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REGIONAL PROBLEMS

Long-Term Evolution of Russia's Market Integration

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Abstract—This article considers an aggregated national market represented by a staples basket and analyzes changes in its spatial integration during 1992 to 2019. In an integrated market, interaction of demand and supply in the national space, and not in a regional space, determines the regional price of a good. Based on this, the extent of dependence of regional prices on regional quantities demanded serves for measuring the degree of market integration.

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A market consisting of spatially separated segments—regional markets—is deemed integrated if only "natural" barriers restrict freedom of inter-regional trade. It is the spatial separation itself that creates such barriers, making necessary to incur costs of transportation goods between regions. In such a fully integrated market the price of a tradable good (i.e., a good that can participate in inter-regional trade) in two regions will differ by no more than shipping costs per unit of the good. A mechanism that maintains spatial equilibrium is the goods arbitrage, i.e., purchasing the good in regions where it is cheaper for selling where it is more expensive. Therefore, the regional price of the good should not depend on regional demand, since arbitrage eliminates changes in the price caused by increase or decrease in demand.

Obviously, the national market is fully integrated in no one country. Many "artificial" barriers restrict freedom of arbitrage (a part of them can be called as such somewhat conventionally, though). These are regional protectionism, regional price control, activity of organized crime, imperfect local markets for labor and real estate (which cause inter-regional differences in distribution costs), institutional factors (which narrow the choice of trade partners, e.g., because of long-term contracts, long-standing partnership, reputation of potential partners), etc. This poses a question of the degree of market integration: how close is a market to the ideal, full integration?

This question attracted great interest (mainly, among foreign researchers) with respect to Russia in the 1990s, when it transited from the centrally-planned economy to market economy. Using data on prices for different goods in various spatial samples and time spans, they inquired by means of diverse statistical methodologies whether integration of the Russian market improved in the course of the transition and whether it existed at all [1–6]. When the transition process has mostly completed and the Russian market became "ordinary," foreign researchers have lost interest to the issue of its integration; mainly Russian economists have come to deal with it. They consider integration of markets for both final goods [7–10] and intermediate goods [11, 12]. Articles [13, 14] study Russia's market integration in some time spans belonging to the transition and further times.

More than a quarter of century has passed ever since the Russian economy turned to the market way of development. It makes it possible to look at integration of the Russian market "from a bird's-eye view" and see how it has been changing in the course of transition from planned to market economy and then, and what impacts of different macroeconomic shocks on it have been. That is what this article aims at.

Methodology of the analysis. As it follows from the aforesaid, a dependence of price for a good in some region on quantity demanded there evidences that the market deviates from full integration. The "strength" of such dependence can measure the degree of market integration: the stronger the dependence, the weaker the integration. A model based on this idea has been put forward in [13]. In general terms, the model is as follows.

Let P_r be the price of a good in region r and M_r be income per capita in r; $D(P_r, M_r)$ is the demand function and $S(P_r)$ is the supply function. From the equilibrium condition for the regional market, $D(P_r, M_r) = S(P_r)$, the price can be expressed in terms of income

per capita as $P_r = aM_r^{\beta}$. So the dependence of price on per capita income replaces the dependence on quantity demanded (statistical data on which are lacking). Assuming the demand functions to be the same across all regions, we get $P_s = aM_s^{\beta}$ for region s. Then

$$\ln(P_r/P_s) - \ln T_{rs} = \beta \ln(M_r/M_s), \quad (1)$$

where regions are arranged so that $P_r \geq P_s$; $T_{rs} = (1 + \tau_{rs})$; τ_{rs} is costs needed to carry unit of the good between r and s relative to the price of the good. Let us use a widely adopted assumption that shipping costs are determined by distance between regions, L_{rs}: $\ln T_{rs} = \alpha + \gamma\tau \ln L_{rs}$, where α is a coefficient depending on unit of distance.

Inserting this relationship into Equation (1) and adding random shocks ε_{rs}, the following econometric model is arrived at:

$$\ln(P_r/P_s) = \alpha + \beta \ln(M_r/M_s) + \gamma \ln L_{rs} + \varepsilon_{rs}. \quad (2)$$

Here, β is the elasticity of price differential with respect to income differential (as it is proved in [13], β should be non-negative). It is its value (which essentially characterizes market segmentation) that measures the degree of integration: the lesser the β, the stronger the market integration. In the fully integrated market, $\beta = 0$. The observations are region pairs (r, s); their total number equals $N(N-1)/2$, where N stands for the number of regions in a sample. Sequentially estimating Regression (2) for every point in time, we get the dynamics of the degree of integration, β_t, during the time span under consideration $t = 1, \ldots, T$.

Data. The time span to be dealt with is 1992 to 2019. The econometric analysis is performed with the use of annual and monthly data.

Integration of markets for individual goods does not provide a general pattern, as it can significantly depend on particular features of one or another market. Therefore, it is desirable to consider an aggregated market represented by a goods basket. For the sake of comparability, the basket should be uniform across regions and time-invariant. There are a few indicators of the costs of different baskets in the Russian statistics. These are the goods price index (a subindex of consumer price index, CPI), cost-of-living index, the cost of the fixed basket of goods and services, and the cost of the minimum food basket (staples basket). However, the baskets used to compute CPI are not comparable across regions. While the goods coverage in regional baskets is the same, the weights of the goods in the basket are region-specific and change every year. The next two indicators have started to be published only since the 2000s, so not covering the whole time span of interest (moreover, the relevant baskets include, in addition to tradable goods, services).

Therefore, there is nothing to do other than consider the aggregated market represented by the staples basket. This basket is uniform across regions; however, its composition has changed a few times. It contained 19 foods in 1992–1996, 25 foods in January 1997 to June 2000 [15, p. 428], and 33 foods since July 2000 to present [16, Appendix 3]. That is why the analysis uses data on costs of unlike baskets and somewhat different region coverage for 1992–2000 and 2001–2019. The annual basket costs are computed as the averages of monthly costs (for 1992, over 11 months), based on the fact that the Russian statistical agency computes annual income per capita in the similar way.

The estimations for 1992–2000 (and the monthly estimations for February 1992 to June 2000) use the cost of the 25-food basket (hereafter, "basket-25"). The Russian statistical agency has provided these data on author's request (and it has specially computed the costs for February 1992 to December 1996).[1] The estimations for 2001–2019 (and the monthly estimations for July 2000 to December 2018) use the cost of the 33-food basket (hereafter, "basket-33") [17]. Therefore, the results obtained for these two time spans are not fully comparable. The differences are not only in the compositions of the baskets and quantities of goods in the baskets. The cost of basket-25 relates to region's capital city alone, while the cost of basket-33 is the regional average.

The monthly data on incomes per capita for 1992–2000 have been obtained directly from the Russian statistical agency; these for 2001–2018 have been drawn from monthly bulletins "Socio-Economic Situation of Russia." The annual data for 1992–2012 have been drawn from the Rosstat's web-site;[2] the source of data for 2013–2019 is [18].

The federal subjects of the Russian Federation are meant by regions in this article. A federal subject that includes autonomous *okrug*(s) is treated as a single region. The sample used for the 2001–2019 estimations covers 79 regions (3081 region pairs). It does not include the Chechen Republic, Republic of Crimea, and the city of Sevastopol, as the data for them do not cover the whole period. The sample for 1992–2000 does not include, in addition, the Republic of Ingushetia, Jewish Autonomous Oblast, and Chukotka Autonomous Okrug because of incomplete data. Besides, the price data are the same for the city of Moscow and Moscow Oblast, as well as for the city of Saint-Petersburg and Leningrad Oblast, since the cost of the basket is that in the capital city of region in that time. Therefore, these *oblasts* do not enter to the sample as well. In total, this sample consists of 74 regions generating 2701 pairs.

In addition to the whole sample (Russia as a whole), the analysis deals with two subsamples. The

[1] These data (as well as other data used that are absent in open sources) are available from the author on request.

[2] To date, the data have disappeared from the relevant web-page http://www.gks.ru/dbscripts/cbsd/DBInet.cgi?pl=2340019.

Table 1. Descriptive statistics of variables

Year	Russia as a whole				Excluding difficult-to-access regions				European Russia			
	$\bar{p}$	$\sigma(p)$	$\bar{m}$	$\sigma(m)$	$\bar{p}$	$\sigma(p)$	$\bar{m}$	$\sigma(m)$	$\bar{p}$	$\sigma(p)$	$\bar{m}$	$\sigma(m)$
1992	0.207	0.163	0.227	0.392	0.179	0.141	0.150	0.336	0.170	0.136	0.068	0.268
1993	0.253	0.224	0.264	0.424	0.203	0.175	0.171	0.348	0.168	0.159	0.077	0.266
1994	0.274	0.259	0.326	0.450	0.200	0.159	0.233	0.382	0.147	0.117	0.172	0.331
1995	0.239	0.210	0.320	0.459	0.185	0.145	0.246	0.419	0.130	0.104	0.188	0.410
1996	0.225	0.221	0.277	0.498	0.162	0.132	0.201	0.464	0.104	0.089	0.152	0.456
1997	0.204	0.209	0.263	0.483	0.143	0.119	0.195	0.458	0.082	0.067	0.161	0.441
1998	0.191	0.193	0.281	0.491	0.132	0.106	0.214	0.468	0.102	0.086	0.186	0.458
1999	0.150	0.148	0.261	0.521	0.106	0.087	0.187	0.496	0.094	0.084	0.177	0.478
2000	0.157	0.159	0.265	0.517	0.110	0.092	0.200	0.499	0.088	0.078	0.203	0.477
2001	0.175	0.200	0.318	0.502	0.112	0.088	0.232	0.462	0.089	0.075	0.189	0.447
2002	0.164	0.197	0.314	0.489	0.103	0.083	0.224	0.442	0.083	0.075	0.177	0.435
2003	0.166	0.194	0.306	0.500	0.108	0.084	0.219	0.459	0.091	0.079	0.176	0.459
2004	0.189	0.214	0.310	0.479	0.125	0.097	0.234	0.446	0.095	0.075	0.196	0.448
2005	0.180	0.214	0.299	0.486	0.116	0.095	0.221	0.453	0.083	0.068	0.190	0.456
2006	0.192	0.223	0.289	0.458	0.125	0.098	0.216	0.427	0.093	0.073	0.191	0.428
2007	0.184	0.216	0.260	0.449	0.117	0.091	0.190	0.421	0.088	0.069	0.171	0.418
2008	0.173	0.188	0.236	0.388	0.115	0.086	0.171	0.357	0.091	0.067	0.156	0.351
2009	0.197	0.214	0.229	0.389	0.131	0.102	0.158	0.352	0.098	0.072	0.140	0.358
2010	0.183	0.199	0.199	0.380	0.122	0.097	0.127	0.341	0.091	0.068	0.114	0.348
2011	0.173	0.182	0.200	0.368	0.117	0.092	0.130	0.330	0.086	0.066	0.121	0.336
2012	0.204	0.203	0.182	0.370	0.145	0.112	0.113	0.331	0.105	0.079	0.107	0.334
2013	0.199	0.201	0.189	0.378	0.142	0.108	0.115	0.334	0.103	0.077	0.112	0.337
2014	0.192	0.193	0.180	0.361	0.135	0.104	0.106	0.313	0.100	0.076	0.113	0.309
2015	0.181	0.176	0.174	0.358	0.131	0.103	0.102	0.312	0.100	0.079	0.099	0.310
2016	0.196	0.194	0.185	0.368	0.140	0.107	0.109	0.320	0.111	0.087	0.109	0.317
2017	0.185	0.184	0.194	0.371	0.131	0.100	0.117	0.320	0.109	0.087	0.109	0.319
2018	0.187	0.188	0.206	0.383	0.132	0.100	0.124	0.326	0.110	0.087	0.111	0.329
2019	0.185	0.187	0.203	0.386	0.130	0.098	0.121	0.329	0.107	0.084	0.112	0.331

first is Russia excluding difficult-to-access regions. It differs from the whole sample in that it does not include remote regions, mostly, with poor transport accessibility. They are regions that inherently cannot participate in arbitrage, namely, the Murmansk, Sakhalin, and Magadan Oblasts, Kamchatka Krai, Republic of Sakha (Yakutia), and Chukotka Autonomous Okrug. This subsample consists of 69 regions (2346 pairs) in 1992–2000, and 73 regions (2628 pairs) in 2001–2019. The second subsample is European Russia. In includes all regions from the European part of the country except for northern ones, the Murmansk and Arkhangelsk Oblasts and Republic of Komi. It covers 51 regions (1275 pairs) in 1992–2000, and 54 regions (1431 pairs) in 2001–2019.

The distances between regions are the shortest rail distances between their capitals [19, 20]. In the cases when railway communication is lacking, road, river, or sea distance is added. The average distance from cities of the Moscow Oblast where the statistics observes prices according to [21] to Moscow plus the distances to Moscow serve as the distances to this *oblast*, similarly for the Leningrad Oblast.

Results. Table 1 reports means and standard deviations of the dependent variable—price differential $p_{rs} = \ln(P_r/P_s)$—and the explanatory variable—income differential $m_{rs} = \ln(M_r/M_s)$—over all region pairs in a relevant spatial sample. They are denoted respectively as $\bar{p}$, $\sigma(p)$, $\bar{m}$, and $\sigma(m)$.

Since all p_{rs} are nonnegative by construction, their mean and standard deviation can be considered as aggregate indicators of price dispersion in the country or in one or another its part. For instance, $\bar{p}$ is the log-

Table 2. Estimates of Regression (2) on annual data

Year	Russia as a whole				Excluding difficult-to-access regions				European Russia				
	β		γ		β		γ		β		γ		*p*-value of γ
1992	0.142	(0.008)	0.031	(0.003)	0.078	(0.008)	0.012	(0.003)	0.034	(0.013)	0.015	(0.005)	0.008
1993	0.203	(0.010)	0.077	(0.004)	0.087	(0.009)	0.050	(0.004)	0.065	(0.015)	0.010	(0.007)	0.136
1994	0.265	(0.009)	0.123	(0.004)	0.124	(0.007)	0.077	(0.004)	0.130	(0.009)	0.024	(0.004)	0.000
1995	0.201	(0.007)	0.110	(0.003)	0.125	(0.006)	0.073	(0.003)	0.135	(0.007)	0.013	(0.004)	0.000
1996	0.166	(0.008)	0.131	(0.004)	0.075	(0.005)	0.077	(0.003)	0.096	(0.005)	0.008	(0.003)	0.019
1997	0.148	(0.007)	0.137	(0.003)	0.066	(0.005)	0.079	(0.003)	0.085	(0.004)	0.008	(0.002)	0.001
1998	0.152	(0.007)	0.106	(0.003)	0.076	(0.005)	0.046	(0.002)	0.108	(0.005)	0.007	(0.003)	0.017
1999	0.119	(0.005)	0.065	(0.003)	0.059	(0.004)	0.018	(0.002)	0.093	(0.005)	–0.006	(0.003)	0.059
2000	0.116	(0.005)	0.088	(0.003)	0.061	(0.004)	0.037	(0.002)	0.106	(0.004)	–0.001	(0.003)	0.815
2001	0.199	(0.007)	0.088	(0.003)	0.099	(0.004)	0.027	(0.002)	0.098	(0.005)	0.003	(0.003)	0.216
2002	0.209	(0.008)	0.075	(0.003)	0.099	(0.004)	0.017	(0.002)	0.095	(0.006)	0.001	(0.003)	0.651
2003	0.187	(0.008)	0.076	(0.003)	0.083	(0.005)	0.018	(0.002)	0.078	(0.007)	0.003	(0.003)	0.292
2004	0.200	(0.008)	0.103	(0.003)	0.098	(0.004)	0.041	(0.002)	0.093	(0.005)	0.010	(0.003)	0.000
2005	0.192	(0.008)	0.106	(0.003)	0.089	(0.004)	0.042	(0.002)	0.079	(0.005)	0.008	(0.002)	0.001
2006	0.212	(0.009)	0.112	(0.004)	0.096	(0.004)	0.045	(0.002)	0.086	(0.005)	0.010	(0.003)	0.000
2007	0.200	(0.008)	0.109	(0.004)	0.084	(0.004)	0.040	(0.002)	0.075	(0.005)	0.014	(0.002)	0.000
2008	0.208	(0.008)	0.092	(0.003)	0.086	(0.004)	0.034	(0.002)	0.075	(0.005)	0.012	(0.002)	0.000
2009	0.242	(0.009)	0.107	(0.003)	0.101	(0.005)	0.045	(0.002)	0.068	(0.005)	0.016	(0.003)	0.000
2010	0.232	(0.009)	0.100	(0.003)	0.094	(0.005)	0.044	(0.002)	0.072	(0.005)	0.014	(0.002)	0.000
2011	0.229	(0.008)	0.089	(0.003)	0.100	(0.005)	0.040	(0.002)	0.074	(0.005)	0.013	(0.002)	0.000
2012	0.230	(0.009)	0.107	(0.003)	0.095	(0.006)	0.055	(0.002)	0.077	(0.007)	0.014	(0.003)	0.000
2013	0.232	(0.009)	0.104	(0.003)	0.094	(0.006)	0.054	(0.002)	0.083	(0.006)	0.014	(0.003)	0.000
2014	0.248	(0.009)	0.097	(0.003)	0.104	(0.006)	0.049	(0.002)	0.085	(0.007)	0.012	(0.003)	0.000
2015	0.226	(0.008)	0.084	(0.002)	0.108	(0.006)	0.044	(0.002)	0.088	(0.007)	0.012	(0.003)	0.000
2016	0.244	(0.009)	0.092	(0.003)	0.108	(0.006)	0.043	(0.002)	0.101	(0.007)	0.018	(0.003)	0.000
2017	0.245	(0.008)	0.076	(0.003)	0.110	(0.005)	0.032	(0.002)	0.107	(0.007)	0.018	(0.003)	0.000
2018	0.253	(0.009)	0.076	(0.003)	0.116	(0.005)	0.032	(0.002)	0.109	(0.007)	0.019	(0.003)	0.000
2019	0.250	(0.008)	0.078	(0.003)	0.117	(0.005)	0.035	(0.002)	0.112	(0.006)	0.019	(0.003)	0.000

Standard errors of estimates are in parentheses; *p*-values of all estimates, except for γ for European Russia, are less than 0.0005.

arithm of the geometric average of price differences, P_r/P_s. As $\ln(1 + x) \approx x$, the figures in the table can be roughly interpreted as represented in unit fractions, and not in logarithms ($e^x - 1$ gives the exact values).

The price dispersion rose dramatically in the initial years of the market transformations. In Russia as a whole, the average price difference reached maximum in 1994, equaling circa 32% ($e^{0.274} - 1$). After that, the price dispersion started nearly steadily decreasing and came to the minimum in 1999–2000. In Russia as a whole, the average price difference decreased up to 16% ($e^{0.15} - 1$) in 1999. In 2001–2019, the price dispersion remained fairly stable, fluctuating within a not wide range. Recall that the staples baskets used are different for 1992–2000 and 2001–2019 (that is why the line divides these time spans in Tables 1 and 2). As a result, jumps in prices in the way from 2000 to 2001 reflect the change of basket (and, to some extent, region coverage), and not a real phenomenon.

As for incomes per capita, their regional dispersion mainly increased up to 2004–2005. After that, convergence of regions in incomes per capita started. It apparently stopped since 2015.

Table 2 reports results of the regression analysis with the use of annual data. Figure 1 shows the dynamics of Russia's market integration characterized by changes in the values of β, the degree of market segmentation.

In the initial stage, 1992–1994, market segmentation increased dramatically. Although, it is possible to speak about market of that time only at a stretch. (The estimates themselves for those years must therefore be

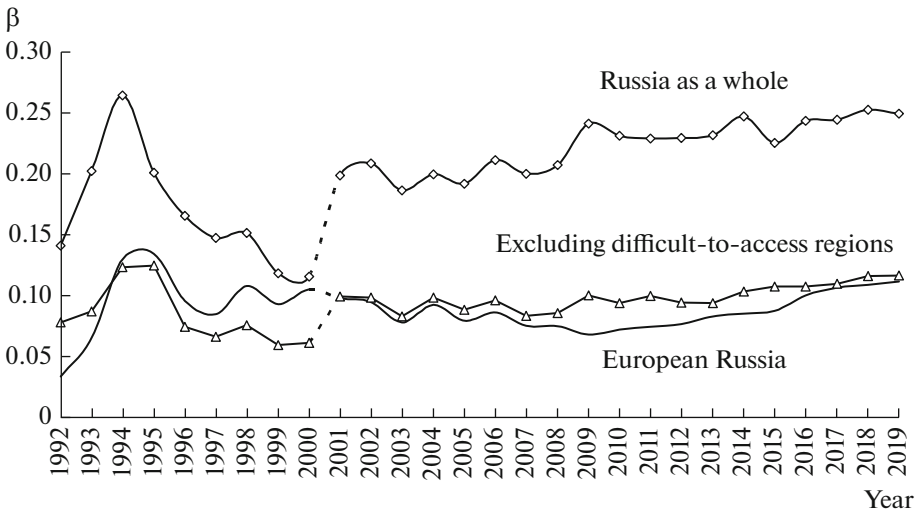

Fig. 1. Dynamics of Russia's market integration by year.

taken with caution.) Retail trade remained mainly state-run,[3] although it had been eligible for pricing on its own. The "money overhang" created by goods shortage in the previous years made it possible a great increase of retail prices since January 1992. When the "overhang" disappeared, the "inflation spiral" started to act: in response to the rise in prices, workers demanded wage raise, and increase in wages resulted in further rise in prices. These processes were closed within regions, so creating strong inter-dependence between prices and incomes in the region. Retail trade relied upon former sources of supply; inter-regional arbitrage was out of the question as there were no owners interested in this (besides, information on prices across regions was extremely scrappy).

Formation of the genuine market of consumer goods—as a result of mass privatization of trade enterprises and market self-organization—can be attributed to 1994–1995. Since that time, integration of the regional markets started improving. The 1998 crisis somewhat turned this process back (in a number of regions, the exportation of goods was even prohibited). However, the crisis eventually became a powerful force for further improving integration. The collapse of the ruble exchange rate (from 5.96 RUR/$ as of January 1, 1998, to 20.65 RUR/$ as of December 31 [22]) forced the market to switch from imported to domestic goods. A consequence was a substantial increase in inter-regional trade and, accordingly, in integration of the Russian market.

A strange feature can be observed in Fig. 1. In 1994–2000, the degree of integration in European Russia is less than in Russia excluding difficult-to-access regions. However, taking account of much more developed transport infrastructure and lesser distances between regions in the European part of the country than in the Asian part, one would expect the reverse pattern. The reasons will be discussed further.

Jumps in the transition from 2000 to 2001 (shown by dashed lines in Fig. 1) are caused by the change of staples basket used for the analysis. Available data on the costs of both basket-25 and basket-33 for several months of 2000 allow comparing estimates obtained with different baskets (and somewhat diverse region coverage) and understanding how great the differences are. Table 3 tabulates these estimates by month and for the whole period of June–December 2000 (with data averaged over 7 months).

As Table 3 suggests, the discrepancies between respective estimates are fairly sizeable. They are particularly great for Russia as a whole. The estimate of the segmentation degree over 7 months with basket-33 exceeds the estimate with basket-25 by 26%. The discrepancies for Russia excluding difficult-to-access regions are somewhat smaller. In this case, the estimates with basket-33 also suggest a higher degree of market segmentation, by 23% over June-December. However, the degree of market segmentation of European Russia estimated with basket-33 is less than that estimated with basket-25 (by 20% for estimates over 7 months).

A more detailed analysis evidences that there were no dramatic changes in Russia's market integration in 2001 as compared to 2000. Therefore, it can be believed (somewhat conventionally) that the integration paths for 2001–2019 are continuations of the paths for 1992–2000, assuming the values of β (with basket-33) in 2000 and 2001 to be close. In Fig. 1, this would correspond to shifts of the 1992–2000 paths by the magnitude of discrepancy between estimates with

[3] It is worth noting that the official statistics recorded prices solely in state-run shops in that time. It added marketplaces (where private trade prevailed) as the objects of the price observation only after some time.

Table 3. Estimates of β on monthly data for June to December 2000

Month	Russia as a whole		Excluding difficult-to-access regions		European Russia	
	basket-25	basket-33	basket-25	basket-33	basket-25	basket-33
June	0.109	0.124	0.053	0.052	0.094	0.069
July	0.116	0.126	0.064	0.064	0.108	0.092
August	0.113	0.137	0.061	0.087	0.106	0.092
September	0.109	0.128	0.060	0.073	0.098	0.071
October	0.119	0.160	0.064	0.083	0.103	0.084
November	0.110	0.150	0.063	0.081	0.099	0.084
December	0.107	0.157	0.058	0.079	0.103	0.082
June–December	0.128	0.161	0.071	0.087	0.117	0.094

basket-25 and basket-33 (upward for Russia as a whole and Russia excluding difficult-to-access regions, and a bit downward for European Russia).

During 2001–2008, the degree of integration remained relatively stable, fluctuating around some constant values. Along with this, a trend toward higher integration emerged in European Russia since 2007.

The impact of the 2008 global crisis manifested itself in the next year. The crisis was accompanied by the devaluation of ruble (which began to show in August 2008). By the end of 2008, the ruble was devaluated by the factor of 1.2 as compared to the beginning of the year; this figure reached 1.5 in February–March of 2009. Farther, however, this process turned back. By October of 2009, the devaluation equaled approximately 1.25 relative to the beginning of 2008. After that, the exchange rate stabilized (calculated from data drawn from [22]).

The devaluation of ruble caused some disorganization of the market. It resulted in a sizeable deterioration of market integration in Russia as a whole. However, if the difficult-to-access regions are excluded, the deterioration appears fairly small (in European Russia, the trend to improvement in integration that had emerged formerly even continued). Thus, the difficult-to-access regions that had been weakly integrated with other regions became even less integrated.

By 2010, segmentation of the Russian market decreased, but did not reach the pre-crisis value, remaining about the same level up to 2013. Again, comparing with Russia excluding difficult-to-access regions, it can be concluded that only they have suffered (because of the absence of arbitrage). In the rest part of the country, segmentation increased not too much, within the range of fluctuations in the previous years of the 21st century. The pattern of the evolution of integration appeared different in European Russia. Starting in 2010, integration slowly but steadily deteriorated there. The considerable devaluation of ruble created favorable possibilities for strengthening price competition of Russian producers of consumer goods with foreign producers. It would have resulted in widening trade between regions and improvement in inter-regional integration. But the Russian producers lost their chance, preferring instead (along with retail and wholesale trade) to force up prices.

The next shock was caused by "countersanctions," i.e., embargo on importation of foods from the EU, USA, and some other countries. The embargo was imposed in August 2014 (a new wave of devaluation of ruble that started at that time superimposed on it). This shock is clearly seen on the integration path of Russia as a whole. It gave rise to an explosive increase in market segmentation, by 0.018 (although it temporally decreased in 2015 even below the 2013 level). Excluding the difficult-to-access regions, the jump in 2014 appears less dramatic (by 0.010). However, it called forth a trend to slow but almost permanent deterioration of integration. The impact of the shock in European Russia manifested itself in that the deterioration of integration (started as far back as in 2010) accelerated appreciably since 2016. While the increase in β was a bit more than 0.003 per annum in 2010–2015, the average over 2015–2019 equaled 0.006 per annum.

In 2019 as compared to 2013, β increased by 0.018 in Russia as a whole, by 0.023 in Russia excluding difficult-to-access regions, and by 0.029 in European Russia. Paradoxically, the difficult-to-access regions proved to be in a more advantageous position. Apparently, this is due to the closeness of most of them to markets of South-East Asia. A possible reason for deterioration of Russia's market integration in the first years of embargo is processes of adaptation of the market to new conditions, switching import to other countries among them. (Results of a more detailed research, namely, analysis of the impact of embargo on integration of market for vegetables [8, 23], corroborate this guess).

However, further improvement in market integration could be expected. The food embargo, devaluation of ruble, and government support resulted in increased agricultural production and food processing. At the same time, reduced imports facilitated

access to market for Russian producers, which should have increased inter-regional trade. Nonetheless, the analysis performed suggests the absence of positive changes in Russia's market integration up to 2019. Reasons for this need a special investigation.

In Table 2, high *p*-values of the coefficient on distance, γ, in 2000–2003 in European Russia are seen. Moreover, γ is negative in 1999 and 2000, contradicting to the prerequisites of the model. This phenomenon is exclusively due to the market of the city of Moscow. This market is very poorly integrated with markets of other regions [13, 24]. This "spoils" the whole pattern of integration of European Russia (and, to a lesser degree, that of Russia excluding difficult-to-access regions). Table 4 reports a portion of results of econometric analysis obtained with removing Moscow from European Russia.

As it is seen, the exclusion of Moscow makes estimates of γ comparable with estimates for other years. Their *p*-values are very small, which evidences good consistency of the model with the data. (As for γs for 1999 and 2000, they become positive.)

The influence of the Moscow market explains one more strange feature noticed above. In contrast to the assumption based on economic-geographical considerations that the market of European Russia has to be integrated much stronger than the market that includes also Siberia and the Russian Far East, the difference is small. Moreover, the pattern is even reversed in 1994–2000. Deleting Moscow from the sample suggests that this assumption is true. This significantly diminishes – approximately to a half – the values of β, as comparisons of Tables 2 and 4 evidence. Then the estimates of β in Russia excluding difficult-to-access regions turn out to be 1.5–2 times more than in European Russia. (In 1994–2000, the "abnormal" relationship between values of β disappears in these subsamples.) This means the regions of European Russia to be in fact much stronger integrated with one another than the analysis on the sample containing Moscow suggests. The situation changes over time, though. Prices in Moscow are converging with prices in some other regions [24]. Consequently, the gap between the segmentation degree of market of European Russia with and without Moscow decreases, equaling about 25% in 2016–2019.

Table 4. Estimates of Regression (2) on annual data, European Russia excluding Moscow

Year	β		*p*-value of β	γ		*p*-value of γ
2001	0.057	(0.006)	0.000	0.010	(0.003)	0.000
2002	0.046	(0.006)	0.000	0.008	(0.003)	0.002
2003	0.029	(0.007)	0.000	0.009	(0.003)	0.003

Sstandard errors of estimates are in parentheses.

Although analysis with annual data makes it possible to eliminate many random shocks, it can miss some details. Let us therefore consider briefly results of analysis with monthly data. Fig. 2 presents them (because of the lack of monthly data on income per capita during 2019, the plot ends in December 2018).

The paths of β in Fig. 2 are smoothed to some extent with the use of moving average, $\beta'_t = 0.25\beta_{t-1} + 0.5\beta_t + 0.25\beta_{t+1}$. Nonetheless, they remain highly volatile. This is due to high volatility of regional incomes per capita which have sawtooth-like dynamics. In par-

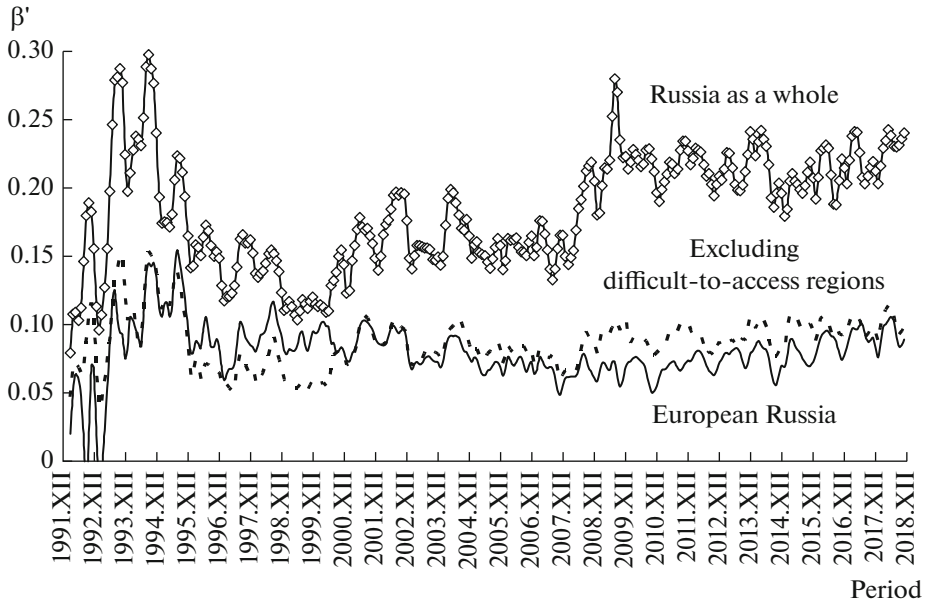

Fig. 2. Dynamics of Russia's market integration by month.

ticular, incomes dramatically rise in December of every year, and fall dramatically in January. Surges and slumps of incomes occur within year as well (for instance, in the holiday season). A shortcoming of income per capita as a proxy of demand manifests itself in analyzing monthly data. Consumer demand does not respond (or responds weakly) to transient fluctuations of income; retail prices are all the more persistent. Therefore, for example, the inter-regional income dispersion increases owing to the December surge of incomes, whereas the price dispersion either remains prior or changes weakly. Thus, a seeming abatement of the linkage between prices and incomes takes place, which reduces β (as if suggesting an improvement in integration).

As it follows from Fig. 2, the monthly evolution of integration corroborates in general principal trends found by the analysis with the annual data. It merely adds some details of intra-year evolution (however, the above reservations should be taken into account). Perhaps, the most interesting is the behavior of β in European Russia in 1992–1993. In some months, β is negative, that is, the price dispersion decreases with increasing income dispersion (or vice versa). This evidences inadequacy of the applied model for the first years of transition to market economy. This is the case, indeed. As noted above, estimates of the model for those years must be treated with caution, as only the seeds of market existed at that time. Inter-regional trade was chaotic in those years; transaction participants proceeded not from the market logic (profit maximization), but from other considerations, e.g., eliminating shortage in one or other good. Pricing was fairly chaotic as well, as there was no experience of acting in the market environment. Therefore, no wonder that a pathological (from the viewpoint of the economic theory) relationship between demand and prices emerged from time to time. It is not inconceivable that in cases the estimates of the model for that time suggest a linkage between dispersions of incomes per capita and prices we have in fact a spurious regression. Namely, nonsynchronous across regions rise in both prices and incomes led to rise in their inter-regional dispersions, whereas no linkage between them existed. Apparently, only since 1994–1995 such a linkage appeared and inter-regional goods arbitrage started developing.

Over less than decade, by the 2000s, the Russian consumer market that had emerged instead of the system of planned distribution of goods got rid of features peculiar to the transitional economy, and became only slightly different from markets in long-established market economies. By the 2010s, it became undistinguishable from them. Nor the Russian market stands out for its degree of spatial integration, if the group of difficult-to-access regions is excluded from consideration. A comparative analysis of Russia and the US with the use of data for 2000 shows the degree of Russia's market integration to be comparable with that in the US [25].

Nonetheless, it seems that the Russian market has not reached a maximum feasible degree of integration. It can be expected that the processes caused by the food embargo and devaluation of ruble will lead (although with a delay, reasons for which are not clear as yet) eventually to strengthening of country's market integration. However, the events of 2020 have shown that any expectations are unreliable. On the one hand, protectionism that expands all around the world can facilitate strengthening of domestic market integration. But, on the one hand, breaking the ties between regions within the country can act in the opposite direction.

CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

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