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**EDUCATIONAL ASSORTATIVE MATING:
PATTERNS, TRENDS AND EFFECT ON INCOME INEQUALITY**

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Motivation

This dissertation lies at the intersection of three large disciplinary problem fields. One of them is devoted to the educational structure of the population and its dynamics. The second focuses on family formation and on the composition of unions in accordance with educational level. Finally, the third category analyses the peculiarities of income distribution. Within each of them, there are numerous open research and investigation questions, but the focus of this study is on the analysis and discussion of the relationships between them.

Since the second half of the 20th century, the global economy has been entering the “educational race”: the share of tertiary – mostly university – educated people has been growing worldwide, and higher education is becoming a social norm. For instance, the share of university graduates in the population aged 24–35 has increased from 23.3% in 1981 to 41.1% in 2020 in the US. Over the same period, this figure rose from 15.1% to 36.1% and from 23.6% to 38.6% in France and Sweden, respectively.¹ The causes of the higher education expansion are attributed to both the supply and demand of labor. On the supply side, the expansion was driven by a set of changes in the economic and demographic behavior of the population: a mass entry of women into the labor market, a transition to smaller families, the formation of the middle class as an important social group and its growing incomes, an increase in the number of funded places in universities, etc. On the demand side, the explanations emphasize the rapidly growing role of innovation and skilled labor in the modern economy. This phenomenon has been underlined theoretically and empirically in the concept of skill-biased technological change (SBTC) [Katz, Murphy, 1992]. Russia has also been following global trends. According to population census data, the share of university graduates among the population aged 25–34 rose from 16% in 1989² to 39% in 2020.³ This development has not been gender-neutral; women have surpassed men in participation and success in higher education.

Educational trends have profound implications for various dimensions of demographic behavior, including entry into marriage and assortative mating. Assortative mating refers to any systematic departure from a random marriage pattern that is often expressed in the selection of a partner with similar characteristics. This study focuses on one type of assortative mating, namely on educational assortative mating.

¹ URL: <https://stats.oecd.org/#> (date of request: 25.07.2022)

² URL: https://rosstat.gov.ru/storage/mediabank/Tom3_tab1_VPN-2020.xlsx (date of request: 25.05.2023)

³ URL: https://gks.ru/free_doc/new_site/population/demo/micro-perepis/finish/micro-perepis.html (date of request: 25.07.2022)

In modern society, formal education yields return in the marriage market⁴ and the labor market for both men and women [Chiappori, Iyigun, Weiss, 2009]. In the labor market, more education is associated with higher wages through the human capital channel. In the marriage market, women's economic potential has become a more important determinant of the living standards of the family, and both women and men now tend to prefer more educated partners. Sociologists also argue that increased educational attainment has strengthened the structural impact of the educational system on marital sorting [Blossfeld, Timm, 2003; Nielsen, Svarer, 2009]. Meanwhile, the ease of access to higher education may have reduced its value as a characteristic that affects the marital choice. Education has become less elitist, and the student population has become more varied, which increases the likelihood of contact with a more diverse social environment. Widening participation in higher education has brought a significant variation in the quality of education. These developments undermine the signaling and structural impact of education and blur the relationship between the level of education, income, and common interests of people. All these may have contributed to the declining influence of education on marital choice. Other trends in the modern world, namely the development of the Internet and the growing popularity of online dating platforms that expand opportunities to meet a partner from other social circles, may lead to lower educational assortative mating, especially among young people.

Changes in the gender balance in education that emerged from the rapid growth of the educational attainment of women have also shaped the marital patterns. The rising educational level of women has enhanced the convergence between the preferences of men and women. Greater similarity in preferences means that both genders now prefer a partner who has attained at least the same educational level, leading to an increase in the proportion of couples who share the same level of education. However, the situation changes dramatically when women surpass men in educational attainment. Highly educated women face a marriage squeeze reinforced by the increasing alternative value of marriage. As a result, the proportion of women who marry less educated husbands is rising, which is accompanied by an increase in the proportion of women who are not married.

Educational assortative mating is not neutral with regard to household income formation. The expansion of higher education and higher returns from it in recent decades has been a major driver of income inequality. A rise in assortative mating among the highly educated may increase household income differences relative to those couples in which both spouses have a

⁴ Becker (1973; 1974) introduced the notion of the marriage market as a conditional space where individuals, given the existing constraints, compete, search for a mate, rate marriage partners, and choose him or her.

low level of education, thereby widening income inequalities. At the same time, the transmission of marriage and educational patterns from parents to children can slow down intergenerational income mobility and freeze inequality in the long term.

The socio-demographic and economic processes described above have been observed in different countries. Russia is no exception. Russian literature discusses the issues lying at a juncture of trends in education and family formation, family structure and income inequality, and education and income inequality (e.g., see [Zakharov, 2007; Arkhangelsky, Zinkina, Shulgin, 2019; Mitrofanova, 2020; Lukyanova, 2016; 2020; 2007; Kartseva, Kuznetsova, 2020]). However, a study that analyzes these issues integrally has not yet been conducted. This dissertation aims to fill this gap. Notably, although this research is a complex interdisciplinary study, it primarily relates to the field of economics since it is based on theoretical and methodological developments in economics.

Brief literature review

The starting point for the theoretical comprehension of marriage behavior is the model elaborated by Becker [Becker, 1973; 1974]. According to Becker, the primary source of benefits from marriage is the gender division of labor, with husbands specializing in market production and wives specializing in household production. In this framework, education is only important for men as it allows them to increase their wages. The educational level is irrelevant to the non-market sphere, so it does not bring returns to women. However, specialization is not the only source of benefit from marriage, as additional utility is generated in the production of family goods and joint consumption. Spouses' similarity by various characteristics, including educational level, is critical for these aspects of married life. A shared outlook and a similar level of intellectual development provide additional utility in raising children, solving everyday issues, organizing, and holding joint leisure activities, etc. The possibility to ensure risks in the case of job loss by one of the spouses further strengthens mate selection preferences for partners with higher education [Hess, 2004; Shore, 2010].

Educational attainment has become one of the key factors in marital choice owing to the mass entry of women into the labor force, the emergence of reliable birth control methods, and the democratization of society. These shifts are the assumptions in the models elaborated by Chiappori and his coauthors [Chiappori, Iyigun, Weiss, 2009; Chiappori, Salanié, Weiss, 2017; Chiappori, Dias, Meghir, 2018]. Thus, education, as a form of human capital, started to bring returns not only in the labor market but also in the marriage market, both for men and women.

The predicted effects of these trends, given the growing returns to education due to technological progress, are an increase in mating preferences for educational homogamy.

Economic theories also suggest explanations for the deviation in mating behavior from the optimal scenario. According to the partner search theory, suboptimal marriage formation and the violation of the equilibrium match are associated with the fact that people have imperfect information about the structure of the marriage market. Simultaneously, the process of obtaining reliable information about potential spouses entails costs, and the odds of meeting potential partners follow a probability law [Oppenheimer, 1988; Lichter, Anderson, Hayward, 1995]. Plus, though education is one of the key factors in marital choice, it is not the only factor: educational attainment interacts with other characteristics.

Sociological literature draws attention to the fact that the educational system and its evolution may have a structural impact on educational assortative mating [Oppenheimer, 1988; Blossfeld, Timm, 2003]. The higher the educational level, the less diverse the social surroundings. University graduation is at an older age, so more educated people have a higher probability of marrying a partner with the same educational level. Those who leave school earlier have a less homogeneous social environment at work or leisure in terms of educational level. Thus, educational assortative mating among these educational groups may be lower.

As one can see above, the issues of marital choice have been actively discussed in the literature, but there is still no consensus on how educational assortative mating works. Therefore, the predictions of theoretical models require empirical verification. Numerous studies in foreign countries have documented that men and women alike tend to prefer partners with similar education (see, for example, [Mare, 1991; Smits, Park, 2009; De Rose, Fraboni, 2016]). For the dynamics of educational assortative mating, previous studies have not revealed any universal facts even for developed countries [Schwartz, 2013]. Findings, even for one country, quite often vary depending on the datasets, the level of detail of the education variable, and empirical approaches to measuring educational assortative mating. Measures of assortative mating that do not account for changes in educational composition often document an increase in the proportion of couples who share the same level of education (educational homogamy). These measures suggest a rise in the share of couples in which husbands are less educated than their wives (educational hypogamy). They also indicate a drop in the likelihood of marriages in which husbands are more educated than their wives, i.e. educational hypergamy [Schwartz, Mare, 2005]. Measures adjusted for changes in educational composition of men and women show that shifts in marriage patterns are primarily driven by educational trends rather than by changes in mate selection preferences [Gihleb, Lang, 2020]. In addition, changes in marital sorting vary by

educational attainment: assortative mating has been declining among university graduates and increasing among low-educated individuals [Eika, Mogstad, Zafar, 2014; 2019].

Analyzing educational assortative mating on the basis of the search theory, one should consider the characteristics of local marriage markets, primarily their educational composition. This approach accounts for the probability of marrying a person with certain educational attainment. Lewis, Oppenheimer (2000) found that both men and women are more likely to marry partners with the same or higher level of education in the states with a more educated population. In states with a low-educated population, women are more likely to marry down, and the risk of hypergamy increases with the age of marriage. Esteve, Garcia-Román, Permanyer (2012) demonstrated that women's higher educational advantage is associated with greater educational hypogamy.

Educational assortative mating is interesting because it may be the factor behind the increase in household income inequality. If men with a high level of education and with high income are married to highly educated and highly paid women, their aggregate income will be higher. Lower educated and lower paid individuals must seek mates among less educated and poorly paid individuals. Thus, as marriages between individuals with the same level of education become more widespread, income inequality may also rise. The research confirms that educational assortative mating contributes to the unequal distribution of household incomes, but the size of the effect is usually small [Greenwood et al., 2014; 2015; Hakak, Firpo, 2017]. Changes in assortative mating over time also have little impact on trends in household income inequality [Eika, Mogstad, Zafar, 2014; 2019].

There is extensive literature examining educational assortative mating internationally, but studies of it in Russia are rare.⁵ The literature reveals that Russian men and women tend to choose spouses with similar education [Volkov, 1986; Roshchin, Roshchina, 2008]. However, these studies are descriptive and use simple contingency tables, covering a relatively short period or containing results averaged over a long period. Few studies employ sorting indicators adjusted for changes in educational composition [Kalmykova, 1991]; however, their results are not representative of the entire Russian population. Hence, previous studies have not documented the evolution of educational assortative mating over a long period and the entire population and cannot provide a comprehensive understanding of the issue. The literature on Russia lacks empirical studies on the association between marital choice and the educational structure of local marriage markets. Existing studies focus narrowly on how local age and sex composition affect

⁵ There is plenty more to learn about assortative mating by other characteristics in the Russian literature: demographers and sociologists most often studied the age and ethnic composition of married couples (see, for instance, [Kurbatova et al., 1988; Volkov, 1989; 2014; Soroko, 2014]).

the probability of getting married (see, for example, [Ilyina, 1977; Darsky, Ilyina, 1990]). We also do not know how specific Russia is in terms of educational assortative mating and its impact on income inequality. This lack of knowledge about educational assortative mating in Russia determines the relevance of this thesis.

Objectives of the research

The aim of this dissertation is to investigate the changes in educational assortative mating and the impact of this demographic dimension on income inequality in Russia.

To achieve this objective, the following steps need to be taken:

1. To study the main theoretical concepts that explain non-random marital choice to demonstrate the research groundwork existing in the literature; to analyze approaches to measuring educational assortative mating, and to determine which of them is most relevant for this study.
2. Based on previous studies, to adapt the research methodology for a comprehensive analysis of the relationship between educational trends, educational assortative mating, and unequal income distribution.
3. To identify the degree of educational assortative mating using a range of measurement techniques, to examine how it evolved in Russia, and to reveal the consequences of trends in education for shifts in educational assortative mating.
4. To assess the effect of education on marital status and educational assortative mating, accounting for changes in the demographic and educational composition of regional marriage markets.
5. To determine the contribution of educational assortative mating to household income inequality in Russia.

The object of the dissertation is educational assortative mating.

The subject of the dissertation is the effect of educational trends on the educational composition of marriages and the contribution of educational assortative mating to the distribution of household incomes in Russia.

Structure of the dissertation

The research is organized as follows.

The phenomena and categories of definitions used in this study are operationalized in the first chapter. The main theoretical approaches to explaining and analyzing marital choices are

also identified here. Various methods for measuring educational assortative mating and existing assessments of its degree and dynamics in foreign countries and in Russia are discussed in detail.

The second chapter focuses on alternative evaluations of educational assortative mating in Russia between 1995 and 2020. We obtain a measure of the overall educational assortative mating among both the entire adult population and by age group. We then study the relationships between the educational structure of the Russian population and its marital status, as well as the educational composition of its unions.

The third chapter aims to detail the effect of education on Russia's citizens' marital status and educational assortative mating using econometric techniques (in particular, the regression analysis). The distinctive feature of the regression model is that the effect of education is introduced at two levels, i.e., as an individual trait and as an aspect of the regional marriage markets.

The fourth chapter examines the importance of educational assortative mating for household income inequality. We describe the mechanism of the effect of educational assortative mating on inequality and present a brief literature review of this issue. Employing a decomposition method, we quantify the contribution of educational assortative mating to income inequality among married couples. The impact of changes in educational assortative mating on the evolution of income inequality is considered separately.

The final section provides a summary of the study and offers prospects for future research.

Methodology

The research methodology is based on standard descriptive statistics and more complex econometric methods. The descriptive analysis builds on rank-order correlation coefficients and coefficients of the homogamy family, which is a routine methodological approach in this type of research. The homogamy coefficients are derived from contingency tables in which the rows and columns represent the distribution of husbands and wives by education. In such calculations, shifts in marriage patterns are contaminated by changes in educational attainment. Thus, simple measures may be misleading. Along with simple measures of educational assortative mating, we apply more sophisticated indicators that explicitly adjust for changes in the educational composition. We use the indicator proposed by L. Eika, M. Mogstad and B. Zafar (2014; 2019). This measure has additional advantages, as it can account for the ages of spouses (or for other characteristics) and can be combined with decomposition methods.

Changes in assortative mating come from two simultaneous processes: the transformation of preferences for a spouse with a certain education level and shifts in educational composition. To split these effects and assess their specific impacts on assortative mating, this study implements the Sinkhorn-Knopp algorithm followed by decomposition [Sinkhorn, Knopp, 1967]. This algorithm involves the standardization of contingency tables such that the marginal distributions of education remain equal to those in the initial year. With the standardized tables, we construct homo-, hypo-, and hypergamy indicators purified from the trends in education.

Multinomial logit regression is used to assess the effect of education on marital choice, controlling for individual heterogeneity and the specificities of local marriage markets. We investigate how education affects two outcomes of marital choice: marital status and the educational composition of marriages. Education enters the model as an individual characteristic and as a feature of the regional marriage market. Regional marriage markets are described by three educational variables: the share of university graduates in the total population, the growth rates of higher education since 1992, and the age-specific index of female educational advantage. The model also includes the age-specific sex ratio to control for regional demographic disparities. We do not claim causal interpretation of the regression results. However, the restriction of the sample to individuals aged 30–50 and careful selection of covariates gives us confidence in the correct identification, at least, of the sign of the effect.

Finally, we employ the decomposition method proposed by DiNardo, Fortin, and Lemieux (1995) to quantify the contribution of educational assortative mating to household income inequality. This decomposition is a non-parametric method with a modified reweighting function. The latter is estimated through the stochastic matching procedure proposed by L. Eika, M. Mogstad and B. Zafar (2014; 2019). The aim of this decomposition is to produce income distributions under counterfactual scenarios and compare them with the actual distributions. We construct two counterfactual income distributions. The first scenario represents a counterfactual situation in which spouses are randomly matched. The second scenario corresponds to a situation in which educational assortative mating is fixed at the base-year level, while the other factors vary over time. By comparing the first counterfactual with the actual income distribution, we assess the effect of educational assortative mating on household income inequality. The differences between the actual and the second counterfactual income distributions reveal how income inequality is affected by changes in educational assortative mating.

Data

This study employs data from several sources. The main dataset comes from the Russia Longitudinal Monitoring Survey – Higher School of Economics (RLMS-HSE) for all waves conducted between 1995 and 2020.⁶ This dataset is representative at the national level and contains information on a wide range of socioeconomic and demographic characteristics.

The second data source consists of data from the Labor Force Survey (LFS)⁷ and the resident population data for 1995–2020 estimated by the Federal State Statistics Service. These datasets are representative at the regional level and are used to construct the characteristics of the regional marriage markets.

To test the representativeness of the RLMS-HSE data, we also use population census data.

Main findings

1. The Russian marriage market was characterized by positive educational assortative mating between 1995 and 2020. This means that marriages occurred more frequently among individuals with the same level of education than it would be expected under random matching with respect to education. There was evidence of positive assortative mating at all levels of education. Over the past 25 years, the degree of educational assortative mating has declined, but only slightly. In 1995, Russians with the same level of education were approximately 2.1 times more likely to be married to one another as compared to the probability under random mating. By way of comparison, Russians in 2020 were 1.8 times as likely to be married to someone with the same level of education as compared to the probability of random mating. The lack of a strong trend in educational assortative mating can be explained by the substantial heterogeneity in developments across educational subgroups. Educational assortative mating among the highly educated has been steadily declining over time despite a substantial rise in the proportion of the population with a high school diploma. This result is due to the increase in women's educational attainment relative to that of men. However, educational assortative mating has gradually increased among individuals with low education.

⁶ "Russia Longitudinal Monitoring survey, RLMS-HSE", conducted by National Research University "Higher School of Economics" and OOO "Demoscope" together with Carolina Population Center, University of North Carolina at Chapel Hill and the Institute of Sociology of the Federal Center of Theoretical and Applied Sociology of the Russian Academy of Sciences. (RLMS-HSE web sites: <https://rlms-hse.cpc.unc.edu>, <https://www.hse.ru/org/hse/rlms>).

⁷ URL: <https://rosstat.gov.ru/compendium/document/13265> (date of request: 25.07.2022)

2. The results obtained with a range of homogamy coefficients point to a reduction in educational homogamy, a rise in educational hypogamy and a negligible shift towards educational hypergamy. Nevertheless, educational homogamy remains the most prevalent marriage pattern. Unlike in developed countries, in Russia, an increase in hypogamy was accompanied by a decline in homogamy, but not in hypergamy.

3. Adjustment for educational trends suggests that the actual growth of hypogamy arose primarily due to changes in the educational attainment of men and women. These changes in educational composition were derived from two educational booms; their consequences were observed during the reporting period. There was a post-WWII boom in secondary and vocational education and a boom in higher education that occurred in the late 1990s and 2000s. There was no significant change in the marital choice in favor of hypogamy, even at young ages. The observed dynamics of hypergamy were driven by both educational trends and mating patterns, which compensated each other. The actual homogamy reduction was associated with a decrease in mate selection preferences due to the rise in the propensity for hypogamy and hypergamy. Changes in mating patterns affected only those with a low level of education. These changes were due to blurring in the differences between low-secondary and secondary education.

4. The regression analysis of the education effect on marital choice suggests that highly educated men were more likely to be married compared to men with a high school diploma. For women, higher education did not change the chances of being married. For men, the higher the level of their education, the higher the probability of being in a hypogamous or homogamous union. The educational characteristics of regional marriage markets were hardly correlated with marital status but had a significant effect on educational sorting. Gender asymmetry in education was found to be associated with a higher likelihood of living in hypergamous union. Only for men we find statistically significant evidence that the educational sorting was associated with the share of the highly educated population. For them, the probability of matching with a more educated female partner increased as the share of university-educated people grew. The pace of expansion of higher education was not statistically related to educational assortative mating for either gender. A significant effect of the sex ratio on educational sorting was found only for men. Men are more likely to marry equally on education in the regions with more balanced gender composition.

5. Another goal of this research is to quantify the contribution of educational assortative mating to household income inequality in Russia. We obtained conclusive results based on a counterfactual scenario in which men and women with the same level of education marry as frequently as what would be expected under a marriage pattern that was random in terms of education. Our results suggest that the Gini coefficient was an average of 3% higher

compared to the counterfactual situation in which the spouses were randomly matched. This result is consistent with the estimates from developed countries, but this effect is weaker than the one identified for developing countries. Educational assortative mating mattered most for inequality in the tails of the distribution, then its central part: the effect reached 4–8%, mainly due to the impact on the upper part of the distribution.

Contribution

1. This thesis contributes to the literature by structuring the main competing theories of partner choice by educational attainment. This research also complements the literature by reviewing the measurement and interpretation aspects of existing studies on educational assortative mating.

2. This is the first study to analyze non-random marriage formation with respect to education in Russia for the whole population and for specific age groups, using a range of methodological approaches. The contingency tables adjusted for the changes in the educational composition of the population point to the dominance of educational trends over mate selection preferences for spouses with certain educational level. This result holds for the entire population and most population subgroups.

3. This is the first paper to conduct an empirical modeling of marital choice in Russia, controlling for regional heterogeneity in gender, age, and educational composition. The regression analysis allowed us to identify and assess the effect of education as an individual trait and as a feature of regional marriage markets. Our findings suggest that higher education is associated with an increase in the odds of being married for men. For women, higher education does not decrease their chances of being married. The educational and demographic characteristics of regional marriage markets have a weak effect on marital status for both genders, but they are strongly correlated with educational assortative mating.

4. This dissertation complements the literature by quantifying the contribution of educational assortative mating and its trends to the distribution of household income in Russia using the nonparametric decomposition method proposed by DiNardo, Fortin, and Lemieux (1996). We find that educational assortative mating generates a rise in income inequality among married couples. We also demonstrate that the effect of educational assortative mating is stronger at the top of the income distribution.

Publications

The results of the thesis have been published in leading Russian journals:

1. Zinchenko, D. (2021). The expansion of higher education and its impact on patterns of union formation and assortative mating: evidence from Russia. *Demographic Review*, 8(4), 81–105. (In Russ.)

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2. Zinchenko, D., Lukyanova, A. (2021). Trends in Educational Assortative Mating in Russia: Do Changes in Educational Structure Matter? *Universe of Russia*, 30(1), 111–133. (In Russ.)

Characteristics: RSCI; SCOPUS Q2; Size – 0.7 copyright sheet.

3. Zinchenko, D., Lukyanova, A. (2018). Educational Assortative Mating and Income Inequality. *HSE Economic Journal*, 22(2), 169–196. (In Russ.)

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