the consignment's value) exist for Kyrgyz exports through Kazakstan into Russia. Kyrgyz businessmen report that in one-quarter of the cases they never get the deposit back. In addition, many countries charge foreigners higher rates for rail transport. Finally, all enterprises in countries which have not signed PTAs with Russia are forced to pay value-added taxes (of 20 percent) twice–once when they produce goods in their own country and a second time when goods cross the border with Russia.

7.5 Management turnover

The statistics on management turnover come from a World Bank survey of manufacturing enterprises in the FSU (Djankov 1998). The survey asks managers about the duration of their tenure with the enterprise. The highest management turnover rates are recorded in Georgia, Estonia, Latvia, Central Russian region, and Turkmenistan, where 55.4, 53.2, 47.9, 48.5 and 44.5 percent of

managers were replaced in the 1991-1996 period. The least turnover was reported in Belarus, the Far East region, the Chernozyom region, and Ukraine, where 19.4, 22.9, 26.8, and 27.2 percent of managers were replaced. Data are not available for Armenia, Azerbaijan, Lithuania, Tajikistan and Uzbekistan; and the North, North Caucases, Volga-Vyatka, Western and Eastern Siberian regions.

Table 1: Benchmark Specification

	1987	1988	1989	1990	1994	1995	1996
Y_i	0.76*	0.77*	0.77*	0.75*	0.93*	0.88*	0.88*
	(28.5)	(28.4)	(28.5)	(29.0)	(17.7)	(15.2)	(16.6)
Y_j	0.72*	0.72*	0.72*	0.73*	0.90*	0.89*	0.82*
	(27.2)	(27.2)	(27.4)	(29.0)	(15.1)	(17.3)	(16.1)
DIST	-0.42*	-0.42*	-0.42*	-0.42*	-0.98*	-1.05*	-1.16*
	(-12.2)	(-12.0)	(-12.0)	(-12.4)	(-15.6)	(-16.5)	(-16.5)
RUSSIA	-0.12	-0.10	-0.11	-0.15	0.31*	0.42*	0.46*
	(-1.6)	(-1.3)	(-1.3)	(-1.9)	(2.33)	(3.1)	(3.5)
No. of obs.	504	502	495	494	492	486	487
Adj R-square	0.81	0.81	0.81	0.82	0.70	0.70	0.72

*Significant at the 5 percent level. Heteroskedasticity corrected t-statistics are in parentheses.

All regressions run with a constant, values for the constants are not reported.

Table 2: Panel Regression

	OLS		Random Effects	
	pre-reform	reform	pre reform	reform
Y_i	0.76*	0.90*	0.76*	0.87*
	(57.4)	(28.5)	(30.6)	(20.1)
Y_j	0.72*	0.87*	0.71*	0.84*
	(55.6)	(27.9)	(28.5)	(19.4)
DIST	-0.42*	-1.06*	-0.42*	-1.06*
	(-24.4)	(-28.1)	(-13.7)	(-15.9)
RUSSIA	-0.12*	0.40*	-0.10	0.47*
	(-3.0)	(5.2)	(-1.2)	(2.7)
No. of obs.	1995	1465	1995	1465
Adj R-square	0.82	0.71	0.99	0.89

*Significant at the 1 percent level. Heteroskedasticity corrected t-statistics are in parentheses.

All regressions run with a constant, values for the constants are not reported.

Table 3. Allowing for Country Heterogeneity

(excluding inter-republic trade)

	pre-reform	t-stat	bias	reform	t-stat	bias
Armenia	0.31*	(4.2)	0.73	-0.54*	(-3.3)	1.7
Azerbaijan	0.40*	(6.3)	0.67	-0.62*	(-5.0)	1.9
Belarus	0.50*	(9.3)	0.61	0.10	(1.1)	0.9
Estonia	-0.26*	(-3.5)	1.30	-1.03*	(-8.2)	2.8
Georgia	0.25*	(4.0)	0.78	-2.10*	(-16.2)	8.2
Kazakstan	-0.21*	(-3.7)	1.23	0.30*	(2.6)	0.7
Kyrgistan	-0.27*	(-3.4)	1.31	-0.70*	(-3.9)	2.0
Latvia	-0.06	(-0.9)	1.06	-1.03*	(-9.4)	2.8
Lithuania	0.20*	(3.1)	0.82	-0.88*	(-8.2)	2.4
Moldova	0.46*	(6.5)	0.63	0.02	(0.2)	1.0
Tajikistan	-0.17*	(-2.0)	1.19	-0.90*	(-4.3)	2.5
Turkmenistan	0.00	(-0.1)	1.00	-1.31*	(-8.9)	3.7
Ukraine	0.18*	(3.7)	0.84	-0.20	(-1.9)	1.2
Uzbekistan	-0.02	(-0.34)	1.02	-0.53*	(-2.8)	1.7
Y_i	0.88*	(41.4)		0.83*	(22.1)	
Y_j	0.87*	(40.4)		0.82*	(22.4)	
DIST	-0.25*	(-13.1)		-1.01*	(-22.3)	
No. of obs.	1267			920		
Adj R-square	0.89			0.85		

*Significant at the 1 percent level. Heteroskedasticity corrected t-statistics are in parentheses.

All regressions run with a constant, values for the constants are not reported.

Table 4: Estimating the Effect of Tariffs and Adjustment Costs

	1994	1995	1996	1994	1995	1996	1994	1995	1996
Y_i	0.89*	0.86*	0.79*	0.64*	0.59*	0.51*	0.64*	0.57*	0.48*
	(14.6)	(16.3)	(15.1)	(7.9)	(9.1)	(7.1)	(7.8)	(8.5)	(6.6)
Y_j	0.91*	0.85*	0.85*	0.66*	0.57*	0.55*	0.65*	0.54*	0.52*
	(16.9)	(14.2)	(15.6)	(9.0)	(8.5)	(7.7)	(8.8)	(8.0)	(7.2)
DIST	-0.98*	-1.05*	-1.20*	-0.75*	-0.82*	-0.92*	-0.76*	0.82*	-0.92*
	(-15.9)	(-16.9)	(-16.8)	(-10.5)	(-12.5)	(-12.8)	(-10.7)	(-12.8)	(-13.2)
RUSSIA	0.02	0.08	0.07	0.34*	0.41*	0.46*	0.12	0.08	0.08
	(0.2)	(0.5)	(0.4)	(2.8)	(3.4)	(3.8)	(0.8)	(0.5)	(0.5)
TARIFF	-1.20*	-1.46*	-1.65*				-0.93*	-1.44*	-1.64*
	(-2.7)	(-3.0)	(-3.2)				(-2.1)	(-3.1)	(-3.2)
PTRADE				0.48*	0.55*	0.57*	0.47*	0.55*	0.57*
				(5.8)	(6.4)	(6.1)	(5.6)	(6.4)	(6.1)
No. of obs.	492	486	487	490	484	486	490	484	486
Adj R-square	0.70	0.70	0.72	0.72	0.72	0.74	0.72	0.73	0.75

*Significant at the 1 percent level. Heteroskedasticity corrected t-statistics are in parentheses.

All regressions run with a constant, values for the constants are not reported.

Table 5: Instrumental Variables

	1994	1995	1996	1994	1995	1996	1996
Y_j	0.68*	0.64*	0.54*	0.67*	0.61*	0.50*	0.77*
	(8.5)	(9.3)	(7.4)	(8.2)	(8.4)	(6.5)	(10.2)
Y_i	0.83*	0.72*	0.74*	0.80*	0.68*	0.69*	0.76*
	(12.1)	(9.6)	(10.0)	(11.4)	(8.7)	(8.9)	(10.5)
POP_j	0.44*	0.49*	0.55*	0.45*	0.51*	0.59*	
	(5.2)	(4.5)	(5.4)	(5.3)	(4.8)	(5.8)	
POP_i	0.18*	0.30*	0.27*	0.19*	0.32*	0.29*	
	(2.2)	(3.4)	(3.1)	(2.3)	(3.6)	(3.3)	
$MANAGER_j$							-3.05*
							(-3.9)
$MANAGER_i$							-3.35*
							(-3.9)
DIST	-0.97*	-1.06*	-1.17*	-0.97*	-1.06*	-1.17*	-1.13*
	(-15.9)	(-17.0)	(-17.5)	(-16.5)	(-17.8)	(-18.3)	(-12.5)
RUSSIA	0.50*	0.63*	0.66*	0.19	0.21	0.18	0.08
	(3.5)	(4.6)	(4.7)	(1.2)	(1.3)	(1.1)	(0.37)
TARIFF				-1.31*	-1.81*	-2.08*	-1.34
				(-2.9)	(-3.7)	(-4.0)	(-1.77)
No. of obs.	492	486	486	492	486	486	199
Adj R-square	0.71	0.72	0.77	0.71	0.72	0.75	0.78

*Significant at the 1 percent level. Heteroskedasticity corrected t-statistics are in parentheses.

All regressions run with a constant, values for the constants are not reported.

Table 6: Change in train speed 1996-1989 (km/minute)

Between Republics	and Russia	and Republics	Between Regions	and Russia	and republics
Armenia	-0.040	-0.405	North	0.018	-0.687
Azerbaijan	-0.037	-0.495	Northwest	0.029	-0.840
Belarus	-0.021	-1.110	Central	0.028	-0.649
Estonia	-0.077	-0.804	Chernozyom	0.018	-0.715
Georgia	-0.069	-0.545	Caucases	0.019	-0.631
Kazakstan	-0.076	-0.497	Volga	0.007	-0.529
Kyrgistan	-0.105	-0.459	Volga-Vyatka	0.023	-0.524
Latvia	-0.050	-0.554	Ural	0.019	-0.408
Lithuania	-0.048	-0.224	Fareast	-0.003	-0.477
Moldova	-0.068	-1.210			
Tajikistan	-0.041	-0.569			
Turkmenistan	-0.040	-0.423			
Ukraine	-0.061	-0.790			
Uzbekistan	-0.091	-0.505			

Table 7: Infrastructure and trade

	TIME89	TIME96	TIME96	CHANGE
Y_i	-0.02*	-0.03**	-0.02**	-0.008
	(-2.2)	(-4.0)	(-3.1)	(-1.2)
Y_j	-0.02*	-0.03**	-0.02**	-0.009
	(-2.2)	(-3.7)	(-2.6)	(-1.3)
DIST	1.04**	1.02**	1.02**	
	(71.2)	(72.0)	(74.9)	
RUSSIA	0.02	-0.06**	0.03	-0.05**
	(0.87)	(-2.2)	(0.63)	(-6.5)
TARIFF			0.39**	0.09**
			(3.1)	(3.4)
no. of obs.	495	487	487	476
adj-R-square	0.094	0.94	0.95	0.23

**Significant at the 1 percent level, *Significant at the 5 percent level.

Heteroskedasticity corrected t-statistics are in parentheses.

All regressions were run with a constant, estimates for constant values not reported.

Table 8: Adjustment and Anticipation

	1991	1991	1991
Y_i	0.92*	0.58*	0.94*
	(27.5)	(9.2)	(27.4)
Y_j	0.90*	0.58*	0.91*
	(26.6)	(7.7)	(27.1)
DIST	-0.49*	-0.46*	-0.47*
	(-13.4)	(-12.9)	(-12.7)
RUSSIA	0.61*	0.38*	0.59*
	(7.5)	(4.6)	(7.2)
$Y96_i$		0.28*	
		(5.7)	
$Y96_j$		0.26*	
		(4.9)	
EDU_i			0.36*
			(3.3)
EDU_j			0.30*
			(2.7)
no. of obs.	494	494	494
adj. R-square	0.80	0.82	0.80

*Significant at the 1 percent level. Heteroskedasticity corrected t-statistics are in parentheses.

All regressions run with a constant, values for the constants are not reported.