INTERNATIONAL DIFFERENCES IN EDUCATION MOBILITY ACROSS GENERATIONS

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Abstract

This paper uses cross-country variation to test for correlation between intergenerational education mobility and economic and policy environments. For this purpose, an index which ranks economies by their mobility is proposed. Intergenerational mobility is characterized by a Markov process, and represented in a transition matrix. In the income mobility literature, many useful indices are based on ranking transition matrices. Education differs from income mobility, because the distribution of education arises from an equilibrium outcome. A sensible measure of education mobility must take this into account.

This index proposed in this paper is based on a partial ordering suggested by Dardanoni (1993). The measure compares the social welfare experienced under the economy's actual mobility mechanism to the welfare which would prevail under a perfectly mobile mechanism, holding the distribution of education constant.

Using data from the International Adult Literacy Survey, mobility is estimated for 19 countries. The paper then tests for correlation in mobility and economic and policy variables including measures of education expenditure.

1. Introduction

Higher levels of education are associated with many benefits, not the least of which is higher wages. Because of these potential benefits proponents of equality often argue that individuals in a society should have equal access to formal education. Generally,

equal access means, not that everybody has the same level of education, but that all individuals have the same opportunity to gain education.

What is frequently observed in data suggests that not all individuals have equality in opportunity. It would appear that children of highly educated parents are more likely to become highly educated, and the converse is true for children of poorly educated parents. This relationship is called intergenerational mobility.

This paper attempts to find a reasonable way of describing intergenerational mobility so that it is possible to compare economies along this dimension. An index based on Dardanoni's (1993) partial ordering is suggested. The index compares the social welfare under the economy's mobility mechanism to what would prevail if the same economy was perfectly mobile across generations.

Mobility is usually discussed in the context of income, probably because income is a reasonable metric of well-being. Income also has the convenient characteristic that "more is better" in any imaginable circumstance. In contrast, education does not translate as transparently into well-being. In particular, more education is not always better.

To understand why this is the case, there are two cases to consider. First, if education can be valued intrinsically, preferences for this good are likely to be heterogeneous across individuals. Indeed, economic models of education choice typically assume that "distaste" for education is decreasing in ability. Second, if education can be transformed into something of value, such as wages, then the transformation

process is unlikely to be uniform across individuals. For example, if education improves productivity then a given level of education would likely increase productivity relatively more among high ability individuals. Consequently, education differs from income conceptually because there is an optimal education level that differs across individuals.

Not only is the optimal *level* of education individually heterogenous, but also the optimal *distribution* of education can differ across economies. Education is an equilibrium outcome arising from both supply and demand. The supply of education is typically determined by public infrastructure, although private provision can play an important role at some levels in some economies. One can think of the demand for education arising from the aggregation of individual assessments of the costs and benefits of education. Both of which are shaped by the nature of labour markets, and other economic factors. In short, it is not a simple matter to say that one particular distribution of education is better than another.

A reasonable measure of education mobility should avoid being confounded by differences in the spot distributions in education. The differences can arise in part because of variations in economic structure, as discussed above and also because of differences in educational systems. Some countries begin preparation for the labour market earlier than others in the education system. Thus, it may appear that members of an economy have a lower level of education, when they have the same level of skills.

The measure of mobility should also distinguish between shifts in the distribution and changes in mobility. Such distributional movements are referred to as "structural mobility" in the income inequality literature, and implies little about the actual mobility in the economy. When the distribution shifts to the right, what matters is not *how many* individuals in the new generation have access to higher levels of education, but *which* individuals. If the children of the relatively privileged still have greater access to higher education, then economies experiencing growth in education can be quite immobile.[1]

This paper aims to tackle these difficulties in assessing mobility in education. It begins with a brief review of previous research that studies intergenerational correlations and mobility in educational attainment. Because very few studies have produced measures specific to mobility in education, the paper continues by considering the indices frequently used to measure income mobility. In particular, the paper details the welfare-based approach suggested by Dardanoni (1993). This approach is used to develop an index that is particularly useful for ranking mobility in education. Following this, the data used to estimate the index are described including some summary measures of the sample countries. Next, the estimates of the welfare gap are presented. Finally, the paper attempts to find correlations between the welfare gap and policy and economic factors.

[1]At the limit, of course, if everybody has the highest level of education, then the economy is perfectly mobile in a trivial sense. It is important to recall that this paper restricts itself to economies with stable non-degenerate distributions

2. Previous Research on Education Mobility

The literature on intergenerational education mobility has for the most part not been concerned with developing an index useful for ranking mobility. Instead, most of this literature describes the strength of the relationship between children's and parents' education.

Fernando (2000) employs a path model to describe intergenerational correlations in education within Canadian and foreign born families. Using data from the 1993 Survey of Labour and Income Dynamics, Fernando estimates correlations between the years of education for fathers, mothers, daughters and sons.

Father's education was a strong predictor of both son's and daughter's education for all birth countries, with the exception of U.S. born sons. Fernando reports that there appear to be ethnic differences in the transmission of education across generations, however, it is difficult to assess this claim because no statistical tests for differences were reported. Interestingly, there appears to be no correlation in the education of Aboriginal children and their parents. This is likely because education levels of Aboriginal parents are so low.

Other papers attempt to uncover a causal link. Oreopoulos, Page and Stevens (forthcoming) find a strong relationship between parents' education and children's outcomes in data from the U.S. Census. Variation in compulsory school laws, over time and across states, is used to identify exogenous differences in parents' educational attainment. Oreopoulos, Page and Stevens find that an additional year of schooling

reduces grade retention among children ages 7 to 15 and lowers the chance that children ages 15 to 16 (still living at home) will drop-out of school.

Black et al. (2004) provides another example using compulsory schooling laws. In 1960, Norwegian compulsory school laws were reformed such that an additional two years of schooling were required. The reforms were introduced in stages across different municipalities. This provided exogenous variation in both time and across regions. Exploiting this variation, Black et al. (2004) estimate how the extra years of parental education affected children's educational choices. No relationship was found between fathers' and children's education or between mothers and sons. Mothers' education was statistically related to daughters' education.

Experimental data is used by Magnuson (2003) to estimate the causal effect of maternal education on children's outcomes. The National Evaluation of Welfare-to-Work Strategies (NEWWS) increased participation in education among single mothers, who also received welfare. Because participation in the NEWWS program was randomly assigned the increase in maternal education is exogenous. Magnuson finds that participation in education increases school readiness and reduces reported problems in school.

These studies provide evidence of some causal mechanism that transmits education across generations. This paper differs from this branch of the literature because here the interest lies in comparing the intergenerational connection in different economies. Very few papers have attempted to rank countries by their educational mobility.

Checchi, Ichino, and Rusticini (1999) evaluate intergenerational mobility in Italy and the United States. They find evidence that despite a more egalitarian education system, there is less educational and occupational mobility in Italy when compared to the United States. To reach this conclusion, Checchi, Ichino, and Rusticini use the scalar indices widely used in the income mobility literature. The limitations of these measures are discussed in more detail below.

Researchers working with the same data used in this paper have concentrated on mobility in post-secondary education. de Broucker and Underwood (1998) create a measure they call the synthetic intergenerational educational gap. The measure has two components, one which attempts to capture the extent to which children of poorly educated parents are disadvantaged and the other which captures the advantage of being born in a family with highly educated parents. The first component is calculated as the ratio of observed to expected proportions of persons with post-secondary attainment coming from parents with less than secondary attainment. The second component is a similar ratio of observed to expected proportions of persons with post-secondary attainment coming from parents who have also attained a post-secondary education. To create the measure the first component is inverted and added to the second component.

This measure has an advantage over a simple correlation insofar as it can account for both the disadvantages and advantages associated with different parental education levels. However, there are two noteworthy shortcomings.

First, the measure ignores any mobility with respect to the middle of the distribution. In most countries, the largest fraction of the population has attained a level of education equivalent to high school. Moreover, this level of education is in some countries associated with substantially higher earnings relative to not completing upper secondary education.[2] Consequently, it is important to gauge the amount of mobility into and out of this level of education across generations.

Second, the measure is sensitive to the mean of the parents' distribution. Economies that have high proportions of parents with post-secondary education or economics with low proportions of parents with less than upper secondary will appear more mobile. To see why, consider the measure of advantage. This measure compares the unconditional probability that parents have attained post-secondary education to the same probability conditional on their children also having post-secondary level education. Since the standard deviation increases as the unconditional probability gets close to 50 per cent then there is greater chance that the conditional probability is much larger.

3. Mobility Indices

Measures of intergenerational mobility have been studied extensively in the literature on income and earnings mobility. Maasoumi (1998) provides a review of this literature. This section focuses on indices based transition matrices.

[2]In 1993, the ratio of mean earnings among those with less than upper secondary to those with upper secondary ranged from .66 in the Czech Republic to .93 in Finland (OECD 1997)

It is useful to express the relationship between children's and parents' education as a transition matrix since it is possible to show upward and downward movements from any number of discrete states. If one assumes that education or income is characterized by a first-order Markov process, then the transition matrix can describe the mobility between two generations. Define π_t, a row-vector, as the spot distribution in time or generation t, then the evolution of a distribution can be expressed as,

$$\pi_t = P \cdot \pi_{t+1} \tag{1}$$

The transition matrix is P, where each element p_{ij} describes the probability of an individual transiting from state i to state j. In education example, it is the probability that a child who's parents have education level i will himself have education level j. Naturally, it must be the case that $\sum_j p_{ij} = 1$. It is conventional to organize the states from lowest to highest.

At the extremes, an identity matrix can be considered least mobile because there is no chance of changing states. A matrix where each row is identical, that is $p_{ij} = p_{kj} \ \forall k$, will exhibit perfect mobility since transition probabilities are independent of the initial state.

Some simple measures of mobility are calculated directly from the transition matrix. The trace of the matrix P is one such measure. Transition processes in which there is a high probability of remaining in the initial state will have larger traces. However, this

measure ignores any dynamics between the off diagonal states. Another measure, the determinant of P, is based on the idea that a perfectly mobile matrix is not invertible. A problem with this measure is that it takes on the minimum value of zero whenever any two rows are identical.

The second largest eigenvalue can be used to measure mobility since it describes the speed of escape from the initial state. If, however, there were a change in the transition matrix which left the row and column sums unaffected but made the poorest individuals better off, this measure would not reflect the improvement. These types of transfers are called dynamic Pigou-Dalton (DPD) transfers.

In addition to simple measures derived directly from transition matrices, the literature provides more complex measures. Chakravarty (1995) suggests a Kullback minimum discrimination information statistic, which measures the difference between the spot distributions. The statistic is defined as,

$$K = \sum_{i=1}^{n} \pi_i^t \log\left(\frac{\pi_i^t}{\pi_i^{t+1}}\right) \tag{2}$$

The statistic will take on its minimum value, of zero, when $\pi^t = \pi^{t+1}$. Chakravarty argues that K measures mobility because $\pi^t = \pi^{t+1}$ if and only if the transition matrix is an identity matrix. This is *not true for stationary distributions.* Indeed, if the economy is in steady state, $\Pi_i^t = \Pi_i^{t+1}$ holds true for any transition matrix. It would seem that K measures distance from the steady state rather than mobility.

Economies with substantial increases in the average level of education will appear immobile according to the K-statistic.

4. Welfare Based Ranking of Mobility

A key shortcoming in many of these measures of mobility is that they are not directly related to the wellbeing of the individuals. As discussed previously, this is particularly important in the context of education mobility since the connection between education and welfare is not transparent. Dardanoni (1993) suggests a partial ordering of transition matrices based on the social welfare implied by the mobility structure.

Holding constant the stationary distribution, Dardanoni compares the lifetime utility, or in the case intergenerational mobility, the dynastic utility implied by different transition mechanisms. Consider n states with the associated vector of utilities $u = (u_1, u_2, \cdots, u_n)'$. Lifetime utility under transition matrix P, for a given discount factor ρ, is

$$\begin{aligned} V^p &= u + \rho P u + \rho^2 P^2 u + \cdots \rho^t P^t u \\ \lim V^p_{t\to\infty} &= [1 - \rho P]^{-1} u \equiv P(\rho) \end{aligned} \tag{3}$$

Dardanoni shows that, under the assumption of anonymity, it is not possible to rank transition matrices using additive symmetric social welfare functions. The intuition for this result is that while mobility depends on individuals, utilitarian social welfare

functions treat individual movements as irrelevant. Dardanoni argues that, in order to rank transition matrices, it is necessary to relax symmetry. He considers the class of functions where social welfare is the sum of weighted utilities,

$$W\left(V^{p},\lambda\right)=\sum_{i}\pi_{i}\lambda_{i}V_{i}^{p} \tag{4}$$

The vector of weights $\lambda=(\lambda_1,\lambda_2,\cdots\lambda_n)$ is non-increasing such that higher weight is placed on individuals who begin in lower positions. This asymmetry is only reasonable if individuals in lower initial states are disadvantaged. Dardanoni, therefore, restricts attention to matrices that are monotone. Monotonicity means that the lottery faced by children born in each higher state stochastically dominates the lottery faced by children born into the lower states.

Under these conditions, Dardanoni shows that for any stationary distribution and any two transition matrices such that $\pi=\pi P=\pi Q$,

$$W\left(V^{P},\lambda\right)\geq W\left(V^{Q},\lambda\right)\Longleftrightarrow T'\Pi\left[P\left(\rho\right)-Q\left(\rho\right)\right]T\leq 0. \tag{5}$$

T is an upper triangular matrix with zeros below and ones on and above the main diagonal. Π is an $n\times n$ diagonal matrix with the stationary distribution on the diagonal.

The ranking condition generates a cumulative sum of $\Pi P\left(\rho\right)$ and $\Pi Q\left(\rho\right)$. The comparison is therefore between the cumulative probability that an individual (or

family) who begins in state i or lower remains state in k or lower. A matrix is more mobile if that cumulative probability is lower for all i and k.

5. A Welfare Based Index of Intergenerational Mobility in Education

The measure proposed here is based on Dardanoni's partial ranking. A key challenge in adopting this ordering is that the stationary distributions must be the same. It has been argued that this is not a reasonable assumption for international comparisons in education distributions. To circumvent this difficulty, the measure suggested in this paper does not directly compare transition matrices from different economies. Instead, *within* an economy, the transition matrix is compared to the perfectly mobile matrix that would produce the same stationary distribution. The gap in welfare between the perfectly mobile mechanism and the actual transition matrix are then used to rank the economies.

This paper maintains Dardanoni's assumption that the transition matrices are regular, that is $p_{ij} > 0 \ \ \forall i, j$. This guarantees there exists a unique stationary distribution independent of the initial distribution. Another useful result is that the stationary distribution is given by the rows of $\lim_{t\to\infty} P^t$ (Stokey and Lucas 1989). This means that for every regular transition matrix there is a unique perfectly mobile transition matrix leading to the same stationary distribution.

To calculate the index, first a transition matrix is estimated for each economy. Call this matrix $\hat{P}$. This matrix implies a stationary distribution $\pi_j = \hat{P}^{\infty}_{1j}$. For this

stationary distribution there is one perfectly mobile matrix, P^m, where each row is the same as the stationary distribution. Comparing $\hat{P}$ and P^m using Dardanoni's ranking condition gives the welfare lost by arriving at the stationary distribution via the estimated transition mechanism relative to the perfectly mobile mechanism.

The index, called WG for welfare gap, is created by summing the elements of Dardanoni's measure assuming that $\rho = .99$[3]

$$WG = \mathbf{1}'T'\Pi\left[P^m(\rho) - \hat{P}(\rho)\right]T\mathbf{1} \tag{6}$$

where $\mathbf{1}$ is an n-vector of ones.

The index has a number of desirable features. Because the measure evaluates economies at their stationary distribution (regardless of whether the economy is at steady state) the index is not confounded by any structural growth. Moreover, the measure evaluates the welfare associated by the path to the stationary distribution, rather than the distribution itself. Finally, the index is the difference between two welfare levels. These features makes comparisons between economies reasonable.

6. Data

In order to rank intergenerational mobility in different countries, it is necessary to have an international source of data that include education information from two

[3]Dardanoni proves that if the reverse chain of Q, $\Pi^{-1}Q'\Pi$, is monotone then (5) holds for any discount factor.

generations. The International Adult Literacy Survey (IALS) offers such an opportunity to estimate mobility across generations. Respondents provided information about their own education and the education of both of their parents. Collection of the IALS data was a collaborative effort of 20 different countries as well as UNESCO and OCED. Data for 19 of those countries was available for this paper.[4].

Countries participated in 3 waves. In 1994, respondents were interviewed in Canada, Germany, Ireland, Netherlands, Poland, Sweden, and the United States. Data was collected in 1996 in Belgium, New Zealand and the United Kingdom. The Czech Republic, Italy, Norway, Slovenia, Denmark, Finland Hungary and Chile participated in the 1998 wave. In Switzerland, participants were interviewed in French and German in 1994 and in Italian in 1998.

For this paper, the sample is restricted to respondents who reported their own education level and the education level of at least one parent. Any respondents still in high school are excluded. Because immigrants are often educated outside of their host country, only non-immigrants are included in the analysis. The sample is also divided into two cohort. At the time of the survey, the younger cohort was aged 26 to 35 and the older cohort was 36 to 45. Throughout the paper, and in all the tables the younger cohort is called cohort 1 and the older cohort is cohort 2.[5] The last columns of Tables 1 and 2 show the sample sizes for each cohort.

[4]Public use data was not available for Australia

[5]The survey included respondents who were younger than 26. This cohort is not included because many individuals would not yet have completed their education. Older cohorts are not included because of the difficulty in finding contemporaneous policy data.

7. Sample Characteristics

Some sample characteristics for each country are presented in Tables 1 and 2. These tables illustrate that although most countries in the sample are advanced in their economic development, there remains considerable variation in their characteristics. One exception is that the samples are fairly balanced in terms of gender.

The sample countries differ in the extent to which they are urbanized.[6] While Italy and Norway have the lowest fractions of urban respondents, Chile and the United Kingdom have the highest proportion of urban respondents. [7] On average, about 67 per cent of the respondents live in urban areas.

Self-reported employment also varies considerably. Employment is the ratio of respondents who indicated they were employed when asked about their work situation to all respondents' to the question.[8] Not surprisingly, Chile has the lowest level of reported employment in both cohorts. Germany also has a very low level of reported employment in the younger cohort. This results because women are somewhat over-represented in the sample of younger Germans. About 23 per cent of these women report that they are homemakers, compared to 20 per cent among all younger women.

Measures of economic aggregates have greater potential to demonstrate the extent to which sample countries vary. Tables 3 through 8 report some descriptive statistics

[6]Each country's statistical agency used their own definition of 'urban'

[7]In Canada, the younger cohort are also highly likely to live in an urban area. This reflects the tendency of younger people to live in cities.

[8]This is not an employment rate in the typical sense

and indicators of economic performance in 1965, 1975, and 1985 and 1995.[9] These years were chosen because they span the years in which the two cohorts were ages 16 to 25. When individuals are ages 16 to 25, they are typically making important decisions about whether to continue in school.[10]

Clearly, the United States is the largest economy, both in terms of population and per capita GDP. While the U.S. population is over three times larger then next largest country (Germany), per capita GDP is about 10 per cent higher than the other wealthy countries in the sample. In 1995, per capita GDP was over $20,000$ (constant USD) in about half the countries.

The sample also includes small countries and relatively poor countries. Ireland, New Zealand and Norway have populations under 5 million. Slovenia is the smallest country with just under 2 million in 1995. Slovenia is also among one of the poorer sample countries. Per capita real GDP was about 12,500 in 1995. The poorest countries are Chile, Hungary, and Poland. Per capita GDP in the richest country (United States) is almost 4 times larger than the poorest country (Poland). There is, therefore, considerable variation within the sample, although, globally, the sample countries are among the most developed.

Table 5 reports a measure of labour productivity. Productivity is defined as the ratio of real GDP to total hours worked. Again there is substantial variation in labour

[9]Data for Tables 3 and 4 come from the Penn World Tables. Data for Table 5 to 8 are from the OECD

[10]Recent research, for example Looker (2001) suggests that the intention to invest in human capital is established at earlier ages, but the actual action is undertaken during these ages

productivity indicating vast differences in the structure of the sample economies. Some differences might also reflect measurement error.[11].

Because education is highly related to outcomes in the labour market, it is instructive to consider differences in the indicators of labour market activity. The employment to population ratio, labour force participation rate and unemployment rates are presented for the sample countries in Tables 6 to 8. The employment rate is a useful indicator of labour demand, while labour force participation suggests labour supply. Unemployment rates demonstrate the intensity of factor utilization.

Both employment and labour force participation are tightly distributed around their means of 54 and 59 per cent, respectively. These measures are also nearly perfectly correlated. Unemployment varies more across countries, this is in part because this measure is inherently more volatile. While the average level of unemployment was about 9 per cent in 1995, some countries, such as Switzerland and Norway, have virtually no unemployment. In most countries, unemployment has been growing over time. It is also worth pointing out that Finland experienced a severe economic downturn in 1990 which lead unemployment to rise from 5 to 15 per cent in the decade between 1985 and 1995.[12]

[11]Data for Table 5 come from the International Labor Organization

[12]The severity of the recession has been attributed to the large volume of trade between Finland and the former Soviet Union.

8. Education Distributions

In the IALS, respondents are asked to report the highest level of education they have completed, as well as that of their mother and father. Responses were coded by the levels of education relevant in the survey country. These levels were then translated into the UNESCO classification, International Standard Classification of Education (ISCED). The levels of education in the IALS data correspond roughly to no schooling, primary, lower secondary, upper secondary, tertiary not leading to a university degree and tertiary leading to a university degree. Because of the small sample sizes involved, these categories have been aggregated into less than upper secondary, upper secondary and tertiary.

Although the ISCED attempts to make education levels internationally comparable, the vast differences in systems makes this problematic. In order to gauge how sensitive the results are to these systematic differences, a second measure of educational attainment was employed. Respondents indicated the years of formal education they had completed. Parents' years of education was inferred from the average years of education reported by respondents 20 years older within each country and each education level.[13]

The distribution of respondents' education, by cohort, in the ISCED categories are reported in Tables 9 and 10. The parents' education is shown in Tables 11 and 12. Parents' education is defined as the parent with the highest level of education. Tables

[13]The full distribution of education categories was used to infer parents years of education.

13 through 16 contain the distributions of years of education. These tables also report the mean years.[14]

Although the mean years of education are similar across the sample countries, this masks tremendous variation in the distribution of education. The fraction of respondents with less than upper secondary ranges from 6 per cent in the younger cohort in Norway to 56 per cent in Germany and Poland.

The fraction of drop-outs in the older cohort is at least as large as the fraction in the younger cohort for all the countries except the United States. In the U.S., 8 per cent of respondents who were 16 to 25 years old in the 1980s had achieved less than upper secondary schooling. This compares to 6 per cent of the respondents who were 16 to 25 in the 1970s. This difference is not, however, statistically different from zero.

At the higher levels of the education distributions, countries vary less. Post-secondary education credentials are more common in some countries, such as Canada and the United States, where over 40 per cent of the younger cohort have some type of post-secondary credential.

To a large extent, these variations in the education distribution are generated by differences in the education systems. For example, post-secondary credentials are perhaps more prevalent in the U.S. and Canada because relatively little vocational training occurs at the secondary level. This contrasts with Germany where upper secondary school can include 3 years of vocational training. Indeed, the large number

[14]The categories for years of education were selected to minimize the number of countries that were dropped for insufficient cell frequencies.

of Germans with less than upper secondary is almost certainly an artifact of the education system, and not an indication that Germans have particularly low levels of education. [15]

Because of these differences in the structure of education systems, a second set of education categories is considered. Here, respondents are organized by the number of years completed. About three quarters of the observations fall into the same categories. For most of the countries, mass moves from the lower tail of the distribution to the center. For the Czech Republic and the United Kingdom the shift is dramatic. In both of these countries, about half of the younger cohort have less than upper secondary, while less than 10 per cent have fewer than 10 years of education. The length of compulsory schooling probably accounts for sensitivity to category definitions. Children can begin school at age 3 and must remain in school until they are 15 in the Czech Republic and 16 in Great Britain.

In some countries, the mass moves from higher categories to lower categories. One notable example is Norway. While 6 per cent of cohort 1 and 10 per cent of cohort 2 have less than upper secondary schooling, 20 and 40 percent, respectively, have completed fewer than 10 years of school. Again, the duration of compulsory schooling likely explains this pattern. In Norway, compulsory schooling begins when children are age 7. Children are legally required to remain in school until they are 16.

[15]Mean years of education is statistically significantly below the sample average in both cohorts. The average number of years is about .4 and .8 of a year lower in the younger and older cohorts respectively

9. Estimates of Intergenerational Mobility

The first step in ranking economies by their intergenerational mobility in education is to estimate transition matrices. The estimates are reported in the appendix. Each transition probability is estimated by maximum likelihood. Because the samples are fairly small, estimates were repeated and averaged until the averages converged. Estimates for countries in which there are fewer than 30 individuals in an education category by cohort are considered unreliable.[16]

After estimating the transition matrix, the stationary distribution is found by post-multiplying transition matrix by itself until it converges. That is, the stationary distribution is any row of $\lim_{t\to\infty} \hat{P}^t$. The matrices converge to four decimal places within ten iterations.[17]

The stationary distributions are shown in Tables 17 to 20. There is a stationary distribution for each cohort. The intuition behind different steady states is that within the ten years separating the cohorts enough has changed in terms of policy and economic environment to imply a different transition mechanism. For all the countries, in both cohorts, average education is weakly higher in the stationary distribution. This is true whether the ISCED or year categories are used.

Using the estimated transition matrices and the stationary distributions, it is then possible to compute the welfare gap index. The index is reported in Table 21 for the

[16]In the next version, bootstrapped standard errors should be include.

[17]The year category matrix for the older cohort in Slovenia was not regular; however, this matrix was among those dropped because of small cell frequency.

ISCED categories and using year categories the index is shown in Table 22. The index measures perfect mobility as zero. More negative numbers exhibit more immobility. A way to think of what the index measures is the welfare the economy loses under the estimated transition mechanism relative to the perfectly mobile counter-factual.

The mobility ranks for each cohort and each category type are shown in Table 23. Larger ranks are more mobile economies. The first thing to note about this table is that the ranks are not particularly consistent between the two category types. The measures have correlations of .6 and .3 for the younger and older cohorts respectively. The correlations is likely so low in the older cohort because the countries at the extremes of the ranking are missing.

In the younger cohort, Chile and Poland are consistently among the least mobile countries. Finland and Switzerland are ranked most mobile when the ISCED categories are used but with the year categories, these countries are considerably less mobile. According to the index, using year categories, Norway and Slovenia are most mobile. Interestingly, the United Kingdom which had the most dramatically different distributions under the two classification methods has a very similar ranking. This would suggest that the differences in rankings across the two types of categories is not strictly mechanical.

10. Correlations between Mobility Rank and Policy and Economic Factors

The next section attempts to uncover any correlations between the mobility ranks and various measures of policy and the country's economic environment.[18] It is important to proceed with caution not only because the rankings are sensitive to the definition of education categories but also because all of the estimates are based on fairly small samples. Because the rankings of the welfare gap measure were not very consistent across the ISCED and year categories in the older cohort, correlations are tested using just the younger cohort.[19]

First, the paper tests for a correlation between the welfare gap index and some aggregate macro-economic measures. Tables 24 to 27 report the results. Both Pearson and Spearman correlation coefficients are shown. Positive correlations mean that higher values of the variable increase mobility.

Three measures of national wealth are presented in the tables, per Capita Real Gross Domestic Product (GDP), Gross National Product and Real GDP per Worker. All three of these measures are positively correlated suggesting that richer countries are more mobile. Real per capita GDP is significantly associated with mobility using either a Spearman or a Pearson correlation coefficient in the ISCED categories.

Population is negatively but not statistically significantly correlated with mobility. Although not significant, the Spearman coefficients are fairly large, over .30. With

[18]Sources of data are listed in the appendix

[19]Policy and economic data comes from the years 1980 to 1990. When more than one year of data was available, the mean was taken.

such small samples, the standard errors are naturally very large. Consequently there is very little power to detect a significant correlation.

In a similar fashion, labour productivity has large positive correlation coefficients that are not statistically significant. In this case, the Spearman coefficients are both .4 for the ISCED and year categories. Despite being insignificant in a statistical sense, there is probably some relationship between mobility and labour productivity. Indeed, there are likely causal links in both directions. For example, more mobile societies could have fewer barriers to high ability individuals born into homes with low educational attainment. This would raise labour productivity. In the other direction, economies with high labour productivity are likely to offer high wages. These wages might make education sufficiently attractive to break down any mobility reducing barriers.

The correlations between composition of GDP and the welfare gap measure are also shown in the tables. Larger consumption shares are associated with less mobility, while countries with higher share of GDP going to investment are more mobile. Countries with higher savings rates are also more mobile. However, it is always possible that these correlations are spurious; poorer countries have higher consumption and richer countries have relatively more investment and savings.

To check whether GDP is driving the correlations with mobility, the welfare gap was regressed on real per capita GDP, investment and consumption shares. The

results are shown in Table 36 for ISCED categories and Table 37 for year categories. Because of the small sample sizes these coefficient are jointly zero.

In columns 2 and 3 of Table 36 consumption and investment are added separately along with GDP. Using ISCED categories, GDP remains significant in both cases, while consumption and investment shares are no longer significant. Current savings is also not significant when GDP is held constant. There are similar results with the year categories, except that current savings is statistically significant. These findings suggest that real per capita GDP does indeed move with mobility while the composition of GDP does not.

Next, the data are tested for correlations between the welfare gap index and two population ratios: the ratio of college-aged (age 20 to 24) to the total population and the working age (15 to 65) to total population. As Tables 32 to 35 suggest, there is no relationship between college cohort size and mobility. This is probably because only one cohort is used in the analysis. If there were data including the baby boom cohort, for example, one might expect to find some relationship.

Using the ISCED categories, it appears that more mobile countries have a higher ratio of working aged population relative to their total population. This correlation is driven in part by Chile, which is quite immobile and has the lowest fraction of working aged population relative to total population. The Spearman correlation drops from .45 to an insignificant .37 when Chile is not included.

Finally, Tables 36 to 39 report the correlations with some measures of education policy. Neither the length of compulsory schooling nor expenditure patterns are significantly correlated with mobility. After stressing the caveat that the results are not significant, it is worth noting that the coefficients on both the fraction of per capita GDP and the fraction of education expenditure spent on tertiary education are all negative.

While spending patterns do not appear to be strongly related to mobility, enrollment at least at the secondary level is. Once again, it is necessary to check whether this relationship is generated by the correlation between GDP and enrollments.

Interestingly, when GDP is held constant secondary enrollment rates are still significantly related to mobility, but only when the year categories are used. This finding reflects the idea that secondary enrollment might proxy the fraction who have completed 10 years of schooling, but would not necessarily indicate how many have completed upper secondary. Once again, it is apparent that how states are defined affects how mobility is measured in more than just a mechanical way.

11. Conclusion

This paper has attempted to adopt a means of ranking countries by intergenerational mobility in educational attainment. Although it draws from the literature concerning income, the index proposed is particularly suited to assessing mobility in education. This follows because the index is not confounded by any differences in the optimal education distribution. The measure compares the social welfare experienced

under the economy's actual mobility mechanism to the welfare which would prevail under a perfectly mobile mechanism, holding the distribution of education constant. Intuitively, it is the gap between what is and what could be under perfect mobility.

One drawback with the proposed index is that the orderings it produces are sensitive to how educational levels are defined. Since it is generally discretely distributed, separating levels of education into categories is unavoidable. The index is sensitive to these definitions because the timing of important transitions varies across educational systems. The antidote to this problem is to make the educational categories as small as possible. Given a large enough data set, the ideal categories would be yearly.

One important reason to find a measure of educational mobility is to make useful comparisons across economies. If this was possible, then the index could be used to explore which policies and economic factors either improve or exacerbate mobility. This paper made a preliminary attempt at describing some correlations between mobility and economic and policy variables. Unfortunately, limited sample sizes make it impossible to form any conclusions. Many countries are participating in follow-up IALS surveys. With larger samples, future research has the potential to uncover important links between policy and intergenerational mobility in education.

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Data Sources

Variable	Data Source
Population	Penn World Tables 6.1
Per Capita Real Gross Domestic Product	Penn World Tables 6.1
Gross National Product	Penn World Tables 6.1
Real GDP Per Worker	Penn World Tables 6.1
Labour productivity	ILO LaborSta http://www.ilo.org/public/english/bureau/stat/portal/online.htm
Consumption Share of GDP	Penn World Tables 6.1
Investment Share of GDP	Penn World Tables 6.1
Government Share of GDP	Penn World Tables 6.1
Current Savings	Penn World Tables 6.1
Ages 20-24/Total	UN Population and Vital Statistics Report: Series A
Working age/Total	UN Population and Vital Statistics Report: Series A
Duration of compulsory education (years)	World Bank EdStats http://www1.worldbank.org/education/edstats
Gross enrollment rate, secondary	World Bank EdStats http://www1.worldbank.org/education/edstats
Gross enrollment rate, tertiary	World Bank EdStats http://www1.worldbank.org/education/edstats
Pupils reaching grade 5 (% of cohort)	World Bank EdStats http://www1.worldbank.org/education/edstats
Public exp. per student (% of p.c.GDP), secondary	World Bank EdStats http://www1.worldbank.org/education/edstats
Public exp. per student (% of p.c.GDP), tertiary	World Bank EdStats http://www1.worldbank.org/education/edstats
Share of exp. for secondary education (% of total)	World Bank EdStats http://www1.worldbank.org/education/edstats
Share of exp. for tertiary education (% of total)	World Bank EdStats http://www1.worldbank.org/education/edstats

Tables

Table 1: Demographic Characteristics-Cohort 1

	Female	Urban	Employed	Sample
Belgium	0.50	0.73	0.82	390
Canada	0.49	0.83	0.76	864
Chile	0.50	0.84	0.65	861
Czech Republic	0.49	0.71	0.79	600
Denmark	0.49	0.75	0.78	695
Finland	0.51	0.66	0.77	573
Germany	0.55	0.62	0.65	452
Hungary	0.52	0.62	0.70	445
Ireland	0.52	0.62	0.69	433
Italy	0.50	0.44	0.71	688
Netherlands	0.50	0.79	0.77	707
New Zealand	0.50	0.74	0.74	617
Norway	0.48	0.48	0.85	654
Poland	0.49	0.62	0.69	580
Slovenia	0.49	0.68	0.89	559
Sweden	0.49	0.68	0.77	486
Switzerland	0.46	0.72	0.82	827
United Kingdom	0.51	0.84	0.76	1501
United States	0.57	0.71	0.82	468
Total	0.53	0.68	0.76	12400

Table 2: Demographic Characteristics-Cohort 2

	Female	Urban	Employed	Sample
Belgium	0.48	0.71	0.77	404
Canada	0.48	0.74	0.74	848
Chile	0.51	0.84	0.62	726
Czech Republic	0.55	0.70	0.89	667
Denmark	0.49	0.75	0.87	638
Finland	0.49	0.55	0.84	659
Germany	0.49	0.50	0.77	328
Hungary	0.49	0.69	0.74	542
Ireland	0.49	0.57	0.56	457
Italy	0.50	0.42	0.74	711
Netherlands	0.48	0.79	0.77	654
New Zealand	0.55	0.70	0.80	591
Norway	0.49	0.43	0.89	631
Poland	0.49	0.68	0.76	760
Slovenia	0.48	0.72	0.87	570
Sweden	0.49	0.66	0.89	466
Switzerland	0.51	0.69	0.85	676
United Kingdom	0.47	0.78	0.81	1253
United States	0.51	0.71	0.83	514
Total	0.53	0.65	0.78	12095

TABLE 3. Population (in 1000s)

	1965	1975	1985	1995
Belgium	9,436	9,782	9,857	10,137
Canada	19,678	23,142	25,843	29,354
Chile	8,572	10,337	12,047	14,210
Czech Republic	.	.	.	10,327
Denmark	4,758	5,060	5,114	5,222
Finland	4,564	4,711	4,902	5,108
Germany	.	78,679	77,668	81,661
Hungary	.	10,532	10,579	10,229
Ireland	2,876	3,177	3,541	3,601
Italy	52,112	55,441	56,593	57,301
Netherlands	12,288	13,660	14,488	15,460
New Zealand	2,628	3,087	3,272	3,656
Norway	3,724	4,006	4,153	4,358
Poland	.	34,022	37,203	38,588
Slovenia	.	.	.	1,990
Sweden	7,734	8,192	8,350	8,827
Switzerland	5,856	6,404	6,534	7,041
United Kingdom	54,350	56,226	56,685	58,612
United States	194,338	215,981	238,506	263,073

TABLE 4. Real Gross Per Capita GDP

	1965	1975	1985	1995
Belgium	2,420.38	5,801.65	12,195.17	20,702.13
Canada	3,013.09	6,755.61	15,405.36	22,450.86
Chile	1,056.40	1,681.08	3,604.68	8,676.46
Czech Republic	.	.	.	12,551.75
Denmark	3,387.47	6,777.44	14,557.66	23,119.20
Finland	2,343.03	5,728.72	12,704.09	18,517.58
Germany	.	5,548.82	12,410.98	20,676.81
Hungary	.	2,863.29	6,751.34	8,536.63
Ireland	1,491.01	3,489.56	8,293.64	16,978.96
Italy	2,136.47	5,066.15	11,814.97	19,783.39
Netherlands	2,725.38	6,219.67	12,741.72	20,607.32
New Zealand	3,411.07	5,847.68	11,367.27	17,075.04
Norway	2,711.91	6,269.16	16,050.25	23,015.92
Poland	.	2,778.53	4,774.39	7,204.21
Slovenia	.	.	.	12,574.96
Sweden	3,215.37	7,012.12	13,962.23	20,438.30
Switzerland	4,244.53	8,092.38	16,236.09	24,110.12
United Kingdom	2,702.16	5,237.29	11,693.21	19,187.64
United States	3,679.37	7,490.47	17,504.80	27,894.92

TABLE 5. Labour Productivity

	1975	1985	1995
Belgium	21	30	37
Canada	28	33	36
Chile	.	.	.
Czech Republic	.	.	187
Denmark	175	234	285
Finland	16	21	29
Germany	19	25	32
Hungary	.	.	.
Ireland	13	20	28
Italy	16	21	26
Netherlands	24	31	36
New Zealand	27	28	32
Norway	223	313	412
Poland	.	.	.
Slovenia	.	.	.
Sweden	211	242	283
Switzerland	47	56	56
United Kingdom	11	15	18
United States	27	30	34

TABLE 6. Ratio of Employed to Population

	1965	1975	1985	1995
Belgium	52	49	45	45
Canada	53	55	58	57
Chile	.	.	.	.
Czech Republic	.	.	.	59
Denmark	61	60	61	60
Finland	66	61	62	51
Germany	59	54	51	53
Hungary	.	.	.	44
Ireland	54	49	44	47
Italy	51	.	45	42
Netherlands	.	47	44	55
New Zealand	56	57	54	60
Norway	53	57	61	59
Poland	62	64	62	50
Slovenia	.	.	.	.
Sweden	61	63	63	56
Switzerland	67	63	62	68
United Kingdom	61	58	53	56
United States	55	55	59	62

TABLE 7. Labour Force Participation

	1965	1975	1985	1995
Belgium	53	52	51	52
Canada	55	59	64	63
Chile	.	.	.	.
Czech Republic	.	.	.	62
Denmark	62	64	66	65
Finland	67	63	66	61
Germany	60	56	55	57
Hungary	.	.	.	48
Ireland	57	54	53	54
Italy	54	.	50	48
Netherlands	.	49	50	59
New Zealand	56	57	57	64
Norway	53	58	62	62
Poland	62	64	62	58
Slovenia	.	.	.	.
Sweden	61	64	65	61
Switzerland	67	63	63	70
United Kingdom	61	60	60	61
United States	57	59	63	65

TABLE 8. Unemployment Rate

	1965	1975	1985	1995
Belgium	2	5	12	13
Canada	4	7	11	10
Chile	.	.	.	.
Czech Republic	.	.	.	4
Denmark	1	5	7	7
Finland	1	2	5	15
Germany	1	4	7	8
Hungary	.	.	.	10
Ireland	5	9	17	12
Italy	5	6	10	12
Netherlands	.	5	11	7
New Zealand	0	0	4	6
Norway	1	2	3	5
Poland	.	.	.	13
Slovenia	.	.	.	.
Sweden	1	2	3	9
Switzerland	.	0	1	3
United Kingdom	1	3	11	9
United States	4	8	7	6

TABLE 9. Respondent's Education -Cohort 1 (ISCED Categories)

	Less than Upper secondary	Upper secondary	Post-Secondary
Belgium	0.24	0.41	0.35
Canada	0.21	0.38	0.41
Chile	0.48	0.30	0.22
Czech Republic	0.48	0.37	0.15
Denmark	0.18	0.53	0.29
Finland	0.14	0.59	0.26
Germany	0.56	0.27	0.17
Hungary	0.20	0.63	0.16
Ireland	0.43	0.34	0.22
Italy	0.45	0.44	0.11
Netherlands	0.26	0.50	0.24
New Zealand	0.47	0.24	0.29
Norway	0.06	0.62	0.32
Poland	0.56	0.27	0.17
Slovenia	0.21	0.56	0.23
Sweden	0.11	0.59	0.30
Switzerland	0.09	0.68	0.23
United Kingdom	0.53	0.24	0.24
United States	0.08	0.45	0.47

TABLE 10. Respondet's Education -Cohort 2 (ISCED Categories)

	Less than Upper secondary	Upper secondary	Post-Secondary
Belgium	0.36	0.36	0.27
Canada	0.25	0.34	0.41
Chile	0.54	0.28	0.18
Czech Republic	0.52	0.32	0.16
Denmark	0.21	0.45	0.34
Finland	0.18	0.58	0.24
Germany	0.59	0.22	0.18
Hungary	0.22	0.55	0.23
Ireland	0.56	0.26	0.18
Italy	0.51	0.36	0.13
Netherlands	0.43	0.35	0.22
New Zealand	0.48	0.21	0.31
Norway	0.10	0.62	0.27
Poland	0.59	0.26	0.16
Slovenia	0.26	0.57	0.17
Sweden	0.18	0.49	0.33
Switzerland	0.13	0.67	0.20
United Kingdom	0.54	0.19	0.27
United States	0.06	0.47	0.46

TABLE 11. Respondent's Education -Cohort 1 (Year Categories)

	10 or Fewer	Between 11 and 14	More than 14	Mean Years
Belgium	0.14	0.51	0.35	13.27
Canada	0.17	0.55	0.28	13.05
Chile	0.42	0.43	0.15	10.82
Czech Republic	0.07	0.74	0.19	12.83
Denmark	0.15	0.47	0.38	13.70
Finland	0.11	0.45	0.44	14.07
Germany	0.48	0.31	0.21	12.14
Hungary	0.19	0.60	0.21	12.07
Ireland	0.43	0.48	0.09	10.86
Italy	0.42	0.38	0.20	11.64
Netherlands	0.13	0.46	0.41	13.96
New Zealand	0.23	0.61	0.16	12.20
Norway	0.20	0.57	0.23	12.47
Poland	0.21	0.67	0.12	11.94
Slovenia	0.20	0.63	0.17	12.04
Sweden	0.16	0.62	0.22	12.56
Switzerland	0.15	0.55	0.29	13.25
United Kingdom	0.06	0.74	0.20	12.78
United States	0.06	0.55	0.39	13.86

TABLE 12. Respondent's Education -Cohort 2 (Year Categories)

	10 or Fewer	Between 11 and 14	More than 14	Mean Years
Belgium	0.26	0.46	0.28	12.35
Canada	0.20	0.48	0.32	13.21
Chile	0.49	0.40	0.11	9.97
Czech Republic	0.10	0.66	0.24	13.25
Denmark	0.22	0.44	0.34	13.42
Finland	0.26	0.42	0.32	12.98
Germany	0.52	0.32	0.16	11.53
Hungary	0.22	0.52	0.26	12.21
Ireland	0.55	0.34	0.10	10.18
Italy	0.48	0.33	0.19	10.98
Netherlands	0.31	0.37	0.31	12.97
New Zealand	0.29	0.56	0.16	12.00
Norway	0.40	0.44	0.16	11.81
Poland	0.33	0.56	0.12	11.47
Slovenia	0.25	0.59	0.15	11.52
Sweden	0.24	0.52	0.24	12.46
Switzerland	0.28	0.51	0.21	12.52
United Kingdom	0.23	0.55	0.22	12.45
United States	0.05	0.57	0.37	14.00

TABLE 13. Parent's Education -Cohort 1 (ISCED Categories)

	Less than Upper secondary	Upper secondary	Post-Secondary
Belgium	0.53	0.26	0.21
Canada	0.40	0.35	0.25
Chile	0.73	0.18	0.09
Czech Republic	0.48	0.38	0.14
Denmark	0.25	0.49	0.26
Finland	0.41	0.32	0.27
Germany	0.78	0.11	0.12
Hungary	0.41	0.47	0.11
Ireland	0.76	0.15	0.09
Italy	0.75	0.18	0.07
Netherlands	0.59	0.26	0.15
New Zealand	0.53	0.18	0.29
Norway	0.27	0.47	0.26
Poland	0.73	0.17	0.10
Slovenia	0.46	0.42	0.12
Sweden	0.49	0.27	0.24
Switzerland	0.20	0.62	0.18
United Kingdom	0.79	0.07	0.14
United States	0.14	0.50	0.36

TABLE 14. Parent's Education -Cohort 2 (ISCED Categories)

	Less than Upper secondary	Upper secondary	Post-Secondary
Belgium	0.70	0.21	0.10
Canada	0.52	0.27	0.21
Chile	0.77	0.18	0.06
Czech Republic	0.58	0.32	0.10
Denmark	0.37	0.48	0.14
Finland	0.63	0.23	0.14
Germany	0.86	0.08	0.06
Hungary	0.59	0.30	0.11
Ireland	0.83	0.12	0.04
Italy	0.83	0.12	0.05
Netherlands	0.74	0.17	0.09
New Zealand	0.61	0.15	0.24
Norway	0.43	0.43	0.14
Poland	0.81	0.13	0.06
Slovenia	0.53	0.41	0.06
Sweden	0.63	0.24	0.13
Switzerland	0.33	0.47	0.21
United Kingdom	0.86	0.05	0.09
United States	0.22	0.50	0.28

TABLE 15. Parent's Education -Cohort 1 (Year Categories)

	10 or Fewer	Between 11 and 14	More than 14	Mean Years
Belgium	0.53	0.38	0.09	11.34
Canada	0.40	0.48	0.13	11.25
Chile	0.73	0.21	0.06	7.55
Czech Republic	0.10	0.76	0.14	12.90
Denmark	0.25	0.57	0.19	12.82
Finland	0.41	0.51	0.07	11.08
Germany	0.78	0.15	0.07	10.40
Hungary	0.41	0.47	0.11	11.08
Ireland	0.76	0.18	0.06	8.93
Italy	0.75	0.18	0.07	8.22
Netherlands	0.59	0.26	0.15	11.72
New Zealand	0.05	0.86	0.08	11.74
Norway	0.74	0.10	0.16	10.88
Poland	0.73	0.20	0.07	9.57
Slovenia	0.46	0.48	0.06	10.41
Sweden	0.49	0.39	0.13	10.56
Switzerland	0.20	0.72	0.08	11.93
United Kingdom	0.03	0.89	0.08	11.27
United States	0.14	0.60	0.26	13.52

TABLE 16. Parent's Education -Cohort 2 (Year Categories)

	10 or Fewer	Between 11 and 14	More than 14	Mean Years
Belgium	0.70	0.21	0.10	10.09
Canada	0.52	0.36	0.12	10.03
Chile	0.77	0.19	0.05	6.53
Czech Republic	0.17	0.74	0.10	11.74
Denmark	0.37	0.52	0.11	11.76
Finland	0.86	0.08	0.06	8.79
Germany	0.86	0.10	0.04	9.39
Hungary	0.59	0.30	0.11	10.00
Ireland	0.83	0.14	0.03	8.21
Italy	0.83	0.12	0.05	6.95
Netherlands	0.74	0.17	0.09	10.51
New Zealand	0.61	0.31	0.08	11.37
Norway	0.85	0.06	0.09	9.58
Poland	0.81	0.14	0.05	8.09
Slovenia	0.53	0.45	0.02	9.52
Sweden	0.87	0.06	0.07	9.00
Switzerland	0.33	0.47	0.21	11.31
United Kingdom	0.86	0.10	0.05	10.72
United States	0.22	0.55	0.23	12.95

Table 17: Stationary Education Distribution-Cohort 1 (ISCED Categories)

Variable Names	Below Upper secondary	Upper secondary	PSE
Belgium	0.08	0.24	0.67
Canada	0.19	0.35	0.46
Chile	0.29	0.24	0.48
Czech Republic	0.31	0.42	0.28
Denmark	0.14	0.54	0.32
Finland	0.13	0.58	0.29
Germany	0.58	0.24	0.18
Hungary	0.14	0.66	0.20
Ireland	0.19	0.32	0.48
Italy	0.24	0.50	0.26
Netherlands	0.17	0.39	0.45
New Zealand	0.40	0.33	0.27
Norway	0.04	0.28	0.67
Poland	0.40	0.31	0.29
Slovenia	0.10	0.60	0.31
Sweden	0.07	0.58	0.35
Switzerland	0.04	0.61	0.35
United Kingdom	0.32	0.25	0.44
United States	0.14	0.32	0.53

Table 18: Stationary Education Distribution-Cohort 2 (ISCED Categories)

Variable Names	Below Upper secondary	Upper secondary	PSE
Belgium	0.02	0.12	0.86
Canada	0.17	0.37	0.47
Chile	0.31	0.33	0.36
Czech Republic	0.34	0.40	0.25
Denmark	0.14	0.42	0.44
Finland	0.15	0.51	0.34
Germany	0.64	0.20	0.16
Hungary	0.08	0.54	0.38
Ireland	0.21	0.45	0.33
Italy	0.22	0.42	0.36
Netherlands	0.22	0.31	0.47
New Zealand	0.27	0.26	0.47
Norway	0.05	0.24	0.71
Poland	0.40	0.30	0.30
Slovenia	0.17	0.42	0.41
Sweden	0.07	0.36	0.58
Switzerland	0.04	0.66	0.30
United Kingdom	0.35	0.16	0.50
United States	0.03	0.36	0.61

Table 19: Stationary Education Distribution-Cohort 1 (Year Categories)

Variable Names	10 or Fewer	Between 11 and 14	More than 14
Belgium	0.04	0.23	0.73
Canada	0.13	0.58	0.29
Chile	0.12	0.37	0.52
Czech Republic	0.03	0.63	0.33
Denmark	0.10	0.42	0.48
Finland	0.06	0.24	0.70
Germany	0.52	0.28	0.21
Hungary	0.12	0.59	0.28
Ireland	0.27	0.58	0.15
Italy	0.21	0.39	0.40
Netherlands	0.07	0.29	0.64
New Zealand	0.20	0.64	0.16
Norway	0.05	0.38	0.57
Poland	0.08	0.61	0.31
Slovenia	0.10	0.71	0.19
Sweden	0.12	0.60	0.28
Switzerland	0.10	0.44	0.46
United Kingdom	0.04	0.63	0.33
United States	0.07	0.42	0.52

Table 20: Stationary Education Distribution-Cohort 2 (Year Categories)

Variable Names	10 or Fewer	Between 11 and 14	More than 14
Belgium	0.01	0.20	0.79
Canada	0.09	0.53	0.39
Chile	0.29	0.42	0.29
Czech Republic	0.06	0.55	0.39
Denmark	0.15	0.37	0.48
Finland	0.10	0.27	0.64
Germany	0.57	0.28	0.15
Hungary	0.07	0.50	0.44
Ireland	0.23	0.59	0.18
Italy	0.20	0.34	0.47
Netherlands	0.11	0.38	0.51
New Zealand	0.11	0.58	0.31
Norway	0.16	0.32	0.51
Poland	0.18	0.51	0.31
Slovenia	.	.	.
Sweden	0.02	0.33	0.65
Switzerland	0.14	0.56	0.30
United Kingdom	0.02	0.37	0.61
United States	0.03	0.46	0.51

TABLE 21. Welfare Gap Index (ISCED Categories)

	Cohort 1	Cohort 2
Belgium	-0.0013	-0.0013
Canada	-0.0025	-0.0016
Chile	-0.0065	-0.0050
Czech Republic	-0.0062	-0.0034
Denmark	-0.0016	-0.0017
Finland	-0.0004	-0.0016
Germany	-0.0012	.
Hungary	-0.0017	-0.0025
Ireland	-0.0049	.
Italy	-0.0028	-0.0034
Netherlands	-0.0031	-0.0052
New Zealand	-0.0025	-0.0040
Norway	-0.0024	-0.0019
Poland	-0.0077	-0.0060
Slovenia	-0.0014	.
Sweden	-0.0008	-0.0027
Switzerland	-0.0007	-0.0011
United Kingdom	-0.0047	-0.0037
United States	-0.0043	-0.0018

TABLE 22. Welfare Gap Index (Year Categories)

	Cohort 1	Cohort 2
Belgium	-0.0010	-0.0010
Canada	-0.0013	-0.0009
Chile	-0.0057	.
Czech Republic	-0.0016	-0.0018
Denmark	-0.0017	-0.0021
Finland	-0.0014	-0.0022
Germany	-0.0009	.
Hungary	-0.0021	-0.0028
Ireland	.	.
Italy	-0.0031	-0.0030
Netherlands	-0.0012	-0.0020
New Zealand	-0.0014	-0.0011
Norway	-0.0007	-0.0029
Poland	-0.0026	-0.0028
Slovenia	-0.0008	.
Sweden	-0.0009	.
Switzerland	-0.0020	-0.0019
United Kingdom	-0.0019	-0.0013
United States	-0.0025	-0.0018

TABLE 23. Ranks of Welfare Gap Index

	Cohort 1 ISCED	Cohort 2 ISCED	Cohort 1 Years	Cohort 2 Years
Belgium	15	15	14	13
Canada	9	14	12	14
Chile	2	3	1	.
Czech Republic	3	6	9	9
Denmark	13	12	8	6
Finland	19	13	11	5
Germany	16	.	16	.
Hungary	12	9	5	3
Ireland	4	.	.	.
Italy	8	7	2	1
Netherlands	7	2	13	7
New Zealand	10	4	10	12
Norway	11	10	18	2
Poland	1	1	3	4
Slovenia	14	.	17	.
Sweden	17	8	15	.
Switzerland	18	16	6	8
United Kingdom	5	5	7	11
United States	6	11	4	10

Table 24: Spearman Correlation with Macro Aggregates
-ISCED Categories

Variable Names	Correlation	P-Value	Sample Size
Population	-0.34	0.18	17.00
Per Capita Real Gross Domestic Product	0.50	0.04	17.00
Gross National Product	0.26	0.33	16.00
Real GDP Per Worker	0.36	0.17	16.00
Labour productivity	0.41	0.14	14.00
Consumption Share of GDP	-0.47	0.06	17.00
Investment Share of GDP	0.58	0.01	17.00
Government Share of GDP	-0.01	0.97	17.00
Current Savings	0.62	0.01	17.00

Table 25: Spearman Correlation with Macro Aggregates
-Year Categories

Variable Names	Correlation	P-Value	Sample Size
Population	-0.32	0.23	16.00
Per Capita Real Gross Domestic Product	0.39	0.13	16.00
Gross National Product	0.12	0.67	15.00
Real GDP Per Worker	0.27	0.32	15.00
Labour productivity	0.40	0.18	13.00
Consumption Share of GDP	-0.59	0.02	16.00
Investment Share of GDP	0.47	0.07	16.00
Government Share of GDP	0.08	0.76	16.00
Current Savings	0.56	0.02	16.00

Table 26: Pearson Correlation with Macro Aggregates -ISCED Categories

Variable Names	Correlation	P-Value	Sample Size
Population	-0.23	0.37	17.00
Per Capita Real Gross Domestic Product	0.63	0.01	17.00
Gross National Product	0.50	0.05	16.00
Real GDP Per Worker	0.60	0.01	16.00
Labour productivity	0.29	0.31	14.00
Consumption Share of GDP	-0.47	0.06	17.00
Investment Share of GDP	0.57	0.02	17.00
Government Share of GDP	0.01	0.98	17.00
Current Savings	0.57	0.02	17.00

Table 27: Pearson Correlation with Macro Aggregates -Year Categories

Variable Names	Correlation	P-Value	Sample Size
Population	-0.15	0.58	16.00
Per Capita Real Gross Domestic Product	0.60	0.01	16.00
Gross National Product	0.45	0.09	15.00
Real GDP Per Worker	0.51	0.05	15.00
Labour productivity	0.38	0.21	13.00
Consumption Share of GDP	-0.26	0.33	16.00
Investment Share of GDP	0.61	0.01	16.00
Government Share of GDP	-0.24	0.38	16.00
Current Savings	0.65	0.01	16.00

Table 28: Spearman Correlations with Population Ratios-(ISCED Categories)

Variable Names	Correlation	P-Value	Sample Size
Ages 20-24/Total	-0.40	0.11	17.00
Working age/Total	0.45	0.07	17.00

Table 29: Spearman Correlations with Population Ratios-(Year Categories)

Variable Names	Correlation	P-Value	Sample Size
Ages 20-24/Total	-0.14	0.58	17.00
Working age/Total	0.16	0.54	17.00

Table 30: Pearson Correlations with Population Ratios-(ISCED Categories)

Variable Names	Correlation	P-Value	Sample Size
Ages 20-24/Total	-0.33	0.20	17.00
Working age/Total	0.45	0.07	17.00

Table 31: Pearson Correlations with Population Ratios-(Year Categories)

Variable Names	Correlation	P-Value	Sample Size
Ages 20-24/Total	-0.58	0.02	17.00
Working age/Total	0.41	0.10	17.00

Table 32: Spearman Correlation with Education Data-ISCED Categories

Variable Names	Correlation	P-Value	Sample Size
Duration of compulsory education (years)	-0.10	0.71	16.00
Gross enrollment rate, secondary	0.42	0.08	18.00
Gross enrollment rate, tertiary	0.38	0.11	18.00
Pupils reaching grade 5 (% of cohort)	-0.12	0.73	11.00
Public exp. per student (% of p.c.GDP), secondary	0.27	0.35	14.00
Public exp. per student (% of p.c.GDP), tertiary	-0.22	0.42	15.00
Share of exp. for secondary education (% of total)	0.34	0.22	15.00
Share of exp. for tertiary education (% of total)	-0.21	0.44	16.00

Table 33: Spearman Correlation with Education Data-Year Categories

Variable Names	Correlation	P-Value	Sample Size
Duration of compulsory education (years)	0.24	0.39	15.00
Gross enrollment rate, secondary	0.55	0.02	17.00
Gross enrollment rate, tertiary	0.47	0.06	17.00
Pupils reaching grade 5 (% of cohort)	0.11	0.75	11.00
Public exp. per student (% of p.c.GDP), secondary	-0.03	0.93	13.00
Public exp. per student (% of p.c.GDP), tertiary	-0.28	0.33	14.00
Share of exp. for secondary education (% of total)	0.13	0.66	14.00
Share of exp. for tertiary education (% of total)	-0.11	0.70	15.00

Table 34: Pearson Correlation with Education Data-ISCED Categories

Variable Names	Correlation	P-Value	Sample Size
Duration of compulsory education (years)	-0.02	0.93	16.00
Gross enrollment rate, secondary	0.41	0.09	18.00
Gross enrollment rate, tertiary	0.23	0.36	18.00
Pupils reaching grade 5 (% of cohort)	-0.30	0.37	11.00
Public exp. per student (% of p.c.GDP), secondary	0.30	0.30	14.00
Public exp. per student (% of p.c.GDP), tertiary	-0.33	0.23	15.00
Share of exp. for secondary education (% of total)	0.41	0.13	15.00
Share of exp. for tertiary education (% of total)	-0.22	0.42	16.00

Table 35: Pearson Correlation with Education Data-Year Categories

Variable Names	Correlation	P-Value	Sample Size
Duration of compulsory education (years)	0.25	0.37	15.00
Gross enrollment rate, secondary	0.72	0.00	17.00
Gross enrollment rate, tertiary	0.26	0.32	17.00
Pupils reaching grade 5 (% of cohort)	-0.09	0.78	11.00
Public exp. per student (% of p.c.GDP), secondary	0.20	0.52	13.00
Public exp. per student (% of p.c.GDP), tertiary	-0.39	0.17	14.00
Share of exp. for secondary education (% of total)	0.20	0.48	14.00
Share of exp. for tertiary education (% of total)	-0.17	0.53	15.00

TABLE 36. Effect of GDP and Composition on Mobility–ISCED Categories

	(1)	(2)	(3)	(4)
Real p.c. GDP	1.91e-07	2.92e-07	2.43e-07	2.48e-07
	(1.44e-07)	(1.15e-07)**	(1.44e-07)*	(1.30e-07)*
Consumption Share of GDP	-.0001	-.0001		
	(.00007)	(.00007)		
Investment Share of GDP	.0001		.0001	
	(.0001)		(.0001)	
Current Savings				.0001
				(.0001)
Const.	-.002	-.0003	-.009	-.009
	(.005)	(.005)	(.002)***	(.002)***
Obs.	17	17	17	17
R^2	.514	.466	.442	.466
F statistic	4.592	6.115	5.555	6.099

TABLE 37. Effect of GDP and Composition on Mobility–Year Categories

	(1)	(2)	(3)	(4)
Real p.c. GDP	1.10e-07	1.89e-07	1.16e-07	1.17e-07
	(9.26e-08)	(7.74e-08)**	(8.60e-08)	(7.34e-08)
Consumption Share of GDP	-1.00e-05	-1.00e-05		
	(.00004)	(.00005)		
Investment Share of GDP	.0001		.0001	
	(.00008)		(.00008)	
Current Savings				.0001
				(.00006)**
Const.	-.005	-.003	-.006	-.006
	(.003)	(.003)	(.001)***	(.001)***
Obs.	16	16	16	16
R^2	.455	.361	.452	.52
F statistic	3.338	3.673	5.372	7.053

TABLE 38. Effect of GDP and Enrollment on Mobility

	ISCED	Year
	(1)	(2)
Gross enrollment rate, secondary	.00002	.00006
	(.00005)	(.00003)**
Per Capita Real Gross Domestic Product	3.00e-07	2.51e-08
	(1.66e-07)*	(9.47e-08)
Const.	-.008	-.008
	(.003)**	(.002)***
Obs.	16	15
R^2	.404	.565
F statistic	4.408	7.784

Transition Matrices

Table 1: Transition Matrix for Belgium-Cohort 1 (ISCED Categories)

Variable Names	Below Upper secondary	Upper secondary	PSE
Below Upper secondary	0.26	0.36	0.38
Upper secondary	0.08	0.36	0.56
PSE	0.06	0.19	0.75

Table 2: Transition Matrix for Belgium-Cohort 2 (ISCED Categories)

Variable Names	Below Upper secondary	Upper secondary	PSE
Below Upper secondary	0.35	0.30	0.35
Upper secondary	0.12	0.25	0.63
PSE	0.00	0.09	0.91

Table 3: Transition Matrix for Canada-Cohort 1 (ISCED Categories)

Variable Names	Below Upper secondary	Upper secondary	PSE
Below Upper secondary	0.34	0.41	0.25
Upper secondary	0.20	0.45	0.36
PSE	0.13	0.25	0.62

Table 4: Transition Matrix for Canada-Cohort 2 (ISCED Categories)

Variable Names	Below Upper secondary	Upper secondary	PSE
Below Upper secondary	0.40	0.33	0.27
Upper secondary	0.13	0.35	0.51
PSE	0.11	0.39	0.50

Table 5: Transition Matrix for Chile-Cohort 1 (ISCED Categories)

Variable Names	Below Upper secondary	Upper secondary	PSE
Below Upper secondary	0.59	0.30	0.12
Upper secondary	0.16	0.43	0.41
PSE	0.17	0.10	0.73

Table 6: Transition Matrix for Chile-Cohort 2 (ISCED Categories)

Variable Names	Below Upper secondary	Upper secondary	PSE
Below Upper secondary	0.66	0.21	0.13
Upper secondary	0.10	0.46	0.44
PSE	0.20	0.31	0.50

Table 7: Transition Matrix for Czech Republic-Cohort 1 (ISCED Categories)

Variable Names	Below Upper secondary	Upper secondary	PSE
Below Upper secondary	0.59	0.39	0.02
Upper secondary	0.23	0.50	0.27
PSE	0.10	0.32	0.58

Table 8: Transition Matrix for Czech Republic-Cohort 2 (ISCED Categories)

Variable Names	Below Upper secondary	Upper secondary	PSE
Below Upper secondary	0.53	0.37	0.10
Upper secondary	0.35	0.36	0.28
PSE	0.08	0.51	0.41

Table 9: Transition Matrix for Denmark-Cohort 1 (ISCED Categories)

Variable Names	Below Upper secondary	Upper secondary	PSE
Below Upper secondary	0.30	0.53	0.17
Upper secondary	0.16	0.57	0.28
PSE	0.04	0.49	0.47

Table 10: Transition Matrix for Denmark-Cohort 2 (ISCED Categories)

Variable Names	Below Upper secondary	Upper secondary	PSE
Below Upper secondary	0.30	0.38	0.32
Upper secondary	0.15	0.53	0.32
PSE	0.09	0.32	0.59

Table 11: Transition Matrix for Finland-Cohort 1 (ISCED Categories)

Variable Names	Below Upper secondary	Upper secondary	PSE
Below Upper secondary	0.14	0.62	0.24
Upper secondary	0.17	0.56	0.27
PSE	0.04	0.61	0.35

Table 12: Transition Matrix for Finland-Cohort 2 (ISCED Categories)

Variable Names	Below Upper secondary	Upper secondary	PSE
Below Upper secondary	0.23	0.64	0.13
Upper secondary	0.17	0.55	0.29
PSE	0.09	0.39	0.52

Table 13: Transition Matrix for Germany-Cohort 1 (ISCED Categories)

Variable Names	Below Upper secondary	Upper secondary	PSE
Below Upper secondary	0.66	0.21	0.13
Upper secondary	0.48	0.27	0.25
PSE	0.47	0.29	0.24

Table 14: Transition Matrix for Germany-Cohort 2 (ISCED Categories)

Variable Names	Below Upper secondary	Upper secondary	PSE
Below Upper secondary	0.66	0.19	0.16
Upper secondary	0.59	0.28	0.13
PSE	0.64	0.13	0.23

Table 15: Transition Matrix for Hungary-Cohort 1 (ISCED Categories)

Variable Names	Below Upper secondary	Upper secondary	PSE
Below Upper secondary	0.31	0.62	0.08
Upper secondary	0.14	0.71	0.15
PSE	0.04	0.51	0.45

Table 16: Transition Matrix for Hungary-Cohort 2 (ISCED Categories)

Variable Names	Below Upper secondary	Upper secondary	PSE
Below Upper secondary	0.33	0.56	0.11
Upper secondary	0.08	0.65	0.26
PSE	0.02	0.38	0.61

Table 17: Transition Matrix for Ireland-Cohort 1 (ISCED Categories)

Variable Names	Below Upper secondary	Upper secondary	PSE
Below Upper secondary	0.46	0.40	0.14
Upper secondary	0.24	0.35	0.41
PSE	0.06	0.27	0.67

Table 18: Transition Matrix for Ireland-Cohort 2 (ISCED Categories)

Variable Names	Below Upper secondary	Upper secondary	PSE
Below Upper secondary	0.61	0.27	0.12
Upper secondary	0.15	0.56	0.29
PSE	0.04	0.43	0.53

Table 19: Transition Matrix for Italy-Cohort 1 (ISCED Categories)

Variable Names	Below Upper secondary	Upper secondary	PSE
Below Upper secondary	0.47	0.44	0.08
Upper secondary	0.20	0.53	0.26
PSE	0.10	0.47	0.43

Table 20: Transition Matrix for Italy-Cohort 2 (ISCED Categories)

Variable Names	Below Upper secondary	Upper secondary	PSE
Below Upper secondary	0.46	0.43	0.12
Upper secondary	0.19	0.48	0.33
PSE	0.12	0.34	0.55

Table 21: Transition Matrix for Netherlands-Cohort 1 (ISCED Categories)

Variable Names	Below Upper secondary	Upper secondary	PSE
Below Upper secondary	0.39	0.40	0.21
Upper secondary	0.17	0.49	0.34
PSE	0.08	0.29	0.63

Table 22: Transition Matrix for Netherlands-Cohort 2 (ISCED Categories)

Variable Names	Below Upper secondary	Upper secondary	PSE
Below Upper secondary	0.51	0.27	0.22
Upper secondary	0.26	0.42	0.32
PSE	0.06	0.26	0.68

Table 23: Transition Matrix for New Zealand-Cohort 1 (ISCED Categories)

Variable Names	Below Upper secondary	Upper secondary	PSE
Below Upper secondary	0.54	0.26	0.20
Upper secondary	0.37	0.43	0.20
PSE	0.23	0.30	0.47

Table 24: Transition Matrix for New Zealand-Cohort 2 (ISCED Categories)

Variable Names	Below Upper secondary	Upper secondary	PSE
Below Upper secondary	0.52	0.18	0.30
Upper secondary	0.27	0.39	0.34
PSE	0.13	0.24	0.63

Table 25: Transition Matrix for Norway-Cohort 1 (ISCED Categories)

Variable Names	Below Upper secondary	Upper secondary	PSE
Below Upper secondary	0.18	0.60	0.22
Upper secondary	0.09	0.49	0.42
PSE	0.01	0.17	0.81

Table 26: Transition Matrix for Norway-Cohort 2 (ISCED Categories)

Variable Names	Below Upper secondary	Upper secondary	PSE
Below Upper secondary	0.22	0.50	0.28
Upper secondary	0.08	0.44	0.48
PSE	0.03	0.15	0.82

Table 27: Transition Matrix for Poland-Cohort 1 (ISCED Categories)

Variable Names	Below Upper secondary	Upper secondary	PSE
Below Upper secondary	0.68	0.22	0.09
Upper secondary	0.30	0.44	0.26
PSE	0.12	0.28	0.60

Table 28: Transition Matrix for Poland-Cohort 2 (ISCED Categories)

Variable Names	Below Upper secondary	Upper secondary	PSE
Below Upper secondary	0.65	0.25	0.10
Upper secondary	0.32	0.32	0.35
PSE	0.14	0.33	0.52

Table 29: Transition Matrix for Slovenia-Cohort 1 (ISCED Categories)

Variable Names	Below Upper secondary	Upper secondary	PSE
Below Upper secondary	0.30	0.62	0.08
Upper secondary	0.10	0.63	0.27
PSE	0.03	0.52	0.45

Table 30: Transition Matrix for Slovenia-Cohort 2 (ISCED Categories)

Variable Names	Below Upper secondary	Upper secondary	PSE
Below Upper secondary	0.45	0.49	0.06
Upper secondary	0.22	0.59	0.19
PSE	0.00	0.22	0.78

Table 31: Transition Matrix for Sweden-Cohort 1 (ISCED Categories)

Variable Names	Below Upper secondary	Upper secondary	PSE
Below Upper secondary	0.22	0.56	0.22
Upper secondary	0.08	0.62	0.30
PSE	0.02	0.52	0.46

Table 32: Transition Matrix for Sweden-Cohort 2 (ISCED Categories)

Variable Names	Below Upper secondary	Upper secondary	PSE
Below Upper secondary	0.27	0.60	0.14
Upper secondary	0.13	0.45	0.42
PSE	0.01	0.27	0.72

Table 33: Transition Matrix for Switzerland-Cohort 1 (ISCED Categories)

Variable Names	Below Upper secondary	Upper secondary	PSE
Below Upper secondary	0.17	0.64	0.19
Upper secondary	0.03	0.68	0.29
PSE	0.02	0.50	0.48

Table 34: Transition Matrix for Switzerland-Cohort 2 (ISCED Categories)

Variable Names	Below Upper secondary	Upper secondary	PSE
Below Upper secondary	0.17	0.66	0.17
Upper secondary	0.04	0.73	0.22
PSE	0.01	0.51	0.48

Table 35: Transition Matrix for United Kingdom-Cohort 1 (ISCED Categories)

Variable Names	Below Upper secondary	Upper secondary	PSE
Below Upper secondary	0.57	0.23	0.21
Upper secondary	0.27	0.31	0.43
PSE	0.16	0.23	0.61

Table 36: Transition Matrix for United Kingdom-Cohort 2 (ISCED Categories)

Variable Names	Below Upper secondary	Upper secondary	PSE
Below Upper secondary	0.52	0.20	0.28
Upper secondary	0.34	0.12	0.54
PSE	0.23	0.14	0.63

Table 37: Transition Matrix for United States-Cohort 1 (ISCED Categories)

Variable Names	Below Upper secondary	Upper secondary	PSE
Below Upper secondary	0.48	0.30	0.23
Upper secondary	0.14	0.51	0.35
PSE	0.06	0.22	0.73

Table 38: Transition Matrix for United States-Cohort 2 (ISCED Categories)

Variable Names	Below Upper secondary	Upper secondary	PSE
Below Upper secondary	0.26	0.52	0.22
Upper secondary	0.07	0.49	0.44
PSE	0.00	0.27	0.73

Table 39: Transition Matrix for Belgium-Cohort 1 (Year Categories)

Variable Names	10 or Fewer	Between 11 and 14	More than 14
10 or Fewer	0.11	0.56	0.33
Between 11 and 14	0.04	0.40	0.56
More than 14	0.03	0.16	0.80

Table 40: Transition Matrix for Belgium-Cohort 2 (Year Categories)

Variable Names	10 or Fewer	Between 11 and 14	More than 14
10 or Fewer	0.25	0.42	0.33
Between 11 and 14	0.05	0.36	0.59
More than 14	0.00	0.15	0.85

Table 41: Transition Matrix for Canada-Cohort 1 (Year Categories)

Variable Names	10 or Fewer	Between 11 and 14	More than 14
10 or Fewer	0.27	0.59	0.13
Between 11 and 14	0.13	0.63	0.24
More than 14	0.07	0.48	0.46

Table 42: Transition Matrix for Canada-Cohort 2 (Year Categories)

Variable Names	10 or Fewer	Between 11 and 14	More than 14
10 or Fewer	0.31	0.53	0.15
Between 11 and 14	0.06	0.59	0.35
More than 14	0.08	0.43	0.49

Table 43: Transition Matrix for Chile-Cohort 1 (Year Categories)

Variable Names	10 or Fewer	Between 11 and 14	More than 14
10 or Fewer	0.53	0.41	0.07
Between 11 and 14	0.11	0.54	0.35
More than 14	0.03	0.24	0.74

Table 44: Transition Matrix for Chile-Cohort 2 (Year Categories)

Variable Names	10 or Fewer	Between 11 and 14	More than 14
10 or Fewer	0.63	0.31	0.06
Between 11 and 14	0.06	0.62	0.32
More than 14	0.29	0.24	0.47

Table 45: Transition Matrix for Czech Republic-Cohort 1 (Year Categories)

Variable Names	10 or Fewer	Between 11 and 14	More than 14
10 or Fewer	0.17	0.78	0.05
Between 11 and 14	0.03	0.77	0.20
More than 14	0.03	0.37	0.60

Table 46: Transition Matrix for Czech Republic-Cohort 2 (Year Categories)

Variable Names	10 or Fewer	Between 11 and 14	More than 14
10 or Fewer	0.20	0.69	0.11
Between 11 and 14	0.08	0.63	0.28
More than 14	0.00	0.42	0.58

Table 47: Transition Matrix for Denmark-Cohort 1 (Year Categories)

Variable Names	10 or Fewer	Between 11 and 14	More than 14
10 or Fewer	0.28	0.53	0.20
Between 11 and 14	0.11	0.48	0.41
More than 14	0.05	0.35	0.61

Table 48: Transition Matrix for Denmark-Cohort 2 (Year Categories)

Variable Names	10 or Fewer	Between 11 and 14	More than 14
10 or Fewer	0.30	0.41	0.29
Between 11 and 14	0.15	0.50	0.35
More than 14	0.11	0.25	0.64

Table 49: Transition Matrix for Finland-Cohort 1 (Year Categories)

Variable Names	10 or Fewer	Between 11 and 14	More than 14
10 or Fewer	0.08	0.60	0.32
Between 11 and 14	0.11	0.36	0.53
More than 14	0.04	0.17	0.79

Table 50: Transition Matrix for Finland-Cohort 2 (Year Categories)

Variable Names	10 or Fewer	Between 11 and 14	More than 14
10 or Fewer	0.36	0.42	0.22
Between 11 and 14	0.11	0.30	0.59
More than 14	0.05	0.23	0.72

Table 51: Transition Matrix for Germany-Cohort 1 (Year Categories)

Variable Names	10 or Fewer	Between 11 and 14	More than 14
10 or Fewer	0.59	0.24	0.17
Between 11 and 14	0.42	0.35	0.23
More than 14	0.46	0.28	0.26

Table 52: Transition Matrix for Germany-Cohort 2 (Year Categories)

Variable Names	10 or Fewer	Between 11 and 14	More than 14
10 or Fewer	0.60	0.27	0.12
Between 11 and 14	0.56	0.28	0.17
More than 14	0.45	0.31	0.24

Table 53: Transition Matrix for Hungary-Cohort 1 (Year Categories)

Variable Names	10 or Fewer	Between 11 and 14	More than 14
10 or Fewer	0.31	0.61	0.09
Between 11 and 14	0.12	0.66	0.22
More than 14	0.04	0.45	0.51

Table 54: Transition Matrix for Hungary-Cohort 2 (Year Categories)

Variable Names	10 or Fewer	Between 11 and 14	More than 14
10 or Fewer	0.34	0.51	0.15
Between 11 and 14	0.08	0.65	0.28
More than 14	0.02	0.32	0.66

Table 55: Transition Matrix for Ireland-Cohort 1 (Year Categories)

Variable Names	10 or Fewer	Between 11 and 14	More than 14
10 or Fewer	0.49	0.44	0.07
Between 11 and 14	0.22	0.59	0.19
More than 14	0.08	0.77	0.15

Table 56: Transition Matrix for Ireland-Cohort 2 (Year Categories)

Variable Names	10 or Fewer	Between 11 and 14	More than 14
10 or Fewer	0.63	0.32	0.05
Between 11 and 14	0.15	0.76	0.09
More than 14	0.00	0.38	0.62

Table 57: Transition Matrix for Italy-Cohort 1 (Year Categories)

Variable Names	10 or Fewer	Between 11 and 14	More than 14
10 or Fewer	0.45	0.41	0.14
Between 11 and 14	0.19	0.42	0.38
More than 14	0.11	0.34	0.55

Table 58: Transition Matrix for Italy-Cohort 2 (Year Categories)

Variable Names	10 or Fewer	Between 11 and 14	More than 14
10 or Fewer	0.44	0.38	0.18
Between 11 and 14	0.16	0.38	0.46
More than 14	0.12	0.29	0.59

Table 59: Transition Matrix for Netherlands-Cohort 1 (Year Categories)

Variable Names	10 or Fewer	Between 11 and 14	More than 14
10 or Fewer	0.18	0.53	0.30
Between 11 and 14	0.09	0.36	0.55
More than 14	0.05	0.23	0.72

Table 60: Transition Matrix for Netherlands-Cohort 2 (Year Categories)

Variable Names	10 or Fewer	Between 11 and 14	More than 14
10 or Fewer	0.36	0.38	0.26
Between 11 and 14	0.11	0.46	0.43
More than 14	0.05	0.33	0.62

Table 61: Transition Matrix for New Zealand-Cohort 1 (Year Categories)

Variable Names	10 or Fewer	Between 11 and 14	More than 14
10 or Fewer	0.23	0.77	0.00
Between 11 and 14	0.22	0.63	0.15
More than 14	0.12	0.48	0.41

Table 62: Transition Matrix for New Zealand-Cohort 2 (Year Categories)

Variable Names	10 or Fewer	Between 11 and 14	More than 14
10 or Fewer	0.29	0.57	0.14
Between 11 and 14	0.11	0.57	0.31
More than 14	0.05	0.58	0.37

Table 63: Transition Matrix for Norway-Cohort 1 (Year Categories)

Variable Names	10 or Fewer	Between 11 and 14	More than 14
10 or Fewer	0.23	0.52	0.26
Between 11 and 14	0.07	0.37	0.56
More than 14	0.02	0.38	0.60

Table 64: Transition Matrix for Norway-Cohort 2 (Year Categories)

Variable Names	10 or Fewer	Between 11 and 14	More than 14
10 or Fewer	0.38	0.39	0.23
Between 11 and 14	0.24	0.28	0.48
More than 14	0.05	0.33	0.62

Table 65: Transition Matrix for Poland-Cohort 1 (Year Categories)

Variable Names	10 or Fewer	Between 11 and 14	More than 14
10 or Fewer	0.26	0.69	0.06
Between 11 and 14	0.10	0.71	0.19
More than 14	0.00	0.40	0.60

Table 66: Transition Matrix for Poland-Cohort 2 (Year Categories)

Variable Names	10 or Fewer	Between 11 and 14	More than 14
10 or Fewer	0.37	0.57	0.07
Between 11 and 14	0.17	0.58	0.25
More than 14	0.09	0.36	0.55

Table 67: Transition Matrix for Slovenia-Cohort 1 (Year Categories)

Variable Names	10 or Fewer	Between 11 and 14	More than 14
10 or Fewer	0.29	0.64	0.07
Between 11 and 14	0.10	0.72	0.18
More than 14	0.01	0.70	0.29

Table 68: Transition Matrix for Slovenia-Cohort 2 (Year Categories)

Variable Names	10 or Fewer	Between 11 and 14	More than 14
10 or Fewer	.		
Between 11 and 14	.	.	
More than 14	.	.	.

Table 69: Transition Matrix for Sweden-Cohort 1 (Year Categories)

Variable Names	10 or Fewer	Between 11 and 14	More than 14
10 or Fewer	0.26	0.60	0.14
Between 11 and 14	0.09	0.68	0.23
More than 14	0.12	0.45	0.44

Table 70: Transition Matrix for Sweden-Cohort 2 (Year Categories)

Variable Names	10 or Fewer	Between 11 and 14	More than 14
10 or Fewer	0.29	0.57	0.15
Between 11 and 14	0.00	0.31	0.69
More than 14	0.02	0.34	0.65

Table 71: Transition Matrix for Switzerland-Cohort 1 (Year Categories)

Variable Names	10 or Fewer	Between 11 and 14	More than 14
10 or Fewer	0.31	0.53	0.16
Between 11 and 14	0.10	0.53	0.37
More than 14	0.06	0.33	0.61

Table 72: Transition Matrix for Switzerland-Cohort 2 (Year Categories)

Variable Names	10 or Fewer	Between 11 and 14	More than 14
10 or Fewer	0.33	0.48	0.19
Between 11 and 14	0.14	0.65	0.21
More than 14	0.06	0.43	0.51

Table 73: Transition Matrix for United Kingdom-Cohort 1 (Year Categories)

Variable Names	10 or Fewer	Between 11 and 14	More than 14
10 or Fewer	0.05	0.87	0.08
Between 11 and 14	0.06	0.73	0.21
More than 14	0.00	0.41	0.59

Table 74: Transition Matrix for United Kingdom-Cohort 2 (Year Categories)

Variable Names	10 or Fewer	Between 11 and 14	More than 14
10 or Fewer	0.20	0.59	0.21
Between 11 and 14	0.04	0.50	0.45
More than 14	0.01	0.28	0.71

Table 75: Transition Matrix for United States-Cohort 1 (Year Categories)

Variable Names	10 or Fewer	Between 11 and 14	More than 14
10 or Fewer	0.30	0.52	0.18
Between 11 and 14	0.07	0.59	0.33
More than 14	0.03	0.26	0.71

Table 76: Transition Matrix for United States-Cohort 2 (Year Categories)

Variable Names	10 or Fewer	Between 11 and 14	More than 14
10 or Fewer	0.25	0.55	0.19
Between 11 and 14	0.05	0.60	0.35
More than 14	0.00	0.32	0.68