Supply Side Wage Determinants: Overview of Empirical Literature[1]

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Abstract: The list of variables included in wage models has been extended substantially since 1974 when Mincer published his model containing years of schooling and quadratic function of potential experience. This paper provides an overview of the variables most often employed in wage equations, including results from their estimations. Education, experience, particular skills, psychological traits, beauty and health, social capital, characteristics potentially connected with discrimination, individual's household characteristics and social, cultural and economic background the individual was exposed to during childhood and adolescence, all these are aggregated fields of interest which are discussed in detail. The paper is concluded by the outline of the probable development of research on wage determinants.

Key words: overview, wage determinants, education, experience, skills, psychological traits, beauty, health, social capital, discrimination, household characteristics, background

JEL Classification: J12, J13, J24, J31, J71

Introduction

Becker's human capital theory (Becker, 1962) and Mincer's wage equation (Mincer, 1974) can be seen as foundation stones of an analysis of supply-side wage determinants. Mincer's original wage model, containing years of schooling and quadratic function of potential experience, has been extended by adding many new variables since its origin. At the present time, there are thousands of papers on this theme which exhaustively describe wage effects of various supply-side factors. The current state of knowledge in the field of wage determinants, however, leads to the following fundamental questions:

1. Do we already know supply-side factors determining wages? Empirical papers have provided a great deal of evidence on the relation between various characteristics of an individual and his/her wage. It can be thus possible that the accumulation of perfect knowledge on all wage determinants, including their measurement and influence on wages, is beyond the capability of labour economists not specialized in this field. The general knowledge on supply-side wage determinants can be, therefore, limited only to several notoriously known facts.

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2. Is the future of research in the field of supply-side wage determinants bright or dark? Several decades of research examined and described wage effects of many factors and individuals' characteristics. It is possible that the intensive research revealed all mysteries of supply-side wage determinants and the future research in this field will be absolutely unfruitful, but the opposite is possible as well. Which one is more likely?

These questions have to be answered one by one because insufficient knowledge of particular wage determinants represents a significant barrier for a discussion on future development of research activities in this field, and eventually for defining new research questions, too. This paper therefore deals with an overview of variables most often included in wage equations, as well as with a brief description of their measurement and results as achieved from relevant papers. The probable development of research on supply-side wage determinants is briefly outlined in the conclusions.

It has to be emphasized that the volume of literature on wage determinants leads unavoidably to selectivity of this review. Thus, the paper does not provide any exhaustive list of supply side wage determinants nor comprehensive description of results on a specific wage determinant, but an illustration of heterogeneity of approaches to this issue. It also means that the overview of results informs rather on direction of returns to particular factors (whether they are positive or negative) than exact values, as the number of reviewed papers is limited and methodology and data used by them are not discussed in detail. A more focused literature review or study of original papers could be recommended in case of interest in particular wage determinant.

Overview of empirical literature on supply side wage determinants

The following paragraphs describe the variables most often employed in wage equations, including results from their estimations. Education, experience, particular skills, psychological traits, beauty and health, social capital, characteristics potentially connected with discrimination, individual's household characteristics and social, cultural and economic background an individual was exposed to during childhood and adolescence represent aggregated fields of interest which are discussed in details.

Education represents the basic supply side wage determinant, as arises from Becker (1962). It is usually measured either by years of school attendance, or levels of educational attainment. Both approaches were employed during several decades of interest in the estimating returns to education which culminated in the period of economic transition in Central and Eastern European countries. Focusing on these countries, the empirical literature quantifies returns to one year of schooling in early transition period at the level from 3.9 % to 5.7 % (Jones, Simon, 2005; Flanagan, 1998; Chase, 1997; Bird, Schwarze, Wagner, 1994), only exceptionally 11.2 % (Campos, Jolliffe, 2002). The returns to university degree (in comparison with primary education) are often estimated at the level around 50 % (Flanagan, 1998; Noorkõiv, Orazem, Puur, Vodopivec, 1998; Chase, 1997; Stanovnik, 1997), but it is also possible to identify estimates exceeding 80 % (Campos, Jolliffe, 2002; Orazem, Vodopivec, 1997).[3] It seems that in general, returns to education are slightly higher for women regardless

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[3] For a detailed overview of results on returns to education in Central and Eastern European countries see Campos, Jolliffe (2002).

whether years of schooling (Campos, Jolliffe, 2002; Flanagan, 1998; Chase, 1997) or levels of educational attainment (Flanagan, 1998; Chase, 1997; Orazem, Vodopivec, 1997) are used.

Not only quantitative, but also qualitative aspects of education play a significant role in wage determination. For instance, some fields of study are associated with a significant either wage premium or wage penalty regardless of whether individual's occupation is controlled (Joy, 2003; James, Alsalam, Conaty, To, 1989; Angle, Wissmann, 1981). Characteristics of educational institution can represent another factor potentially influencing the quality of education attained. It seems that graduation from highly selective and elite institutions is connected with wage premium even if individual's occupation is controlled (Monks, 2000; James, Alsalam, Conaty, To, 1989).

General labour market experience and tenure, i.e. firm specific work experience, correspond to Becker's idea of general and specific human capital respectively (Becker, 1962) accumulated through work experience and on-the-job training. The main attention is paid to contribution of these two variables to the wage growth, considering their endogeneity, immeasurable worker characteristics, job characteristics and job-worker match. As results show, returns to general labour market experience are substantially larger than returns to tenure, which represent statistically significant wage premium for seniority (this wage premium was not identified, for example, in the case of blue collar workers; see Abraham, Farber, 1987). Cumulative returns to 10 years of labour market experience reach values from 14.7 % to 44.2 % (with prevalence of higher values), while cumulative returns to 10 years of tenure reach values from 6.6 % to 28.0 % (with prevalence of lower values) (see Altonji, Williams, 2005; Abowd, Kang, 2002; Topel, 1991; Altonji, Shakotko, 1987). The returns to labour market experience and tenure differ significantly by educational attainment (Buchinsky, Fougère, Kramarz, Tchernis, 2010) or socioeconomic status of a particular job (Abraham, Farber, 1987).

In the case of unavailability of relevant data for labour market experience and tenure, the age or potential work experience, i.e. age reduced by years of schooling and age at the beginning of schooling (see Mincer, 1974), are often used as an approximation of labour market experience.[4] Differences in returns to potential work experience between men (from 1.4 % to 2.5 %) and women (from 1.1% to 2.2 %) suggest that they are higher in case of men (Flanagan, 1998; Chase, 1997; Orazem, Vodopivec, 1997; Stanovnik, 1997).

Although education and labour market experience of an individual consist of a set of particular knowledge and skills, an examination of their wage returns is relatively limited. Difficulties with their measurement, especially in the case of soft or social skills, can be seen as one of the most important factors of this situation.

Cognitive skills are most often approximated by individual's IQ score (e.g. Zax, Reese, 2002) or more often by individual's test score in numeracy (e.g. Murnane, Willett, Duhaldeborde, Tyler, 2000; Murnane, Willett, Levy, 1995), literacy (e.g. Carbonaro, 2006) or both (e.g. Blau, Kahn, 2005; Farkas, England, Vicknair, Kilbourne, 1997). All stated studies found cognitive skills statistically significant determinant of wage level

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[4] For a detailed overview of results on returns to potential experience in Central and Eastern European countries see Campos, Jolliffe (2002).

regardless of whether direct or total influence of cognitive skills on wage was taken into account. For instance, Zax and Reese (2002) quantified an increase of wage associated with a one standard-deviation increase in adolescent IQ at the level of 5.4 % at age 35 and 13.4 % at age 53. Murnane, Willett and Levy (1995) estimated an effect of a one standard-deviation increase in mathematics test score of 1980 high school graduates on their wages at age 24 at the level of 6.9 % for males and 10.6 % for females, whereas the corresponding wage premium at the age of 27 was estimated by Murnane, Willett, Duhaldeborde and Tyler (2000) at the level of 6.5 % for both genders. Farkas, England, Vicknair and Kilbourne (1997) provide a similar estimation of returns to cognitive skills, i.e. wage premium at the level of 6.0 % for males, and 6.7 % for females connected with a one standard-deviation increase in test score on language and mathematics performance. Evidence on ambiguous differences in returns to cognitive skills among genders provided Blau and Kahn (2005), who estimated their total (i.e. direct and indirect) returns in 9 developed countries. They stated that a standard deviation increase in cognitive test scores raises wages by 5.3 % to 15.9 % for men and 0.7 % to 16.2 % for women.[5]

Literacy and numeracy are not the only general skills whose wage returns have been examined in empirical literature. Some other examples can be provided as an illustration. For instance, Krueger (1991) provides evidence that computer skills or, more specifically, using a computer at work was rewarded by 13.9 % wage premium in 1989. It can be emphasized that the wage premium differed for different occupations and computer tasks significantly. Also knowledge of official language was found as a statistically significant predictor of wages for non-native inhabitants of USA (Aguilera, Massey, 2003) and Estonia (Noorkõiv, Orazem, Puur, Vodopivec, 1998), although their levels differ substantially.

Soft skills represent a hardly measurable sub-group of general skills. Kuhn and Weinberger (2005) estimated returns to leadership as one of the soft skills. Leadership was approximated by simultaneous acting as a team captain and club presidents (behavioural measurement) and match of individuals with 5 characteristics (self-assessment) during high school studies. Different datasets used by authors provided results of the same sign, but with a different magnitude. The lowest estimates point at 3.8 % wage premium in the case of simultaneous acting as a team captain and club presidents, and 16.2 % premium in case of individuals having all 5 characteristics approximating leadership. Weinberger (2011) estimated wage premium of aggregate leadership variable at the level of 5.3 % in 1979, and 11.5 % in 1999. Also other soft skills were identified as relevant wage determinants (see e.g. Bacolod, Blum, 2008; Black, Spitz-Oener, 2007; Borghans, Weel, Weinberg, 2006 and 2008).

Knowledge of labour market plays an important role in a determination of wage and social status, as it is suggested by Parnes and Kohen (1975). This knowledge was measured by a test consisting of a description of duties and requirements on educational

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[5] It seems that returns to cognitive skills differ significantly among countries. Carbonaro (2006) provides evidence that returns to cognitive skills are higher in liberal market economies than social market economies, i.e. in countries with lower collective bargaining coverage. This conclusion is supported also by Blau and Kahn (2005), who identified a negative relationship between unionization rate and returns to cognitive skills.

attainment for 10 occupations and selection of occupations with higher earnings (from 8 pairs of occupations). The estimation confirmed statistical significance of the labour market knowledge as a wage predictor (one standard deviation in test score brings a wage premium of 0.11 dollars per hour).

Psychological capital represents an attempt to replenish commonly used human capital variables (e.g., education, work experience or health capital) in wage equations with less observable, but also highly relevant variables representing human attitudes and psyche. For example, the so-called Big Five personality dimensions[6] seem to be relevant wage determinants, especially conscientiousness being significantly correlated with an individual's wage and productivity (Barrick, Mount, 1991). Self-esteem as an important factor influencing ability to make decisions and work independently was also identified as significant determinants of wage. Goldsmith, Veum and Darity (1997 and 1998) identified 13.3 % wage premium connected with 10 % increase of self-esteem. Moreover, the results suggest that self-esteem is systematically correlated at least with race and sex (e.g. self-esteem of women is reduced through socialization patterns, see Karsten, 2006).

Beauty or physical attractiveness, as a part of, let us say, somatic capital, is a wide concept containing facial beauty, height and weight. Perception of beauty is changing over time (Veblen, 1999), but the changes are slow enough to consider beauty standards as constant in any given time period.

Facial beauty seems to be a very specific wage determinant because it generates wage premium even in the situation of no real productive effect (Mobius, Rosenblat, 2006).[7] An evaluation of frontal facial photographs on five-point scale by "board of observers" is a possible method of data set creation which was applied e.g. by Biddle and Hamermesh (1994 and 1998). They identified 5.3 % wage premium for above-average looks and -9.1 % wage penalty for below-average looks (Biddle and Hamermesh, 1994). It can be stated that facial beauty has two features which make it interesting for wage equation: the evaluation of individual's beauty is relatively stable over time (there is relatively high correlation between facial beauty evaluation at individual's early-age and older-age) and significant differences in the evaluation of facial beauty between women and men (Biddle and Hamermesh, 1998).

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[6] The Big Five personality dimensions consists of extraversion/introversion (associated with being sociable, gregarious, assertive, talkative and active), emotional stability (associated with being anxious, depressed, angry, embarrassed, emotional, worried and insecure), agreeableness (associated with being courteous, flexible, trusting, good-natured, cooperative, forgiving, soft-hearted and tolerant), conscientiouness (associated with being careful, thorough, responsible, organized, able to plan, hardworking, achievement-oriented and persevering) and openness to experience (associated with being imaginative, cultured, curious, original, broad-minded, intelligent and artistically sensitive).

[7] The meta-analysis of 68 studies on relationship between physical attractiveness and intellectual competence (Jackson, Hunter, Hodge, 1995) shed light on the existence of beauty wage premium regardless it has no real productive effect. Although the analysis confirms that attractiveness and intellectual competence are unrelated, it shows that the intellectual competence of attractive adults and children is generally perceived as higher in comparison with their less attractive peers. Moreover, this effect is stronger in the situation when no information on real individual's competence is available, and in the case of adults.

Body beauty, approximated by height and weight themselves, or most often by their combination into one variable, usually Body Mass Index (BMI = kg/m^2), is an important determinant not only of wages, but also of social interactions (e.g., Carr, Friedman 2005). Regardless of BMI value, clinical classification of weight or weight itself (with controlled variable for height) is applied, the prevailing results suggest that overweight and obesity have significant negative effect on wages for women (approximately from -10 % to -15 % for obesity) and neutral or even positive effect on wages for men (e.g. Cawley, 2004; Averett, Korenman, 1996; McLean, Moon, 1980; Haskins, Ransford, 1999; Biddle and Hamermesh, 1994).[8] Height is also positively associated with wage level; e.g. Biddle and Hamermesh (1994) identify wage premium for above-average height at the level 2.7 % for men and 10.4 % for women, and wage penalty for below-average height at the level -10.5 % for men and -1.7 % for women. Positive wage returns to height for USA was reported also by Schultz (2002).

Height, weight or BMI are also often used in developmental empiric studies as an approximation of nutrition and health status, which are issues much more associated with health capital than with beauty. The positive effects of these variables on wage level can be found for a whole range of developing countries (e.g. Schultz, 2002 and 2005, Croppenstedt, Muller, 2000; Deolalikar, 1988).

Health capital or, in short, health is an important factor of both individual's labour supply and wage. Three methods of measuring it are widespread in the empiric literature: an evaluation of health condition (e.g., Mullahy, Sindelar, 1993), an evaluation of work limits in connection with health condition (e.g., Parnes, Kohen, 1975), and an identification of particular diseases (e.g., Bartel, Taubman, 1986 and 1979; Baldwin, Weisbrod, 1974). Empirical evidence confirms significant negative effect of ill health on wages, e.g. wage penalty at the level of -28.1 % was identified for health related work limits (Parmes, Kohen, 1975), and approximately the same wage penalty was identified in the case of heart disease, psychoses, neuroses and bronchitis (Bartel, Taubman, 1979).

Smoking, alcohol drinking and drug using are activities closely related with both health and conformity of individual's behaviour to social norms. All these behaviour patterns have a significant influence on an individual's labour supply (e.g., Auld, 2005; Mullahy, Sindelar, 1993; Burgess, Propper, 1998) and wage. Empirical studies suggest that daily smoking is associated with wage penalty ranging from -7 % to -9 % (Auld, 2005; Levine, Gustafson, Velenchik, 1995), moderate alcohol consumption is connected with wage premium compared to absent or high alcohol consumption (Auld, 2005; Lye, Hirschberg, 2004; French, Zarkin, 1995), and hard drugs consumption brings about a decrease of wage from -25 % to -36 % (Burgess, Propper, 1998).

Social network or individual social capital (for brief description of different approaches to the social capital and its measurement see Šafr, Sedláčková, 2006) represents an important factor of labour market success.[9] Earnings, as one of labour market outcomes,

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[8] Authors usually use variables of weight together with variable of health (as a control variable) to distinguish aesthetic and health dimensions of weight.

[9] There are empirical evidences of its positive effect, among others, on finding a job (e.g., Fernandez, Weinberg, 1997) or productivity of entrepreneurs in developing countries (e.g., Fafchamps, Minten, 2002 and 2001; Barr, 2000).

are positively connected with social capital stock of an individual (Bayer, Ross, Topa, 2008; Flap, Boxman, 2000), although its positive effect on them is apparently caused more by enhanced labour market participation than higher wage rates, because the influence of social capital on wage rates seems to be statistically insignificant or even negative (Bayer, Ross, Topa, 2008; Delattre, Sabatier, 2007), and higher labour market participation in relation to social capital is often confirmed by empiric results. Mixed returns to social capital were identified also in studies focusing on immigrants (Xue, 2008; Aguilera, Massey, 2003). These studies revealed that activation of social networks is more favourable for disadvantaged groups of immigrants and different kinds of social capital are activated in different conditions.

Gender represents an important control variable in estimates using pooling sample of males and females. The statistical significance and magnitude of the gender coefficient should not be automatically ascribed to gender discrimination on the labour market, but it should be interpreted with caution as the estimate can be biased by omitted variables, which are systematically correlated with gender (e.g. see Bertrand, 2010 for discussion on gender differences in psychological traits). The necessity of cautious interpretation is given also by significantly different estimates of gender coefficients presented by various papers. It is possible to identify papers indicating relatively low wage penalty for women at the level from -3.9 % to -6.0 % (Toutkoushian, Bellas, Moore, 2007[10]; Joy, 2003; Gerhart, 1988), but also to find papers indicating wage penalty for women exceeding -20 % (Carlson, Persky, 1999; Angle, Wissmann, 1981).

Race or ethnicity is often included into wage regressions to control for labour market status of different minorities. However, an interpretation of statistical significance and magnitude of race regression coefficients as race discrimination is highly disputable (as in the case of gender and gender discrimination). It can be illustrated by mixed results of various papers using ethnicity as one of the control variables, which found coefficients for both black and Hispanic (in comparison with whites) negative, statistically insignificant, and also positive (Toutkoushian, Bellas, Moore, 2007[11]; Joy, 2003; Carlson, Persky 1999; see also Carr, Friedman, 2005; Waldfogel, 1997). Papers focusing on wage effects of race show, among others, that race coefficients can be biased by omitted skills (Finnie, Meng, 2002; Neal, Johnson, 1996) which are not equally distributed among different ethnic group, or by influence of immigrants in the case of pool samples, because immigration is connected with a significant wage penalty, which is not ethnically neutral (Hum, Simpson, 1999; Pendakur, Pendakur, 1998). For instance, Hum and Simpson (1999) estimated wage effects of being a member of one of six ethnic groups among non-immigrants in Canada and found a statistically significant wage penalty at the level of -24.1 % only for black men. Similar estimates were made by Pendakur and Pendakur (1998) for eight visible ethnic minorities. Statistically significant wage penalties were found only for black men (at the level of -17.4 %) and

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[10] Toutkoushian, Bellas and Moore (2007) focused on gender differences in faculty salaries and they identified statistically significant wage penalty for women at the level of -3.9 %. For detailed overview of pay equity studies in higher education see Barbezat (2002).

[11] Toutkoushian, Bellas and Moore (2007) focused on race differences in faculty salaries and they identified statistically significant wage premium for Asians at the level 4.3 % and statistically insignificant wage differences for Blacks and Hispanics. For detailed overview of pay equity studies in higher education see Barbezat (2002).

Chinese men (at the level of -12.5 %). It should be noted that the number of observations for other ethnic groups was insufficient. The comparison of estimates for men and women among different studies suggests that men face higher wage penalties or lower wage premiums connected with their ethnicity (Finnie, Meng, 2002; Hum, Simpson, 1999; Pendakur, Pendakur, 1998; Neal, Johnson, 1996). Ethnicity variable obviously consists of more than only skin colour, because it is possible to find statistically significant wage differences also among different ethnical groups of white non-immigrant Canadians (Pendakur, Pendakur, 1998), which is not consistent with the explanation of race discrimination.

An inclusion of sexual orientation into wage equations is driven either by its potential to mirror discrimination of homosexual and bisexual individuals at the labour market, or its assumed relation to the market and non-market activities specialization within households. The sexual orientation is usually identified on the basis of sexual behaviour or sexual preferences. Findings in this field suggest that homosexual and bisexual men earn from -3 % to -30 % less than heterosexual ones, whereas there is no statistically significant negative effect on earnings of homosexual and bisexual women, or it is even positive (Plug, Berkhout, 2004; Black, Makar, Sanders, Taylor, 2003; Allegretto, Artur, 2001; Badgett, 1995). Moreover, these effects are most significant in comparison of homosexual individuals with married ones.

An inclusion of marital status variable into a wage equation is usually explained either by determination of an individual's work effort by spouse's income (e.g. increased productivity of men financially securing his family), productive effect of a housework specialization within family (not confirmed in Hersch, Stratton, 2000), or using marital status as a proxy variable for hardly observable characteristics (e.g. stability, loyalty, responsibility, etc.) closely connected with a solemnization of marriage. Empirical evidence shows wage premium of marriage for men ranging approximately from 7 % to 20 % (Auld, 2005; Allegretto, Artur, 2001; Hersch, Stratton, 2000; McLean, Moon, 1980), for women, though, it seems statistically insignificant (Black, Makar, Sanders, Taylor, 2003; Badgett, 1995).

Number of children, together with their age structure, affects many aspects of women's life, including their labour supply and wage. The labour supply is negatively affected by young children (e.g., Adair, Guilkey, Bisgrove, Gultiano, 2002; Chiswick, 1986), whereas the negative effect of children on wages appears regardless of their age and seems to persist over time (Leung, 2007). The "motherhood wage penalty", which is usually explained e.g. by lower work experience of mothers, employment in lower-wage jobs with more "family-friendly" environment, employers' discrimination or other factors, reaches the value ranging from -2 % to -5 % for one child, and from -4 % to -13 % for two or more children according to the elapsed time from a childbirth and mother's educational attainment (Leung, 2007; Waldfogel, 1997). It is noteworthy that statistically significant differences in impact of children on wages have been identified between genders in favour of men (Millimet, 2000; see also Hersch, Stratton, 2000; Levine, Gustafson, Velenchik, 1995).

Division of housework and time spent carrying out this activity is another important determinant of wage. Hersch and Stratton (2002), who used number of hours spent performing 9 different kinds of housework activities, identified wage penalty connected

with housework as ranging from -29 % to -39 % for women, whereas the wage penalty for men was statistically insignificant (statistical insignificance of wage penalty for men is reported also by Hersch, Stratton, 2000). The difference was caused by both higher participation of women in housework in general (see also Hersch, Stratton, 1994), and their higher involvement in activities such as meal preparation, cleaning, shopping and laundry, which are attended to on a daily or almost daily basis.

An environment a person was exposed to during childhood and adolescence has a significant influence on his/her future development. Social, cultural and economic background is, therefore, often implemented into wage models purpose of which is to estimate their direct and indirect effects on wages. There are no doubts about indirect wage effects of background, which consists mainly of its influence on individual's educational attainment. Direct wage effects of background are, however, more disputable. Many studies control simultaneously for both variables affected by individual's background and the background itself, thus giving us the opportunity to identify its direct effects. For instance, household income during individual's childhood and adolescence has positive direct effects on wage of an individual (Joy, 2003; Zax, Reese, 2002; Monks, 2000; Goldsmith, Veum, Darity, 1997), education of parents is usually connected with none or positive direct wage effects (Joy, 2003; Zax, Reese, 2002; Farkas, England, Vicknair, Kilbourne, 1997; Goldsmith, Veum, Darity, 1997; Powell, Parcel, 1997; Murnane, Willett, Levy, 1995), direct wage effects of parents' occupation was found rather ambiguous (Zax, Reese, 2002; Goldsmith, Veum, Darity, 1997; Angle, Wissmann, 1981), two-parent family has none or negative direct effects on wage (Zax, Reese, 2002; Goldsmith, Veum, Darity, 1997; Powell, Parcel, 1997; Murnane, Willett, Levy, 1995), number of siblings is connected with none or negative direct wage effects (Zax, Reese, 2002; Powell, Parcel, 1997; Murnane, Willett, Levy, 1995), and finally direct wage effects of religion was also found to be ambiguous (Goldsmith, Veum, Darity, 1997; Powell, Parcel, 1997). For some other background variables such as parental attitude towards college, peers' characteristics or localization of high school see Zax and Reese (2002) or Murnane, Willett and Levy (1995).

Conclusions

The list of variables included in wage models has been extended substantially since 1974 when Mincer published his model containing years of schooling and quadratic function of potential experience (Mincer, 1974). This paper provides an overview of the variables most often employed in wage equations, including results of their estimations. Education, experience, particular skills, psychological traits, beauty and health, social capital, characteristics potentially connected with discrimination, individual's household characteristics and social, cultural and economic background the individual was exposed during the childhood and adolescence, these all are aggregated fields of interest which were discussed in details. It can serve as the first insight into the theme of supply-side wage determinants.

It is very difficult to size up development in research of wage determinants. It can be supposed that existing empirical literature comprehends major parts of an individual with a potential to wage determination, as the overview above suggests. Three main

directions of current and future research on wage determinants, with emphasis on supply side, can be seen:

1. Definition of new variables with emphasis on better description of major parts of an individual. For instance, current lack of data on interpersonal skills (as Murnane, Willett, Duhaldeborde, Tyler, 2000 pointed out), or only exceptional use of job performance measurement (e.g. in Gerhart, 1988) limit the explanatory power of wage models, or even lead to bias of variables correlated with omitted variables.

2. Revision of existing variables with emphasis on measurement of real characteristics. For instance, particular skills of an individual should be measured instead of years of schooling or educational attainment because the latter measure an input and not an output of education (Neal, Johnson, 1996). Legitimacy of this approach can be illustrated by results of Flap and Boxman (2000), who found that incorporation of company specific skills requirements into wage equation leads to statistical insignificancy of education. Gender and race variables can be mentioned as other examples because it can be assumed that rather than dealing with only physical differences among people, these variables describe characteristics common to relevant parts of population.

3. Design of highly comprehensive models. Specification of comprehensive wage equations (see e.g. Joy, 2003) prevents potential bias of estimated regression coefficients due to omitted variables, and increases the explanatory power of the model. However, availability of rich datasets forms a very basic condition for application of this approach. The advantage of a comprehensive model could thus be further strengthened by the dataset reflecting needs stemming from the previous paragraphs, i.e. extended by entirely new variables and capable of capturing the real traits.

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