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Abstract

This paper obtains an evolving pattern of goods market integration in Russia, considering the period of economic upturn, since the second half of 2000 through the end of 2007. In an integrated market, the price of a tradable good at any location is determined by the national market, not local demand. Based on this, the strength of dependence of local prices on local demands is used to detect and measure market segmentation. The costs of a staples basket across almost all Russian regions with a monthly frequency are used as the empirical stuff. The pattern obtained suggests that in the time span under consideration the degree of Russia's goods market integration was relatively stable, fluctuating around some level; no sufficient improvements or deteriorations were detected.

JEL classification: P22, R10, R15

Keywords: market integration, law of one price, price dispersion, Russian regions.

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NON-TECHNICAL SUMMARY

A spatially dispersed market for a tradable good can be deemed as integrated if there are no impediments to trade in the good between locations. In other words, transaction costs are the same for an inter-location deal and within-location deal. On the other hand, the same conditions are needed for the law of one price to hold: given the absence of impediments to trade, the good is sold for the same price in all locations. This implies that the price of the good at any location is determined by the national market, not local demand. Hence, local prices should not depend on local demands in the integrated market. If such a dependence does take place, the market is not integrated, and the strength of the dependence can measure the degree of market segmentation. (Or, conversely, the degree of market integration: the weaker the dependence, the better the integration.) Assuming income per capita is the only determinant of demand apart from price, the quantity demanded in a location can be replaced by local income per capita. To be realistic, the spatial separation of locations has to be allowed as an irremovable impediment to trade, "cleaning" local prices from transportation costs.

Based of these theoretical considerations, the evolution of Russia's market integration during June 2000 through December 2007 is estimated, taking Russian regions as locations (80 of all the 83 regions are covered). The costs of a staples basket across regions with a monthly frequency are used as the empirical stuff; transportation costs are proxied by distances between capital cities of regions. In addition to Russia as a whole, the estimations are run over two more spatial samples. The first is Russia excluding 6 regions with difficult access (i.e., remote regions having poor communication with the rest part of the country, mostly lacking railway communication with it). The second sample is European Russia, that is, regions of the European part of the country except for its northern territories.

The results obtained suggest that the degree of integration of the Russian market in 2001-2007 is rather stable, fluctuating around some stable level. These fluctuations can be assigned for the most part to random shocks and sometimes to seasonal phenomena. It can be believed that the degree of integration in 2001-2007 is roughly the same that was reached by 1999-2000. In contrast to previous findings, no sufficient difference is found between integration in Russia excluding difficult-to-access regions and European Russia. The pattern obtained gives grounds to surmise that levels of integration in 2001-2007 are those of practically achievable degrees of integration in Russia at present time.

1. INTRODUCTION

Two fundamentally different stages can be distinguished in the economic development of contemporary Russia. Since the beginning of 1990s, economic recession took place in the country. Following some time after the August 1998 financial crisis in Russia it changed to upturn. The issue of goods market integration in Russia in the first stage was of great interest for economists. Berkowitz, DeJong and Husted (1998), Berkowitz and DeJong (1999, 2001, 2003), de Masi and Koen (1996), Gardner and Brooks (1994), Goodwin, Grennes, and McCurdy (1999), and Koen and Phillips (1992, 1993) analyzed this issue, using different product and location samples as well as time spans and exploiting various methodologies. Their findings can be summarized as follows. In the early years of transition, segmentation of the Russian goods markets increased, whereupon, about the middle of 1990s, a turn for the improvement of integration started. Such a pattern is the most pronounced in Berkowitz and DeJong (2001) and Gluschenko (2003), who estimated integration trajectories, i.e. time series of a degree of integration. From the latter paper, one can believe that by 1999 or 2000 the integration of the Russian goods market reached some practically achievable maximal degree, and so, it would be more or less stable from that time on. Unfortunately, no paper on market integration in Russia in the stage of economic upturn has appeared, and so, it is still a question whether such a belief is true.

This paper fills the gap, analyzing the evolution of market integration in the country in 2001-2007. It uses a methodology put forward in Gluschenko (2003, 2004) that is based on the following idea. The market is deemed integrated if the law of one price holds in it, controlling for transportation costs. Hence, in an integrated market, the price of a tradable good at any location is determined by the national market, and not by local demand. Otherwise the strength of dependence of local price on local demand measures market segmentation (or, conversely, integration: the smaller the segmentation, the higher the integration). To make such a relationship operational, it is transformed to that between local price and local income per capita. Running cross-sectional estimations of the degree of segmentation/integration for each available point in time, an integration trajectory is obtained, thus providing the temporal pattern of market integration. The cost of a staples basket is used as a goods price index. The data cover almost all regions in Russia, and span the period June 2000 up to December 2007 at a monthly frequency.

In fact, this paper is a sequel to Gluschenko (2003), extending the 1992-2000 integration

trajectories obtained in that paper to 2007. Unfortunately, in spite of the same methodology, the 1992-2000 and 2001-2007 trajectories are not fully comparable because of difference in the staples baskets (both in the commodity and location coverage) for these time spans. The data on the costs of both baskets overlap in the last seven months of 2000, which allows comparing estimates and roughly assessing the effect of difference in the data.

The results obtained suggest that the degree of integration of the Russian market in 2001-2007 is, indeed, rather stable, fluctuating around some stable level. These fluctuations can be assigned for the most part to random shocks and sometimes to seasonal phenomena. Being estimated on a yearly basis, the degrees of integration are close across years. Taking account of the difference in the data used for 1992-2000 and 2001-2007, it can be believed that the degree of integration in 2001-2007 is roughly the same that was reached by 1999-2000. However, there is one significant difference between results in Gluschenko (2003) and this paper. The former finds market integration in European Russia excluding its northern territories to be weaker than in Russia excluding difficult-to-access regions, while the latter suggests that these parts of the country are integrated equally.

The rest of the paper is organized as follows. The next section describes methodology of the analysis and the data used. Section 3 presents empirical results for 2000-2007. Section 4 considers the effect of difference in the staples baskets and confronts integration trajectories for 1992-2000 and 2001-2007 with each other. Section 5 concludes.

2. METHODOLOGY AND DATA

Here is a brief restatement of the methodology used for assessing the degree of market integration in Gluschenko (2003, 2004):

Consider a market for a tradable good consisting of a great number of spatially separated sub-markets (regions of the country) $\{r\}$. Taking all variables as logarithms, let P_r be the price of the good in region r, I_r the per capita income, $Q_r = D(P_r, I_r)$ the demand function (assuming I_r is the only determinant of demand apart from price), and $Q_r = S(P_r)$ the supply function. (Local quantities are negligibly small compared to their total across all regions.) Regions are linked by arbitrageurs (also supposed to be numerous) so that no monopolistic effects occur, even if the good is not produced in some regions. By moving the good to or from the region, arbitrageurs

adjust the quantity supplied in it when the local price increases or decreases due to changes in local demand (e.g., because of variations in per capita income).

A market is deemed integrated when such an adjustment leads prices to equalize across regions so that the law of one price holds. Perfect integration implies there are no impediments to the movement of the good between regions, and the market operates like a single perfectly competitive market. Thus, the price of the good at any region is determined by the national market, not local demand. From the viewpoint of an individual region, the supply curve S is perfectly elastic. The presence of impediments to inter-region trade causes the market to be segmented. These impediments are quantified as arbitrage transaction costs C_{rs} needed to move a unit of the good between s and r. In the segmented market, prices differ across regions, resulting in a dependence of local prices on local demand.

From the above considerations, it follows that the dependence of local prices on local demand could be used to detect and measure market segmentation. However, data on quantities demanded are, as a rule, unavailable. Therefore, it is more convenient to derive a relationship between prices and incomes as a testable version. Taking a single region r, the equilibrium condition in its market

$$D(P_r, I_r) - S(P_r) = 0 \tag{1}$$

yields $P_r = f(I_r)$. It is important to note that while demand $D(P_r, I_r)$ is a local one, supply $S(P_r)$ is not that of local producers only, being formed jointly by producers from all regions through the inter-region arbitrage. It is this that makes $S(P_r)$ to be a horizontal line when there are no market frictions, or something like a logistic curve in the presence of impediments to arbitrage.

With some additional assumptions, $f(I_r)$ can be represented as a log-linear function

$$P_r = \kappa + \beta I_r. \tag{2}$$

Thus, $\beta = dP_r/dI_r$. As (1) holds for each I_r, the derivative of its left-hand side with respect to I_r equals zero. From this we obtain

$$dP_r/dI_r = -\varepsilon_I/(\varepsilon_D - \varepsilon_S), \tag{3}$$

where ε_I is the income elasticity of demand, and ε_D and ε_S are the price elasticities of demand and supply. It follows from (3) that $\beta \geq 0$. With finite ε_S, β is positive. However, $\beta = 0$ in a perfectly integrated market, i.e. β vanishes as supply approaches perfect elasticity ($\varepsilon_S \to \infty$).

Subtracting (2) for some region s from that for r, an equation in terms of percentage

differentials, $P_{rs} \equiv P_r - P_s$, $I_{rs} \equiv I_r - I_s$, is arrived at (throughout the paper, r and s are arranged so that $P_{rs} \geq 0$):

$$P_{rs} = \beta I_{rs}. \quad (4)$$

Although (4) is a pairwise comparison, the region pair, r and s, is not dealt with in isolation. The rest of regions act "behind the scene," forming supplies in r and s, and so, influencing on the value of β.

Thus, relationship (4) can be used as a cross-sectional test for market segmentation. A positive value of β indicates that regional markets are not perfectly integrated. The magnitude of β (the elasticity of price dispersion vis-à-vis income dispersion) can be used as a measure of the degree of market segmentation/integration: a higher value for β means weaker integration (or higher segmentation). If $\beta = 0$ holds over a set $\{(r, s)\}$, implying the law of one price holds, then the relevant market can be deemed integrated.

To control for transportation costs, T_{rs}, the price differentials should be cleaned from them (so using a weaker version of the law of one price): $P_{rs} - T_{rs} = \beta I_{rs}$ or $P_{rs} = \beta I_{rs} + T_{rs}$. By assuming transportation costs to be log-linear function of distance, $T_{rs} = \alpha + \gamma L_{rs}$, the following equation is arrived at:

$$P_{rs} = \alpha + \beta I_{rs} + \gamma L_{rs}, \quad (5)$$

where L_{rs} is log distance separating regions r and s. Taking into account random shocks, ε_{rs}, we obtain an econometric version of (5):

$$P_{rs} = \alpha + \beta I_{rs} + \gamma L_{rs} + \varepsilon_{rs}. \quad (6)$$

This regression is estimated over a set of $N \times (N-1)/2$ region pairs; N is the number of regions.

The subjects of the Russian Federation are taken as regions. An exception is autonomous *okrugs* (districts) that are parts of different subjects of the federation, *oblasts* or *krais*, being at the same time separate subjects of the federation and possessing equal rights with other ones. (The Chukot Autonomous Okrug only is not a part of other administrative-territorial entity.) In such a case, only inclusive *oblast* or *krai* is present in the spatial sample as a region. In the recent years, the autonomous *okrugs* have been uniting with the inclusive *oblasts*/*krais*, ceasing to be separate subjects of the Russian Federation. By now, only three autonomous *okrugs* as parts of *oblasts*/*krais* (as compared to nine in 2000-2005) remain. The data for inclusive regions cover prices and incomes in the autonomous *okrugs*, therefore the mentioned changes in the

administrative and territorial division of Russia during the time span under consideration do not affect the data used. (Thus, in fact, the autonomous *okrugs*, either actual or former, are present in the spatial sample, although implicitly.)

The spatial sample covers almost all regions of the country except for three: the Chechen Republic and the Moscow and Leningrad Oblasts. Although price data are available for the Chechen Republic, information on incomes there is still lacking. Cities of Moscow and St. Petersburg are separate subjects of the Russian Federation ("cities-regions"), and at the same time they are the capital cities of the surrounding Moscow and Leningrad Oblast; hence the distance between, say, Moscow and the Moscow Oblast is zero. That is why only these "cities-regions" are present in the sample, while the relevant surrounding *oblasts* are omitted. The basic spatial sample contains 77 regions, generating 2,926 pairwise observations.

Two more subsamples are exploited. The first is Russia excluding difficult-to-access regions. These are the Murmansk Oblast, Republic of Sakha (Yakutia), Sakhalin Oblast, Magadan Oblast, Kamchatka Oblast, and Chukot Autonomous Okrug. They are remote regions lacking (except the Murmansk Oblast) railway and highway communication with other regions. Therefore, arbitrage cannot be bilateral there, goods being imported only in these regions. Obviously, difficult access to a number of regions worsens integration of the national market. And so, eliminating such regions is equivalent to controlling for this "natural" impediment to integration. This subsample contains 71 regions (2,485 pairwise observations).

Another subsample represents the European part of Russia excluding its northern territories; it is hereafter referred to as simply "European Russia;" there are 52 regions in this subsample. Since the transport infrastructure is more developed in this part of the country, and distances are shorter, it seems that European Russia have to be more integrated than the remainder of the country without difficult-to-access regions. However, the results of Gluschenko (2003) suggest that it is not the case, and it is interesting whether the situation changed in 2001-2007. This subsample provides 1,326 pairwise observations.

The time sample covers June 2000 to December 2007 with a monthly frequency, containing 91 points in time. The period June to December 2000 is exploited also for comparison with the previous results.

The cost of a stapes basket is used as a price representative for the analysis. This basket was introduced by the Russian statistical agency, Rosstat (formerly Goskomstat), since June

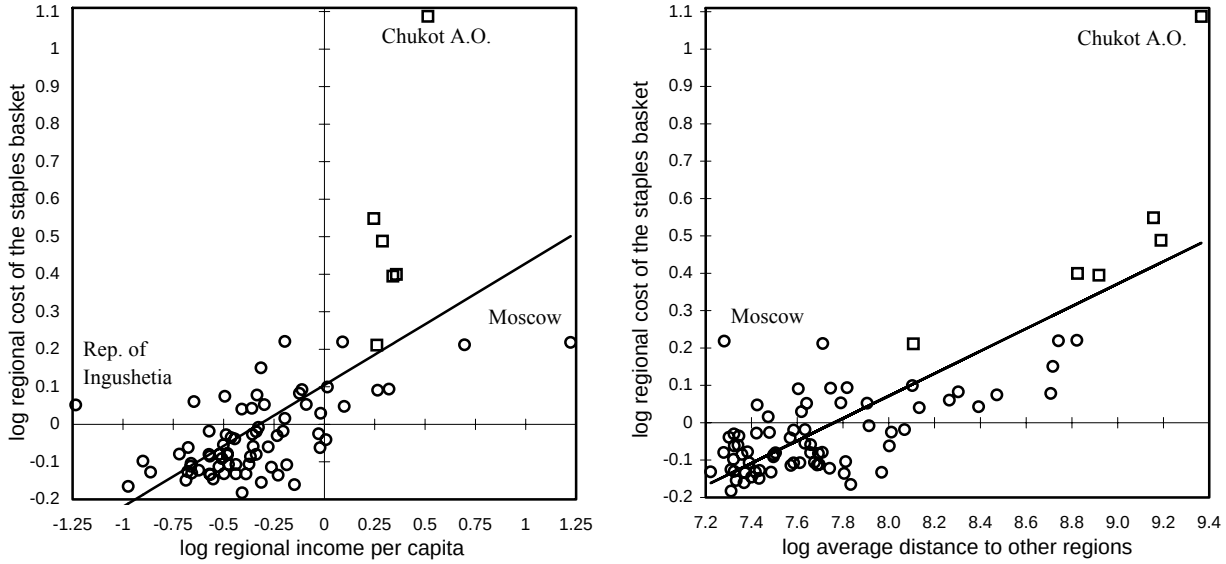
2000; it includes 33 foods. The data on the cost of the staples basket and income per capita by region are drawn from monthly statistical bulletins Goskomstat/Rosstat (2000-2007).

Distances are measured between capital cities of regions in network-transportation mileage. The railroad distances are drawn from the Tariff Manual (1965). They are updated and supplemented with highway, sea, and river distances for regions lacking railway communication with the use of modern geographical atlases. (The distance matrix was compiled by Alexei Abramov, Novosibirsk State University.)

As mentioned in the Introduction, the price data in this paper differ from those used in Gluschenko (2003). First, the old basket included 25 foods; coinciding goods have different quantities in the baskets of 25 and 33 foods. Appendix 1 provides comparison of these baskets. Second, the cost of the old basket was that in only the capital city of a region (while income represented the whole region, like in this paper). Unlike this, the cost of the new basket is that for the whole region. (In fact, it covers region's capital city and a few more cities/towns within the region, among them necessarily the capital cities of former or current autonomous *okrugs*, if the region contains any. The city/town population proportions are used as weights for aggregation.) Lacking data for capital cities of autonomous *okrugs*, the spatial sample in Gluschenko (2003) did not include them. Besides, three more regions are explicitly added to the spatial sample in this paper: the Republic of Ingushetia, Jewish Autonomous Oblast, and Chukot Autonomous Okrug. While comparing the 1992-2000 and 2001-2007 integration trajectories in Section 4, the spatial samples are uniformed by omitting these regions from the 2000-2007 sample.

3. EMPIRICAL RESULTS

Let us first take a look at unconditional relationships presented in Figure 1. Prices and incomes in the figure are normalized to those for the whole of Russia (the latter are weighted averages over all regions) and geometrically averaged over 2000:6 through 2007:12. In real terms, the range of prices is 0.85 to 2.97 of the national average (thus, the prices differ across Russian regions up to 3.5-fold); the range of per capita incomes is 0.29 to 3.41 (i.e., the cross-regional difference of nominal incomes amounts to 11.8 times). The distance in Figure 1(b) is a geometric average of distance from a given region to all other regions; its span is 1,370 to 11,680 kilometers. It is worth noting that the pattern displayed in Figure 1 is rather stable across 2000-2007; the by-year plots are very similar to it.



(*a*) (*b*)

Figure 1. Prices vs. incomes and distances

Note: Squares denote difficult-to-access-regions.

Figure 1 shows that regional prices are strongly correlated with both incomes and distances. The former correlation evidences the presence of market segmentation. The slope of the regression line in Figure 1(a) equals 0.324, which implies a 1-percent change in regional income per capita to yield about a 0.3 percent change in the regional cost of the staples basket (of course, conditional on distances this elasticity would decrease). Three outliers are marked in the figure. These are the poorest and richest regions in Russia, the Republic of Ingushetia and Moscow, and the most expensive region, the Chukot Autonomous Okrug. These outliers could somehow distort the pattern of market integration. Indeed, in the below results, the Republic of Ingushetia decreases the overall degree of segmentation, seemingly having no dependence of prices on incomes: while the income is minimal there, the cost of the staples basket is on average 5 percent above the Russian cost. However, the actual reason of the relative expensiveness is a considerable barrier to trade with this region that is due to very high risk. Being a close neighbor of Chechya, Ingushetia is the most anxious region of Russia from the viewpoint of terrorism, kidnapping, and hijacking.

Regarding the dependence of prices on distances, Figure 1(b), it looks almost classically, like an illustration to bivariate regression from an econometric textbook. The slope of the regression of price on distance equals 0.300. Two outliers are seen in this figure: the Chukot Autonomous Okrug, the most remote region in Russia, and Moscow, where prices are high

despite its closeness to many regions. In the lower left corner of the price-distance scatter plot, the regions of European Russia are concentrated with a rather weak correlation of prices and distances. And so, Moscow can further weaken the dependence of prices on distances while dealing with this spatial subsample.

Turning to the dynamics of market integration, Figure 2 plots the standard deviation of the dependent variable, price differential P_{rs}, over the three spatial samples under consideration.

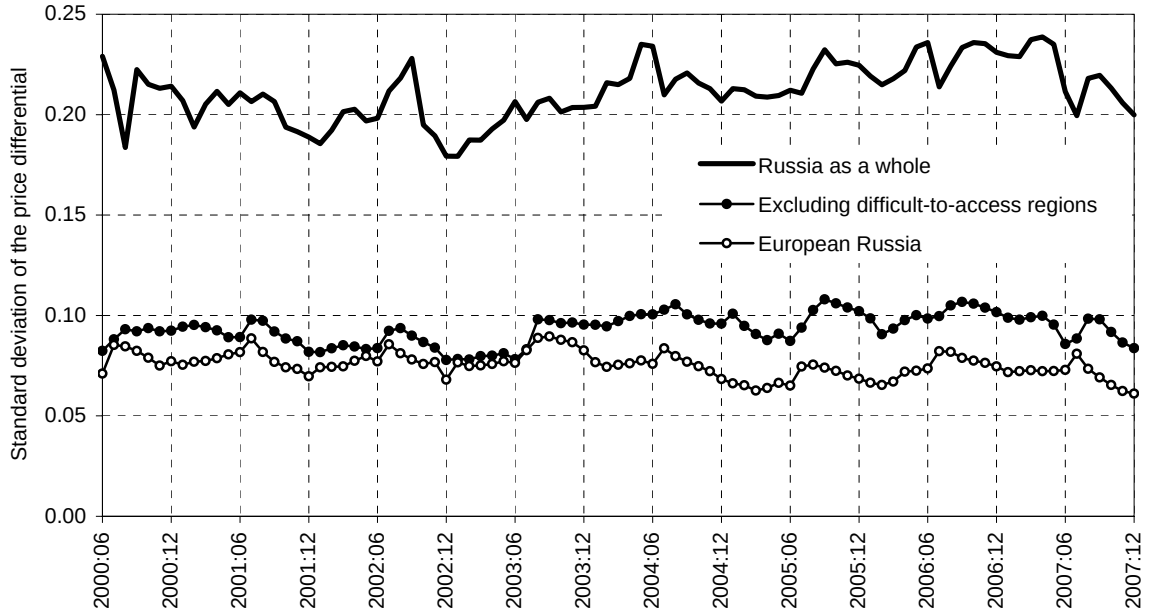


Figure 2. Price dispersion over Russian regions

Being one of the summary regression statistics, the indicator plotted characterizes at the same time price dispersion in Russia. As all $P_{rs} \geq 0$, it is the standard deviation of the absolute price differential. Figure 2 suggests that price dispersion during the time span considered is rather stable, fluctuating around some levels. In Russia as a whole, this level is about 0.21, and the range of deviations from it is roughly ±0.03, or less than 15 percent. In Russia excluding difficult-to-access regions, the dispersion equals on average 0.093 with ±0.015 deviations, about 15-16 percent. In European Russia, price dispersion is 0.075 ± 0.014, that is, the fluctuation range is less than 19 percent in either direction.

Figure 3 presents integration trajectories, estimates of the degree of segmentation, β, in regression (6), across monthly points in time of the period under consideration. The regressions were run with the use of the White heteroskedasticity-consistent errors. All estimates of β as well

as estimates of γ (the coefficient on distance) in Russia as a whole and Russia excluding difficult-to-access regions are highly significant, having *p*-values less than 0.001. As for γ in European Russia, of 91 estimates, 31 are significant at the 1-percent level, 4 are significant at the 5-percent level, 6 are significant at the 10-percent level, and 50 are insignificant, sometimes with a negative value. (Estimates of γ are presented graphically in Appendix 2.)

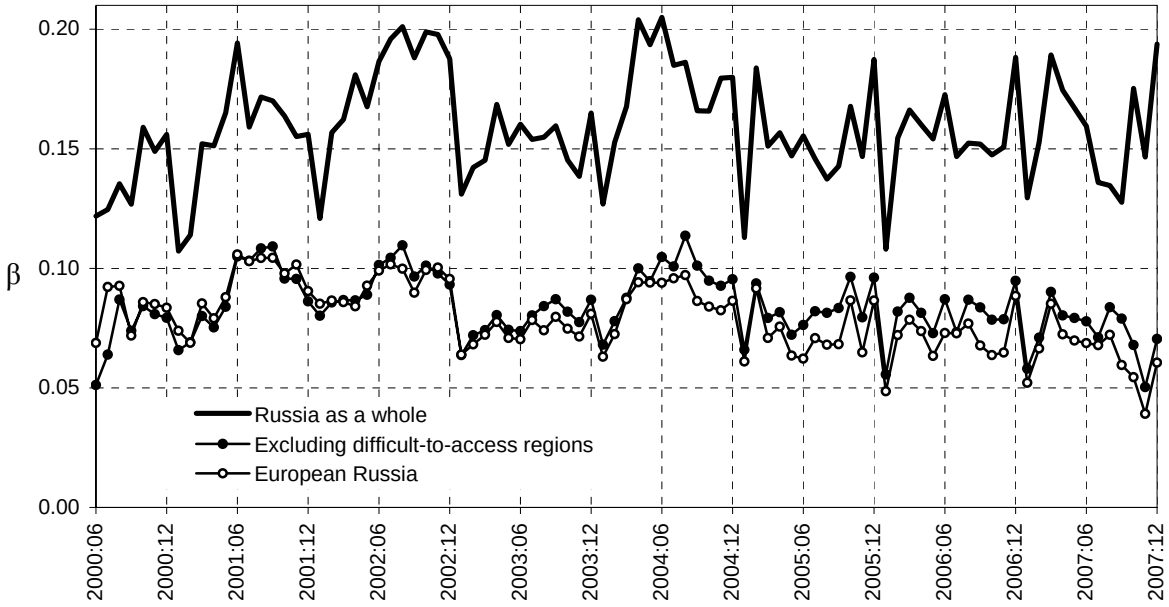


Figure 3. Market integration in Russia in 2000-2007

Like the price dispersions, the degree of market integration in 2000-2007 can be deemed as more or less stable. However, unlike the dispersion of prices, β is much more volatile. In Russia as a whole, it has the mean equaling to 0.159 and changes from 0.107 to 0.205, that is, deviating from the baseline by up to 33 percent down and 29 percent up. Taking the country excluding difficult-to-access regions, the range of β is 0.050 to 0.114 with the mean equaling 0.084, the deviations from the mean mounting to 40 percent down and 36 percent up. The figures for European Russia are the following: the range of β is 0.039 to 0.106, the mean is 0.079, and the maximal deviations from the mean are –51 percent and 34 percent.

While market integration in Russia as a whole does not reveal any trend, that in other two spatial subsamples evinces a trend to very slow improvement. The linear trend of the integration trajectory in Russia excluding difficult-to-access regions has the slope equaling –0.000096 (significant at the 10-percent level); the slope of the European Russia integration trajectory is

–0.000305 (significant at the 0.1-percent level). This implies that the degree of market segmentation falls during a year by 1.3 percent of the initial level in the former territory, and by 4 percent in the latter one.

Unlike Gluschenko (2003), where European Russia has been found weaker integrated than Russia excluding difficult-to-access regions since about 1996, these two territories are integrated almost equally. Not infrequently, European Russia is integrated even stronger in 2003-2007. However, the difference is minor; the 95-percent confidence intervals of estimates of β over these two subsamples strongly overlap. A caveat is that such a result can be due to a distorting effect of the Republic of Ingushetia. This issue is considered below, in the end of this section and in the next section.

Regularity is seen in the fluctuations of integration trajectories: as if market integration deteriorates dramatically in January of every year. However, this is a seeming phenomenon. In Decembers, personal incomes skyrocket in Russia because of yearly bonuses, repayment of wage arrears, etc. In Januaries, incomes fall, as a rule to values even smaller than in October and November of the previous year. But prices mechanically keep rising, having been pushed by the December increase in demand. Moreover, it is "traditionally" the beginning of January when regulated prices for services (electricity, other public utilities, outlet rent, etc.) are raised, so pushing retail prices further up. This two movements, rise in prices and fall of incomes, are not concerted with each other, thus resulting in weakening the dependence of local price on local demand. (However, as Figure 3 shows, prices again adjust to local demands as soon as after a month or two.) A similar reason caused the decrease of β in the end of 2007. In September of that year, a wave of significant rise in prices, both wholesale (producers' and importers') and retail, for many foods started; this rise was not concerted, again, with local demands. Thus, such outliers hardly evidence real changes in market integration; they rather can be deemed as noisy deviations from an "actual" integration trajectory.

Some other local changes in the trajectories can also be believed as noise. The point is that food prices in Russia are very mobile over high inflation (across 2001-2007, the cost of the staples basket rose by 7.6 to 18.8 percent per year; in 2007, the rise amounted to 22.3 percent). Sometimes (or/and in some regions), the prices change faster than demand, which is captured by the model as transient strengthening or weakening of the price-income dependence, hence, as a change of the degree of market integration.

Thus, it makes sense to smooth integration trajectories for somehow eliminating noisy deviations. Figure 4 reports integration trajectories smoothed through a moving average $\beta^*_t = 0.1\beta_{t-2} + 0.2\beta_{t-1} + 0.4\beta_t + 0.2\beta_{t+1} + 0.1\beta_{t+2}$. These trajectories look more reasonable than those in Figure 3 from the intuitive viewpoint. Some noise seems to be still present in the trajectories; nevertheless, it is obvious that further smoothing would leave the trajectories to be bumpy in the space of 2000-2004. This suggests that there were cycles of increase and decrease of market integration in those years with oscillation period of circa one year (except for 2003) and amplitude equaling roughly 0.05 in Russia as a whole and 0.025 in the rest two subsamples.

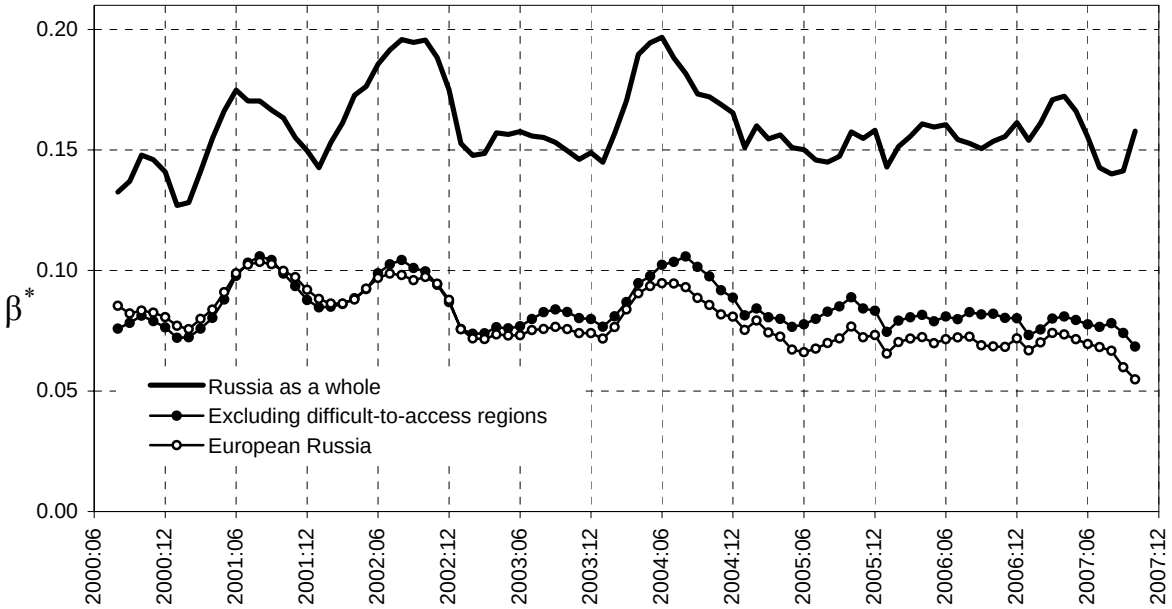


Figure 4. Smoothed integration trajectories

An alternative way to eliminate random shocks in βs is to estimate them over time averages. The upper panel of Table 1 reports estimates of model (6) with the use of yearly averages of prices and incomes (for 2000, the averages are over its last 7 months) as well as averages over the entire time span, 2000:7-2007:12. Since the relative prices and incomes are averaged rather than their absolute values, the averaging over time is reasonable despite high inflation. As expected, the by-year pattern also suggests oscillations of the degree of integration in 2000-2004. Besides, the yearly estimates capture the price shock in the end of 2007 as a new cycle of improvement in integration. Taking estimates of β over the entire span of 2000-2007 as baselines, downward deviations from a baseline are much greater than upward ones: the former

are up to about –18 percent, reaching –26 percent in European Russia, while the latter do not exceed 10 percent. For the most part, the degree of market segmentation is higher in Russia excluding difficult-to-access regions than in European Russia; however, the differences are not significant, falling within the 95-percent confidence intervals. A minor difference between the 2000-2007 estimates over these territories corroborates the impression of almost uniform integration in them.

Table 1. Estimation results for time averages

Year	Russia as a whole		Excluding difficult-to-access regions		European Russia		
	β	γ	β	γ	β	γ	p-value of γ
Baseline model (6)							
2000	0.143 (0.006)	0.110 (0.004)	0.077 (0.004)	0.031 (0.002)	0.087 (0.005)	0.0063 (0.0031)	0.043
2001	0.165 (0.006)	0.102 (0.004)	0.096 (0.004)	0.032 (0.002)	0.098 (0.005)	0.0063 (0.0029)	0.029
2002	0.186 (0.007)	0.089 (0.004)	0.098 (0.004)	0.021 (0.002)	0.098 (0.006)	0.0027 (0.0030)	0.364
2003	0.155 (0.007)	0.089 (0.004)	0.081 (0.005)	0.021 (0.002)	0.077 (0.007)	0.0034 (0.0036)	0.338
2004	0.181 (0.008)	0.109 (0.004)	0.097 (0.004)	0.042 (0.002)	0.090 (0.006)	0.0081 (0.0028)	0.005
2005	0.157 (0.007)	0.116 (0.004)	0.085 (0.004)	0.045 (0.002)	0.076 (0.005)	0.0064 (0.0026)	0.015
2006	0.162 (0.008)	0.125 (0.004)	0.085 (0.004)	0.048 (0.002)	0.074 (0.005)	0.0090 (0.0030)	0.002
2007	0.170 (0.008)	0.117 (0.004)	0.077 (0.004)	0.042 (0.002)	0.068 (0.005)	0.0120 (0.0027)	0.000
2000-2007	0.174 (0.007)	0.107 (0.004)	0.093 (0.004)	0.036 (0.002)	0.089 (0.006)	0.0056 (0.0029)	0.050
Model (6) augmented for the difficult access and Ingushetia dummies							
2000	0.104 (0.005)	0.055 (0.003)	0.094 (0.004)	0.033 (0.002)	0.116 (0.004)	0.0054 (0.0023)	0.021
2001	0.123 (0.005)	0.054 (0.003)	0.105 (0.004)	0.033 (0.002)	0.112 (0.004)	0.0067 (0.0024)	0.006
2002	0.149 (0.005)	0.044 (0.003)	0.119 (0.004)	0.023 (0.002)	0.129 (0.004)	0.0021 (0.0022)	0.339
2003	0.138 (0.005)	0.042 (0.003)	0.112 (0.003)	0.022 (0.002)	0.122 (0.004)	0.0014 (0.0022)	0.520
2004	0.154 (0.006)	0.066 (0.003)	0.119 (0.004)	0.044 (0.002)	0.120 (0.004)	0.0076 (0.0022)	0.001
2005	0.125 (0.005)	0.070 (0.003)	0.102 (0.004)	0.047 (0.002)	0.098 (0.004)	0.0058 (0.0021)	0.005
2006	0.130 (0.006)	0.076 (0.003)	0.105 (0.004)	0.050 (0.002)	0.103 (0.004)	0.0086 (0.0023)	0.000
2007	0.125 (0.006)	0.068 (0.003)	0.093 (0.004)	0.044 (0.002)	0.088 (0.004)	0.0126 (0.0024)	0.000
2000-2007	0.138 (0.005)	0.061 (0.003)	0.114 (0.004)	0.038 (0.002)	0.121 (0.004)	0.0051 (0.0020)	0.014

Notes: β is the coefficient on income differential (the degree of market segmentation), and γ is the coefficient on distance; the White heteroskedasticity-consistent errors are in parentheses; except for γ in European Russia, all estimates are significant at the 0.1-percent level.

Turning back to Figure 1, much stronger dependence of prices on incomes is seen in difficult-to-access regions, particularly, in the Chukot Autonomous Okrug. Because of this feature, the overall degree of segmentation of the Russian market is overstated. Another feature is the seeming lack of the price-income dependence in the Republic of Ingushetia, which leads to understatement of the degree of segmentation. To control for these features, model (6) is augmented

for two relevant dummies. The difficult access dummy is constructed as $d^{(da)}_{rs} = d^{(da)}_{r} - d^{(da)}_{s}$, where $d^{(da)}_{r}$ and $d^{(da)}_{s} = 1$ if r or s, correspondingly, is a difficult-to-access region and 0 otherwise. The Ingushetia dummy is constructed in the same way, so that $d^{(Ing)}_{rs} = 1$ if r is Ingushetia, $d^{(Ing)}_{rs} = -1$ if s is Ingushetia, and $d^{(Ing)}_{rs} = 0$ otherwise. The lower panel of Table 1 presents the results. The difficult-to-access dummy is present only when estimations are run over Russia as a whole; the Ingushetia dummy is used for all the three spatial samples. Estimates of dummies are not reported (all they are significant at the 0.1-percent level and have the positive sign). One more outlier in Figure 1 is Moscow. Controlling for it with a relevant dummy is not reasonable. This would improve the estimates of γ in European Russia, but at the same time eliminate the contribution of Moscow to market segmentation. (When the only Moscow dummy is added to the baseline model, the estimate of β in European Russia over the entire 2000-2007 span falls by one third, to 0.051, and the estimate of γ rises almost twice as much, to 0.0106 with the 0.1-percent level significance. Regarding the by-year and by-month estimates of γ in European Russia, adding the Moscow dummy makes all of them significant.)

The lower panel of Table 1 suggests that controlling for some regional features decreases the degree of market segmentation in Russia as a whole by about one fifth, when the 2000-2007 span is considered. In 2000, 2001, and 2007, the decrease is even greater, by more than a quarter. The elasticity of price difference vis-à-vis distance, γ, becomes almost half, both over the entire time span and across years. Controlling for Ingushetia, indeed, increase the degree of market segmentation in Russia excluding difficult-to-access regions (by about a quarter) and European Russia (by more than a third), while the estimates of γ changes only slightly (although their standard errors turn out to be visibly smaller in European Russia). Unlike the baseline model estimates, European Russia in 2000-2003 proves to be integrated weaker than in the country excluding difficult-to-access regions; their degrees of segmentation become close only since 2004.

The qualitative pattern of dynamics remains, nevertheless, almost the same. It contains the same cross-year cycles, although with somehow different relative amplitudes. Again, the degree of market segmentation is on average constant over 2000-2007, while other two trajectories contain weak negative trends, so suggesting very slow improvement in market integration over time in these parts of the country.

4. 1992-2000 vs. 2001-2007

Before combining the integration trajectories for 1992-2000 from Gluschenko (2003) and 2001-2007 from the previous section and discussing the difference between dynamics of market integration in these time spans, let us consider the effect of difference in price data used for obtaining these two groups of trajectories. Having got data overlapping for June through December 2000, this difference can be analyzed quantitatively. For comparability, all estimates with the use of the 33-food basket are run over the same spatial samples as those used when the cost of the 25-food basket was exploited. Recall that three regions are lacking in these samples: The Republic of Ingushetia, Jewish Autonomous Oblast, and the Chukot Autonomous Okrug. (Thus, the 2000-2007 trajectories in Figures 5 and 6 below differ somehow from those in Figure 3.) Hereafter, Russia as a whole covers 74 regions (2,701 pairs), Russia excluding difficult-to-access regions includes 69 regions (2,346 pairs), and European Russia contains 51 regions (1,275 pairs).

Table 2 compares means and standard deviations of price differential across the two baskets. Both baskets provide almost the same pattern of price dispersion. For the most part, the relevant summary statistics are close or even coincide; the maximal difference does not exceed 7 percent. Thus, from the viewpoint of price dispersion, both baskets can be deemed as equivalent.

Table 2. Summary statistics of the dependent variable

Period	Russia as a whole		Excluding difficult-to-access regions		European Russia	
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
Basket of 25 foods						
2000:06	0.150	0.149	0.106	0.086	0.088	0.073
2000:07	0.161	0.155	0.115	0.090	0.105	0.086
2000:08	0.172	0.168	0.123	0.096	0.104	0.086
2000:09	0.162	0.161	0.115	0.096	0.094	0.080
2000:10	0.161	0.163	0.113	0.098	0.091	0.081
2000:11	0.161	0.163	0.114	0.098	0.087	0.077
2000:12	0.161	0.161	0.115	0.099	0.089	0.080
Basket of 33 foods						
2000:06	0.148	0.151	0.102	0.083	0.085	0.071
2000:07	0.161	0.156	0.114	0.089	0.108	0.086
2000:08	0.168	0.162	0.120	0.094	0.099	0.085
2000:09	0.159	0.156	0.113	0.092	0.090	0.080
2000:10	0.156	0.154	0.112	0.095	0.086	0.080
2000:11	0.157	0.154	0.113	0.093	0.084	0.076
2000:12	0.156	0.151	0.113	0.092	0.085	0.075

However, that is not the case when the dependence of local prices on local demands is dealt with. Table 3 provides comparison of monthly estimates of model (6) as well as estimates over the entire span of 2000:6-2000:12 for both staples baskets.

Table 3. Comparison of estimation results for different staples baskets

Period	Russia as a whole		Excluding difficult-to-access regions		European Russia		
	β	γ	β	γ	β	γ	p-value of γ
Basket of 25 foods							
2000:06	0.109 (0.005)	0.081 (0.003)	0.053 (0.004)	0.032 (0.002)	0.094 (0.004)	-0.0007 (0.0025)	0.766
2000:07	0.116 (0.005)	0.079 (0.003)	0.064 (0.004)	0.028 (0.002)	0.108 (0.005)	0.0126 (0.0028)	0.000
2000:08	0.113 (0.005)	0.091 (0.003)	0.061 (0.004)	0.035 (0.002)	0.106 (0.005)	0.0078 (0.0029)	0.008
2000:09	0.109 (0.005)	0.091 (0.003)	0.060 (0.004)	0.037 (0.003)	0.098 (0.005)	0.0049 (0.0028)	0.083
2000:10	0.119 (0.005)	0.091 (0.003)	0.064 (0.005)	0.040 (0.003)	0.103 (0.005)	0.0045 (0.0028)	0.105
2000:11	0.110 (0.005)	0.098 (0.003)	0.063 (0.004)	0.047 (0.003)	0.099 (0.004)	0.0022 (0.0026)	0.397
2000:12	0.106 (0.005)	0.094 (0.003)	0.058 (0.004)	0.046 (0.003)	0.103 (0.004)	0.0028 (0.0027)	0.287
2000:06-2000:12	0.117 (0.005)	0.090 (0.003)	0.064 (0.004)	0.039 (0.002)	0.106 (0.004)	0.0029 (0.0026)	0.426
Basket of 33 foods							
2000:06	0.125 (0.005)	0.083 (0.003)	0.068 (0.004)	0.033 (0.002)	0.104 (0.004)	0.0055 (0.0023)	0.018
2000:07	0.130 (0.005)	0.078 (0.003)	0.076 (0.004)	0.027 (0.002)	0.115 (0.004)	0.0236 (0.0027)	0.000
2000:08	0.147 (0.005)	0.081 (0.003)	0.102 (0.004)	0.028 (0.002)	0.115 (0.005)	0.0070 (0.0028)	0.013
2000:09	0.142 (0.004)	0.080 (0.003)	0.099 (0.004)	0.028 (0.002)	0.110 (0.004)	0.0028 (0.0027)	0.304
2000:10	0.150 (0.004)	0.079 (0.003)	0.104 (0.004)	0.034 (0.002)	0.114 (0.004)	0.0037 (0.0026)	0.153
2000:11	0.138 (0.005)	0.086 (0.003)	0.097 (0.004)	0.038 (0.002)	0.108 (0.004)	0.0034 (0.0024)	0.159
2000:12	0.134 (0.004)	0.082 (0.003)	0.094 (0.004)	0.038 (0.002)	0.106 (0.003)	0.0028 (0.0024)	0.248
2000:06-2000:12	0.144 (0.004)	0.083 (0.003)	0.096 (0.004)	0.033 (0.002)	0.116 (0.004)	0.0071 (0.0024)	0.003

Notes: β is the coefficient on income differential (the degree of market segmentation), and γ is the coefficient on distance; the White heteroskedasticity-consistent errors are in parentheses; except γ in European Russia, all estimates are significant at the 0.1-percent level.

When the case in hands is the 33-food basket, the Russian market turns out to be more segmented than indicated by estimates based on the 25-food basket. Taking the entire 7-month span, β increases by about a quarter in Russia as a whole, and by a half in the country excluding difficult-to-access regions. However, the increase is less than 10 percent in European Russia. As a rule, the dependence of price differential on distance is slightly weaker for the 33-food basket (although the pattern is vague in European Russia; the entire-span estimate of γ suggests that it is stronger). Anyway, γs are little affected, for the most part, by the change of the basket.

The reason of the rise in βs with the new basket seems to be a wider spatial coverage rather

than changes in commodity coverage and quantities of goods. Recall that the cost of the old basket is that in the capital city of a region, while income is for the entire region. Due to this, the dependence of prices on incomes seems weaker than actual. For example, the Tyumen Oblast is the second in Russia according to ranking by incomes per capita, while the prices in the city of Tyumen are a few percent above the Russian average. But there are northern expensive cities and towns in this region that were not taken into account in the price data used for estimating the 1992-2000 integration trajectories. With the new data, regional prices and incomes become more consistent with one another. For the most part, this is strongly valid for the Asian part of Russia (Siberia and the Russian Far East), while taking account of additional cities/towns within regions has a relatively smaller effect in European Russia, hence smaller difference in estimates of β across the baskets. Thus, the estimates of the degree of market integration based of the new price data can be believed to be more accurate and reliable.

The above considerations help to confront integration in 1992-2000 with that in 2001-2007 despite the lack of sewing of relevant trajectories in the second half of 2000. Figure 5 reports the evolution of market integration in Russia from almost the very beginning of price liberalization in Russia (occurred in January 1992) till recent time, the 1992-2000 trajectories being drawn from Gluschenko (2003). Figure 6 depicts the same trajectories smoothed in the same way like in Figure 4.

In the early years of market reforms in the country, market segmentation rose dramatically. Then, beginning about the end of 1994, integration started to improve (this process being broken for some time by the August 1998 financial crisis in Russia and preceding events that caused it). The improvement came to the end by 1999 in Russia as a whole and excluding difficult-to-access regions, and a year after in European Russia, when market integration stabilized at territory-specific levels. Taking account of the difference between the price data used for obtaining the 1992-2000 and 2001-2007 integration trajectories, it can be believed that the latter are in fact continuations of the former. Be estimated with the use of the same data, corresponding trajectories would be sewed together in 2000. Based on this, it can be concluded that market integration remained, in general, stable during 2001-2007, keeping the levels reached by the beginning of this period. Roughly, these levels correspond to $\beta = 0.15$ in Russia as a whole and $\beta = 0.1$ in Russia excluding difficult-to-access regions and European Russia. (Two appreciable deviations of increase of segmentation occurred, however, in 2002 and 2004.)

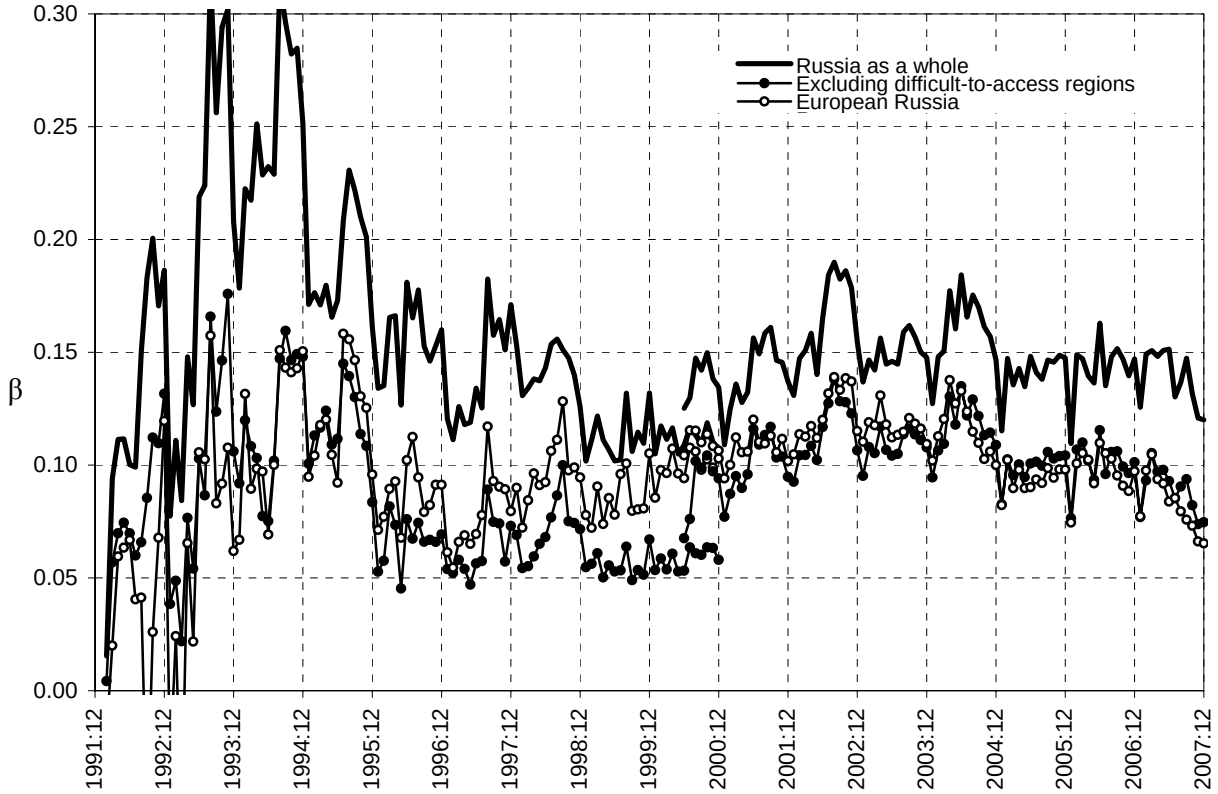


Figure 5. Market integration in Russia during 1992-2007

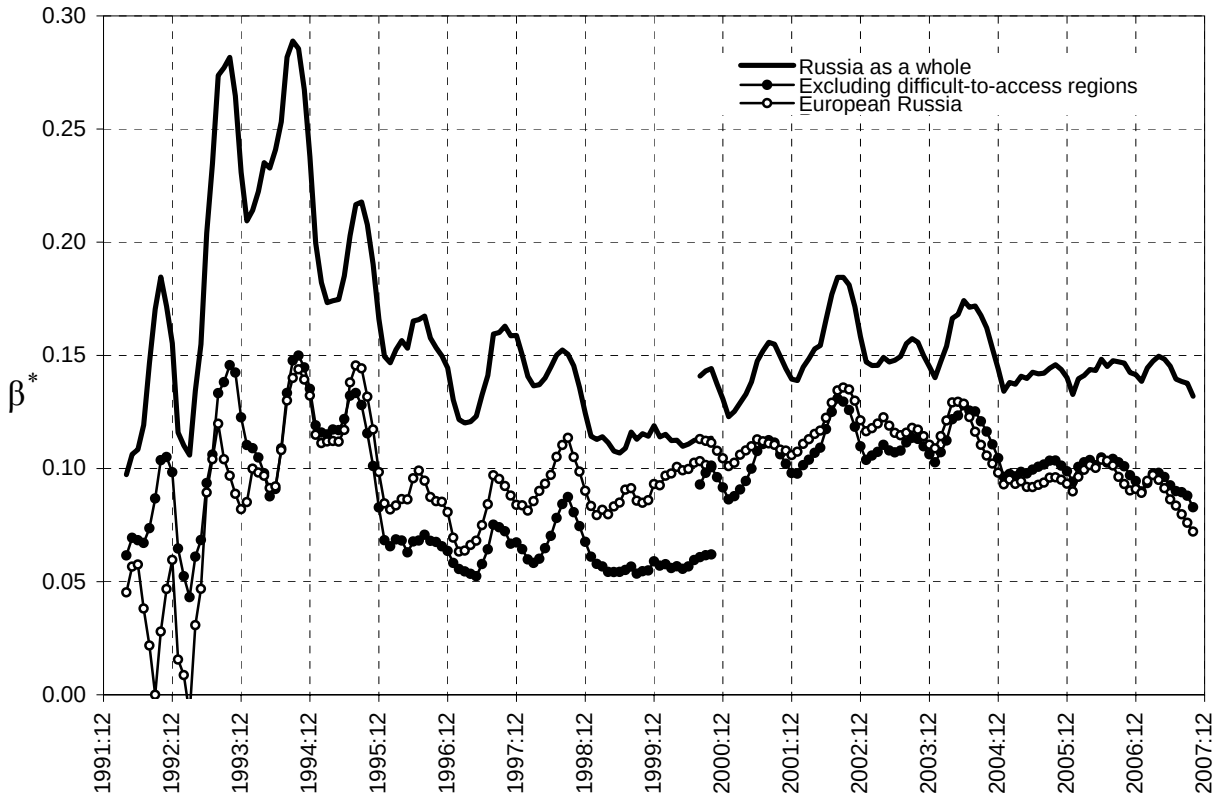


Figure 6. Integration in 1992-2007: Smoothed dynamics

While the integration trajectories for European Russia and the country excluding difficult-to-access regions diverge in 1992-2000, they are very close to each other in 2001-2007. Weaker integration of European Russia could be an artifact caused by insufficient spatial coverage of the price index used for 1992-2000. But, on the other hand, Gluschenko (2006), exploiting cointegration analysis, finds that it is European Russia where most of regions not integrated with the national market and not tending to integration with it are concentrated.

5. CONCLUSIONS

Using the cost of the staples basket as the price representative, the temporal pattern of market integration in Russia in the years of economic upturn, 2001-2007, has been analyzed. The results obtained evidence, in general, roughly stable market integration during the time span under consideration. The degrees of integration fluctuate around some stable level due to random shocks and, sometimes, seasonal phenomena; only two temporary deviations from such a behavior occur. Taking into account that the data used for the 1992-2000 and 2001-2007 estimations are different, the levels of integration in 2001-2007 can be deemed as roughly the

same as reached by 1999-2000.

They can be believed to be levels of practically achievable degrees of integration in Russia. Taking the degree of integration in the US as the maximal feasible one, Gluschenko and Kulighina (2006) estimate β over a sample of US cities (using a basket of 27 groceries) for the first quarter of 2000. Two versions of estimations yield the values of 0.047 and 0.055. The value of β over Russia excluding difficult-to-access regions for 2000 (both averaged over monthly estimates and estimated with the use of yearly averaged data) equals circa 0.06. That is, the estimates for the US and Russia proved to be very close. The results of this paper suggest that the Russian β has, in fact, the crude value of 0.1. However, this does not cancel a conclusion made by Gluschenko and Kulighina (2006). Being corrected to a greater value, the degree of market segmentation in Russia (excluding its difficult-to-access regions) still remains, nevertheless, comparable to that in the US, having the same order of magnitude. Thus, regarding markets of Russia excluding difficult-to-access regions and European Russia, they are not much more segmented than the US goods market.

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APPENDIX 1. The staples baskets

Table A1. Composition of the 25- and 33-food baskets

Sources: Goskomstat (1996), p. 428, and Rosstat (2006), p. 161.

Good	Unit of measure	Quantity, the 25-food basket	Quantity, the 33-food basket
Bread, white and rye-wheat	kg	5.725	9.583
White bread	kg	5.242	6.250
Wheat flour	kg	1.625	1.667
Rice	kg	0.308	0.417
Millet	kg	0.817	0.500
Peas and beans	kg	—	0.608
Vermicelli	kg	0.433	0.500
Potatoes	kg	10.350	12.500
White cabbages	kg	2.342	2.917
Cucumbers	kg	—	0.150
Carrots	kg	3.125	2.917
Onions	kg	2.367	1.667
Apples	kg	1.617	1.550
Sugar	kg	1.725	1.667
Candies	kg	—	0.058
Cookies	kg	—	0.058
Beef	kg	0.700	1.250
Mutton	kg	—	0.150
Pork	kg	—	0.333
Chicken	kg	1.458	1.167
Boiled sausage	kg	0.038	—
Boiled-and-smoked sausage	kg	0.029	—
Frozen fish	kg	0.975	1.167
Salted herring and the like	kg	—	0.058
Milk	litre	10.258	9.167
Sour cream	kg	0.133	0.150
Butter	kg	0.208	0.150
Cottage cheese	kg	0.825	0.833
Cheese	kg	0.192	0.208
Eggs	piece	12.617	15
Margarine	kg	0.325	0.500
Sunflower oil	kg	0.533	0.583
Salt	kg	—	0.304
Black tea	kg	—	0.042
Black pepper	kg	—	0.061

APPENDIX 2. The coefficient on distance

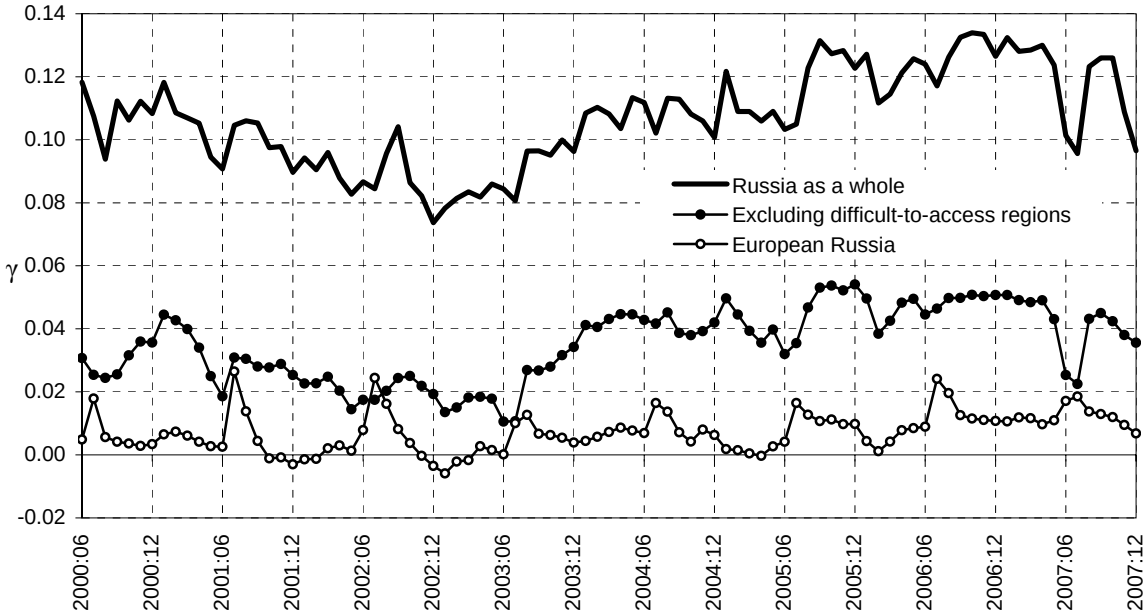

Figure A1. Estimates of the coefficient on distance

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