

Do Graduates Wages Measure the Quality of Education?

A Review of Existing Studies

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Abstract. This paper is a review of studies that investigate factors that determine starting wages of university graduates. The focus is laid upon the works addressing the question: To what extent can starting graduate wages be indicative of the quality of education received? We discuss the theoretical conceptions shedding light on the reasons for differences in wages of fresh grad-

uates: the theory of human capital, the job market signaling theory, the theory of compensating wage differentials, and empirical studies aimed at measuring the influence various factors have on the size of starting wages. An analysis of different studies has shown that, despite the important role played by the quality of education, there are many other factors that can have an impact on wages. Such factors include heterogeneity of graduates and jobs, market imperfections, individual preferences of graduates and their strategies of entering the labor market. The provided review and critical analysis of studies designed to assess the correlations between the quality of higher education and the level of starting wages for graduates allows us to define the general requirements to data quality in case of Russia adopts the system of university graduate monitoring.

Keywords: higher education, labor market, graduate wages, the theory of human capital, job market signaling, compensating wage differentials, university graduate monitoring systems.

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The existing situation with Russian professional education is determined by the recent transition from elite to mass higher education. Higher percentage of school graduates obtain higher education, which naturally gives rise to problems, the most acute of which are:

- degradation of the overall quality of higher education and differentiation among educational institutions and programs by quality of the education they provide;

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- inconsistency between the education received by graduates and the jobs they acquire (job-education mismatch), as well as between jobs and the level of formal qualification completed (over-education), resulting in depreciation of higher education.

Under such conditions, households, employers, and government bodies are interested in having a system of education quality assessment criteria to facilitate decision-making processes in choosing higher professional education institutions, hiring, or allocating budgetary funds among various institutions and programs. With a view to create a quality control system, the Ministry of Education and Science of the Russian Federation initiated the Monitoring of Efficiency of State Universities. The key assessment criteria included educational activities, academic research activities, international activities, finance and economics, and infrastructure.

In 2013 there was made a decision to conduct university performance monitoring on a yearly basis, and the expert community's reviews resulted in a series of changes to the list of assessment criteria. In particular, a graduate employment indicator was added, which is the proportion of the total population of graduates to those full-time graduates who didn't resort to employment services during the first year after graduation.

This indicator, however, does not observe whether university graduates work in the field they studied or whether their jobs correspond with their skill level. That is why experts have been discussing the idea of developing a complex criterion of university performance assessment that would also consider career success and revenues of graduates. Calculation of such an indicator requires introduction of a university graduate monitoring system in Russia.

Such studies take place in many countries, that collect statistical data on graduates' revenues in a centralized way (for instance, with tax authorities). Data is collected for a certain period of time immediately after graduation, usually five years, for each higher education institution and each field of study. Additionally, studies take into account whether graduates work in the field they studied.

Graduate surveys in various countries have two major formats:

- 1) total centralized surveys based on data received from tax authorities, such as the Integrated Database for Labor Market Research (IDA) established by Statistics Denmark. This database contains information provided by tax authorities on all employees and employers in the country. Particularly, it keeps track of the career patterns of all Danish university graduates, together with their detailed personal information (gender, education, professional experience, length of service, etc.) [Fredriksen, Kato, 2011];
- 2) partial questionnaire surveys of a sample of university graduates. A classic example is the Baccalaureate and Beyond Longitudinal

Study (B&B) database compiled by the US National Center for Education Statistics (NCES). It represents cross-sectional data on a sample of 10,000 graduates over their first post-baccalaureate year, panel data on the initial period of their careers, salaries, types of jobs they acquired, and their socio-demographic characteristics.

Successful integrated statistics collection and labor market monitoring systems were designed for the purpose of education development in Chile and Colombia in 2006 with the participation of the World Bank. The My Future (Mi Futuro) database in Chile and National System of Higher Education Information (Sistema Nacional de Información de Educación Superior, SNIES) in Colombia provide the following information:

- status of graduates in the labor market (occupational fields, revenues, and employment rate);
- information about higher education institutions (management, infrastructure, financial indicators);
- data about professor staff and research activity of universities (quantitative characteristics, information about professional skills, research projects);
- information about students (socioeconomic characteristics);
- information about educational programs (majors available, location, enrolment, tuition fees, student and teaching staff mobility).

This data provides the possibility of exploring the correlation between the education received by graduates and their subsequent revenues, to make managerial decisions on higher education reforms, and it also to make students' and their parents' choice of higher education institutions and fields of study easier. The key question when using data from these databases is to what extent graduates' wages can measure the quality of university education.

Wages is an essential characteristic of graduate's status in the labor market, as it reveals how an employer evaluates a worker with regard to his/her productivity, possession of specific competencies and skills, the quality of education received, and the size of human capital accumulated. Meanwhile, one can hardly say that wage is a direct reflection of education quality, because a number of other factors may be present, alongside productivity, education quality, and human capital. Differences in wages of graduates may be explained by:

- heterogeneity of graduates (differences in the size of human and family capital, the level of education, socio-demographic characteristics, etc.), which is partially generated by the quality of education;
- jobs heterogeneity;

- market imperfections;
- different behavioral strategies of entering the labor market.

Differences in wages caused by diversity of graduates are largely (though not completely) determined by the quality of university education; however, the latter only affects the rest of the abovementioned factors indirectly or doesn't affect them at all. Hence, graduates' wages do reflect education quality in part, but a number of other characteristics should also be controlled to avoid evaluation bias. We will dwell below on potential predictors of graduates' wages and analyze how they depend on education quality.

Diversity of graduates combines differences in the level of their expected productivity, the size of human and family capital, the quality of education received, possession or lack of a specific "educational signal" and professional experience, as well as differences in socio-demographic characteristics. All of these factors are studied by the human capital theory [Becker 1964; Mincer, 1996] and the signaling theory [Spence, 1973; Weiss, 1995].

The review of theoretical and empirical studies on the issue of assessing how education quality contributes to graduates' wages is of great importance, as such information is necessary for developing recommendations on sample design and qualitative characteristics of data for the university graduate monitoring system—if one is created in Russia.

This research was primarily focused on finding out how well graduates' wages can indicate the quality of education received and what limitations this assessment approach may have. It wasn't our goal to give a quantitative evaluation of effects education quality has on wages, which is first of all due to insufficient data. At the same time, the review format of our research provides an opportunity to systematize the critical studies in this field and to analyze various aspects of the issue.

1. Between the Human Capital Theory and the Signaling Theory

The theory of human capital relates differences in wages to differences in accumulated human capital, which is understood as characteristics of an employee's work capacity, her/his knowledge, skills, and competencies. Human capital is also based on inherent unobservable abilities and may be increased through education, professional training, or accumulation of experience [Becker, 1964]. Thus, human capital theory assigns an important role to education in shaping the level of wages. Gary Becker and Jacob Mincer established the tradition of investigating the issue of assessing the return on human capital, which is now one of the most elaborated in labor economics. Analysis of return to education has been covered in a tremendous number of publications, including the famous papers that grounded and developed the concept of human capital [Becker, 1964; Minc-

er, 1996] and some newer studies designed first of all to assess the returns to education empirically [Ashenfelter, Harmon, Oosterbeek, 1999; Card, 1999; 2001].

There is a wide variety of papers based on Russian labor market data, which are dedicated to return on education and the associated challenges, such as:

- returns to investment in human capital in transition economies [Nesterova, Sabiryanova, 1998; Clark, 2003; Cheidvasser, Benitez-Silva, 2007];
- return on the level and quality of education [Denisova, Kartseva, 2007];
- efficiency of using human capital in Russia [Gimpelson et al., 2009];
- assessment of the cost of human capital in Russia [Kapelyushnikov, 2013];
- regional differentiation in returns to education [Oshchepkov, 2010];
- comparison of the returns to education in Russia to that in other post-Soviet states [Gorodnichenko, Sabiryanova, 2005];
- meta-analysis and systematization of the results of various studies on the return to education [Lukyanova, 2010].

The human capital theory allows a conclusion that salary is a good measure of education quality, since it reflects the size of accumulated human capital, which forms through education. Indeed, different quality of education results in human capital with different qualitative characteristics, all other factors being equal; consequently, the return on education expressed in wages will also be different.

Trying to explain the correlation between the level of education and the size of wages, the human capital theory is engaged in competition with the signaling theory. The latter discards the idea of direct relationship between salary and accumulated human capital and suggests instead that education does not improve abilities or productivity [Spence, 1973]. The theory puts it that individuals differ in the level of their innate abilities. Obtaining an education requires considerable costs (of time, money, efforts). The signaling theory suggests that the more talented students receive their education with fewer costs, so that higher or better education is always obtained by the more prospective individuals. As costs of selecting candidates and identifying their expected productivity are rather high, employers use “educational signals” to predict worker productivity [Ibid.]. Therefore, higher education affects wages as a signal of worker productivity for the employer.

In this case, it's not the quality of education but the fact of having one that salary measures. This is true to some extent. However, in a situation where the proportion of university students to the rele-

vant age cohort is increasing and education is undergoing a transition from elite status to massification, it's the quality of educational institution that may serve as the "educational signal."

When accessibility of higher education for the masses increases, employers expect higher productivity from graduates of elite universities than from those who graduate from ordinary institutions. An elite university diploma becomes a signal of potentially high worker productivity for employers. In the Russian context, higher education is available to most young people, so the signal an employer receives here is the lack of higher education as a proxy for low worker productivity [Andrushchak, Prudnikova, 2011].

2. Influence of Education Quality on Wages through Graduate Quality

In the previous chapter, we analyzed the theoretical grounds of the mechanism of education influencing the wage level. Graduate quality is a crucial factor affecting the size of wages. This property is specific for each individual and develops under the influence of a significant number of variables, the most crucial of which is the quality of education received. The main determinants of the level of wages that are connected with graduate quality include:

1. quality of education, i. e.
 - quality of university;
 - demand for specialization;
 - academic performance;
2. family capital;
3. skills;
4. socio-demographic characteristics.

2.1. Quality of education

Let's go into a more detailed analysis of education quality components that affect the level of wages. The quality/elite status of a university, demand for selected specializations, and academic performance are the characteristics of acquired education that determine the quality of a graduate.

2.1.1. Quality of university

A high quality of university is generally understood as one belonging to an elite group of educational institutions that includes the leaders in education on the national level. High quality is proven by a powerful, well-known and recognizable brand that is well-reputed and appreciated by employers.

In an analysis of the quality of Russian higher education institutions, their status as belonging to the elite category may be indicated by their legal status: exclusive legal status (Lomonosov Moscow State University, Saint Petersburg State University), national research university status, federal university status, or being on the list of 15 universities—winners of world university ranking grants.

The return on university quality has been proven in a number of empirical studies [Smart, 1988; Fox, 1993; James, Alsalam, 1993; Rumberger, Thomas, 1993; Brewer, Eide, Ehrenberg, 1999; Dale, Krueger, 2002; Thomas, 2003; Thomas, Zhang, 2005; Lindahl, Renger, 2005; Power, Whitty, 2008; Zhang, 2008; Hussain, MacNally, Tellhaj, 2009; Chevalier, 2009; Walker, Zhu, 2008]. For example, Brewer, Eide, and Ehrenberg find a 9–15% higher return to attending a top private university instead of a bottom public university in the American labor market in the periods of 1972–1979, 1980–1986, and 1982–1992 [Brewer, Eide, Ehrenberg, 1999]. Later, Zhang proves, using the Baccalaureate and Beyond database, a 20% salary “bonus” for elite university graduates in the US labor market in 1993–2003 [Zhang, 2008]. Walker and Zhu find a similar level of return on elite education (22%) in the British labor market in 1996–2003 [Walker, Zhu, 2008].

The human capital theory and the signaling theory also compete in explaining the empirical fact of return on elite education. Adherents to the human capital theory argue that a “quality” higher education institution offers more opportunities for students to accumulate human capital. Indeed, top universities provide expert teachers, supportive learning environments created by talented and motivated students, large libraries, well-equipped laboratories—all of which means they can give their students more of the powerful resources required for human capital accumulation than lower quality universities can [Thomas, Zhang, 2005]. Defenders of the signaling theory explain salary “bonuses” for graduates from elite universities by suggesting that a top university diploma signals potentially high worker productivity, which employers translate into higher wages. Some studies also show that elite university graduates normally work more hours than their counterparts from other institutions, which explains in part the differences in higher education “bonuses” between graduates from universities of different quality [Zhang, 2008]. Thus, the results obtained should be controlled for the number of working hours to avoid bias in studies on the return on education in a “quality” university.

Self-selection of the most prospective students to elite universities is another source of evaluation bias. Such graduates get return not only to elite university education but also to their own innate abilities that also make part of human capital, which biases the results of research on return on an elite education [Heckman, 1979; Brewer, Ehrenberg, 1996; Stolzenberg, Relies, 1997].

Elite universities usually provide higher quality education and impose higher admission and learning requirements. The fact that learning in elite universities yields salary “bonuses” for graduates proves that wages do measure education quality. Bias may take place in some cases, as graduates’ wages depend not only on the quality of a higher education as such but also on the brand and reputation of a specific institution. Brand and reputation reflect assessment of uni-

versity education quality in the labor market, but one should remember possible time lag bias: current quality of education in a university may be higher or lower than it has been reputed to have. It takes higher education institutions a lot of time to earn a stable reputation and to create a recognizable brand, so young but efficient institutions with high teaching standards and education quality may just have not yet been noticed in the labor market long enough to earn a decent reputation. Conversely, when education quality and teaching standards in a renowned and respected university get lower for some reason, the institution may remain quite reputed and recognizable for a long period of time due to the lag.

2.1.2. Demand for specialization Another crucial factor affecting the wages of graduates is demand for the chosen specialization. Its influence is determined by the following:

- Graduates with the degrees in the most sought-after areas of specialization are paid better than others due to the laws of supply and demand in the labor market.
- The most prospective students are self-selected to the areas of specialization in highest demand. As a result, graduates get return not only on their specialization being in demand but also to their own unobservable abilities, which enabled them to qualify for this specialization.
- Graduates with degrees in demanded areas of specialization have more chances of getting employed in their field of study. Meanwhile, ample research proves that field-specific knowledge is only remunerated by the labor market when it is used as intended, i. e. if graduates work in their fields of study [Heijke, Meng, Ramaekers, 2002].
- Graduates with degrees in areas of specialization in high demand risk job-education mismatch or over-education at work. As both of these factors yield considerable negative return, the chance to avoid them offered by a demanded area of specialization actually means getting a salary “bonus.”

Many researchers stress the great impact a chosen field of study has on future salary and recognize it, along with quality of university, as one of the overriding factors in predicting the level of future income [Rumberger, 1984; Berger, 1988; James et al., 1989; Rumberger, Thomas, 1993; Eide, 1994; Grogger, Eide, 1995; Thomas, 2003; Thomas, Zhang, 2005]. Assessment of the effects field of study has on salary varies a lot. Thus, for instance, return on the choice of specialization was 25% higher for business, engineering and medicine than for teaching in the United States in the 1980s [Grogger, Eide, 1995], while in 1993–2003 the return on education in medicine and engineering fields was as much as 40% higher than the return on teacher education [Zhang, 2008].

Some areas of specialization, regardless of the country of research, prove to yield considerably higher salary “bonuses” than teaching fields of study, all other factors being equal. These are, in particular, specializations in business, healthcare, mathematics, and engineering [Thomas, Zhang, 2005; Zhang, 2008;].

Similar research in terms of the Russian labor market has been conducted by I. Denisova, M. Kartseva, and K. Sabiryanova [Denisova, Kartseva, 2005; Sabiryanova-Peter, 2003]. The highest salary “bonuses” in Russia are provided by legal, technical, and economic education. Some gender-related specifics have been revealed in return on field of study: women get positive return on education in humanities, medicine, and teaching specializations [Denisova, Kartseva, 2005].

Therefore, graduates’ fields of study have profound effects on their wages. The interdependence of field of study and education quality appears ambivalent. Answering the question whether graduates’ wages can measure quality of education, one should recognize the possibility of bias, as wages also depend on the choice of specialization, above and beyond education quality. Field of study itself can yield essential returns. At the same time, field of study may be related to education quality. Indeed, return on a specific specialization may be explained partly by the set of skills and competencies outlined by education quality and standards, which employers associate with this specialization. Moreover, students themselves correlate complexity of learning and quality of education in the area of specialization with their abilities and preferences. As a result, quality of education may affect salary indirectly, through the choice of field of study.

An array of studies have analyzed the correlation between students’ academic performance and their future wages [Wise, 1975; James et al., 1989; Jones, Jackson, 1990; Rumberger, Thomas, 1993; Smith, McNight, Naylor, 2000; Thomas, 2003; Bratti et al., 2004; Arcidiacono, Bayer, Hizmo, 2008; Ireland et al., 2009; Di Pietro, 2010].

2.1.3. Academic performance

Academic performance is usually assessed either through the average grade during studies or through the type of diploma acquired (honors/regular). As Jeremy Smith and Massimiliano Bratti point out [Smith, McKnight, Naylor, 2000; Bratti et al., 2004], an honors diploma increases employment chances by 7% for men and 4% for women. The general belief is that academic performance impacts the level of salary, the chances of getting employed, and the quality of job, all of these factors being quite naturally intertwined.

There are two alternative viewpoints on how academic performance affects the level of starting salary. Some researchers find actual effects of academic achievements [Ireland 2009], while others believe academic performance only “takes on” the effects of other interrelated unobservable variables, such as abilities [Arcidiacono, 2008]. Followers of the direct effects hypothesis go by the employer learning and statistical discrimination (EI-SD) model [Altonji, Pierret,

2001]. This formalized model suggests that an employer cannot observe worker quality directly and thus selects workers based on easily observable correlates of productivity. This way, academic performance becomes a signal of worker productivity [Ireland et al., 2009; Di Pietro, 2010]. Researchers who deny a direct influence of academic performance on salary argue that employers don't need to discriminate statistically among workers, since more and more other ways to assess potential employee performance appear: CVs, tests, personal interviews, recommendations, etc. In this context, academic performance is only a proxy for abilities [Arcidiacono, Bayer, Hizmo, 2008].

Correlations between academic performance, education quality, and starting salary level are an important aspect to analyze. With the massification of higher education, quality of university is the key criterion of graduate assessment, while academic performance may cause bias in this case. The truth is that a high average grade or an honors diploma in an elite university are virtually incomparable to those in a "low quality" institution. Education quality standards in an elite university account for a high degree of complexity of learning, which makes it much harder to demonstrate good academic performance in a top university than in a "bottom" one. Therefore, there is an inverse correlation between quality of university and academic performance. Students with similar abilities, all other factors being equal, will have totally different levels of academic achievement if they learn in universities of different quality. As a result, the massification of higher education and the great number of universities with low requirements to students can cause a negative effect of high academic performance on the level of salary, as graduate achievements may be treated as a proxy for low quality education. So, the elite status of universities should be controlled when assessing the effects of academic performance on salary.

2.2. Family capital The family characteristics of graduates (family capital) may also limit the efficiency of assessing education quality through starting wages. Family capital exerts a great influence on graduates' wages and on the quality of graduates, which may result in bias.

Family capital is commonly understood as a combination of the financial, social, cultural and human capital of a family. Family capital may be measured through such indicators as family income, parental education and occupation, family type (two-parent/single-parent), family size, number of children, number of books in home library, etc.

Studies dedicated to assessment of the contribution family characteristics make to the level of return on university education analyze the following key variables:

- family income;
- parental education;
- family size (structure).

Most studies obtain data showing that family income has a great positive impact on the size of a graduate's salary, this impact being mediated by both education-related variables and other factors [Rumberger, 1984; Bourdieu, 1988; Card, 1999; Deschenes, 2007; Zhang, 2008].

Let's enumerate the basic mechanisms of family income influencing a graduate's salary. High-income families can afford to invest heavily in their children's education, i. e. to pay for studies in a "quality" university and for preparation courses (provided by tutors, universities, etc.) [Rumberger, 1984]. Better-off parents can back up their kids for the period of the job search, so that graduates have more time to choose a job that will yield the highest possible return on human capital. Besides, well-connected parents with rich social capital can promote their children to prestigious high-paying jobs [Granovetter, 1973]. Parents may also accord some family funds to their kids to invest in a business of their own, which will yield return in the form of surplus income.

Researchers find the positive effects family income has on chances of getting higher education, academic performance, and wages of graduates. High family income correlates inversely with the probability of combining work and study [Zhang, 2008].

Parental education is another crucial factor causing essential bias in assessing the effects of education quality on starting wages. Numerous studies reveal a positive correlation between the level of parents' education and the academic achievements of their children, the educational stages they can reach, and the size of their wages [Altonji, Dann, 1996; Ermisch, Francesconi, 2001]. Empirical studies also show salary "penalties" for first-generation graduates, i. e. whose parents don't have a higher education [Zhang, 2008]. Moreover, first-generation graduates will more likely have "low quality" jobs [Gottschalk, Hansen, 2003; Boudarbat, Chernoff, 2009].

Some researchers also point out the negative effects family size (number of children) has on the level of children's education and their future wages [Deschenes, 2007].

Thus, while measuring the influence of education quality on graduates' wages, one should take into account bias caused by the size of graduates' family capital by controlling family capital parameters: parents' income, parental education, and size of family (number of children).

Graduates' unobservable abilities are, in fact, the key factor causing bias in analyzing the effects of education quality on the size of salary. Indeed, before getting an education, all individuals have entirely different innate abilities, which build the foundation of human capital. Later, they accumulate their human capital through education and receive returns on it in the labor market. Since innate abilities are unobservable, it is rather hard to understand whether salary is a good

2.3. Abilities

indicator of education quality or whether it just results from innate abilities that are only slightly affected by education.

The human capital theory doesn't find common ground with the signaling theory on this issue either. Though the human capital theory assigns a role of abilities in the structure of human capital, it recognizes education measured in number of years of study as the paramount factor [Becker, 1964; Schultz, 1961; Mincer, 1994]. The signaling theory posits that abilities are distributed unequally among individuals from the very beginning, and the more prospective individuals obtain higher education with fewer costs or of better quality [Spence, 1973; Weiss, 1995]. Eventually, higher education as such and elite higher education are restricted to more talented individuals, all other things being equal. Hence, a higher education diploma is a proxy for the unobservable abilities of an individual, and the value of education is not in just having one but in indicating the abilities possessed by a graduate.

Meanwhile, the abilities of individuals are unobservable for employers, too. An employer's task is to select the most prospective graduates in the context of asymmetric data on their abilities and, hence, productivity. Therefore, just like employers, researchers study the return on education and cope with bias related to unobservable abilities of individuals encounter the problem of measuring unobservable abilities and evaluating their effects on worker productivity and, consequently, size of salary.

Employers have an array of tools to measure worker abilities:

- analysis of education received (quality of education, academic performance, field of study);
- CV analysis (most CVs include results of various examinations and standardized test scores);
- personal interviews and recommendations [Arcidiacono, Bayer, Hizmo, 2008];
- diverse tests, including standardized exams (like SHL, for instance).

The tools listed above allow employers to reduce uncertainty about worker productivity, to select the most productive candidates, and to offer relevant wages to them. Thanks to the use of these tools, salary may reflect, *inter alia*, abilities of graduates.

Many researchers observe that the education of graduates is the key factor when making hiring decisions and determining starting wages, because it is a relatively precise and easily observable measure of individuals' abilities [Arcidiacono, Bayer, Hizmo, 2008]. However, the employer collects more and more information about worker's abilities as time goes by, so in the end it's abilities that start playing a more important role in determining the size of salary as compared to formal education [Farber, Gibbons, 1996; Altonji, Pierret, 2001].

While trying to answer the question of whether salary is an indicator of education quality, researchers should consider the factor of unobservable abilities, which causes bias. Education quality reflects some of these abilities, but the rest part of abilities' direct influence over salary size have nothing to do with quality of education received.

The socio-demographic characteristics of individuals may also result in bias when assessing the effects education quality has on graduates' wages. On the one hand, specific socio-demographic characteristics have different impacts on worker productivity and thus yield different economic returns in terms of salary. On the other hand, employers themselves differentiate between candidates based on easily observable socio-demographic characteristics, such as gender, ethnicity, age, status of having children, etc. Using these characteristics, employers discriminate statistically among workers, paying wages according to the average productivity of a relevant socio-demographic group (women, ethnic minorities, etc.) [Arrow, 1973; Phelps, 1972; Altonji, Williams, 2005].

2.4. Socio-demographic characteristics

According to researchers, the fundamental socio-demographic characteristics affecting the level of salary include:

- gender;
- age (including that of graduation);
- marital status;
- ethnicity/race;
- parental status

Effects of all the demographic characteristics listed above has been studied empirically, but it's gender and racial discrimination that are under a magnifying glass of economists. This is explained to some extent by the leading positions of American experts in labor economics and social issues that are priorities for the United States [Oaxaca, 1973; Polachek, 1978; Blau, Kahn, 1992; 1996; 1997; 2002; Altonji, Blank, 1999].

Studies on the effects socio-demographic characteristics have on graduates' wages discover "penalties" for being a woman (15–22%), with the salary gap between men and women increasing in the long term [Perrucci, 1980; Blau, 2001; Joy, 2003; Kunze, 2003; Garcia-Aracil, 2007; Zhang, 2008]. Some researchers explain this gap by gender segregation in workplaces, employment sectors, and industries, which may lead to differences in wages [Garcia-Aracil, 2007]. Others point to gender segregation in educational trajectories and in the choice of profession [Joy, 2003; Kunze, 2003]. It has been observed empirically that the choice of field of study may account for 40–50% of the salary gap between men and women [Gerhart, 1990; Weinberger, 1998].

Age of graduates may also affect their salary level, this impact appearing to be ambivalent—i. e., either negative [Bellás, 2001] or positive [Henderson, 1994].

Depending on whether the sample consists of full-time or part-time students, results may be polar opposites, particularly in the Russian education system. Acceptable quality of higher education is successfully maintained for full-time degrees in state universities, while quality of extramural (part-time) education is considerably lower and harder to monitor. That is why extramural students should be excluded from the potential sample when assessing the influence of education quality on salary, as they differ dramatically from full-time students in their socio-demographic characteristics and the quality of education they receive, which may result in substantial bias.

Marital status and parental status can also greatly affect the size of salary. Empirical studies have revealed “marriage bonuses” for men and “marriage penalties” for women, which is explained by the specialization effect (men concentrate on labor market activity while women focus on the household) and selection effect (most prospective and successful men are more likely to be married) [Nakosteen, Zimmer, 1997; Hersch, Stratton, 2000; Bardasi, Taylor, 2008; Petersen, Penner, Høgsnes, 2011].

3. Effects of Diversity of Jobs on the Level of Graduates' Wages

Not only does a graduate's salary form as an assessment of the graduate, but it also depends on the job. Diversity of jobs is an essential factor of bias in assessing the effects education quality has on salary level. Some job characteristics may influence tangibly the size of a graduate's salary, while being independent from the quality of education received. Yet, it would be incorrect to say that education quality has no influence on the type of job.

The main factors accounting for diversity of jobs are as follows:

1. Jobs differ in salary level and non-salary characteristics (safety, status, location, employment conditions, type of employment, benefits package).
2. Sectors of employment and fields of work also differ in their characteristics and can yield economic return.
3. Conditions of the same job will be different depending on whether graduates work in their field of study and in positions consistent with their level of education (the over-education and education-job mismatch problems).

It would be quite natural to suggest that graduates with a “higher quality” education have more chances to get a more “quality” job in terms of both salary size and non-salary characteristics. From this perspective, using salary level as the only measure of a graduate's success in the labor market cannot be considered justified. It is perfectly true that salary is an essential indicator of how a graduate is assessed in the labor market. However, it is also important to consider non-salary job characteristics, such as status (prestige), safe-

ty, location, employment conditions, type of employment, benefits package, working hours, etc. All of them can affect a graduate's salary, which can be higher, for example, due to harmful labor conditions (the theory of compensation differences in wages) [Frank, Glass, 1997]. Worker utility function includes, inter alia, non-salary characteristics, which impact the choice of job eventually. Specifically, Frank's model (the model of job-status-related compensation differences) suggests that job status and prestige represent a particular economic good that workers are ready to "pay for" by accepting a lower salary [Frank, Glass, 1997].

Part of the variations in graduates' wages may be explained through differences in the amount of time devoted to work. Results of some studies demonstrate that graduates from elite educational institutions normally devote more hours to work than graduates from ordinary institutions, and men work on average more than women [Zhang, 2005].

Factors like employment sector and field of work (specialization) can also have a great impact on a graduate's salary. In particular, employment in the private sector differs considerably in economic return from employment in public sector in a number of countries.

Research on job-education mismatch and over-education makes up a specific, rather massive body of economic literature dedicated to the influence diversity of jobs has on graduates' wages.

Job-education mismatch entails negative effects for both graduates and society as a whole. Many researchers find a negative correlation between job-education mismatch and graduates' wages [Heijke, Meng, Ris, 2003; Wolbers, 2003; Robst, 2007; Boudarbat, Chernoff, 2009; Boudarbat, Montmarquette, 2009], which is also true for other characteristics that may be included in worker utility function. Job-education mismatch reduces job satisfaction considerably [Garcia-Espejo, Ibanez, 2006]. On the macro-level, the job-education mismatch problem faced by an increasing number of graduates is indicative of poor performance of the education system as a whole. This is an urgent social issue, given the ever growing role education and human capital play in economic growth and the heavy investments in education made by the state and society. For employers, having job-education mismatches in the staff means additional expenses for in-house training systems [Van Smoorenburg, Van der Velden, 2000]. Among factors exerting positive influence on chances of matching job and education, researchers single out quality of university, demand for specialization, academic performance, and higher degree of education acquired (a Master's degree as compared to a Bachelor's) [Boudarbat, Chernoff, 2009].

If supply of highly qualified workers exceeds demand for qualified labor, part of such workers may be pushed out to jobs that don't require higher education. Such workers receive negative return on their human capital. The short-term over-education effect may be explained

by market imperfections (asymmetry of information and signals in the labor market), depreciation of human capital in the case of continuous unemployment, specifics of market entry requirements for university graduates, or lag of currently used technologies behind the educational structure of the workforce. The long-term over-education effect may be caused by “informal” human capital characteristics, such as innate abilities, education quality, or professional experience [Bauer, 2002; Tsai, 2010; Gimpelson, Kapelyushnikov, Lukyanova, 2010].

Employment of highly-qualified workers in jobs that don’t require use of the skills acquired is a rather negative phenomenon for both workers and society as a whole. The implications and negative effects of over-education are analyzed in depth in economic literature [Freeman, 1976; Duncan, Hoffman, 1982; McGuinness, 2006]. Studies reviewed by Seamus McGuinness show a variation of the over-education “penalty” from 8% in Portugal to 27% in Great Britain, with the mean value of 15.3% (as compared to workers whose level of education corresponds with the complexity of work performed) [McGuinness, 2006].

With transition from elite to mass higher education, a lot of developed countries witnessed an increase in the number of workers with high levels of formal education. Researchers faced the challenge of assessing the effects that the increase in supply of highly-qualified workers had on the level of return on education and on the proportion of overeducated workers. Research reveals a tendency towards an increase in the number of overeducated workers; yet, graduates working in accordance with their skills receive a stable return on education [Gottschalk, Hansen, 2003; Walker, Zhu, 2008].

The transition of Russia from elite to mass higher education was followed by a decrease in education quality and raised substantially the proportion of workers with high levels of formal education, so the problem of over-education became rather urgent for the Russian labor market. However, an intuitive assessment of its significance wasn’t proved empirically to the full. The proportion of overeducated workers in Russia is 22–29%, and the over-education “penalty” is 17–22% [Gimpelson, Kapelyushnikov, Lukyanova, 2010], these values being pretty much the same across different age cohorts. In this regard, Russia differs little from other countries. A few over-education problems in Russia are probably due to the services industry which has been “absorbing” university graduates since its boost throughout the 2000s. In the long run, however, the over-education issue may have serious negative effects, given the all-time high coverage of youth age cohorts with higher education and the stagnation of Russian economics.

4. Effects of Market Imperfections on the Level of Graduates’ Wages

Market imperfections are an important source of bias when measuring education quality through graduates’ wages. Asymmetry of information is the principal reason for market imperfections in predicting graduates’ starting wages.

Workers make decisions under conditions of uncertainty about future job characteristics, and employers under conditions of uncertainty about expected worker productivity. The problem of candidate selection in a situation of information asymmetry has been investigated in a number of studies using various stochastic models and micro-economic risk models [Hartog, Serrano, 2002; Belzil, Hansen, 2002; Berkhout, Hartog, Webbing, 2006; Berkhout, Hartog, 2007].

The labor market theory suggests that wages of workers should be determined by their marginal productivity. The trouble is that employers don't know the margins of worker productivity and can only predict it using indirect indicators. Coming across uncertainty about worker productivity, employers try to reduce their risk:

- by paying less than the expected marginal worker productivity, thus shifting the risk to employees;
- by assessing worker productivity based on indirect data: results of standardized tests (certificates), employment tests, personal interviews, recommendations, proof of academic performance and experience (including that in worker's field of study);
- through statistical discrimination by university quality, field of study, and socio-demographic characteristics [Berkhout, Hartog, 2007].

Another possible employer strategy consists in holding back on worker productivity assessment at the beginning and revealing the margins of productivity over time. As employers learn more about worker abilities, they rely less upon "educational signals" and pay more attention to worker productivity [Farber, Gibbons, 1996; Altonji, Pierret, 2001].

The massification and large-scale degradation of higher education in today's Russia exaggerates the information asymmetry issue dramatically. In the past, employers would uniformly use higher education diplomas as an absolute criterion for selection of the most productive candidates, but now the value of diplomas is much lower. A higher education diploma is a necessary but not sufficient employment condition. Employers encounter a giant supply of university graduates with high formal levels of education, which stops the diploma from being a signal of higher worker productivity. Employer expenses on selecting the most productive workers increase, and they obviously shift their risks to employees by paying them starting wages below expected marginal productivity. Employers may also make use of instruments like probation periods and work trials. During a specified period of time, workers receive a salary below their marginal productivity or no salary at all, trying to show their performance, skills, and abilities to get employed.

Graduates entering the labor market also face uncertainty about future job characteristics, their own productivity, and compliance of

jobs to their abilities and demands. Just as employers, they adjust to market imperfections using various behavioral strategies, which will be analyzed in the chapter that follows.

5. Behavioral Strategies of Graduates in the Labor Market

The size of graduates' wages is greatly affected by their behavioral strategies in the labor market, which comprise study-to-work transition models (whether a student combined work and study and whether they matched), job mobility, and personal job preferences.

5.1. Combining work and study¹

Economists agree to investigate the issue of student employment in terms of the study-to-work concept, the signaling theory, the human capital theory, and the concept of transition from elite to mass higher education. The fundamental aspects of research on combining work and study include:

- motivation for combining work and study [Ford, Bosworth, Wilson, 1995; Curtis, Lucas, 2001; Beerkens, Mägi, Lill, 2011];
- effects of student employment on their future performance in the labor market (salary size and chances of getting employed) [Ehrenberg, Sherman, 1987; Ruhm, 1995; Beerkens, Mägi, Lill, 2011];
- effects of student employment on their academic performance and chances of getting expelled [King, 2002; Kalenkoski, Wulff-Pablonia, 2010].

The patterns of study-to-work transition and distinctive features of the youth labor market have been analyzed in world literature in detail for country-specific labor markets [Gardecki, Neumark, 1998; Klerman, Karoly, 1994; Ryan 2001; Bell, Blanchflower, 2010]. The most profound review of studies has been performed by Paul Ryan [Ryan, 2001].

Transition from university to work in Russia has some peculiarities. Modern youth cohorts more and more often engage in work during their studies instead of waiting for graduation [Roshchin, 2006]. At the same time, motivation for combining work and study is different from the one observed in the Soviet era and in the early 1990s, when it mainly consisted in getting surplus income (side jobs). Today, the key trigger is the desire to accumulate practical experience or to find a permanent job to keep. This is primarily explained by the transition from elite to mass higher education, which decreased education quality and lowered requirements for students. Higher education is no more the absolute signal of worker productivity. Employers want

¹ Combining work and study by Russian university students and international studies in this field are analyzed in detail in [Roshchin, Rudakov, 2014].

candidates to have professional experience, the lack of which closes the door on many jobs.

Thus, under conditions of discrimination among universities by education quality, students find themselves having to choose between three options in equilibrium, according to Spence's model: to study in a "regular" university, to study in a "quality" university, or to combine work and study. The issue of student employment in Russia from the perspective of the signaling theory is dwelled on in [Apokin, Yudkevich, 2008].

Students want to acquire experience (preferably in their field of study) because they find it more important than investing their time and efforts in academic achievements and an honors diploma. This behavioral strategy is especially typical of students studying in "low-quality" universities with low education standards. On the one hand, "low-quality" universities usually enroll students with low levels of family (financial, human, cultural) capital; on the other hand, such students will more likely combine work and study and less likely continue studying for higher degrees [Di Maggio, 1982; Bourdieu, 1988].

This way, when the value of the "educational signal" gets lower, employers focus on the signal of experience. Graduates with experience, especially in their field of study, have good chances of getting employed and receive higher wages.

At the same time, students combining work and study accumulate less human capital, provided they get a quality education. In the short term, because of their experience they are paid more than their counterparts who devote themselves entirely to studying. However, students who focus only on studying may outdo students combining study and work in the long run due to the higher level of human capital, which includes field-specific knowledge and skills acquired during studies. Yet, this hypothesis is only valid provided there are high education standards and a stable return on education.

Considerable differences in wages may also take place, depending on whether or not students combine study with work in their field. Students working in their field of study actually work their trial periods and will more likely stay in these jobs after graduation. As a result, they will receive a salary "bonus" not only for the length of service in their field, but also for a length of specific service at a given job. This is especially true for large companies with formalized career ladders, where workers are promoted depending on both their productivity and the accumulated length of specific service. Students working in mismatching jobs may have less return on work experience, which will depend on where they continue their career and whether they stay in their part-time jobs or come back to their university specialization, or choose something totally different. Besides, starting wages are seriously affected by the type of work that students combine with study: whether it is unskilled/auxiliary labor or it involves performing duties in accordance with their future areas of specialization.

5.2. Job mobility The behavior of young people in the labor market is specifically characterized by their high job mobility, including changing jobs between companies. Indeed, young workers change their jobs much more often than their elder counterparts, which is confirmed by a number of empirical studies [Ryan, 2001; Martin, 2009; Bell, Blanchflower, 2010].

There are several theories shedding light on this phenomenon [Roshchin, Slesareva, 2012]. First of all, these include the job matching theory and the job shopping theory. The latter, which represents one job search model, relies upon the heterogeneity of workers and jobs and on information asymmetry. Graduates (young workers) don't know exactly in which field of work they would like to build their careers, try out extremely different occupations and positions, and finally choose the one that conforms most of all to their requirements [Johnson, 1978]. The job matching theory also assumes there is asymmetry of information, asserting that young workers switch jobs looking for the best possible match between their characteristics and job parameters. The more efficient the match, the less likely a young worker will keep changing jobs [Jovanovic, 1979].

Empirical investigations show that worker mobility affects positively the level of salary (up to one third of pay rise is explained by job mobility), provided workers change jobs voluntarily and don't stay unemployed for too long between them [Becker, Hills, 1983; Topel, Ward, 1992; Murphy, Welch, 1992; Davia, 2010]. In the Russian labor market, the mobility of young workers exerts a positive influence on salary size if an individual changes three jobs at the most. If jobs are switched more often, the effects turn out to be insignificant [Roshchin, Slesareva, 2012].

5.3. Personal job preferences of graduates Graduates' wages may be greatly affected by personal job preferences. According to the hedonic price theory of wages, graduates try to maximize their utility by choosing the most appropriate job. Worker utility function may include both salary and non-salary characteristics. Using salary as a measure of education quality, one should understand that a lot of workers regard salary as an important but not the only characteristic comprised in their utility function. Nearly the same importance may be attached to non-salary job parameters, such as prestige, number of working hours, overtime work, harmful labor conditions, etc. Personal preferences of graduates may seriously bias the results when assessing education quality through salary. A typical example is when equally educated and productive workers choose different employment sectors and types of job in accordance with their personal preferences.

Research Period and Econometric Issues in Assessing the Effects of Education Quality on the Level of Graduates' Wages

6.1. Research period

The existing empirical studies show that the dynamics of graduates' wages depends on the period selected for research (short-, medium-,

or long-term). Indicators like returns to education, education quality, field of study, experience, specific tenure, etc. may vary greatly depending on how long the period of research is.

Short-term periods are 1–2 years after graduation, while medium- and long-term periods make 3–5 and 6–10 years, respectively. The choice of a period depends on the purpose and objectives of research, and also on the specifics of statistical data available to the researcher. In some countries, which started to collect panel data on graduates not so long ago, only cross-sectional data for 1–2 years may be available, while others—the U.S., Great Britain, Denmark, the Netherlands, Sweden, Chile, and Colombia—have access to panel data on graduates' wages over five to ten-year periods. There are also cohort studies that analyze age-specific samples of the same year of graduation and monitor the dynamics of their wages.

Endogeneity is the key econometric issue that can cause bias when analyzing the effects of education quality on graduates' wages. Endogeneity is generated by three types of drawbacks in research design:

6.2. Econometric research issues

- omitted variable bias;
- measurement error;
- self-selection bias.

Besides, results can be affected by measurement error on the dependent variable, as respondents may overestimate/underestimate their revenues.

Omitted-variable bias occurs because graduates' abilities that have a great effect on wages are unobservable [Card, 1999; Ebbes, 2004]. However, there are a lot of proxy variables for abilities, so the endogeneity issue may be solved partially by using the instrumental variables method [Arcidiacono, 2008]. Results of standardized tests or parental education characteristics may be used as instrumental variables for unobservable abilities [Card, 1999; 2001].

Another problem is associated with measurement error in the regressors. Bias may occur when individuals assess their own education level, as conscious over- or underestimation is possible here [Griliches, 1977]. Databases on graduates available normally solve this problem by using data on actually received education instead of relying upon self-assessment data. At the same time, there is the problem of using revenue self-assessment as a dependent variable. Individuals may overestimate or underestimate their income, which leads to bias.

The self-selection problem plays a big role in analyzing the effects education quality has on graduates' wages. In this research, particularly, it may appear in the following aspects:

- self-selection to higher education institutions and fields of study [Heckman, 1979; Brewer, Ehrenberg, 1996; Stolzenberg, Relles, 1997];
- self-selection of respondents.

It would be natural to suggest that universities and fields of study are not selected randomly, but by individuals with specific socio-demographic characteristics and abilities. Their wages may be determined not only by the education they received but also by their innate abilities and socio-demographic characteristics that triggered their choice of specialization and university, which may result in bias.

Moreover, if the survey of graduates is not total and uses a questionnaire instead, individuals have the right to refuse to participate, which creates the respondent self-selection bias. For example, if a financial reward is offered for participation, the sample may be self-selected towards low-income population groups. In an analysis of university graduates, the sample may be biased due to the following factors. On the one hand, more successful graduates will more likely participate in a survey, because they have jobs and decent wages and want to share their successful career experience, while unemployed graduates may refuse to participate, unwilling to admit they are not demanded. On the other hand, participation in a survey requires a certain amount of time, and more successful graduates have less time and value it more, so they will less likely be willing to spend it on a survey.

7. Conclusion This review of studies devoted to factors affecting the level of graduates' wages has produced a number of limitations to the use of graduates' wages as the key indicator of education quality.

Of course, the quality of an acquired education expressed in university quality, demand for the field of study, and academic performance exerts a substantial influence on starting wages of graduates. At the same time, salary depends on many other factors that characterize an individual, such as socio-demographic indicators, innate abilities, family (cultural, human, financial) capital. Besides, graduate's salary depends on job properties (employment sector, non-salary characteristics, job-education mismatch and over-education effects). Wages are also greatly affected by market imperfections, first of all by asymmetric information about worker productivity encountered by employers and about job characteristics encountered by employees. Finally, the level of salary may be shaped largely by the graduate's behavioral strategy in the labor market (combining work and study, changing jobs between companies, personal job preferences).

When analyzing graduates' starting wages, researchers may deal with challenges that can lead to bias, such as choice of research peri-

od and endogeneity. The choice of research period depends primarily on the databases available to researchers.

Nevertheless, despite the specified problems of using graduates' wages as a measure of education quality, many of the studies prove such measurements appropriate. The effects of a worker's abilities and job characteristics on salary size are not critical when measuring education quality, as higher-quality educational programs select more prospective candidates, providing them with access to the best jobs, all other factors held equal. Thus, a graduate's abilities and job characteristics affecting salary level correlate, in their turn, with education quality.

On the one hand, this review of studies on the possibility of measuring education quality through starting wages of university graduates reveals an array of limitations to such measurements; on the other hand, it enables an elaboration of requirements to properties of data required to assess accurately the contribution that education quality makes in university graduates' wages.

Many of the reasons for bias will be eliminated if there is a possibility to consider not only salary- and education-related factors but also worker and job characteristics described in detail in this review, as well as the educational strategies of graduates—when developing a design for monitoring Russian university graduates. Besides, when diversity of graduates and jobs can be considered, it will allow for efficient use of starting wages to measure the quality of university education, so that they also become a criterion for university quality assessment.

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