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ABSTRACT

Age and Education in the Russian Labour Market Equation[1]

This paper deals with age and educational dimensions of the labour supply in Russia and explores two time periods: from 2000 to 2015 (retrospective), and the next 15 years (prospective). For our analysis we exploit the micro-census (2015) data and all LFS waves covering the retrospective period. Combining demographic projections with expected employment rates and data on educational achievement we forecast the employment composition up to 2030. If recent past changes in both age and education have contributed to economic growth, their effect is likely to be negative in the next 15 years. These two dimensions are directly associated with such challenges as ageing and over-education of the labour force. Russia is not unique here, but it is more exposed to both dimensions than are many other countries due to its demographic and educational developments. The paper concludes with several tentative policies that could ease, although not cure, the problem.

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1. Introduction

Economic growth and successful modernisation depend on the quantity and quality of the labour supply; these are shaped primarily by the age and the education of the labour force. Younger and better educated labour is more productive, more entrepreneurial, and more innovative than are older and less trained workers. When young age and better education coincide, these two dimensions strongly complement each other. However, they are directly associated with such challenges as ageing and the slowdown in growth of educational attainment, which most developed and some emerging economies are facing. Russia is not unique in facing these challenges but it seems to be even more exposed to them than are many other countries, due to peculiarities of demographic and educational developments.

The purpose of this paper is to explore the evolution of the labour supply in Russia through the lenses of age and education and to outline its potential implications for economic growth. The Russian economy has got stuck at the crossroads of modernisation and stagnation, and it seems that an energetic and well-educated labour force is a vital condition for the country to resume moving along its former path. Although the shortage of such a labour force can become an additional constraint, for which few remedies are available, this problem has not been well understood yet.

In this paper we look at 2000–2015 and project the changes during the next 15 years (2016–2030). In the retrospective period, the Russian economy enjoyed an enormous demographic dividend that supported high growth rates. The size of labour force and levels of employment rose in absolute numbers. The demographic dependency ratio was on the decline, while the fraction of the most productive age groups within the employed population was on the rise. New age cohorts that were entering the labour market had a much larger proportion of workers with tertiary education than did the older cohorts that were exiting the workforce. The total demographic contribution to economic growth was positive and accounted for one third of the GDP growth during 1997–2011, according to the World Bank (2016). In 2011, the GDP in constant prices was 85 per cent higher than in 1997 (Rosstat, 2016a) and, if World Bank estimates are correct, almost 30 per cent of the GDP growth can be attributed to the demographic change.

In the middle of the 2010s, these fortunate trends stopped and even reversed. The working-age population started shrinking, affecting employment negatively, ageing raised the dependency ratio, and the age composition of employment shifted towards older groups. Large-scale contraction of youth in the labour market is a threat to the expansion of entrepreneurship, innovation activity, and technology diffusion. Meanwhile, educational attainment cannot rise forever and is unlikely to

compensate for demography-induced losses in the future. Therefore, instead of a double dividend that contributes earlier to economic growth, the double penalty appears to be the most plausible perspective option.

Two main messages come from the analysis. The first concerns long-term constraints on the labour supply, i.e., a fall in the growth of the working age population, which brings little 'optimism'. These constraints are predetermined by demography, and even the first-best policy intervention can mitigate them only partially. The second message is more 'optimistic', since the negative impact is likely to be somewhat smaller than one might expect. Fortunately, the ageing of the total population is not fully equivalent to the ageing of those in employment and their trends can diverge in the future.

The analysis presented in the paper uses a wide set of data sources. It includes the micro-census data (2015) and all labour force surveys (LFS) covering the retrospective period. Using demographic projections from the Russian state statistical service (Rosstat) up to 2030 we can forecast the age and educational composition of the employed population over the next 15 years. Two important surveys are utilised to estimate returns to education. These are the Russian Longitudinal Monitoring Survey (RLMS-HSE), which covers 2000–2016, and the so-called October Wage Survey (OZPP), conducted by Rosstat, which covers 2005–2015.

The paper consists of introduction, two substantive sections and conclusions. Tables and figures are collected in Appendix. Section 2 discusses retrospective and prospective changes in the size and the age structure of the Russian employed population. Section 3 looks in the same spirit into the educational attainment of the labour force and explores prospective interaction between age and education. Conclusions sum up the preceding sections and discuss tentative policies to mitigate the adverse effects.

2. Age dimension of employment
2.1. Almost 'brilliant' past

For Russia, the beginning of this millennium was marked by a gradual population contraction, from 146.3 million in 2000 to 142.7 million in 2009. The population size then grew to 143.7 million by 2014 and reached 146.4 million in 2015, due to the takeover of Crimea (Rosstat, 2015).

The age composition of the population during the most recent 15 years did not remain constant either. The share of individuals under the working age, which is currently 16 to 54 for women and 16 to 59 for men, decreased from 19.4 per cent in 2000 to under 18 per cent in 2015; in

the meantime, the share of those above the working age increased from 20 per cent to 24 per cent. This resulted in a shrinking of the working age population (WAP) from 60 to 58 per cent.

The economic activity of individuals changes as they age. Participation and employment rates are typically low for younger people; they stay very high and relatively stable for individuals within the age brackets from 30 to pre-retirement, and then they go down again. This results in a bell-shape with a long plateau in the middle. High participation/employment rates signal that the working potential is fully utilised.

Figure 1 presents absolute numbers for employment and changes in employment across 5-year age groups in 2000–2015. The increase in employment rates or the employment to population ratio (e/p) in the main working age groups compensated for absolute losses in population (if the inclusion of Crimea is not taken into account) and even brought some employment growth. For the most recent 15 years, total employment, according to the LFS based estimates, grew from 65.3 to 72.3 million, or by 7.1 million (Rosstat, 2016).

Figure 1 about here

The observed employment growth was achieved during the economic boom of the early 2000s, being simultaneously its outcome and one of the drivers. The columns of the histogram show absolute changes in employment. As we can easily see here, the pre-retirement and retirement age cohorts made the largest contribution to the total employment growth, but one of the most productive age groups, 25–34, expanded their employment by 5 million (Figure 1). The employment contraction of the 35–49 age group was smaller than that gain and cannot change the principal conclusion. Therefore, the economy enjoyed double benefits, both due to an increase in the total employment and due to a rising share of the young prime-age cohort (this cohort had a very high e/p ratio). However, the age composition in general did not move in a favourable direction, showing clear signs of ageing (Table 1). The fraction of young workers, those aged 15–24, dropped by 4.6 percentage points during 2000–2015, while the fraction of the old (50 and over) increased by 8.2 percentage points, from 19.2 to 27.4 per cent. What follows from this fact is that the radical ageing of the workforce that many observers expect in the future has already occurred, and the Russian economy has adjusted to this change.

Table 1 about here

Figure 2 presents employment rates over age groups for the years 2000, 2008 and 2015 and their change over time measured in percentage points (Rosstat, Labour Force Surveys). Visual inspection suggests the following:

Figure 2 about here

First, during the most recent 15 years, the employment rate increased in all groups over 25 years of age, with the highest gains being in the group aged 55–59 years. Young people under 25, on the other hand, decreased their participation, and the decline was the largest among the youngest.[2] Second, the increase in the employment rates took place mainly in the first half of the 2000s, or before 2008. It was supported by a growing labour demand during the boom, when the rapid wage growth could drive up the substitution effect. After 2008, the e/p ratios for younger ages continued to decrease. The contraction could be driven by the outflow of youth from employment to education when the slide into stagnation began (the income effect). Meanwhile, the fraction of youth aged 15–24 in the total population fell also, from about 16 per cent in 2000 to 10 per cent in 2015. This reduction was shared between employment and education and was not to the benefit of the former.

The e/p ratios over age presented in Figure 2 ignore the internal age-related heterogeneity. To eliminate the impact of observed individual characteristics, we estimate the simple probit regression, where the dependent variable is the dummy for employment/nonemployment on age, controlling for education, marital status, children, and region. The youngest age group is taken as the reference category.

The marginal effects, or changes in employment probabilities, from this regression (here, we use 2015 LFS data) are given separately for men and women in Figure 3. They rise sharply for both genders, then stay on a plateau and, starting from the preretirement age, move down sharply again. In the two older groups, they become negative, meaning that employment chances in this age are lower than for the youngest group, those aged 15–19. Interestingly, the line for marginal effects for women goes higher than does that for men, though e/p ratios for men are markedly higher than are those for women. This means that employment probabilities

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[2] In 2000, the proportion of students aged 16–19 in full-time education was 72 per cent, and this was 19 per cent for students aged 20-24. In 2015, these indicators were 88 per cent and 35 per cent, respectively (authors' calculations based on the Russian Labour Force Surveys' data).

for women change over age more sharply than they do for men if other variables are constant. In younger groups, this relates to the higher educational attainment of women and to some delay in labour market entry due to maternity leave.

Figure 3 about here

Summing up this part of the discussion, we can say that, in the retrospective period, demographic change that affected the Russian employment was very beneficial for economic growth. As we will see, it will be different in the prospective period.

2.2 Less brilliant future

Understanding the main demographic and employment age-related trends helps us look into the future. Labour supply depends on two main factors: i) the size of the working age population and ii) the fraction of the population in employment. Both vary over age and are not deemed to be constant over time. Knowing both we can estimate the prospective employment both in the aggregate and by the age groups. Employment in year t is calculated as

$$E^t = \sum_a^k e_a^0 * pop_a^t$$
, where $e_a^0 = \frac{E_a^0}{pop_a^0}$. Index *a* is for age group and indexes *0* and *t* are for the base and the prospective years, respectively. *E* represents absolute employment numbers and *pop* represents population size.

What population size is it reasonable to expect? Rosstat provides three prospective scenarios of population growth based on different assumptions about future fertility, mortality, and migration. Their resulting estimates are in the range of 143 to 152 million (Figure 4). The medium scenario that we take as the baseline sees the population size reach approximately 147 million by 2030. Although this scenario does not envisage any further decline for the total, the structural change within the population in terms of the age composition is expected to be profound. According to this scenario, the fraction of the population aged 25–39 in the total economically active population aged 15–72, according to Russian definition, will shrink from 32 per cent to 22 per cent, while the fraction of the older groups will expand correspondingly.

Figure 4 about here

Over the last few years, the employment rates have changed little, and the assumption that they will stay stable looks quite plausible. Even in 2015, when the Russian economy suffered from the acute crisis, the employment rates (Figure 2) did not show any sizable reaction and stayed at the levels they had been at before. For our foresight calculation, we can fix the employment rates at the level of the most recent year (or they can be averaged over a few recent years) for which the actual data are available, and we take 2015 as the base year.

Depending on which of the above-mentioned Rosstat scenarios we take as basic, the employment size in 2030 may vary from 63.6 to 67.1 million, with 65.5 in the medium option (Figure 5). However, all scenarios predict a large employment contraction, and one can hardly see any alternative, either a stable or an increasing employment trend.

Figure 5 about here

According to the medium scenario, by 2030 (compared to 2015), the contraction can reach 7.0 million (from 72.3 million to 65.3 million), returning the Russian employment level to the size it was in the early 2000s. The difference between now and then is that at that time there were significant reserves of unutilised labour that could be mobilised through a decrease in unemployment and an increase in labour market participation.

Histogram columns (Figure 6) show absolute gains and losses in employment by age groups. Major losses are concentrated in ages under 40 years: by 2030, their employment will shrink by almost a quarter compared to 2015. This loss can be compensated, though partially, by increased employment in ages 40 and above, by 45 per cent only. The largest contraction is expected among workers in the very productive age of 25–34 years, in which employment rates are already very high. This prospect contrasts with what was observed in the previous 15-year period. In fact, employment of individuals aged 50+ may contract by 1.5 million if the current retirement policy does not change, while almost the total gain, which can be approximately 4 million, will be concentrated among those in their 40s. Comparing the current (2015) and the prospective (2030) structures of employment we see little change in the age distribution in both scenarios. The fractions of young and old workers will barely shift and major changes will be contained within the middle part of the age distribution.

Figure 6 about here

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Can population ageing proceed without employment aging? This paradox has real grounds, and it can be explained by peculiarities of the Russian age structure. The fraction of elderly persons aged 70+ is expected to increase by 4 percentage points, but is unlikely to add much to employment numbers, because this age group has an e/p ratio close to zero.

In any case, by 2030, the workforce will be smaller and somewhat older, though better educated. Employment contraction by 10 per cent within 15 years is unlikely to be painless. We cannot remember any episode in modern history when the labour supply has dropped at such a rate in peacetime. Accelerated washout of younger ages from the labour pool aggravates the employment situation, since the young drive innovations and entrepreneurship. The only smoothing factor is the fact that this contraction is going to be gradual over time, thereby easing the adjustment. However, comparing retrospective and prospective changes in the fraction of 50+ year-old workers in the total employment figure, one can conclude that there was more radical ageing in 2000–2015, when this fraction increased by 8 percentage points, while it will be more modest in the future and is unlikely to cause higher unemployment among older workers.

Comparisons of the Russian employment rates with those in the Organisation for Economic Co-operation and Development (OECD) can provide some hints concerning reserves for higher economic activity. Unemployment in Russia remains low, with the rates hovering between 5 and 6 per cent even during crisis times. The employment rate for the 25–54 age group exceeds that average in the OECD countries by 10 percentage points and is unlikely to go up further. It is true that employment rates for the 15–24 and 55–64 age groups are 10 percentage points lower than the OECD average for these ages, but these reserves are not easy to mobilise. The younger group is constrained by high and rising educational enrolment, the older group suffers from poor health and loss of skills, and the future demand for their services is not guaranteed.

A better understanding of where Russia stays in terms of e/p ratios for flanking age groups comes from Figure 7. It ranks the OECD and some partner countries in ascending order according to the ratio for the 55–64 age group. Employment rates in the 55–64 age group in Russia are under 50 per cent, being 47.8 per cent in 2015, while they are above 70 per cent in Scandinavian countries and Switzerland. However, the distance from the OECD average is only 10 percentage points (see above), while the distance from the Eurozone average is even smaller. Moreover, the Russian e/p rates are comparable to those in many European countries with much

higher per capita GDP and with higher retirement ages, e.g., France, Italy, Austria, and Spain, assuming that the association between the e/p ratio, on one hand, and the per capita GDP and retirement age, on the other hand, is not automatic.

Figure 7 about here

The comparison suggests that the room for further rises in employment rates is not as great as it may look. Human capital constraints will negatively affect employment rates even if the retirement age is raised. For younger groups, higher education has become a strong social norm that supports high enrolment. More flexible legal regulations of employment could help, but the overall effect of this measure is hard to predict, and the deregulation itself is a complex political matter.

Although the age structure of employment is almost predetermined by demography and by age-related employment rates, an increase in the retirement age can affect employment rates in the older age groups. The question is how and under what conditions and to what extent?

The legal retirement age in Russia is 55 years for women and 60 years for men, which is lower than in most other developed and emerging economies. The effective retirement age is even a few years lower, since multiple categories of workers, such as military, miners, teachers, doctors, among a few others, are eligible for an earlier pension. Political discussions on increasing the legal age of retirement have gone on for years, but they have always faced fierce opposition from the Government and the State Duma. As of the time of writing this paper, it has become quite evident that there is no alternative to raising the retirement age, but the particular schedule of the transition to new retirement rules, as well as the contours of a new pension system in general, remain unclear, despite multiple reformist attempts undertaken since the early 1990s.

The Russian law allows continuation of paid employment beyond the legal retirement age, and many individuals complement their modest pensions with full-time or part-time wage work.[3] This means that the expected change in retirement age (if this stipulation holds) will affect employment rates in new working ages only marginally. We can assume that the further

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[3] Upward adjustment of the pensionable age leads to temporary loss of pension for those who are affected by the reform and combine pensions and labour income. The discontent of this group seems to be a major political constraint on the reform.

increase in retirement age will have a positive impact on employment rates, but the scale of the effect is uncertain without having additional information about the design of the new pension system. However, one can simulate tentative effects by setting up a few alternative scenarios for the increase in e/p ratios for the older groups, given the current levels and those that are observed in the OECD countries (Figure 7).

We may consider three different options for prospective change in the e/p ratio associated with increasing the official retirement age by 5 additional years for both men and women. They assume increases in the e/p by 5 either percentage points, 10 percentage points, or 15 percentage points for the affected age groups, with corresponding implications for absolute employment quantities. We keep ratios for age groups not affected by a change in retirement age as fixed at the current level (as for 2015). The age brackets that are affected are 55–59 years for women and 60–64 years for men. Under the first option, i.e., growth by 5 percentage points, the employment to population ratio in affected groups goes up from 52 to 57 per cent for men and from 38 to 43 per cent for women. The second – growth by 10 percentage points – and the third – growth by 15 percentage points – options raise the employment ratios further. These rises bring the Russian e/p closer to the OECD averages. Thus, for women aged 55–59, the OECD e/p average is approximately 56 per cent, and for men aged 60–64 it is 60 per cent. Even in the first and most modest option, Russia reaches the levels observed in Austria, Belgium, or Finland. In the latter group of countries, the is considerably higher than is the current retirement age in Russia, and even higher than that proposed in non-public expert discussions (OECD 2015).

What could the total employment gains in 2030 be compared to the baseline scenario if the e/p ratios are raised according to these options? How much would such adjustments contribute to off-setting employment losses driven by the adverse demographic wave? Potential gains are not large and cannot be guaranteed by a mechanical shift in retirement age. Those in the disputed ages who have been outside of the labour force and are now considered a tentative source for labour supply may have low employability, either due to weak human capital or due to poor health, or both. Bringing them into employment would require additional training and/or health care efforts, which are not without cost and are not easy to implement.

Each 5 percentage point increase is equivalent to bringing an additional 0.4 million individuals to employment. The maximum option under consideration would add approximately 1.2 million workers to total employment. This would be a useful addition, but it is, nevertheless, much less than the total decline predicted by the baseline option. In this, the

most optimistic, case, the employment in 2030 will be smaller than that in 2015 by 5.8 million workers (against a loss of approximately 7 million in the baseline option). Although even the partial compensation of the loss can be beneficial, the associated increase in labour supply should be matched by a corresponding increase in demand. We can assume quite safely that, under conditions of such contraction in the labour supply, the demand for older workers will remain stable and will not provoke a rise in unemployment, other things being equal. Indeed, even an increase in the e/p ratio for old-age workers by 15 percentage points in the course of the tentative pension reform will boost their share in the total employment by a modest 2 percentage points only.

Summing up this part of the discussion, we argue that, by 2030, the Russian economy is destined to lose almost one-tenth of the quantity of workers employed in 2015. The most dramatic part of this story concerns the distribution of employment across age groups. In 2000–2015, the largest employment gain came about through increased young prime-age and old-age cohorts. In the next 15 years, the incoming young prime-age cohorts in employment will contribute to a drastic employment contraction. At the same time, the cumulative fraction of young and old workers among the entire employed population will hardly change at all. The long-run downward trend set by demography seems unavoidable and cannot be reversed by any politically and technically feasible reform of the pension system.

3. The challenge of over-education

High-quality education is an important pre-requisite of modernisation. However, as the level of educational attainment and the supply of skilled workers rise, the demand for their services does not always rise. This leads to under-utilisation of the human capital and educational mismatch. In this case, over-education emerges as another long-term challenge, with associated socio-political tensions. Emerging and developing economies usually have larger mismatches than do developed economies, since a low-quality institutional environment depresses job creation and the demand for skilled labour (McGuinness et al., 2017).

3.1 Anatomy of the educational boom

From 1990 to 2010, enrolment in university-level institutions experienced a real boom: the number of students increased by 2.6 times, from 2.8 to 7.4 million, doubling for males and tripling for females (Goskomstat, 2002; Education in the Russian Federation 2016). The

number of currently enrolled students is almost twice as large as it was in the late Soviet years, despite contraction of the youth cohort. This unprecedented expansion brought new human capital and provoked fears of its underutilisation due to growing educational mismatches. What factors have been driving the expansion of tertiary education during the last 25 years?

On the demand side, the main candidate for explaining this phenomenon is the rising return to the human capital. Elimination of the rigid wage grid after the demise of the planned economy allowed for larger educational premiums (Flabbi, Paternostrod, and Tiongson, 2008), while the structural change and the shift towards services brought a variety of new jobs. This pulled students into the tertiary educational institutions. On the supply side, the deregulation of these institutions, which caused an increase in the number of institutions, emergence of the private universities and colleges, and expansion of the educational programmes on a fee basis, etc., eased the adjustment to fast-growing demand of youth for tertiary education.

As a result, a sharp increase in the proportion of workers with the highest formal educational credentials on the labour market may be documented. According to the census data, in the late 1980s, approximately 16 per cent of all employed in Russia had university-level education, and this figure was 26 per cent by the early 2000s. For the technical colleges classified as short-cycle tertiary education, the expansion was even steeper – from 24 to 36 per cent. During 2000–2015, the educational upgrading of the employed population continued and, currently, over 37 percent of the Russian workers have either complete or incomplete higher education, and approximately 35 percent have some college education (Table 2).

Table 2 is about here

The low end of the educational distribution has nearly collapsed. The fraction of low-educated workers with the basic level 9 school grades or lower has shrunk to 4 percent of the total, meaning that the Russian economy has completely lost its low-educated workforce. This positive development may have complex repercussions, since unskilled jobs have not disappeared and are unlikely to disappear in the foreseeable future. At least, the fast-growing literature on job polarisation warns us about this perspective (see Autor and Dorn, 2013). Potential responses include either importing more unskilled migrant labour or raising wages for low-skilled work to attract better-educated domestic workers. Both options are not without social and political costs.

Table 3 about here

These developments have placed Russia among the leading group of countries, according to the international comparisons of education (Table 3). In 2015, approximately 95 percent of Russians in the 25–64 age group had an education level that was not lower than upper secondary. This is the highest proportion for all countries that are monitored and accounted for by the OECD statistics. Other BRIC countries lag far behind, with this proportion being under 50 percent in Brazil and under 25 percent in China. The proportion of people with tertiary education – 67 percent – looks even more surprising; it is higher by 22 percentage points than in Canada, which comes second, while other post-socialist countries do not reach even 25 percent.[4] All this makes Russia an obvious outlier on the educational achievement versus per capita GDP plot (Figure 8). There is no other economy that leads in the first dimension while being a mediocre performer in the second.

Figure 8 about here

3.2 Economic outcomes of educational boom

Expansion of the educated labour supply raises the question whether the Russian economy has been able to generate enough skilled jobs to absorb the supply. If not, how can this mismatch be managed and what are the social losses in terms of efficiency of utilisation of the human capital? These are obvious questions, given the overall mediocre economic performance and the weak institutional system in Russia.

If expectations of the growing mismatch hold true, falling returns to the human capital seem an obvious outcome. When the supply of educated labour exceeds demand, a few reactions are possible. First, excess workers face higher unemployment; second, relative earnings fall; third, many diploma holders move to less skilled jobs. On the contrary, maintaining low unemployment, providing large wage premiums, and preserving high

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[4] The composition of the the Russian educational system provides a partial clue to this paradox. Short-cycle tertiary education, or technical colleges, constitutes an important component of the tertiary education; however, even if it is completely excluded, the proportion of university-level diploma holders (30.4 per cent) leaves Russia as an outsider, high above the general trendline.

occupational status for this segment of the workforce would suggest that the demand for educated labour keeps pace with the supply (Kapeliushnikov, 2012). Let us look more closely at the empirical evidence.

What do unemployment rates show? Having a university-level diploma halves the unemployment risk compared to average workers in the total labour force (Table 4). The risk of unemployment for those with a level of education no higher than basic is 3 to 4 times higher than on average. We observe similar variation when looking at long-term unemployment, the duration of job searches, or discouraged workers. In all cases, the higher level of education seems like good insurance, and we see no signs for a change in the trend.

Table 4 about here

The unemployment rates broken down by educational groups have moved in parallel with changes in unemployment for the whole population (Figure 9). Contrary to widespread alarmist predictions, a mass inflow of university and college graduates has caused no increase in unemployment for these groups so far. Data presented in Figure 9 suggest that they are pulled into employment, not pushed out.

Figure 9 about here

Are returns to education declining? Low unemployment rates do not exclude some negative reaction on the wage side. The decrease in relative wages can be a price paid by workers for stability of employment and avoidance of unemployment. We explore this issue using major data sources available to date, including the Russian Longitudinal Monitoring Survey (RLMS-HSE) and the October Wage Survey (OZPP).[5] These two surveys differ in

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[5] The RLMS-HSE is the nationally representative panel study of Russian households (see more on survey sampling and design in http://www.hse.ru/en/rlms/). The OZPP survey is the bi-annual October Survey, conducted by Rosstat, and contains earnings' data for approximately 750,000 workers in all Russian regions (http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/wages/labour_costs/). It covers large- and medium-sized firms only and excludes Agriculture, Finance, and Public

design and sampling and are not fully comparable. The RLMS data cover the years 1994–2016 (except for 1997 and 1999), while the OZPP covers 2005, 2007, 2009, 2011, 2013, and 2015.

We start with the 'canonical' specification of the Mincer equation that regresses the log hourly wage on gender, the number of years of schooling, the number of years of potential experience, and potential experience squared (see note to Figure 10). This specification assumes that the return to one year of schooling does not vary across levels of education, which cannot always hold true. For example, one year spent in primary school and one year of university studies can have different impacts on productivity and wages (Carneiro and Heckman, 2005: 91). To soften the assumption, we apply the alternative specification, in which we use levels of completed education, instead of duration of schooling, as our main explanatory variable. In the latter case, workers with upper secondary education make up the reference group. Coefficients for our variable of interest (and this is either the number of years or the level of schooling) is statistically highly significant (p<.01) in all specifications and data sets utilised.

Returns to schooling, if estimated using the RLMS-HSE data set, varied from 6.7 per cent to 9.3 per cent in 2000–2016 (Figure 10). They peaked by the early 2000s, when they exceeded 9 per cent, but they lost 2.5 percentage points by the end of the decade. According to these estimates, the educational boom of the 2000s trimmed the economic value of education to some extent. A few factors that amplify each other could be at work here. First, increased competition among university and college graduates on the labour market could result in limited demand for their services and, therefore, compress their relative earnings. Second, the expansion of tertiary education was likely to affect its quality negatively. The rising fraction of part-time students is a clear indication of this. Third, easy enrolment into university-level education makes it accessible to low-ability students and pulls in young people with no educational prerequisites for these studies.

Figure 10 is about here

Although the decline in returns to education looks plausible, and its driving forces are easy to imagine, the OZPP-based estimates fluctuate around the 10 percent level and show no

Administration, as well as all subcontractors, part-timers, top managers, and all those working in small businesses with fewer than 15 employees.

decrease in returns in 2005–2015 (Figure 11). With this divergence in estimates, we remain largely agnostic as to whether the returns have actually been falling.[6]

Figure 11 is about here

One way to explore further how the benefits brought to workers by higher education evolved is to use an alternative specification measuring the completed education in levels, and not just in years of schooling (see note to Figures 12–13). Figures 12–13 present educational premiums or wage advantage for a university graduate relative to an observationally similar worker with a high school certificate only. These estimates for 2000–2015 are based on the same two data sets (RLMS-HSE and OZPP) and show a significant wage advantage of holding a university diploma.

Figure 12 is about here
Figure 13 is about here

The premium fluctuated within the range of 50–77 percent, peaking by the early 2000s, and then declined gradually to the current level of 55 percent, according to the RLMS-HSE. The OZPP data set paint a more stable development, with just minor fluctuations within the range of 73–76 percent. Although the upper bounds for the estimates derived from the alternative data sets are similar, the lower bounds are not.[7] Each of the data sets has its own sources to bias the results, since they differ both in coverage of the work force (see fn.7) and in the technology of data collection. The RLMS data come from household surveys, the OZPP

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[6] For women, the return to education turns out to be higher than it is for men: 7.0 against 6.4 percent in 2016, according to the RLMS-HSE, and 12.3 percent against 8.6 percent in 2015, according to OZPP (Figures 10–11). Asymmetric returns across genders are typical for most countries (Dougherty, 2003; Psacharopoulos and Patrinos, 2004).

[7] University diplomas yield much higher payoffs for females than for males. According to the RLMS-HSE, women enjoyed a larger premium to higher education higher than did men. The difference was approximately 10 percent (Figure 12). This gender gap, as it emerged from the OZPP data, was even larger: these premiums were close to 90 percent for women and 60 percent for men (Figure 13).

data are administrative data. Overall, the OZPP bias seems to be somewhat smaller than is that of the RLMS-HSE. However, even if we accept the lower estimates, which point to a gradual decline in the premium over time, the potential gains to employees remain high enough to keep attracting young people into higher education.

Did educated workers slide down to the lower layers of the skills hierarchy? The excess supply of educated workers can end experiencing downward occupational mobility. If holders of tertiary education cannot find jobs that fit their skill capacity, they have to look for less-skilled jobs. If this is widespread, the bulk of educated labour appears underutilised.

Table 5 presents the distribution of Russian workers across aggregated occupational groups in 2000 and 2015. The fraction of professionals increased by 4.8 percentage points, and this group emerges as the main beneficiary of the occupational change over the period. This was followed by the group of managers, which gained 4.2 percentage points. These two groups gained 9 percentage points in sum. On the contrary, the fraction of unskilled workers downsized by 3.9 percentage points and emerged as the main loser. Other occupations that did not require tertiary education also contracted. The only exception was the group of workers in trade and services, in which most occupations had a kind of free entry; this group expanded by 2.7 percentage points.

Table 5 about here

In brief, the occupational change went in the 'correct' direction, and workers moved upwards on the skills ladder. But was the scale of adjustment on the demand side enough to accommodate the growing inflow of the educated workforce? In searching for answers to these questions we can do the following simple exercise. On the demand side, we divide all jobs into two large segments defined by required skills. The high-skill segment contains jobs belonging to the first three occupational groups (as they are defined by the International Standard Classification of Occupations, or ISCO), while the occupations in the ISCO categories from 4 to 9 relate to the low-skill segment. On the supply side, we also introduce a simple dichotomy, selecting workers who have any tertiary education versus those who have not. Comparing the gap between supply and demand, one can figure out whether they fit to each other and how this match has been changing over time.[8] Paradoxically, the last 15 years saw this gap narrowing,

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[8] This approach was suggested first in (Hecker 1992). See also: (OECD 2009).

not enlarging, despite mass inflow of university and technical college graduates.[9] Table 6 reports data on how workers aged 25–64 with a tertiary education are allocated across high-/low-skilled jobs. The allocation in Russia contrasts with that in the OECD countries (OECD 2009).

Table 6 is here

The fraction of "overeducated" in Russian employment in the selected age was approximately 40 per cent at the beginning of the period and approximately 30 percent by its end. It is in clear contrast with the OECD average, which is around 20 per cent. Among all developed countries, only Spain, Canada, and the USA demonstrate a similarly high rate of underutilisation of a highly-educated educated labour force as the rate seen in Russia. For this comparison, the Russian technical colleges were considered as tertiary education, with all caveats applied to this classification.[10] However, if we exclude this group from the tertiary education and only focus on workers with a university diploma, the overeducated fraction in Russia becomes even less than the OECD average.

The previous analysis did not account for heterogeneity of the labour force. One of the dimensions directly affecting the overeducation gap is age. Labour market entrants, including recent graduates, often make up the most vulnerable part of the workforce and face a higher risk of downward occupational mobility than do either prime-age or older workers. However, the fraction of workers aged 25–34 with a tertiary education in high-skilled jobs increased by 16 percentage points during 2000–2015 (Table 6). If higher education only is considered, the change would be virtually zero (under 1 percentage points). The older workers, regardless of the educational definition, were even less affected.

These estimates suggest that, during 2000–2015, the demand for educated labour in the Russian economy outpaced its supply. High-skilled jobs were able to absorb the growing inflow of university and college graduates. Although many young graduates had to accept low-skilled

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[9] This paradox is discussed in (Gimpelson, Kapeliushnikov 2016).

[10] There are two channels of entry into technical colleges: after completing high school and after completing 9 grades of secondary school. The latter option cannot be classified as part of the 'tertiary education'.

jobs in the early 1990s, by the middle of the 2010s their chances to get managerial or professional jobs improved.

3.3. How bright does the future look?

In what direction can the evolution of the Russian human capital proceed? The long-run supply side effects are set by demography and are path-dependent to the recent educational trends that we discussed above. Their intersection shows a likely trajectory for the future and narrows the space for diverging scenarios.

Most students graduate successfully from their universities by their mid-twenties. Taking a conservative position on the future expansion of higher education, one can assume safely that all subsequent five-year cohorts (those that were under 25 years old in 2015) will end up with the same proportion of holders of higher education as was observed for the group aged 25–29 in 2015. In other words, further educational upgrading will stop at the level of 2015, when about 40 per cent of male workers and 57 per cent of female workers aged 25–29 were endowed with higher education. Although these figures are surprisingly high for a middle-income country, they reflect reality, and we take them as our basic scenario for the future. Moreover, we cannot argue that the recent educational expansion is already totally exhausted, and no further rise is plausible. Our alternative scenario assumes that further educational upgrading is likely to continue, so that, in all subsequent 5-year cohorts that were younger than 25 in 2015, the proportion of holders of university level education will ultimately be 5 percentage points higher than in the 25–29 age group in 2015. Under these two scenarios, the total number of workers endowed with higher education can increase by 2030 from the current 27 million to 29.5 million in the first scenario and 31 million in the second.[11] Given that the total workforce is going to contract substantially during the period, the proportion of workers with higher education will increase from the current 37.4 percent to 43.6–45.4 percent in 2030.

The divergence between educational upgrading and population contraction does not make our forecasts much more optimistic. In some age groups, the absolute number of workers with higher education is likely to decrease (Figure 14). For instance, the numbers of each of the 25–29 and 30–34 age groups can decline by about 1.5-2 million persons. If new ideas are

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[11] The scenario with decreasing educational attainment does not seem plausible, because having a higher education has become a strong social norm, and the associated economic benefits remain substantial.

generated by educated young prime age cohorts, the stream of innovations will dry out. At the same time, the increment of workers with higher education among 40 years olds will be huge enough: nearly 4.5 million. The younger group will be in shorter supply, while the supply of the older group will increase. If workers of different ages do not perfectly substitute each other, we can expect changes in relative wages to the benefit of those who are younger.

Figure 14 is here

A huge increase in the proportion of workers with higher education requires adequate growth in demand for their services. Fast growing GDP during the 2000s made this possible. Unfortunately, at the time of writing this paper– as prospective stagnation looks like a more probable option than modernisation – fast GDP growth does not emerge as the most likely scenario. In this case, the gap between education and productivity, or between supply of educated labour and its demand, is likely to widen. Actually, firms can react to the further growth in the supply of formally educated labour in two different ways. They can either ignore it or respond enthusiastically, creating new and technologically modern jobs at higher rates. In theory, both options are possible, but an in-between scenario of limited adjustment seems the more likely one.

If the demand for labour keeps growing, but at a slower pace than it did in the 2000s, it can lose the race against the change in supply. Massive creation of high-skilled, high-tech jobs requires huge investments, massive flows of technological and institutional innovations, and a friendly business climate. These preconditions are currently absent, and their prospects look gloomy. An expected slowdown in growth rates supports this forecast. The alternative and more likely long-run scenario sees Russia moving to the structure of employment, with the limited set of high-skilled, high-paid jobs open to a minority of well-trained job seekers. All other candidates, regardless of their formal education, will have to take "bad" jobs: low-skilled and low-paid jobs where complex human capital is not a hotly-required component. This type of segmented labour market leaves little room for vertical social mobility, since most jobs are dead-ends but not stepping stones to better occupational careers.

If the labour market evolves in the above-mentioned direction, multiple negative implications, avoided so far, are pending. These include high unemployment of workers with tertiary education (due to longer search for better jobs), falling returns to higher education (if the educational variation disappears), downward occupational mobility, and further extensive

expansion in educational enrolment. To get better positions, job candidates will need to secure a place closer to the top of the educational ladder and be one step ahead of many others. Having a good formal education will not be enough. This will impel an endless race of individuals for even higher formal educational credentials. Such evolution will destroy the advantages brought (so far) by high education and will result in huge efficiency and welfare losses, as well as unpredictable social and political implications.

4. Conclusions

There are multiple reasons why an economy can either choose the path of modernisation or is doomed to stagnate. Institutional factors and human capital endowment are often among priority explanations for prosperity associated with modern technologies and ideas (Acemoglu and Robinson, 2012). This paper explores how the age and education of the population shapes the supply side of the human capital for the Russian economy and how these factors can become long-term constraints for development. As our preceding analysis shows, whereas the beginning of the century (2000–2015) brought double benefits to the economy – in terms of both age and education dimensions – the next 15 years are expected to be less optimistic in this regard and promise a double penalty.

Although demography largely determines the labour supply, as the latter is likely to evolve by 2030, are there any remedies, if not cures, to mitigate the negative impact? We believe that there are, although the room for policies is limited, as they are not without political and financial cost, and the success is far from being guaranteed. Given the expected 10 per cent employment contraction, addressing the issue of early exit from the labour force is one of the priorities. A few relevant policy measures in this direction are worth considering. Pension reform, including a rise in retirement age, emerges as a self-evident option, but, as we document, it is not sufficient to fill the emerging gap. As we can see, the reserves within the Russian population are very scarce and are not easy to mobilise. To bring more individuals of older ages into the labour market, such individuals should be retrained and their human capital significantly updated. This poses complex challenges in the areas of life-long education and training, as well as health care. Currently both are problematic and have no simple solution in the medium-term future. Finally, the supply of labour in these age groups is highly elastic and sensitive to terms of employment. This brings employment flexibility forward as an important policy issue. The possibility of working either part-time, or short term, or out-of-office would be attractive to many older (and younger) persons who do not want rigid attachment. So far, the

Russian employment regulations have remained very strict and unfriendly to any non-standard options and have successfully resisted any liberalisation (Gimpelson and Kapeliushnikov 2013).

Filling the 25% gap in the younger labour force that is going to emerge over the next 15 years, due to the fact that the generation that has recently entered the labour is much smaller, is an even more daunting task. Larger migration of young workers could be a part of the potential solution, but the expected contraction is too large simply to fill it with migrants. Any mass migration is not easy politically, and, in addition, the Russian-speaking pool of foreign labour is limited and mostly low-skilled. Hopes to turn flows of youth towards employment instead of education are unjustified. Such a policy, if undertaken, would undermine human capital in the longer run. More flexible employment and economic restructuring that would result in more efficient reallocation of younger workers can be a big help, but this measure itself depends on modernisation, including modernisation of labour market institutions.

To be employable at any age, the human capital embodied in education and skills should always be up-to-date. One-time large investments into education and training are not enough on their own, and the whole educational system should be adaptive and highly sensitive to occupational changes in labour demand. In addition, high rates of job creation are important, since they reflect demand for labour.

To sum up, the demographic composition of the labour force is not neutral to the labour market development and shapes long-term factors that either ease modernisation or increase the likelihood of stagnation. Expected (and almost predetermined) changes in age and educational composition do not make the hard task of achieving robust economic growth and complex modernisation of the Russian society any easier. Policies to mitigate the emerging constraints exist and are well known, although they are always risky and difficult to implement. However, this choice is always political. All policies mentioned above need friendly and pro-modernisation institutions that support competition, job creation, and demand for advanced human capital. So far, this environment is absent, as are preconditions for the remedying policies.

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Table 1 Distribution of the employed population by 5-year age groups, 2000, 2008, 2015, and 2030, actual and prospective estimates; *percent*

	15-19	*20-24*	*25-29*	*30-34*	*35-39*	*40-44*	*45-49*	*50-54*	*55-59*	*60-72*	*Total*
2000	2.6	9.6	12.1	11.6	15.0	15.8	14.1	9.8	4.4	5.0	100
2008	1.6	10.0	13.0	12.6	11.9	12.0	14.5	12.5	8.0	3.9	100
2015	0.6	7.0	14.5	13.9	13.0	12.2	11.4	13.0	9.3	5.1	100
2030	0.9	6.5	9.8	9.5	12.0	16.9	16.1	13.4	8.9	6.0	100

Source: Rosstat 2015.

Table 2 Distribution of the total and employed populations by educational attainment, 1989, 2002, and 2015; *percent**

Highest level attained	*Total Population Aged 15 and Over*			*Employed Population Aged 15 and Over*		
	1989	*2002*	*2015*	*1989*	*2002*	*2015*
Higher complete	11.3	16.2	25.8	14.6	23.3	34.6
Higher incomplete	1.7	3.1	2.8	1.3	3.0	2.8
Technical colleges	19.2	27.5	31.1	24.3	35.7	34.7
Vocational schools	13.0	12.8	9.2	17.8	15.3	9.8
Upper secondary general	17.9	17.7	17.9	20.8	16.2	14.3
Lower secondary general	17.5	13.9	9.7	13.5	5.6	3.6
Primary	12.9	7.8	3.2	6.7	0.9	0.2
Preprimary	6.5	1.0	0.3	1.1	0.1	0
Total	100	100	100	100	100	100

Sources: Goskomstat 1989; Rosstat 2004; Rosstat 2016b.

* Without persons with unspecified educational levels.

Table 3 Educational attainment of population aged 25-64, 2015; *percent*

	Population that has attained at least upper secondary education	Total population		
		Population that has attained tertiary education		
		Short-cycle tertiary education	*University-like tertiary education and advanced research programmes*	*Total tertiary*
Developed countries				
Canada	90.4	25.7	29.5	55.2
France	77.3	14.6	19.0	33.5
Germany	86.8	0.6	27.0	27.6
Italy	59.9	-	17.5	17.5
Japan	-	20.6	28.9	49.5
United Kingdom	61.9	10.1	33.4	43.5
United States	89.5	10.5	34.1	44.6
Central Eastern Europe				
Czech Republic	93.2	0.2	22.0	22.2
Hungary	83.2	1.3	22.9	24.2
Poland	90.8	0.1	27.6	27.7
BRICS				
Brazil	47.4	-	14.3	14.3
China	24.5	5.8	3.9	9.7
India	-	-	-	-
South Africa	42.4	-	14.6	14.6
Russia	94.2	36.8	30.4	67.2

Sources: OECD 2016a; Rosstat 2016b.

Table 4 Unemployment rates by gender and educational attainment, 2015; *percent*

	Higher complete	*Technical colleges*	*Vocational schools*	*Upper secondary*	*Lower secondary*	*Primary and preprimary*	*Total*
Total*	3.4 (0.2)	4.5 (0.6)	5.8 (0.8)	8.6 (1.3)	13.4 (3.3)	21.3 (5.9)	5.6 (0.7)
Male	3.4	4.8	5.7	8.2	13.7	19.9	5.8
Female	3.4	4.3	6.0	9.2	12.9	23.8	5.3

Source: Rosstat, Russian Labour Force Surveys.
Note: * Rates for discouraged workers are given in parentheses.

Table 5 Occupational composition of the employed population aged 15-72, 2000 and 2015; *percent*

Occupations	2000	2015
Managers	4.4	8.6
Professionals	15.6	20.4
Technicians	15.2	15.3
Clerks	3.4	2.9
Service workers	11.8	14.5
Skilled agricultural workers	6.3	3.4
Craft workers	16.3	13.1
Plant and machine operators	13.5	12.2
Elementary occupations	13.5	9.6
Total	100	100

Source: Rosstat, Russian Labour Force Surveys.

Table 6 Percentage of workers with tertiary education employed on high-skilled jobs (ISCO 1-3), employed population aged 25-64, Russia and OECD countries; *percent*

	Groups by age					Increase for group 25–34, percentage points	Increase for total workers 25–64, percentage points
	25–34	*35–44*	*45–54*	*55–64*	*25–64*		
Russia-1*							
2015	71.0	72.2	70.1	66.9	70.6	+16.2	+12.5
2000	54.8	56.4	61.9	64.2	58.1	–	–
Russia-2**							
2015.	82.4	86.8	87.7	84.9	85.2	-0.9	+0.1
2000	83.5	84.4	87.3	85.0	85.1	–	–
OECD average							
2006	79	82	85	86	82	–1	–2
1998	80	85	87	88	84	–	–

Notes: * Basic definition: workers with university and technical college diplomas are qualified as having tertiary education.
** Modified definition: only workers with university diplomas are qualified as having tertiary education.
Sources: Rosstat, Russian Labour Force Surveys; OECD 2009.

Figure 1 Employed population by age, 2000 and 2015; *thousand*
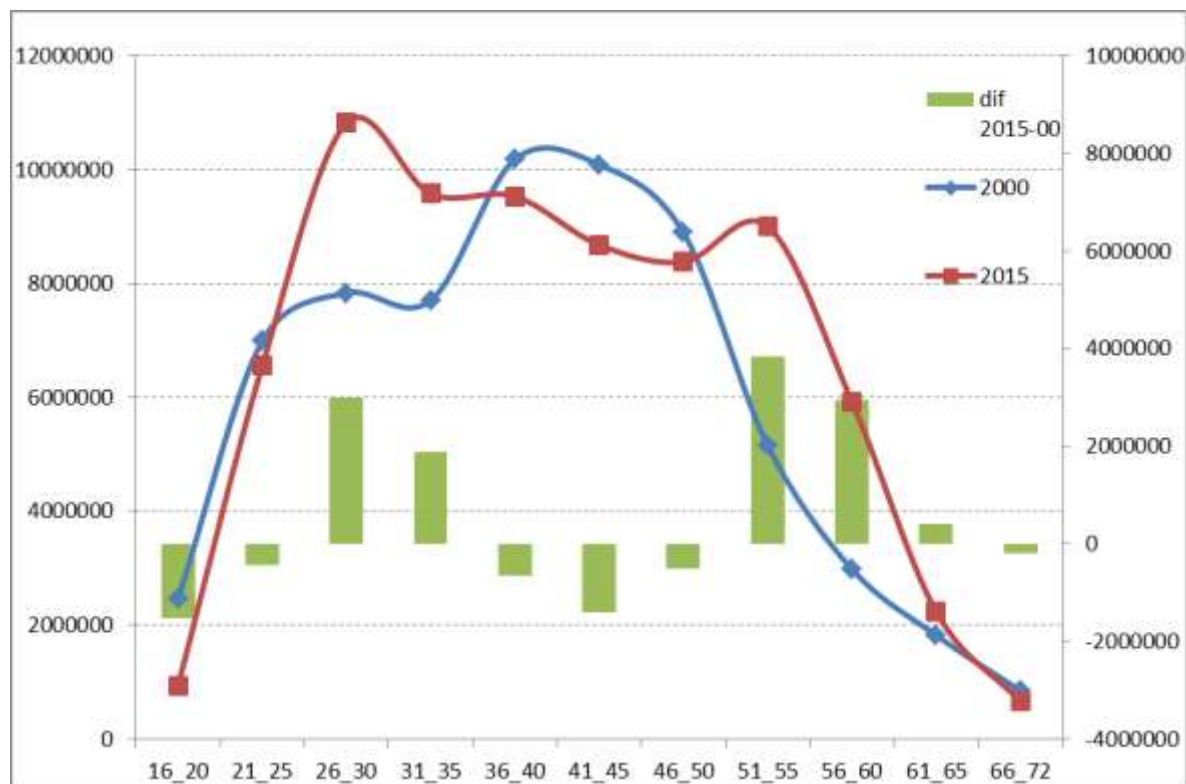
Source: Rosstat, Labour Force Surveys. Authors' calculations.

Figure 2 Employment-to-population ratios (e/p) by age, 2000, 2008, and 2015; *percent*
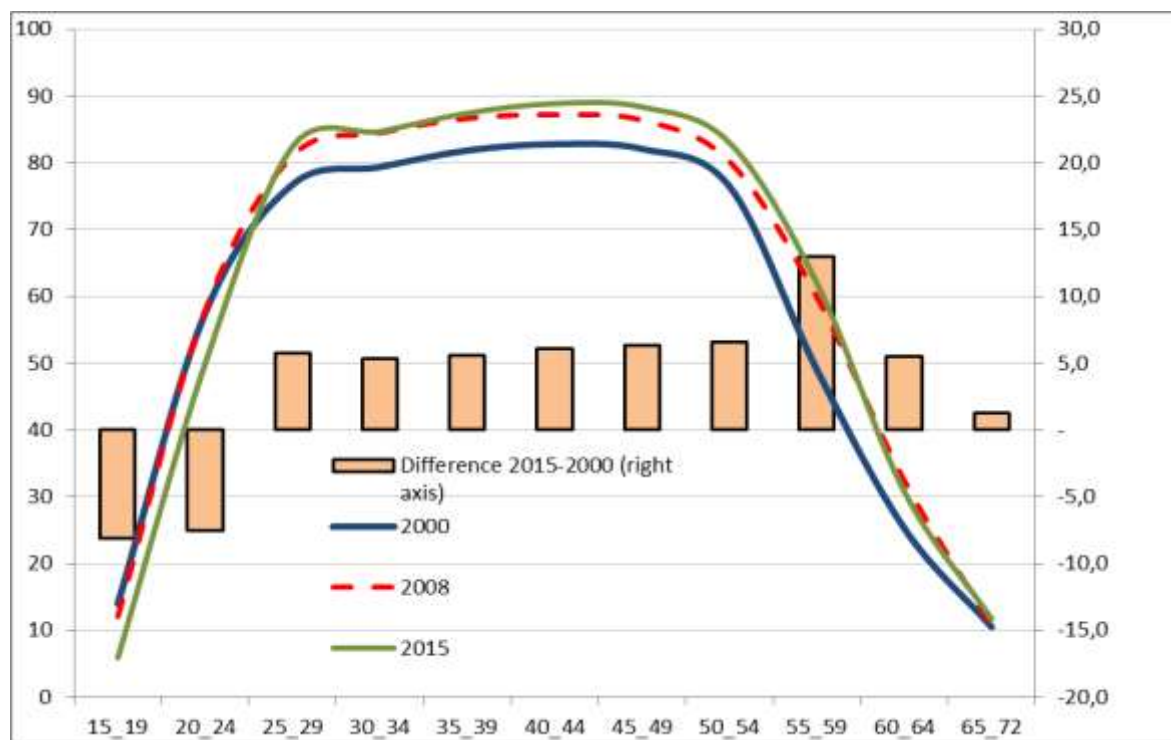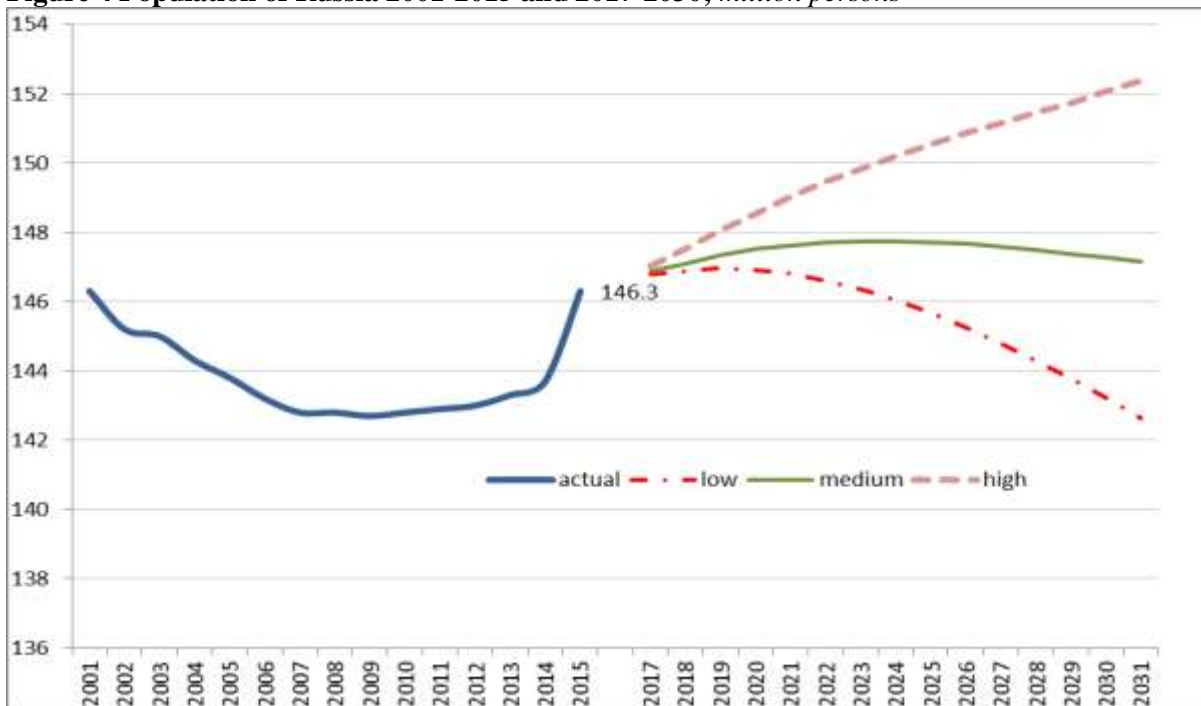

Source: Rosstat, Labour Force Surveys. Authors' calculations.

Figure 3 Marginal effects of age on probability of employment by gender; *percent*
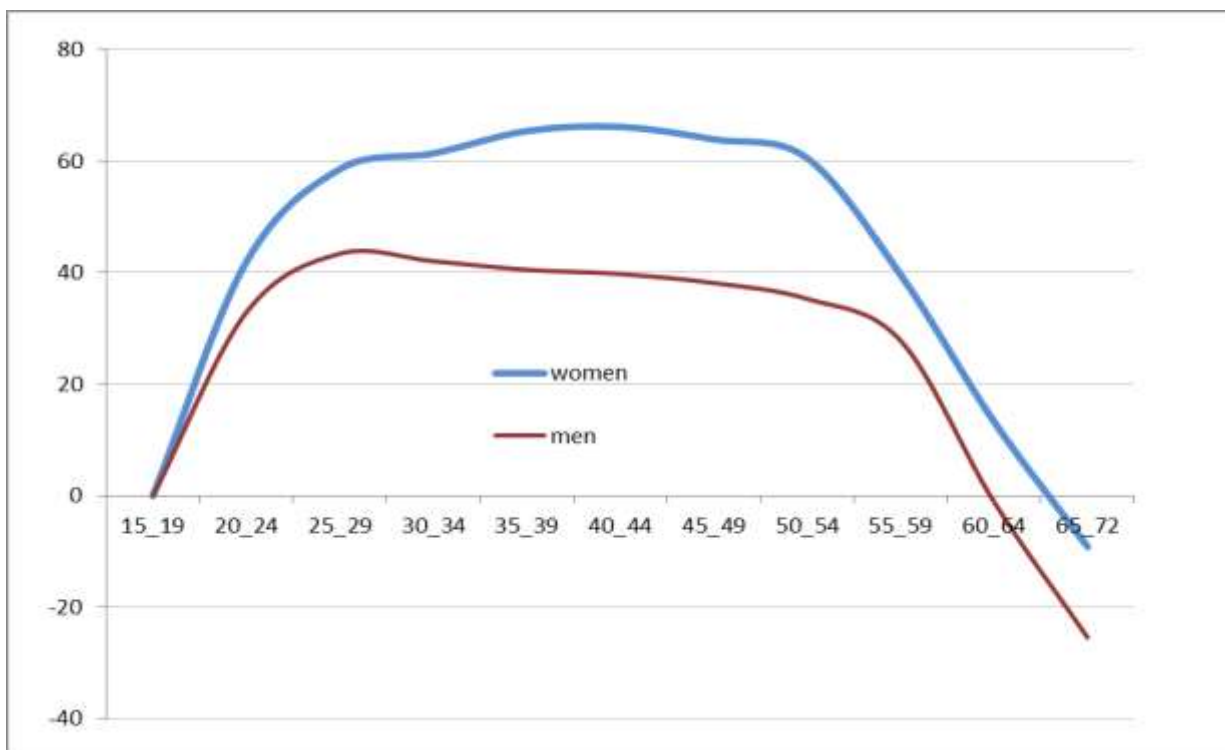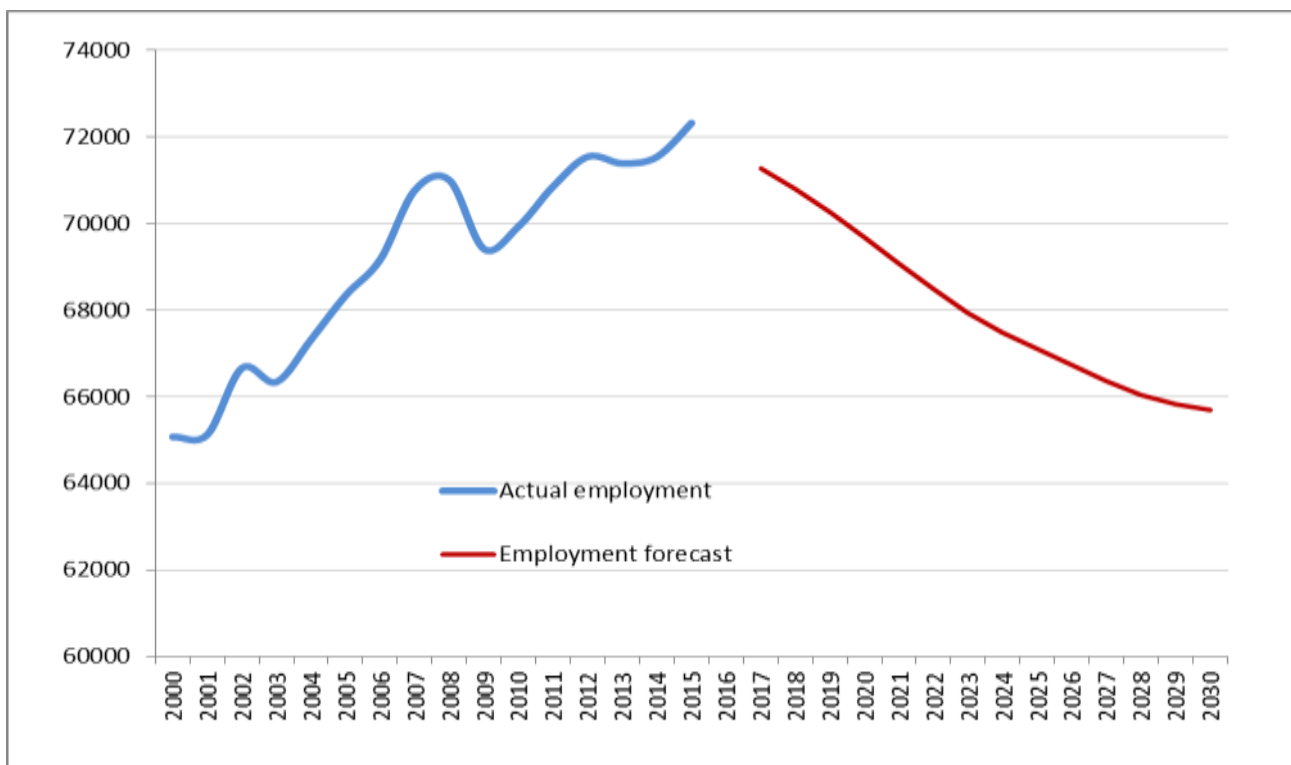

Source: Authors' calculations.

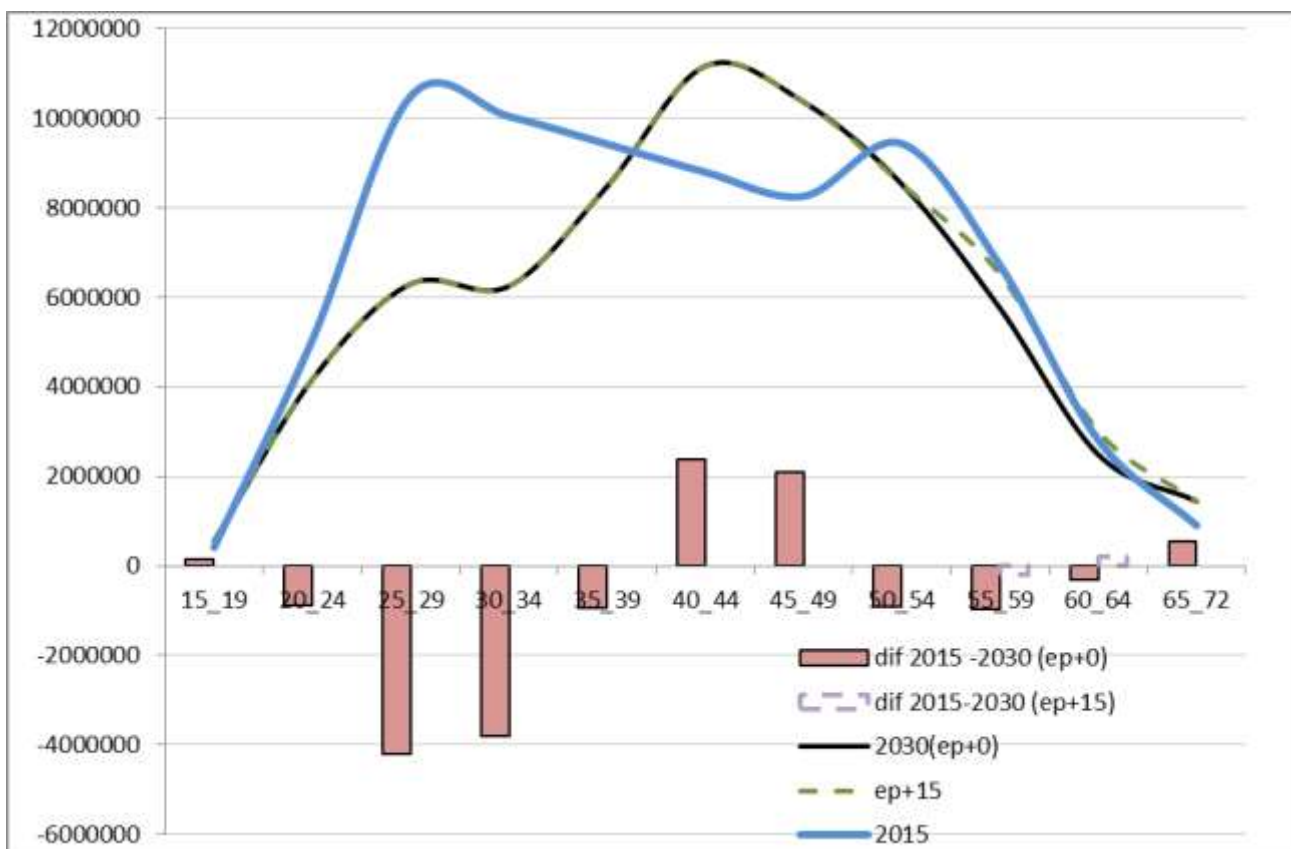**Figure 4 Population of Russia 2001-2015 and 2017-2030;** *million persons*

Source: Rosstat 2017.

Figure 5 Employment forecast up to 2030; *thousands*

Source: Authors' calculation on the basis of the Rosstat's medium demographic prognosis (Rosstat 2017).

Figure 6 Distribution of employment over age, 2015 and 2030; t*housand*

Source: Authors' calculations.

Figure 7 Employment-to-population ratios in the OECD countries, 2015; *percent*
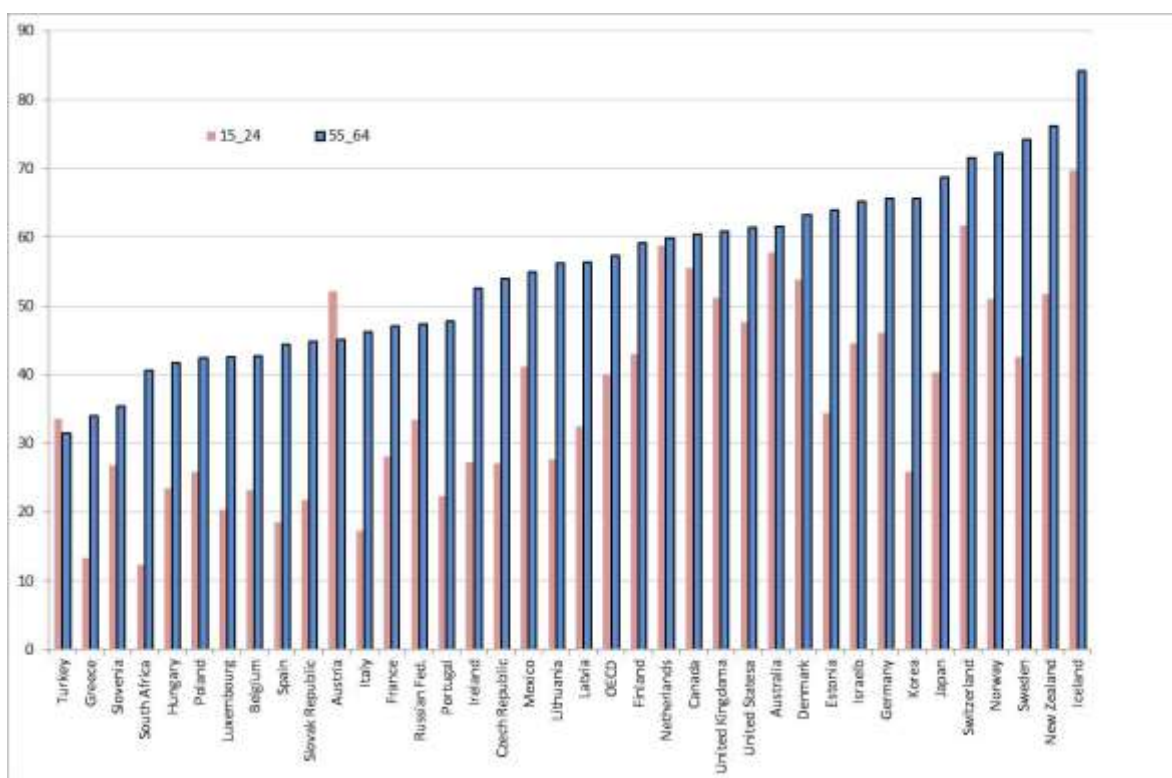
Source: OECD 2016b.

Figure 8 Percentage of population aged 25-64 with tertiary education by GDP per capita, 2015
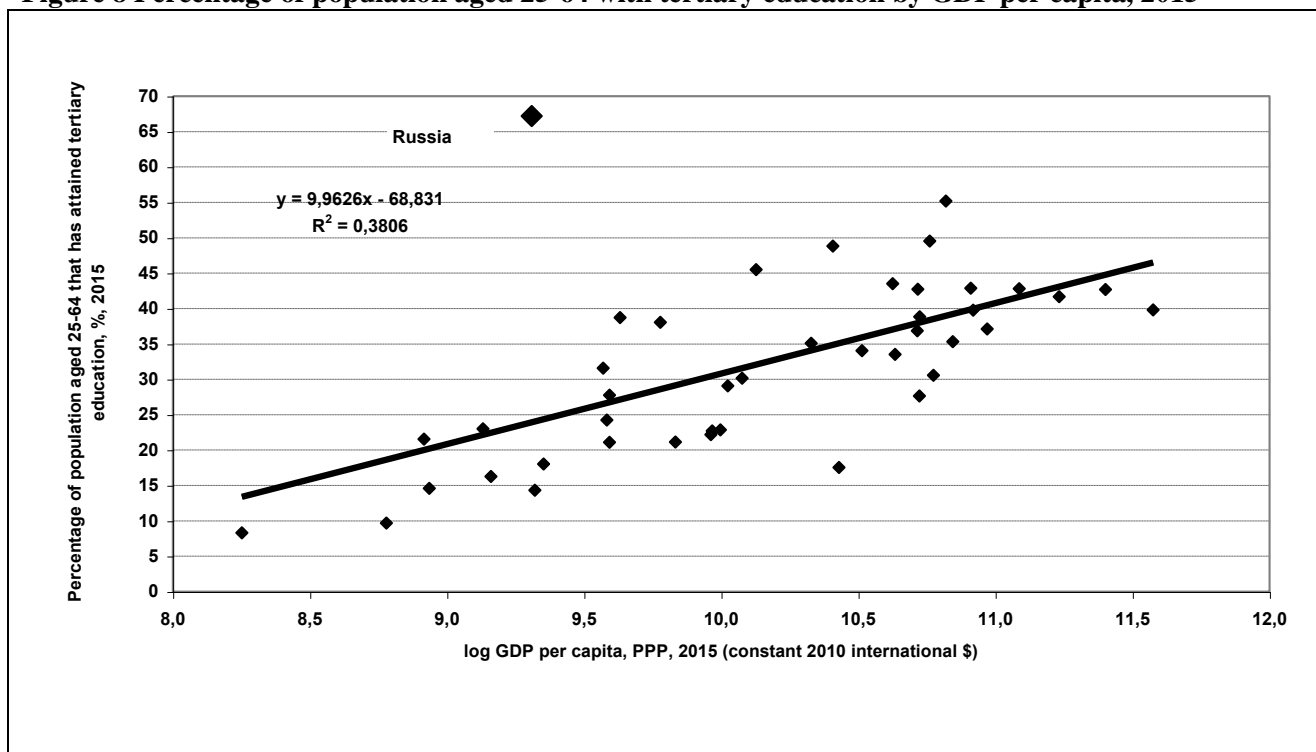
Sources: OECD 2016a; Rosstat 2016b; World Development Indicators.

Figure 9 Unemployment rates by educational attainment, the total labour force aged 15-72, 2000–2016; *percent*
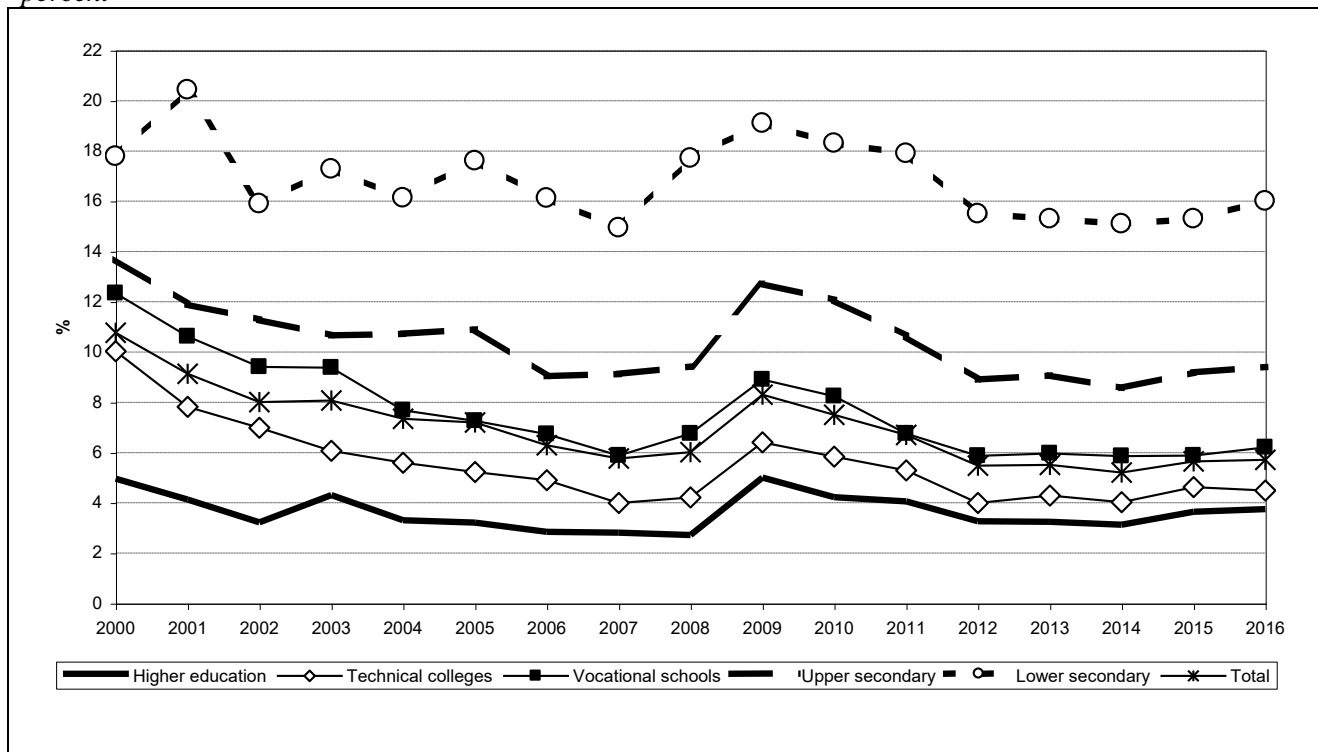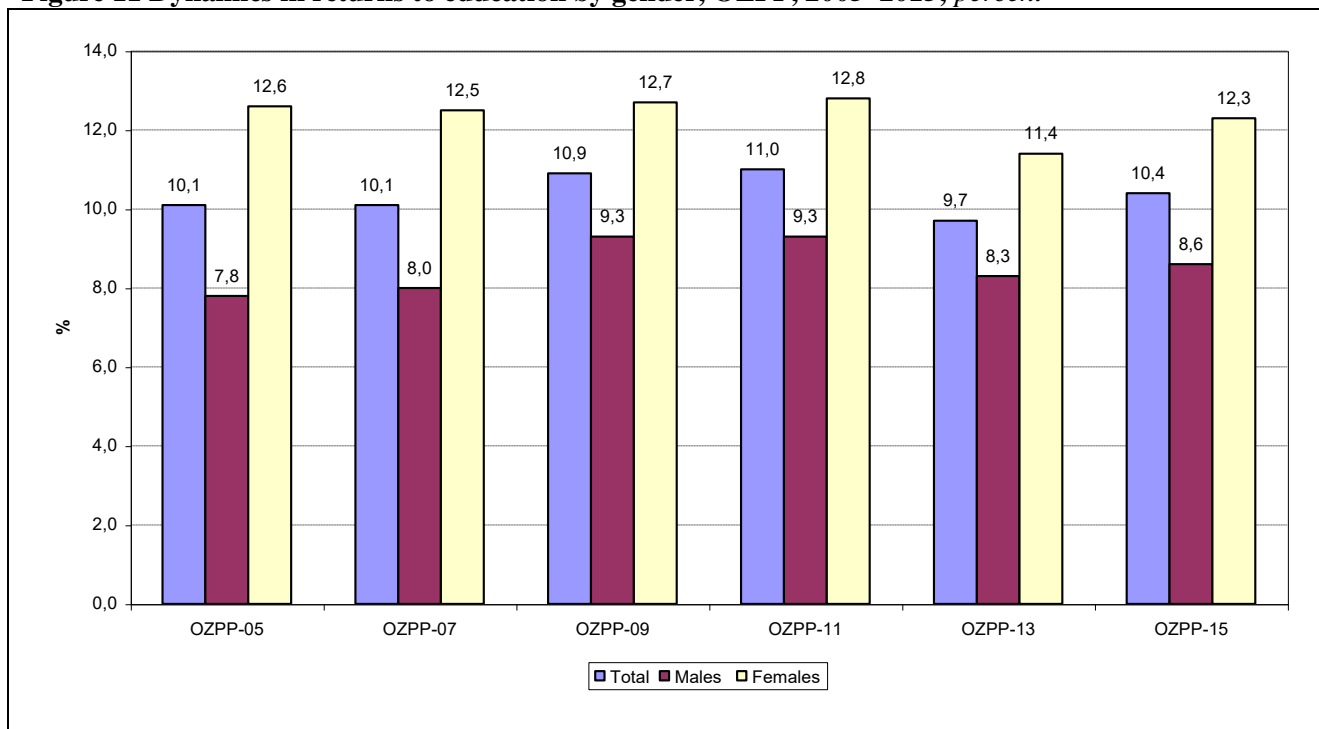

Source: Rosstat, Russian Labour Force Surveys.

Figure 10 Dynamics in returns to education by gender, RLMS-HSE, 2000–2016; *percent*
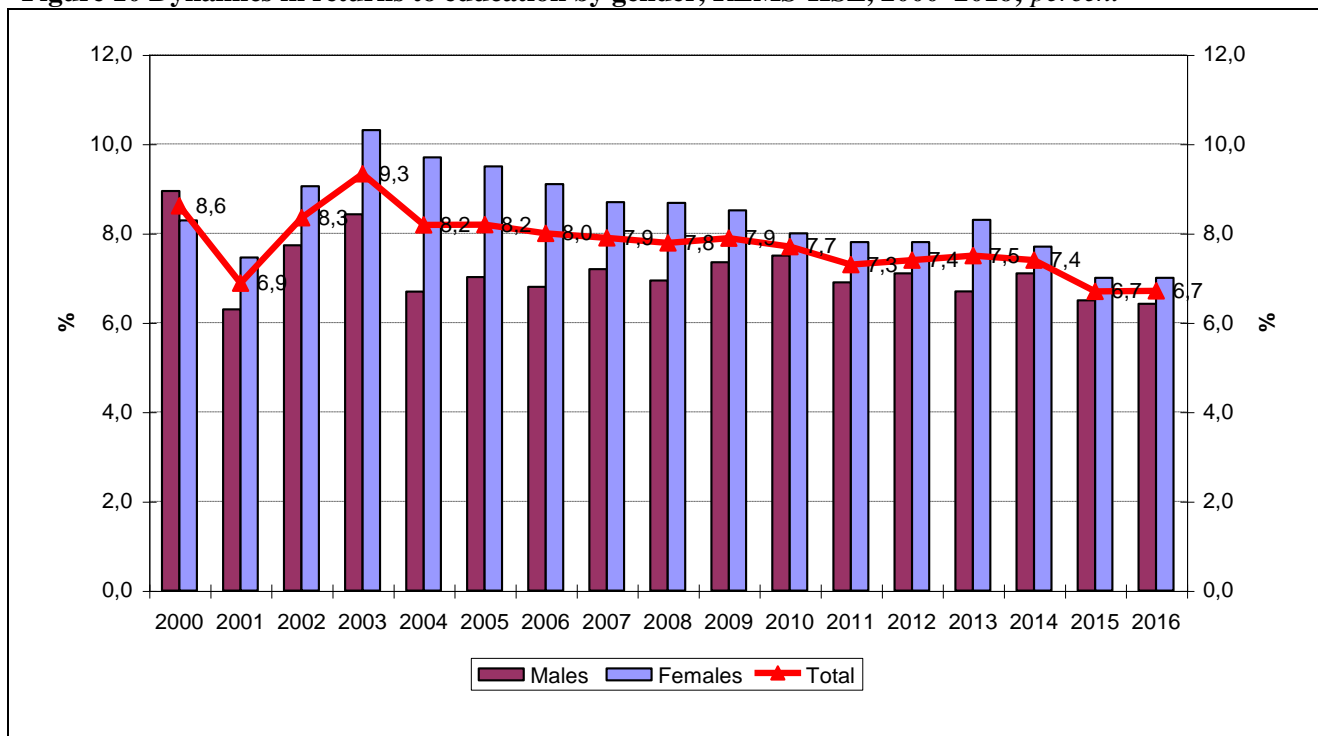
Source: RLMS.

Note: OLS estimates of the "canonical" Mincer earnings equation: $\ln W_i = a_0 + \alpha G_i + rS_i + \beta_1 t_i + \beta_2 t_i^2 + \varepsilon_i$, where W – hourly wage, G - gender, S – years of schooling, t – potential experience, ε – error term.
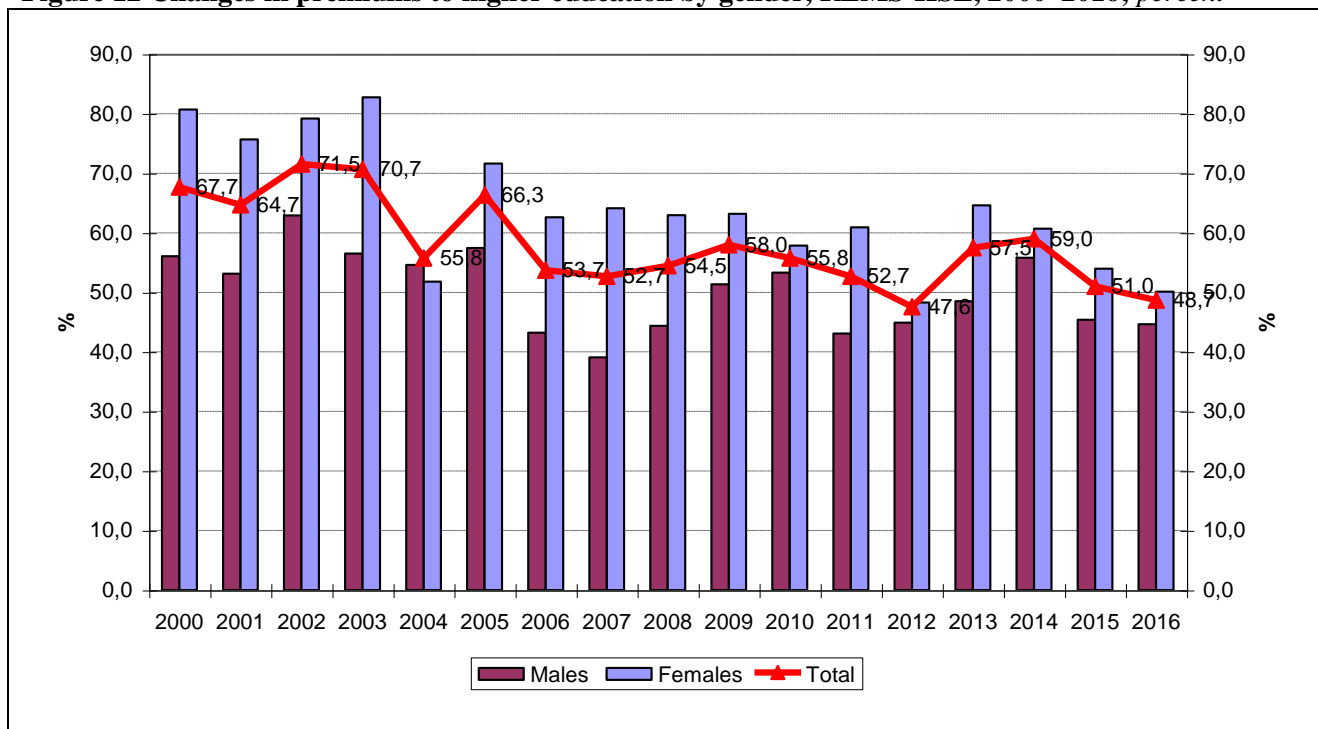
Figure 11 Dynamics in returns to education by gender, OZPP, 2005–2015; *percent*

Source: OZPP.

Note: OLS estimates of the "canonical" Mincer earnings equation: $\ln W_i = a_0 + \alpha G_i + rS_i + \beta_1 t_i + \beta_2 t_i^2 + \varepsilon_i$, where W – hourly wage, G - gender, S – years of schooling, t – potential experience, ε – error term.

Figure 12 Changes in premiums to higher education by gender, RLMS-HSE, 2000–2016; *percent*

Source: RLMS.

Note: OLS estimates of the alternative specification of Mincer earnings equation: $\ln W_i = a_0 + \alpha G_i + \rho_1 L_i + \rho_2 V_i + \rho_3 T_i + \rho_4 P_i + \beta_1 t_i + \beta_2 t_i^2 + \varepsilon_i$, where W – hourly wage, G - gender, L, V, T and H – dummies for lower secondary, vocational, technical college and higher education, t – potential experience, ε – error term (the reference group is general upper secondary education).

Figure 13 Dynamics in premiums to higher education by gender, OZPP, 2005-2015; *percent*
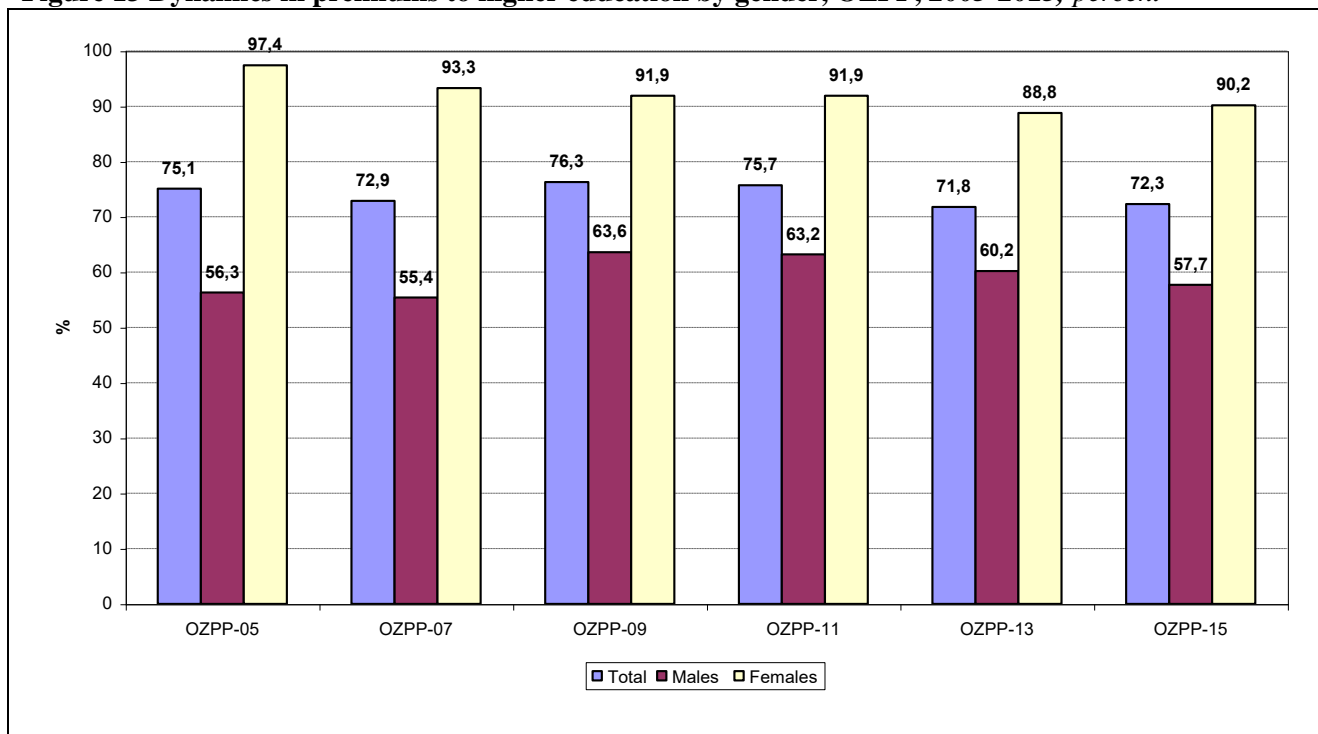
Source: OZPP.

Note: OLS estimates of the alternative specification of Mincer earnings equation: $\ln W_i = a_0 + \alpha G_i + \rho_1 L_i + \rho_2 V_i + \rho_3 T_i + \rho_4 P_i + \beta_1 t_i + \beta_2 t_i^2 + \varepsilon_i$, where W – hourly wage, G - gender, L, V, T and H – dummies for lower secondary, vocational, technical college and higher education, t – potential experience, ε – error term (the reference group is general upper secondary education).

Figure 14 Number of workers with complete and incomplete higher education by 5-year age groups, 2000, 2015 and 2030, actual and prospective estimates; *million*
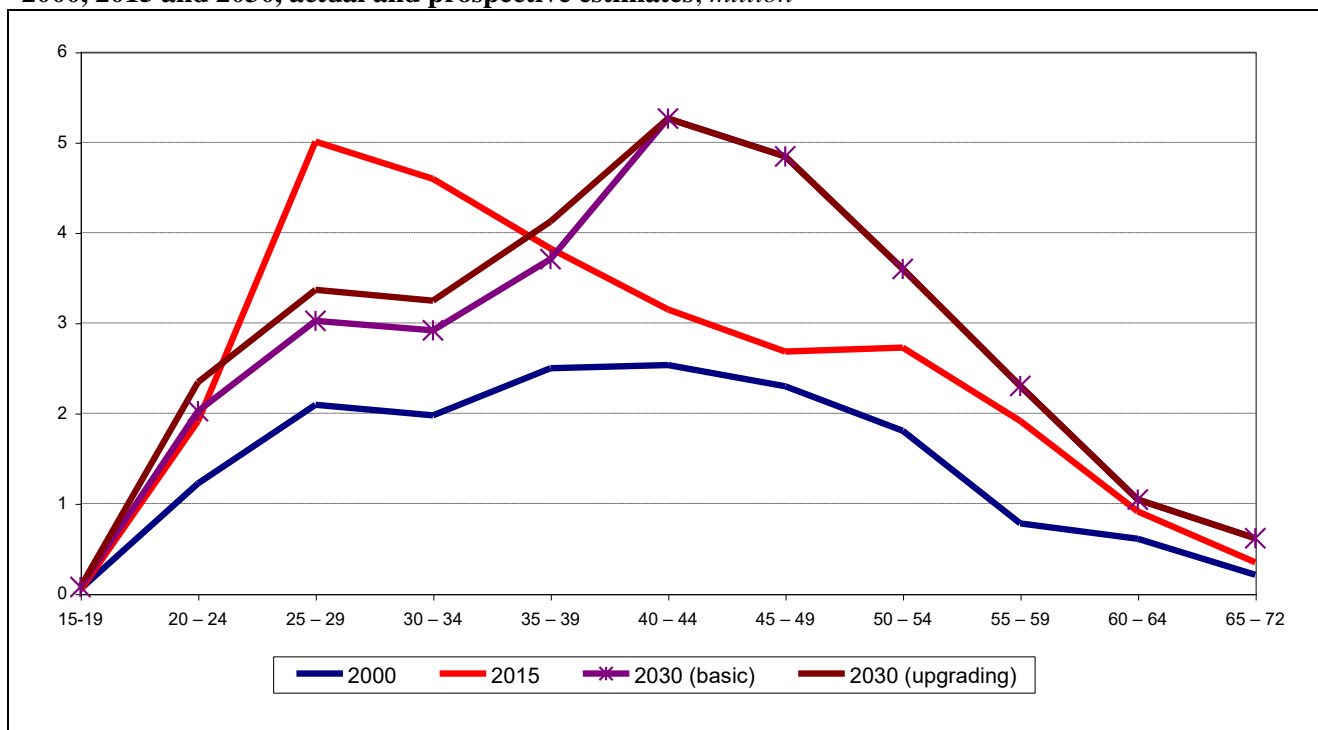
Source: Authors' calculations on the basis of Rosstat's medium demographic prognosis (Rosstat 2017).