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How Did Occupational Returns to Education Change Over Time?

Abstract

Comparative status attainment research suggests that the effect of education on occupational standing has grown over cohorts as predicted by modernization theory. We argue, however, that an adequate test of the theory requires that education be treated as a set of discrete categories rather than as a single continuous variable, the latter approach prevailing in the field so far. We examine this idea using a subset of the International Stratification and Mobility File containing information on 637,767 men from 42 nations observed in repeated cross-sectional samples covering most of the 20th century and the beginning of the 21st century. We measure educational attainment using an ordinal scale differentiating seven levels, derived from the International Standard Classification of Education. The data show partial convergence and partial divergence between average occupational statuses of individuals with various levels of education: occupational returns to education among those with tertiary education are diverging from occupational returns among those with secondary education or less; but within these two large categories, the specific level of education attained appears to become less important over time. Over all, occupational returns to education have been decreasing. This picture is consistent with a greater increase over time in the amount of education people attain than in the proportion of high status occupations. Taken together, these results suggest a complex pattern of changing relationships between education and occupation, which is consistent with some but not all aspects of modernization theory. In the final section of the paper we consider the implications of the results for claims stemming from over-education, occupational upgrading, and skill-based technological change theories.

Keywords: education, occupational status, cross-national, trends, modernization

1. Introduction

Research has consistently shown education to be the single most important determinant of people's occupational success, in terms of earnings, prestige and socio-economic status. This finding holds for societies at very different levels of development, and for societies with different historical experiences, cultural and religious backgrounds, and diverse forms of government (e.g. Blau and Duncan, 1967, Featherman and Hauser, 1978, Gerber, 2003, Hanley and Treiman, 2005, Hout, 1988, Marks, 2014, Psacharopoulos, 1973, 1980, Sewell and Hauser, 1975, Shavit and Müller, 1998, Treiman and Yip, 1989 and Walder, Li, and Treiman, 2000).

Sociologists have typically studied the link between education and occupation in the context of the intergenerational status attainment model (see e.g. Blau and Duncan, 1967) and many have used a single statistical indicator (e.g. a correlation or regression coefficient) to quantify its strength, while controlling for potential confounders such as parental education and father's occupation. The changing size of this statistical indicator over cohorts has been taken as evidence of social change (e.g. modernization). However, Featherman and Hauser (1978, ch. 5) suggest that graded schooling and college training may play fundamentally different roles in status attainment: each may be influenced by socio-economic background to a different degree and they may also differ in their effects on occupational standing and earnings. The idea that status attainment research might benefit from utilizing a categorical measure of education – as either a dependent or independent variable – was later adopted by many others (see e.g. Ballarino, Panichella, and Triventi, 2014, Hout, 1988, Mare, 1980, 1981, and Shavit and Blossfeld, 1993) and is now frequently accepted in the field.

We use the term "occupational returns to education" to characterize the link between a person's education and occupation (see e.g. Sandefur and Park, 2007, van der Ploeg, 1994 and Wolbers, Graaf, and Ultee, 2001, for similar uses of this term). Since we measure levels of education using a categorical variable and occupational status using an interval variable (ISEI, see below for details), occupational returns to a given level of education tell us what each level of educational attainment brings – on average – in terms of additional occupational status. Stratification literature offers ample evidence that occupational returns to education are consistently positive and large.[1] However, little is yet known about differences in returns to specific levels of education, despite the fact that various segments of the educational system are organized quite differently in terms of the occupational outcomes they intend to achieve for their graduates, a point we will elaborate below.

This paper examines occupational returns to education across labor force entry cohorts in 42 nations that cover most of the 20th century and the beginning of the 21st century. We ask whether the occupational returns to specific levels of education remain stable over time or, if they change, what the nature of the change is.

[1] Our definition is – broadly speaking – consistent with the economic approach (inspired by human capital theory) of measuring the rate of return on investment in education as the percentage change in earnings associated with a one year increase in education. There is obviously a difference in the nature of the measurement of socioeconomic status (an interval scale has no naturally occurring zero point) and of earnings (a ratio scale with a natural zero): while economists may compute the percentage change in earnings due to one additional year of schooling, the occupational status scale does not permit this. Hence, we speak of changes in average occupational status.

We begin the paper by reviewing the main theoretical arguments that explain trends in occupational returns to education; *modernization theory*, *occupational upgrading theory*, the *theory of skill-biased technological change*, and *overeducation theory*, each of which makes different, and sometimes ambiguous, predictions.

2. Theories predicting changes in occupational status returns to education over time

2.1. Modernization theory

Modernization theory predicts a fundamental transformation of the principles of stratification. In particular, it proposes that the role of education in determining one's occupation increases as societies develop, while the impact of family background on attainment declines (Blau and Duncan, 1967, DiPrete and Grusky, 1990, Featherman and Hauser, 1978, Lippényi, Maas, and van Leeuwen, 2013 and Treiman, 1970). Several processes have been proposed to explain these trends, including the rise of the welfare state (Beller and Hout, 2006), educational expansion and reform (Ballarino, Panichella, and Triventi, 2014), explicit egalitarian policies (Paterson and Iannelli, 2007), industrialization (Treiman, 1970), post-industrialization (Bell, 1973), and other shifts in the economic structure of modern production (De Graaf and Luijkx, 1993 and Featherman and Hauser, 1978), as well as urbanization, individualization, and value change (Blau and Duncan,1967, Lenski, 1966 and Parsons, 1970).

One reading of modernization theory suggests that as modernization progresses and the proportion of professional, technical, clerical, and managerial jobs in the workforce grows (at first, at the expense of farm occupations and, later, at the expense of industrial work), formal

education gains in importance for learning occupationally relevant skills (Brown, 2001, Featherman and Hauser, 1978 and Treiman, 1970). Moreover, industrialization and advanced processes of technological change require that stratification processes place individuals into positions in the social structure on the basis of skills and talents, and that ascribed characteristics lose importance (Blau and Duncan, 1967, Parsons, 1951 and Treiman, 1970). The growing dependence of modern societies on skill and talent would make the achievement principle imperative for the functioning of society. Organizations, firms, and states relying on other mechanisms of allocating persons to jobs would be too inefficient to prosper or perhaps even to survive.

<Figure 1 about here>

While modernization literature seems to agree that the association between educational attainment and occupational standing should grow over time, it is somewhat unclear how this growing association comes about. One possibility is that, in response to the ever increasing demands of modernizing technologies, the average occupational status of the best educated should grow leaving all other workers behind (see Figure 1, panel D). Another possibility is that the status of the best educated workers does not change, whereas the less educated lose ground (such as in Figure 1, panel C). This pattern might be expected as the direct transfer of occupations between parents and offspring declines, another prediction of modernization theory. The principal insight is that the occupational inheritance characteristic of a pre-industrial society is dominated by three groups: independent professionals (e.g., doctors and lawyers, who make up a small fraction of the total); small tradesman and shopkeepers; and peasant agriculturalists. If the sons of peasants, tradesmen, and shopkeepers fail to get substantial education, only low skilled industrial, construction, and service jobs will be

available to them. Of course, a combination of both trends is also possible (see for instance Figure 1, panel E) as even more complicated patterns of change are possible.

2.2. Occupational upgrading

Another version of modernization theory, *the theory of occupational upgrading,* proposes that the average occupational statuses of all levels of education tend to decrease over time. By the "logic of industrialism", the increasing complexity of modern societies and the constant invention of new modes of production (Kerr, 1983 and Kerr et al., 1960) constantly increase the demand for skilled labor, even *within* occupations.[2] The main difference between the generalized version of modernization theory and the theory of occupational upgrading is that the latter not only hypothesizes a growth in the number of high status jobs, but also emphasizes the increasing skills required for the execution of any given occupation. The *occupational upgrading argument* suggests that *the hiring criteria for specific jobs have been modified, because occupations today require more skill than before (e.g. the ability to work with new technology)* (e.g. Autor, Katz, and Krueger, 1998, Featherman and Hauser, 1978 and Rodriguez, 1978). This expectation would especially hold for entry into managerial and modern professional jobs that were accessible in the past to those with relatively little education but are now increasingly closed off by credential requirements.

[2] While the vocabulary surrounding this argument has recently shifted towards that of 'post-industrial society,' 'knowledge society,' or 'information society,' the essence of the argument still emphasizes the growing demand for skill.

2.3. Skill-biased technological change

In its most general form, occupational upgrading theory applies to the full spectrum of occupations and, as a consequence, to all levels of education (see e.g. panel B in Figure 1). One can, however, emphasize the role of new technologies to develop specific hypotheses concerning only some education categories. In particular, economists (and some sociologists) have recently proposed a theory of *skill-biased technological change* (SKBT) to explain the growing earnings premium for college education (e.g. Acemoglu, 2002, Acs and Danzinger, 1993, Autor, Katz, and Krueger, 1998, Card and DiNardo, 2002, and Morris and Western, 1999). The SKBT theory argues that the growing wage inequality in the U.S. (and in other industrial or industrializing nations) is driven by the increasing demand for technical skills that results from the spread of computer and information technologies throughout the economy. This technological change stimulates increasing demand for skilled labor both across and within occupations, but some occupations (and industries), particularly those with high rates of technological modernization, are affected more than others (Autor, Katz, and Krueger, 1998, Nelson and Phelps, 1966, Spitz-Oener, 2006 and Wolff 2000).[3]

SBTC implies that educational levels would diverge in their average earnings (in a pattern similar to what we see in Figure 1, panel D or panel E), and this may be extended to apply also to trends in average occupational standing, as new skill requirements are factored into the hiring, firing, promotion, and demotion of workers. People with insufficient formal

[3] Bartel and Lichtenberg (1987) found that the relative demand for educated workers is higher in industries with higher rates of technological innovation. Mincer and Higuchi (1988) confirmed that more rapidly industrializing industries offer higher returns to skills.

qualifications may find themselves without access to occupations for which they were formerly eligible and hence must look for employment elsewhere.

Education levels diverge in their average occupational standings, since new technologies are, at the same time, complements to, and substitutes for human labor (cf. Autor, Levy, and Murnane, 2003, Fernández-Macias, 2012 and Goos and Manning, 2007). Manual labor is frequently substituted by technology, which increases the risk of unemployment and depresses the occupational standing of the least educated. Educated workers' human capital is, on the other hand, complemented by new technologies, and they thus gain an occupational premium for developing, engineering, maintaining, and managing new technologies. This predicts the growing divergence of educational levels: the tertiary educated improve their occupational standing, while the less educated experience worse occupational prospects in comparison to the past.

2.4. Overeducation theory

While occupational upgrading theory and SBTC see the increasing demand for skilled labor as the primary driver of change in occupational returns to education, *overeducation theory* focuses on the consequences of the increasing supply of educated workers (Korpi and Tåhlin, 2009). Several authors have claimed that both individual students and society as a whole invest too much in education. Mills (1951: 271), for instance, predicted more than half a century ago that the production of college graduates in the US would soon be, or already was at that time, greater than the demand for their qualified labor in the economy. Dresch (1975) in a similar vein predicted that college enrollments would decline in the US by 33 % between 1970 and 2000. These predictions were not confirmed by subsequent developments, but,

nonetheless, later research has pointed out that increasing proportions of employees possess more education than is formally or substantively required for their jobs (Baert, Cockx, and Verhaest, 2013, Croce and Ghignoni, 2012, Donton and Vignoles, 2000, Rodriguez, 1978, Sicherman, 1991 and Verhaest and Van der Velden, 2013). 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). Overeducation theory argues that skills are underutilized and that both individual and collective investments in schooling do not bring the expected returns. This is claimed to be not only a U.S. problem, but one which apparently occurs in many countries (Borghans and De Grip, 2000, Croce and Ghignoni, 2012, Dolton and Vignoles, 2000, Sicherman, 1991, Van der Ploeg, 1994, Verdugo and Verdugo, 1989 and Verhaest and Van der Velden, 2013).

Overeducation may be seen as a problem of the college-educated population, but insofar as it exists, it indirectly harms less educated workers as well. 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 and De Grip, 2000). Indeed, overeducation is often invoked as an explanation for the concentration of unemployment among the least educated and the consequent social problems (Åberg, 2003, Wolbers, 2000).

One possible explanation of overeducation is that educational attainment in the labor force increases more rapidly than the occupational structure can expand, because educational expansion is driven by positional goods mechanisms (Hirsch, 1976, Sorensen, 1977, Thurow, 1975 and Van de Werfhorst, 2011). 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: when there are more qualified workers than jobs requiring a respective level of qualification, some of the well-educated will eventually accept jobs of lower status than those for which they are formally qualified. Of course, this does not imply that the association between education and occupation should be declining (Wolbers, De Graaf, and Ultee, 2001). It may simply mean that the average occupational status of all education groups would deteriorate over time, as is pictured schematically in Figure 1, panel B.

However, several overeducation arguments predict a change in the net association between educational qualifications and occupational destinations. Berg (1970) suggested that in the post-World War II period U.S., employers deliberately changed their hiring criteria in response to an increased supply of college educated workers. For reasons not necessarily related to worker productivity, employers began to require higher qualifications than were actually necessary to perform the work satisfactorily. Similarly, Solga (2002) maintains that educational expansion would alter employers' perceptions of the lowest acceptable level of education even if there was no correlation between the amount of education and productivity. She suggests that the signaling value of education is a socially constructed norm that depends – among other things – on the overall distribution of credentials in the labor force. If enrollments in higher levels of education burgeon, Solga (2002) argues, less educated workers will be increasingly stigmatized simply by virtue of their decreasing numbers in the population (see also Gesthuizen, Sloga, and Künster, 2011 and Olneck and Kim, 1989).

The overeducation argument proposes that within categories of education average occupational attainment should decline. However, unlike occupational upgrading theory,

overeducation theory maintains that the least educated workers experience the largest declines in average occupational status, because the effects of their limited employability and economic productivity combine with social stigmatization, while the better educated may witness only modest declines in their occupational prospects. This leads to the expectation that *the rate of decline in occupational returns to education will be modest at higher levels of education and stronger at lower levels* (see Figure 1, panel C for an illustration).

3. Existing empirical evidence and the added value of this paper

Status attainment researchers seem to agree that the link between education and occupational status strengthened in the 20th century. This finding is typically based on a set of regression coefficient of occupational standing on years of schooling compared over age groups, cohorts, or survey years (the proxy for time/social change depends on the design of the specific study). For instance, Broom and Jones (1976, p. 101) reported that the association between education and occupational attainment became stronger over time in Australia. Halsey, Heath and Ridge (1980) concluded that the influence of academic credentials on occupational position increased over time. Kerckhoff et al. (1982) arrived at a similar conclusion (based on a comparison of age groups in one survey). Marks (2009) reported an increasing effect of education on occupation among men (but not among women). A large comparative study conducted by Marks (2014) showed that the average effect of years of education on occupation (ISEI) increased slightly (from 0.500 to 0.524) in a pooled sample from 52 countries. At least a slight increases was found in 26 of the 52 nations in his sample. In another large comparative study, Treiman and Yip (1989) found that the effect of education on occupation increased with modernization. Finally, DiPrete and Grusky (1990) reported that

the effect of education on current occupation increased by nearly 30 percent in the US between 1972 and 1987 in the General Social Survey data.

Featherman and Hauser (1978) introduced an important (and, later, almost forgotten) conceptual and methodological innovation into the field. They separately modeled the effects of years of graded schooling and years of tertiary education on occupational standing. To do this, they utilized a spline function with a knot at 12 years, arguing that graded schooling and tertiary education are fundamentally different in their effects on occupational success. They showed that the effect of a year of college training on current occupation (measured on Duncan's SEI scale) is much stronger that the effect of a year of pre-college education: while each additional year of graded schooling improved occupational status by 1.94 points on average, each additional year of college education increased SEI by an average of 6.41 points (Featherman and Hauser, 1978, p. 258). Furthermore, the occupational premium for college increased between 1962 and 1973 among most age groups (the exception being men under 34 years) with the most significant increases among men over 45 years of age. Interestingly, no subsequent occupational status attainment study has treated education as a categorical variable, though it is clear – as we have argued – that a single global measure of the education-occupation link may hide important trends in occupational returns to education that are specific to particular parts of the education distribution.

Also, wage inequality between levels of schooling has been growing in recent decades, at least in some countries. For example, the real average weekly wage in the United States 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, and Pierce, 1993; see also Morris and Western, 1999). Gottschalk and Joyce (1998) reported

growing returns to education in other countries as well, although much smaller ones (increases were found in Sweden, France, Canada, UK, the Netherlands, and Australia). These findings have, however, been contested by recent studies for countries such as Australia, Canada, Norway, and the UK (see the references in Marks 2014, p. 229).

Economic research in this area is particularly pertinent since it often highlights – in its substantive argumentation – developments in a particular part of the education hierarchy, something sociologists began doing almost 40 years ago but then stopped. Yet, economic research often neglects the potentially confounding effects of socioeconomic background on the education-occupation link. Hence, we see substantial potential in combining the insights of these two streams of literature. In this study, we model the effects of respondent's education (measured with a categorical variable) on respondent's occupational status, thus allowing for the occupational returns to education to differ at the bottom, in the middle, and at the top of the educational distribution. In contrast to economic studies, however, we also control father's occupational status when modeling the effect of education on occupation status and we are thus able to avoid one source of omitted variable bias. Research on intergenerational status attainment has highlighted the influence of father's occupation on men's occupation over and above the indirect effect via educational attainment. For example, in Blau and Duncan's original (1967) model of status attainment in the U.S. in 1962, this confounding effect amounted to almost 25% of the total correlation between respondent's education and current occupation, as well as 30% of the total correlation between education and occupation at labor market entry. Clearly, models that assess the effect of education on occupation need to take this confounding effect of family background into account.

Theoretical arguments highlight the possibility of changes in the effect of family background over time. 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). Moreover, the classes with traditionally the highest levels of occupational inheritance – the agricultural and petty bourgeoisie sectors – have declined in size (De Graaf and Luijkx, 1993), which substantially contributes to the declining extent of direct occupational inheritance. Indeed, empirical studies confirm that the effect of parental characteristics on children's occupational status has declined over time (Featherman and Hauser 1978, pp. 103-104 and Treiman and Yip 1989, p. 392).

4. Design, data, and variables

4.1. Data

Using a large international data set, we adjudicate among the competing theories discussed above by estimating a series of regression models of occupational status on education (represented first as a linear variable, for comparison to other studies, and then by seven discrete categories). We use an extract of the data from the International Stratification and Mobility File (ISMF, see Ganzeboom and Treiman, 2014). Surveys are included in the ISMF if they have an indicator for father's occupational status (as well as respondent's education and respondent's occupation), and are harmonized according to principles and procedures that are documented by the authors on the ISMF website (http://www.harryganzeboom.nl/ismf).

For this analysis we utilize 42 ISMF nations. We limit our analysis to nations with replicated surveys in order to be able to observe successive labor market entry cohorts at various stages

of their careers. Our analytic data set consists of 637,767 men who entered the labor market between the late 19th and early 21st century and were surveyed between 1947 and 2010. This data set was compiled from 502 surveys. The 42 nations consist of states as well as sub-state units. Sub-state units refer to political units that are parts of larger states but that have distinct identities, separate education systems, separate labor markets, and sometimes separate languages. Examples include England/Wales, Scotland, and Northern Ireland within Great Britain; English and French Canada; and the Flemish- and French-speaking parts of Belgium. The complete list of countries investigated in this paper (along with country-specific sample sizes and the earliest and most recent labor market entry cohort) can be found in Table A1 in the Appendix.

Countries that are politically independent today are treated as separate nations even if they were not independent in the past. Examples include the Czech Republic, Slovakia, Slovenia, Estonia, and Russia. We also the separate the former German Democratic Republic from the Federal Republic of Germany, even though they were re-united in 1990 (and all the data on the GDR were collected after 1990). We base these decisions on both practical and theoretical grounds. First, we are thus able to use valuable nation-level survey data that would not qualify for the master data set if we strictly relied on data sets representative of the entire state. Moreover, we believe that comparing nations/countries that were previously independent, or became independent, is of theoretical interest. However, the extent to which these additional nations add explanatory power to our design hinges on the extent to which they were really independent units, both at the micro- and macro- levels.

The sample was restricted to men because the process of occupational attainment cannot be assumed to be the same for men and women, especially since female participation in the labor

force is highly restricted in some nations. Moreover, some of the surveys available in the ISMF contain samples of men only, so that data on women would be missing in many cases even when women were in the labor force. In future work, we intend to compare men and women.

The weighted[4] sample size of the original data file was 773,987 men[5] aged 18- 64 at the time of the respective survey. Missing data[6] on some or all variables reduced the sample size to 637,767 cases. The smallest weighted samples came from Nigeria (N=1,635), Estonia (N=1,840), Bulgaria (N=2,706), New Zealand (N=2,785), and South Africa (N=2,641). The

[4] Weights in the ISMF reflect both post-stratification weights as found in the originating studies and design weights that rescale panel data in which respondents appear multiple times. Entries in all weighted frequency tables are rounded to whole numbers.

[5] Since much of our theoretical argument turns on the relative supply of, and demand for labor, the restriction to men 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 unlikely to be too large, because male and female labor forces 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 and Bielby, 1984, Charles and Grusky, 2004 and Petersen and Morgan, 1995). Given trends in gender attitudes, we would assume that the degree of sex segregation of the labor force in other nations is even greater than in the U.S. (Chang, 2004).

[6] Overall 68,926 (unweighted) respondents had missing occupational characteristics and another 65,835 unweighted cases were missing information on father's job. In addition, years of schooling (a variable used to compute years of work experience and labor market entry cohort) was missing for 29 respondents. Moreover, our formula for calculating years of work experience (see below) resulted in some negative numbers and these respondents were dropped from the sample as well (this applied to 1430 cases).

largest samples came from Italy (N=73,220), the USA (N=63,558), Poland (N=55,478), Hungary (N=53,637), and the Netherlands (N=46,279). The average sample size (taken across the set of 42 nations) was 15,185 and the 25th, 50th, and 75th percentiles of the distribution of sample sizes were 4,714, 7,550, and 16,354, respectively. A complete frequency distribution of weighted sample size by country is shown in Table A1 in the Appendix.

4.2. Variables

4.2.1. Respondent's and father's occupational status

The *dependent variable,* respondent's occupation, as well as the main *control variable*, father's occupation, were measured using the International Socio-Economic Index of occupational status (ISEI). This index was developed by Ganzeboom, De Graaf, and Treiman (1992; see also Ganzeboom, and Treiman, 1996) as an optimal scaling of occupations throughout the world with respect to educational requirements and expected earnings. Unlike its major parallel at the national level, Duncan's (1961) Socioeconomic Index of Occupations (SEI) for the U.S., the ISEI index was developed without reference to a criterion external to the process of stratification itself, such as occupational prestige. Conceptually, ISEI is simply a ranking of the characteristics of occupations that convert someone's education into earnings. While the conceptual underpinning of SEI measures of occupational status have been criticized (Hauser and Warren, 1997), the ISEI continues to be arguably the best available hierarchical scalings of detailed (3-digit) occupational categories. They also have attractive measurement properties and considerable face and criterion validity in representing status attainment processes, particularly compared to discrete measures of occupational class.

The ISEI metric was originally developed for the 1968 version of the International Classification of Occupations [ISCO-68] (ILO, 1969). The index was updated to the newer and by now more often used International Classification of Occupations 1988 (ISCO-88) (ILO, 1990) by Ganzeboom and Treiman (1996). Almost all of our data were matched to both versions of ISCO (which follow somewhat different logics); some were coded in ISCO-68 by their primary investigators and others in ISCO-88. The measure of ISEI we applied in this study was averaged over the two versions of ISEI (each based on the respective ISCO code), a strategy that was found to give a slightly more reliable account of the underlying occupation data. The ISEI metric ranges from 10 (shared by unskilled farm laborers and kitchen helpers) to 90 (for judges) with typical means of around 40 and standard deviations for male samples of around 15. The descriptive statistics of respondents' and fathers' ISEI in the analytical sample are shown in Tables A2 and A3 in the Appendix. Father's ISEI was centered on its grand mean (37.03) before the analysis to make the intercept of the regression equation more readily interpretable.

4.2.2. Education categories

The core explanatory variable in our analysis is the *level of educational attainment*, which is organized into seven ordered categories (which take values from 0 to 6 when used as interval variable in the analysis). The source information for this core variable was any information on education found in the originating data file; the original coding of education was highly variable across the 502 survey data files used here. Where available, the ISMF files included both duration measures of education (such as years of schooling completed or age of school leaving), as well as information on the highest level completed. In constructing our 7-category educational level variable, we used both types of information where available and attempted

to be sensitive to between-country variation in typical durations of levels of schooling. The seven levels are described in more detail just below. The percentage distribution of cases across education levels in our sample is shown in Table 1. Table A4 in the Appendix displays distributions in individual countries. Note that Table 1 is intended only to provide a sense of the data and cannot be taken as representing the worldwide distribution of education over the 20th century because, as noted above, the size of the samples from different nations was highly variable and because not all cohorts were represented. In particular, early cohorts represent developed nations even more than later ones since in developing nations national probability sample surveys only began to be conducted recently.

<Table 1 about here>

The seven levels are

1. *Illiterate.* This category includes those with no formal schooling at all – that is, zero years of schooling reported. This level is not always present in our data, and appears in only 29 of the 42 nations studied, mostly in older cohorts. However, more than 40 % of our respondents from Nigeria and India are in this category. Also Brazil, China, Malaysia, and Turkey have high proportions of illiterates in the population (15 %, 5 %, 11 %, and 9 %, respectively).

2. *Incomplete primary schooling*. This level includes all those who left primary schooling prior to the grade at which it formally ended. It refers to leaving without a certificate, or to reported durations that were clearly below the most often occurring duration in the specific country. Note that this leaving age may vary among countries: primary school takes 6-8 years in many countries, but lasts 5 years in Italy and 4 years

in older cohorts in Germany, Hungary, and Austria. Again, not all studies measure this level, although about 9 % of all the men in our weighted sample are found at this level, with the largest proportions arising in the countries that also have large proportions of illiterates: Brazil (52 %), India (21 %), Malaysia (37 %), Philippines (32 %), and Turkey (16 %). Incomplete primary schooling is also rather frequent in some more advanced nations such as Hungary (24 %), Spain (15 %), Quebec (10 %), Poland (11 %), Israel (6 %), and the U.S. (4 %). In the case of Israel and the U.S. it is likely that this category is mainly comprised of immigrants from other nations with low levels of schooling.

3. *Complete primary schooling*. In general, this includes the completion of basic comprehensive training, which typically lasts between 4 and 8 years (the modal duration in our data is 6 years of schooling, which corresponds to a school leaving age of 12 years). This category is very often explicitly labeled as such in the original studies. This level constitutes almost 20 % of cases in the analytical sample, although in some countries (English-speaking Canada, the Czech Republic, Estonia, East Germany, Israel, Northern Ireland, Russia, and the U.S.) it has hardly any representation (the share is below 7 %), and in many other countries it is hardly represented in the more recently born cohorts.

4. *Lower secondary education*. In general, secondary education usually involves non-comprehensive education, i.e. students are grouped at different levels or in different tracks, and receive instruction in discrete areas by specialized teachers. In some countries this may involve elementary vocational training. Most typically, lower secondary training will involve 3-4 years of additional training beyond primary school and will last until the age of 15 or 16. The completion of lower secondary education often coincides with the end of compulsory schooling in countries where compulsory

education does not end with primary completion. This is the most common level of education among our seven categories (attained by almost 28 % of all men in the data) and represents the most frequent level of educational attainment in almost all of our 42 nations. The share of the population with lower secondary schooling ranges between 6 and 58 per cent of the weighted analytical sample.

5. *Higher secondary education*. Typically, the higher secondary level merges levels of education that constitute specialized vocational training and general academic training. It typically provides a path to tertiary education, although sometimes such access is restricted to those with academic high secondary education (Hillmert and Jacob, 2010; Kreidl, 2004; Treiman, 2013). Most typically, higher secondary education is completed after 11-13 years of school, with the typical school-leaving age falling between the ages of 17 and 19. Higher secondary education is almost always non-compulsory in our set of 42 countries (the U.S. is an exception). The schools included here may be quite diverse, particularly in systems that are divided into vocational and academic tracks. It is the second most prevalent level of schooling in our sample, with 22% of respondents. Of course, one should take into account that many of the educational qualifications included here are not meant to be completion levels, but are targeted at obtaining further, tertiary training, which many of its graduates will have chosen as a further career step. In many nations, higher secondary education may provide specific vocational training.

6. *Lower tertiary level*. Tertiary education is usually defined as specialized, either vocationally, or by intellectual specialty. Despite variations, students at the tertiary level will almost always have a major and usually single field of specialization, which will prepare them for professional or semi-professional (i.e. technical) occupations. The lower level of tertiary training typically involves 2-4 years of post-secondary

training: teaching, nursing, and librarian training are important examples of this level, as well as the initial level of university training, if explicitly distinct from a higher level. About 10 % of our respondents acquired this level of education, but this is highly variable by country, as in some countries this level is almost non-existent (e.g. 1 % in Italy, 2 % in Austria and Nigeria), whereas significant proportions are found elsewhere (47 % in Northern Ireland, 31 % in English-speaking Canada, 24 % in Quebec and Israel, 19 % in Finland).

7. *Higher tertiary level*. This includes university training of 4 years or more and all categories of "post-graduate" training. Of all seven levels, this is probably the one with the most robust cross-national definition: it is the highest level of education found in a country and virtually everywhere includes professional training. About 10 % of our respondents are university trained, with the highest proportions (over 15 %) found in Northern Ireland, Norway, Russia, and the U.S. Higher tertiary education is least common (below 4 % of the population) in Brazil, China, India, Malaysia, and Turkey.

Our seven levels of education are similar to, but not identical with, the broad distinctions in UNESCO's International Standard Classification of Education (ISCED). Levels 1-4 are conceptually identical with ISCED, but our level 0 (illiterate) is not explicitly distinguished in ISCED. By contrast, the ISCED category 'Post-secondary, non-tertiary' is not distinguishable in the ISMF. With respect to tertiary education, our levels 5 and 6 try to separate associate-professional education (such as teacher and nurse training) from fully professional training, which corresponds to professional schools and university education in many education systems – this distinction is not present in ISCED.

Harmonizing educational indicators in 502 studies was a daunting, perhaps foolhardy, task that required a fair amount of experimentation, interpretation, and judgment. We undoubtedly made some mistakes. However, it was impossible to harmonize the data we had according to very rigorous or mechanical rules. This was certainly true between countries, but also within countries. The studies varied greatly in the level of detail used and supplied to the user. Individual studies also differed in the specific value labels attached to educational variables. Furthermore, many studies differed in the number of variables used to measure educational attainment.

Two common features of much of the education data helped considerably: in a large majority of the files, the level of detail was limited, and, if so, the categories were almost always presented to the respondent and analyst alike in a hierarchical order. These two features considerably limited the possible degrees of freedom for harmonization. They also prevented the analyst from making entirely inadequate choices. Nevertheless, it was certain that some element of non-comparability remained in our re-classification of the data. We can only hope that this was compensated by the sheer number of replicated studies, which presumably averaged out study-specific features.

4.2.3. Labor market entry cohort

Labor market entry cohort is an interval variable measuring each respondent's approximate year of entry into the labor market. Entry year was computed on the basis of the following approximation: ENTRY YEAR = YEAR OF SURVEY – AGE + YEARS OF SCHOOLING[7]

[7] Years of schooling was taken either from a duration measure of education – if present in the data – or from an assumed duration of the highest level of schooling reached (which is available in the ISMF).

+ 6 – 1900. Entry year was then standardized into the 0-1 interval, whereas entry years before 1905 (there were 49 such cases, all of them in Japanese, Dutch, and U.S. data) were recoded to this value before standardization. Since the cohort variable was centered on its grand mean, the regression intercepts will refer to this value (the average entry year was 1963).

Our respondents entered the labor market between the late 19th and early 21st centuries. This enormous span over many labor market entry cohorts gave us a unique opportunity to examine modernization and other alternative theories with unprecedented data support. However, even this may prove to be insufficient, because in Europe, 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 also because the time frame may not be long enough in some countries to permit a study of the shift from a non-industrial to an industrial economy.

4.2.4. Work experience

We computed years of *work experience* using the following formula: EXPERIENCE = AGE - YEARS OF SCHOOLING - 6. When this calculation yielded a negative result, the case was dropped from the sample. A total of 1430 cases were lost as a result. The resulting measure was categorized into 5 categories (0-10, 11-20, 21-30, 31-40, 40+) and entered into the analysis as a set of dummy variables. Some models, however, also use a linear work experience variable that was rescaled from the original metric to a 0-1 range.

Finally, we used *nation* dummies to account for the underlying difference between contexts.

5. Results

We present two sets of models, those with education represented by an interval variable and those with education represented by the set of categories detailed above. Our motivation for presenting models with a linear representation of education was to facilitate comparisons with analyses conducted by other researchers and to highlight the effect of representing education categorically. In presenting these models, we focus on differences in coefficients that are large enough to be substantively meaningful, ignoring tests of significance or measures of goodness-of-fit, since our sample size is so large that differences large enough to be substantively important will always be statistically significant at conventional levels. All our models are estimated using ordinary least squares regression, with dummy variables to permit the intercepts to vary across nations. The models differ by the way we treat father's occupational status, cohort, and experience, as well as their various interactions.

5.1. Models with a continuous measure of education

We begin with four simple models that regress occupational status on education and other covariates (see Table 2). These models treat education as a continuous scale and serve mostly to replicate results of earlier research in which a single continuous measure of educational attainment was employed. Model 1 uses our continuous education measure with no other controls. The estimated parameters of Model 1 reveal that each additional level of education increases – on average – the expected ISEI score by almost 6.5 points. Yet, this overall estimate of the occupational return to education is likely to be biased since the model does not control for labor market entry cohort or experience. These two covariates are added in Model 2, with labor market entry cohort represented in linear form (transformed to a 0-1 scale). We

can see that the effect of education is stronger in Model 2 and, net of cohort and work experience, each additional level of education increases the expected ISEI by more than 7 points (precisely, 7.2). The experience terms indicate that ISEI scores increase over one's career with the exception of the oldest age group,[8] but the cohort parameter suggests that, net of labor force experience and education, average ISEI scores declined by almost 9 points (precisely, 8.8 points) over the course of the 20th century, consistent with the expectations of the occupational upgrading and over-education theories.

<Table 2 about here>

Model 3 adds two interactions – between the continuous education measure and the linearized version of the cohort variable, and also between the continuous education scale and a linearized version of experience. Whereas the first interaction is an estimate of the overall change in occupational status returns to education, the second interaction is important as a corrective to the fact that members of older labor market entry cohorts were generally observed at higher ages (and thus with many years of labor market experience). Otherwise, failing to let the education effect vary by experience may result in confounding experience and cohort effects.

[8] This group consists of men with at least 36 years of work experience, and sometimes much more. Thus, they are typically in their 50s or even older. The drop off in occupational status for men late in life has been widely reported, as men leave their main employment and take "retirement jobs." When work experience is represented by a continuous variable, it is common to add a squared term to allow for the curvilinear relationship between experience and occupational status (or earnings) (e.g., Schulz and Maas, 2012).

The estimated parameters of Model 3 show that, on average, each additional level of education increases the expected ISEI score by 6.6 points among individuals with no labor market experience and that this occupational return to education seems – consistent with the literature (e.g. Marks, 2014) – to have increased over cohorts so that it is 8.3 (precisely 8.279 = 6.615 + 1.664, see Table 2) at the end of our observation period. This finding seems to support the assertion that occupational returns to education have grown during societal modernization. Further, we also observe the declining occupational status of all education groups, which is in line with occupational upgrading theory. For instance, the average occupational status of the least educated group declined by more than 14 points (at 0 years of work experience). Interestingly, the trend in the average occupational status changes with education level, becoming less negative with each additional level. So, for instance, the expected decline over the 20th century in the average ISEI for individuals with higher tertiary education (and no work experience) is only -4.267 (=-14.251-(6*1.664), see Table 2). Therefore, Model 3 suggests that the gap between the least and the best educated on the ISEI scale grew by 10 points (precisely by 9.984=1.664*6, see Table 2). Finally, Table 2 also reveals that the effect of education declines somewhat over one's career.

Model 4 serves to document the amount of bias in Model 3 resulting from not controlling for father's occupation (and the interactions between father's occupational status and cohort, and between father's occupational status and experience). Recall that we suggested above that the effect of father's status is likely to change over cohorts and over the course of careers. The estimated parameters of Model 4 confirm that each one point increase in father's ISEI yields a .33 point increase in the respondent's ISEI, net of other factors. Further, in keeping with the expectations of modernization theory, the effect of father's ISEI declined by a fair amount

over the course of the 20th century – from 0.33 to 0.12 (= 0.333 - 0.213, see Table 2, Model 4).

The newly introduced controls turn out to modify other effects to some degree. Specifically, the effect of education for those with 0 work experience, at the average with respect to cohort and with an average value for father's ISEI, is .785 less (6.489 - 5.704) in Model 4 compared to Model 1, so that the difference in the expected occupational attainment between those with the most education and those with the least declines from 38.9 ISEI points (precisely 38.934=6*6.489, see Model 1, Table 2) to 34.2 ISEI points (6*5.704=34.224 precisely, see Model 4, Table 2). While the main effect of cohort in Model 4 indicates an even steeper decline (compared to Model 3) in the average ISEI of the least educated group, among those with no labor market experience whose fathers had average ISEI, the interaction between education and cohort suggests that the effect of cohort is reduced for those with high levels of education, as indicated by the positive coefficient. For example, the effect of cohort is only -4.6 among those with higher tertiary education, compared to an effect of -15.9 among those with no education. Since the average ISEI for the least educated group declines much more than that of the better educated group, we see clear evidence of a growing association between one's education level and one's occupational standing: over the course of the 20th century the gap between the least and the best educated increased by more than 11 ISEI points (precisely 11.304=1.884*6, see Model 4, Table 2). We thus see that a failure to control for father's ISEI (and its interactions) would result in an upwardly biased effect of education. The omission to control for father's ISEI (and its interactions) would also lead to an underestimate of the decline in the average ISEI of the least educated (but not of the best educated), and would thus also result in an underestimate of the increasing occupational return to education. Whereas the model without father's ISEI control (Model 3) suggested that the gap in

occupational standing between the least and the best educated grew by 9.984 points on the ISEI scale, the model with appropriate family background controls suggests that this gap grew by 11.304 points, i.e. the latter (and, we believe, more precise) estimate is higher by 13 percentage points. Other effects do not differ significantly between Model 3 and Model 4.

To summarize the results from Models 1-4: when we use a continuous measure of educational attainment, we essentially confirm the findings of earlier research and also find a growing association between educational attainment and occupational status (c.f. Marks, 2014). We also show why researchers should control for father's ISEI (and its changing effect over the life course and across cohorts) in order for the estimated upward trend not to be downwardly biased. We have seen in Model 3 that the difference in the average ISEI between those without schooling and those with university education grew by 10.0 points over the course of the century, whereas with father's ISEI controlled, the growth was 11.3 points.

5.2. Models with educational attainment expressed by a set of categories

Now we turn to models that substitute our categorical measure of educational attainment with a linear specification. We begin with a simple model (Model 5) that shows the total (reduced-form) effect of education. This model simply shows the mean ISEI of men in each educational attainment category. Unsurprisingly, we see that the average ISEI grows with each additional level of education, but adjacent education levels are not equidistant; indeed, in general, the differences increase exponentially. At first, the differences are of a similar order: the average difference between those with no schooling and those with incomplete primary education is slightly over 4 points on the ISEI scale (Table 3), the difference between those with incomplete primary and those with complete primary is just over 3 points (3.016=7.174-

4.158), and the difference between lower secondary and complete primary is 4.5 points (4.519=11.693-7.174), on average. The distances between higher education levels are – on the other hand – larger. For instance the gap between lower secondary and higher secondary is almost 7 points (6.735=18.427-11.693) and the difference between higher secondary and lower tertiary is of similar size (6.837 points = 25.264-18.427). The largest gap is found between lower and higher tertiary levels (11.345 points = 36.610-25.264). These numbers indicate that the linear specification utilized in Models 1-4 was at best an oversimplification, or outright incorrect.

<Table 3 about here>

Model 6 adds controls for cohort (linear and centered) and experience (categorical) and suggests that the average decline in the average ISEI – taken across all education levels – was over 7 points (precisely 7.357) during the 20th century. Model 7 then introduces cohort and life-cycle variations in the effect of education by adding interactions. One interaction is between linear cohort (measured on the 0-1 scale) and linear education (measured on the 0-6 scale) and the other is between linear experience (measured on the 0-1 scale) and linear education (measured on the 0-6 scale).[9] Once these controls are introduced, the results change dramatically. Now, the occupational status of illiterates (with no labor experience) still

[9] We chose to use dummy coding for the main effect of education and experience and a linear effect of these variables in the interactions to increase parsimony. A similar strategy was used in the papers by Cheung and Heath (2007: 527) to find variation in the effect of educational attainment on the occupational status/employment chances of ethnic groups in several nations.

declines, but less so than that of the other education groups – their average occupational status declined by 3.7 points (precisely 3.695, see Model 7, Table 3) on the ISEI scale between the late 19th and early 21st centuries. The expected occupational status declined more at higher education levels. For instance, the expected ISEI decline for individuals with higher tertiary education was 10 points (precisely 10.049=3.695 + 6*1.059, see Table 3). Hence, education levels now seem to converge with respect to their average occupational status. This can also be inferred from the estimated main effects of education, which are now bigger than in Model 6. This clearly goes against the prediction based on modernization theory.

Model 8 introduces discrete trends, i.e. it lets the trend in the expected ISEI vary for each education level. While the pattern of change is somewhat complicated, three features of the model deserve particular attention. First, there is strong convergence between education levels 1, 2, 3, and 4, i.e. between incomplete primary and higher secondary. For instance, the average ISEI declines by 3.5 points (precisely 3.456) among those with incomplete primary education (and no experience), whereas it declines much more strongly (by 8.5 points) among those with lower secondary education, and even more strongly (by 11.3 points) among graduates of higher secondary education (see Table 3 for individual coefficients). Thus, overall, the gap between individuals with incomplete primary and higher secondary shrank by almost 8 points on the ISEI scale (precisely 7.892= 11.348- 3.456, see Model 8, Table 3). Second, there is also convergence between levels 5 and 6, since the average ISEI of graduates of lower tertiary institutions declined by 4.7 points, while that of graduates of higher tertiary institutions declined by 9.1 points. That is, this occupational distinction shrank by 4.4 points (precisely 4.379=9.143-4.664, see Table 3). However, we also observe a clearly widening gap between education levels 4 (higher secondary) and 5 (lower tertiary). Level 0 also diverges, but it needs to be kept in mind that this level does not appear in all countries, is very small

(including only 2.2% of the cases in our sample (Table 1), and is tending to vanish in all countries in which it appears, so this anomalous result is of little overall importance.

<Figure 2 about here>

Model 9 reintroduces the parental occupation control (along with its interactions). These controls work very much the same as in Model 4. They do not change the picture in qualitative ways, but reveal interesting details that illustrate that controlling for parental socioeconomic background is necessary. In Model 9, the gap between education levels 4 and 5 widens, and the convergence between education levels 5 and 6 is less dramatic. The pattern of change predicted by Model 9 is depicted in Figure 2; the evaluation sets all continuous control variables at their means, labor force experience at 20 years, and uses the country dummy for Italy (since this country has the largest sample size).

6. Conclusions and discussion

This paper analyzed trends in occupational returns to education across 42 nations over labor market entry cohorts between the late 19th and early 21st centuries. We decided to use a categorical measure of education in our analyses to see how the occupational returns to education varied across education levels. We have shown that the common finding of an increasing association between educational attainment and occupational status (i.e. a divergence of the ISEI score between educational levels) is only found if a continuous measure of education is utilized (cf. Marks, 2014). Once we use a categorical measure of

education, we observe that *the extremes of education distribution converge to a significant degree*. From a more nuanced perspective, we see a pattern of partial convergence and partial segmentation with each trend applying to a different part of the education distribution. Specifically, upper and lower tertiary education levels tend to become more alike over time in their average occupation standing. All education levels below the tertiary (with the exception of those without schooling) also tend to converge, but to a different point. Yet, the gap between tertiary education and higher secondary seems to be becoming more pronounced over time. Thus, the transition to tertiary education appears to be becoming the major driver of occupational advantage.

Strictly speaking, our results do not lend full support to any of the theories predicting trends over time. We claim, however, that they shed doubt upon the classical statement of the modernization theory, which predicts the general divergence of average occupational status across all education categories. Clearly, this was not the case in our data. Furthermore, we found some evidence to support the occupational upgrading theory and overeducation theory, which both predict that the occupational status of all education groups would decline over time. This suggests that jobs of the same status now require more education than before (or, alternatively, that the same level of education does not provide the same level of skill and productivity today as it used to a century ago). None of the theories we have discussed fully explains the partial convergence of lower and higher tertiary education.

Skill-biased technological change theory, however, does seem to be consistent with our results to some degree. It can be read as predicting a growing gap between tertiary education and sub-tertiary education on the assumption that only tertiary education is a serious complement to new technologies. SBTC does not, however, offer any explanation of the

convergence of occupational positions between people with lower tertiary and higher tertiary education. Clearly, the relative improvement of the occupational standing of the lower tertiary group vis-à-vis the higher tertiary group is puzzling. There is nothing in the overeducation argument that could explain this trend. And SBTC theory would have to argue that it is specifically those with lower tertiary education but not those with higher tertiary education who reap the fruits of technological innovation and expansion.

Also the relative improvement in the occupational status of the least educated groups – in particular individuals with incomplete primary, complete primary, and lower secondary education, in contrast to graduates of higher secondary institutions – needs to be explained. We believe that increasing international migration may contribute to this trend. While immigrants to most countries in our sample tend to be less educated than the natives (see e.g. individual chapters in Heath and Cheung, 2007 for evidence) and constitute a growing share of these education categories, they also tend to be positively selected on various traits relevant to occupational success, such as ambition, talent, achievement orientation, and so on. Hence, they may achieve better occupational positions – on average – than natives with similar educational credentials. The growing share of migrants would then drive the average occupational status of these education groups up.

On a more abstract theoretical level, we conclude that the results are in line with recent modifications of modernization theory – namely with blended occupational upgrading theory (e.g. Autor, Katz, and Krueger, 1998, Autor, Levy, and Murnane, 2003, Featherman and Hauser, 1978 and Rodriguez, 1978), overeducation theory (Baert, Cockx, and Verhaest, 2013 and Verhaest and Van der Velden, 2013), and skill-biased technological change (Acemoglu, 2002, and Autor, Katz, and Krueger, 1998).

We believe that our investigation of occupational returns to education offers several important innovations. First, we used the socio-economic index of occupations (ISEI) as the dependent variable. Thus, we were able to work with a variable that has a fairly stable distribution (in terms of its mean and standard deviation) across contexts, which means that any identified changes in occupational returns to education are less likely to be attributable to changes in the distribution of occupations in a society (which tends to be fairly comparable across contexts, see Treiman, 1977; see also Hout and DiPrete, 2006), and more likely to result from underlying stratification principles. Hence, seen from this perspective, our approach is superior to those using earnings as the dependent variable. Second, we examined trends in average occupational status net of father's occupational status, which eliminated one very important source of omitted-variable bias. Third, this investigation was less sensitive to selection into the labor market, because we were able to approximate the situation of presently not-employed individuals by coding their last existing job. The final advantageous feature of this study is the size of the sample, both at the nation level and at the respondent level: we studied 673,767 men participating in 502 survey studies conducted in 42 nations between 1947 and 2010. This produced unusually robust and generalizable results.

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8. Tables

Table 1: Percentage distribution of education level. 42 countries selected from the ISMF, 1947-2010.

Level	Per cent
No education, illiterate	2.2 %
Incomplete primary	8.9 %
Complete primary	19.6 %
Lower secondary	27.6 %
Higher secondary	21.6 %
Lower tertiary	10.1 %
Higher tertiary	10.0 %
TOTAL	100%
(N)	(637,767)

Note: all percentages are rounded to one decimal place.

Table 2: Estimated parameters and standard errors (in parentheses) of selected OLS regression models of occupational status, men from 42 ISMF countries, N=637,767.

	Model 1	Model 2	Model 3	Model 4
Education – ordinal measure (0-6 scale)	6.489 (.012)	7.159 (.013)	6.615 (.067)	5.704 (.071)
Labor market entry cohort (0-1 scale)		-8.818 (0.154)	-14.251 (.326)	-15.888 (.338)
Experience				
0-10 years		-1.630 (.050)	-2.781 (.072)	-2.879 (.072)
11-20		*ref.*	*ref.*	*ref.*
21-30		.536 (.047)	1.330 (.066)	1.304 (.066)
31-40		.645 (.056)	2.012 (.103)	1.907 (.106)
40+		.127 (.070)	1.437 (.136)	1.243 (.142)
Father's ISEI				.333 (.007)
Interactions				
Education*cohort			1.664 (.084)	1.884 (.090)
Education*experience			-.869 (.051)	-.808 (.054)
Father's ISEI*cohort				-.213 (.009)
Father's ISEI*experience				-.036 (.005)
Intercept	22.552 (.062)	26.187 (.128)	28.549 (.226)	32.146 (.235)

Note: country dummies (41 parameters) are not shown in the table in order to save space.

Table 3: Estimated parameters and standard errors (in parentheses) of selected OLS regression models of occupational status, men from 42 ISMF countries, N=637,767.

	Model 5	Model 6	Model 7	Model 8	Model 9
Education					
None/Illiterate	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
Incomplete primary	4.158 (.126)	4.428 (.125)	4.845 (.138)	2.793 (.318)	2.580 (.313)
Complete primary	7.174 (.125)	8.057 (.125)	8.935 (.174)	5.529 (.324)	5.098 (.321)
Lower secondary	11.693 (.125)	13.580 (.127)	15.033 (.223)	14.507 (.352)	13.049 (.354)
Higher secondary	18.427 (.126)	20.952 (.129)	23.138 (.281)	23.878 (.391)	21.518 (.397)
Lower tertiary	25.264 (.131)	28.024 (.135)	30.944 (.342)	26.773 (.447)	23.492 (.457)
Higher tertiary	36.610 (.131)	39.468 (.134)	43.192 (.407)	41.175 (.476)	36.146 (.495)
Labor market entry cohort (0-1 scale)		-7.357 (.154)	-3.695 (.340)		
Experience					
0-10 years		-1.742 (.049)	-1.852 (.072)	-1.892 (.072)	-2.074 (.072)
11-20		*ref.*	*ref.*	*ref.*	*ref.*
21-30		.517 (.047)	.672 (.065)	.717 (.065)	.759 (.066)
31-40		.515 (.055)	.849 (.103)	.960 (.103)	.982 (.106)
40+		-.428 (.069)	.164 (.135)	.362 (.136)	.329 (.142)
Father's ISEI					.317 (.007)

Table 3 – continued

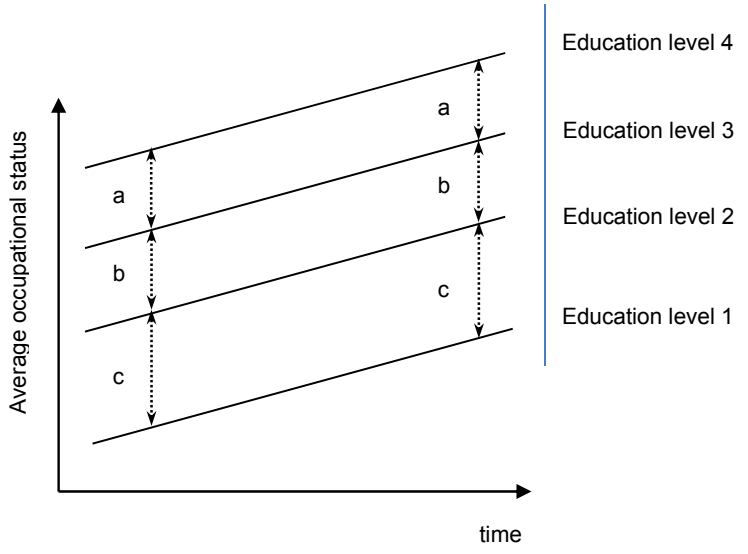
Interactions					
Education*cohort			-1.059 (.087)		
None/Illiterate*cohort				-8.225 (.764)	-9.119 (.755)
Incomplete primary*cohort				-3.456 (.405)	-4.795 (.403)
Complete primary*cohort				-1.796 (.271)	-3.564 (.269)
Lower secondary*cohort				-8.543 (.208)	-9.623 (.204)
Higher secondary*cohort				-11.348 (.230)	-12.236 (.228)
Lower tertiary*cohort				-4.664 (.321)	-5.119 (.321)
Higher tertiary*cohort				-9.143 (.335)	-8.462 (.346)
Education*experience			-.185 (.051)	-.252 (.051)	-.266 (.054)
Father's ISEI*cohort					-.199 (.008)
Father's ISEI*experience					-.034 (.005)
Intercept	29.117 (.130)	32.226 (.172)	30.588 (.245)	32.241 (.345)	34.731 (.345)

Note: country dummies (41 parameters) are not shown in the table in order to save space.

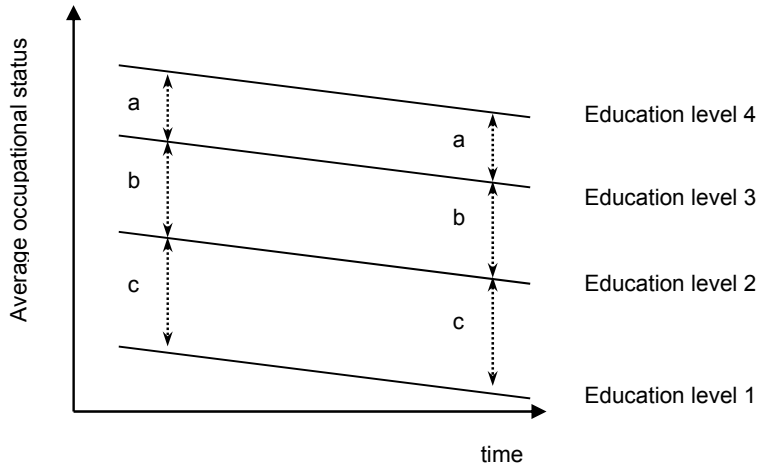
9. Figures

Figure 1: Possible patterns of change over time in occupational returns of education.

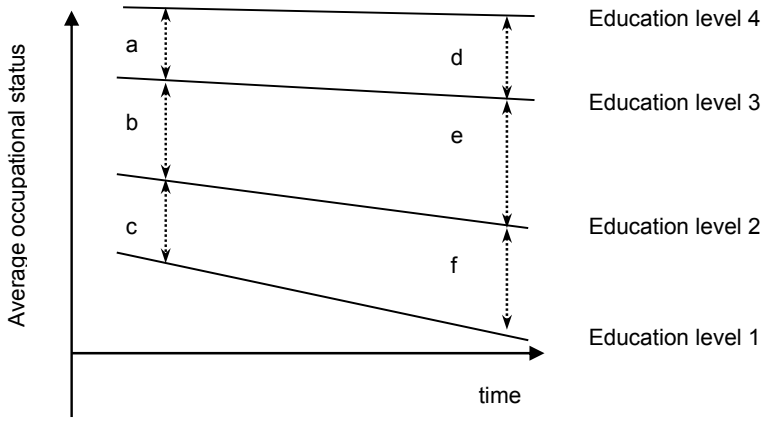
A. No change in returns, version 1



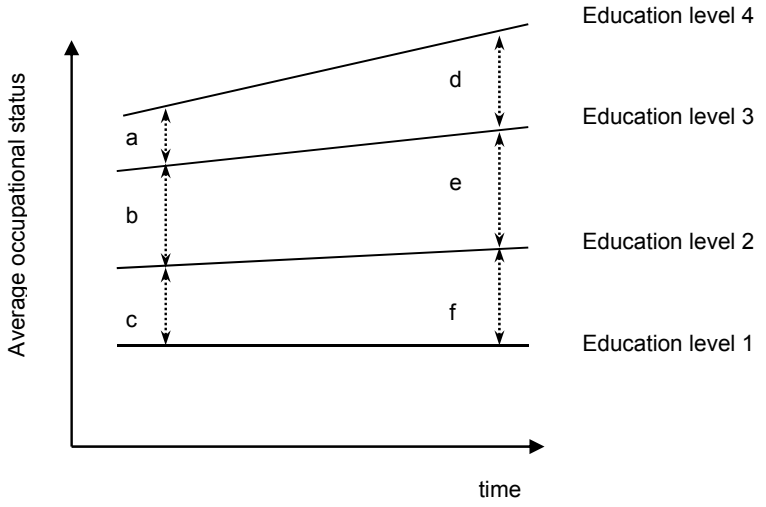
B. No change in returns, version 2



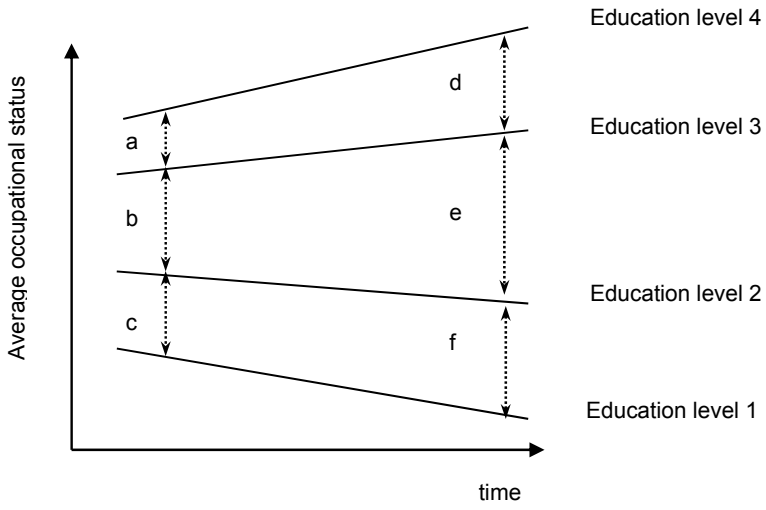
C. Divergence, version 1



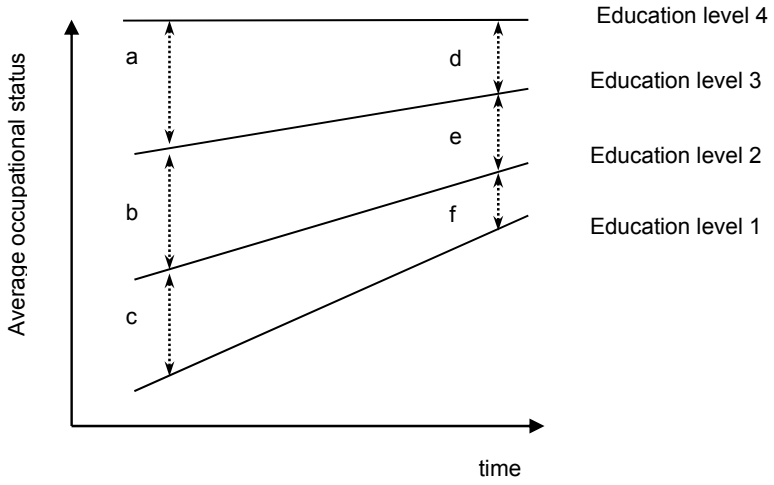
D. Divergence, version 2



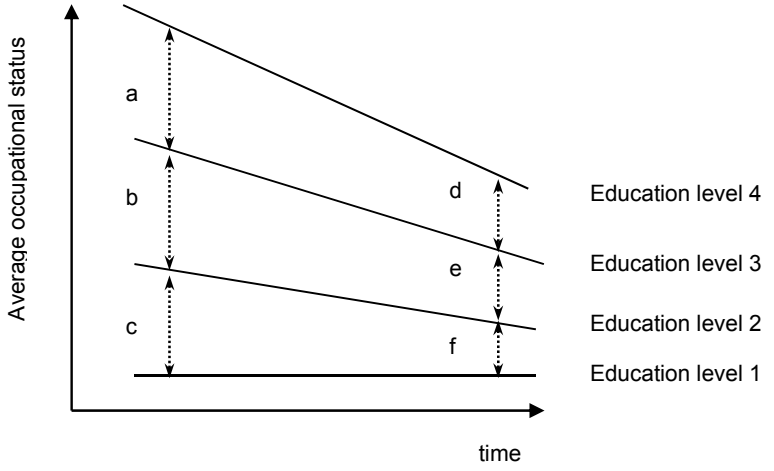
E. Divergence, version 3



F. Convergence, version 1



G. Convergence, version 2



H. Convergence, version 3

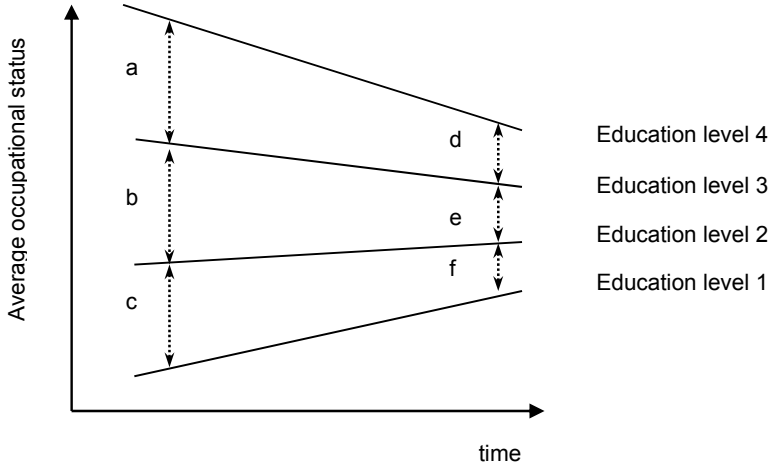
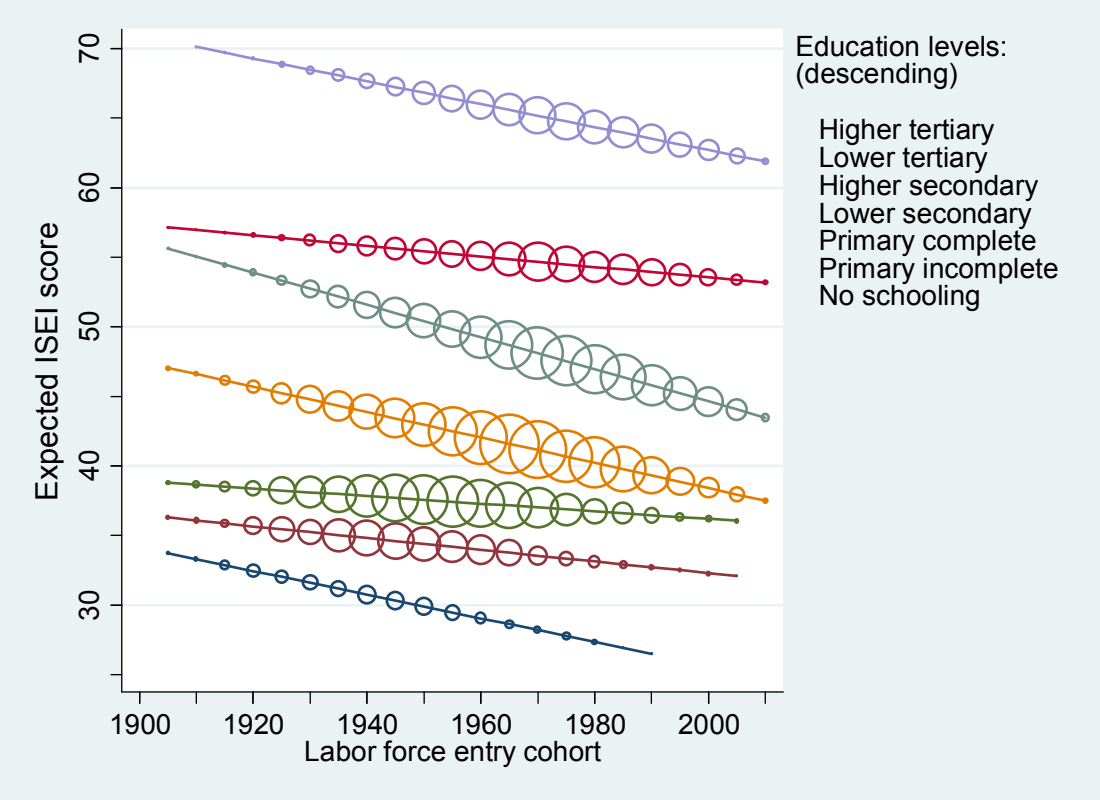


Figure 2: Expected level of occupational attainment (ISEI) for each of seven education levels by labor force entry cohort (the circles are proportional to the weighted sample size for each education-entry cohort combination).



Note: The Graph shows the expected values with each of the interval variables in Model 9 set at their means, labor force experience set at 20 years, and the value for country being that for Italy, the nation with the largest sample size.

10. Appendices

Table A1: Sample size and labor market cohort range by country. Total N=637,767.

		Labor market entry cohort	
Country	Sample size	Minimum	Maximum
Australia	13,509	1911	1999
Austria	21,539	1919	2006
Belgium-Flemish	3,757	1919	2008
Belgium-Walloon	3,492	1919	2006
Brazil	26,074	1915	1996
Bulgaria	2,706	1937	2003
Canada –English	25,023	1911	1999
China	3,896	1938	2008
Czech Republic	9,411	1934	2009
Denmark	5,217	1920	2008
England & Wales	16,214	1911	2008
Estonia	1,840	1938	2009
Finland	5,849	1918	2007
France	8,464	1907	2008
German Democratic Republic (GDR)	4,160	1942	2007
German Federal Republic	23,036	1919	2009
Hungary	53,637	1915	2008
India	5,683	1909	1970
Ireland	5,777	1918	2009
Israel	9,039	1916	2009
Italy	73,220	1905	2009
Japan	9,899	1900	2000
Malaysia	6,619	1910	1974
Netherlands	46,279	1904	2009
Nigeria	1,635	1913	1970
Northern Ireland	8,280	1916	2004
Norway	6,488	1905	2008
New Zealand	2,785	1924	1998
Philippines	14,712	1910	1999
Poland	55,478	1918	2007
Quebec (Canada)	11,168	1906	1999
Russia	6,015	1937	2009
South Africa	2,641	1933	1991
Scotland	5,912	1915	2004
Slovenia	8,321	1913	2008
Slovakia	5,142	1934	2008
Spain	15,758	1932	2008
Sweden	8,920	1932	2008
Switzerland	5,113	1920	2008
Taiwan	26,042	1912	2005
Turkey	5,263	1921	2009
USA	63,558	1890	2004

Table A2: Descriptive statistics of respondent's occupational status by country.

Country	Mean ISEI	Median ISEI	s.d. ISEI
Australia	45	40	16
Austria	42	41	14
Belgium-Flemish	45	45	15
Belgium-Walloon	50	52	17
Brazil	36	32	15
Bulgaria	38	35	14
Canada –English	43	41	16
China	32	28	18
Czech Republic	42	38	14
Denmark	44	39	17
England & Wales	42	36	15
Estonia	42	36	16
Finland	44	38	16
France	45	41	15
German Democratic Republic (GDR)	42	36	14
German Federal Republic	44	40	14
Hungary	37	35	14
India	34	32	12
Ireland	39	35	16
Israel	46	42	16
Italy	44	43	15
Japan	41	36	14
Malaysia	31	23	16
Netherlands	48	47	16
Nigeria	37	27	15
Northern Ireland	39	35	15
Norway	45	43	16
New Zealand	44	41	16
Philippines	32	28	12
Poland	37	32	14
Quebec (Canada)	43	41	16
Russia	43	36	16
South Africa	39	35	15
Scotland	40	35	15
Slovenia	43	41	14
Slovakia	42	36	14
Spain	44	41	14
Sweden	44	40	16
Switzerland	47	44	16
Taiwan	42	36	15
Turkey	38	41	13
USA	42	39	16

Table A3: Descriptive statistics of father's occupational status by country.

Country	Mean ISEI	Median ISEI	s.d. ISEI
Australia	40	35	15
Austria	38	38	14
Belgium-Flemish	42	42	14
Belgium-Walloon	45	44	17
Brazil	30	27	14
Bulgaria	33	29	13
Canada –English	39	39	15
China	26	16	16
Czech Republic	38	35	14
Denmark	41	41	15
England & Wales	39	35	14
Estonia	40	36	16
Finland	40	36	16
France	42	41	14
German Democratic Republic (GDR)	41	36	14
German Federal Republic	40	36	13
Hungary	32	29	14
India	32	27	11
Ireland	37	32	15
Israel	43	41	15
Italy	38	34	15
Japan	37	31	13
Malaysia	48	46	12
Netherlands	43	39	15
Nigeria	32	27	11
Northern Ireland	36	33	13
Norway	42	40	16
New Zealand	40	35	15
Philippines	31	27	10
Poland	32	27	11
Quebec (Canada)	38	35	14
Russia	39	36	16
South Africa	34	32	15
Scotland	36	32	13
Slovenia	37	35	12
Slovakia	36	32	14
Spain	39	41	14
Sweden	41	39	16
Switzerland	43	39	15
Taiwan	34	31	15
Turkey	33	27	11
USA	38	33	15

Table A4: Percentage distribution of education level by country.

Country	None	Incomplete primary	Complete primary	Lower secondary	Higher secondary	Lower tertiary	Higher tertiary
Australia	0.4	2.4	17.5	27.1	31.5	7.4	13.1
Austria	0.0	1.1	57.3	23.2	11.7	1.5	5.2
Belgium-Flemish	0.0	1.4	15.2	35.2	21.9	17.6	8.6
Belgium-Walloon	0.0	1.7	11.8	34.3	20.6	17.6	14.1
Brazil	14.8	51.9	11.5	5.6	9.2	3.2	3.8
Bulgaria	0.0	4.8	20.0	39.0	12.2	10.9	13.1
Canada –English	0.6	7.9	6.5	29.5	15.2	30.8	10.1
China	5.3	8.1	18.1	44.2	15.5	5.7	3.2
Czech Republic	0.0	0.3	5.8	43.7	31.1	4.5	14.7
Denmark	0.0	0.2	19.1	48.3	10.5	9.0	12.9
England & Wales	0.0	0.1	34.7	31.4	16.1	8.1	9.7
Estonia	0.0	0.7	1.8	39.9	35.2	11.8	10.7
Finland	0.2	2.0	11.8	38.0	21.0	18.8	8.2
France	0.2	2.6	24.1	37.0	12.5	9.0	14.7
German Democratic Republic (GDR)	0.0	0.8	1.9	57.8	20.1	9.1	10.4
German Federal Republic	0.1	1.0	22.2	37.3	22.1	7.7	9.5
Hungary	0.6	23.8	31.6	15.2	17.4	5.8	5.6
India	46.0	21.0	9.7	11.9	5.8	3.9	1.8
Ireland	0.0	3.6	20.4	21.1	41.0	4.2	9.7
Israel	2.2	5.8	5.4	33.4	20.9	24.2	8.1
Italy	0.2	3.0	16.8	38.9	30.0	1.1	9.9
Japan	0.0	0.3	10.4	39.5	31.6	5.1	13.2
Malaysia	11.4	36.8	25.6	18.8	3.7	2.5	1.2
Netherlands	0.0	0.2	11.8	32.2	29.1	17.3	9.4
Nigeria	41.4	3.2	28.6	8.1	11.2	2.1	5.4
Northern Ireland	0.0	0.0	5.8	23.4	7.7	46.8	16.2
Norway	0.0	0.4	13.2	21.9	34.8	10.4	19.3
New Zealand	0.0	0.6	7.6	49.2	15.0	18.1	9.5
Philippines	8.9	31.6	20.5	11.8	11.0	6.7	9.5
Poland	0.0	10.6	36.7	25.6	17.4	3.3	6.4
Quebec (Canada)	0.2	10.3	13.4	27.2	13.8	23.5	11.6
Russia	0.0	1.4	3.4	37.2	19.5	8.8	29.8
South Africa	4.4	7.4	7.9	36.1	25.8	10.1	8.3
Scotland	0.0	5.5	12.5	48.9	17.3	11.9	4.0
Slovenia	0.0	5.6	22.6	36.7	20.4	7.3	7.5
Slovakia	0.0	1.6	6.7	35.0	37.8	5.9	13.0
Spain	0.8	14.9	35.6	19.6	11.3	8.0	9.7
Sweden	0.0	0.8	27.2	37.7	11.7	12.2	10.3
Switzerland	0.0	0.4	9.0	54.0	17.5	4.9	14.4
Taiwan	3.3	2.6	20.5	17.1	29.0	15.1	12.4
Turkey	9.0	16.3	44.6	11.8	8.8	6.3	3.2
USA	0.5	4.0	5.5	23.9	31.6	16.6	17.7

Note: all entries are rounded to one decimal place.