

# Spatial variation of in-migration to Moscow: Testing the effect of housing market

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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 a 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 migrants' first residential choices within Moscow, i.e. intensity of in-migration to a specific district. We test the theory-driven hypotheses about the association between residential choices and housing prices. Our results show that there are some areas that attract migrants of specific socio-economic status. However, housing prices do not explain a substantial share of variance in the intensities of in-migration, at least at the level of city districts; quite a strong association is only evident for foreign migrants. Thus, we find limited evidence of the Moscow' socio-spatial structure polarization due to the residential choices of migrants. **HIGHLIGHTS:** - Internal migration accounts for more than 90% of in-migration to Moscow - Internal migrants' residential patterns are more heterogeneous than immigrants' - Immigrants from neighboring countries mostly settle in peripheral districts - Immigrants from remote countries settle in prestigious central districts - Housing prices explain a limited variation of migrants' residential choices

Post-socialist urban development | Moscow | Migration | Residential choices | Housing market

## 1. 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 noticeable impact on their urban and regional development, as well as the life of the society (Marcinićzak et al., 2013; Round and Williams, 2010). Neoliberal shift in economy increased inequalities in development, which have a pronounced spatial pattern. In other words, spatial development of the post-socialist countries is becoming increasingly polarized (Ehrlich et al., 2012; Fischer-Tahir and Naumann, 2013). A characteristic feature of the polarized development is the intensification of migration flows from economically weak to economically prosperous areas (Weck and Beißwenger, 2014). The majority of the latter are capital cities and areas in their proximity that experience fast population growth (Ehrlich et al., 2012; Kashnitsky, 2018).

Since the 1990s, the intensive in-migration to the post-socialist capitals along with the increased residential mobility within the cities have largely contributed to the substantial transformation of their residential areas, altering appearance and social structure (Haase et al., 2012; Hess et al., 2012;

Kährlik et al., 2012; Kubeš, 2013). If under state socialism housing was distributed on the priority basis according to the decision of the authorities (Gentile and Sjöberg, 2006; Hess et al., 2012; Vendina, 2002), under market conditions the residential choices of households depend on individual needs/aspirations and are limited by the available resources (Mulder and Wagner, 1998). Previous research suggests that people of the same race, ethnic origin, and social status tend to choose housing in the neighborhoods where people alike live (Musterd et al., 2015; Quillian, 2002; Schelling, 1972; Van Ham and Tammaru, 2016). Since residential choices are limited by the available to the household resources, then they to some degree associate with housing prices. Brasington, Hite, and Jauregui (2015) and Musterd et al. (2015) find evidence that low and high income households concentrate in different parts of the city. The inflow of migrants of different social status, ethnic origin and various income levels reinforces the preset differentiation of neighborhoods and districts as a result of the first residential choices (Bolt and Van Kempen, 2010).

The present study focuses on migrants' first residential choices within a post-socialist capital city. We investigate the spatial patterns of in-migration flows to city districts and test the association with housing prices. Such an association would be an evident sign of the polarization of city's socio-spatial structure. Our study builds upon previous research on post-socialist capitals and major cities - the ongoing residential changes and mobility within them (Haase et al., 2012; Hess et al., 2012; Kährlik et al., 2012), polarization and segregation (Marcinićzak et al., 2013; Sykora, 1999; Vendina, 2002).

The empirical evidence is drawn from Moscow, the largest and one of the most migration attractive capital cities of the post-socialist/post-soviet space (Makhrova et al., 2013). With a notable stability Moscow has been gaining roughly one million people each decade in the 20-th century (Denis-senko and Stepanova, 2013) despite the social shocks<sup>1</sup> and persistent struggle of authorities to inhibit the process (Haus-laden, 1985). In the post-soviet period the removal of administrative barriers restricting migration to the large cities as well as the economic stagnation, low wages, unemployment, and poor amenities in many Russian regions contributed to the intensification of migration to Moscow (Andrienko and Guriev, 2004). Besides economic stimulus, common

<sup>1</sup> 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).

motives for migration to Moscow include education and family reasons (Kashnitsky et al., 2016). 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 and Mkrtchyan, 2009). Thus, Moscow is an illuminating case study site for investigating migrants' first residential choices in the post-socialist capitals.

In order to answer our research questions, we analyze the types of migration flows in terms of sex, age, place of origin, and their intensities for 125 districts of Moscow, exploring variation by housing prices. The intensity of immigration to Moscow's districts is in fact the amount of people who registered within a district for a period over 9 months – rented or bought housing; thus, its spatial variation provides information on migrants' first residential choices within the city. 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 for 2012 at the city district level was published (Service, 2012). Although the quality of data should not be overestimated, there is a hope that they are capturing the real process a bit better than they used to do previously (Kashnitsky et al., 2016; Zayonchkovskaya and Mkrtchyan, 2009). A serious limitation of the dataset is that it is published for 1 year only; however, we believe that it would still allow to identify the main features of the phenomenon under study. All in all, the present research on Moscow at the level of city districts allows us to add up on the knowledge of urban development and population mobility in the post-socialist and especially post-soviet context, which is still underrepresented in the international academic literature.

## 2. 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). Socialist cities were developed under central planned economic model. The absence of an open market – i.e. state-control over housing, goods and services – insured their distribution to different population groups, as was mentioned above, on the priority basis (Borén and Gentile, 2007). Inequality in the access to housing existed, albeit, of different nature; social status was the indicator of being privileged in the society (Vendina, 1997). The privileged social strata consisted mainly of party nomenclature, military, scientists, as well as individuals who represented the country on the international arena (e.g. sportsmen, musicians, artists, diplomats). Thus, despite the income equalization, the above mentioned social groups had an access to better housing (Szelenyi, 1978).

According to Sýkora (1999), the creation of the socio-spatial differentiation within socialist cities was driven by two main factors. The first one is that the inner structure

of those cities, 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 (Marcinčzak, 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 got housing in certain newly built areas of the city. Naturally, those of higher social status acquired newly built housing of higher quality with a better access to infrastructure (Dangschat and 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 the post-socialist period, with the loosened state control, households received unprecedented freedom in housing choices. It became possible to make an individual choice, which was driven by the households' needs and desires (Clark, 2009; Mulder and Wagner, 1998). The individual needs and desires vary depending on the households' life course stage, socio-economic background, and cultural orientation (Clark et al., 1984; Kährlik et al., 2016). The choice of housing is therefore influenced by infrastructural and spatial characteristics of the area: the accessibility of amenities, workplaces, distance to family members and friends (Kährlik et al., 2012; Karsten, 2007). The reputation and perceived image of the area are also important in making residential choices (Sørensen, 2014). Naturally, income inequalities play a crucial role mediating these choices (Gentile, 2015; Marcinčzak, 2012; Marcinčzak et al., 2012) and limiting the opportunities for low income households (Kährlik et al., 2012, 2016; Musterd et al., 2015). Thus, the development of socio-spatial structures within post-socialist capital cities is characterized by contradictory processes (Smith and Timár, 2010). 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 attracting high-income households could be located in the proximity of crumbling and abandoned buildings (Gdaniec, 2005). Yet, the inequalities formed 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 these preset inequalities are still largely visible, as urban development is largely limited by historical inertias (Vendina, 2013).

Migrant households that make their first residential choice within the city of destination are no exception to the above guidelines; they choose housing according to personal preferences and available resources. However, the association of migrants' first residential choices and housing prices is complicated: both way influence could be argued (Mulder, 2006). For example, analyzing 20 cities of Italy, Accetturo, Manaresi, Mocetti, and Olivieri (2014) found that

in-migration raises average housing prices at the city level, while it reduces price growth in the districts mostly affected by migration inflow.

For particular migrant groups, such as temporary labor migrants, housing prices may play even a more important role. Not only they delimitate their housing choices, but also define whether to move alone or together with their families (Demintseva and Peshkova, 2014). The residential patterns of ethnic minority populations (mainly immigrants from other countries) may be influenced not only by housing prices but also by the housing market discrimination that impose additional restrictions on the residential choice (Bolt and Van Kempen, 2010). As long as the inflow of migrants to post-socialist capitals is largely fostered by economic stimulus such as unemployment or low wages in the areas of out-migration (Fischer-Tahir and Naumann, 2013; Hess et al., 2012), it is natural to assume that migrants may prefer less prestigious, relatively cheap neighborhoods and districts, at least at the moment of the first residential choice. In line with this argument, the inflow of migrants would then contribute to the social-spatial polarization of the city structure, since areas of migrant concentration would increasingly become low income enclaves.

### 3. Moscow context

Moscow consists of 125 city districts grouped into 10 *okrugs*<sup>2</sup> (Figure 1-A). The average population size of a district was 92 thousands, according to the Russian Census 2010 (Service, 2010); yet, there is an evident spatial regularity with the peripheral districts being more populated than the central ones (Figure 1-B). One explanation is that the majority of buildings in the central districts are used for offices. Another explanation refers to the varying building types. In the late Soviet period, when Moscow was rapidly expanding, the peripheral districts were built up with large multi-storeyed buildings, which resulted in formation of the densely populated sleeping quarters (Makhrova et al., 2013).

The urban economy of Moscow has adapted quite quickly to the new market conditions, Vendina (1997, p. 350) argues: “already in the late Soviet times it embarked on a road of post-industrial development, when prerequisites were created for restructuring the economy, especially through a more active growth of foreign economic, finance and credit, trade and mediation activity.”

Nowadays the main sectors of employment in Moscow are trade, real estate transactions, and construction; in 2012 they accounted for 25, 18, and 13%, correspondingly, of the employed population of Moscow (Service, 2013). As mentioned in the introduction, economic stimulus, namely employment, is among the main reasons for in-migration to Moscow. The urban economy of Moscow is becoming more and more dependent on migrant labor, and some sec-

tors are more dependent than the others. The spheres of high-qualified employment in Moscow are more competitive than low-skilled. Thus, often migrants, especially from CIS countries, occupy the jobs, that the local population prefers to ignore. As the result, migrants in Moscow are mainly employed in low-paid and low-prestige jobs, such as construction, trade, and various service industries (Tyuryukanova, 2009). The spatial projection of employment and income differentiation, including the employment of migrants, is reflected in the growth of the contrasts in residential choices and the dependency between the level of welfare and the prestige of residential area (Makhrova and Golubchikov, 2012).

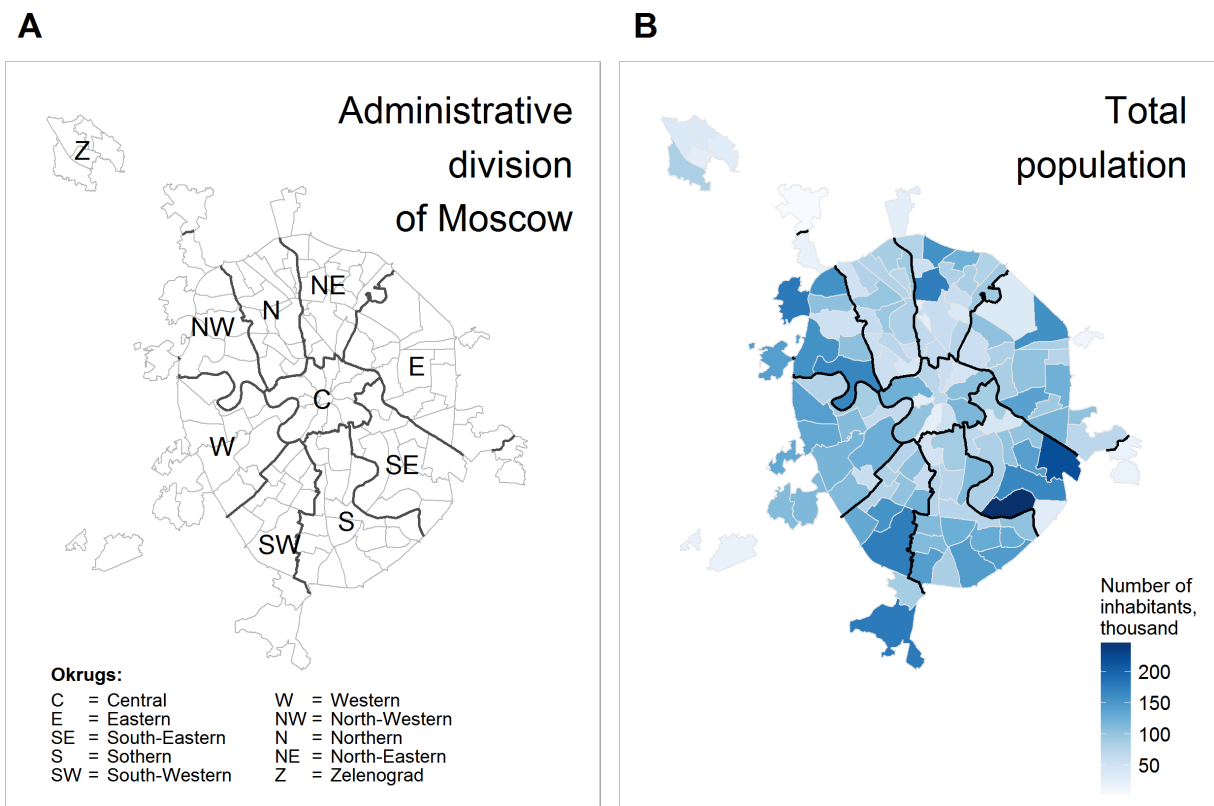
The clearly visible spatial patterns of housing prices reflect to some extent the prestige of the *okrugs* and districts (Figure 2). The two main regularities in the formation of housing prices are evident. First, there is a strong negative correlation between housing prices and the remoteness from the city center. The price gap between the central and remote districts increases steadily (Makhrova and Nozdrina, 2002). Unlike many Western cities, Moscow does not have prestigious suburbs. This is a long-lasting preference of Moscow citizens that was previously noted. For example, Alden, Beigulenko, and Crow (1998, p. 373) write: “culture of central living is extremely strong, despite the high pollution in the city center”. Second, the Western part of the city is more prestigious and expensive than the Eastern part (Bater, 2001; Kirillov and Makhrova, 2012; Makhrova, 2006; Popov, 2014). 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 the Western part. Today, the Eastern and Southern districts of the capital are perceived as low-prestige and even marginal (Vendina, 2013).

Over 30% of Moscow real estate were constructed in the post-soviet times (Makhrova and Golubchikov, 2012). Despite the considerable pace of new construction, the issue of housing affordability is not nearly resolved; and the chaotic construction under the large surplus of the demand over the supply results in the creation of less human urban environment (Makhrova and Golubchikov, 2012; Vendina, 2009). New elite houses, that are usually gated like fortresses, are built in the central and sub-central parts of the city, primarily in the Western and to a lesser extent in the Northern districts; that results in the expansion of the prestigious central residential area (Trubina, 2011; Vendina, 2013), while the more affordable housing is constructed mainly in the remote districts of Moscow.

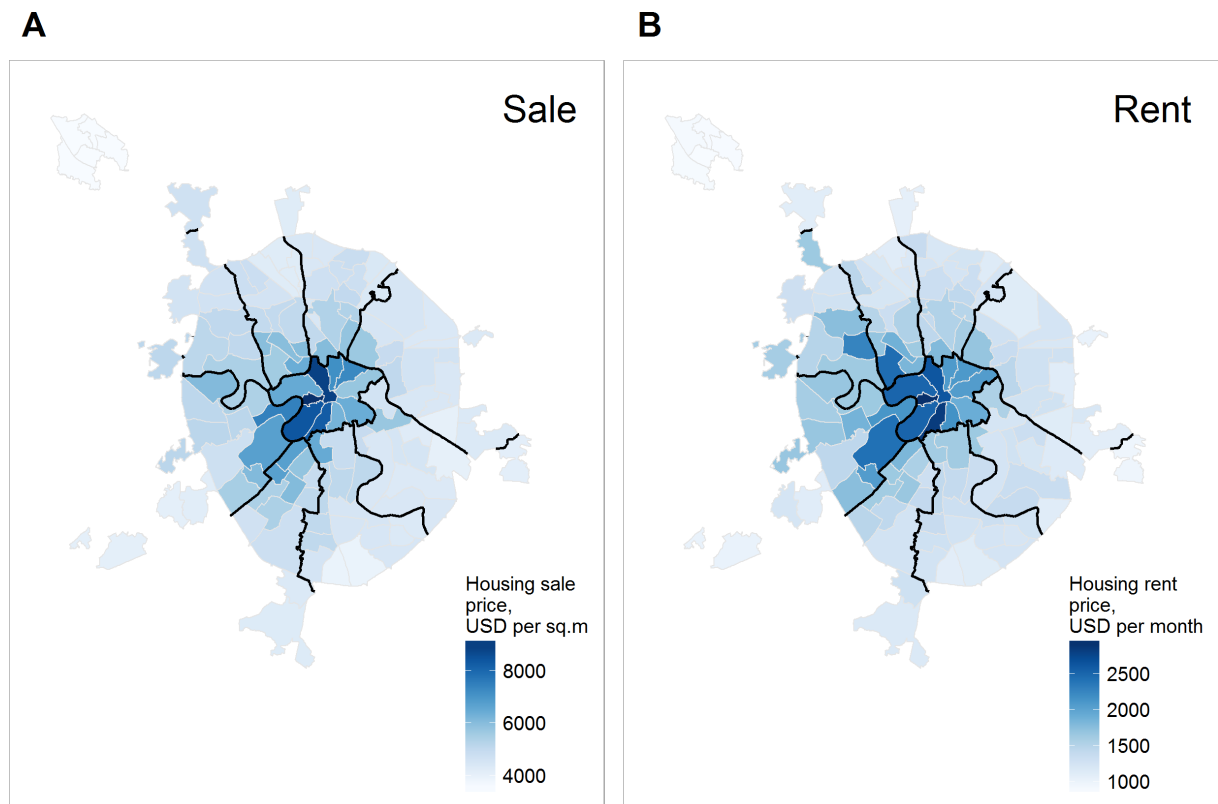
### 4. Data and methods

**4.1. Data.** This paper uses data on Moscow migration from a recently published Rosstat Municipal Database (Service,

<sup>2</sup> In July 2012 there was a major administrative reform in Moscow which resulted in almost 2.5 times 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.



**Fig. 1.** Descriptive maps of Moscow districts: (A) reference map of administrative division; (B) total population by districts.



**Fig. 2.** Spatial variation of housing prices in Moscow in 2012: (A) sell price; (B) rent price. \*Note\*: To transform the prices from RUB to USD, we use the currency exchange rate on 30 June 2012.



Characteristics of migration flows	Levels
Type (5)	Whole migration Migration between regions of Russia 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

**Table 1. Characteristics of migration flows**

2012). The data represent numbers of migrants in 2012 disaggregated by two hierarchical spatial levels (okrugs and districts) and four characteristics of migration flows (Table 1).

The data have some limitations. First, there is a mismatch between the total numbers of in-migrants as computed by summing up the figures for all districts and the aggregated data published for the whole Moscow<sup>3</sup>. According to aggregated data, 205.5 thousand persons were registered within the city in 2012. The summation of district-specific data gives only 183.3 thousand. One of the reasons for the discrepancy in the in-migration records is that a migrant can be registered not only according to the actual place of residence within the city, but also by an employer without any reference to a specific district. Second, the data only include the information on legal migrants. Both researchers (Shmatko, 2014; Vakulenko and Tsimaylo, 2011) and city government officials (Moskvi, 2008) agree that the volume of illegal migration to Moscow may be very high. Unfortunately, there are no precise and transparent estimates of the number of unregistered migrants; and, of course, such estimates are not available at the level of city districts. Thus, we have to neglect this part of in-migration to Moscow in our analysis.

To compute age-specific migration rates, we use age structure as captured by Russian Census 2010 (Service, 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 the estimates of the age-specific migration rates, but this effect is quite moderate and cannot affect migration patterns strongly.

Data on housing prices distribution across Moscow districts were taken from two sources. The first are monthly ratings of Moscow districts by average housing *sale* prices (measured in USD per square meter) published by RBC<sup>4</sup> (RBC, 2013). These ratings are based on IRN<sup>5</sup> data. The second data source is average monthly *rental* prices (measured in RUR) in 2012 collected from CIAN<sup>6</sup> 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, as the estimates are based on big samples and are unlikely to be inaccurate.

**4.2. 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 the generalization of age groups, migration intensities are very small for some partial flows in many districts. Poisson regression models are also implemented to find the association between in-migration rates and housing prices. To assess the explanatory power of the regressors, we use analysis of variance (Welch, 1951). Spatial hierarchical decomposition of Theil's index of inequality (Theil, 1979) is applied in order to Fig. 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, 2016). Additional packages were used: (i) for data manipulations, dplyr (Wickham and Francois, 2015), tidyr (Wickham, 2016b); (ii) for visualization, ggplot2 (Wickham, 2016a), rgdal (Bivand et al., 2015), viridis (Garnier, 2016), cowplot (Wilke, 2016).

## 5. Comparison of migration flows' intensities

**5.1. Variation by type of migration flow.** Migration intensities are distributed unevenly by the types of migration flows (Figure 3). 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 (Figure 3-A).

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 intensities<sup>7</sup>, between regions and two types

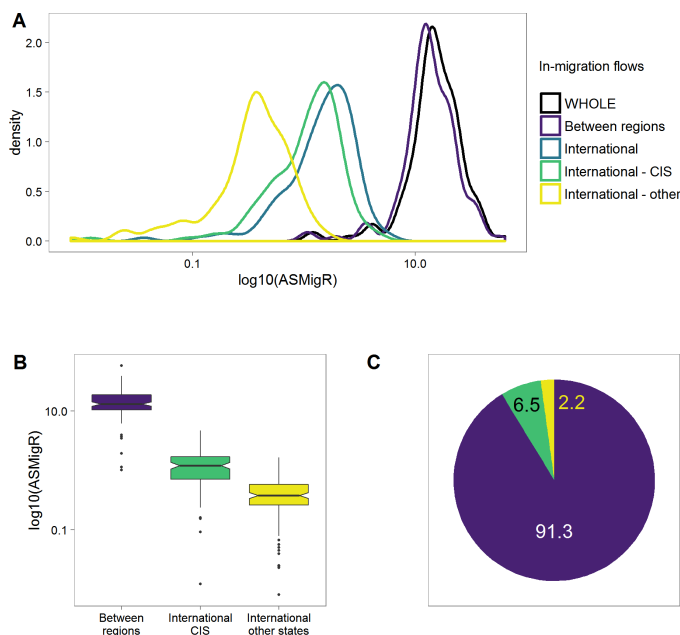
<sup>4</sup>Russian Business Consulting (www.rbc.ru)

<sup>5</sup>Indicators Rinka Nedvizhimosti (Indicators of Real Estate Market, www.irn.ru)

<sup>6</sup>Tsentri Informatsii i Analitiki Nedvizhimosti (Centre for Real Estate Data and Analytics, www.cian.ru)

<sup>7</sup>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.

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



**Fig. 3.** 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.

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 (Figure 3-C). 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%).

**5.2. Variation by age and sex.** Age variations of migration intensities are, of course<sup>8</sup>, considerable. Interestingly, there is a notable diversity of age profiles by type of migration flow (Figure 4-A). 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 – student ages. Of course, not all of these migrants are students, but the recent estimates indicate that the majority of them are (Kashnitsky et al., 2016). Moscow is a major educational center in Russia; yet it is not recognized as one of the world leading educational centers. Thus, the international student migration to Moscow is quite limited, most of the immigration from the foreign countries occurs at the ages a bit older than student.

Immigration from CIS is highly concentrated at prime working ages. These migrants mainly occupy low ranked

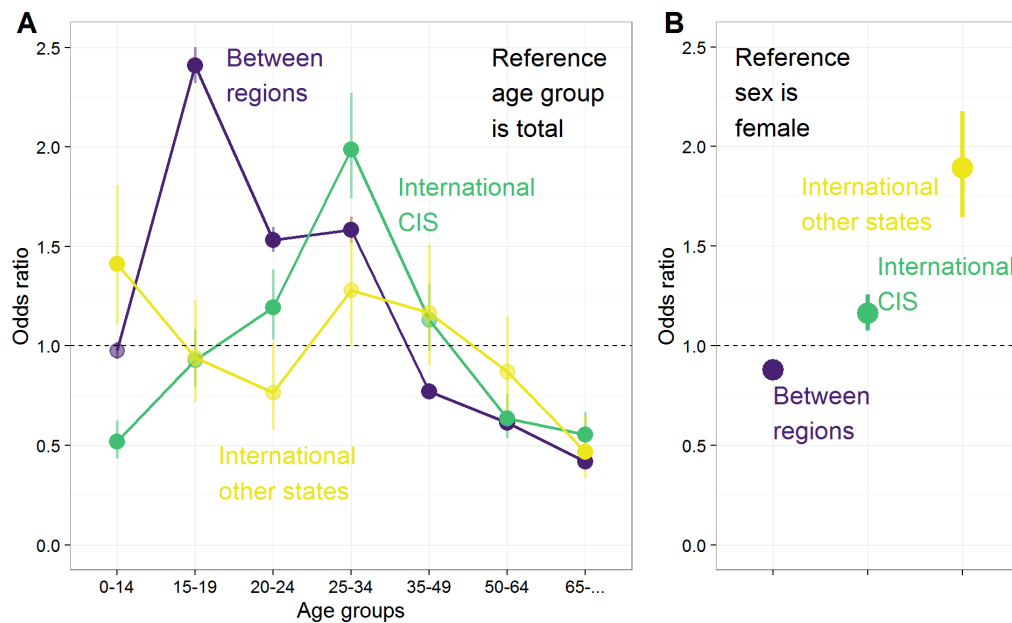
jobs and earn just enough to survive and send some money back to their families in the counties of origin. According to Demintseva and Peshkova (2014), up to 70% of adult migrants from Middle Asia share one room between 3-8 people. No wonder, three quarters of them have no children in Moscow though only 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, it seems that migrants from CIS with relatively low socio-economic status cannot afford to move to Moscow with their children. The 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) migration<sup>9</sup>. In-migration to Moscow is mainly described by internal migration (between regions) in which women dominate (Figure 4-B). 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.

**5.3. 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 (Figure 5). For each of the migration types a separate model was built; all regression models were built separately at the levels of districts and okrugs.

<sup>8</sup> Age selectiveness of migration is well known and is observed on virtually any migration data. See for example Pittenger (1974) or Castro and Rogers (1981).

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



**Fig. 4.** 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.

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)<sup>10</sup>. 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 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

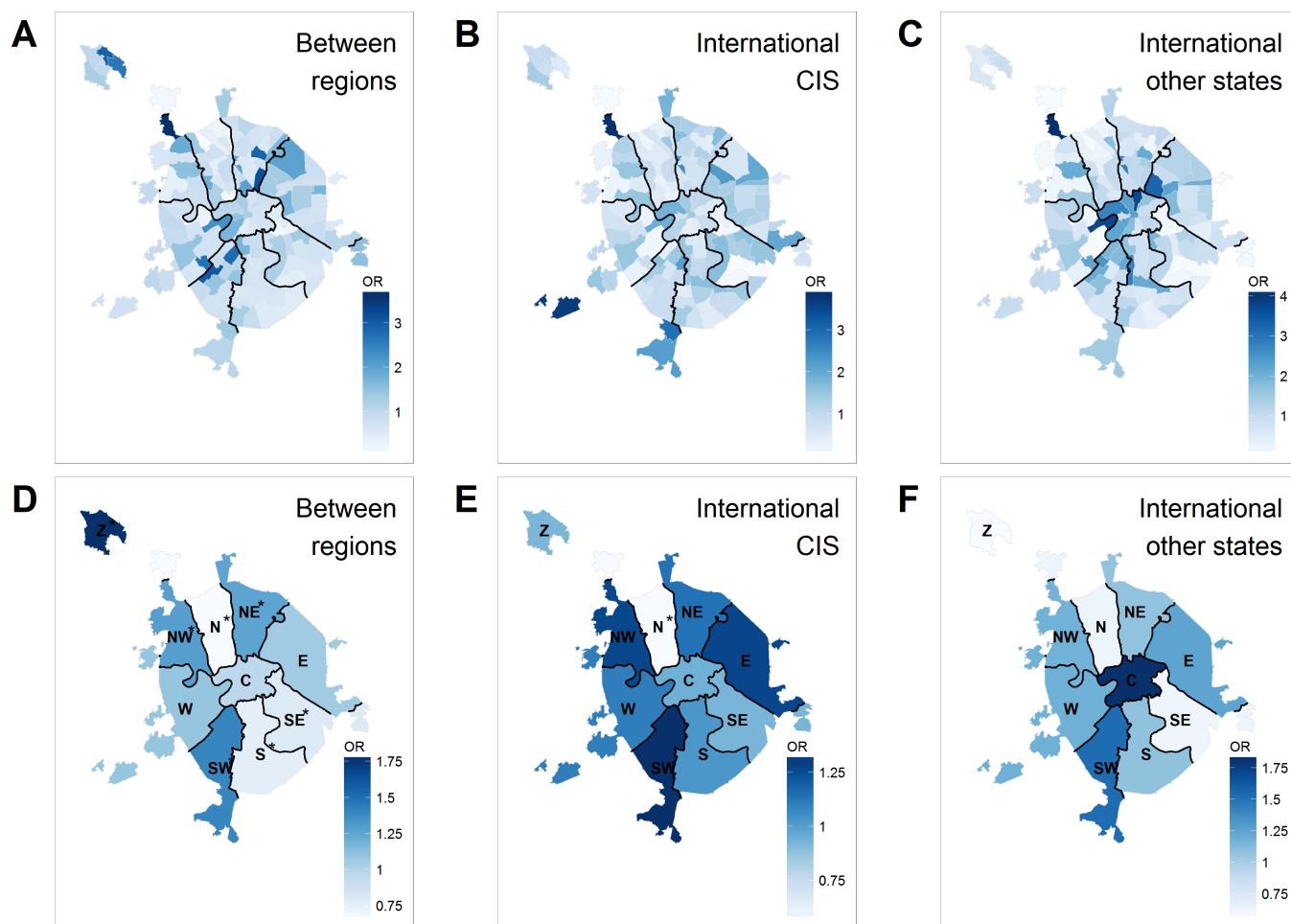
favor to live close to other foreigners to be able to form social contacts. As a result, immigrants from non-CIS countries might be willing to pay quite an extra sum for their housing to ensure that they live in an area where they can establish social contacts and perform daily activities.

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 (Figure 6).

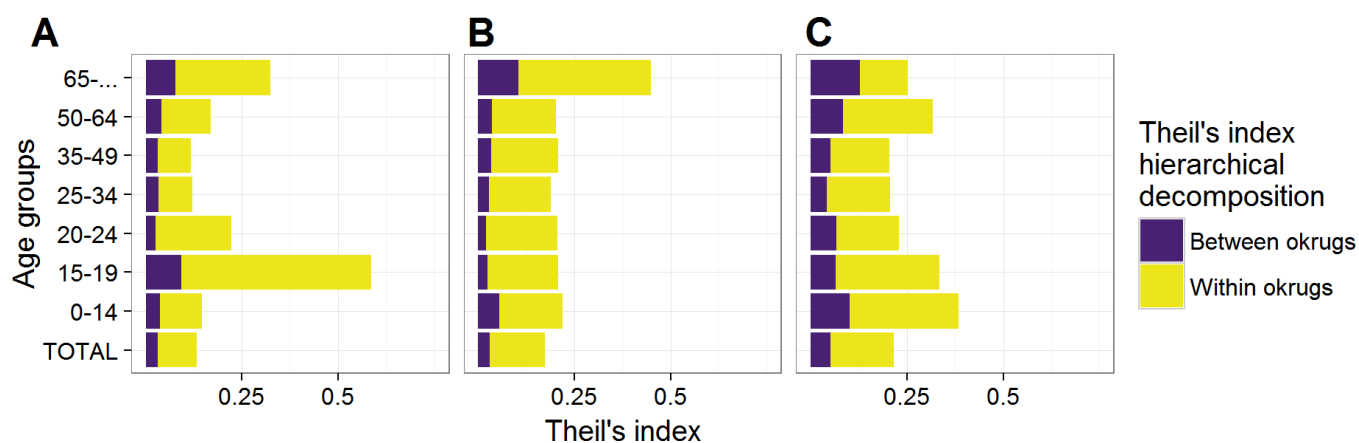
Three main outputs could be derived from the inequality analysis. First, within okrugs inequality is much bigger than between okrugs inequality. That means that okrugs are quite heterogeneous. In other words, it is difficult to draw strong conclusions about spatial variation of in-migration analyzing 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

<sup>10</sup> 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*.



**Fig. 5.** 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.



**Fig. 6.** 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).



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 if 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.

## 6. Do housing prices matter?

Data on housing sale and rent prices gathered from different sources show very similar spatial patterns ( $R = 0.895$ , see Fig. 2). 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 (Figure 7).

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 (Figure 7)). 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 and 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

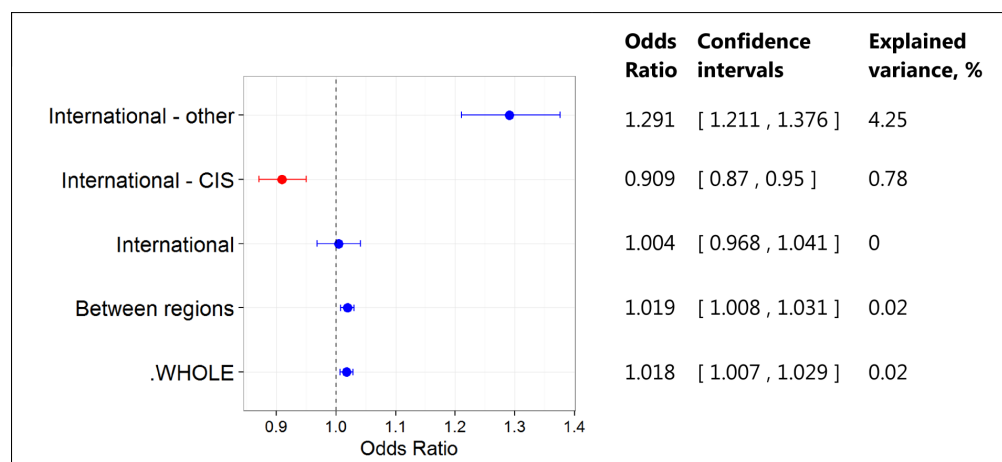
even at the district level. Generally, prestige of a district is still a better predictor for in-migration flows than housing prices.

## 7. 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. The inflow of internal migration is the youngest, as its big portion is constituted by students; women dominate in internal migration. International migrants are on average older; among these migrants, men dominate.

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 in the southern and eastern parts of the city, although the areas of the high concentration of these two migrant groups differ. This regularity supports the hypothesis of the relatively low income that limits their residential choice largely. Besides the choices of CIS migrants are also to some extent dictated by the discrimination in the housing market, the phenomenon that was mentioned earlier in the literature review. The evidence of discrimination was found by Ashkenazi and Vakshtein (2009) when analyzing the rent advertises containing phrases as “only Russian”, “only Slavs”, “except from the Caucasus”, “except from Asia” and so on. The results of our analysis, in line with the arguments of Demintseva and Peshkova (2014), Vendina (2013), Ashkenazi and Vakshtein (2009), suggest that immigrants from CIS reside in the most deprived districts, e.g. the regions with high crime rates, worst environmental, and infrastructural conditions. In contrast, non-CIS immigrants tend to settle in the more prestigious central districts. These 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 spatial pattern of the first residential choices.

Empirical evidence from the Western cities suggests that housing prices and the first residential choices are inter-related, at least regarding immigrants (Bolt et al., 2002; Musterd, 2005; Musterd and Van Kempen, 2009; Van Ham and Manley, 2009). Generally, higher housing costs reduce the likelihood that a particular location within a city is selected (Plantinga et al., 2013). However, housing prices in Moscow have limited association with in-migration intensities, i.e. migrants’ first residential choices, at least when the analysis is conducted at the level of city districts. Although



**Fig. 7.** 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 the effect: blue – positive, red – negative.

statistically significant association between housing prices and migration intensities usually exists, variance explained by the explanatory variable is very limited. There are few possible explanations for that. First, internal migrants have more opportunities regarding residential choices that are not associated with their income, e.g. students can stay in dormitories or with their relatives (Yashunsky and Zamyatina, 2012) thus residing within the high housing price districts. Second, residential choices of internal migrants may be to a higher degree shaped by other factors, such as proximity to work or educational facility. The fact that a considerable effect of housing prices is only evident for residential choices of the highly diverse international migrant group strongly supports both of the above hypotheses. Third, the prestige of some districts still means much more than the objective characteristics of housing (Rudolph and Brade, 2005; Vendina, 1997), and contributes largely to the formation of the mean housing prices (Popov, 2014). However, housing prices may vary greatly within the district due to the objective characteristics of the houses and the infrastructure. Such a mixed housing landscape is characteristic of many post-socialist cities (Marciniczak et al., 2014; Sýkora, 2009). Under such conditions the average housing prices become a poor predictor even at the district level.

The obtained results on migrants' first residential choices provide evidence that, to some extent, the process of residen-

tial socio-spatial differentiation is going on in Moscow. There are clearly some districts that attract more migrants of specific status and ethnicity than others. But the spatial patterns of residential choices correspond more with the prestige of localities and not the housing prices, which seem to vary a lot on an intra-district level. Taking this into account, a more detailed data on in-migration and housing prices is needed to investigate the evolution of the city's socio-spatial structure on the inner district level. Migrants may reside somehow evenly within the districts producing heterogenic socio-spatial structures or segregated at the level of neighborhoods. Regarding the level of city districts, our research suggests that the spatial polarization of the city structure produced by the residential choices of the in-comers to Moscow is quite low. It is clear that further, more detailed research in this direction is needed; however, it would only be possible with the publication of new statistical data.

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