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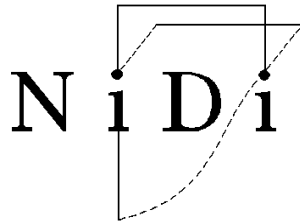
Spatial variation of in-migration to Moscow: housing market VS socialist legacy

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Spatial variation of in-migration to Moscow: housing
market VS socialist legacy

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ABSTRACT

The collapse of state socialism and the introduction of market relationships in Central and Eastern Europe resulted in profound changes of urban development. Evidence from Central and Eastern Europe indicates that the development of strong housing market and growing material inequalities contribute to the socio-economic polarization of city districts and residential segregation. Based on empirical data, we analyze spatial variation of in-migration to Moscow at the level of city districts and investigate the theory-driven association between in-migration intensities and housing prices to find evidence of socio-spatial polarization. Our results show that, although there are some areas that concentrate migrants of specific socio-economic status, housing prices do not explain a substantial share of variance in in-migration intensities, at least at the level of city districts; quite a strong association is only evident for foreign migrants.

KEYWORDS

Post-socialist urban development, Moscow, migration, residential patterns, housing market

HIGHLIGHTS

- Migration is the main driver of population growth in Moscow
- Internal migration accounts for more than 90% of in-migration to Moscow
- Housing prices explain a limited variation of in-migration intensities
- Immigrants from neighboring countries mostly settle in less privileged districts
- Immigrants from remote countries settle in prestigious central districts

INTRODUCTION

More than two decades have passed since the collapse of the state socialism across countries of Central and Eastern Europe (CEE). The exposure to global market and neoliberal economic policies have had a dramatic impact on urban and regional development, as well as the life of the society (Marcinićzak, Gentile, & Stępniać, 2013; Round & Williams, 2010). In the general guidelines of the transition, however, the intensity of processes occurring differed in post-socialist cities, i.e. there is no typical post-socialist city but various urban forms that were subjected to similar processes and evolved into entities showing somewhat different development patterns (Borén & Gentile, 2007). There are quite a few studies on residential socio-economic polarization in the major post-socialist cities of CEE (e.g. Földi & Kovács, 2011; Krupickaitė, 2014; Marcinićzak et al., 2015; Sýkora, 2009). The actual spatial effects of growing inequalities within these cities are subjected to national, regional and local peculiarities (Marcinićzak et al., 2015). We may argue that empirical evidence from each particular city enriches the theory of socio-spatial development of post-socialist cities. The post-socialist cities of the Commonwealth of the Independent States (CIS) are of particular interest as they are still understudied in the academic literature (Borén & Gentile, 2007).

Our study focuses on Moscow as one of the most migration attractive cities of the post-soviet space (Makhrova, Nefedova, & Treivish, 2013). It was regarded as a city of wealth and almost unlimited career possibilities until now (Zubarevich, 2012). With a notable stability Moscow has been gaining roughly one million people each decade in the 20-th century (Denissenko & Stepanova, 2013) despite the social shocks¹ and persistent struggle of authorities to inhibit the process (Hausladen, 1985; Vendina, 2012). The removal of administrative barriers restricting migration to large cities as well as the poor economic situation in regions that followed the transition period, contributed to the intensification of migration to Moscow (Andrienko & Guriev, 2004). According to the survey conducted by the Russian center for public opinion research, one fifth of Russians (19%) would like their children to live in Moscow (Zayonchkovskaya & Mkrtychyan, 2009). The large amount of migrants of different socio-economic status and ethnic origin (Vendina, 2004) arriving to the Russian capital, from a theoretical point of view, should contribute to the socio-economic polarization of neighborhoods and districts for two main reasons. First, people of the same race and ethnic origin tend to migrate to neighborhoods where people alike live (Quillian, 2002; Schelling, 1972); second, the emergence of a housing market in a post-socialist city and increasing disparities of housing prices interrelate with migrants' residential patterns (Brasington, Hite, & Jauregui, 2015).

This paper aims to shed light on spatial variation of in-migration patterns within Moscow and their association with the housing market. Previous studies on the socio-economic differentiation of districts in post-socialist cities have focused mainly on the existing residential patterns (Marcinićzak, 2012; Sýkora, 2009; Vendina, 2002) and on the processes that underpinned them (Borén & Gentile, 2007), while we explore in-migration that to some extent shapes and reshapes the social-economic structure of districts and neighborhoods. The research questions that we address in our paper are: "To what extent has housing market affected residential choices of new in-migrants to Moscow?" and "Has it contributed to the creation of socio-economic polarization of districts?" In order to answer the above questions, we analyze in-migration intensities for 125 Moscow and try to explain their variance with the data on housing prices. The present study of in-migration spatial patterns in Moscow at the

¹ Moscow population reduced from 2.04 mln to 1.03 mln during the Revolution and Civil war of 1917-1920. Similar outcomes happened during the Second World war when Moscow population dropped from 4.2 mln in 1940 to 2.0 mln in 1942 (Vendina, 2012).

level of city districts allows us to add up on the knowledge of urbanization and socio-spatial polarization in post-socialist countries.

Until now, such research for Moscow was not possible due to the scarcity of data on migration. However quite recently a detailed data set on migration flows at the city district level was published (RosStat, 2012). Although the quality of data should not be overestimated, there is a hope that the data are capturing the real process a bit better than they used to do previously (Kashnitsky & Mkrtchyan, 2014; Zayonchkovskaya & Mkrtchyan, 2009).

POST-SOCIALIST SOCIO-SPATIAL CITY STRUCTURE AND POPULATION MOBILITY

The socio-spatial structure of cities under socialism was argued to be less polarized and segregated than in a typical capitalist city of the same time period (Smith, 1996; Szelenyi, 1987; Weclawowicz, 2002). Along with the other aspects of social life organization, urbanization in the socialist cities was developing under central planned economic model. In the absence of an open market, state-control over housing, goods and services insured their distribution on the priority basis (Borén & Gentile, 2007). Thus, social differentiation of population existed, albeit, of different nature; social status and prestige were the indicators of being privileged in the society (Vendina, 1997): party nomenclature, military, scientists, as well as individuals who represented the country on the international arena (e.g. sportsmen, musicians, artists, diplomats). Despite the income equalization, the privileged strata had much better housing opportunities (Szelenyi, 1978).

According to Sýkora (1999), the creation of the socio-spatial differentiation was influenced by two main factors. The first one is that the inner structure of cities, those that were not founded under socialism, was composed of districts build up in different era - pre-socialist and socialist. The high quality pre-socialist quarters usually housed people of higher social status measured in terms of occupation and education (Marcinićzak, 2012; Sýkora, 1999). The second factor is associated with newly built housing estates. The priority-based differentiation of economic activities had also an impact on residential patterns; people of different occupations concentrated in certain newly built areas of the city. Naturally, those of higher social status usually got houses of higher quality with better access to infrastructure (Dangschat & Blasius, 1987). Yet, the barriers between the social strata were generally not too rigid, i.e. people of different status could still be living side by side in the same houses and neighborhoods (Vendina, 1997).

In post-socialist period, income inequalities began to play the crucial role in residential differentiation (Gentile, 2015; Marcinićzak, 2012; Marcinićzak, Musterd, & Stępniać, 2012). Under new conditions, cities in CEE are characterized by contradictory processes. There are simultaneous suburbanization and gentrification in the downtown (Sýkora, 2009; Weclawowicz, 2005). Some districts face hominization, i.e. ghettoization of the rich and the poor citizens, while the others face heterogenization, i.e. newly built or renovated elite housing estates could be located in the proximity of crumbling and abandoned buildings (Gdaniec, 2005). Such development contrasts are more evident in metropolitan areas (A. Smith & Timár, 2010) where rapid economic transition is taking place (Fujita, Kumo, & Zubarevich, 2005) contributing to the greater income disparities.

Those who migrate choose a place to live according to economic opportunities and personal preferences. If post-socialist cities are to follow the development path of capitalist cities, then, the settlement patterns of new migrants, who choose on the basis of their income, should associate with housing prices. Though, these interrelations are complicated: both way influence could be argued (Mulder, 2006). For example, analyzing 20 cities of Italy, Accetturo, Manaresi, Mocetti, & Olivieri (2014) found that “immigration raises average house prices at the city level, while it reduces price growth in the district affected by the inflow vis-à-vis the rest of the city”. Numerous authors argue that low housing prices foster inflow of migrants and increase ethnic and social residential segregation (Bolt, Hooimeijer, & Van Kempen, 2002; S. Musterd, 2005; Sako Musterd & Van Kempen, 2009; van Ham & Manley, 2009). Furthermore, evidence of the spatial clustering of migrants with higher socio-economic status in relatively expensive districts is often found (White, 1998).

But even with respect to newcomers, the profound transformation of spatial residential structures requires a long period of time, as it is limited by historical inertias such as previously accumulated

wealth by the households, emotional attachment to the place of residence, social networks, and social welfare policies that may differ across locations (Borén & Gentile, 2007; Sýkora, 2009). In their study on Russia and Ukraine, Round & Williams (2010) emphasize the essential role that residential locality plays in the life of post-socialist society. Their research states that individuals in post-social countries are highly dependent on the social networks and, thus, the localities in which the interactions take place. Individuals prefer to remain in their current location - even if it is costly - rather than migrate to a cheaper place; social ties play the major role in keeping them.

The inequalities set under socialism, e.g. variable housing quality, differences in service provision, reputation and prestige of certain districts, are the starting point for shaping inequalities under market conditions (Smith, 1996); and the spatial patterns of these structures are specific for each city.

DATA& METHODS

Data

This paper uses data on Moscow migration from a recently published RosStat Municipal Database (RosStat, 2012). The data represent numbers of migrants in 2012 disaggregated by two hierarchical spatial levels (125 city districts grouped in 10 *okrugs*²) and four characteristics of migration flows (Table 1).

Table 1. Characteristics of migration flows

Characteristics of migration flows	Levels
Type (5)	Whole migration Migration between regions of Russia ³ International migration - exchange with CIS - exchange with other countries
Direction (3)	Saldo In Out
Sex (3)	Both Female Male
Age (18)	Total From 0 to 4 ... From 75 to 79 80 and older

Migration data have serious limitations. There is a mismatch between the total numbers of out-migrants as computed by summing up the figures for all districts and the aggregated data published for the whole Moscow. According to aggregated data, 99.7 thousand persons were registered leaving the city in 2012. The summation of district-specific data gives only 42.8 thousand. The discrepancy for in-migration also exists, but it is not so big (205.5 thousand against 183.3 thousand, accordingly). One of the reasons for the discrepancy in in-migration records is that a migrant can be registered by an employer without any reference to a specific district. As for the reason of the big discrepancy in out-migration records, we have only vague intuition. Apparently, a big share of out-migration is

² In July 2012 there was a major administrative reform in Moscow which resulted in almost 2.5 increase in the area of the city. 21 new districts grouped in 2 *okrugs* were cut of Moscow oblast (the region surrounding Moscow). Not much data is available for the sparsely populated new districts. In this paper we analyze Moscow in the administrative borders before the reform of July 2012.

³ There were 83 regions in Russia in 2012. Moscow has the official status of a region (federal unit).

recorded *de facto* at the end of the year; these records contain no information on the districts from which people had left. Taking the data quality into account, we decided to analyze only in-migration.

To compute age-specific migration rates (ASMigR), we use age structure as captured by Russian Census 2010 (RosStat, 2010). Of course, the demographic structure at the moment of Census (14 October 2010) was not the same as it became by 1 January 2012. Yet, we had to assume this equality due to the absence of demographic structure estimates and vital and migration statistics for 2011. This data limitation reduces the preciseness of ASMigR estimates, but the effect of such a limitation is quite moderate and cannot affect migration patterns strongly.

Data on housing prices distribution across Moscow districts were taken from two sources. First are monthly ratings of Moscow districts by average housing *sale* prices (measured in USD per square meter) published by RBC⁴ (2013). These ratings are based on IRN⁵ data. Second data source is average monthly *rental* prices (measured in RUR) in 2012 collected from CIAN⁶ interactive map of real estate prices (CIAN, 2012). These data are based on statistics of rental contracts signed in 2012 and indexed by CIAN database. The quality of the housing prices data is not alarming. The estimates are based on big samples and are unlikely to be inaccurate.

Methods

To compare the intensities of in-migration flows we use Poisson regression which is known to perform better than linear ordinary least squares models dealing with low intensity rates or rates of events happening in a small population (Frome, 1983). This feature of Poisson regression is important for the design of our study because even after generalization of age groups (see Appendix) migration intensities are very small for some partial flows in many districts. Poisson regression models are also implemented to find associations between in-migration rates and housing prices. To assess the explanatory power of regressors, we use analysis of variance (Welch, 1951). Spatial hierarchical decomposition of Theil's index of inequality (Theil, 1979) is applied in order to figure out the most heterogeneous age group in terms of spatial variation of in-migration rates.

For the data preparation, analysis and visualization we used *R*, a language and environment for statistical computing (R Core Team, 2015). Additional packages were used: (i) for data manipulations, *reshape2* (Wickham, 2007), *dplyr* (Wickham & Francois, 2015); (ii) for visualization, *ggplot2* (Wickham, 2009), *rgdal* (Bivand, Keitt, & Rowlingson, 2015), *viridis* (Garnier, 2015), *cowplot* (Wilke, 2015).

⁴ Russian Business Consulting (www.rbc.ru).

⁵ Indicators Rinka Nedvizhimosti (Indicators of Real Estate Market, www.irm.ru).

⁶ Tsentr Informcii i Analitiki Nedvizhimosti (Centre for Real Estate Data and Analytics, www.cian.ru).

COMPARISON OF MIGRATION FLOWS' INTENSITIES

Variation by type of migration flow

Migration intensities are distributed unevenly by the types of migration flows (fig. 1). The whole migration to Moscow is mainly described by between regions movements rather than by international migration. Similarly, immigration to Moscow from abroad is mainly about exchange with CIS (fig. 1A).

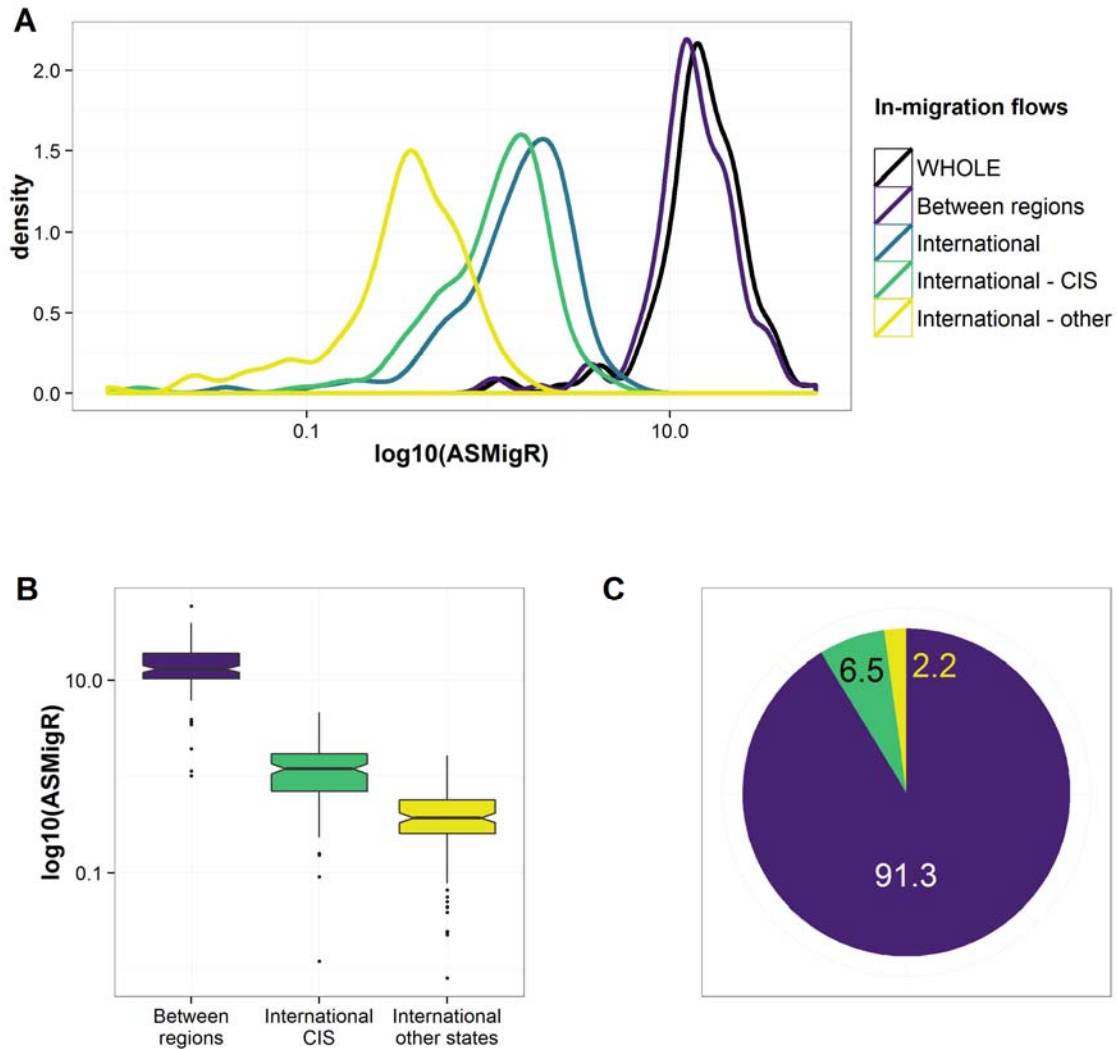


Figure 1. Density (A), box (B), and pie (C) plots of in-migration flows (both sex, total age group) by type of migration flow. Note: two types of international migration (from CIS and from other countries) add up to general international migration; between regions and international migration flows add up to whole migration. Source: RosStat (2012).

To compare intensities formally, we perform Poisson regression controlling for age and sex; reference category for types of flows is whole migration. As it is precisely the sum of all partial flow intensities⁷, between regions and two types of international; the odds ratios (OR) of these partial flows intensities add up to 1. Thus, using Poisson regression we estimate the contribution of each type of migration flow controlling for age and sex (fig. 1C). Between regions migration is responsible for 91.3% of all in-migration to Moscow. The rest 8.7% stand for international migration and is unevenly divided between inflow from CIS (6.5%) and inflow from all other countries (2.2%).

Variation by age and sex

Age variations of migration intensities are, of course⁸, considerable. Interestingly, there is a notable diversity of age profiles by type of migration flow (fig. 2A). We compare age profiles of in-migration flows separately for each type of migration flow, controlling for sex; the reference age group is total. Between regions migration differs from international mostly at “student ages”. The biggest migration influx to Moscow from other regions of Russia is registered at the age group 15-19. Moscow is a huge educational centre for Russia but not for the rest of the world. Thus, immigration from foreign countries occurs at a bit older ages.

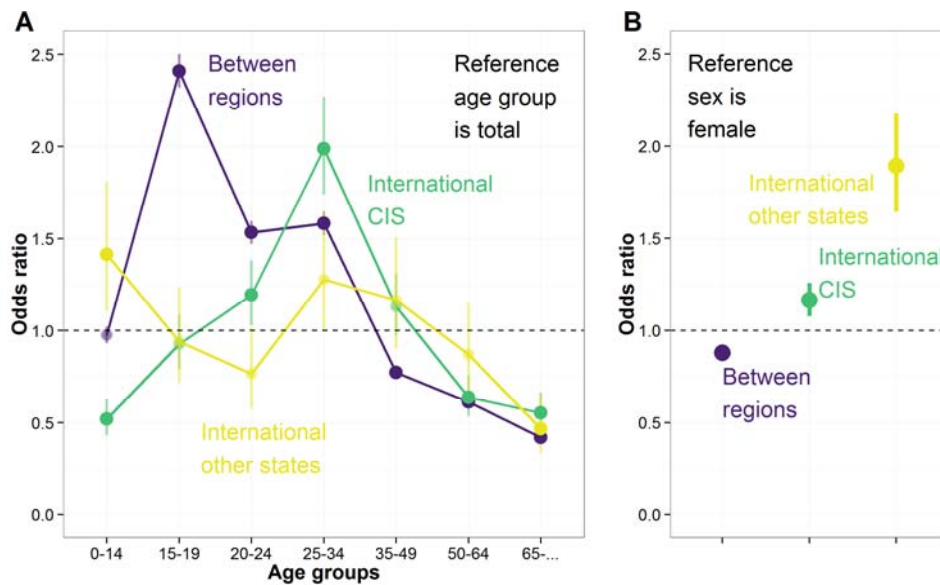


Figure 2. The effect of age (A) and sex (B) on in-migration to Moscow by type of migration flow. Note: for each type of migration flow a separate Poisson regression model was built; models are controlled for sex and age, correspondingly; vertical ticks represent 95% confidence intervals; in panel A, statistically significant ORs are marked with solid dots. Source: RosStat (2012).

⁷ This is true, because each partial flow’s intensity is computed by relating the partial number of migrants to the constant mean population of a city district. The similar logic is not applicable for age and sex because computing ratios for specific age and sex imply relation of partial number of migrants, i.e. to age- and sex-specific populations of city districts.

⁸ Age selectiveness of migration is well known and is observed on virtually any migration data. See for example (Pittenger, 1974) or (Castro & Rogers, 1983).

Immigration from CIS is highly concentrated at prime working ages. These migrants mainly occupy low ranked jobs and earn just enough to survive and send some money back to their families in the counties of origin. According to Demintseva & Peshkova (2014), up to 70% of adult migrants from Middle Asia share one room between 3-8 people. No wonder, three quarters of them have no children in Moscow though only less than 30% of them claim they have no children at all. Our results strongly support these findings. For international immigration from CIS, OR for children aged 0-14 is 0.52 in comparison with total. All in all, migrants from CIS with relatively low socio-economic status cannot afford to move to Moscow with their children. Quite opposite is true for immigration from other countries. As already shown above, the intensity of immigration from countries other than CIS is negligibly low (about 2% of all in-migration). This minor group of migrants is mainly represented by diplomats and consular workers. Of course, these people are of relatively high socio-economic strata. As could be seen from the age distribution of this migration flow, immigrants from non-CIS countries tend to move to Moscow at rather mature ages and with children, though for the prime working ages differences in migration intensities by age are not statistically significant.

Inequality of migration intensities by sex is quite moderate when the whole migration is considered. The OR for men is 9.5% lower comparing with women as a reference and controlling for type of migration flow and age. This finding corresponds with the basics of Ravenstein-Lee theory of migration (Lee, 1966; Ravenstein, 1885). One of the “laws of migration” states that women are more active in short-distance migration while men dominate in long-distance moves. In practice, empirical evidence for this law is usually found in distinction between internal (short-distance) and international (long-distance) migration⁹. In-migration to Moscow is mainly described by internal migration (between regions) in which women dominate (fig. 2B). A separate model for internal migration shows even lower participation of men; OR for men is 13.6% lower comparing with women as a reference and controlling for age. The regression model for international migration flows provides further support for the “international” part of Ravenstein-Lee law. OR for men in international migration is 29.5% higher. Though, international in-migration flow is quite heterogeneous. There is lower predominance of men among migrants from CIS, 15.3%. For immigration from all other countries OR for men is 86.2% higher.

Spatial variation

To analyze spatial variation of in-migration rates, we run Poisson regressions including dummies for districts and okrugs. The mapped ORs represent migration intensity at a given district /okrug in relation to the average intensity for the whole Moscow and controlling for sex and age (fig. 3). For each of the migration types a separate model was built; all regression models were built separately at the levels of districts and okrugs.

⁹ Distance here should be broadly considered as the cumulative cost of migration rather than physical distance.

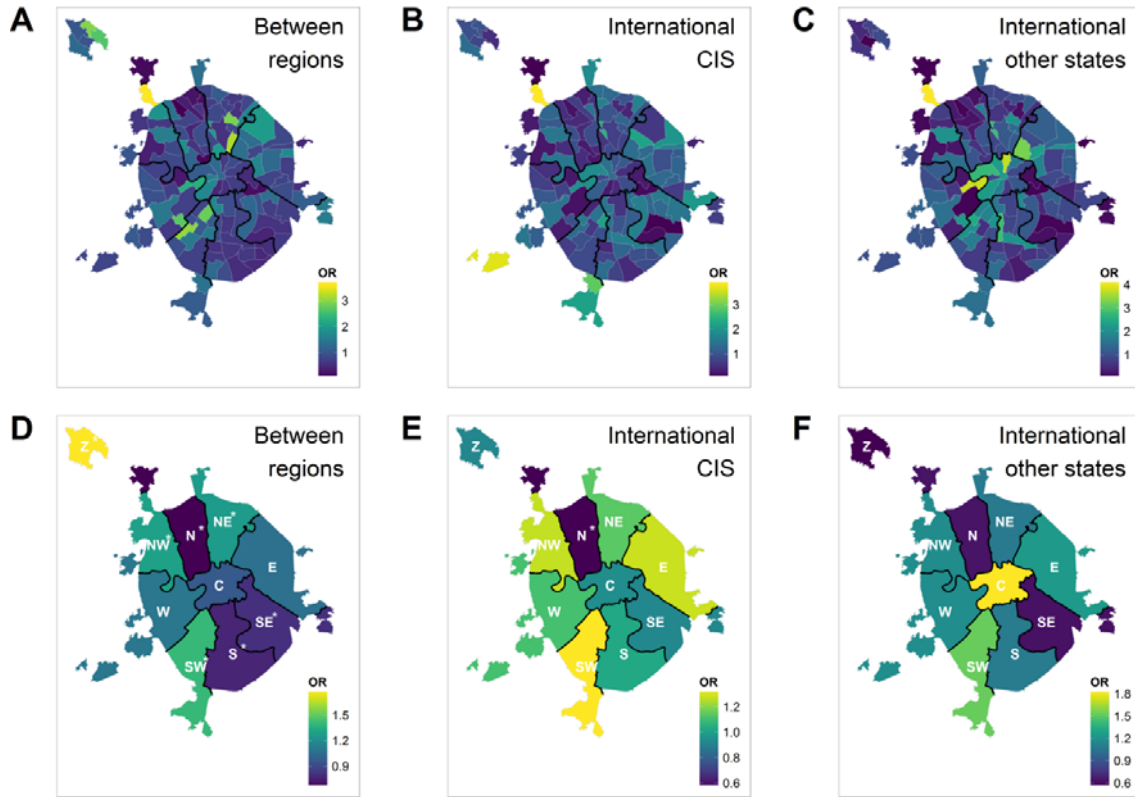


Figure 3. Spatial variation of in-migration to Moscow by type of migration flow and spatial levels: city districts (A-C), okrugs (D-F). Note: mapped values represent ORs from Poisson regression models; for each type of migration flow a separate model was built; models are controlled for sex and age; reference is the whole Moscow; statistical significance at 95% confidence interval for okrugs is marked by a star. Source: RosStat (2012).

In general, spatial variation tends to be statistically significant for internal migration. Less districts experience international immigration at a rate statistically different from the intensity for the whole Moscow. Keeping statistical significance in mind, we would like to highlight two extreme differences between types of migration flows. First, for between regions migration the symptomatic phenomenon is the high OR for the okrug of Zelenograd, while international migrants are not attracted by this remote okrug of Moscow. Probably, this difference may be explained with varying housing strategies. Our intuition is that internal migrants are more likely to buy houses while international migrants prefer to rent apartments. Housing prices are much lower outside Moscow Ring Road (MKAD)¹⁰. Popov (2014) reports a 20-25% drop in housing prices with the crossing of the Moscow city border. Probably, this factor is much more important in attraction of property buyers rather than tenants. Second, for immigrants from non-CIS countries ORs for settling in the central city districts are higher. This fact indicates that non-CIS migrants may be of a higher socio-economic status. If the hypothesis of the higher socio-economic status of immigrants from non-CIS countries is true, our finding strongly correlates with those of White (1998) who found that immigrants from the developed world settle densely in the center of London. The reasons for such a clustering may be not only pure

¹⁰ Moscow Ring Road is a big motorway that was opened in 1961. At that moment MRR encircled the whole territory of Moscow. In Russian: *Moskovskaya koltsevaya avtomobil'naya doroga*.

economic. Other factors in favor of central location might be language issues and security considerations. The center of Moscow is quite international and, thus, suits better for those migrants who do not speak Russian: due to language limitations international migrants might favor to live close to other foreigners to be able to form social contacts. As a result, immigrants from non-CIS countries might be willing to pay quite an extra sum for their housing to ensure that they live in an area where they can establish social contacts and perform daily activities.

One may notice that okrugs appear to be quite heterogeneous. The decomposition of Theil's index of inequality helps to identify which part of spatial variation in migration intensities could be attributed to inequality between okrugs, and which is caused by inequality within okrugs (fig. 4).

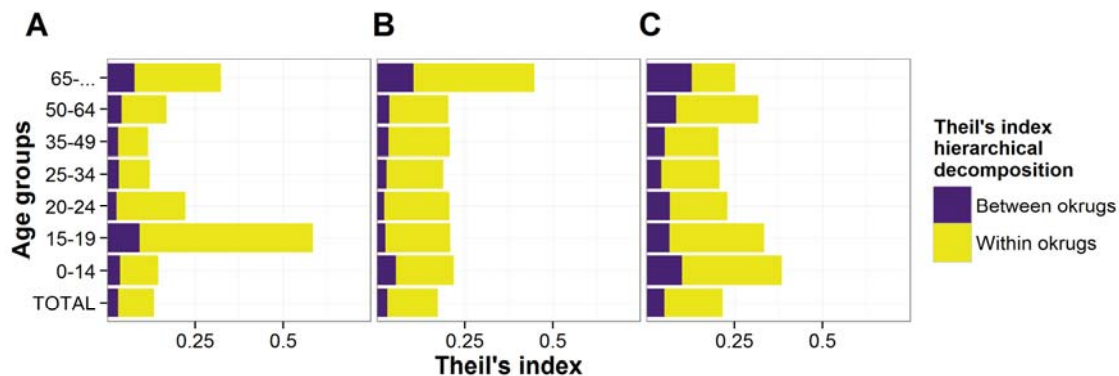


Figure 4. Hierarchical decomposition of Theil's index of inequality in in-migration rates by types of migration flows: between region (A), international from CIS (B), and international from other countries (C). Source: RosStat (2012).

Three main outputs could be derived from the inequality analysis. First, within okrugs inequality is much bigger than between okrugs inequality. That means that okrugs are quite heterogeneous. In other words, it is difficult to draw strong conclusions about spatial variation of in-migration analyzing data only at the spatial level of okrugs. Second, lower intensities of migration cause bigger inequality because a considerable number of districts do not experience any in-migration. This is particularly true for international migration flows. Finally, the biggest inequality in migration intensities is a feature of internal migration at the ages of 15-19, and this inequality is mainly within okrugs. That means, a limited number of districts attract the biggest share of all internal migrants aged 15-19. Such a high level of inequality means that there is a factor explaining large share of variance in settlement patterns of these particular migrants.

As the migrants aged 15-19 are mainly students, their settlement pattern should be driven by the location of student dormitories. To our knowledge, there is no open data base on student dormitories. So we composed the list of student dormitories that are affiliated with the largest Moscow universities. We collected data on 82 buildings located in 46 districts. Using these data, we composed a dummy variable showing presence of student dormitories in districts. Of course, one would want to use the data on all student dormitories within city boundaries, ideally accounting for the capacity of each building. But such detailed data are not available. Nevertheless, even a roughly composed dummy variable proves to be very useful as it explains a notable share of variance (14.5%) in in-

migration rates of those aged 15-19. The presence of one or several student dormitories in a district almost triples the inflow of youths aged 15-19 (OR = 2.83). Interestingly, this is only true for internal migration, which accounts for 95.6% of all the inflow to Moscow at ages 15-19. International migration to districts with student dormitories is not statistically higher than to “non-student” districts; Moscow is not a world-wide acknowledged university center. Yet, for Russian regions, it is hard to overestimate the importance of Moscow as a destination for students.

DO HOUSING PRICES MATTER?

The spatial distribution pattern of housing prices in Moscow is clearly visible (fig. 5). Two main rules of price formation are evident. First, there is a strong negative correlation between housing prices and remoteness from center. Unlike many Western cities, Moscow does not have prestigious suburbs. This is a long-lasting preference of Moscow citizens. For example, Alden, Beigulenko, & Crow (1998) write: “culture of central living is extremely strong, despite the high pollution in the city center”. Second, Western part of the city is more prestigious and expensive than Eastern part¹¹ (Bater, 2001; Kirillov & Makhrova, 2012; Makhrova, 2006; Popov, 2014).

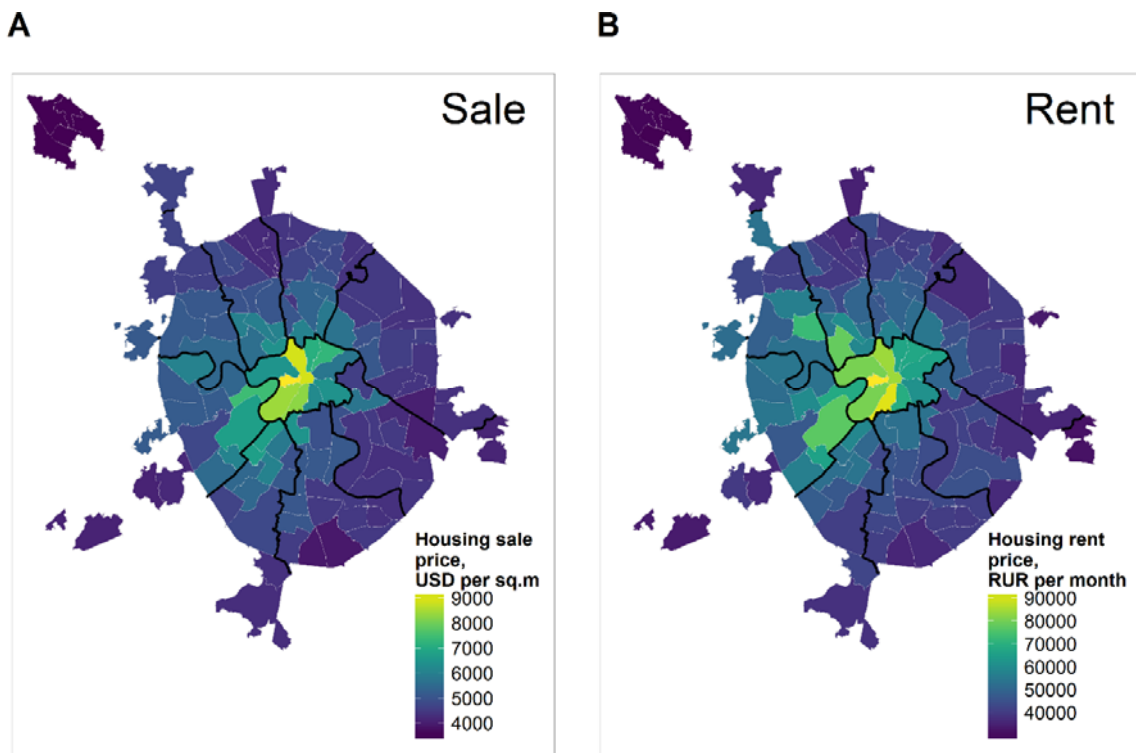


Figure 5. Spatial variation of housing prices in Moscow in 2012: (A) sell price; (B) rent price. Source: RBC (2013) – (A), CIAN (2012) – (B).

Data on housing sale and rent prices gathered from different sources show very similar spatial patterns ($R=0.895$). Probably, the lack of big difference between spatial variation of sale and rent housing prices is caused by the large volume of Moscow housing rent market. In fact, both housing prices variables are almost identical in explaining variation in migration rates. Thus, we provide the results of modeling only for one of them, sale prices (fig. 6).

¹¹ This regularity of settlement is quite usual for continental Europe. The underlying explanation is purely geographical. The main wind direction is Western because of Prevailing Westerlies. Historically manufactures were mainly located in the Eastern part of the city. Thus, those who could afford it struggled to settle in Western part.

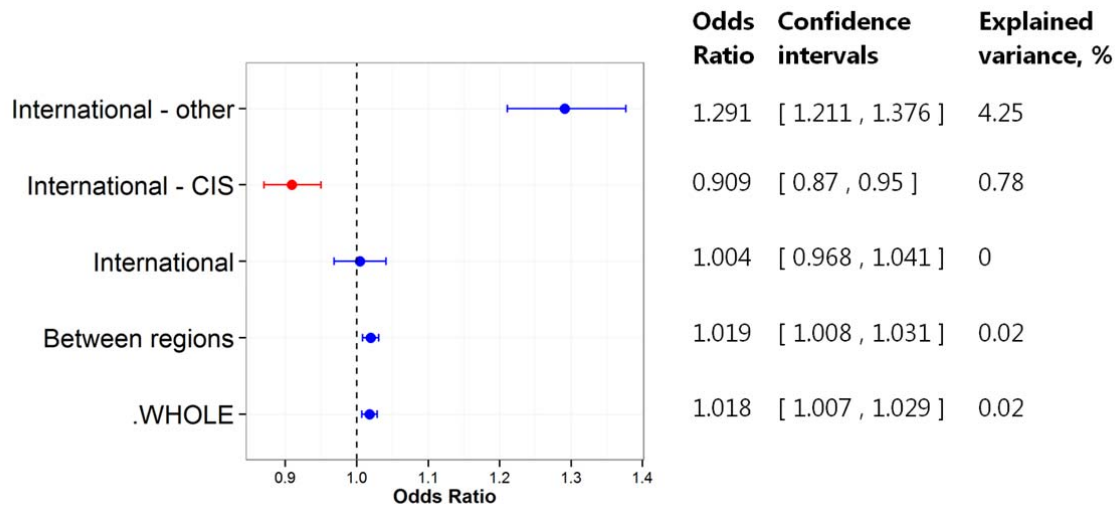


Figure 6. The effect (ORs) of housing sale prices on in-migration to Moscow by type of migration flow. Note: for each type of migration flow a separate Poisson regression model was built; regressor is the logarithm of housing sale prices; models are controlled for sex, age, and presence of student dormitories; horizontal lines represent 95% confidence intervals for ORs; color stands for effect: blue – positive, red – negative. Source: RosStat (2012).

The effect of housing sale prices on in-migration to Moscow is statistically significant for all types of migration flows except for the total international one. Though, the explanatory power of the regressors is quite low. Only for non-CIS countries housing prices explain more than 1% of the variation in migration intensities across city districts (“Explained variance” column of table in fig. 5). One standard deviation increase in housing sale price (1086 USD per sq. m) is associated with 29.1% increase in the intensity of immigration from far-away countries.

Quite opposite effect housing prices cast on the intensities of immigration from CIS. One standard deviation rise in housing prices corresponds to a 9.1% reduction in immigration from CIS rates. The difference between two categories of international in-migration supports the idea of varying socio-economic characteristics of immigrants.

The effect of housing prices on internal migration is very limited. A standard deviation increase in housing prices corresponds to 1.9% increase in internal migration intensity. This weak positive association is still surprising. As mean wages in Moscow are higher than in the rest of the country (Zubarevich, 2012), with the lower incomes of internal migrants the overall effect of housing prices on in-migration rates should be negative. However, the difference in house quality and price within district could be much higher than the difference among districts (Bater, 2001; Demintseva & Peshkova, 2014). For instance, some districts offer affordable economy class housing on the secondary market, while the primary market provides expensive high class housing; as the result, mean value is not very meaningful. This heterogeneity and imbalance of housing prices hinders the analysis even at the district level. Generally prestige of a district is still a better predictor for in-migration flows than housing prices.

DISCUSSION AND CONCLUSION

The intensities of in-migration to Moscow are very unevenly distributed by the lands of origin. Migration from regions of Russia accounts for 91.3% of all the inflow to Moscow. Of the rest 8.7% international migration from CIS holds three quarters, immigration from all non-CIS countries constitute only 2.2% of the whole in-migration.

Empirical evidence from the Western cities suggests that housing prices (Bolt et al., 2002; S. Musterd, 2005; Sako Musterd & Van Kempen, 2009; van Ham & Manley, 2009) are interrelated. Generally, higher housing costs reduce the likelihood that a particular location is selected (Plantinga, Détang-Dessendre, Hunt, & Piguët, 2013). However, unlike Western cities, housing prices in Moscow have limited association with in-migration, at least when the analysis is conducted at the level of city districts. Although statistically significant association between housing prices and migration intensities usually exists, variance explained by the regressor is very limited. Considerable effect is only evident for highly diverse international migration which does not constitute a substantial part of the whole in-migration to Moscow. One of the reasons why housing prices are not a reliable predictor for in-migration intensities could be the relative immaturity of Moscow housing market which had to adapt rapidly to major changes in economy after the fall of the Soviet Union (Daniell & Struyk, 1997; Kosareva, 1993). Once the differentiation of districts was established in the socialist era, the inequality is prone to be self-reinforcing (Smith 1996). Socialist legacy, to some extent altered under market conditions, shapes the spatial variations of in-migration flows to Moscow. The prestige of some localities still means much more than the objective characteristics of houses and infrastructure (Rudolph & Brade, 2005; Vendina, 1997). Generally speaking, the infrastructure in various districts may not be as different as the social impression of certain localities; prestige and image contribute largely to the formation housing prices (Popov, 2014). Moreover, housing prices may vary greatly within the district due to their objective characteristics. Such a mixed housing landscape is characteristic of many post-socialist cities (Marcinićzak, Gentile, Rufat, & Chelcea, 2014; Sýkora, 2009).

The spatial patterns of in-migration vary by type of migration flow, i.e. the types of origin territories. Both internal migrants (from other Russian regions) and immigrants from CIS tend to prefer less prestigious locations, although the areas of the concentration of these two migrant groups differ. It seems that immigrants from CIS reside in the most deprived districts, e.g. the regions with high crime rates, worst environmental and infrastructural conditions (Demintseva & Peshkova, 2014). In contrast, non-CIS immigrants tend to settle in the more prestigious central districts. The above general preferences indicate that there is a socio-economic differentiation between internal migrants, CIS and non-CIS immigrants. The latter seem to be of a higher socio-economic status. One of the major disturbance factors of the analysis is the presence of student dormitories. Student migration constitutes a notable share of internal inflow to Moscow. Thus, the location of the biggest student dormitories in the most prestigious districts, which is often the case in Moscow, blurs the sharpness of the in-migration spatial patterns.

The obtained results on spatial variations of in-migration flows provide evidence that, to some extent, the process of residential socio-spatial differentiation is going on in Moscow. The results correspond to those, obtained by (Vendina, 2004), indicating a transition of districts to a more homogeneous social strata. There are clearly some areas that concentrate migrants of specific socio-economic status and ethnicity. However, the spatial patterns of polarization correspond more with the prestige of localities and not the housing prices. And since housing prices seem to vary a lot on an intra-district

level, we believe, that it is too early to formulate conclusions about segregation at the level of city districts. Migrants could be spread somehow evenly within the districts producing heterogenic socio-spatial structures or segregated at the level of neighborhoods. Corresponding with the results of Marcińczak et al. (2015) on other capital cities of CEE (Budapest, Warsaw, Prague, Tallinn, Vilnius), the investigated socio-economic polarization produced by the in-comers in Moscow is quite low at least at the level of city districts. It is clear that further research in this direction is needed. With the advent of more detailed migration and housing prices data, it will be possible to investigate inner district structures.

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APPENDIX 1

Preprocessing of data

Analyzing in-migration rates could be problematic due to the small numbers of events once disaggregated by city districts, flows, sex and age groups. The problem is especially evident at older age groups. For example, the number of in-migrants at the age of 75-79 was 0 in just 3 districts out of 125. If we look only at men, the number increases to 11. Once further disaggregated by the type of migration, the number of regions not experienced, for instance, male international in-migration at age 75-79 becomes 66 out of 125. Lots of zero coefficients make regression analysis unreliable.

To address this problem, some data should be grouped. As we are determined to analyze migration flows at the geographical level of city districts, spatial aggregation is not an option. Information of sex and type of migration flows is also worth preserving. So, the natural choice is to reduce the number of age groups merging the closest ones. To do so, we performed hierarchical clustering based on correlation coefficients between age-specific in-migration rates (both sex, net migration). The heatmap visualization of this clustering (fig. A1) clearly shows that some age groups could be easily merged without much of a reduction in variance.

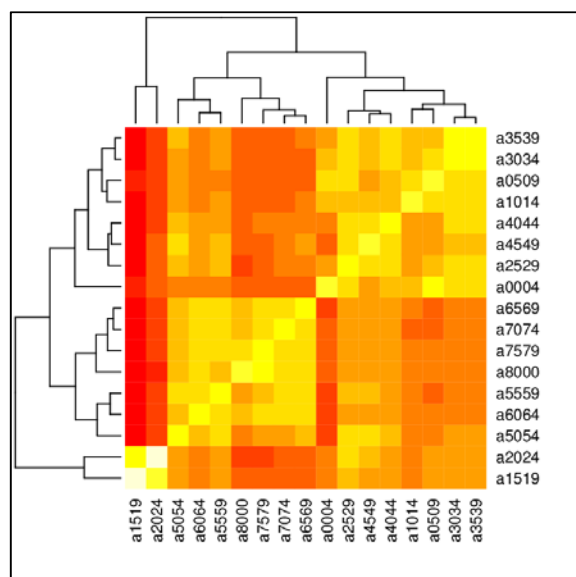


Figure A1. Hierarchical clustering of correlations between ASMiGR (whole migration, both sex). Source: (RosStat, 2012).

It seems natural to keep separated the most different age groups of those aged 15-19 and 20-24. Next, there is a big cluster of elderly people aged 50+ which is clearly subdivided into two age groups 50-64 and 65+. The rest is another big cluster which is not so easy to separate. As it is naturally torn apart by age groups 15-19 and 20-24, it seems reasonable to distinguish child age group 0-14 and two age groups of adults aged 25-34 and 35-50. Such clustering reduces the number of age groups from 17 to 7.

The collapse of state socialism and the introduction of market relationships in Central and Eastern Europe resulted in profound changes of urban development. Evidence from Central and Eastern Europe indicates that the development of strong housing market and growing material inequalities contribute to the socio-economic polarization of city districts and residential segregation. Based on empirical data, we analyze spatial variation of in-migration to Moscow at the level of city districts and investigate the theory-driven association between in-migration intensities and housing prices to find evidence of socio-spatial polarization. Our results show that, although there are some areas that concentrate migrants of specific socio-economic status, housing prices do not explain a substantial share of variance in in-migration intensities, at least at the level of city districts; quite a strong association is only evident for foreign migrants.

The Netherlands Interdisciplinary Demographic Institute (NIDI) is an institute for the scientific study of population. NIDI research aims to contribute to the description, analysis and explanation of demographic trends in the past, present and future, both on a national and an international scale. The determinants and social consequences of these trends are also studied.

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