Disintegration and Trade Flows:

Evidence from the Former Soviet Union

Simeon Djankov
World Bank

Caroline Freund*
Federal Reserve Board

Abstract

We study the effects of trade barriers and the persistence of past linkages on trade flows in the former Soviet Union (FSU). Estimating a gravity equation 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). Our results suggest that the bias towards domestic trade in the reform period is primarily a result of tariffs. We also find that past linkages, such as infrastructure, production and consumption chains, and business networks, have limited the reorientation of trade.

*We are grateful to Don Davis, Alan Deardorff, Simon Evenett, Linda Goldberg, Jim Harrigan, Oleh Havrylyshyn, John Helliwell, David Hummels, John Rogers, Maurice Schiff, Kei-Mu Yi and seminar participants at CEPII-Paris, the Federal Reserve Board, the New York Federal Reserve Bank, and the World Bank for comments on earlier drafts. The views in this paper are solely the responsibility of the authors and should not be interpreted as reflecting the views of the World Bank, the Board of Governors of the Federal Reserve System, or any other person associated with the Federal Reserve System. Correspondence: caroline.l.freund@frb.gov.

1 Introduction

Borders significantly influence trade flows, however, the reasons behind this 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 examine 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 collapse of 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. We also find that the elasticities of trade to income and distance, in the pre-reform period, are markedly smaller than those typically found in empirical work using the gravity equation. In the reform period, however, the elasticities are similar to those from studies of other countries. It thus appears that the decline of central planning has allowed gravity to set in, and now income and distance influence trade flows in a more standard way in the FSU.

Second, we distinguish the primary causes of the border effect. 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 national borders alone have not diverted trade flows in the FSU.

Third, our results also suggest that slow adjustment of production and of infrastructure has limited trade reorientation. Using past trade to proxy for linkages developed when the Soviet Union was integrated, we find that past linkages significantly influence current trade. Since past trade was centrally planned it is unlikely that we are picking up other unobserved persistent variables, such as tastes or comparative advantage. As linkages with other republics continue to atrophy, the domestic trade bias will increase to well over the 60 percent we estimate currently.

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 in 1996 following the preferential trading agreement (PTA) between the two countries.[1] 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 past linkages have 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.

[1] An alternative 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.

[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.

The paper is organized as follows. Section 2 reviews the literature on the border effect. Section 3 discusses the empirical specification and results. Section 4 concludes.

2 Why do borders matter?

Empirical studies on the effects of borders are uniform in finding a high domestic bias in trade. 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. The first implies borders matter because of tariffs, quotas, and other barriers to trade. Trade barriers raise the relative price of imported goods and lead to a consumption bundle biased towards domestically produced goods.

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 relatively homogeneous, have similar tastes, and in which the regional economies are linked. These associated regions may create borders to protect themselves from external shocks.

Finally, cross-border trade may be relatively small because past isolation has led to domestically oriented infrastructure and production. 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.

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. Eichengreen and Irwin (1998) find that lagged bilateral trade is significant in determining current bilateral trade in a large cross-section of countries, after controlling for income and distance, and interpret this as evidence that past linkages adjust only slowly to new conditions. Also indicative of the importance of historical linkages, Freund (2000) 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.

3 Empirical specification

The FSU provides a unique case study because in the pre-reform period infrastructure and technology were uniform across regions and republics, there were no trade barriers, and trade was centrally planned. In the reform period, borders have been erected, large tariffs are in place, and central planning has been abandoned; but, transport costs, infrastructure, and technology are likely to be slow to change. This allows us to examine how past integration affects current trade and how tariffs influence trade, when there are no differences in infrastructure and history. That is, any correlation

between pre-reform trade and current trade, after controlling for size and distance, must be largely a result of historical linkages and not the result of unobservables such as comparative advantage and tastes.

3.1 The Data

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. Unweighted average ad-valorem tariff rates are published by the EBRD. Population figures are from the World Bank. (See the Appendix for a detailed description of the data and a map of the region.)

There are two weaknesses in the data. First, because of central planning, the pre-reform trade values are not market values. Since we are comparing across regions and republics all of which are within the same country and subject to the same prices, they are nevertheless valuable estimates of relative trade between partners. The second problem is the presence of barter trade, which became quite common in the FSU in the reform period. Barter trade is recorded in the dataset, however the prices at which it is recorded are likely to be biased downwards in order to avoid taxes and tariffs. Again since we are comparing trade within the FSU, this is less of a problem because barter trade is likely to be as prevalent among regions as between regions and republics (see Appendix). Therefore, although the magnitudes of trade are likely to be distorted, there is no reason to think that relative trade among parties within the FSU is systematically biased. If we included non FSU countries in the study, these problems would distort relative trade as well.

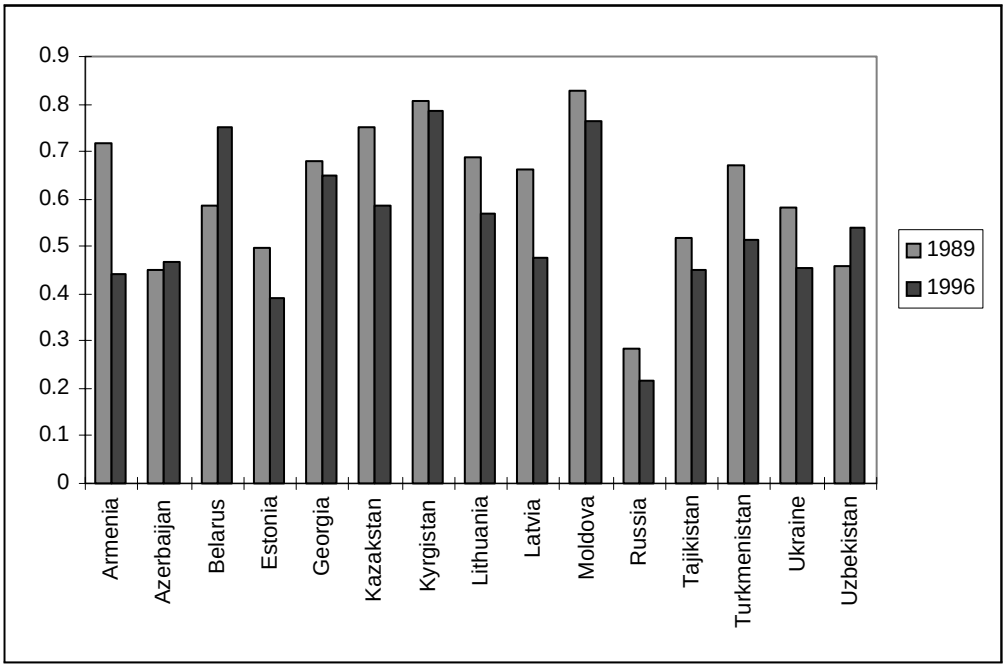

Figure 1: Exports to other FSU countries relative to total exports

Figure 1 shows each country's share of total exports that go to other FSU countries. FSU export shares have declined for all but three former members—Azerbaijan, Belarus, and Uzbekistan. This suggests that a significant 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, so we also document 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 each region's 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.

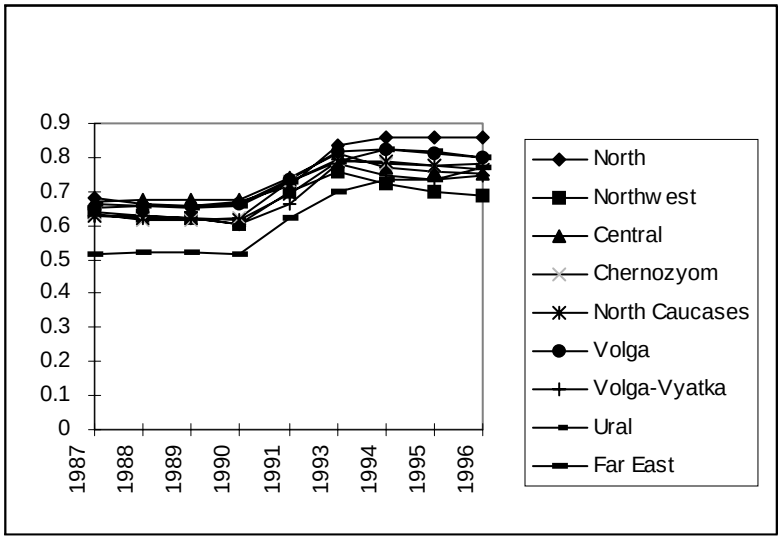

Figure 2: Share of total FSU trade with Russia by region

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. For example, the increased Russian trade share among the regions may be the result of relatively higher income growth. Next, we use a simple gravity 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 account for country specific effects, tariffs, and history.

3.2 The benchmark specification

We use a gravity equation to examine trade within Russia. The gravity equation describes trade between two parties as proportional to the product of their incomes divided by the distance between them. Theoretical models supporting the gravity equation are numerous. In particular, the monopolistic competition model and Heckscher-Ohlin model of trade both produce estimating

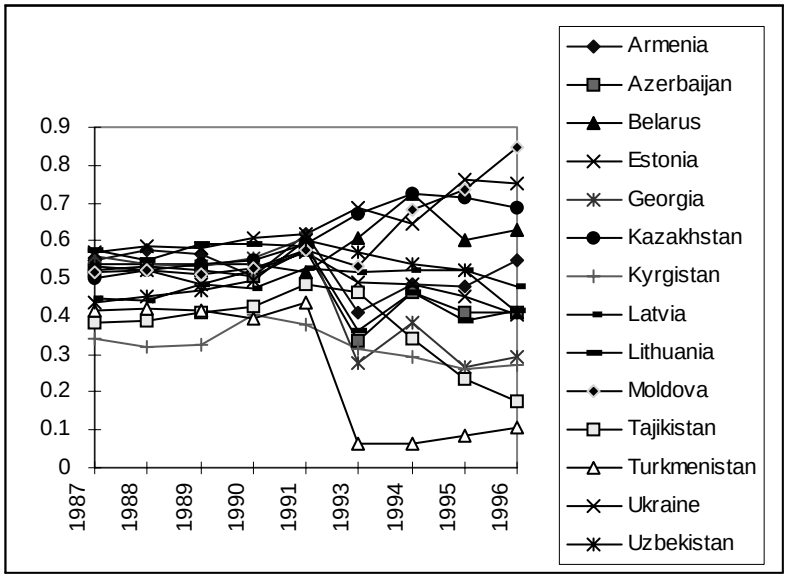

Figure 3: Share of total FSU trade with Russia by republic

equations similar to the gravity equation describing bilateral trade flows (Deardorff 1998).

We estimate a 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 regression equation for each year in log levels is:

$$TRADE_{ij} = \alpha + \beta_0 Y_i + \beta_1 Y_j + \beta_2 DIST_{ij} + \beta_3 RUSSIA + u_{ij} \quad (1)$$

where $TRADE_{ij}$ 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 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

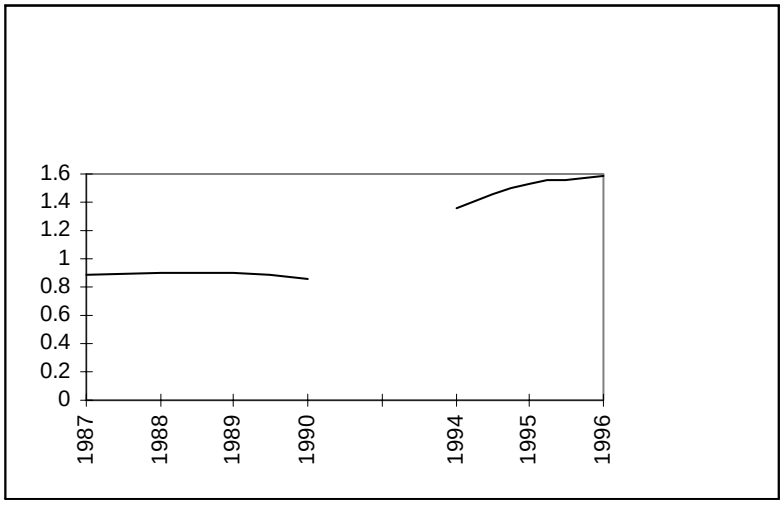

Figure 4: Domestic Bias in Russian Trade

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.[3]

The insignificant (and negative) bias in trade between Russian regions in the pre-reform period is not surprising given that trade was centrally planned across all of the FSU and there were no borders. The move away from central planning is also noticeable in Table 2. In all specifications we

[3]We also organize the data into two panels, a pre-reform period (1987-1990) and a reform period (1994-1996) and use OLS and random effects (not reported). The regression is based on equation (1), with an added time dimension. These results confirm our earlier estimates–the coefficient on $RUSSIA$ was not significant in the pre-reform period and in the reform period the OLS results estimate the bias to be 50 percent and the random effects estimate the bias to be 60 percent.

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.[4] This suggests that gravity has set in and that trade patterns in the FSU are now determined in a similar way to the rest of the world.

Since GNP is not exogenous with respect to trade we also use population to instrument for GDP. The results are shown in Table 2. The coefficients on income are higher. The reorientation within Russia is still evident from the change in significance of the Russia dummy over time. Russian regions are significantly less likely to trade with one-another in the pre-reform period and this bias disappears in the reform period.

3.3 Allowing for heterogeneity across countries

Non-tariff barriers, currency variability, and differences in wages and prices across regions and republics may affect trade. To allow for this possible heterogeneity, we split the sample into two panels–pre-reform and reform–and use country fixed effects in the estimation. We exclude inter-republic trade from the sample and estimate equation (2) separately for the pre-reform and reform periods,

$$TRADE_{ij,t} = \alpha_t + \beta_0\gamma_{ij} + \beta_1 Y_{it} + \beta_2 Y_{jt} + \beta_3 DIST_{ij} + u_{ij}, \tag{2}$$

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

[4]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.

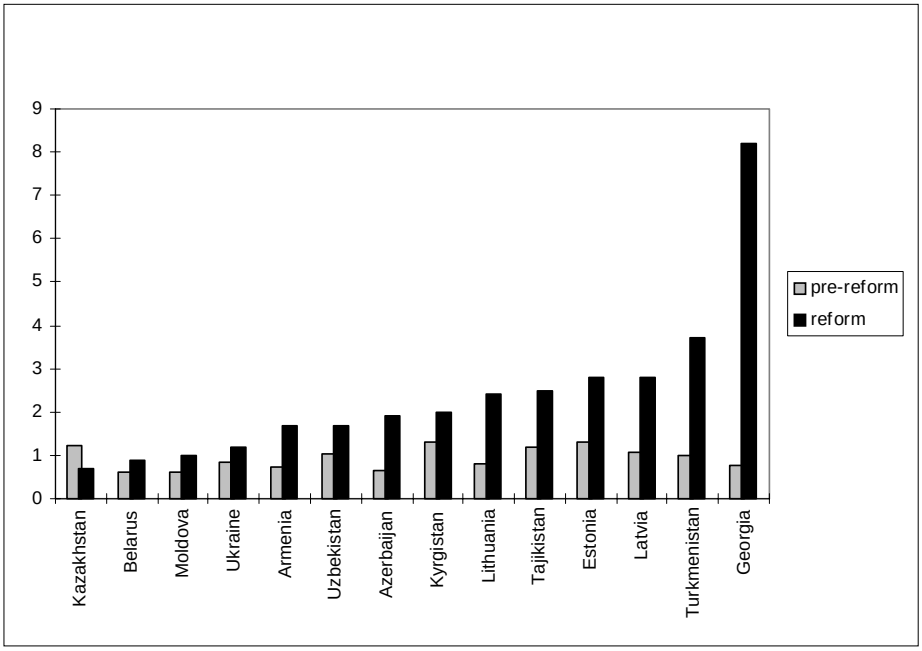

Figure 5: Russian bias against former republics

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 with 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). Figure 5 shows 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.[5] Trade between the Russian regions and all republics, except Kazakhstan, fell from the pre-reform to the reform period. The countries that experienced the greatest 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 Kazakhstan 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. These two countries alone signed a free trade agreement with Russia. This implies that the Russian bias in trade may be largely a result of trade barriers.

3.4 Estimating the effect of tariffs and adjustment costs

The benchmark model used to estimate the trade bias (equation (1)) includes distance as a proxy for transport costs and a dummy variable ($RUSSIA$) to estimate possible excess trade between Russian regions. The question is how to interpret the positive coefficient on the dummy variable in the reform period. It could be picking up other parts of trade costs besides distance related transport costs or it could be picking up trade barriers. Alternatively, it may represent differences in factor endowments, tastes, or technology.

In this section we attempt to examine the effect of tariffs and past linkages on trade. We incorporate tariff levels into the benchmark equation as the log of one plus the ad-valorem tariff

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

rate in the importer country ($TARIFF$).[6] Two PTAs were ratified in the reform period: one between Russia, Kazakhstan, 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 2. The inclusion of the tariff variable eliminates the significance of $RUSSIA$. This indicates that trade policy is the main cause of lower trade among regions and republics. The coefficient can be interpreted as the elasticity of trade with respect to the tariff. The coefficients on the tariff rate of -1.2 in 1994 and -1.65 in 1996 imply that the elasticity of trade to the tariff is increasing in absolute value over time. This is consistent with there being adjustment costs in reorienting production and infrastructure. The impact on trade is relatively small when the tariff is initially imposed, as time goes on and infrastructure and production are reoriented, the magnitude of its effect rises.

Next we also include a variable describing past linkages ($LINKS$). Past linkages exist throughout the FSU as a result of central planning. For example, there are highly integrated production and consumption chains, infrastructure for trade, and business networks all of which are likely to change slowly, and all of which lead to greater current trade than in their absence.

We assume that the current linkage between two areas is an increasing function of their past trade:

$$LINKAGE_{ijt} = F(M_{ijt-1}, M_{ijt-2}, M_{ijt-3}, ...).$$

The intuition is that greater trade in the past generated more investment and hence a larger capital stock (in terms of production and infrastructure) geared toward that trade. For a model

[6] This format can be derived from a model where tariffs enter multiplicatively, such as a differentiated goods model.

that develops a similar intuition see Bougheas et. al. (1999). They show that if infrastructure lowers transport costs, then infrastructure and the volume of trade will be positively correlated in a Dornbusch-Fischer-Samuelson model. While they model specific infrastructure for transport, we have in mind a more general notion of linkages through physical infrastructure, production chains, and business contacts.

As a result of central planning, trade in the pre-reform period was very similar across years, as evidenced by Table 1. We thus assume that linkages will be positively correlated with centrally planned trade from the pre-reform period. This implies that we can include pre-reform trade patterns as a measure of current linkages for trade.

The regressions including past trade are reported in the final three columns of Table 3. 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. That is, past linkages have limited the bias on current trade. Specifically, the results imply that 1 percent increase in trade in 1987 leads to about half of one percent increase in current trade.

One problem with including past trade is that it may also be correlated with current trade because of other persistent variables that are not included in the regression equation, such as endowments or technology, but that are not related to past linkages.[7] This is likely to be less of an issue in this data because 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

[7]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.

now have different currencies, and prices are no longer equalized across regions and republics.

Still, as a robustness check, we use the fitted values of past trade from the simple gravity equation in the regression (Column five of Table 3). The results remain robust implying that a significant amount of current trade is determined by past linkages.

3.4.1 Interpretation and Implications for the Future

The results in this paper show that trade has been reoriented within Russia, primarily as a result of trade barriers, and that trade flows within the FSU are still significantly impacted by past linkages. We have also shown that the elasticity of trade with respect to tariffs increases over time, likely as a result of a reorientation of production, infrastructure, and networks. This implies that the Russian bias we estimate will continue to increase over time. Decreasing trade between Russian regions and republics will affect production, infrastructure maintenance and development, and business networks. As these linkages for trade deteriorate, the cost of international trade will increase, which will cause trade between FSU countries to decline further.

At present this process is likely show up in only marginal improvements or neglect of existing infrastructure. To examine the extent to which this process has begun, we first examine passenger train speed within the FSU as a proxy for investment in infrastructure that links regions to republics, and then we discuss how nascent projects in the FSU countries are likely to alter international linkages.[8]

Using train schedules between FSU countries and Russian regions, we find that trains got faster between most Russian regions from 1989 to 1996, and trains to the former republics slowed. Table 4 reports the average percent change in time of travel between and among regions and republics from

[8]Train schedules for 1989 and 1996 are from the National Railways archives in Moscow.

1989 to 1996. While travel times between regions and republics and among republics lengthened; travel times among the Russian regions were nearly all shorter in 1996 as compared with 1989 (last column in Table 4). For example, a train from the North region to the republics took 4.9 percent longer on average in 1996 as compared with 1989; but a train from the North to the other Russian regions took 2.0 percent less time on average in 1996 than in 1989. The largest travel time increase was between Chernozyom and Uzbekistan; it took 41 percent longer to travel between the two capitals in 1996. The sharpest decline was between Central Russia and Chernozyom; it took 7.2 percent less time to travel between the two capitals in 1996 as compared with 1989. This suggests that trains in Chernozyom have been reoriented towards Moscow and away from the southern route to Uzbekistan.

Changes in travel times were accompanied by a change in the frequency of service. The frequency of trains traveling between Russian regions have for the most part remained constant or improved, but train service from regions to republics has become less frequent. These results suggests both that infrastructure between regions and republics is deteriorating and that connections for business travel across national borders are less frequent. While this is probably partially a result of declining trade, it is also likely to increase the costs of international trade and hence facilitate the reorientation in trade.

Reorientation of infrastructure is also evident in the new projects and agreements that have emerged in most FSU countries. One striking example is the move of the Kazakh 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 building a fast train link between their capitals. Belarus and Russia recently agreed to deeper economic and political integration, the accord includes currency unification and enacting unified customs regulations. These projects and agreements are

likely to affect trade patterns in the FSU in the years to come. As these new linkages are developed and past linkages atrophy, the domestic bias in Russian trade will surely increase.

4 Conclusions

In the days of the Soviet Union, trade was centrally planned, trade links between regions and republics were very strong, and the regions did not trade more with each other than with the republics. The collapse of central planning along with the disintegration of the Soviet Union have induced a change in the determinants of trade. As gravity has set in, the elasticities of trade to income and distance have risen and are now similar to those found in the rest of the world. In addition, an increasing bias towards domestic trade in Russia has developed. Specifically, we show 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.

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. That is, 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 erection of political borders, however, will likely be followed by the development of new economic borders. This implies that the domestic bias in Russia (and in the new republics) will grow over time.

References

[1] Bond, Eric, "Transportation, Infrastructure Investments, and Trade Liberalization," Mimeo, Penn State University, 1997.

[2] Bougheas, Spiros, Panicos Demetriades, and Edgar Morgenroth, "Infrastructure, Transport Costs, and Trade" Journal of International Economics 1999, pp. 169-189.

[3] Deardorff, Alan, "Determinants of Bilateral Trade" In J. Frankel (Ed.) *The Regionalization of the World Economy* NBER 1998, pp. 7-21.

[4] EBRD, *Transition Report*, London, 1997.

[5] Eichengreen, Barry and Douglas Irwin, "The Role of History in Bilateral Trade Flows," in J. Frankel Ed., *The Regionalization of the World Economy*, The University of Chicago Press, 1998.

[6] Engel, Charles and John Rogers, "How Wide is the Border," *American Economic Review*, December 1996, pp. 1112-25.

[7] Frankel, Jeffrey, "Regional Trading Blocs," Institute for International Economics, Washington DC, 1997.

[8] Frankel, Jeffrey, Ernesto Stein and Shang-jin Wei, "Trading Blocs and the Americas: The Natural, the Unnatural, and the Super-natural," *Journal of Development Economics*, Vol. 47 1995, pp. 61-95.

[9] Freund, Caroline, "Different Paths to Free Trade: The Gains from Regionalism," *Quarterly Journal of Economics*, forthcoming 2000.

[10] Goskomstat Rossiiskoy Federacii, *Regionii v Rossii*, Moscow, (various issues).

[11] Goskomstat Rossiiskoy Federacii, *Rossiiskii Statisticheskii Ezhegodni*k, Moscow, (various issues).

[12] Goskomstat Rossiiskoy Federacii, *Uroven' Obrasovaniya Naseleniya SSSR, Perepis' Naseleniya*, 1989.

[13] Helliwell, John, "Do National Borders Matter for Quebec's Trade?" *Canadian Journal of Economics*, August 1996, pp.507-522.

[14] Helliwell, John, *How Much Do National Borders Matter?* Brookings Institution Series on Integrating National Economies, 1999.

[15] Helpman, Elhanan and Paul Krugman, *Trade Policy and Market Structure*, The MIT Press, 1989.

[16] Hummels, David and James Levinsohn, "Monopolistic Competition and International Trade: Reconsidering the Evidence," *Quarterly Journal of Economics*, August 1995, pp. 799-836.

[17] McCallum, John, "National Borders Matter: Canada-U.S. Regional Trade Patterns," *American Economic Review*, June 1995, pp. 615-23.

[18] Ministerstvo Transporta SSSR, *Putevoditelnii Atlas Sovetskovo Soyza*, Moscow, 1990.

[19] Wei, Shang-jin, "Intra-national Versus International Trade: How Stubborn are Nations in Global Integration?" NBER Working Paper #5531, 1996.

[20] Wonnacott, Ronald, "Comment," in J. Frankel Ed., *The Regionalization of the World Economy*, University of Chicago Press, 1998.

[21] World Bank, *Statistika Vneshnei Torgovli v SSSR i gosudarstvach preemnikach*, Washington DC, 1992, 1993, 1994, 1995, 1996, 1997.

[22] World Bank, *Kazakhstan: Joint Private Sector Assessment*, Washington D.C. 1998.

5 Appendix: Data

5.1 Trade Flows

Data on inter-regional and inter-republican trade flows in the Soviet Union were collected consistently starting in 1964. After the collapse of the Soviet Union in 1992, the Russian State Statistics Committee (Goskomstat) with the assistance of the World Bank continued the collection and publication of inter-republican trade flow data (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 1987-1990, and 1993-1996. 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 1987-90 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. Two Russian regions (East and West Siberia) were excluded from the dataset due to many missing values in the 1994-96 period.

Two possible biases exist in the data: one related to barter transactions, and one related to

unrecorded 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, however, may be somewhat stronger in cross-border transactions since consignments are levied with customs duties and an additional 20 percent value-added tax. 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 Ukrainian enterprises than in trade between enterprises in different Russian regions. This is, however, not consistent with the enterprise survey evidence (World Bank, 1998). Barter transactions were as least as common within Russia.

5.2 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, Kazakhstan, 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.

5.3 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 archives in Moscow (unpublished data).

5.4 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, Kazakhstan, 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 Kazakh 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. 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.

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: Estimation with Population as Instrumental Variable for Income

	1987	1990	1994	1995	1996
Y_i	0.83*	0.82*	1.14*	1.14*	1.10*
	(26.8)	(27.8)	(16.9)	(15.0)	(15.6)
Y_j	0.84*	0.83*	1.05*	1.05*	1.04*
	(27.2)	(27.9)	(15.6)	(15.1)	(16.2)
DIST	-0.41*	-0.41*	-0.96*	-1.02*	–1.12*
	(-11.6)	(-11.9)	(-14.8)	(15.0)	(-15.1)
RUSSIA	-0.35*	–0.34*	0.20	-0.15	-0.11
	(-3.8)	(-4.0)	(1.21)	(-0.88)	(-0.70)
No. of obs.	504	494	492	486	487
Adj R-square	0.81	0.82	0.69	0.69	0.71

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

Population is used as instruments for income.

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

Table 3: Estimating the Effect of Tariffs and Adjustment Costs

	1994 (OLS)	1995 (OLS)	1996 (OLS)	1996 (OLS)	1996 (TSLS)	1996 (OLS)
Y_i	0.89*	0.86*	0.79*	0.51*	0.61*	0.48*
	(14.6)	(16.3)	(15.1)	(7.1)	(6.1)	(6.6)
Y_j	0.91*	0.85*	0.85*	0.55*	0.66*	0.52*
	(16.9)	(14.2)	(15.6)	(7.7)	(6.1)	(7.2)
DIST	-0.98*	-1.05*	-1.20*	-0.92*	-0.99*	-0.92*
	(-15.9)	(-16.9)	(-16.8)	(-12.8)	(-12.5)	(-13.2)
RUSSIA	0.02	0.08	0.07	0.46*	0.46*	0.08
	(0.2)	(0.5)	(0.4)	(3.8)	(3.8)	(0.5)
TARIFF	-1.20*	-1.46*	-1.65*			-1.64*
	(-2.7)	(-3.0)	(-3.2)			(-3.2)
PTRADE				0.57*	0.39*	0.57*
				(6.1)	(2.6)	(6.1)
No. of obs.	492	486	487	486	486	486
Adj R-square	0.70	0.70	0.72	0.74	0.74	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 4: Average Percent Change in Travel Time 1996-1989

Between Republics	and Republics[a]	and Russia[b]	Between Regions	and Republics[a]	and Russia[b]
Armenia	5.9	5.3	North	4.9	-2.0
Azerbaijan	7.2	5.1	Northwest	6.3	-2.8
Belarus	9.3	2.2	Central	5.4	-3.1
Estonia	6.2	5.7	Chernozyom	8.5	-1.9
Georgia	7.2	8.9	Caucases	5.9	-2.0
Kazakstan	6.8	5.5	Volga	6.1	-0.6
Kyrgistan	6.1	8.8	Volga-Vyatka	5.4	-2.1
Latvia	5.8	4.5	Ural	5.4	-2.0
Lithuania	2.7	4.5	Fareast	4.5	0.1
Moldova	8.8	7.5			
Tajikistan	7.4	4.5			
Turkmenistan	5.2	4.3			
Ukraine	6.4	5.9			
Uzbekistan	6.7	11.1			

a. The average percent change in travel time between the capitol of the region or the republic and the capitols of all other republics. b.The average percent change in travel time between the capitol of the region or the republicand the capitols of Russian regions.