TRENDS IN OCCUPATIONAL RETURNS TO EDUCATION: A COMPARATIVE PERSPECTIVE

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1 CONTENT

2 ABSTRACT

Education has been shown to be the single most important determinant of people's occupational success, both in terms of the socioeconomic status and in terms of prestige. There is, however, much less consensus in the social sciences regarding trends in occupational returns to education. In this paper we test the competing theories of *modernization, of educational upgrading* and of *overeducation,* each of which proposes different hypotheses regarding trends in occupational returns to education. We also test additional hypotheses about the effects of different education systems and of communism on returns to education. We use a large international data set containing information on 368,804 individuals from 42 countries who entered the labor market between 1900 and 2000 and estimate a series of multilevel models to predict the effects of interest.

The data reveal that while *the upper education categories were losing occupationally* and *the middle education categories maintained their average occupational standing*, the *people at the bottom succeeded in improving their occupational position* in the course of modernization even after the marginal distributions of education and occupation are controlled. We also find that tracked education systems harm people at the bottom, and increase the average ISEI of graduates in the middle and at the top of the educational ladder. Communism appears to improve the occupational standing of the best educated, probably as a result of limited supply of highly skilled labor force on communist labor markets.

3 INTRODUCTION

There is a persistent interest both in and outside the academia in the individual and societal-level consequences of education. Education has been shown to be the single most important determinant of people's occupational success, both in terms of the socioeconomic status and in terms of prestige. This relationship holds in a number of social contexts, including societies at very different levels of development, societies with various historical experiences, cultural and religious backgrounds as well as societies with rather diverse forms of government (Blau, Duncan 1967; Featherman, Hauser 1978; Gerber 2003; Hanley, Treiman 2004; Psacharopoulos 1973, 1980; Sewell, Hauser 1975; Shavit, Mueller 1997; Treiman, Yip 1989; Walder, Li, Treiman 2000).

There is much less consensus in the social sciences regarding trends in occupational returns to education. Proponents of the *modernization theory of stratification* claim that returns to education should grow over time, while the *educational upgrading* and *overeducation theories* suggest that occupational returns to education should decrease over time. In this paper we use a large international data set to adjudicate the competing theories using a series of multilevel models. The data set we use contains information on 368,804 individuals from 42 countries who entered the labor market between 1900 and 2000.

4 THEORIES ABOUT TRENDS IN OCCUPATIONAL RETURNS TO EDUCATION

4.1 Modernization theory and trends in occupational returns to education

Modernization theory predicts a transformation of basic stratification principles. It proposes that *the role of education in determining one's occupation will grow* as societies modernize and industrialize. However, the theory is rather vague in its verbal formulation and therefore allows for multiple ways how to translate its propositions into the language of statistical models. One stream within modernization theory suggests that as modernization progresses and the proportion of professional, technical, clerical and administrative jobs in the workforce grows, formal education gains in importance for learning occupationally relevant skills (Brown 2001; Treiman 1970). Moreover, industrialization and a more advanced division of labor require that stratification processes select individuals into positions in the social structure on the basis of skills and talents and ascribed characteristics are disregarded (Treiman 1970). The growing dependence of modern societies on skill and talent make the achievement principle imperative for societal functioning. Increasing occupational returns to education are also reinforced by a value change favoring universalism over particularism (Blau, Duncan 1967; Lenski 1966; Parsons 1970).

The increasing role of education in determining occupational status is accompanied by a decreasing tendency in the direct effect of family background on the achievement of the offspring, and thus indirectly raising the relative importance of education in the stratification process. First, the growing predominance of large, highly bureaucratized

organizations in the economy make it more difficult for parents to directly influence their children's occupational standing (Treiman 1970). Second, the classes with traditionally highest levels of occupational inheritance- such as farming and petty bourgeoisie – decline in size (DeGraaf, Luijkx 1993) and further contribute to the declining degree of direct occupational inheritance. Nonetheless, there remains a direct net effect of family background on the occupational achievement of the offspring (Blau, Duncan 1967; Featherman, Hauser 1978; Hout 1988; Treiman, Yip 1989).

A stronger education- occupation link may mean two rather different things. It could simply be that the within-education-category variance gets smaller relative to the between-education-category variance, as education more completely determines exactly what kind of occupations people enter. Alternatively, the correlation between education and occupation could grow because *average occupation statuses for each level of schooling should diverge over time,* while the with-education-category variance in occupational status may remain unaltered. It is this later proposition that we are testing in this paper ***(hypothesis 1)***.

It is not quite clear from the theory whether the average occupation of the best educated should grow, leaving all other workers behind, or if it is mostly the less educated who are losing ground, or is both trends occur at the same time. We are mostly interested in trends in occupational returns to education, which is an issue that has not been, at least to our knowledge, investigated yet, so there is little previous research to build expectation upon. There is, however, corollary evidence showing that wage inequality between levels

of schooling has been growing in recent decades, at least in the United States[1]. While we do not want to overemphasize the importance of this finding[2], it clearly at least fails to disprove our general argument that *the occupation returns to highest levels of education should grow over time (**hypothesis 1A**)*, while *occupational returns to lowest levels of education should decline (**hypothesis 1B**).*

Interestingly, another stream of modernization theory, *the theory of educational upgrading,* proposes that occupational returns to education will decline over time. The logic of industrialism, increasing complexity of modern societies and new modes of production (Kerr 1983; Kerr et al. 1960) constantly increases demand for skilled labor (see above). While the vocabulary surrounding this argument has recently shifted towards that of 'post-industrial society' and 'knowledge society' and the like (xxx), the essence of the argument still emphasizes growing demand for skill. The main difference between the modernization theory and the theory of educational upgrading is that according to the latter the demand for more skill has increased even within individual occupations, because new technologies permeate even areas where they were historically absent. The *educational upgrading argument* suggests that not only has aggregate demand for skill increased, but

[1] The real average weekly wage has declined for the least educated by 5% between 1963 and 1989, while it rose for the most skilled workers by 40%, resulting in increasing overall wage inequality (Juhn, Murphy, Pierce 1993). Income and earnings inequality also grew in other countries, e.g. in the post-communist ones, but there it is clear that the source of the change was more complex and we are hesitant to take those trends, at least on their face, as a direct empirical support for our modernization hypothesis.

[2] There have been other influential descriptions of growing wage inequality in it US mainly linking it to specific demographic changes (baby boom and baby bust) and economic changes (the declining demand for manufacturing labor and the increasing demand for both high tech labor and low tech service labor; see e.g. Levy, Murnane 1992).

also *the hiring criteria have been modified, because occupations today require more skill than before* (e.g. Featherman, Hauser 1978), or because the rapid technological innovations within occupations pay a previously nonexistent premium for workers' flexibility and thus for higher education (Bartel, Lichtenberg 1987; Mincer, Higuchi 1988).

The educational upgrading theory has a background in the economic theory of endogenous changes in knowledge. Arrow (1962) proposed that experience gained while working with a particular production technology- 'learning by doing'- modifies the production function; namely, in our context, the ability to learn to operate a new technology increases efficiency of production. Because it is likely that educated labor force will learn faster, production units with higher rate of technological innovation may prefer workers with higher learning potential, .i.e. skilled workers (e.g. Nelson, Phelps 1966; Wolff 2000). Technological change therefore stimulates increasing demand for skilled labor even within occupations, and educational requirements grow so as to increase future productivity. Bartel and Lichtenberg (1987) for instance reveal that the relative demand for educated workers is higher in industries with higher rate of technological innovation and Mincer and Higuchi (1988) confirmed that more rapidly industrializing industries offer higher returns to skills, again confirming that the relationship between education and occupational attainment shifts in response to modernizing forces.

*The theory of educational upgrading hypothesizes that average occupational attainment within educational categories should decline with progressing modernization (**hypothesis 2**)*, because each occupation requires more previous training and flexibility.

The theory seems to suggest that the average occupational status of each educational level should decline at the same rate.

4.2 Overeducation theory

Some authors have advanced the *overeducation argument* to explain that both individual students and the society as a whole invest too much into education. Mills (1953) predicted half a century ago that the production of college graduates in the US would soon be, or already was a his time, greater than the demand for their qualified labor in the economy. Dresch (1975) in a similar tone predicted that college enrollments would decline in the US by 33% between 1970 and 2000. These predictions were not confirmed by subsequent development, but nonetheless later research has pointed out that increasing proportions of employees posses more education than what is required for their jobs (Donton, Vignoles 2000; Rodriguez 1978; Sicherman 1991) and growing proportions of employees work in jobs that used to be occupied by workers with lower educational qualification (Borghans, de Grip 2000; Halaby 1994). Students, it seems, graduate with lower odds of reaping the desired fruits of better employment prospects, higher prestige jobs, and higher incomes (Freeman 1976, 1980). The overeducation theory argues that their skill is underutilized and both the private and public investment into schooling doesn't bring expected returns. So, seemingly rational individual attainment strategies produce collective irrationalities (cf. Van der Ploeg 1994). Indeed, previous, mostly economic research has documented lower, but nonetheless positive, returns to surplus schooling (Rubb 2003a; Verdugo, Verdugo 1989).

Many studies have mapped the prevalence of overeducation in various countries and estimated that, depending on the concrete measure, between 11% (Verdugo, Verdugo 1989) and 40% (Sicherman 1991) of the US male labor force were overeducated. Dolton and Vignoles (2000) similarly find that 38% of graduates were overeducated for their first job in the UK in 1980 and 30% were still overeducated six years later, while also other western countries reach similar levels of overeducation (e.g. Borghans, de Grip 2000). Furthermore, overeducation is a permanent phenomenon in the US, not just a short-run alternative to unemployment or a temporary education-job mismatch (Rubb 2003b), which suggests that it has some structural determinants.

Judging on the basis of available literature, overeducation is a problem of highly industrialized societies only and scholars as well as international organizations continue to recommend that non-western countries increase their investment into education as a major part of their developmental policy that will speed up their economic growth, increase productivity and so on (Borghans, de Grip 2000; OECD 1996; xxx). We nonetheless believe that the overeducation argument can be phrased more generally, so that it also is applicable to developing societies as well. Treiman (1970) argued that because people perceive the advantages of education, there is pressure on governments to expand the educational system more rapidly than the demand for labor warrants. We believe that governments face the same pressure in developed and in developing societies alike. It is actually possible that the problem may be more severe in developing societies, whose very often populist governments may be in some ways more responsive to the voice from

below. The result can be an "over-educated" or "under-employed" population and potentially civil unrest at any stage of development (Treiman 1970).

Overeducation implies wasting of skill and resources (Freedman 1976), but has also other rather undesirable individual and social consequences. For the overeducated individual overeducation decreases job satisfaction (Burris 1983; Tsang, Rumberger, Levin 1991) and it also harms the less educated workers. When the better-educated accept jobs below their skill level, they engage in job competition with the less-educated, who are then pushed down in the occupation hierarchy or lose their jobs altogether irrespective of their real abilities or potential productivity- a phenomenon known as *crowding-out* or *bumping-down* (Borghans, de Grip 2000). Overeducation is therefore often held accountable for the increasing unemployment rates, the concentration of unemployment among the least educated and related social problems (Åberg 2003; Wolbers 2000), although there is less than a consensus that the net effect of low education on employment prospects really changed over the course of the last decade (Røed, Nordberg 2004).

One possible explanation of overeducation is that educational attainment in the labor force increases more rapidly than the occupational structure expands (Åberg 2003; Clogg, Shockey 1984; Wolbers, de Graaf, Ultee 2001; Borghans, de Grip 2000). This structural transformation, ceteris paribus, could produce a tendency for highly skilled people to be, on average, increasingly employed in occupations with lower socioeconomic status, lower prestige and lower wages. This explanation is entirely compatible with the job queue theory (Thurow 1975), Arrow's filtering argument (Arrow 1973), Spence's signaling theory (Spence 1974), and Hirsch's view of education as a positional good

(Hirsch 1977): when there are more qualified workers than qualification-requiring jobs, some of the well-educated will eventually accept jobs below their formal educational credentials. Previous research in the Netherlands has indeed showed that once educational and occupational distributions and the stage of the business cycle are controlled, there remains no statistically significant trend in the association between education and occupation (Wolbers, de Graaf, Ultee 2001).

There is a number of theories predicting a change in the net association between educational qualifications and occupational destinations. Berg (1970) suggested that employers deliberately changed their hiring criteria in response to increased supply of college educated workers. For reasons not necessarily related to workers' productivity, employers began to require higher qualifications than what was actually necessary to perform the work satisfactorily. For instance Solga (2002) maintains that educational expansion would alter employers' perceptions of the least educated even if their actual productivity remained the same. She suggests that the signaling value of education is a socially constructed norm that depends on the overall distribution of the credentials in the labor force. If enrollments burgeon, Solga (2002) argues, the less educated workers will be increasingly stigmatized simply by virtue of their decreasing numbers in the population (see also Olneck, Kim 1989).

Others have pointed out that as education expands higher education becomes very diffuse (Clog, Shockey 1984; Smith 1984) and average school quality and thus ultimate productivity of workers may well drop. If indeed average quality of a school graduates declines over time, additional schooling will not necessarily increase productivity and will

thus not be rewarded, be it with higher earnings (Lang 1994; Rumberger 1987) or with higher occupational status.

The overeducation argument proposes that the average occupational attainment within categories of education should decline. However, unlike the occupational upgrading theory, overeducation theory maintains that the least educated workers experiences the largest declines in average occupational status, because the effects of their limited employability and economic productivity combine with the social stigmatization, while the better educated may witness only modest declines in their occupational prospects. Therefore, we expect that *the rate of decline in occupational returns to education will be modest at the higher levels of education and stronger at the lower levels (**hypothesis 3**).*

5 THEORIES ABOUT OTHER MACRO-LEVEL EFFECTS

5.1 Political intervention into the stratification process: the effects of communist rule

Communism replaced market allocation of persons to jobs with an administrative system where people had little or no choice but had to work where the system planners sent them (Gerber 2003). The system of mandatory job assignments existed in most communist countries for most of their communist history, although the actual implementation varied across countries and within countries over time (Gerber 2003; Solnick 1998). The system also created very close ties between vocational schools and factories; in fact many vocational schools were run by the factories and job placements

were often made before a student graduated. While similar systems exist in other countries (e.g. Japan, see Rosenbaum, Kariya 1989), communists brought it to its extreme.

Treiman (1970) suggested that one possible explanation of educational expansion is growing demand in the population and the responsiveness of governments to such demands. On this argument, we should on average expect higher returns to higher, particularly tertiary, education in communist nations (or, more precisely, in non-democratic nations), because authoritarian governments can better resist public pressures to expand the educational system. Indeed, the communist nations are distinctive in the slow rate of expansion of education. This proposition leads us to believe that *occupational returns to higher education should be stronger under communism* (***hypothesis 4A***). An alternative expectation is that *returns to higher education should be declining in democratic societies and shouldn't be changing during communism (**hypothesis 4B**).*

Communism, however, also created a system of dual career paths, in which occupational success was based either on educational credentials or on political criteria (Walder, Li, Treiman 2000). Education was a valuable asset for upward mobility into the professional class, whereas political loyalty and communist party membership increased the odds of entering the class of administrators. A similar pattern of intragenerational mobility was found in China (Walder, Li, Treiman 2000) as well as in Eastern Europe (Hanley, Treiman 2004). The dual career path model suggests that *average occupational returns to lower secondary and upper secondary education should be higher under communism (**hypothesis 4C**)* as those people were able to advance occupationally using resources other than their human capital.

5.2 Effects of vocational educational systems on occupational returns to education

Arum and Shavit (1995) elucidate the dual role of vocational education in occupational stratification in the United States. On the one hand, vocational training helps students avoid unemployment and downward mobility to unskilled jobs and increases their likelihood of employment as skilled workers. On the other hand, enrollment in a vocational track inhibits students' chance of going to college and reduces their odds of obtaining a managerial and professional job. We want to generalize their findings and include the type of education system a country had in a particular labor market entry cohort as one of the explanatory variables in the macro-level equations.

We expect the effect of the type of education system to vary by level of education. Tracked systems are likely to reduce the average occupational status for the least educated, i.e. of those who have less than secondary education or vocational training, because they are not able to obtain jobs as skilled workers and are locked into unskilled manual occupations. Tracked systems are also likely to improve the relative occupational status of the best educated, because people with vocational credentials are not able to compete with them effectively in the labor market. Reduced competition from below should help well-qualified workers maintain their relative occupational advantage. The effect of tracking on the occupational status of apprentices is more difficult to predict, but is most probably neutral. The positive effects, i.e. protection against downward mobility, and the negative effects, i.e. lower rates of upward occupational mobility are likely to offset each other and results in to net effect overall.

6 DATA, VARIABLES AND METHODS

We use a multi-level design, where the first, micro-level, observations are individuals and the macro-level units are defined by the intersection of nation by labor market entry cohort by experience group. The micro-level data come from a large, compiled survey data file based on data collected in 291 individual surveys between 1947-2001 in 42 nations[3]. The data file contains information on a total of 457,651 men[4] aged 21-64 at the time of the respective survey.

[3] Some countries contribute more one nation to the analysis, for instance we distinguish English and French-speaking parts of Canada, Dutch and French- speaking parts of Belgium, and we analyze separately Scotland, Northern Ireland, and the rest of the UK (England, Wales). Also, some countries that are politically independent today and were not necessarily independent for the entire 20th century are treated as independent units of analysis (Czech republic, Slovakia, Slovenia, Estonia, Russia). We also separate former German Democratic Republic from the Federal Republic of Germany, even though they were re-united in 1990. We made the decisions about units of analysis based on both practical and theoretical reasons. For all the nations we dispose of valuable survey data collected in independent surveys, which otherwise (we do not use regional samples at all), wouldn't qualify for the data set. Moreover, we believe that comparing nations/ countries what were previously independent, or became independent, is of extreme theoretical interest. However, the extent to which those additional nations add explanatory power to our design hinges on the extend to which they were really independent units, bot at the micro- and macro- levels. In some cases, this assumption may prove to be rather difficult to advocate.

[4] Since much of our theoretical arguments turns on the relative supply and demand for labor, the restriction to men at minimum introduces noise into the analysis because of changes in the supply of (and demand for) female labor over time. We believe, nonetheless, that the resulting distortion is likely to not be too large, because the male and female labor force are to a large degree effectively non-competing groups. The evidence comes mostly from U.S. studies that show that many jobs, especially in the manual sector, are almost entirely sex segregated within firms, so that the actual degree of sex segregation in the workplace is much greater than would be implied by estimates of the sex segregation of occupations (Baron, Bielby 1984; Petersen, Morgan 1995). Given trends in gender attitudes, it is not surprising that the degree of sex segregation of the labor force is greater in other nations than in the U.S. (Chang 2004).

We analyze the net effect of respondent's level of education on his occupational status (ISEI) controlling for father's occupation. Missing data on some or all central variables reduce the effective sample size. For 4024 respondents education information was missing entirely, and for 34 individuals we were able to determine the level of their schooling but failed to classify them as graduates of either a vocational or a general track (see below), an additional 43,859 respondents were missing on their job characteristics, and another 40,930 cases were missing on father's job information. This leaves us with 368,804 individuals to analyze. Our respondents entered the labor market some time during the 20th century. This enormous span on the data over that many labor market entry cohorts gives us an unique opportunity to look at the modernization and other alternative theories with unprecedented data support. However, even this may prove to be insufficient, because in Europe and the developed Anglo world, and Japan, modernization occurred mainly in the 19th century, which means that studying changes in the course of the 20th century may miss most of the action and because the time frame may in some countries be not long enough to permit a study of the shift from a non-industrial to an industrial economy.

6.1 Micro-level variables and models

We measure *respondent's education* using 7 categories: no education, incomplete primary, complete primary, lower secondary, upper secondary, lower tertiary, and higher tertiary[5]. We use a *dummy variable* to distinguish education obtained in a *vocational vs.*

[5] The lowest categories of education were not represented with sufficient number of cases in some countries. In such cases we merged the lowest one or more categories with the one above them in order not to lose any

general track. We measure both respondent's and father's occupational status using the standard International Socio-Economic Index of occupational status (ISEI; Ganzeboom, De Graaf, Treiman 1992; Ganzeboom, Treiman 1996).

We estimate the following model within each 'context'[6] (see below for a definition for the macro-level context):

$$(\hat{ISEI}) = a_i \sum_{i=1}^{7} EDUC + b_i \sum_{i=0}^{1} VOC + c * FISEI$$

where the dependent variable is respondent's current or last job's ISEI, education is measured as a set of seven dummy variables, and father's occupational status is measured on the ISEI scale as well. Because both the vocational dummy and father's ISEI scores were centered around the within-context means and there is no separate constant, the seven coefficients associated with levels of education show *the expected ISEI for people in the given education category* given they had an average father and an average exposure to vocational tracks. Those *net effects* of education on occupational status, once estimated, were written-out to a separate matrix and, after they were merged with the macro-level variables (see later), they became the dependent variables in the macro-level equations.

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cases. This was done in Australia, Austria, both parts of Belgium, Czech Republic, Denmark, England, Estonia, Finland, France, German Democratic Republic, Federal Republic of Germany, Ireland, Japan, the Netherlands, Northern Ireland, Norway, New Zealand, Poland, Quebec, Slovenia, Slovakia, Sweden, and Switzerland.

[6] The individual-level data were weighted to account for design effects of the original studies whenever a weight was provided in the original file.

6.2 Macro-level contexts, measurements, and models

Macro-level contexts are defined by unique combinations of nation (42 values) by 5-year labor market entry cohort (21 distinct values) by 10-year labor market experience groups (5 distinct values). In addition to 'nation', two other variables were created from the individual level data to determine the 'membership' of each observation in a specific context. Labor market entry year was defined as:

ENTRY YEAR = YEAR OF SURVEY – AGE + YEARS OF SCHOOLING + 6 – 1900[7]

And years of labor market experience were produced by the following approximation:

EXPERIENCE YEARS = YEAR OF SURVEY – ENTRY YEAR – 1900

Entry years before 1900 (there were 59 such cases) were re-coded to 1900, entry years after 2000 (3 cases) were re-coded to year 2000. Where the above-presented expression for years of labor market experience yielded negative results (620 cases), the value of the variable was set to 0.[8]

Overall, there are 4410 potential contexts, however, due to data limitations, we are able to estimate the micro-level equations in only 1313 contexts. The number of contexts per country varies between 15 (Estonia, Finland) and 64 (USA).

[7] 260 respondents reported more than 21 years of schooling, those values were re-coded to 21 for the purpose of subsequent calculations.

Dependent variable in macro-contexts is the expected ISEI from micro-level equations for each level of education.

Economic development is measured using a composite measure created to measure social and economic development in a rather broad sense. Individual indicators come from two sources. First is the 1815- 1973 series of indicators developed by Arthur Banks and stored with ICPSR (Study I7412) and the second one database collected by the World Bank for the 1965- 1994 period (World Bank 1997). The pool of indicators includes the proportion of non-farm and industrial workers in the economy, and energy consumption as measures of technological change. The wealth of nations is measured by GDP. There is a direct measure of urbanization, plus we use direct measures of mail, telephone, television and radio usage/access. Besides, we also measure educational expansion via figures on secondary and tertiary school enrollments. The last aspect of development that our measure covers is access to medical care (measure by the number of physicians per population). We believe that the composite measure grasps well the main underlying dimension of development. However, it may be less suitable to measure the concept of post-industrialism.[9]

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[8] Labor market experience is then used as a control in macro-level equations. Its values were determined using the following procedure: the last two digits of the entry year were rounded to multiples of 5, e.g. all individuals with 0 to 9 years of experience received a score of 5, respondents with 10 to 19 years a score of 15 etc. Respondents with more than 40 years of experience were assigned a score of 45.

[9] Unfortunately, the data are not available for all nations that we would like to consider independent units of analysis. For instance we have no independent data for all parts multi-nation states such as English and French speaking Canada, French and Dutch speaking Belgium, Scotland, Northern Ireland, and England. In such cases each nation is assigned the same values. For Estonia, data were available only for the pre-1940 period; years after 1940 were imputed based on data for the USSR, as were data for Russia. The entire time-

The data provided by both sources is supplied for bi-yearly intervals, but offer by no means a complete coverage of the entire period. Missing parts of the distribution including in some cases the missing tails were filled in by a non-linear extrapolation.[10] Finally, the variable was re-scaled to go from a minimum of –0.5 (e.g. India in 1930) to a maximum of +0.5 (most western countries at the end of the 20th century[11]).

Each labor market entry cohort was assigned the value of the development variable at the time when they entered the labor market and this value is further used in the macro-level equations.

Other explanatory variables in the macro-level equations include *the position of each education category in a stylized job queue*. A job queue is a queue of people ranked by their education from the top to the bottom and competing for jobs. We approximate the relative occupational prospects of the group of people within each education category by measuring how far is the middle of their education category from the top, or more precisely, what percentage of people in the given context stand above that mid-point in the job queue. The measure obviously ranges from 0 to 100%, although it may not, by definition, reach the extreme values for the topmost and bottommost category. We control changes in the structure of available jobs by computing a simple *proportion of people*

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series is also identical for both the Czech and Slovak republics. Where judged reasonable, additional adjustments were made to account for developmental difference between nations within countries based on the micro-level data, namely the mean years of schooling in the populations and the percentage of farming fathers.

[10] We ran a simple OLS regression of the existing values on calendar years and years-squared and years-cubed and then replaced missing values with the resulting predicted values. (xxx)

within each context with jobs with ISEI equal or greater than 25 points. This measure is intended to control for shifts in the occupational structure that may themselves influence occupational returns to education and enables us therefore to analyze changes in the association after controlling for changes in marginal distributions.

We measure tracking educational structures using a single ordinal variable that measures the *degree to which tracking occurs within the system*. The scale runs from 0- no tracking at all to 4- maximum tracking. Examples of countries with minimal tracking include the US, Malaysia and the Philippines, maximum tracking is found in Germany, Austria and some other central European countries before 1948, where the first track placement occurs at the primary level, usually before the age of 12 years. The intermediate levels of the variable describe systems where tracking occurs at lower secondary level (value 3), upper secondary level (value 2) and in the tertiary sector only (value 1). The value of the variable may change across cohorts within countries to reflect reforms in the education system of that country. For instance some of the former soviet bloc countries went from the German-type pre-1948 system with extreme tracking to a less tracked socialist systems, where selection into tracks doesn't begin util after the 8th grade (Kreidl 2004).

Communism enters the macro-level equations as a simple dichotomous variable, which takes a value of 1 if the entire particular cohort entered the labor market during the communist rule and 0 otherwise. Because the five-year wide cohorts do not always overlap

[11] Even the most developed countries today, started their way through the 20th century with values around –0.3 on our scale.

exactly with political changes, the communism dummy is coded 1 beginning with the first cohort after the establishment of communism in a country, and is again coded 0 for the first complete cohort entering the labor market after the regime changed back to democracy. Ten out of our 42 countries have gone through a communist rule of one form or another during the period under study; they include Bulgaria, China, The Czech republic, Estonia, the German Democratic Republic, Hungary, Poland, Russia, Slovakia, and Slovenia.

Then, we estimate a series of macro-level OLS regression in the following form.

$$(\hat{a}) = \alpha_j \sum_{j=1}^{7} Ed.Level + \beta * Development$$

$$+\gamma * JobQueue + \delta * Occup.Distrib. + \varepsilon_k \sum_{k=0}^{1} Communism + \phi * Tracking$$

$$+\varphi_l \sum_{l=1}^{7} Ed.Level * Development$$

$$+\eta_m \sum_{m=1}^{4} Ed.Level * Communism$$

$$+\kappa_n \sum_{n=1}^{7} Ed.Level * Tracking$$

$$+\lambda_p \sum_{p=1}^{41} Country + \mu * Experience$$

where the left hand side is simply the predicted ISEI for each education category within each context. The unit of analysis now is defined by each unique combination of

nation by labor market entry cohort by experience year. The right-hand side contains some or all of the above-mentioned explanatory variables, and possibly also some of their interactions. We thus have seven macro-level equations, one predicting ISEI for each education category over time and on other macro-level explanatory variables.

In order to be able to impose equality constraints on some of the effects across equations, we also stacked all seven equations one on top of the other and included education level among the explanatory variables. Then, by testing for the presence of interactions between development and education level, between tracked systems and individuals selected education levels, and between communism and selected education levels, we can test the primary hypotheses outlined in the opening sections of this paper. In our work we will mostly rely on criteria of classical inference, although we will also supply BIC statistics (Raftery 1995) for the interested reader. It turns out, however, that both criteria provide rather consistent evidence and therefore we were less strongly forced to decide between statistical significance and parsimony as differently weighted by classical inference and BIC.

7 RESULTS

Our primary concern in this paper are trends in occupational returns to education over time. We estimate the above-described OLS regression and test for the presence of various interactions to test our specific hypotheses. First, we want to see if there are any trends in net occupational returns to education in the course of modernization. We accomplish this by testing for the presence of interactions between education level (seven

dummy variables) and the single measure of development. In order to show the robustness of our results we test for the presence of this interaction in the context various alternative model specifications. Model 1 contains the following explanatory variables: all forty one country dummies (USA is the reference category), labor force experience, 7 dummies for education levels, 7 slope lines, one for each level of education (i.e. interactions between development and level of education), the communism dummy and the main effect of education system. There is no explicit constant in this any of the subsequent models and therefore we can interpret all education level dummies and education level slopes directly (see Model 1 in Table 1 for an overview of all effects).

We test two constraints within model 1. First, if the seven interactions between development and education level are collectively different from zero. This is accomplished via a Wald test with 7 and 6278 degrees of freedom. This returns an F- statistic of 46.87, which is highly statistically significant (p=.0000; see Table 2 for all test statistics presented in this section of the paper). Second, we test the proposition that all the trend lines, while different from zero, are in fact parallel. The F-statistics associated with this Wald test is 42.70 (6 and 6278 df) is again highly statistically significant. So, clearly, the unrestricted model is clearly superior to both the restricted models and *we are led to conclude that there are trends in occupational returns to education and these trends differ by level of education*. BIC statistics for each of the above comparisons are shown in the last column of Table 2 and they lead to the same conclusion as the Wald test.

Model 2 is estimated to perform the same test, while controlling for the marginal distributions of occupations (percentage of people with ISEI 25 and higher) and

educational attainment (job queue variable) in each context. All other parameters from Model 1 enter Model 2 as well. Model 2 is built to see if the previously uncovered interactions between development and education level remain significant even after controlling for marginal distributions. First, we again test if the seven interactions between development and education level are collectively different from zero. The associated Wald test with 7 and 6276 degrees of freedom returns a F- statistics of 51.94, which is highly statistically significant (p=.0000; see Table 2). Second, we test the hypothesis that all trend lines are parallel, but differ from zero. The F-statistics associated with this Wald test is 54.39 (6 and 6276 df) is again highly statistically significant. So, again, the unrestricted model is clearly superior to both the restricted models and *we conclude that there are trends in occupational returns to education and these trends differ by level of education even when the marginal distributions of education and occupation are controlled*. As in the previous case, the BIC-based tests are shown in the last column of Table 2 and they lead to the same conclusion as the Wald test.

Model 3 keeps all explanatory variables from Model 2 and adds to it interactions between the characteristics of the education system (tracking) and education level (7 new parameters) and the interaction between the 4 highest categories of education and communism (4 new parameters). We repeat the same tests as before within Model 3 and again conclude that the unrestricted model is superior to both the model that assumes no trend in occupational returns to education (F= 50.92, df= 7 and 6267) and the model that assumes an uniform trend (F= 48.51, df= 6 and 6267; see tests of constraints within Model 3 in Table 2 for the statistics of fit of both Wald tests and comparisons based on BIC).

Individual estimated coefficients of Models 1, 2 and 3 are presented in Table 1. All models presented there can potentially help us answer our main question, however Model 2 is probably the easiest to read and interpret at this stage. We are most interested in slope coefficients for expected ISEI for each level of schooling over the course of development (panel labeled " *Education level * Development*" in Table 2). For the sake of interpretation, we computed expected values of ISEI for each education category from Model 2 and graphed them in Figure 1. The model is evaluated for the United States for the purpose of the graph. The values of the 'communism' and 'tracking' variables are set equal to 0. *With one exception, the graph shows a rather remarkable convergence of occupational standing of all education categories.* People with incomplete primary and complete primary qualifications can, ceteris paribus, expect their occupational standing to increase by 3.5 and 1.5 points with development shifting from the beginning to the end of our development scale. People with lower secondary education can expect no statistically significant change in the average ISEI. Holders of higher secondary, lower tertiary and upper tertiary degrees can expect declining occupational status during modernization. Over the span of the entire development scale, graduates from higher secondary schools would on average lose almost 5 points on the ISEI scale, people with some college 5 points, and college graduates almost 2.5 points. Overall the difference between individuals with incomplete primary education and college graduates would decrease from 27 points on the ISEI scale (49- 22 =27) at the very early stage of development to just 20 points at the highest level of development (47 – 27=20). The one exception to the general pattern is people with no education at all. For them the trend seems to be occupational decline, although the trend line is only marginally

statistically significant in Model 2 (p=0.11) and somewhat more significant in Model 3 (p=0.01), nonetheless we suggest that care should be executed while interpreting this result given how few people have no formal education in the most advanced countries, and how unlikely they might be to be employed.[12]

Next, we turn our attention to the effect of communism on returns to education and to secondary and post-secondary education in particular. In the theoretical part of the paper we have hypothesized that communism increased returns to all type of secondary and post-secondary education by limiting the supply of skilled workers on the labor market. Because most communist systems expanded secondary education much more than tertiary education (e.g. Gerber, Hout 1995; Kreidl 2004), the effect of communism is likely to be stronger at higher levels of education. We also speculated that the effect might interact with level of education to reflect particular communist job promotion policies, namely the so-called dual career path system (Walder, Li, Treiman 2000; Hanley, Treiman 2004). Then the effect of communism is likely to be stronger at lower secondary and upper secondary levels.

We incorporate the necessary constraints into Model 4. First, we test if all four interactions between the four highest level of schooling and communism are collectively zero (F=51.14, df= 4 and 6273, p=0.0000) and then if the effect of communism may be uniform across the four levels (F= 43.43, df= 3 and 6273, p=0.0000; see Table 2). Clearly, the unrestricted model performs the best statistically and we conclude that the effect of

[12] It is also quite likely that people with no education may be a group increasingly or entirely restricted to mentally incapacitated and incompetent individuals. If this is so, then the observed pattern may be entirely

communism interacts with level of schooling. Model building based on the BIC coefficient would lead us to the same conclusions (see last column in Table 2). Individual coefficients in Table 1 reveal the nature of the interaction: the effect is insignificant at the lower secondary level, and grows with each higher level of schooling so that university graduates can expect to gain on average more than 4.5 points on the ISEI scale in comparison with their counterparts in non-communist societies (see Model 4 in Table 1). Communism boosts occupational chances of the best educated above what the same education would secure them in a non-communist country.

The last test we perform is to determine the nature of the effect of tracked educational systems on occupational attainment. The most plausible hypothesis was that the effect should vary across levels of schooling. We test for the presence of the interaction between tracking and level in Model 5, which contains all the covariates from Model 3 plus the seven interactions between the tracking variable and levels of schooling. Then, we again perform the Wald test to see if there indeed is an interaction. The F statistics associated with this test is 79.14 with 6 and 6270 df, which is highly statistically significant (p=0.0000). Also BIC supports the claim that tracked education systems affect each education level differently. A closer inspection of the size and direction of the interaction effects in the last column of Table 1 confirms that our initial hypothesis was correct. Tracked educational systems seem to have negative consequences for educational prospects of people with no education, are neutral for people with incomplete primary education, improve somewhat the average occupational standing of the graduates from

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produced by a selection on unobservables.

lower secondary and upper secondary schools and increases the expected ISEI of employees with lower tertiary credentials. Interestingly, there is no statistically significant effect of tracking on the occupational status of people with higher tertiary diplomas.

8 CONCLUSIONS

The paper analyzed trends in occupational returns to education across 42 nations in the course of societal modernization during the 20th century. Unlike many previous papers it investigated trends in net returns to educational attainment i.e. after father's occupational status was controlled. Our design also controlled for changes in the structure of occupations and in the supply of education, so indeed it provides estimates of changes in the association between educational degrees and occupational statuses in many different social, economic and historical settings at various levels of development.

Strictly speaking we found little support for any of the theories predicting trends over time in their entirety. We uncovered some very interesting results though. *People in the highest education categories are achieving on average lower status occupations as societies modernize*. We found this trend among graduates from higher secondary schools, among lower tertiary schools graduates, and, to a lesser degree, among university graduates. This finding supports the overeducation argument of the inflation of educational credentials, declining quality of the average graduate, and diminishing returns to education. In the logic of the overeducation argument, we should also observe a declining average occupation status for the less educated. However, we found no supportive evidence. On the contrary, *people with primary and incomplete primary education in fact improve their*

occupational prospects in the course of modernization, while holders of lower secondary degrees experience no trend. *Overeducation theory is then only partially confirmed*. We see that overeducation occurs at the highest levels of schooling, whereas it certainly has no consequences for the occupational status of the least educated. One possible, yet in our view not fully satisfactory, explanation of the patter could be that overeducation pushes some of the less educated out of the labor market entirely and the rest of them, who are able to find employment, are able keep their average occupational standing. To see is this is a correct claim, one would need to model the odds of being employed along with occupational status of those who are employed. We plan to extend the analysis in this direction in the future.

Our results do not fully agree with the educational upgrading thesis either, because we found this theory seems to predict an uniform decline in average ISEI across all education categories, while we find it only at the higher education levels. Obviously, one could reformulate the theory to focus specifically on the groups with higher education arguing that those are most impacted by the influx of new technologies and skill requirements. If researches feel happier with this version of the educational upgrading theory, then this paper offers empirical support for the reformulated version.

We noted in the introductory section of the paper that the modernization theory is somewhat difficult to test empirically as it is formulated in such a way that it allows for various predictions. *Our empirical results however do not support any of the hypotheses that we derived from the classical statements of the modernization thesis*. It appears that

either more theoretical work needs to be done to reformulate the thesis, or other models need to be chosen to test it.

We confirmed that vocation school systems tend to stratify occupational returns to education differently than systems that do not allow for tracking, or which track students to a lesser degree. *Tracking harms occupational chances of the people at the lowest education* level because they have no specialized training are therefore less equipped to compete with employees above then in the job queue. *Workers with intermediate and higher levels of schooling enjoy an additional advantage in tracked systems*. The former because they face less competition from unskilled workers below them, and the later because workers with specialized occupational skills can't effectively compete for jobs in the service class. We therefore confirm earlier findings that tracked education systems create a stronger education- occupation link.

Communism has a positive and rather notable effect on occupational returns to higher education. This finding is supportive of the idea that educational systems expanded less in communist countries and offered therefore an occupational premium to the best educated on top of what would have gained in a non-communist society. We found no evidence to support the idea of dual career paths and communism does not offer an extra premium to skilled workers that could be achieved through political engagement.

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10 TABLES AND GRAPHS

Table 1: Statistics of fit of selected macro-level models of occupational returns to education, 42 countries between 1900- 2000. (N=6,336)

	Model 1	Model 2	Model 3	Model 4	Model 5
Country dummies (41)[13]					
Experience	0.048	0.019	0.020	0.017	0.022
	(.005)	(.005)	(.005)	(.005)	(.005)
Education level					
- none	20.208	15.214	16.418	14.853	16.730
	(.816)	(1.047)	(1.037)	(1.032)	(1.056)
- incomplete primary	27.010	20.012	21.204	19.928	21.344
	(332)	(.74)	(.717)	(.729)	(.729)
- primary	29.364	20.833	22.129	20.885	22.078
	(.284)	(.715)	(.699)	(.705)	(.711)
- lower secondary	33.689	23.642	24.228	23.718	24.167
	(.279)	(.695)	(.669)	(.685)	(.681)
- higher secondary	40.580	28.915	29.421	28.729	29.590
	(.278)	(.703)	(.660)	(.676)	(.672)
- lower tertiary	47.583	34.789	33.058	34.639	33.041
	(.321)	(.703)	(.690)	(.696)	(.702)
- higher tertiary	56.451	43.106	45.338	42.393	45.894
	(.302)	(.696)	(.684)	(.689)	(.696)
Position in the job queue (percent)		-0.069	-0.052	-0.065	-0.056
		(.004)	(.004)	(.004)	(.004)
% of labor force with ISEI > 25		0.165	0.151	0.166	0.151
		(.007)	(.007)	(.007)	(.007)
*Education level * Development*					
- none	-5.523	-3.135	-4.782	-3.650	-4.320
	(2.02)	(1.923)	(1.834)	(1.898)	(1.865)
- incomplete primary	2.786	5.254	3.520	5.076	3.817
	(.833)	(.814)	(.778)	(.800)	(.792)
- primary	-0.306	2.491	1.506	2.044	2.012
	(.633)	(.646)	(.618)	(.639)	(.626)
- lower secondary	-2.446	0.426	-1.060	-0.199	-0.523
	(.57)	(.580)	(.559)	(.576)	(.565)
- higher secondary	-6.719	-4.690	-5.487	-4.970	-5.285
	(.539)	(.537)	(.515)	(.534)	(.520)
- lower tertiary	-5.853	-5.083	-4.834	-5.184	-4.502
	(.725)	(.692)	(.670)	(.693)	(.673)
- higher tertiary	-0.878	-2.346	-2.675	-1.413	-3.667
	(.652)	(.620)	(.604)	(.622)	(.606)

[13] Coefficients not reported, USA is the reference category.

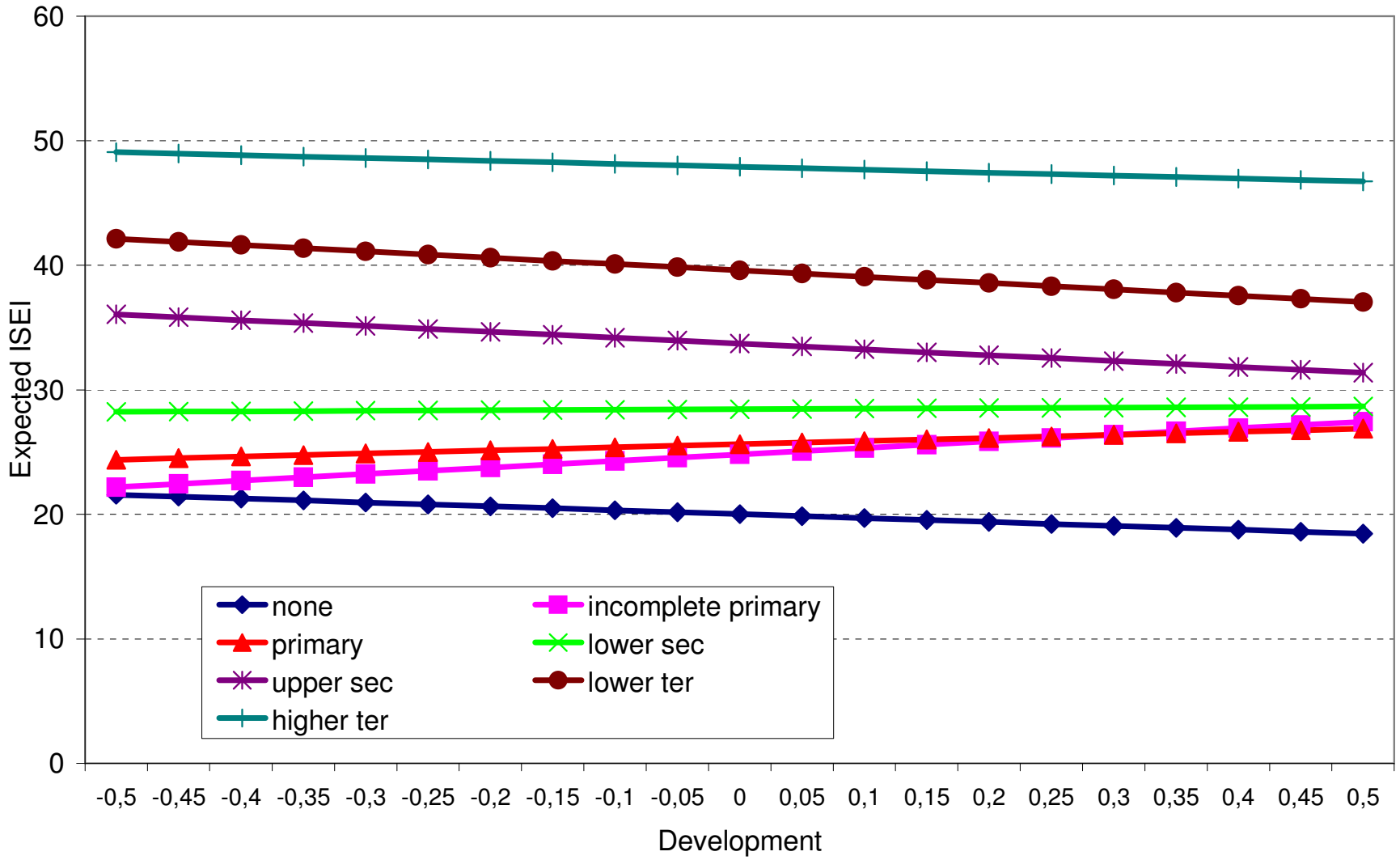
Table 1: continued

Communism main effect	1.597 (.335)	1.311 (.317)			0.547 (.314)
Communism * Education Level					
- lower secondary			0.005 (.226)	0.246 (.276)	
- higher secondary			1.767 (.260)	1.991 (.269)	
- lower tertiary			0.951 (.439)	2.277 (.451)	
- higher tertiary			5.039 (.357)	4.681 (.368)	
Tracked educ. System (main effect)	0.270 (.18)	0.882 (.172)		0.676 (.119)	
*Tracked educ. System * educ. level*					
- none			-0.512 (.225)		-0.558 (.259)
- incomplete primary			0.246 (.125)		0.160 (.182)
- primary			0.643 (.130)		0.604 (.180)
- lower secondary			1.161 (.134)		1.097 (.175)
- higher secondary			1.217 (.134)		1.167 (.175)
- lower tertiary			2.885 (.163)		2.805 (.198)
- higher tertiary			0.053 (.153)		0.159 (.191)
Statistics of fit					
R^2	0.899	0.910	0.919	0.912	0.916
F (df1, df2)	982.5 (57, 6278)	1071.7 (59, 6276)	1046.8 (68, 6267)	1052.7 (62, 6273)	1052.7 (65, 6270)
BIC	-14039.4	-14719.5	-15335.7	-14879.2	-15129.4

Table 2: Wald test statistics and differences in the BIC statistics for tests of constraints within macro-level models of occupational returns to education, 42 countries between 1900- 2000. (N=6,336)

	F	df1	df2	p	Difference in BIC: unrestricted – restricted model
M1: no trend at any education level	46.87	7	6278	.0000	-261.5
M1: common trend for all education categories	42.70	6	6278	.0000	-200.9
M2: no trend at any education level	51.94	7	6276	.0000	-295.6
M2: common trend for all education categories	54.39	6	6276	.0000	-258.7
M3: no trend at any education level	50.92	7	6267	.0000	-289.2
M3: common trend for all education categories	48.51	6	6267	.0000	-235.13
M4: no interaction between communism and selected ed. levels	51.14	4	6273	.0000	-159.8
M4: additive effect of communism and upper education levels	43.43	3	6273	.0000	-104.0
M5: no interaction between type of educ. system and education levels	79.14	6	6270	.0000	-410.0

Figure 1: Expected ISEI by level of education and level of development from Model 2, 42 countries, 1900- 2000.



Note: The model is evaluated for the U.S. assuming that 50% of people are above the mid-point of each given education category in the job queue and 50% of the labor force have jobs with ISEI greater than 25 points. Absence of tracking in the education system is assumed.

11 APPENDICES

Appendix 1: Frequency distribution of individual observations by labor-market-entry cohort and experience group.

cohort5	expr10 5	15	25	35	45	Total
0	0	0	0	0	98	98
5	0	0	0	0	259	259
10	0	0	0	87	813	900
15	0	0	0	183	2.798	2.981
20	0	0	117	539	5.789	6.445
25	0	0	217	2.817	9.096	12.130
30	0	127	589	5.026	11.625	17.367
35	0	231	3.305	12.776	7.670	23.982
40	100	648	6.371	15.413	7.937	30.469
45	125	3.237	14.674	10.636	6.139	34.811
50	320	6.077	16.025	9.329	4.936	36.687
55	2.178	14.225	11.381	8.663	1.545	37.992
60	2.983	16.648	10.866	7.543	133	38.173
65	10.696	12.359	12.343	2.508	0	37.906
70	9.024	12.720	10.472	234	0	32.450
75	6.386	14.260	3.295	0	0	23.941
80	5.712	11.246	233	0	0	17.191
85	7.383	3.115	0	0	0	10.498
90	3.722	200	0	0	0	3.922
95	582	0	0	0	0	582
100	20	0	0	0	0	20
Total	49.231	95.093	89.888	75.754	58.838	368.804