

1 Abstract

This econometric study quantifies the effect of migration on housing prices in Russia from 2021 to 2023, using regional panel data from Rosstat. The analysis incorporates data on internal and external migration, categorized by citizenship and education level, alongside regional income levels and housing price indices (differentiated by housing quality). To address potential endogeneity concerns, we employ two-stage least squares (2SLS) regression, instrumenting migration with regional real estate investment. Our findings reveal a statistically significant positive effect of domestic migration on housing prices, particularly impacting lower-quality housing segments. While foreign migration shows a less clear relationship, the impact of migrants with higher education is significantly positive. These results highlight the differential impact of migration based on both nationality and education level, underscoring the need for targeted housing policies to address regional disparities and affordability challenges.

2 Introduction

The demographic problem is quite acute for Russian conditions. For example, in the period from 2018-2020, there was a negative population growth (Zubarevich 2020 [3]). Therefore, employers are increasingly resorting to hiring emigrants from neighboring countries. In this connection, the question arises about their location and places of residence, which directly affects, to one degree or another, the cost and rental of housing. For many people, housing affordability is the main criterion when deciding to move, especially in the context of urbanization, economic crises or demographic changes. In addition, migration is closely linked to the economic development of the regions. The influx of population contributes to an increase in labor resources, stimulates the development of infrastructure and the economy, while the outflow leads to a reduction in local budget revenues and demographic imbalance. The study of the dependence of housing costs and migration will allow a deeper understanding of how the real estate market affects the territorial mobility of the population.

3 Literature review

The article by Lin.Y.(2018) [2] provides an analysis of the impact of migration on the price level of real estate in 32 Chinese cities over the period from 2007 to 2016. Using an analysis based on panel data, the author concludes that, on average, the influx of migrants increases the cost of housing. It is also noted that the greatest effect is observed in megacities, since the attractiveness of life in these regions is higher. The paradigm of short-term and long-term periods was proposed by Peng(2019) [5]. Analyzing panel data on Taiwan for the period 1994-2016, it was shown that migration and housing prices are co-integrated (i.e. a linear combination) and a positive relationship is observed in the long-term. However, there may be asymmetric results in a short run. A significant positive effect was also observed in New Zealand McDonald (2013) [4]. Each additional percentage of migration increased the cost of housing by 7%. However, a less noticeable effect was observed in interregional migration. It is also important to analyze the demographic situation in Russia Zubarevich (2020). The regions of Russia differ dramatically. There is also a demographic problem inherent in the country in many ways, which directly affects the labor market and, as a result, the influx of migrant workers. It worth to mention that, in Russia observed strong migration from most of

an eastern and poor regions to central regions, especially to the capital. So, author in the article [6] showed that it is also important to estimate migration of native citizens. By decomposing the model, it become obvious that including only foreigners lowers estimations by 24%.

4 Hypotheses

In present study migration is defined as the net flow of new of individuals or groups from one geographical location to another, characterized by a permanent change in residence. This definition includes both domestic and international migratory movements and it is measured as the number of people. In Russian Federation it is common practice to change location looking for a job. Hence, we consider migration as one of the significant factors influencing local labor market. In the case of foreigners most individuals who come from neighbor countries (CIS countries) are engaged in low-skilled labor while domestic migrants are expected to relocate because of employment in high-skilled spheres. Our research shed a light on the mechanisms through which migration influences housing prices in Russia. Migration can affect the housing market by 2 channels: demand side and supply side. Firstly, we suggest that newcomers increase the demand on accommodation on a local real estate market resulting in increase in the housing prices. Moreover, as it is discussed in paragraph above domestic migration is expected to have higher effect on housing prices since domestic migrants represent high-skilled workers and is more likely to have higher salary which makes accommodation for them more available. On the other hand, low-skilled foreign migrants tend to rent an apartment which leads to fact that only domestic migration affect prices from the demand side. Secondly, foreign migrants working in low-skilled spheres often participate in construction and development of new houses. Thus, we can expect that increase in foreign migration will lead to increase in accommodation supply which can result in lower housing prices. In addition, we must say that, as a rule, newcomers are not wealthy enough to afford an expensive house because of lack of savings since the salary is treated as the first likely cause to relocate. As a result, migration may have a small impact on the middle and high price segments of the real estate market while have significant effect on the low-class property. Considering all above, the following hypotheses will be considered:

1. Domestic migration has a positive impact on the cost of housing
2. Foreign migration has a negative impact on the apartment price
3. Migration influence significantly on the lower-class estate prices

5 Data

The dataset used in this study combines information within the period 2021-2023 from three sources provided by Rosstat: migration statistics, income levels, and housing price indices. The migration dataset, measured in the number of people, includes detailed breakdowns of migratory inflow, both internal and external, by region, year, citizenship, and educational level, capturing aspects such as the number of migrants with various education levels or foreign citizenship. The income dataset reflects average annual incomes in rubles by region, while the housing dataset provides dimensionless indices that represent the ratio of real estate prices in the current quarter to those

in the previous quarter. These indices are calculated for various quality categories of housing (e.g., low, medium, elite) and allow for tracking price trends over time. Together, these datasets enable an econometric analysis of how migration patterns—both domestic and international—and regional economic indicators influence housing market dynamics in Russia.

6 Research methods

For estimation the causal effect of the migration on housing prices we use panel data. We utilize panel structure of collected data by using standard Time-Fixed effects model for estimating the coefficients. Panel structure helps both to control problems such as endogeneity and individual heterogeneity and include non-observable parameters eliminating omitted variable bias connected with region or time factor. It is commonly used approach as in article [2]. Another sort of potential bias may come from endogeneity of migration. It is obvious that decrease in prices also can lead to an increase in migration since it increases demand from neighbor areas. To deal with the endogeneity of the variable of interest we use real estate investment as instrumental variable and estimate the model using 2SLS. Real-estate investment is valid instrument because:

1. Investment funds to the real-estate industry, promote the supply of the real-estate industry, and thus affect real-estate prices.
2. Real-estate investments positively influence the number of employed in the sphere of construction, thus, it is highly correlated with number of labor migrants.

Furthermore, discussing the first point, 3-year period of observation may cause potential issues with correlation between housing prices and real-estate investments since it is commonly thought as a long-term investment, and it mostly affect the housing prices in the future. However, to address this problem we focus on the primary housing market only. Nowadays primary housing market is developed enough to construct buildings in 3-year horizons which reasons the instant influence investments on a housing price. Another source of motivation to include investments as instrument lies in fact that mechanism of influencing the housing prices is much more complicated than it seems at first glance. Another reason is that housing prices includes expectation of the future prices positively affected by increase in investment funds leading to another sort of explanation why investment funds can have instant influence on housing market. Finally, in order to motivate our decision concerning the instrument variable we refer to academic practice. In the paper [2] investment funds are treated as a good control variable explaining housing prices dynamics. Significant results from academic sphere and arguments brought above completely remove any doubts about the validity of the chosen instrument.

To control some non-observable regional effects, we use average income. Average income can influence migration bringing more people to a region, increase prices since people increase their spendings and captures some effects concerning regional features such as technological development, local labor market influence etc. Summing up, relationship between variables can be presented as on the graph 1.

To deal with endogeneity of migration we include in the model instrumental variable real-estate investment. To control other factors which can be attributed to region, year or local labor market we use average income as proxy

and fixed time effects as control variables. As a result, estimation of causal effect between dependent variable and variable of interest becomes possible. In the further sections we also consider a model with relative of migration characterized by the relation of net migration to population to control the size-effect of the region in order to reduce the standard errors of coefficient by dividing size and local economy influence.

7 Descriptive statistics

Table 1: Descriptive statistics for main variables

	N	Mean	SD	Min	Max
Price index	261	90.81	12.26	67.90	119.90
Migration	261	981.79	14 341.94	-21 482.00	113 041.00
Investment	261	361 504.30	734 688.78	13 829.02	6 757 235.75
Income	261	43 619.71	20 838.42	18 572.75	139 638.00

So, we can conclude that the price index has a relatively narrow range of values and is concentrated near the average. Migration has a wide range of values with possible negative values, indicating a net outflow in some regions. Investments have an extremely wide range, which may indicate significant differences in the size of investments between regions. Incomes also show a noticeable variation, but they are concentrated closer to the average value. All in all, the variables have different levels of variation. The price index is the least volatile indicator, while migration and investment have the greatest variability. Migration data include negative values, which indicates cases of population outflow. Investments have significant maximum values, which may indicate the presence of emissions or large investment projects in some regions.

8 Empirical results

The general regression function includes the dummy variable of year, the level of migration, which is fitted by instrumental variable of real estate investments and control variable of the average income in the region in the certain year.

$$Price_index_{it} = \gamma_t + \beta_1 Average_Income_{it} + \beta_2 Migration_fitted_{it} + u_{it}$$

where γ_t - time-fixed effect

$$Migration_fitted_{it} = \beta_3 Real_Estate_Investment_{it} + \epsilon_{it}$$

The presented table reflects the results of evaluating the impact of the net migration on the price index at the beginning of the year in three different models, which differ by estimation methods and sets of controls. The beginning of year price index excludes intra-annual price fluctuations that may be caused by seasonality, short-term economic events or other factors unrelated to migration. This allows focusing on the long-term impact of

migration. In the first (OLS) model, the effect of Migration is statistically insignificant, indicating a bidirectional causal relationship and weak explanatory power. In the second model, applying 2SLS with the use of investment eliminates the problem of bidirectional causality, and the effect of migration becomes statistically significant at the 1% level, reflecting a more reliable and clearly defined effect. The third model, adding income, accounts for a broader range of regional characteristics, further strengthening the statistical significance and economic interpretability of the estimates. Thus, in average holding other variables constant additional 1000 of migrants increases price index by 1.18%.

Dependent Variables:	Price index	Migration	Price index	Migration	Price index
IV stages		First	Second	First	Second
Model:	(1)	(2)	(3)	(4)	(5)
<i>Variables</i>					
Migration, thsd	0.052 (0.155)		0.491** (0.238)		1.18*** (0.363)
2021	110.7*** (5.52)	2.76 (2.31)	98.3*** (2.28)	1.07 (2.29)	116.1*** (4.93)
2022	110.9*** (6.42)	-3.27* (1.74)	99.3*** (1.50)	-5.14** (2.11)	123.3*** (6.19)
2023	68.0*** (10.4)	-7.88*** (1.34)	56.6*** (5.82)	-10.2*** (2.39)	89.6*** (11.2)
Income, thsd	-0.262 (0.160)			0.054 (0.041)	-0.632*** (0.146)
Investment, thsd		0.011*** (0.002)		0.011*** (0.002)	
<i>Fit statistics</i>					
F-test (IV only)	95.4	3.00	57.6	11.0	
Wald (IV only), p-value	1.99×10^{-6}	0.040	1.22×10^{-5}	0.001	

Heteroskedasticity-robust standard-errors in parentheses

Signif. Codes: ***: 0.01, **: 0.05, *: 0.1

Next is represented a model with varying level of education. The table below examines a decomposed model of the impact of migrants with different levels of education on housing prices. Categories with higher, specialized secondary and primary vocational education levels were selected, as these are categories of solvent citizens who can significantly affect the cost of housing. Investments in housing act as a tool. It becomes clear from the table that the most statistically significant variable of interest is the variable of higher education, which is taken at a 95% confidence interval. Next comes a variable with secondary special education accepted at the level of 90%. At the

same time, the initial special is not statistically significant. The tool works best for the higher education variable, since f-statistics are greater than 10, and for other variables f-statistics are less than 6, so the tool explains these variables worse.

To sum up, each additional 1000 migrants with higher education increases, on average, all other things being equal, the cost of housing by 5.75%. From this, it can be concluded that people with higher education have the greatest impact on the cost of housing, which can be explained by the fact that, on average, income will grow with each additional year of education. Therefore, by expanding the budget limit, a person can afford to buy a house.

Dependent Variables:	Higher	Price index	Secondary spec	Price index	Initial prof	Price index
IV stages	First	Second	First	Second	First	Second
Model:	(1)	(2)	(3)	(4)	(5)	(6)
<i>Variables</i>						
Higher, thsd		5.75**				
		(2.29)				
Secondary special, thsd				11.9*		
				(6.58)		
Initial professional, thsd					105.0	
					(90.3)	
2021	-0.279	118.9***	0.849	107.2***	0.251*	90.9***
	(0.538)	(4.76)	(0.692)	(9.66)	(0.140)	(26.8)
2022	-1.17**	124.0***	0.167	115.3***	0.020	115.2***
	(0.500)	(5.53)	(0.624)	(8.44)	(0.126)	(13.8)
2023	-1.08**	83.8***	-0.018	77.7***	-0.019	79.6***
	(0.444)	(10.3)	(0.568)	(11.2)	(0.096)	(13.0)
Income, thsd	0.009	-0.622***	0.006	-0.643***	0.001	-0.711***
	(0.010)	(0.137)	(0.010)	(0.172)	(0.002)	(0.251)
Investment, thsd	0.002**		0.001		0.0001	
	(0.0010)		(0.0007)		(0.0001)	
<i>Fit statistics</i>						
F-test (IV only)	53.3	11.0	5.43	11.0	1.91	11.0
Wald (IV only), p-value	0.025	0.013	0.126	0.072	0.299	0.247

Heteroskedasticity-robust standard-errors in parentheses

Signif. Codes: ***: 0.01, **: 0.05, *: 0.1

The following table examines a decomposed model of the impact of migrants with different nationalities on housing prices. The categories with Russian, from the CIS countries and all the others were selected. Investments

in housing act as a tool. It becomes clear from the table that the most statistically significant variable of interest is the variable of Russian citizenship, which is taken at a 99% confidence interval. At the same time, the CIS citizenship variable and the rest are not statistically significant. The tool works best for the variable of Russian citizenship, since f-statistics are greater than 10, and for other variables f-statistics are less than 1, so the tool explains these variables worse.

To sum up, each additional 1000 migrants with Russian citizenship increases the average cost of housing by 4.91%, other things being equal. This can be explained by cultural differences. Russian citizens tend to purchase housing for personal use, while citizens of the CIS countries tend to live together with their compatriots to reduce housing costs [1]. Therefore, when selling, this category may be discriminated against and higher housing prices may be set.

Dependent Variables:	Russia	Price index	CIS	Price index	Other	Price index
IV stages	First	Second	First	Second	First	Second
Model:	(1)	(2)	(3)	(4)	(5)	(6)
<i>Variables</i>						
Russia, thsd		4.91***				
		(1.72)				
CIS, thsd			65.2			
			(137.5)			
Other, thsd					-484.3	
					(726.4)	
2021	2.44***	105.3***	2.46***	-43.2	0.449***	334.9
	(0.788)	(6.53)	(0.416)	(339.2)	(0.072)	(327.7)
2022	2.72***	103.9***	-2.19***	260.0	-0.275***	-15.8
	(0.851)	(7.37)	(0.406)	(300.3)	(0.073)	(204.8)
2023	0.761	73.8***	-0.500*	110.1	0.170***	159.8
	(0.627)	(9.44)	(0.274)	(70.8)	(0.060)	(131.5)
Income, thsd	0.003	-0.581***	-0.003	-0.368	-0.002	-1.36
	(0.013)	(0.130)	(0.006)	(0.488)	(0.001)	(1.49)
Investment, thsd	0.003***		0.0002		-2.57 × 10 ⁻⁵	
	(0.0009)		(0.0004)		(4.04 × 10 ⁻⁵)	
<i>Fit statistics</i>						
F-test (IV only)	25.0	11.0	0.708	11.0	0.398	11.0
Wald (IV only), p-value	0.007	0.005	0.625	0.636	0.526	0.506

Heteroskedasticity-robust standard-errors in parentheses

Signif. Codes: ***: 0.01, **: 0.05, *: 0.1

The next table shows the effect of the variables for which the proposed instrument is valid. Namely, effect of domestic migration and the effect of migrants with higher education on the price index at the end of the fourth quarter of the year in different categories of housing quality: from low level to vip class. The price index of the fourth quarter is taken as a proxy of the beginning of the year, data on which are not accessible. As a result, variables of interest are statistically significant at 0.01 level for low class housing and on average holding other variables constant the effect of increasing by 1 thousand people domestic migration and migration of university graduates gives an increase in the price index by 4.68% and 5.48% respectively. This may be explained by the fact that Russians and people with higher education move to more developed regions in order to earn better wages and improve their standard of living. However, they can initially afford only low-class housing, as past incomes and savings from living in a less wealthy region do not allow them to buy higher-class housing.

Dependent Variables:	Price index low	Price index med	Price index improve	Price index vip				
Model:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Variables</i>								
Russia, thsd	4.68*** (1.66)	-0.009 (0.118)	0.738 (0.737)	0.554 (0.555)				
Higher, thsd		5.48*** (2.10)	-0.012 (0.157)	0.954 (0.943)	0.735 (0.746)			
2021	106.6*** (6.19)	119.5*** (4.49)	105.0*** (0.494)	105.0*** (0.531)	107.5*** (2.79)	109.3*** (4.00)	107.0*** (2.12)	108.5*** (3.40)
2022	106.2*** (7.20)	125.4*** (5.44)	102.0*** (0.661)	101.9*** (0.940)	105.2*** (3.28)	107.6*** (5.13)	104.9*** (2.67)	106.8*** (4.39)
2023	72.7*** (9.28)	82.1*** (10.1)	104.6*** (0.943)	104.6*** (1.11)	101.9*** (4.82)	103.4*** (5.65)	107.5*** (2.68)	108.7*** (3.77)
Income, thsd	-0.556*** (0.126)	-0.595*** (0.134)	-0.006 (0.020)	-0.006 (0.021)	-0.141 (0.118)	-0.148 (0.125)	-0.109 (0.096)	-0.117 (0.103)

Heteroskedasticity-robust standard-errors in parentheses

Signif. Codes: ***: 0.01, **: 0.05, *: 0.1

9 Conclusion

This study confirms a significant positive effect of domestic migration on housing price in Russia, particularly within the lower-cost housing market, using a 2SLS approach to mitigate endogeneity bias. The analysis reveals nuanced effects based on migrant characteristics: domestic migrants, especially those with higher education, exert the strongest upward pressure on housing prices. Conversely, the impact of foreign migration is less pronounced and statistically insignificant for many sub-groups.

These findings suggest that policies addressing housing affordability challenges in Russia should be regionally specific and consider the distinct impacts of different migrant groups. Strategies might include targeted investments in

affordable housing in regions attracting significant inward migration, potentially differentiated by housing quality to address the most pressing affordability issues, coupled with broader initiatives aimed at fostering balanced regional development to reduce migration pressures.

References

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10 Appendix

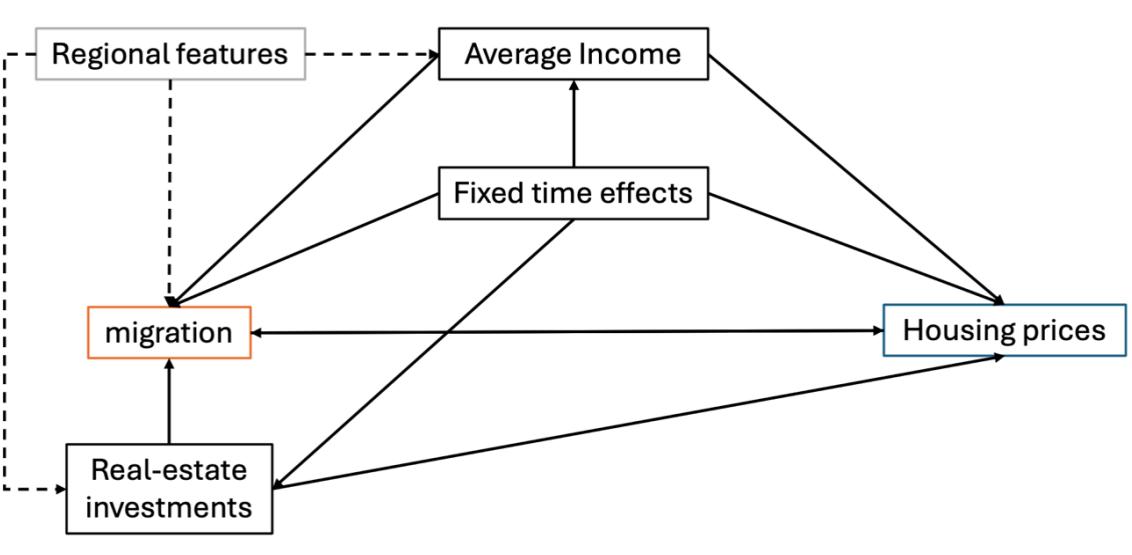


Figure 1: Relationship between variables

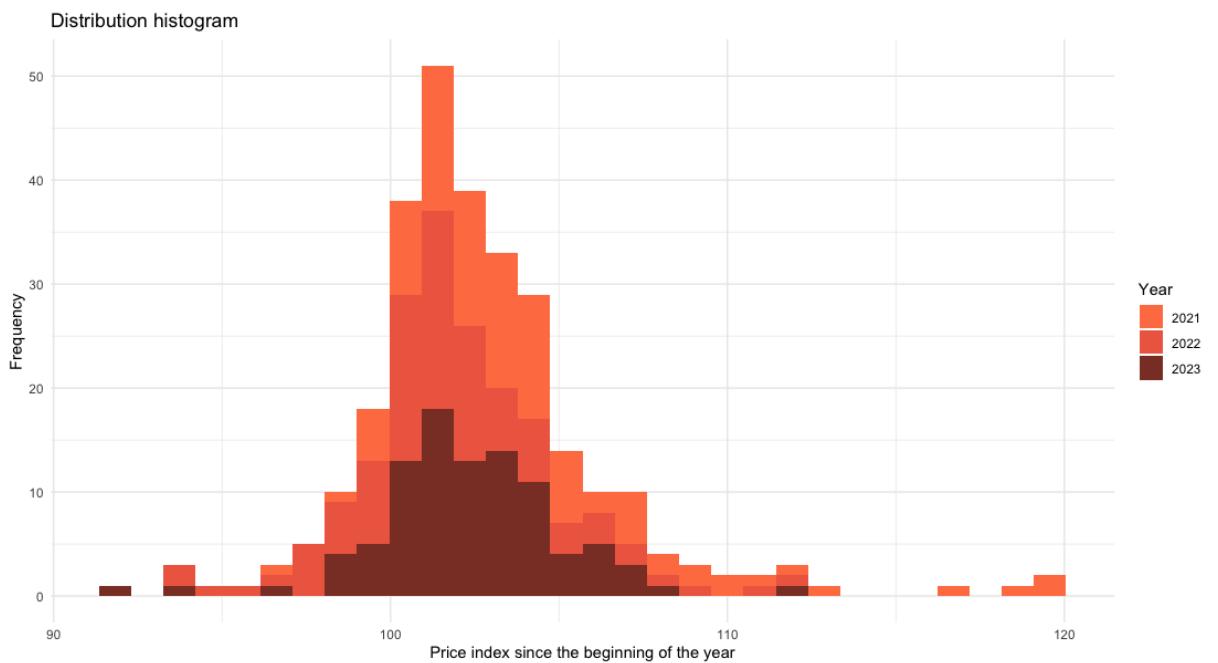


Figure 2: Distribution histogram

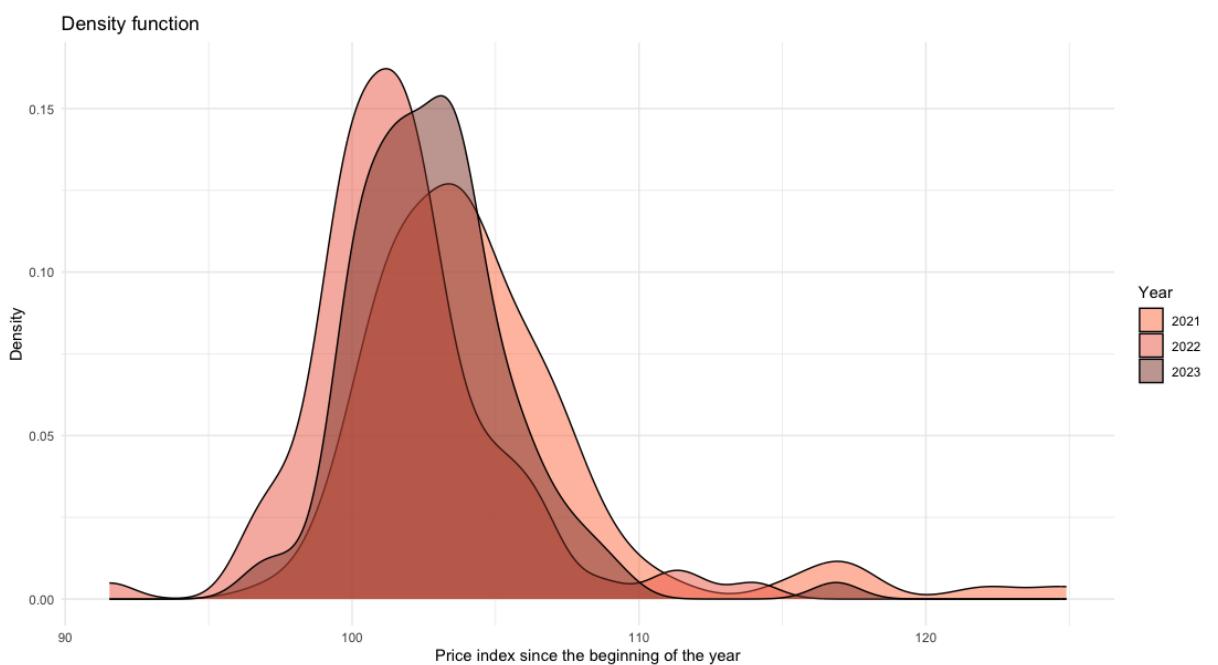


Figure 3: Density function

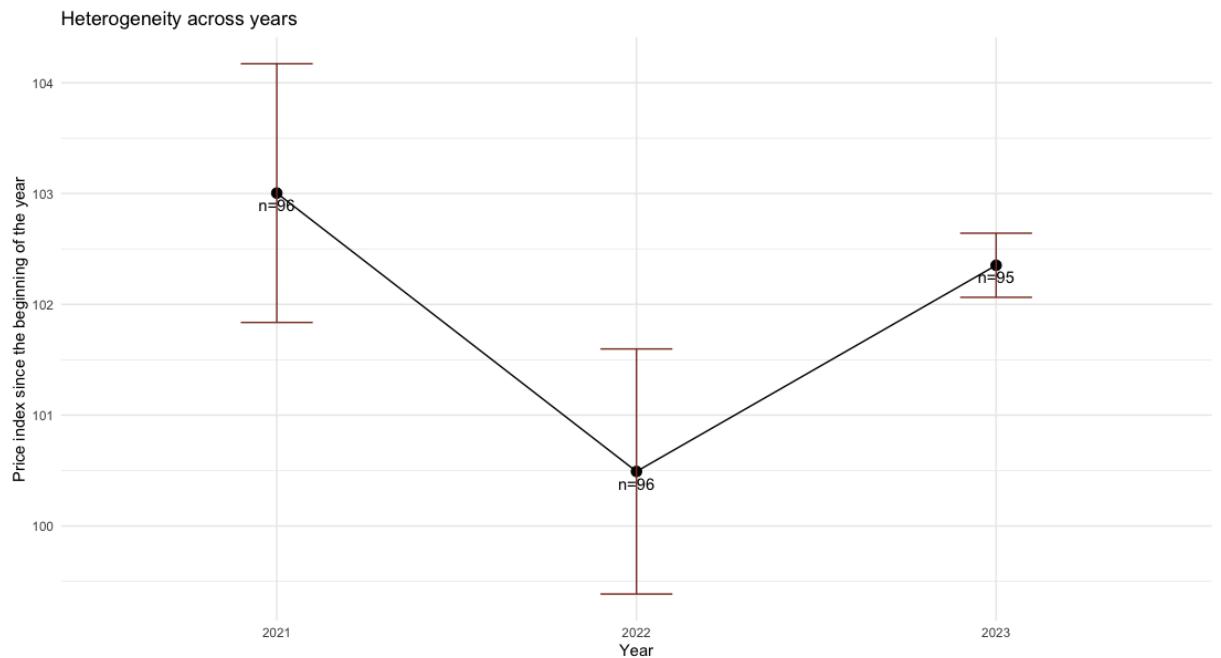


Figure 4: Heterogeneity across years

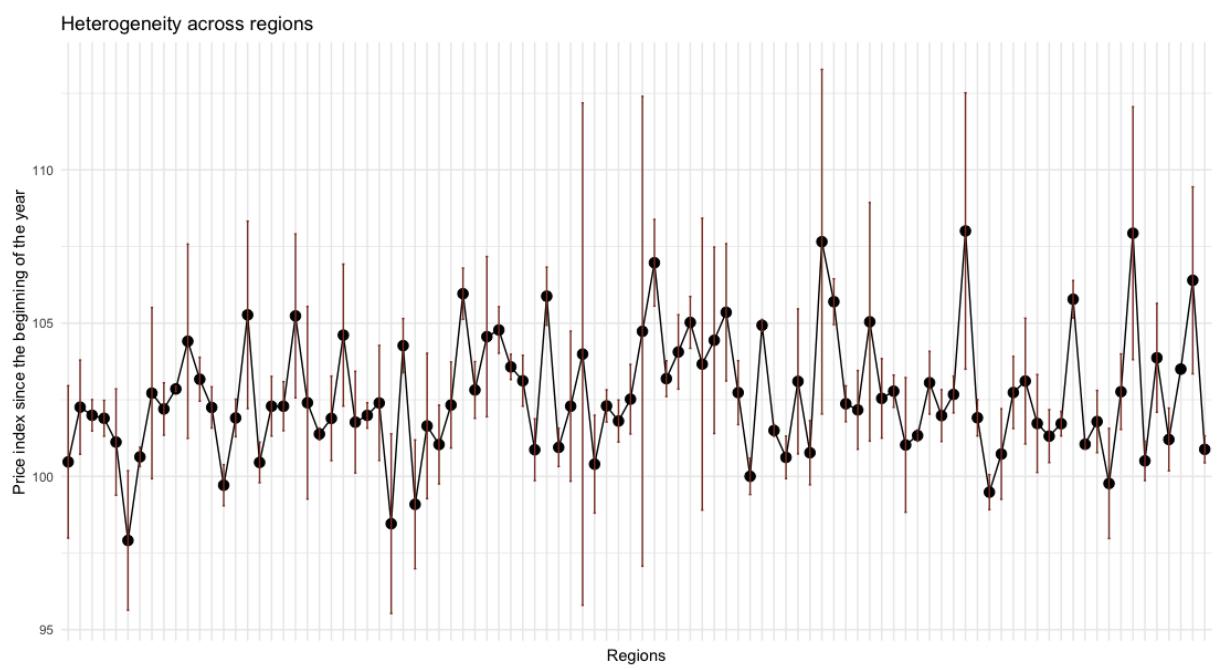


Figure 5: Heterogeneity across regions

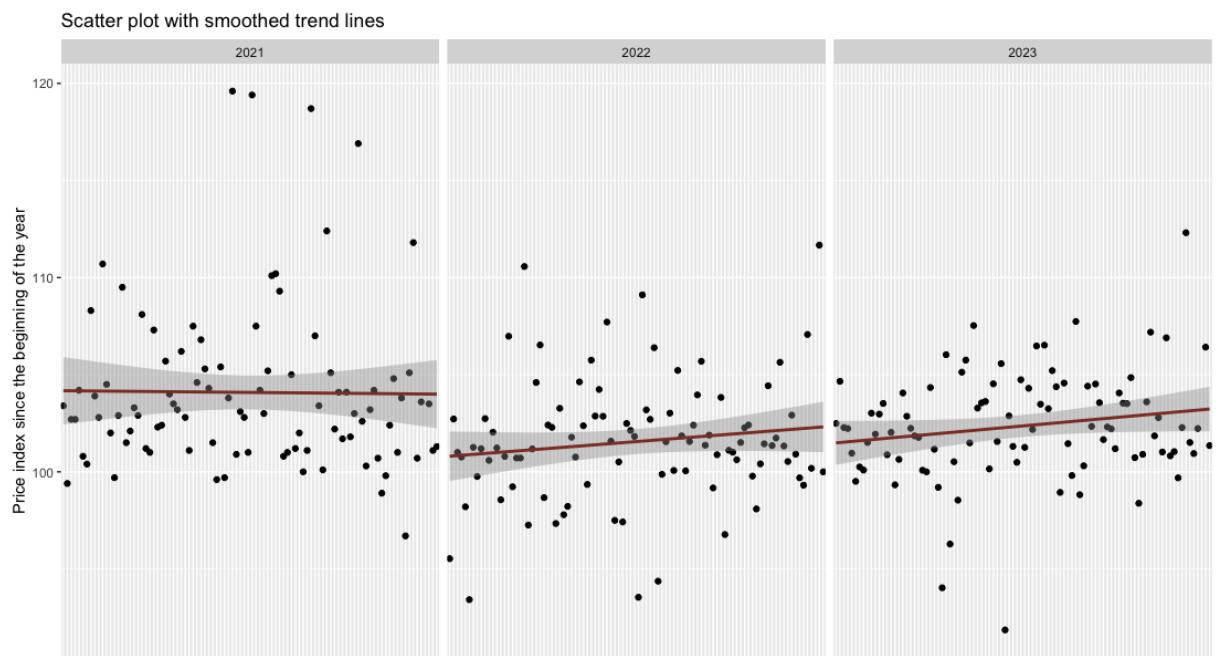


Figure 6: Scatter plot by year for regions



Figure 7: Migration by region for 2021

Migration of citizens with higher education
for 2021 year



Source:rosstat

Figure 8: Migration of citizens with higher education for 2021

Migration by region
for 2022 year



Source:rosstat

Figure 9: Migration by region for 2022

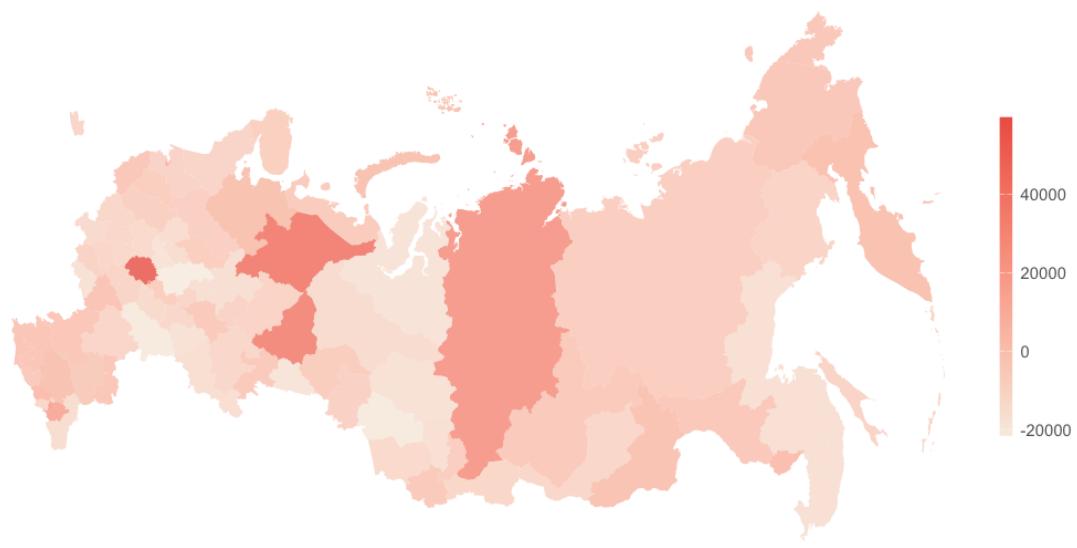
Migration of citizens with higher education
for 2022 year



Source:rosstat

Figure 10: Migration of citizens with higher education for 2022

Migration by region
for 2023 year



Source:rosstat

Figure 11: Migration by region for 2023

Migration of citizens with higher education
for 2023 year



Figure 12: Migration of citizens with higher education for 2023

Table 2: Descriptive statistics for all variables

	N	Mean	SD	Min	Max
Price index	261	90.81	12.26	67.90	119.90
Migration	261	981.79	14 341.94	-21 482.00	113 041.00
Migration Russia	261	2447.43	4530.90	-128.00	36 706.00
Migration CIS	261	7.64	2684.73	-8619.00	13 643.00
Migration other	261	58.97	441.66	-1711.00	1904.00
Migration Higher	261	283.00	2937.87	-2762.00	29 550.00
Migration Secondary special	261	137.34	676.44	-2080.00	6580.00
Migration Initial professional	261	781.44	3690.62	-3834.00	32 004.00
Investment	261	361 504.30	734 688.78	13 829.02	6 757 235.75
Income	261	43 619.71	20 838.42	18 572.75	139 638.00