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Impact of The Global Crisis on Spatial Relationships in Russia

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Impact of the Global Crisis on Spatial Relationships in Russia

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Abstract

This paper seeks an answer to the question of whether the global crisis had a persistent effect on inter-regional income inequality and spatial market integration in Russia. Results obtained suggest that the answer is generally negative.

Keywords: Income inequality; Market integration; Russian regions

JEL classification: O15, P22, P25, R11.

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1. Introduction

The global crisis reached Russia in the second half of 2008. It hit regions of the country to variable degrees because of great differences in regional economy patterns, natural conditions, economic-geographical positions, etc. In turn, this might have changed inter-regional relationships. Here, we focus on two of them, inter-regional inequality in real incomes and integration of regional goods markets, studying the evolution of relevant indicators during 36 months, July 2007 to June 2010.

Ten years before the global crisis, in 1998, Russia experienced a severe financial crisis of its own. Its consequences were a significant decrease in inter-regional income inequality and improvement in Russia's market integration. However, the first effect proved to be temporary. According to Solanko (2008), following a dramatic fall in 1998 income inequality among Russian regions permanently rose and reached the pre-crisis value within a few years. In contrast to this, the second effect turned out to be persistent. As Gluschenko (2003) finds, goods market integration improved after September 1998 and then stabilized since the beginning of 1999. Berkowitz and DeJong (2003) also document a strengthening of integration in 1999. Afterwards, up to 2007, the degree of integration remained roughly stable, fluctuating around some constant level which can be deemed to be crudely the same as reached by 1999 (Gluschenko, 2009).

It is interesting to compare the impact of the global crisis on these two inter-regional relationships in Russia with that of the 1998 crisis. Although both crises have some common features (devaluation of the Russian national currency, ruble, slump in personal incomes, decrease in importation of consumer goods from abroad, etc.), they occurred in fundamentally different conditions. While recession started in the late 1980s had preceded the 1998 crisis, the 2008 crisis happened after an eight-year economic upturn. Therefore, it is a priori unclear whether there should be a similarity between consequences of these crises.

2. Data and methodology

The subjects of the Russian Federation are taken as regions, two composite subjects of the federation – those containing other subjects, autonomous *okrugs* – being considered as a single region. The spatial sample contains 79 regions, covering all regions of the country except for the

Chechen Republic, where data on incomes are lacking.

Incomes are characterized by personal per capita incomes across regions. To estimate real income, the cost of a so called fixed basket of 83 consumer goods and services for inter-regional comparisons of purchasing capacity of population (hereafter, fixed basket) serves as an indicator of the regional cost of living. The ratio of nominal per capita income and the cost of the fixed basket represents real per capita income (which is thus measured in the numbers of fixed baskets). Personal per capita incomes and the costs of the fixed baskets across Russian regions are drawn from Rosstat (2007–2010).

Four indicators measure income inequality among regions: the standard deviation of log real incomes, coefficient of variation, Gini index, and Theil entropy index. Comparing their pre-crisis values with subsequent ones, we can see changes in income inequality among Russian regions induced by the crisis. It is instructive to reveal whether these changes are significant. Instead of testing hypotheses of equality across time for each index, such hypotheses are tested for the entire cross-section distribution of real income. The tests deal with incomes normalized to the national average, which eliminates possible changes in the shape of distribution caused by changes in the overall level of real income.

To measure the degree of goods market integration, a methodology put forward in Gluschenko (2003) is used; see that paper for a description of the methodology at length. This methodology bases 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 region is determined by the national market, and not by regional demand. Otherwise the strength of dependence of local price on regional 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 regional price and regional income per capita.

At last, the following econometric model is arrived at:

$$P_{rst} = \alpha + \beta Y_{rst} + \gamma L_{rs} + \varepsilon_{rst}, \quad (1)$$

where t indexes time (month); r and s index regions; $P_{rst} = \log(p_{rt}/p_{st})$ is price differential, p_{rt} and p_{st} being prices for a good in r and s (r and s are arranged so that $P_{rst} \geq 0$); $Y_{rst} = \log(y_{rt}/y_{st})$ is income differential, y_{rt} and y_{st} being nominal income per capita in r and s ; and L_{rs} is log distance separating regions r and s . This regression is estimated over a set of $N \times (N-1)/2$ region pairs for a

fixed point in time t ; N is the number of regions.

Gluschenko (2003) proves that $\beta \geq 0$. Its magnitude (the elasticity of price difference vis-à-vis income difference) measures the degree of market segmentation/integration: a higher value for β means weaker integration (or higher segmentation). If $\beta = 0$, implying the law of one price holds, then the relevant market can be deemed integrated. Running cross-sectional estimations of Equation (1) for $t = t_1, \dots, t_m$, a sequence of the degree of segmentation/integration is obtained, thus providing the temporal pattern of market integration.

The cost of a 33-stapes basket is used as a price representative for the analysis; Gluschenko (2009) reports the composition of this basket. The costs of the staples basket are also drawn from Rosstat (2007–2010). Distances are measured between capital cities of regions in network-transportation mileage. Therefore only the cities of Moscow and St. Petersburg which are separate subjects of the Russian Federation (“city-regions”) and at the same time the capital cities of the surrounding Moscow and Leningrad Oblast are present in the sample used for analyzing market integration sample, while these surrounding *oblasts* are omitted. The railroad distances are drawn from the tariff manual, Railway Transport Council of the Commonwealth Member Countries (2001). They are supplemented with highway, sea, and river distances for regions lacking railway communication with the use of different sources.

Thus, the spatial sample here contains 77 regions (2,926 pairwise observations). Two more subsamples are exploited. The first is Russia excluding difficult-to-access regions which are remote regions lacking (except the only one) railway and highway communication with other regions (the Murmansk, Magadan, Kamchatka and Sakhalin *oblasts*, Republic of Sakha and Chukchi Autonomous Okrug). 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 (1,326 pairwise observations).

3. Empirical results

It is impossible to indicate exactly when the crisis started in Russia. Troschke (2009) considers August 2008 being the beginning, while Granberg et al. (2009) and Bezrukov et al. (2010) shift it to October or November of that year. Russian government officials admitted the

advent of the crisis in October 2008; as late as in the previous month, Russian Prime Minister Vladimir Putin asserted that no crisis took place in the country. For convenience, let us consider the period of 2007:07–2008:06 as a pre-crisis one, and the period of 2008:07–2010:06 as affected by the crisis. Anyway, it is the second half of 2008 when the crisis reached Russia.

Fig. 1 reports the evolution of income inequality in Russia during 36 months covering both periods. Appendix Table A1 provides numerical values of the inequality indicators. All the four indicators suggest qualitatively the same dynamics; being rescaled, the indicator paths are fairly close to one another (see the right panel of Fig. 1). It is seen that no dramatic changes in income inequality occurred in the second half of 2008 and later. The difference between the second half of 2007 and the first half of 2008 is much more pronounced than that between the latter and the first half of 2009, when the crisis definitely took place in the country. Nevertheless, there are indications of rise in inequality during 2008:09–2009:05. October 2008 to about June 2009 was indeed the most precarious stage of the crisis in Russia.

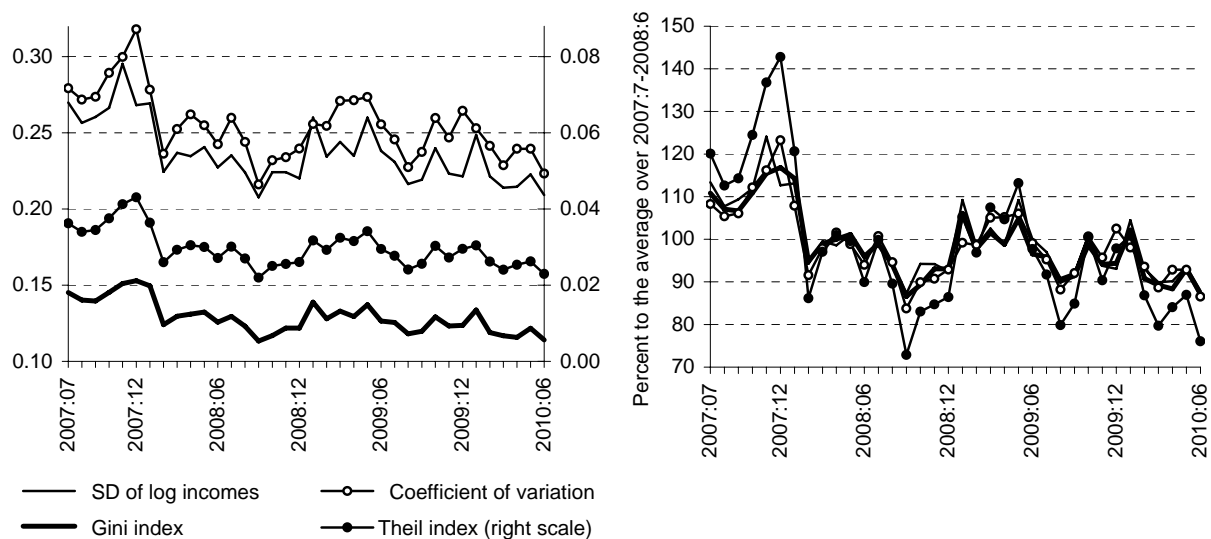


Fig. 1. Regional inequalities in per capita real personal income (left: original values; right: normalized).

As the changes in income inequality that can be assigned to the crisis are fairly modest, the question arises of whether these changes are statistically significant. To answer this question, it is reasonable to compare income distributions from the pre-crisis period with those from the period

affected by the crisis. If the hypothesis of their equality is not rejected, this implies that the same is valid for any one of distribution statistics, among them the inequality indicators (certainly, the reverse is not true). The two-sample Kolmogorov-Smirnov test is applied for such comparisons. Its null hypothesis is that the samples are drawn from the same distribution, i.e. that two income distributions under consideration are identical. Monthly income distributions from 2007:07–2008:06 serve as bases of comparison with distributions in a respective month after 12 and 24 months. In addition, semiannual and 12-month distributions are tested for equality. Table 1 tabulates the results of testing.

Table 1
Kolmogorov-Smirnov test p -values

Base distribution in	Compared with	p -value	Compared with	p -value
2007:07	2008:07	0.813	2009:07	0.916
2007:08	2008:08	0.684	2009:08	0.428
2007:09	2008:09	0.813	2009:09	0.684
2007:10	2008:10	0.428	2009:10	0.813
2007:11	2008:11	0.116	2009:11	0.322
2007:12	2008:12	0.001	2009:12	0.002
2008:01	2009:01	0.322	2010:01	0.052
2008:02	2009:02	1.000	2010:02	0.977
2008:03	2009:03	0.235	2010:03	0.916
2008:04	2009:04	0.977	2010:04	0.322
2008:05	2009:05	0.684	2010:05	0.684
2008:06	2009:06	0.813	2010:06	0.684
2007-H2	2008-H2	0.078	2009-H2	0.322
2008-H1	2009-H1	0.977	2010-H1	0.684
2007:07– 2008:06	2008:07– 2009:06	0.684	2009:07– 2010:06	0.684

Taking the 5% significance level, the test rejects the null hypothesis of the equality of the monthly distributions only in two cases out of 24 comparisons, for Decembers. No one null hypothesis regarding semiannual and 12-month distributions is rejected. To check robustness of these results, similar comparisons were made within the period of 2008:07–2010:06 (see Appendix Table A2). The hypothesis of the equality of distributions proves to be significant in all cases. For the semiannual distributions, p -values of the Kolmogorov-Smirnov test are equal to 0.997 (the second halves of 2008 and 2009) and 0.551 (the first halves of 2009 and 2010). Comparing distribution for 2008:07–2009:06 with that for 2009:07–2010:06, the p -value equals 0.916. (In addition, Appendix Fig. A1 compares kernel densities of semiannual and 12-month

distributions, suggesting their closeness.) Thus, we may confidently conclude that the crisis had no impact on income inequality among Russian regions.

Be the 10% significance level adopted, this conclusion would remain true. Only one more null hypothesis would be rejected among monthly comparisons, 2008:01 vs. 2010:01, and one among semiannual ones, 2007:07–12 vs. 2008:07–12. The latter is expected, given “non-typical” behavior of inequality in the second half of 2007. Moreover, the discrepancies between the December distributions are quite explainable, taking a look at dynamics of real income in

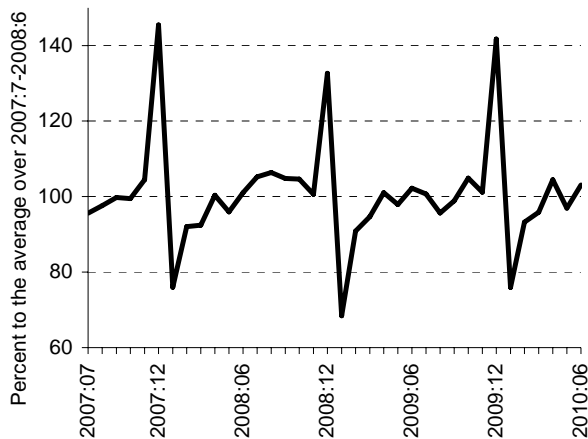


Fig. 2. Real incomes: the Russian average.

Russia as a whole (which is the weighted average over all regions) in Fig. 2. As is seen, the income follows a sawtooth trajectory (which, *inter alia*, makes it clear why comparisons of first half-years with second ones do not make sense). In Decembers, personal incomes skyrocket because of yearly bonuses, repayment of wage arrears, etc. In Januaries, incomes fall because of 10-day New Year holidays and shortage of wage funds caused by additional payments in the previous month. Then it is of no surprise that cross-region income distributions are not equal across Decembers and, maybe, Januaries, as both additional payments and shortages may considerably differ across regions.

Although the crisis did not change income inequality in Russia, Fig. 2 evidences that it did affect real incomes as such: they stopped rising. During three years they fluctuated around a constant level, that of the average over the pre-crisis period. The average real income over 2008:07–2009:06 is greater by 0.8 per cent points, and that over 2009:07–2010:06 is greater by 1 point than the average over 2007:07–2008:06.

Turning to the issue of integration of regional markets, let us first take a look at cross-region price dispersion measured by standard deviation of price differential in Fig. 3. (Appendix Table A3 reports numerical values. It also provides the mean of prices differential. Because all P_{rst} are set to be non-negative, it is equivalent to the mean of absolute price differential, another measure of price dispersion.) This figure shows that no dramatic changes occurred because of the

crisis. It may seem that a weak upward trend started driving price dispersion since somewhere in the second half of 2008. However, that is not the case. Such changes in price dispersion were observed in previous years as well. For example, during 2001–07, dispersion over Russia as a whole changed in the band of 0.18-0.24, having the average of 0.21 like that over our time span (see Gluschenko, 2009). The behaviour of price dispersion in other two region samples also does not manifest deviations from the pattern

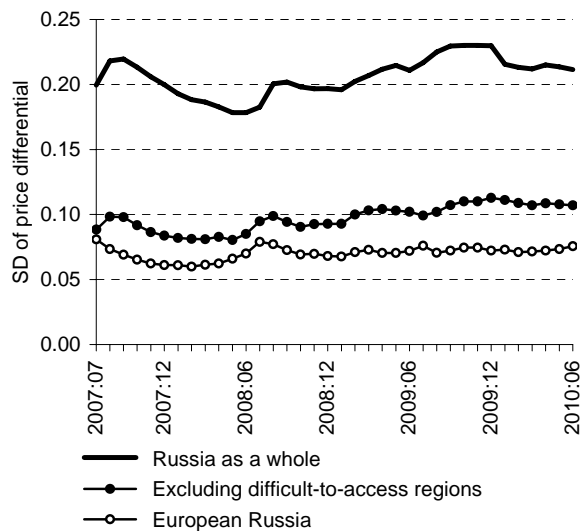


Fig. 3. Price dispersion over Russian regions.

observed in 2001–07. Besides, no structural breaks in time series of price differentials are found while the 1998 crisis has caused breaks in many of them (see Gluschenko, 2010).

Fig. 4 plots integration trajectories, i.e. estimates of β in Equation (1) across 36 points in time (Appendix Table A4 tabulates the full set of estimates). The left panel of this figure presents the trajectories as they are; in the right panel, the trajectories are exponentially smoothed with the use of the Holt-Winters method (Bowerman and O’Connell, 1979). Recall that higher β means weaker market integration.

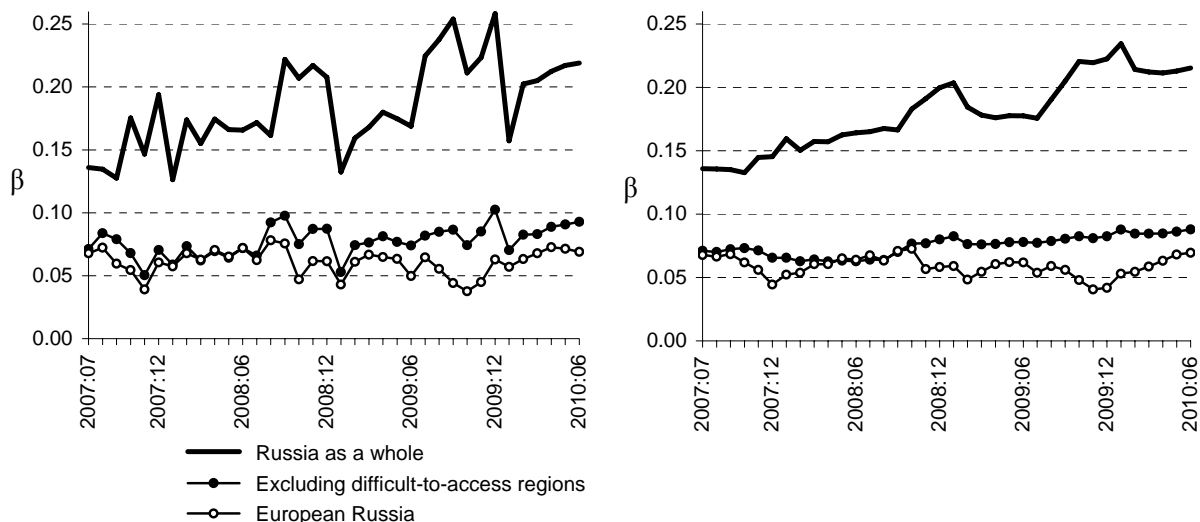


Fig. 4. Trajectories of market integration (left panel: estimated; right panel: smoothed).

Taking a look at Fig. 4, a trend to deterioration of market integration in Russia as a whole is evident (especially on the smoothed trajectory). Indeed, the estimate of the trend factor equals 0.0022 with a 0.1% significance, which implies almost a 20% annual rise of the initial value (in 2007:07). The value of β varies across months from 0.126 to 0.258 with $\bar{\beta} = 0.185$, while this band was 0.107 to 0.205 in 2001–2007 and $\bar{\beta} = 0.159$. The first sharp rise in market segmentation is dated to September 2008 and thus might be assigned to the crisis. (A similar rise, albeit much less pronounced, is seen on the trajectory for Russia excluding difficult-to-access regions.) The second rise occurred in July 2009, which also might be due to the crisis.

However, omitting difficult-to-access regions from the spatial sample, the pattern is quite different. It does not suggest deviations from earlier dynamics of market integration, varying from 0.050 to 0.102 as compared to the band of 0.050 to 0.114 in 2001–2007; the averages of β over time are equal to 0.077 and 0.084, respectively. Although a weak upward trend (with statistically significant factor of 0.0006) takes place, it can be an artifact due to accidental reasons. All the more, the trajectory for European Russia manifests no evidence of being affected by the crisis. It varies in the band of 0.038 to 0.078 with $\bar{\beta} = 0.061$; in 2001–2007, this band was 0.039 to 0.106 and $\bar{\beta} = 0.079$. To gain a better insight, Table 2 reports 95% confidence intervals of semiannual and 12-month estimates of β ; Appendix Fig. A2 plots them graphically. (To obtain these estimates, Model (1) was run with the use of price and income differentials averaged over respective periods.)

Table 2
Confidence intervals of the degree of market segmentation (β)

Period	Russia as a whole	Excluding difficult-to-access regions	European Russia
2007-H2	0.153, 0.183	0.067, 0.082	0.053, 0.071
2008-H1	0.150, 0.180	0.061, 0.076	0.062, 0.078
2008-H2	0.195, 0.230	0.080, 0.099	0.060, 0.081
2009-H1	0.156, 0.186	0.066, 0.085	0.052, 0.071
2009-H2	0.219, 0.261	0.076, 0.098	0.039, 0.063
2010-H1	0.189, 0.224	0.076, 0.097	0.056, 0.079
2007:07–2008:06	0.155, 0.186	0.065, 0.080	0.058, 0.075
2008:07–2009:06	0.182, 0.215	0.078, 0.096	0.059, 0.079
2009:07–2010:06	0.206, 0.245	0.077, 0.098	0.049, 0.072

Considering Russia as a whole, we cannot accept the hypothesis of equality of β across all

half-years as well as 12-month periods. Thus, there were, indeed, statistically significant changes in the degree of market segmentation. They evidence deterioration of integration in the period affected by the crisis. In Russia excluding difficult-to-access regions, the confidence intervals overlap, excluding those for 2008-H1 and 2008-H2. This allows accepting the hypothesis of the equality of β across the periods with a reservation that a temporary weakening of integration occurred in the second half of 2008. All confidence intervals overlap in European Russia, suggesting possible equality of the degree of market integration in this part in the country during the whole period under consideration. Thus, we may conclude that if the crisis had any effect on market integration in Russia, it hit only difficult-to-access regions which anyway were poorly integrated with the rest of the country.

The pattern obtained strikingly differs from that observed for the 1998 financial crisis in Russia (summarized in the Introduction). One main reason is different dynamics of devaluation of the Russian national currency, rouble (RUR). Fig. 5 presents the paths of the RUR/\$ exchange rate during the two crises. The left panel of the figure uses absolute terms, while the right panel demonstrates percentage changes relative to 31 December of pre-crisis years.

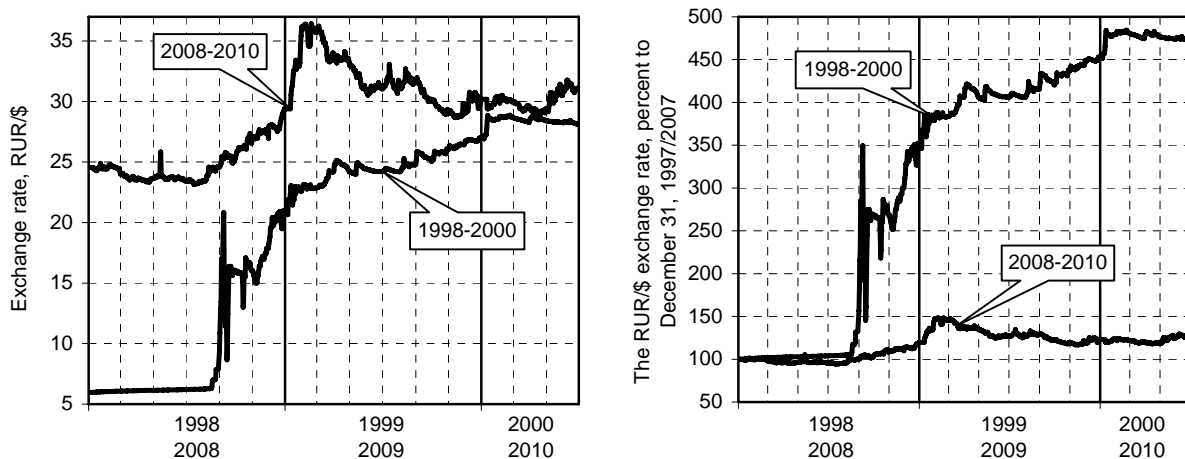


Fig. 5. Devaluation of the Russian rouble during the two crises.
Source: Bank of Russia (www.cbr.ru/currency_base/dynamics.aspx).

In 1998, the devaluation was dramatic and enormous. During three weeks from its beginning on August 18, 2008, the rouble was devaluated by 3.3 times. Albeit the RUR/\$ exchange rate fell somewhat afterwards, it reached the same value corresponding to the 3.3-fold

devaluation by the end of 1998. Altogether over 30 months, January 1998 to June 2000, the devaluation came to 4.7 times. As a result, domestic consumer goods displaced those imported from abroad. This caused expansion of inter-regional trade within Russia, which, in turn, facilitated improvements in goods market integration in the country. High inflation accompanied the 1998 crisis, 84.4% in 1998 and 36.5% in 2009. It greatly differed across regions of the country, so changing relative costs of living, and, in turn, real incomes and spatial income inequality.

In contrast, the devaluation of ruble during the global crisis was very smooth and relatively modest. It peaked in February–March 2009, when the ruble depreciated by about 1.5 times as compared to December 31, 2007. After that the process turned back so that the devaluation stabilized at the level of about 1.25 times (relative to December 31, 2007) since October 2009. Although importation of consumer goods from abroad fell for a few months in the end of 2008 and beginning of 2009, this did not cause a large-scale displacement of imported consumer goods by domestic ones. Nor the crisis caused a surge of inflation which equaled 13.3% in 2008 (as compared to 11.9% in 2007) and 8.8% in 2009. These smooth and slow dynamics allowed consumer market to adapt to the new situation without abrupt changes in market integration. However, it seems that because of the absence of arbitrage with other regions, the dependence of local prices on local demand in the difficult-to-access regions became stronger, so indicating a deterioration of their integration with the rest of Russia.

The second main reason for differences in crisis outcomes regarding spatial income inequality is a different extent of bankruptcies in the financial sector. This sector features the highest salaries, on the average two and more times higher than in the whole Russian economy. The 1998 crisis caused a mass collapse of banks and other financial institutions. As they were concentrated in rich regions of the country, this led to reducing income gaps between these regions and poorer ones, which, in turn, dramatically decreased inter-regional income inequality. In the time of the global crisis, the Russian government saved the banking system from a mass failure, equipping it with additional liquidity and recapitalizing several banks (Troschke, 2009). A result was the absence of a significant earning cut in the financial sector, and thus, in spatial income inequality. Although real incomes moderately fell in Russia in September to November 2008 (see Fig. 2), this causes only a slight and temporary decrease of inter-regional income inequality in September 2008 (see Fig. 1).

4. Conclusion

This paper aimed to reveal an impact of the global crisis on inter-regional inequality and spatial market integration in Russia. Income inequality is found not to be affected by the crisis, although the latter caused halting of rise in real incomes in the country. No significant changes were found in the degree of spatial market integration in Russia that could be assigned to the crisis. Probably, it deteriorated integration of difficult-to-access regions with the rest of the country, but they anyway had been weakly integrated. The pattern obtained strikingly differs from that observed for the 1998 financial crisis in Russia. Different dynamics of devaluation of the national currency and the extent of bankruptcies in the financial sector during these two crises generally explain the differences between the consequences of the crises.

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APPENDIX

Table A1
The evolution of inter-regional income inequality

Period	Gini index	SD of log incomes	Coefficient of variation	Theil(1) index
2007:07	0.145	0.270	0.279	0.036
2007:08	0.140	0.256	0.272	0.034
2007:09	0.140	0.260	0.274	0.034
2007:10	0.145	0.266	0.289	0.038
2007:11	0.151	0.295	0.300	0.041
2007:12	0.153	0.268	0.318	0.043
2008:01	0.150	0.269	0.278	0.036
2008:02	0.124	0.224	0.236	0.026
2008:03	0.130	0.237	0.252	0.029
2008:04	0.131	0.235	0.262	0.030
2008:05	0.132	0.241	0.255	0.030
2008:06	0.126	0.227	0.242	0.027
2008:07	0.130	0.235	0.260	0.030
2008:08	0.123	0.224	0.244	0.027
2008:09	0.113	0.208	0.216	0.022
2008:10	0.117	0.224	0.232	0.025
2008:11	0.122	0.224	0.234	0.026
2008:12	0.122	0.220	0.240	0.026
2009:01	0.139	0.260	0.256	0.032
2009:02	0.128	0.234	0.255	0.029
2009:03	0.133	0.244	0.271	0.032
2009:04	0.129	0.235	0.271	0.032
2009:05	0.137	0.260	0.274	0.034
2009:06	0.126	0.238	0.256	0.029
2009:07	0.126	0.231	0.246	0.028
2009:08	0.118	0.216	0.227	0.024
2009:09	0.120	0.219	0.237	0.026
2009:10	0.129	0.240	0.260	0.030
2009:11	0.123	0.223	0.247	0.027
2009:12	0.124	0.221	0.264	0.030
2010:01	0.134	0.249	0.253	0.030
2010:02	0.119	0.221	0.241	0.026
2010:03	0.117	0.214	0.229	0.024
2010:04	0.116	0.215	0.240	0.025
2010:05	0.122	0.223	0.240	0.026
2010:06	0.114	0.209	0.223	0.023

Table A2

Kolmogorov-Smirnov test p -values:
comparisons within the period affected by the crisis

Comparison	p -value
2008:07 vs. 2009:07	0.997
2008:08 vs. 2009:08	0.977
2008:09 vs. 2009:09	0.551
2008:10 vs. 2009:10	0.813
2008:11 vs. 2009:11	0.977
2008:12 vs. 2009:12	0.684
2009:01 vs. 2010:01	0.551
2009:02 vs. 2010:02	0.916
2009:03 vs. 2010:03	0.078
2009:04 vs. 2010:04	0.235
2009:05 vs. 2010:05	0.052
2009:06 vs. 2010:06	0.116
2008-H2 vs. 2009-H2	0.997
2009-H1 vs. 2010-H1	0.551
2008:07–2009:06 vs. 2009:07–2010:06	0.916

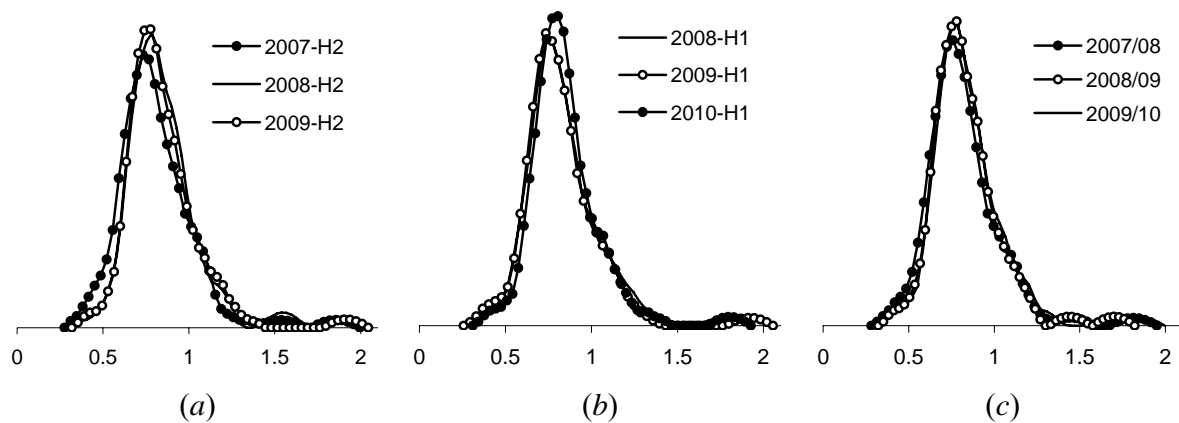


Fig. A1. Kernel density estimates of semiannual and 12-month income distributions:
(a) the second half-years; (b) the first half-years; (c) 12 months beginning in July.
NB: real incomes normalized to the national average are plotted on the horizontal axis.

Table A3
Summary statistics of the price differential

Period	Russia as a whole		Excluding difficult-to-access regions		European Russia	
	Mean	SD	Mean	SD	Mean	SD
2007:07	0.181	0.199	0.120	0.088	0.104	0.081
2007:08	0.195	0.218	0.128	0.098	0.093	0.073
2007:09	0.191	0.220	0.121	0.098	0.086	0.069
2007:10	0.182	0.213	0.115	0.092	0.083	0.065
2007:11	0.176	0.206	0.110	0.087	0.082	0.062
2007:12	0.172	0.200	0.108	0.084	0.081	0.061
2008:01	0.169	0.193	0.108	0.082	0.082	0.061
2008:02	0.166	0.188	0.107	0.081	0.081	0.060
2008:03	0.166	0.187	0.108	0.081	0.084	0.061
2008:04	0.167	0.183	0.111	0.083	0.086	0.062
2008:05	0.165	0.178	0.111	0.080	0.092	0.066
2008:06	0.172	0.178	0.118	0.085	0.098	0.070
2008:07	0.188	0.182	0.134	0.095	0.109	0.079
2008:08	0.197	0.200	0.135	0.099	0.104	0.077
2008:09	0.189	0.202	0.125	0.094	0.096	0.073
2008:10	0.181	0.198	0.118	0.091	0.092	0.069
2008:11	0.181	0.197	0.120	0.093	0.092	0.070
2008:12	0.181	0.197	0.119	0.093	0.090	0.068
2009:01	0.181	0.196	0.119	0.093	0.091	0.068
2009:02	0.190	0.202	0.126	0.100	0.094	0.071
2009:03	0.196	0.207	0.131	0.103	0.096	0.073
2009:04	0.197	0.212	0.130	0.104	0.093	0.071
2009:05	0.197	0.215	0.130	0.103	0.094	0.071
2009:06	0.197	0.211	0.131	0.102	0.099	0.072
2009:07	0.198	0.217	0.131	0.099	0.102	0.076
2009:08	0.202	0.225	0.131	0.102	0.094	0.071
2009:09	0.208	0.230	0.135	0.107	0.097	0.072
2009:10	0.212	0.230	0.139	0.110	0.101	0.075
2009:11	0.212	0.230	0.139	0.110	0.101	0.075
2009:12	0.212	0.230	0.140	0.113	0.099	0.072
2010:01	0.201	0.216	0.136	0.111	0.095	0.073
2010:02	0.198	0.213	0.133	0.109	0.093	0.071
2010:03	0.197	0.212	0.133	0.107	0.094	0.072
2010:04	0.201	0.215	0.135	0.109	0.096	0.072
2010:05	0.201	0.214	0.137	0.108	0.099	0.073
2010:06	0.201	0.211	0.137	0.107	0.100	0.076
2007-H2	0.182	0.209	0.115	0.090	0.086	0.068
2008-H1	0.167	0.184	0.109	0.081	0.086	0.063
2008-H2	0.185	0.196	0.124	0.093	0.095	0.072
2009-H1	0.192	0.207	0.127	0.101	0.094	0.070
2009-H2	0.207	0.227	0.135	0.107	0.098	0.072
2010-H1	0.199	0.213	0.135	0.108	0.096	0.072
2007/08	0.174	0.197	0.112	0.085	0.085	0.064
2008/09	0.188	0.201	0.125	0.096	0.094	0.071
2009/10	0.202	0.220	0.134	0.107	0.096	0.072

Table A4
Estimates of Model (1)

Period	Russia as a whole		Excluding difficult-to-access regions		European Russia		
	β	γ	β	γ	β	γ	p -value of γ
2007:07	0.136 (0.006)	0.096 (0.004)	0.071 (0.004)	0.022 (0.002)	0.070 (0.005)	0.019 (0.003)	0.000
2007:08	0.135 (0.007)	0.123 (0.005)	0.084 (0.004)	0.043 (0.002)	0.065 (0.005)	0.014 (0.003)	0.000
2007:09	0.128 (0.007)	0.126 (0.005)	0.079 (0.004)	0.045 (0.002)	0.072 (0.005)	0.013 (0.003)	0.000
2007:10	0.175 (0.008)	0.126 (0.005)	0.068 (0.004)	0.042 (0.002)	0.062 (0.005)	0.012 (0.003)	0.000
2007:11	0.147 (0.008)	0.109 (0.004)	0.050 (0.004)	0.038 (0.002)	0.078 (0.004)	0.009 (0.003)	0.000
2007:12	0.194 (0.008)	0.097 (0.003)	0.070 (0.003)	0.036 (0.002)	0.076 (0.004)	0.007 (0.002)	0.003
2008:01	0.126 (0.006)	0.107 (0.004)	0.059 (0.003)	0.034 (0.002)	0.047 (0.004)	0.003 (0.002)	0.140
2008:02	0.174 (0.008)	0.098 (0.004)	0.073 (0.004)	0.032 (0.002)	0.062 (0.004)	0.002 (0.002)	0.314
2008:03	0.155 (0.008)	0.099 (0.004)	0.062 (0.004)	0.032 (0.002)	0.061 (0.004)	0.004 (0.002)	0.057
2008:04	0.175 (0.008)	0.093 (0.003)	0.069 (0.004)	0.034 (0.002)	0.043 (0.004)	0.006 (0.002)	0.004
2008:05	0.166 (0.008)	0.086 (0.003)	0.064 (0.004)	0.027 (0.002)	0.061 (0.005)	0.006 (0.002)	0.013
2008:06	0.166 (0.007)	0.089 (0.003)	0.072 (0.004)	0.030 (0.002)	0.067 (0.005)	0.011 (0.003)	0.000
2008:07	0.172 (0.008)	0.096 (0.003)	0.066 (0.005)	0.041 (0.002)	0.065 (0.005)	0.029 (0.003)	0.000
2008:08	0.161 (0.007)	0.114 (0.004)	0.092 (0.005)	0.044 (0.002)	0.063 (0.005)	0.019 (0.003)	0.000
2008:09	0.222 (0.009)	0.102 (0.003)	0.098 (0.005)	0.039 (0.002)	0.050 (0.006)	0.014 (0.003)	0.000
2008:10	0.207 (0.010)	0.097 (0.003)	0.075 (0.005)	0.035 (0.002)	0.065 (0.006)	0.014 (0.003)	0.000
2008:11	0.217 (0.009)	0.094 (0.003)	0.087 (0.005)	0.037 (0.002)	0.056 (0.005)	0.013 (0.003)	0.000
2008:12	0.208 (0.008)	0.098 (0.003)	0.087 (0.004)	0.039 (0.002)	0.044 (0.005)	0.014 (0.003)	0.000
2009:01	0.132 (0.007)	0.109 (0.004)	0.053 (0.004)	0.039 (0.002)	0.038 (0.005)	0.012 (0.003)	0.000
2009:02	0.159 (0.007)	0.113 (0.004)	0.074 (0.005)	0.045 (0.002)	0.045 (0.005)	0.014 (0.003)	0.000
2009:03	0.168 (0.008)	0.118 (0.004)	0.076 (0.005)	0.049 (0.002)	0.063 (0.005)	0.016 (0.003)	0.000
2009:04	0.180 (0.008)	0.119 (0.004)	0.081 (0.005)	0.051 (0.002)	0.057 (0.005)	0.015 (0.003)	0.000
2009:05	0.175 (0.008)	0.115 (0.004)	0.077 (0.004)	0.047 (0.002)	0.063 (0.005)	0.013 (0.003)	0.000
2009:06	0.169 (0.008)	0.110 (0.004)	0.074 (0.005)	0.043 (0.002)	0.068 (0.005)	0.015 (0.003)	0.000
2009:07	0.225 (0.010)	0.105 (0.003)	0.082 (0.005)	0.041 (0.002)	0.073 (0.006)	0.019 (0.003)	0.000
2009:08	0.238 (0.011)	0.112 (0.004)	0.085 (0.005)	0.046 (0.002)	0.071 (0.006)	0.014 (0.003)	0.000
2009:09	0.254 (0.011)	0.114 (0.003)	0.086 (0.006)	0.050 (0.002)	0.069 (0.006)	0.016 (0.003)	0.000
2009:10	0.211 (0.010)	0.117 (0.004)	0.074 (0.006)	0.050 (0.003)	0.070 (0.006)	0.016 (0.003)	0.000
2009:11	0.223 (0.010)	0.117 (0.004)	0.085 (0.006)	0.049 (0.003)	0.065 (0.006)	0.016 (0.003)	0.000
2009:12	0.258 (0.011)	0.112 (0.003)	0.102 (0.006)	0.054 (0.003)	0.072 (0.005)	0.014 (0.003)	0.000
2010:01	0.157 (0.007)	0.125 (0.004)	0.070 (0.005)	0.057 (0.003)	0.062 (0.005)	0.015 (0.003)	0.000
2010:02	0.202 (0.009)	0.115 (0.003)	0.083 (0.005)	0.055 (0.003)	0.078 (0.006)	0.015 (0.003)	0.000
2010:03	0.205 (0.009)	0.115 (0.004)	0.083 (0.005)	0.054 (0.003)	0.076 (0.006)	0.014 (0.003)	0.000
2010:04	0.212 (0.010)	0.117 (0.004)	0.089 (0.005)	0.055 (0.003)	0.047 (0.006)	0.014 (0.003)	0.000
2010:05	0.217 (0.009)	0.107 (0.003)	0.091 (0.005)	0.050 (0.002)	0.062 (0.006)	0.013 (0.003)	0.000
2010:06	0.219 (0.009)	0.106 (0.003)	0.093 (0.005)	0.049 (0.002)	0.061 (0.006)	0.017 (0.003)	0.000
2007-H2	0.168 (0.008)	0.110 (0.004)	0.074 (0.004)	0.038 (0.002)	0.062 (0.005)	0.012 (0.003)	0.000
2008-H1	0.165 (0.008)	0.095 (0.003)	0.068 (0.004)	0.032 (0.002)	0.070 (0.004)	0.005 (0.002)	0.035
2008-H2	0.212 (0.009)	0.100 (0.003)	0.089 (0.005)	0.039 (0.002)	0.070 (0.005)	0.016 (0.003)	0.000
2009-H1	0.171 (0.008)	0.114 (0.004)	0.076 (0.005)	0.046 (0.002)	0.061 (0.005)	0.014 (0.003)	0.000
2009-H2	0.240 (0.011)	0.113 (0.004)	0.087 (0.006)	0.049 (0.002)	0.051 (0.006)	0.015 (0.003)	0.000
2010-H1	0.207 (0.009)	0.114 (0.004)	0.086 (0.005)	0.054 (0.002)	0.068 (0.006)	0.014 (0.003)	0.000
2007/08	0.170 (0.008)	0.103 (0.004)	0.072 (0.004)	0.035 (0.002)	0.067 (0.004)	0.009 (0.002)	0.000
2008/09	0.198 (0.008)	0.106 (0.004)	0.087 (0.005)	0.043 (0.002)	0.069 (0.005)	0.015 (0.003)	0.000
2009/10	0.226 (0.010)	0.114 (0.004)	0.087 (0.005)	0.051 (0.002)	0.061 (0.006)	0.014 (0.003)	0.000

NB: The White heteroskedasticity-consistent errors reported in parentheses; all estimates of β are significant at the 0.1% level; all estimates of γ in Russia as a whole and Russia excluding difficult-to-access regions are also significant at the 0.1% level.

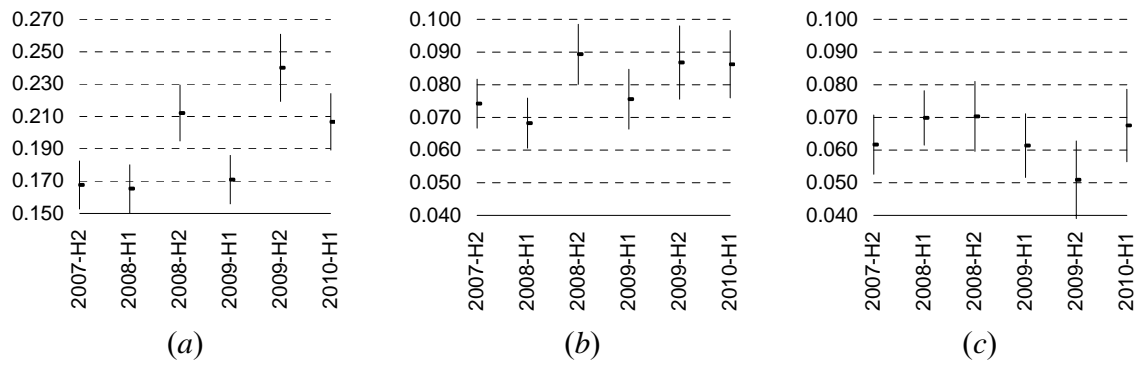


Fig. A2. Confidence intervals of semi-annual estimates of β :
 (a) Russia as a whole; (b) Russia excluding difficult-to-access regions; (c) European Russia.