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The verification of regional capital mobility in the Russian Federation: A spatial econometric approach

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In many cases the perfect capital mobility hypothesis is used by default. Therefore, if we follow this idea there should not be any connection between internal savings and investments in a country or at least this connection must be not significant. But some of empirical research demonstrate opposite results. In economic literature this concept is well-known as the "Feldstein — Horioka Puzzle". Considering the relative lack of studies concerning this theme on the regional level, it seems quite perspective to research the hypothesis from the mesoeconomical point of view. So, the central aim of this article is the verification of regional capital mobility in the Russian Federation, following the logics of the Feldstein — Horioka Puzzle. The main peculiarity of the paper is based on the application a spatial econometric approach. The authors use SLX (spatial lag of X model) and SDM (spatial Durbin model) models to achieve the aim. As the result it was found out that there is almost perfect capital mobility situation on the regional level in the Russian Federation. Hereby the Feldstein — Horioka Puzzle was rejected. Along with it several significant direct and indirect effects were established (for instance, reinforced interaction between geographical neighbors-region, absent of capital flow from some regions and other). The results can be used for the consideration of relatively more efficient regional government policy.

Keywords: regional economy, investments, savings, regional capital mobility, Feldstein — Horioka Puzzle, spatial econometrics.

Introduction

Nowadays the perfect capital mobility hypothesis is one of the most used assumptions in different economic models and theories. More than 30 years ago the well-known article by Martin Feldstein and Charles Horioka was represented to an economic society. They invented the indirect method to measure a degree of capital mobility between the developed countries. The core idea of their research was to examine the assumption of complete arbitrage in a perfect world capital market (Feldstein and Horioka, 1980). In other words, it argued that under perfect capital mobility, there was no necessary association between national savings and investment since savings could move globally in search of the highest returns.

Using statistical information of 21 OECD countries for which data were available for years between 1960 and 1974, they found out that β coefficient was significantly different from zero. This fact meant that a major part of national savings preferred to stay in countries of their origins and obviously it was incompatible with their hypothesis.

M. Feldstein and Ch. Horioka provided some explanations for this phenomenon. They assumed that most investors try to avoid the uncertainties and risks associated with foreign investments and prefer to stay in domestic economies. Also, the researchers supposed that perfect capital mobility could be kept by the important national institutional rigidities (Feldstein and Horioka, 1980).

This fundamental research has created great discussions known as the Feldstein — Horioka Puzzle. Since the 1980s a huge number of scientific papers devoted to this empirical fact have been published. Some of these papers demonstrated the existence of the puzzle in some countries; others did not find the phenomenon based on different statistical information (Coakleya, Kulasib and Smith, 1998).

The main aim of this article is to provide a verification of the Feldstein — Horioka Puzzle based on the Russian data. At the same time, the core feature of the research is the Russian regions' data used for the declared purpose (instead of country level data). We should admit that there is a lack of papers devoted to regional capital mobility, especially for Russia and its regions. We implement a spatial econometric approach for this purpose. This approach seems quite reasonable, since special ties may arise between neighboring regions within the same country, particularly in terms of capital flows.

It is known that a region is regarded as a relatively open economic system in comparison with the country level. So, an openness of any region can be treated as its interaction and cooperation with its external environment in a range of aspects (economic, informational, migration etc.). If we consider this assumption, there should not be any correlation between regional investments and savings, or at least it would be on a very low level. Is this theoretical hypothesis confirmed by the Russian regions' data? In other words, does the Feldstein — Horioka Puzzle remains true for them or not?

The rest of the article is organized as follows. Section 2 provides a literature analysis with special focus on regional based papers from over the World. Section 3 describes the foundation of models and methods which we applied in this article. Section 4 is devoted to data and variables. Section 5 reveals the descriptive analysis and the regressions results. Section 6 presents the conclusions.

1. Literature review

Nowadays the Feldstein — Horioka Puzzle (the FH puzzle) remains a topical interest. There has been a lot of research which tries to solve this puzzle in respect of developed and less developed countries. At the same time there are another two types of papers devoted to the theme. The first ones use a range of different econometric methods and attitudes to measure capital mobility empirically. The second ones are designed not only to measure it but also to find explanations of analyzed situations in different countries which correspond to the economic reality.

M. Obstfeld provided a critical assessment of the empirical evidence on the extent of international capital mobility. On the contrary the researcher admitted increasing capital mobility among OECD countries. He noticed that saving and investment rates could be highly correlated in cross-sectional data because of some common factors affecting both. M. Obstfeld provided estimated correlations between quarterly changes in saving and investment rates for seven OECD countries. He established that the saving-investment correlation was an increasing function of country size (Obstfeld, 1985).

These findings were compared with A. Harberger's ideas and could not be used as evidence against perfect mobility due to M. Obstfeld. A. Harberger in turn denoted that the size of particular countries was very important in researching this issue. He admitted that big countries relied less on foreign debt and used their own savings (Harberger, 1980).

Due to L. Summers the assumption of perfect international capital mobility has important implications for the analysis of competitiveness and for other fiscal questions. L. Summers also established the strong relationship between investments and savings using both net and gross measures for several different intervals. He provided several arguments to explain this correlation. For example, Keynesian effects were used as a possible explanation between domestic savings and investments. He also argued that there could be some third factor (e. g., high rates of population) which had the influence on both savings and investments, leading them to be highly correlated. Another possible explanation of this phenomenon provided by L. Summers was that capital was immobile because countries tried to pursue policies that brought savings and investment into balance (Summers, 1988).

Due to some scientists a high time-series correlation between saving and investment can be explained if business cycle shocks are considered. On the other hand, H. Kim verified this hypothesis and established that aggregate shocks only partially explain the high saving–investment correlation as well as country differences in the size of the GNP and the non-traded sector. H. Kim concludes that the puzzle stays a puzzle after all (Kim, 2001).

N. Ketenci examined the validity of the Feldstein — Horioka Puzzle for 26 OECD countries[1] grouped in different panels (the whole group, the EU15, NAFTA, and the G7). It was found out that the lowest statistically significant coefficient was 0.096 (for the EU15 group) and the highest was 0.784 (for the G7 group). So, the puzzle remains in action only for the G7 group (Ketenci, 2013). T. Singh also supported the idea of low capital mobility for most OECD countries[2] (Singh, 2019).

A. Drakos with colleagues concluded that the Feldstein — Horioka Puzzle is partially valid for the European region. Based on the annual data from 1970 to 2015 for 14 European Union countries members[3] they established that the savings-retention coefficient is smaller than 0.60 and statistically significant. It means that a degree of capital mobility can be characterized as moderate. So, the financial integration within the EU has not been completed and it needs more time to build a homogeneous financial area in Europe (Drakos, Kouretas and Vlamis, 2018). In addition, many papers admit that the capital mobility has increased in EU and OECD countries (Kollias, Mylonidis and Paleologou, 2008; Ketenci, 2012).

[1] Observation period: 1970–2008.

[2] 24 countries, observation period: 1970–2006.

[3] Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, Sweden, and the United Kingdom.

Testing the modification[4] of the Feldstein — Horioka Puzzle S. Kim and colleagues considered not only domestic but also regional and global savings. They showed that North America had the most significant role of domestic savings in financing domestic investments, while regional saving was the main source for investments in Europe. At the same time global saving played a significant role in all regions of the World except North America (Kim, Kim and Choi, 2017).

N. Mamingi estimated the Feldstein — Horioka Puzzle based on the data for 58 developing countries over the period 1970 to 1990. He utilized a time series approach, paying special attention to the problems of serial correlation and endogeneity. As a result, N. Mamingi concluded that saving-investment correlations (following Feldstein and Horioka methodology) were much lower for developing countries than what was found before based on OECD or EU data. It meant that financial assets in developing countries were relatively mobile, especially in the long run (Mamingi, 1997).

H. Kasuga compared the results for 23 OECD countries and 79 developing countries during the same periods (1980–1984, 1985–1989, 1990–1994). The author showed that the OECD countries as the countries with more developed primary equity markets have larger saving — investment correlations. In other words, it indicates that capital mobility is relatively high for developing countries (Kasuga, 2004). The similar conclusions were made by C. Bangake and J. C. Eggoh based on data for 37 African countries during 1970–2006 (Bangake and Eggoh, 2011).

J.-H. Ko and Y. Funashima applied a continuous wavelet approach to investigate the Feldstein — Horioka Puzzle in nine countries probably for the longest observation period in this sphere of research — from 1885 to 2010. They showed that a country's size mattered: large countries, such as the United States of America and Italy, had higher correlations than in medium-sized and small countries. Due to the authors, there was so-called a U-shaped pattern of the time path of capital mobility in Italy, Spain, the United Kingdom, and the United States. It means that capital was more mobile prior to World War I and in recent decades (Ko and Funashima, 2019).

Using the bootstrap panel Granger causality approach M. Irandoust showed that capital is more mobile in Estonia, Russian Federation, and Latvia than Lithuania, Belarus, and Ukraine even though it is still not perfectly mobile internationally[5]. As a result, M. Irandoust concluded that one of the possible ways to change the situation would be to remove capital controls and other restrictions by the countries' governments (Irandoust, 2017).

As for Russia there is a lack of scientific research devoted to this question. But anyway, we would like to mention such an article as "Feldstein — Horioka Puzzle: Modern Aspects" by A. Zubarev and P. Trunin. They concluded that national savings were the main source of growth for national investments in the Russian Federation (Zubarev and Trunin, 2013).

Even though discussions concerning reasons and explanations of the puzzle on country level remain open, there can be emphasized some arterial ideas in this sphere. At the same time there are far fewer papers devoted to the problem on the regional (subnational) level.

One of the first papers in this sphere is the research by S. Sinn for the USA. The author showed that the saving and investment link was much looser within a nation than among

[4] 141 countries, observation period: 1980–2014.

[5] Observation period: 1995–2014.

nations. So Due to Sinn this finding provided direct support to the classical theory of international trade, to be more precise: the mobility of capital is higher within a country than among countries (Sinn, 1992).

Another paper devoted to the regional level was produced by T. Bayoumi and A. Rose for the British regions. Their research was based on the available data for 11 regions from 1971–1985. The authors calculated two different sets of savings ratios. The first was represented as the difference between personal disposable income and consumption and divided by personal disposable income. It was regarded as a proxy for the household saving rate. In other words, it excludes (unobservable) corporate and government saving. The second one was calculated as the difference between gross regional product (GRP) and private consumption, divided by GRP. So, it could be interpreted as a proxy for the sum of total saving and government consumption. As a result, they found out that there is no positive correlation between saving and investment regressions across regions. Additionally, it should be admitted that results were quite similar for both savings proxies (Bayoumi and Rose, 1993).

R. Dekle published the paper concerning the 47 Japanese regions (prefectures) for 1975–1988. One of his basic hypotheses was that based on total regional saving and investment data (inclusive of regional government saving and investment) there should be the negative relations between these ratios. As in the previous papers it was not possible to take the saving data on the regional level from the official statistics. So, it was also calculated by the author. Basically, total saving for each prefecture was represented as prefectural gross national product (GNP) minus consumption minus government spending on the regional level. It was concluded that the association between the Japanese regional total saving and investment rates is negative. Also, Deckle provided the idea that the difference between regions and countries in the saving and investment rate responses could be partly explained by demographics (Dekle, 1996).

There are several papers devoted to the puzzle on the regional level in China. For example, K. Chan and others' paper for the 26 Chinese provinces from 1978–2006. It was admitted that on the one hand the Chinese provinces were often subject to common policy shocks from the central government and other nationwide shocks, but with possibly different impacts across them. On the other hand, provinces were also subject to so-called idiosyncratic shocks which could be initiated by province- or region-specific policies. The estimations were repeated for two sub-periods: 1978–1992 and 1993–2006. The authors pointed out that there was a great improvement in capital mobility. It could be due to several factors: the banking reform in 2000 and the liberalization commitments required by the WTO accession in 2001 (Chan et al., 2011).

Another paper for the 28 Chinese 1979–2010 was presented by S. Wang. In comparison with previously mentioned studies, it expanded the FH puzzle under spatial interaction. It also should be mentioned that two proxy variables (a marketization index (MI), a policy index (PI)) for the analysis of institutional environment were introduced in the model. It was shown that the FH coefficient was significantly negative or non-significant over the 1979–1992 period. Due to the author, it could be regarded as the sign of the incompleteness of the market economic system during this period and the authoritarian status of the central government in the process of resource allocation. At the same time, the FH coefficient was significant and greater than 0.64 from 1994 to 2010. It could mean that the regional capital mobility in China was surprisingly weak during this period (Wang, 2016).

Y. Bineau created the research for the 28 Bulgarian regions from 1999–2009. The author assumed that regional savings was a constant part of national savings and these variables could be calculated proportionally to the ratio of regional gross domestic product (GDP) to national GDP. It was shown that the fixed effect model provided better results in comparison with pooled ordinary least squares and the random effects models. Due to this type of model the regression coefficient was 0.149 and significant. In other words, the intra-capital mobility was high. It was concluded that structural policy measures implemented by national authorities led to an increase of intra-national capital mobility over the period, even if the impact on the investment rate was relatively low (Bineau, 2014).

Most of these papers show that capital is more relatively mobile on interregional level rather than on country level. Basically, it corresponds to the idea about the region as an open economic system and results could be applied for an improvement of economic policy.

During the preparation of this article, we did not find the broad scientific discussion devoted directly to the verification of the Feldstein — Horioka Puzzle on the regional level of the Russian Federation, except some initial steps made by one of the authors of this article (2014). The first estimations showed that the degree of intra-regional capital mobility within the 79 Russian regions from 2000–2011 should be close to absolute.

At the same time there are some papers for sure which are consistent with the hypothesis of perfectly mobile intra-national capital flows in Russia, for instance, N. Kurichev and E. Kurichev's research (Kurichev and Kuricheva, 2019), but not directly connected with the Feldstein — Horioka Puzzle.

The presented article uses the common FH puzzle's logics but applies the completely different attitude emphasizing a spatial econometric approach. It really helped to broaden and deepen the understanding of capital mobility processes in such a geographically large and culturally and economically diverse country as the Russian Federation.

2. Model and methods

The analysis of capital mobility is based on finding the existence of a link between investment rates and saving rates in specific territorial units. In the original article by Feldstein — Horioka it is proposed to establish this presence by estimating correlation coefficients. A naive regression analysis of such a relationship involves the estimation of a pairwise regression model of the investment rate on the savings rate.

However, the estimation of pairwise correlation coefficients or the estimation of pairwise regression coefficients can suffer from the problem of endogeneity and can be significantly biased due to the failure to consider many other characteristics of the territorial entity (in this study, a region), which can affect both the investment rate and the savings rate.

Part of the problems can be solved by estimating the panel data models. The general view of such a model is presented in the formula:

$$inv_{it} = \alpha_i + \beta sav_{i,t-1} + \Sigma_{j=1}^{m} \gamma^j x_{i,t-1}^j + \nu_t + \varepsilon_{it}, \tag{1}$$

where i, t are region and year indicators, respectively; inv, sav are investment and savings rates, respectively; x^j is the j-th control variable; α, ν are region and time fixed effects, respectively; ε is error; β, γ^j are slope coefficients; coefficients α, β, γ^j, ν should be estimated empirically.

The estimation of the coefficient β in this model can be interpreted in terms of interregional capital mobility. If the coefficient turns out to be significant, it means that at the regional level the relationship between savings and investment is confirmed at fixed values of control variables, which will lead to the existence of the Feldstein — Horioka Puzzle and reject the hypothesis of perfect regional capital mobility.

The panel data structure allows to use lagged values of the variables in the right-hand side of the equation, which partially solves the problem of endogeneity in the sense of inverse causality, because investment cannot affect savings backward in time. However, there is still a possibility that the saving rate can be an endogenous variable or in other words the saving rate can be correlated with an error term of regression.

The use of regional fixed effects assists in controlling unobserved heterogeneity. In other words, it helps to reflect an influence of unobservable or omitted time-invariant factors. For instance, such unobservable regional effects as a geographical, cultural, or institutional environment factors could be correlated not only with an investment rate, but also with a saving rate of a region. It means that the fixed effect model is more appropriate in this situation than the random effects model or pooled regression, which does not consider the characteristics of panel data.

The use of time fixed effects, in turn, makes it possible to consider in the model various influences and changes that are the same for all regions at each point in time (in this study, a year). It includes various legislative changes at the federal level, changes in the key rate (formerly the refinancing rate) by the Central Bank of the Russian Federation, changes in the exchange rate regime (floating since 2014), even changes in Russia's country ratings and other macroeconomic shocks, both positive and negative, etc.

Also, in order to obtain unbiased regression estimates, it is necessary to control for other important regional characteristics that change over time. Factors related to the economic potential and structure of the region's economy, the level of development of the regional financial (primarily banking) system, and the quality of regional institutions may be important. All these characteristics may influence both investment rates and savings rates.

Nevertheless, even considering all the above, the model presented in formula 1 is still not free from the problem of endogeneity. The estimation of the coefficient at the savings rate can still be biased due to the omission of some important parameters related to the possible existence of spatial dependence between regions, both in terms of investment and savings. In order to account for this dependence, it is necessary to include in the model spatial lags of dependent and explanatory variables, which are weighted average sums of values of different indicators in neighboring or all regions. Spatial lags in errors can be considered in a similar way.

There are many different models accounting for spatial effects. From the point of view of capital mobility analysis and empirical verification of the FH puzzle the most interesting is the SLX model, which extends the model presented in formula 1 to include spatial lags of explanatory variables. A variant of such a model, which is supposed to be estimated, is presented in formula:

$$inv_{it} = \alpha_i + \beta sav_{i,t-1} + \theta \sum\nolimits_{l=1}^{n} w_{il} sav_{l,t-1} + \sum\nolimits_{j=1}^{m} \gamma^j x_{i,t-1}^j + \nu_t + \varepsilon_{it}, \quad (2)$$

where n is the number of regions; w_{il} is the spatial weighting factor reflecting the degree of proximity of region l to region i (spatial weights are assumed exogenous and constant over time); θ is the parameter to be estimated.

The term $\sum_{l=1}^{n} w_{il} sav_{l,t-1}$ expresses the spatial lag of the savings rate for a particular region, i. e., the values of this variable in other regions weighted according to the degree of their geographical proximity to a particular region in a particular year. These weights can be selected by different methods, the most popular of which is selection of weights based on common borders between regions (the coefficient takes on value 1 if there is a common border, and 0 otherwise), as well as based on distance between regions (in this case coefficients are inverse distances between regions, while distance between regional centers is a distance measure). All weights form a so-called matrix of spatial weights reflecting proximity of all regions to each other in pairs. As a rule, such matrices are normalized by rows so that the sum of elements of each row, i. e., total influence of all other regions on a particular region is equal to one.

Thus, the coefficient θ expresses the total impact on investment in a particular region of savings in all other regions. By construction, the neighboring regions have a greater weight in the estimation of this coefficient. Therefore, the statistical significance of the coefficient θ will mean that there is a relationship between investment in the region and savings in neighboring regions, i. e., local clustering of regions in terms of capital flow. In the context of the research question under study it is difficult to interpret this coefficient unambiguously. On the one hand, a significant coefficient θ will confirm the presence of capital mobility, but only at the local level within some territorial clusters. Since this mobility is manifested only at the local level, it will mean a certain "entrenchment" of capital within these very territorial clusters, which will be an indirect argument for rejecting the hypothesis of perfect capital mobility.

Note that the right-hand side of the equation can include spatial lags of any of the explanatory variables, but in this study the interpretation of the coefficient β in combination with the coefficient θ is of interest first and foremost. In order to interpret these coefficients in terms of regional capital mobility, the study suggests econometric estimation of the equation from formula 2 and testing statistical significance of these coefficients with the following joint interpretation of the results (see Table 1).

Table 1. **Interpretation of SLX model estimation results in terms of capital mobility**

Parameter values	Interpretation
$\beta = 0, \theta = 0$	Perfect capital mobility (no capital entrenchment either at the level of an individual region or at the level of a territorial cluster)
$\beta = 0, \theta \neq 0$	"Local"/"Clustered" capital mobility (capital flows mainly to neighboring regions)
$\beta \neq 0, \theta = 0$	Lack of regional mobility of capital (capital stays in the region, not even flowing to neighboring regions)
$\beta \neq 0, \theta \neq 0$	Clustering of capital (capital either stays in the region or flows to neighboring regions)

Source: authors' interpretation of SLX model estimations.

However, the relationship may arise not only between investments and savings in neighboring regions. It is quite natural to assume the presence of spatial autocorrelation in the investment rate. For example, certain regions can act as a kind of locomotive in terms of investment activity, i. e., pull neighboring regions behind them, transferring their experience and ideas. In this case a positive autocorrelation will be observed. At the same time regions may compete for various investment projects, thus causing a negative spatial autocorrelation.

The presence or absence of significant spatial autocorrelation in the dependent variable is not directly relevant to the research question of regional capital mobility, but the omission of an important significant variable, in this case spatial lag of investment rate, can lead to biased estimates of regression coefficients. In this connection it seems reasonable to conduct a preliminary analysis aimed at finding evidence of such spatial autocorrelation (e. g., by Moran test), and to consider and empirically estimate a spatial Durbin model (SDM) which includes spatial lags of both the explanatory variable (savings rate) and the dependent variable (investment rate). A possible type of model for estimation in this case is presented in formula:

$$inv_{it} = \alpha_i + \beta sav_{i,t-1} + \theta \sum_{l=1}^{n} w_{il} sav_{l,t-1} + \sum_{j=1}^{m} \gamma^j x_{i,t-1}^j + \rho \sum_{l=1}^{n} w_{il} inv_{lt} + \nu_t + \varepsilon_{it}, \quad (3)$$

where ρ is the spatial regression coefficient to be estimated; the other notations coincide with those in formulas 1, 2 (note that spatial weighting coefficients may differ for calculating spatial lags of investment and savings, but in this case, there is no reason to believe that such differences exist).

Note that even in the model presented in formula 3, spatial autocorrelation in the errors can persist. Nevertheless, it is proved that the use of SDM model allows to obtain unbiased estimates of coefficients even if the true data generating process is described by SEM model (as well as by SAR). The only problem in this case is the loss of efficiency.

However, after introducing into the model a spatial lag of the dependent variable the interpretation of coefficients in the model becomes more complicated. From the point of view of capital mobility we are interested in direct and indirect effects of savings on investment. The direct effect is the effect of savings in a particular region on investment in the same region. Indirect effect is the effect on investment by savings in neighboring regions, as well as by savings in the same region, but through the effect on investment in neighboring regions, which is possible when spatial lag of dependent variable is included in the model. In SLX model these effects are expressed by coefficients β and θ respectively. In the spatial Durbin model these effects do not coincide with the coefficients (Vega and Elhorst, 2013).

Therefore Table 1 can be generalized for the SDM model, as shown in Table 2.

Table 2. **Interpretation of SDM model estimation results in terms of capital mobility**

Parameter values	Interpretation
Direct effect = 0, Indirect effect = 0	Perfect capital mobility (no capital entrenchment either at the level of an individual region or at the level of a territorial cluster)
Direct effect = 0, Indirect effect ≠ 0	"Local"/"Clustered" capital mobility (capital flows mainly to neighboring regions)
Direct effect ≠ 0, Indirect effect = 0	Lack of regional mobility of capital (capital stays in the region, not even flowing to neighboring regions)
Direct effect ≠ 0, Indirect effect ≠ 0	Clustering of capital (capital either stays in the region or flows to neighboring regions)

Source: authors' interpretation of SLX model estimations.

On the other hand, it seems plausible to assume that past investments drive contemporaneous investments. Therefore, the data generation process considered in this study may well be described by a dynamic model with a lagged dependent variable. Moreover, lagged values of the dependent variable in neighboring regions may be important. In this case the model will take the following form:

$$inv_{it} = \alpha_i + \beta sav_{i,t-1} + \theta \sum_{l=1}^{n} w_{il} sav_{l,t-1} + \sum_{j=1}^{m} \gamma^j x_{i,t-1}^j + \rho \sum_{l=1}^{n} w_{il} inv_{lt} + \\ + \delta inv_{i,t-1} + \tau \sum_{l=1}^{n} w_{il} inv_{l,t-1} + \nu_t + \varepsilon_{it}, \quad (4)$$

where δ, τ are the parameters to be estimated.

After introducing into the model time lags of the dependent variable the interpretation of coefficients in the model becomes even more complicated, because both direct and indirect effects of savings on investments can be decomposed to short-run effects (within one period) and long-run effects.

3. Data and variables

Main variables. It should be mentioned that such indicators as investment and gross regional product are easily accessible in the statistics source of the Russian Federation, but there is no such information for savings on the regional level of Russia. Therefore, regional savings were received by using some calculations. It is well known that conceptually saving can be represented as the excess of profits (incomes) over expenses (consumptions). In view of this approach, gross regional savings were computed in this way:

$$S_{gross} = GRP - C,$$

where S_{gross} — gross savings of a region; GRP — gross regional product; C — aggregate private consumption in a region

We suggest that such an attitude can be interpreted as the first approximation. In this case the variable is a proxy for the sum of total saving and government consumption. So, the same precondition was used by T. Bayoumi and A. Rose in their paper devoted to the research of capital mobility in the 11 UK regions in the period from 1971 to 1985 (Bayoumi and Rose, 1993).

Then we make one step further in clearing the data. Our assumption is that government consumption on a regional level should be extracted to get more market-oriented savings (if we can say so). It means that government consumption's allocation is not always a rational response to economic situations within regions. Sometimes it could be accomplished due to different political and social issues, for example, a desire to equalize standards of living in some regions in the Russian Federation, make it closer to average value.

$$S_{reg} = S_{gross} - G_{reg},$$

where S_{reg} — regional savings; G_{reg} — expenditures of consolidated budgets of a region of the Russian Federation.

The analogous logic was applied by S. Wang during the analysis of China's interregional capital mobility. This article affects 28 provinces of the Chinese mainland for the period 1979–2010 (Wang, 2016).

At the same time, it should be admitted that we use saving rate and investment rate[6] instead of just saving and investment in absolute values. It allows us to standardize the data.

Control variables. In order to consider important characteristics of the region, which may affect both investments and savings, additional data on the following indicators were collected:

— total volume of monetary income of population;

— share of fully depreciated fixed assets, %;

— total deposits of private persons and organizations, mln rubles (end of year);

— aggregate number of regional credit institutions and branches of other credit institutions which headquarters are situated outside a host region[7] (end of year);

— number of organizations (end of year);

— external trade turnover, mln US dollars;

— number of employees in state and local self-government bodies (end of year), persons;

— share of urban population (beginning of year), %;

— number of registered crimes per 100,000 persons.

So, the list of following control variables is used in order to control for a potential and structure of regional economy, regional banking systems' development, and quality of regional institutions.

Indicators calculated for the data were converted into arithmetic averages (except for the share of urban population in the total population — this indicator is included in the model in its original form). All absolute indicators have been transformed into relative ones to avoid distortion of results due to the influence of scale effect or common time trends of variables.

Dataset description. This research is based on the panel data from the 80 Russian regions collected from such an official statistical source of the Russian Federation as the Federal State Statistics Service[8] in the period from 2000 to 2018. This period was selected deliberately. First of all, the year 2000 was the year of V. V. Putin's first term as the President of the Russian Federation. Obviously, it was the beginning of great changes not only in economic, but also political and institutional spheres of the country. Secondly, 2018 was chosen as the end of the observation period because there is a time lag (2–3 years) in statistical regional data in Russia.

It should be noticed that nowadays there are 85 regions in Russia. The Crimea and Sevastopol joined the Russian Federation only in 2014. The Chechen Republic was not included in the observation because of the lack of statistical data in the period of 2000–2004. So, 3 regions were excluded from the database.

Also Khanty-Mansi Autonomous Okrug — Yugra, Yamalo-Nenets Autonomous Okrug and Nenets Autonomous Okrug were not considered separately because due to

[6] Saving rate = Saving / GRP; Investment rate = Investment / GRP.

[7] The Central Bank of Russian Federation. (2021) *Data from "Quantitative characteristics of the banking sector of the Russian Federation"*. Available at: https://cbr.ru/statistics/bank_sector/lic/ a_72652 (accessed: 20.03.2021). (In Russian)

[8] Federal State Statistics Service. (2021) *Data from "Regions of Russia. Socio-economic indicators" publications* (2012–2020). Available at: https://rosstat.gov.ru/folder/210/document/13204 (accessed: 15.02.2021). (In Russian)

the federation formation their data was included in such regions as Tyumen Oblast and Arkhangelsk Oblast.

To avoid distortions in empirical estimates, the dependent variable (investment rate) was cleared of outliers by censoring the upper 0.5 % and lower 0.5 % of observations. These observations include such regions as Amur Oblast, Moscow, Sakhalin Oblast, and the Republic of Tyva. Even though outliers are observations for only some years for these regions, they are completely excluded from the analysis to ensure balance of the panel, which is important when evaluating spatial econometric models using the quasi-maximum likelihood method.

Also, due to the lack of data for 2000 on several control variables and the need to use lagged values in regression, the data set used is limited to the period 2002–2018.

Thus, the final balanced panel contains 1275 observations on 75 Russian regions for the period 2002–2018.

The final set of variables and their basic descriptive statistics and estimates of pairwise correlation coefficients are presented in Tables 3, 4.

Table 3. **Variables, definitions and descriptive statistics (number of observations = 1275)**

Variable	Definition	Mean	Std Dev.	Min	Max
inv	Investment rate	25.313	8.337	10.810	69.710
sav	Savings rate	–1.379	26.472	–161.910	78.981
income	Real monetary income per capita	4080.272	1700.145	874.860	11 603.491
depr	Share of fully depreciated fixed assets, %	44.893	8.686	15.400	67.300
trade	Ratio of external trade turnover to GRP	0.072	0.095	0.000	0.867
urb	Share of urban population (beginning of year), %	69.290	12.245	26.000	100.000
banks	Ratio of aggregate number of regional credit institutions and branches of other credit institutions which headquarters are situated outside a host region to the total number of organizations within a region	0.001	0.001	0.000	0.005
dep	Ratio of total deposits of private persons and organizations to GRP	0.214	0.112	0.003	0.667
offic	Ratio of number of employees in state and local self-government bodies to total population of a region	0.014	0.007	0.005	0.062
crim	Number of registered crimes per 100,000 persons	1840.350	703.252	310.000	4941.000

Source: authors’ calculations based on the Federal State Statistics Service and the Central Bank of the Russian Federation data.

It can be seen from the correlation matrix that there is a negative statistically significant relationship between the investment rate and the savings rate. All other variables also have a statistically significant relationship to the investment rate and almost all of them to the savings rate, which makes them acceptable as control variables. Control variables are also statistically significantly related, but the degree of closeness is not so great as to be afraid of multicollinearity issues. Some areas of relationships are not consistent with economic intuition, but more accurate estimates can be obtained and interpreted after evaluating the complete model through regression analysis.

Table 4. **Correlation matrix**

Variable	inv	sav	income	depr	trade	urb	banks	dep	offic
inv	1								
sav	–0.0960*	1							
income	0.1892*	0.3299*	1						
depr	–0.1702*	0.1412*	–0.0422	1					
trade	0.0977*	0.4352*	0.5928*	–0.0455	1				
urb	–0.2352*	0.5376*	0.3409*	0.0278	0.3509*	1			
banks	0.1731*	–0.1237*	–0.0937*	–0.2116*	–0.2503*	–0.1457*	1		
dep	–0.1404*	0.0166	0.3381*	0.1601*	0.3216*	0.3826*	–0.5657*	1	
offic	0.1388*	–0.0003	0.4321*	–0.1237*	0.1694*	–0.0325	0.1536*	0.1047*	1
crim	–0.0618*	0.2602*	–0.0193	–0.2428*	–0.0571*	0.2709*	0.1838*	–0.2729*	0.0562*

* $p < 0.05$.

Source: authors' calculations based on the Federal State Statistics Service and the Central Bank of the Russian Federation data.

When incorporated into the model, the investment and savings rates will be left unchanged to conform to economic theory and allow for natural interpretation of the results. All continuous controls will be included in the model in natural logarithms to bring their distribution closer to normal.

4. Results

Descriptive analysis. In the original Feldstein — Horioka article, capital mobility was evaluated based on estimates of correlation coefficients between investments and savings. At the same time, the statistical significance of such a coefficient in combination with a large absolute value allows to reject the hypothesis of perfect capital mobility. Even considering the above-mentioned limitation of analysis, it is interesting to look at the results of such an assessment for the Russian regions.

Figure 1 shows the dynamics of change in cross-sectional estimates of the correlation coefficient between the investment rate and savings rate in Russian regions by years. The point indicates a single year (2005), when the estimated correlation coefficient significantly differs from zero (the coefficient estimate is negative and equals –0.334, p-value = 0.003).

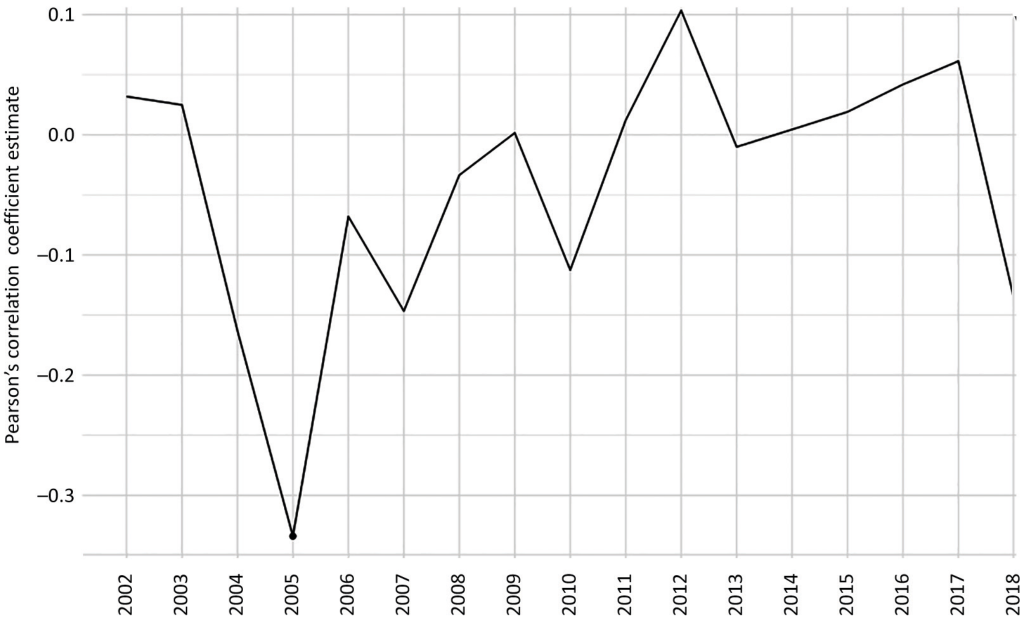

Fig. 1. Dynamics of estimates of the correlation coefficient between the investment rate and the savings rate in the Russian regions

S o u r c e: authors' calculations based on the Federal State Statistics Service data.

For the most years of the period under review the estimated correlation coefficient was insignificant. It is possible to make a preliminary conclusion that there is perfect regional capital mobility in Russia in accordance with the Feldstein — Horioka approach. However, it should be noted that the estimated correlation coefficient for pooled data including all years is statistically significant and equals –0.096 (p-value = 0.001).

It is necessary to keep in mind the possibility of spatial correlation by both the investment rates and savings rates across regions. The maps in Figs 2 and 3 show that regions are clustered to a certain extent according to their investment and savings rates, which adds confidence in the presence of spatial correlation.

Also, looking at Fig. 3 and descriptive statistics from Table 1, one can notice significant differences between Russian regions in terms of savings rates. We found out that some regions had negative value of savings. Probably it means that they consume more than produce. So, such regions continue to operate with help of some subsidies and loans from the Federal Center. We could conventionally name them as "receiver" and other regions which have positive value of saving could be called as "donors". It does not mean that donors donate some financial resources directly to receivers. Obviously, this situation is the result of redistribution of the Russian Federation's tax structure and budget system.

Formally, it is possible to confirm the presence of spatial correlation by calculating the Moran's Index introduced by P. Moran (Moran, 1950). Fig. 4 presents Moran's Index values for investment rate and savings rate in Russian regions calculated separately for each year and using two different spatial weight matrices: contiguity matrix and inverse distance matrix. Both matrices were normalized by rows, and the distance between geographical centroids of the regions was used as a measure of distance.

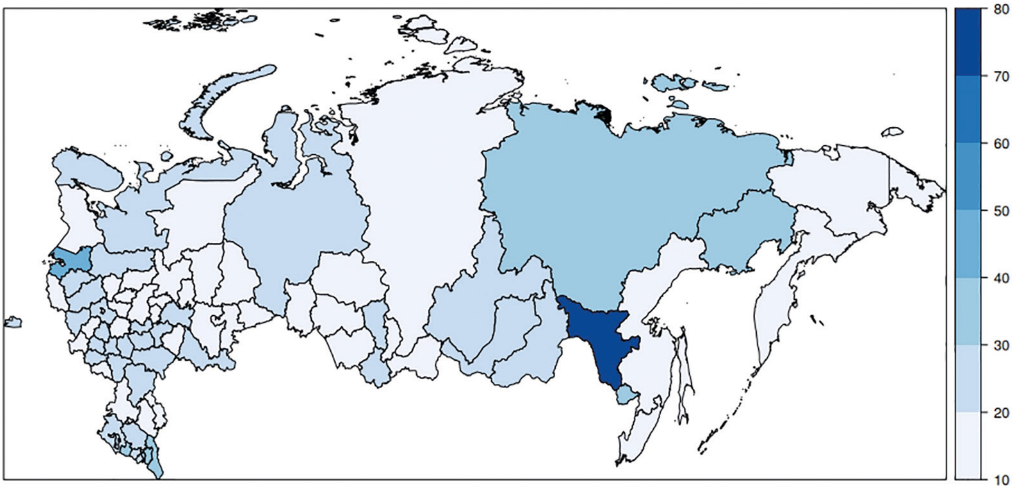

Fig. 2. Investment rate across Russian regions in 2018

Source: authors' calculations based on the Federal State Statistics Service data.

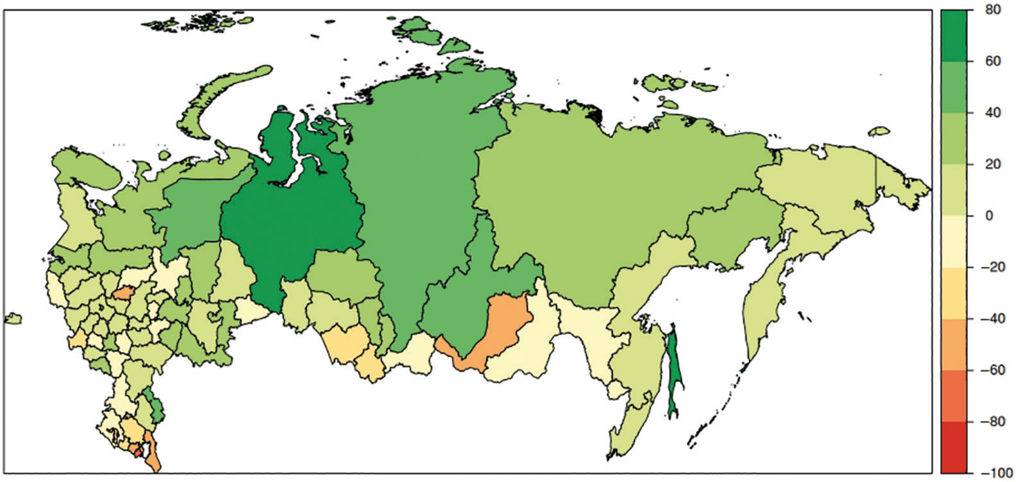

Fig. 3. Savings rate across Russian regions in 2018

As with Fig. 1, points indicate years, when the estimated index significantly differs from zero at least at 10 % level.

Considering the preliminary nature of the results obtained, several conclusions can be drawn, as well as some possible trends. First, there is only positive spatial correlation between Russian regions (all statistically significant estimated coefficients are positive). Secondly, the spatial correlation is much stronger for the savings rate than for the investment rate (the estimated Moran indices are statistically significant for the savings rate in all years and for the investment rate only in some periods).

At the same time, the use of the contiguity weight matrix may be better suited to describe the spatial correlation of Russian regions comparing with inverse distance matrix,

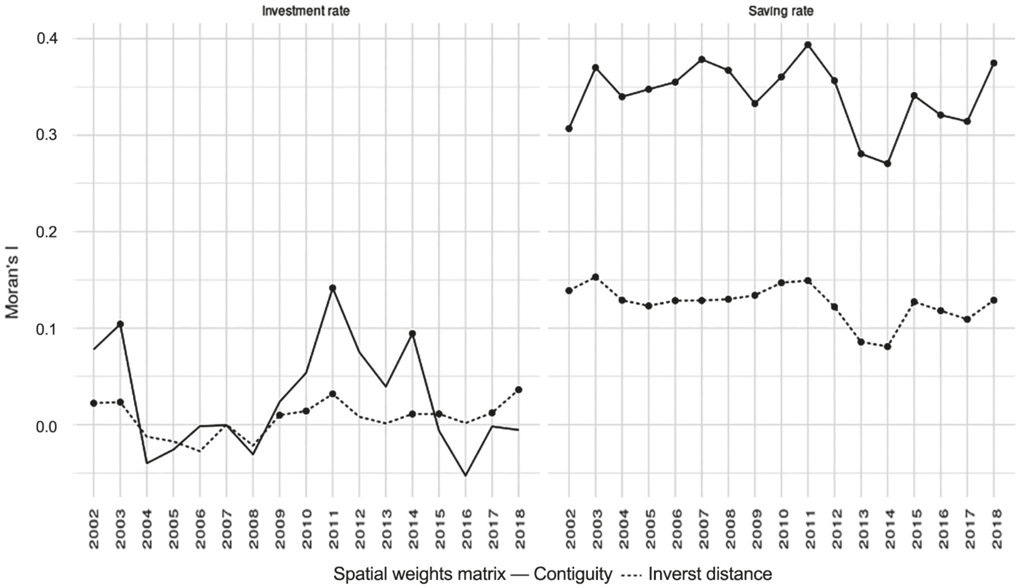

Fig. 4. Dynamics of estimates of the Moran's I index for investment rate and savings rate in Russian regions

S o u r c e: authors' calculations based on the Federal State Statistics Service data.

at least in terms of the savings rate (Moran indices assessed using such a spatial weighting matrix are sustainably higher in absolute value in all years).

In addition to the calculation of the global Moran's Index, which failed to reveal an obvious spatial correlation between the Russian regions in terms of investment rates, some information on spatial relationships can be obtained by calculating local Moran's indices for defining a contribution of each region to global spatial correlation in each period of time (Anselin, 1995). Calculations revealed that in all periods the Moran's local indices assessed for the investment rate are positive, which indicates the clustering of regions, i. e. similarity of some regions with their neighbors in this aspect. The values of the calculated indices vary from 0.414 to 5.630. However, not all is statistically significant: on average, only 8.53 regions per year, and the list of regions varies from year to year. The most common regions that were identified similar to their neighbors: the Republic of Kalmykia (6 times over the whole period), Ivanovo Oblast (5 times), Astrakhan Oblast, Khabarovsk Krai, Kostroma Oblast, and Novosibirsk Oblast (4 times each).

Therefore, the results of the descriptive analysis allow to speak with a certain degree of conventionality about the presence of perfect capital mobility in Russia, as well as about some spatial correlation of Russian regions in terms of investment rates and savings rates. However, more precise conclusions can only be drawn based on detailed regression analysis, the results of which will be further discussed.

Estimating the complete model. Table 5 presents the results of regression analysis of regional capital mobility in Russia using contemporaneous spatial models (without taking into account the dynamic components related to dependent variables). All models are estimated on panel data for 75 regions over 16 years. In all models, the variables in the

Table 5. **Regression results (spatial Durbin models, dependent variable — investment rate)**

Variables and technical parameters	(1)	(2)	(3)	(4)
Main regressors (first time lags)				
sav	–0.027	–0.029	–0.014	–0.012
	(0.061)	(0.054)	(0.064)	(0.060)
depr	2.271	2.616	2.466	2.990
	(2.548)	(2.540)	(2.532)	(2.590)
income	4.603	5.419	4.601	4.979
	(4.560)	(3.849)	(4.468)	(4.113)
banks	0.370	1.038	–0.113	–0.051
	(1.075)	(1.154)	(1.098)	(1.164)
dep	–1.499	–1.661	–1.906	–1.981
	(2.571)	(2.521)	(2.520)	(2.532)
offic	6.106	6.121	5.772	5.204
	(6.572)	(5.939)	(7.031)	(6.683)
urb	5.268	0.046	8.669	1.682
	(13.068)	(13.390)	(13.071)	(13.429)
crim	2.066	2.343	1.617	1.959
	(2.628)	(2.426)	(2.631)	(2.555)
trade	0.850	0.830	0.843	0.641
	(0.718)	(0.721)	(0.708)	(0.691)
Spatial lags of main regressors (first time lags)				
sav	0.071	0.077	**0.514*****	**0.664*****
	(0.043)	(0.049)	(0.179)	(0.253)
depr		2.399		–7.826
		(4.554)		(16.965)
income		0.754		16.394
		(6.702)		(23.647)
banks		–4.089***		–22.830**
		(1.468)		(9.380)
dep		2.672		6.777
		(2.693)		(7.764)
offic		4.944		–11.189
		(8.349)		(40.109)

Variables and technical parameter	(1)	(2)	(3)	(4)
urb		30.238		−22.010
		(34.438)		(151.323)
crim		−0.770		2.806
		(3.671)		(16.860)
trade		−2.805**		−8.542**
		(1.190)		(4.140)
Spatial lag of dependent variable	0.088	0.097	0.037	0.023
	(0.072)	(0.074)	(0.203)	(0.203)
N	1275	1275	1275	1275
AIC	8088.584	8068.238	8078.078	8068.907
BIC	8490.338	8511.198	8479.833	8511.867
Log-likelihood	−3966.292	−3948.119	−3961.039	−3948.454

Clustered by region standard errors in parentheses. All equations include regional and time fixed effects. Constants and fixed effects are not shown for brevity.

All variables, except for inv and sav are taken in natural logarithms; in the right-hand side of the equation — the first lags of regressors are taken.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Source: authors' calculations.

right-hand side of the equation are taken with a lag of one year. All regressions take into account region and time fixed effects, and also include spatial effects. Regressions (1), (3) include spatial lags of the dependent variable (investment rate) as well as spatial lags of the main explanatory variable (savings rate). Regressions (2), (4) supplement regressions (1), (3) by adding to the equation spatial lags of all variables from the right side of the equation. Regressions (1), (2) are estimated by using contiguity weight matrix, while regressions (3), (4) — by using inverse distance weight matrix.

The main results of regressions estimation, relevant from the point of view of regional capital mobility, are estimated coefficients of savings rate and its spatial lags. On the one hand, we can notice that in all regressions the estimated coefficient at the savings rate is statistically significant not different from zero. The absolute value and statistical significance of the coefficient in the spatial lag of the savings rate vary depending on the chosen spatial weights matrix. Using the inverse distance matrix allows us to obtain significant coefficients. Nevertheless, we should remember that absolute values of coefficients in such regressions cannot be interpreted explicitly. Therefore, it is necessary to calculate direct and indirect effects of savings on investment (see Table 6).

As can be seen from Table 6, the direct effects of savings on investment are not significant in all the regressions considered, which may indicate the presence of capital mobility in a global, nationwide sense, i. e. capital is not locked in one region. Indirect effects proved significant in regressions (1), (3), and (4), but in regression (1) this

Table 6. **Direct and indirect effects of savings on investment for spatial Durbin models**

Effect	(1)	(2)	(3)	(4)
Direct	–0.023	–0.026	–0.011	–0.010
	(0.064)	(0.056)	(0.067)	(0.064)
Indirect	**0.079***	0.083	**0.572****	**0.691****
	(0.047)	(0.054)	(0.253)	(0.308)
Total	0.056	0.057	**0.561****	**0.681****
	(0.086)	(0.072)	(0.281)	(0.316)

Clustered by region standard errors in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Source: authors' calculations.

effect is too low in absolute value and significant only at the 10 % level. In regressions (3), (4) the indirect effects of savings on investment are significant at the level of 5 % and quite large. This is in favor of confirming the hypothesis that investment in the region is related to savings in neighboring regions. Interpreting the results within the terminology presented in Table 2, we can say that the results of regressions (3) and (4) show clustered capital mobility (capital flows mainly to neighboring regions), while results of regressions (1) and (2) support the hypothesis of perfect capital mobility (no capital entrenchment either at the level of an individual region or at the level of a territorial cluster).

Table 7 presents the results of regression analysis of regional capital mobility in Russia using dynamic spatial models. All models presented in Table 7 extend the previous models by including lagged values of the dependent variable in the region as well as in neighboring regions. All regressions are estimated by using the inverse distance weight matrix, since estimation of contemporaneous models has shown that only the use of such matrix allows us to obtain significant results. Regressions (5), (7) include spatial lag of the main explanatory variable (savings rate). Regressions (6), (8) supplement regressions (5), (7) by adding to the equation spatial lags of all variables from the right side of the equation. All regressions include lagged values of the dependent variable, but regressions (7), (8) supplement it by including weighted lagged values of the dependent variable in neighboring regions.

Table 8 presents the direct and indirect effects derived from the estimated regressions from Table 7, in the short-run and long-run periods. As can be seen from the table, there are no significant effects in most cases. There are significant total effects of savings on investment in regressions (5) and (7) for the short run, and significant total effects in regression (7) for the long run. However, the total effect can hardly be interpreted in terms of interregional capital mobility. The only significant effect of the rest is the indirect effect of savings on investment in the regression (7). Thus, the results of the estimation of model in regression (7) provide confirmation of the hypothesis of the clustered capital mobility while the results of the estimation of the other models speak in favor of the hypothesis of perfect capital mobility.

Table 7. **Regression results (dynamic spatial Durbin models, dependent variable — investment rate)**

Variables and technical parameters	(5)	(6)	(7)	(8)
Main regressors (first time lags)				
sav	0.017	0.016	0.020	0.018
	(0.020)	(0.016)	(0.020)	(0.016)
depr	7.246***	7.369***	7.248***	7.383***
	(1.761)	(1.738)	(1.751)	(1.725)
income	–0.276	–1.039	–0.197	–0.989
	(2.289)	(2.030)	(2.299)	(2.042)
banks	0.541	0.417	0.488	0.383
	(0.481)	(0.542)	(0.489)	(0.549)
dep	–0.963	–1.553	–0.987	–1.564
	(1.330)	(1.415)	(1.334)	(1.419)
offic	–3.142	–4.205	–3.249	4.269
	(2.886)	(2.819)	(2.845)	(2.802)
urb	–10.255	–12.713	–10.588	–12.702
	(7.688)	(7.878)	(7.771)	(7.913)
crim	1.805	2.140*	1.829	2.156*
	(1.266)	(1.159)	(1.250)	(1.151)
trade	0.057	–0.008	0.030	–0.023
	(0.609)	(0.583)	(0.612)	(0.585)
Spatial lags of main regressors (first time lags)				
sav	0.151	0.173	0.171*	0.188
	(0.095)	(0.166)	(0.098)	(0.169)
depr		5.086		4.389
		(8.717)		(8.394)
income		9.028		9.821
		(12.840)		(13.111)
banks		–7.112		–7.414
		(6.155)		(6.252)
dep		6.685		6.451
		(4.248)		(4.064)
offic		7.616		9.386
		(25.767)		(26.232)
urb		–27.320		–23.383
		(77.937)		(79.068)
crim		–9.252		–8.961
		(9.382)		(9.520)

Variables and technical parameters	(5)	(6)	(7)	(8)
trade		–4.187		–4.137
		(3.073)		(3.046)
Spatial and time lags of dependent variable				
Spatial lag	0.050	0.026	0.063	0.038
	(0.151)	(0.156)	(0.128)	(0.133)
Time lag	0.698***	0.692***	0.699***	0.693***
	(0.045)	(0.043)	(0.046)	(0.043)
Spatial lag of time lag			–0.204	–0.149
			(0.249)	(0.231)
N	1200	1200	1200	1200
AIC	7090.919	7090.800	7092.372	7090.555
BIC	7742.449	7783.050	7748.992	7782.805
Log-likelihood	–3417.459	–3409.400	–3417.186	–3409.277

Clustered by region standard errors in parentheses. All equations include regional and time fixed effects. Constants and fixed effects are not shown for brevity.

All variables, except for inv and sav are taken in natural logarithms; in the right-hand side of the equation — the first lags of regressors are taken.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Source: authors' calculations.

Table 8. **Direct and indirect effects of savings on investment for dynamic spatial Durbin models**

Effect	(5)	(6)	(7)	(8)
Short run				
Direct	0.016	0.015	0.021	0.020
	(0.019)	(0.016)	(0.019)	(0.016)
Indirect	0.161	0.176	**0.185***	0.197
	(0.101)	(0.172)	(0.100)	(0.160)
Total	**0.178***	0.191	**0.207****	0.216
	(0.101)	(0.170)	(0.102)	(0.160)
Long-run				
Direct	0.060	0.047	0.065	0.058
	(0.089)	(0.172)	(0.064)	(0.054)
Indirect	0.861	0.371	0.391	0.454
	(4.362)	(12.322)	(0.239)	(0.427)
Total	0.921	0.418	**0.456***	0.512
	(4.424)	(12.486)	(0.240)	(0.424)

Clustered by region standard errors in parentheses.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Source: authors' calculations.

Conclusion

The concept of perfect capital mobility is the widely used idea in economic theory. In many cases it is set by default. The Feldstein — Horioka Puzzle in turn is one of the most famous methods to verify capital mobility. Generally, it was created for country level verification. Despite the great number of discussions and a lot of arguments for and against its efficiency, the puzzle remains in effect.

It is known that a region is regarded as a relatively open economic system in comparison with the country level. It can be explained, for example, considering a common institutional environment for regions within one country (common laws, traditions, language in use and etc.). Using this assumption, due to the puzzle there should not be any correlation between regional investments and savings, or at least it would be on a very low level. So, in this situation the theoretical hypothesis would be confirmed.

In this case the Russian Federation is the great space for experiments in this sphere. It consists of 85 highly differentiable regions. In the paper we tested all our models based on data for 75 regions over 16 years. Some regions were excluded because of lack of information for them or because of some statistics anomalies. In general, our estimations did not reject perfect capital mobility on the regional level in the Russian Federation. It is shown that the estimated correlation coefficient for pooled data including all years is statistically significant and equals –0.096 (p-value = 0.001). It was not a big surprise for us and partially corresponded with previous papers which were devoted to, for example, China and British regions.

One of our primary goals was to verify the puzzle researching additional effects with respect to regional relationship complexity. There are a lot of explicit and implicit interconnections between regions. Because of that we implemented a spatial econometric approach. It is reasonable, since special ties arise between neighboring regions within the same country, particularly in terms of capital flows.

With help of SDM model it was established that there could be different situations in terms of capital mobility:

1) perfect capital mobility (no capital entrenchment either at the level of an individual region or at the level of a territorial cluster);

2) “Local”/“Clustered” capital mobility (capital flows mainly to neighboring regions);

3) lack of regional mobility of capital (capital stays in the region, not even flowing to neighboring regions);

4) clustering of capital (capital either stays in the region or flows to neighboring regions).

The analysis shows that direct effects of savings on investment are not significant in all the regressions considered. It may indicate the presence of capital mobility in a global, nationwide sense. In other words, capital is not locked in one region. Indirect effects’ significance was found in some specifications (at the 10 % and 5 % levels). It means that investment in the region could be closely related to savings in neighboring regions. Adding dynamic spatial models, we show that there are no significant effects in most cases.

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Верификация региональной мобильности капитала в Российской Федерации: пространственно-эконометрический подход

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Во многих случаях абсолютная мобильность капитала учитывается по умолчанию. Если следовать данной предпосылке, то не должно наблюдаться какой-либо взаимосвязи между внутренними сбережениями и внутренними инвестициями страны или данная связь должна быть весьма незначительной. Отдельные эмпирические данные свидетельствуют об обратном. В экономической литературе установленное несоответствие известно как парадокс Фельдштейна — Хориоки. При учете относительной неразработанности данного направления в региональном разрезе отдельный интерес представляет анализ гипотезы на мезоэкономическом уровне. Цель написания работы заключается в проверке межрегиональной мобильности капитала в Российской Федерации согласно логике парадокса Фельдштейна — Хориоки. Отличительной особенностью исследования является применение пространственно-эконометрического подхода. Авторы используют SLX (модель пространственного лага объясняющей переменной) и SDM (пространственную модель Дарбина) для достижения поставленной цели. Было установлено, что в Российской Федерации наблюдается ситуация, близкая к ситуации абсолютной межрегиональной мобильности капитала. Таким образом, наличие парадокса Фельдштейна — Хориоки не подтверждено. Наряду с этим был выявлен ряд значимых явных и скрытых эффектов в рамках движения капитала между регионами России (например, усиленное взаимовлияние географически близких регионов, отсутствие перетоков капитала из ряда регионов и другие). Полученные результаты могут быть использованы для разработки более эффективной государственной политики.

Ключевые слова: региональная экономика, инвестиции, сбережения, региональная мобильность капитала, парадокс Фельдштейна — Хориоки, пространственная эконометрика.

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