

HOW OFTEN DO APPLES FALL FAR FROM THE TREE? INTERGENERATIONAL EDUCATIONAL AND OCCUPATIONAL MOBILITY

Lex Borghans (Research centre for Education and the Labour Market (ROA), University of Maastricht) & L.F.M. (Loek) Groot (LGroot@econ.uu.nl, Utrecht School of Economics, Utrecht University)

JEL codes: I28, J16, J7

1. Introduction

It is widely documented that in the advanced capitalist societies of the Western world there is considerable social mobility, which led Gintis (1980: 13) to proclaim that “The brute fact is, however we assess trends, capitalism gives us a whole lot more mobility than it does other ingredients of social justice”. Indeed, the social class in which one is born does not determine one’s educational or occupational career as completely as for example in a caste system. Free educational and occupational choice, the so-called formal equality of opportunity, at least ensures that there are no legal barriers to enrol in a specific type of education or to enter a particular job. However, it is also a well-established empirical fact that the educational and occupational achievements of those from a low socio-economic background, say of the so-called underclass, are, on average, far below that of children from the upper classes. Despite increased mobility, class of origin is still among the most important factors determining one’s life-chances, and the access to education, offices and positions.

Ideally, what we should want is what (Rawls 1971: 73) describes as ‘fair equality of opportunity’ as follows:

positions are to be not only open in a formal sense, but that all should have a fair chance to attain them... [A]ssuming that there is a distribution of natural assets, those who are at the same level of talent and ability, and have the same willingness to use them, should have the same prospects of success regardless of their initial place in the social system. In all sectors of society there should be roughly equal prospects of culture and achievement for everyone similarly motivated and endowed. The expectations of those with the same abilities and aspirations should not be affected by their social class.

Clearly, fair equality of opportunity leaves open that genetic differences as well as processes of preference formation leading to diverging motivations and ambitions between classes will affect status achievements. So, although the citation above is quite clear in what the ideal is, it does not prescribe how under fair equality of opportunity the educational and occupational distribution differentiated by class should be. An easy way to see what it entails is when we assume that the natural distribution of innate abilities and talents among the offspring is the same across different socio-economic classes, and in addition, that parental support and encouragement in say the underclass is not different from those in privileged classes. Then we should expect roughly the same educational and occupational distribution of groups differentiated by their parents socio-economic background. In other words, if fair equality of opportunity would apply, then one’s social origin would have no influence at all on the chances to attain a particular

educational or occupational status, and therefore, social class background on the one hand and the educational and occupational distribution on the other would be independent.

It goes without saying that this is not the case: one's socio-economic background has still a profound impact on one's educational and occupational chances. Research in social stratification has focused on measuring class-related educational mobility and on class-related occupational mobility, but only rarely provided a unified framework to study both of them at the same time, taking interaction effects between class-biased educational and occupational distributions into account. There are of course notable exceptions. For example, Marshall, Swift and Roberts (1997), using Goldthorpe's classes, study both class distinctiveness in the educational domain and in the transition from education to class-destinations. A major part of their analysis addresses the question which (loglinear) model best fits the data (transformed into odds ratios). In particular, they test the hypothesis of increasing merit-selection, where merit is equated with educational attainment. This thesis of increasing educational merit-selection can be subdivided into three statements, to wit that:

- (i) differential access to occupational role is increasingly mediated through educational qualifications, whereas
- (ii) the direct (unmediated) association between class origins and class destinations becomes weaker, although
- (iii) there still might be a strong (but in time decreasing) association between class of origin and educational achievement.

Therefore, the importance of educational qualifications (achievement) for access to occupations increases relative to the (unmediated) effect of social class origin on class of destination (ascription).^{1, 2} Although the evidence is mixed with respect to whether the association between class of origin and education is increasing or decreasing (iii) and also with respect to the association between education and occupation (i), they nevertheless find in all their models that the unmediated association between class origin and class destination (ii) is significant, that is, including this association in the model describing the data always leads to an improvement of the explanatory power.³ The framework we present (in section 3) allows to make pronouncements which are closely related to (i)-(iii) statements above,⁴ but using a quite different technique, that of dissimilarity indices. Doing so offers us the opportunity to make pronouncements of the form x% of occupational segregation by class can be explained by the antecedent presorting in the educational domain, and y% can be explained by (unmediated class-based) postsorting (see below for definitions of these terms).

The pedigree of this framework to disentangle intergenerational educational and occupational mobility is our study of educational and occupational segregation between women and men (see Borghans

¹ See in particular Marshall, Swift and Roberts (1997), Chapter 5 which starts with the so-called 'meritocratic triad'. They conclude that "... an individual's social origins influence his or her class destinations, over and above their effects on his or her educational achievement".

² From this it cannot be concluded that the overall effect over class origin on destinations becomes weaker. It might well be the case that although the role educational attainment in the recruitment for occupational roles increases (i), at the same time also the association between class origin and educational attainments increases (iii), where the latter effect dominates the former.

³ The educational merit-selection model allowing associations between class origins and education (iii) and between education and class destinations (i), but no direct impact of class origin on class destination (ii), can always be improved significantly by allowing (ii).

and Groot 1999). We believe this framework can successfully be applied to the study of class mobility, provided a similar dichotomy can be made as between women and men. Admittedly, the distinction between women and men is as rigid as it can be, because there are no dubious cases, whereas in the distinction between different classes no such rigid split is attainable. This being a major drawback of our approach, we still think it is useful to perform the segregation analysis to social mobility.

In the remainder of this paper we first introduce the necessary ingredients to measure mobility rates and to construct segregation indices (section 2). Section 3 breaks down the chain ‘class of origin to class of destination’ into two trajectories, the first focusing on the educational trajectory, the second focusing on the transition from school to the labour market. In section 4 we present the data, and discuss which variables are used, and in what way. Sections 5 and 6 contain the empirical results. Conclusions can be found in the final section.

2. Mobility and status quo maintenance: some distinctions

To flesh out what is at stake consider a world (Im)mobilia, in which we can observe the occupational status of respondents and the social status of their parents,⁵ in a dichotomous way, as illustrated in Table 1. The capital letters L and H indicate the social background status, and the subscript the occupational status of the respondents. Column totals are denoted by dots and for row totals we use the capital letter T.

Table 1. Intergenerational occupational mobility

Occupational status respondent	Social status father		Row totals
	Low	High	
Low	L_1	H_1	T_1
High	L_2	H_2	T_2
Column totals	$L.$	$H.$	$T.$

It is most convenient to normalize the grand total $T.$ to 100%, so that all L_i and H_i and the indicators derived from them are just percentages. The degree of maintenance of the status quo can be represented by $(L_1+H_2)/T.$, and its complement, $(H_1+L_2)/T.$, measures the degree of occupational or class mobility. There is no occupational mobility in the highly unlikely case that both H_1 and L_2 are equal to zero. There is only upward occupational mobility if L_2 is greater than but H_1 is equal to zero. To test our intuitions, and we hope also those of the readers, we indicate what we thought are the most likely outcomes, before we started the empirical research.⁶ Firstly, we expected to find that the overall maintenance of status quo is higher than overall class mobility, so $(L_1+H_2)/T. > (H_1+L_2)/T.$ Secondly, for both groups of respondents

⁴ Somewhat prematurely, we can say that presorting refers to (i), postsorting to (ii) and educational segregation to (iii).

⁵ As is customary in this type of research, we take the fathers’ social status as a proxy for the social status of the parents. Moreover, we assume that social status is only determined by the occupational status, and not for instance by other indicators like being home-owner or renter, smoking or not, number of visits to musea, etc.

⁶ Normally, the empirical results are discussed against the background of intuitions and earlier findings, but doing so is bound to reflect, to some extent, the acquired knowledge of the results and thus to understate the degree to which we have been surprised.

the maintenance of the status quo outweighs occupational mobility, that is $L_1/L_2 > L_2/L_1$ and $H_2/H_1 > H_1/H_2$. Thirdly, the degree of upward mobility is higher than the degree of downward mobility, which is the case if the share L_2/L_1 is higher than H_1/H_2 . The logical corollary is that maintaining the status quo is more likely for those from a higher social background than for those from a lower social background, that is L_1/L_2 is less than H_2/H_1 .

Table 1 comprises only half the story. To illustrate, consider Adam, son of a butcher, and David, son of the Prime Minister, both equally talented. Adam has managed to pass university, but nevertheless ends up doing low skilled work, whereas David, despite his advantaged social background, is a high school drop out but, thanks to his father's well connections all over the place, is appointed a lucrative job of high prestige. That Adam's efforts to improve his position compared to where he comes from is not honoured is a pity, a good illustration of the saying that if you are born poor you remain poor all of your life, but that David's lack of discipline and freewheeling youth has no consequences at all for his adult working life makes Adam's situation extra hard. Again, this is all on the simplifying assumption that merit can be equated with educational achievements. Note that the saliency of the situation of Adam and David cannot be adequately represented in Table 1, where Adam is just situated in L_1 and David in H_2 . As a consequence, the observed occupational mobility in Table 1, $(H_1+L_2)/T_1$, is only a subset of the potential mobility, taking the latter as what we would expect if everybody is assigned the occupational status in accordance with educational credentials, disregarding class origin entirely. Table 2 expands Table 1 by taking the educational status of respondents into account.⁷ As in Table 1, the capital letters L and H indicate the social background status, and the subscripts the educational and occupational status of the respondents, respectively.

Table 2. Intergenerational occupational and educational mobility

Status respondent		Social status father		
Education	Occupation	Low	High	Row totals
Low	Low	L_{11}	H_{11}	T_{11}
High	Low	L_{21}	H_{21}	T_{21}
Low	High	L_{12}	H_{12}	T_{12}
High	High	L_{22}	H_{22}	T_{22}
Column totals		$L_{..}$	$H_{..}$	$T_{..}$

Table 2 thus represents all the possible combinations of father's social status vis-à-vis respondent's educational and occupational status. Each of the eight entries (from L_{11} to H_{22}) in the table represents a group with a unique combination of these three characteristics. These eight groups can be subdivided into three non-overlapping categories, which, for want of better terms, we label as Meritocratic, Unmeritocratic, and Topsy-turvy.

The cases under the rows T_{11} and T_{22} are the more likely cases and, to a lesser extent, 'as it should be' under the presumption that merit is fully described by educational credentials: Those in L_{11} did not

⁷ For simplicity, assume that the father's social status is entirely uncontroversial and unambiguous in the sense that if it is low (high) it reflects a low (high) occupational as well as a low (high) educational status.

manage to climb the occupational ladder due to their low educational achievement; neither did H_{11} , for the same reason, and the high social status of their parents was of no help. L_{22} and H_{22} both achieve a high occupational status which is uncontroversial because it is in accordance with their educational status. So, for both T_{11} and T_{22} occupational status can be thought of as reflecting, and the result of, their prior educational status. For this reason, we can say there is an allocational match between educational and occupational status. We label them, somewhat naively, as Meritocratic, because mobility and also status quo maintenance is mediated exclusively by educational attainments (see also the first row of Table 3 below).

Next, L_{21} and H_{12} represent the at prima facie unmeritocratic cases, with the qualification that L_{21} is unmeritocratic in a weak sense (it is a pity that it happens), and that H_{12} is wrong in a stronger sense (they occupy positions that should be allocated to others). These correspond to Adam and David respectively. The qualifications wrong in the weak and strong sense are of course only appropriate on the presumption that merit can be equated to educational achievement. If not, it might for instance be the case that persons like David, nourished by fortunate family and social circumstances, have a more favourable set of traits relevant for performing jobs of high status adequately.⁸ In a meritocratic society in which education is the only mediator and principal determinant of occupational status, with educational achievement replacing ascription according to class of origin, Adam would be assigned David's job.⁹

Finally, consider the more unlikely cases H_{21} and L_{12} . Those in H_{21} have an advantaged social background and did come up to the mark during their educational careers, but nevertheless end up doing work of low status. The chance that this happens is small, taking into account that both their social and educational background can be expected to work in the opposite direction, towards a job of high status. The occurrence of L_{12} is also unlikely: they come from far, and during school have never been up to much, but surprisingly manage to get hold of jobs of high social standing. In sum, these cases are exactly the opposite as what we would expect to observe in a society in which both the meritocratic and class mechanisms are in force, the reason why we label them as Topsy-turvy.

Table 3 lists the indicators which can be derived for the three groups discussed above. Making use of the distinctions underlying Table 2, we can also define in a straightforward manner upward and downward occupational mobility, and the degree of maintenance of the status quo, subdivided by meritocratic and unmeritocratic maintenance of status quo. We also added an indicator 'status reversal', which is the complement of the indicator for Topsy-turvy. Status reversal occurs when the social origin is low (high),

⁸ For a rather extensive treatment of meritocracy in relation to educational and occupational attainments, see Marshall, Swift and Robert (1997, esp. Ch. 5-7). According to them it is naive to equate merit with education: "Perhaps middle-class parents pass on to their children, whether genetically or through socialization, not only abilities relevant to educational attainment (such as intelligence or the motivation to achieve in school) but also abilities directly relevant to occupational success (such as willingness to take risks or to be innovative). In that case, a person of middle-class origins who failed in educational terms might still be more likely to merit an advantaged destination than someone of working-class origins, and any unexplained class effects need not tell against meritocratic claims broadly understood" (*ibid.*: 76). However, since they equate merit with educational achievement, this complexity is not taken into account in their empirical analysis, nor by us.

⁹ We expected to find that the frequency of L_{21} to be much higher than that of H_{12} , so even if H_{12} would become zero by giving these jobs to those who can be said to have deserved them on meritocratic grounds (like Adam), there will probably be too few 'unjustified' allocations (like David), which if corrected, could absorb and honour all upward educational mobility.

but both the educational and occupational status of the respondent is high (low). These indicators are listed in Table 3 below. For convenience, the grand total $T_{..}$ in Table 2 is normalized to 100%.

Table 3. Indicators for social stratification

<i>Indicator:</i>	<i>Measured by:</i>
Meritocratic match	$MM = (T_{11}+T_{22})/T_{..}$
Unmeritocratic match	$UM = (T_{21}+T_{12})/T_{..}$
Topsy-turvy	$TT = (H_{21}+L_{12})/(H_{.1}+L_{.2})$
Status reversal	$SR = (H_{11}+L_{22})/(H_{.1}+L_{.2})$
Non-maintenance of status quo	$NMS = (H_{.1}+L_{.2})/T_{..}$
Maintenance of status quo	$MS = (L_{.1}+H_{.2})/T_{..}$
Unmeritocratic maintenance of SQ	$UMS = (L_{21}+H_{12})/(L_{.1}+H_{.2})$
Meritocratic maintenance of SQ	$MMS = (L_{11}+H_{22})/(L_{.1}+H_{.2})$
Downward occupational mobility	$DM = H_{.1}/H_{..}$
Upward occupational mobility	$UM = L_{.2}/L_{..}$
Total occupational mobility	$TM = (H_{.1}+L_{.2})/(L_{.1}+H_{.2})$

As can be seen from Table 3, we deliberately chose to vary the nominators across the indicators.¹⁰ For instance, the denominator of downward occupational mobility (DM) comprises the cases H_{11} and H_{21} , or $H_{.1}$, representing those who have a high social origin but do have a low occupational status. The complement of $H_{.1}$ are those with a high social background who have managed to get a job of high status, situated in H_{12} and H_{22} , that is $H_{.2}$. So the indicator for downward occupational mobility becomes $H_{.1}/(H_{.1}+H_{.2}) = H_{.1}/H_{..}$. As in Table 2, the indicator for maintenance of status quo can be represented by $(L_{.1}+H_{.2})/T_{..}$, and its complement, non-maintenance of status quo, by $(L_{.2}+H_{.1})/T_{..}$.

We also make a subdivision between unmeritocratic and meritocratic maintenance of status quo, taking as the nominator the number of respondents for whom the occupational status is the same as their social background, what status quo maintenance in this context entails. The indicator of unmeritocratic maintenance of status quo then measures the incidence of divergence between educational and occupational status among all the respondents for whom the occupational status is the same as their social origin. On the same footing, the meritocratic maintenance of status quo measures the number of respondents for whom the occupational status is in accordance with their educational status, again relative to the number of respondents for whom the occupational status is the same as their social origin.

By definition, the following equalities apply:

¹⁰ The disadvantage of using different nominators is that we cannot observe immediately the relative frequencies, e.g. of Topsy-turvy compared with Meritocratic Match, because they have different nominators. However, this shortcoming can easily be remedied, e.g. multiplying Topsy-turvy by Non-maintenance of status quo gives the frequency of Topsy-turvy as against the grand total.

- (1) $MM+UM = 1$
- (2) $SR+TT = 1$
- (3) $MS+NMS = 1$
- (4) $MMS+UMS = 1$

where we expect to find that in each equation the first term to be higher than the second. In addition, we expect that:

- (5) $UOM > DOM$

The expectation that upward (UOM) outweighs downward occupational mobility (DOM) is motivated by the fact that after World War II there was a steadily expansion of the service sector, inhabited mainly by skilled white collar jobs, accompanied by a steadily decline of the agricultural sector, and to a lesser extent, of the manufacturing sector; populated mainly by unskilled or only low skilled workers. At the same time the length of the educational careers became longer, on average, for each successive cohort entering the labour market.

In section 5, we will use these indicators to get a first impression of social stratification in different countries, and in different time periods. So far the analysis was entirely dichotomous, not only with respect to class (either low or high), but also with respect to educational and occupational status. The analysis of the next section maintains the first dichotomy, but allows in principle any classification of educations and occupations, however detailed.

3. A two-step procedure: presorting and postsorting

Let us now turn to the issue of whether or not (and to what extent) fair equality of opportunities applies, and how it can be measured. Recall that Rawls' criterium of fair equality of opportunity demands that the educational and occupational achievements of those who are similarly endowed and motivated are not affected by social class. However, fair equality of opportunity does not necessarily lead to the situation that educational and occupational achievements are distributed equally across different classes of origin because we do not know whether native talents and aspirations are somehow related to class of origin, or distributed independently of social class. Only under the latter we may expect to find no differences between groups distinguished by social background. Therefore, we make the heuristic background assumption that in the 'default state of affairs' the distribution of ability, effort and also of parental support and encouragement is independent from origin of social class. We can make a distinction between fair equality of opportunity in the educational domain and fair equality of opportunity in the occupational domain. Later on we will refine the analysis, taking the interaction between both domains into account.

Fair equality of opportunity in the educational domain requires that the fraction of respondents from a low social origin with a low (high) educational status is the same as that of the respondents with a high social origin. In terms of Table 2, this can be expressed as:

$$(7) \frac{L_{i.}}{L_{..}} = \frac{H_{i.}}{H_{..}},$$

with the subscript i denoting the educational category or level ($i = 1, 2, \dots, n$). If this equality applies, taken in the statistical sense that the differences between the ratios are statistically insignificant, then class privilege does not have any systematic effect on how people perform in educational terms. If it does not apply, then there is to some extent educational segregation (henceforth abbreviated as ES), e.g. that those from privileged class backgrounds attain higher educational credentials, on average, than those of say working class origin. We define *presorting* as the extent to which a different educational distribution of those from high and low social backgrounds, as measured by ES, give rise to or cause a different occupational distribution across classes of origin. Note that according to this definition, ES is clearly delimited from presorting: the former is just the extent to which class origins influences educational destinations, *irrespective* of its effects on occupational destination after leaving school, whereas the latter measures the further effect of class-induced ES on the occupational destination.

Analogously, for the occupational domain, with subscript j ($j = 1, 2, \dots, m$) denoting the occupational category, if

$$(8) \frac{L_{.j}}{L_{..}} = \frac{H_{.j}}{H_{..}},$$

then class privilege does not lead to unequal access to offices and positions, as represented by the occupational structure, but if it does, then there is transmission of class privileges and we will observe occupational segregation (henceforth OS). Of course, it is unlikely that equality in the occupational domain obtains when there is inequality in the educational domain. Through presorting part of the ES will pass on in the occupational domain.

Now, the whole theme of social stratification entails that these equalities do not apply, and the challenge is how what is taking place during the first trajectory, from class background to educational achievements, can be disentangled from what happens during the second trajectory, from educational achievements in conjunction with class background to occupational achievements. An appropriate index for ES can describe what is going on in the first trajectory. For the second trajectory we need, besides presorting, an index which measures adequately the incidence of *postsorting*, the phenomenon that persons from different class origins but of the same educational level end up in different occupational categories.

As we will see shortly, the index of postsorting we propose measures the distance between the existent distribution and a counterfactual distribution, where by hypothesis the occupational distribution by class is determined through ES and presorting only. In this counterfactual distribution, the transmission of class privileges takes only place in the first trajectory, but not (or only indirectly, through presorting) in the second. In other words, because the counterfactual distribution rules out the possibility that persons with the same educational background but different class of origin are in a systematic way unevenly distributed in the occupational domain, the difference between the actual distribution and this counterfactual distribution can be taken as an indicator of the impact of class, on top of its impact on

educational achievements, on the transition from school to the labour market among persons equally endowed in terms of educational credentials. In terms of the thesis underlying the educational merit-selection model discussed in the introduction (like cases in terms of educational credentials should be treated alike), if it holds, we should expect an insignificant amount of postsorting. Having made these preliminary clarifications and definitions, let us now turn to the measurement of ES, OS, presorting and postsorting.

Using the adjusted Duncan and Duncan dissimilarity index, the degree of ES can be expressed as:

$$(9) \quad ES = \theta \sum_{i=1}^n \left| \frac{L_{i.}}{L_{..}} - \frac{H_{i.}}{H_{..}} \right|$$

with

$$\theta = \frac{L_{..} H_{..}}{T_{..}^2},$$

and the degree of OS as:

$$(10) \quad OS = \theta \sum_{j=1}^m \left| \frac{L_{.j}}{L_{..}} - \frac{H_{.j}}{H_{..}} \right|$$

The value of the segregation indices can never exceed twice the value of the parameter θ : if the ES (or OS) is complete, e.g. when those of a low social background are all enrolled in lower levels of education and those of high social background are all enrolled in higher levels of education, then ES equals 2θ , as can easily be seen from Eq. (9). Suppose $L_{..}$ and $H_{..}$ are apportioned in such a way that they are of equal size, then $\theta = 0.25$ and ES and OS will always fall in between the range $[0; 2\theta = 0.5]$. However, it is customary to let segregation indices vary between 0 (no segregation) and 1 (complete segregation). To do so simply requires that ES and OS to be divided by 2θ .

In presenting the empirical results, we will nevertheless stick to ES and OS as defined by (9) and (10), because it can be given a well-defined meaning. ES and OS measure the share of the total number of workers (whether from low or high class of origin) who would have to change their education or occupation in order to eliminate segregation, while leaving the overall educational or occupational distribution unaffected.¹¹ For example, suppose $L_{..} = 0.4 * T_{..}$ and $H_{..} = 0.6 * T_{..}$, so that $\theta = 0.24$. Under complete educational segregation, $ES = 2\theta = 0.48$. To lift the educational segregation, while maintaining the overall educational distribution irrespective of class of origin as it is, requires that of both groups $L_{..}$ and $H_{..}$, 40% enrolls in lower education and 60% enrolls in higher education. Therefore, from those of $L_{..}$, 60%, and from those of $H_{..}$, 40% have to change their educational status. In total $(0.6 * L_{..}) + (0.4 * H_{..}) = 0.48 * T_{..}$ have to change educational status to arrive at an equal educational distribution by class of origin.

Having defined ES and OS, we now turn to the indices for pre- and postsorting. First we will define two alternative measures of postsorting, and then the indicator for presorting. As noted before, to construct an

¹¹ For more details, see Borghans and Groot 1999: 378-9.

index for postsorting we have to rely on a counterfactual distribution. This distribution, labelled *educ*, is characterized by the fact that no postsorting is taking place:

$$(11) \quad L_{ij}^{educ} = \frac{L_i}{T_i} T_{ij}$$

and

$$(12) \quad H_{ij}^{educ} = \frac{H_i}{T_i} T_{ij} = T_{ij} - L_{ij}^{educ}$$

where T_{ij} can be seen as the classblind nexus between occupation j and education i . Therefore, the influence of class operates via the factors L_i/T_i and H_i/T_i .

The baseline for measuring postsorting is the situation in which no postsorting occurs, that is, when students from one type of education are distributed over occupational classes irrespective of social background status, but merely in proportion to the educational ratios L_i/T_i and H_i/T_i . Note that the *educ*-distribution indeed rules out postsorting, yet still allows any degree of ES and presorting.¹² Of course, in the limiting case of complete ES there can be no postsorting because there are no persons with the same educational credentials but different class of origin, taking into account that postsorting is defined as the extent to which persons of equal educational status but different class of origin end up into different occupational categories. Therefore, all other things equal, the higher the degree of ES, the less scope for postsorting. In the other extreme, that of no ES at all, where those of different class of origin are in an impeccable way evenly distributed over educations, there is still ample room for postsorting leading to OS, but no room for presorting, the latter defined as the extent to which a given level of ES passes on to OS. So it seems that both pre- and postsorting have to be related in some way to the degree of ES. A further complication is that for a given level of ES, presorting will be more likely to occur, and postsorting less likely to occur, if the tightness of the link between occupations and educational prerequisites is strong (e.g. medical practitioners requiring specific medical training).

Making use of Eqs. (11) and (12), we define the first index for postsorting (PS^+) as:

$$(13) \quad PS^+ = \sum_{i=1}^n \sum_{j=1}^m \left| \frac{L_{ij}}{T_{..}} - \frac{L_{ij}^{educ}}{T_{..}} \right|,$$

which thus measures the ‘distance’ between the actual distribution and the counterfactual distribution as induced merely by ES. As said, in the counterfactual *educ* distribution no postsorting takes place, because the chance of someone with a low social background and education i to end up in occupation j , given the number of workers in (i,j) , only depends on the educational share of her social classmates in this type of education. For example, suppose that some occupation j recruits exclusively from one particular type of education i , and also that this type of education is such specific that it only prepares for doing job j (e.g. dental educational

¹² In fact, under *educ* the extent of presorting is equal to that of ES.

preparing for being a dentist), then T_{ij} is equal to T_i (that is, all dentists j have received a dential education i), and, under *educ*, $L_i = L_{ij}$ (that is, all those from a low class who manage to pass the dential education indeed become dentist, as is equally true for those of high class origin). Therefore, under *educ*, it is ruled out that those of high class origin who have prepared for being a dentist have a higher chance actually to become dentist, e.g. because one of their parents already is a dentist and they can take over their practice, than those of a low class origin who are also trained to become a dentist. Thus, under *educ*, the transmission of class privileges can by definition only occur in the educational domain.

Note that in the counterfactual distribution which obeys *educ*, the ES is the same as that of the actual distribution, because in deriving L_{ij}^{educ} and H_{ij}^{educ} according to (11) and (12), we take the actual educational distribution by class as given. This can easily be checked by calculating L_i^{educ} and H_i^{educ} using L_{ij}^{educ} and H_{ij}^{educ} as defined by Eqs. (11) and (12), and then using them to calculate ES according to Eq. (9). Since PS^+ measures the divergence of the actual from the *educ* distribution, while both distributions take the existent level of ES (and therefore also the extent of ES-induced presorting) as given, it really measures the ‘on top of’ postsorting effect on the occupational segregation by class, that is, over and above the effect of ES-induced presorting.¹³

For the second index of postsorting, consider again the *educ* distribution as defined by Eqs. (11) and (12). The amount of OS that would result under this distribution, call this OS^{educ} , must by definition be entirely due to presorting. The difference between OS and OS^{educ} can therefore be taken as an alternative measure for postsorting, so:

$$(14) \quad PS^{+} = OS - OS^{educ}$$

Taking stock of the indices put forward so far and relating it to the theme of equality of opportunity, we propose to say that there is (high) equality of opportunity in the educational domain if ES is zero (low). *Given* the degree of ES, there is (high) equality of opportunity in the occupational domain if the degree of PS^+ or PS^{+} , whichever one prefers, is zero (low). No or little postsorting means that those with the same educational skills, whatever their social background, have the same access to offices and positions of power.

As indicator for the degree of presorting (PS^-), we propose the following formula:

$$(15) \quad PS^{-} = ES - R$$

One may be tempted to treat the ratio of ES and OS as an adequate indicator for presorting. However, this would be imprecise because so far we have overlooked a salient phenomenon which might take place in the transition from school to the labour market, that of *reintegration*, for which we will use the symbol R.

¹³ It is a reasonably precise, but not an exact measure, because we measure postsorting against the baseline in which only presorting and no postsorting occurs. However, we do not know whether the extent of presorting in the actual distribution is higher, lower, or the same as in the counterfactual *educ* distribution. If it is lower, then probably the extent of postsorting measured according to (13) is under-estimated, because a large part of total OS is already due to presorting as based on the *educ* distribution.

Reintegration measures the extent to which people from a low social background and a low educational status end up in the same occupational category as people from a high social background and a high educational status. It is therefore a kind of *negative* presorting, taking positive presorting as the rule, and reintegration as the exception. Basically, what Eq. (15) expresses is that the extent of segregation by social class in the educational domain (ES) not neutralized by reintegration remains segregated in the occupational domain. Note that postsorting does not figure in Eq. (15), and rightly so, because postsorting is something which takes place among people with the same educational skills but different classes of origin, and has therefore nothing to do with presorting, which result when people of different classes of origin are unevenly distributed over educations, and subsequently allocated more or less unevenly, depending on the tightness of the link between educations and occupations, over occupations.¹⁴

4. Data and variables

The data set we used is the *International stratification, mobility and politics file*, which contains 95 variables and 211,929 cases for 16 countries, covering the period 1956-1991. To ensure that we have enough cases in each cell, we selected only those countries for which more than 10,000 observations were available. For our analysis, the following variables are of particular interest:

EDUCYR	Years of education respondent
FEDUCYR	Years of education father
EGP10	EGP10 class respondents' present profession
FEGP10	EGP10 class fathers' profession in respondents' adolescence
SIOPS	Prestige respondents' present or former profession
FSIOPS	Prestige fathers' profession in respondents' adolescence
ISEI	Status respondents' present or former profession
FISEI	Status fathers' profession in respondents' adolescence

EGP10 stands for the Erikson, Goldthorpe and Portocarrero class code of profession (see Erikson, Goldthorpe and Portocarrero 1979 and Ganzeboom, Luijkx and Treiman 1989); SIOPS is the abbreviation of the Standard International Occupational Prestige Scale of profession (see Treiman 1977) and ISEI of the International Socio-Economic Index of Occupational Status (see Ganzeboom, de Graaf and Treiman 1992). The EGP10 Goldthorpe classes are based on aggregating different occupational titles whose members share similar market and work situations, the former referring to levels of income, the degree of economic security, chances of promotion, etc., the latter referring to e.g. (lack of) autonomy and control in performing work. The prestige score SIOPS ranks occupations on a unidimensional scale according to

¹⁴ The only way to make use of postsorting to devise an index for presorting is indirectly, simply by assuming that presorting is hold accountable for the extent of OS not explained by postsorting, so $PS^- = OS - PS^+$. However, it can be shown that although PS^- according to Eq. (15) is very close to PS^- , in general $PS^- < PS^-$. We prefer the expression $PS^- = ES - R$ which takes ES as the baseline for the reason that, as noted above, presorting has to be related in some way to ES. For example, if ES is complete, then there is ample scope for presorting, but the extent to which it occurs depends on the extent of reintegration as a countervailing tendency.

social standing in the community at large. Finally, the status score ISEI is based on the socio-economic status of occupations, as reflected by the educational and income levels of its members. For more details, we refer to the sources mentioned above.

For EDUCYR, EGP10, SIOPS and ISEI the data set sometimes also includes information about the mother of the respondent, but the percentage of missing values for the mother is extremely high for these variables (for MEDUCYR it is 68%, for the occupational variables MEGP10, MSIOPS and MISEI it is well above 90%), so we did not make use of information about the mother of the respondent. For the same reason we did not make use of the variables EGP110, SIOPS1 and ISEI1 (percentage of missing values almost 90%), indicating the class, prestige or status of respondents' first rather than present or former profession. These high percentages of missing values are not because of a low quality of the questionnaires underlying the data set. The *International stratification, mobility and politics file* is constructed by merging the data of a great number of questionnaires, conducted in different countries over a long time period. Only a minority of them reported the variables for which the percentage of missing values are extremely high.

The three occupational variables FEGP10, FSIOPS and FISEI provides us with three different ways to dichotomize the respondents into low and high social background, dependent on the class, status or prestige score of the fathers' profession. In constructing the dichotomy between low and high class origin, we have to sail between Scylla and Charybdis. We can make both groups more homogeneous by applying strict criteria, but this necessarily involves that all intermediary cases (those neither belonging to the underclass, nor to the most privileged class) are left out (this option was chosen for the mobility analysis presented in section 5). Or we apply less strict criteria, with the effect that intermediary cases are assigned to either the low or the high social class, depending on the yardstick used (this option was chosen for the segregation analysis presented in section 6). A further complication is that we want to check to what extent observed mobility rates and status quo maintenance is affected by different occupational classifications.

We proceeded in the following way. First, we collapsed the EGP10 classification into two broad categories, that of non-manual and manual work. The only exception is the category of manual supervisors, which we have merged with the occupations belonging to non-manual work, for the reason that supervising manual work is not the same as doing manual work yourself. We also eliminated the category of self-employed farmers, because we expect that especially this category can bias our results. Usually, the farm is handed over from father to son, and the son is led up the path of farming from his early childhood onwards. Taking all this together, the first group (labelled 'high') contains 45.5% of all cases and comprises the higher controllers, lower controllers, routine nonmanual workers, the self-employed and the manual supervisors. The second group ('low') contains 55.5% of all cases, comprising the skilled manual workers, semi-unskilled manual workers and farm labourers. This 45:55 division gives a value for θ of 0.2475 (see Eq. (9) above).

The variables FSIOPS and FISEI are scaled on an interval of [12; 82] and [10; 90], respectively. The lower the score, the lower the prestige or status of the fathers' profession in respondents' adolescence. The cut-off point for both these variables is chosen in such a way that we get approximately the same

45:55 division¹⁵ as we arrived at using the variable FEGP10. In doing so, we get groups ('low' or 'high') of equal size, whatever the variable used to define class of origin. For the prestige scale indicator of FSIOPS, the interval [10; 33] comprises 44.3% and the interval [34; 90] contains 55.7% of all cases. For FISEI, the interval [12; 39] comprises 45.7% and the interval [40; 82] contains 54.3% of all cases.

We are well-aware that these distinctions do not lead to two homogeneous groups separating respondents into 'high' and 'low' socio-economic background, as measured by the occupational status of the father during the respondents' adolescence. For instance, one could make both groups high and low more and more homogeneous by eliminating more and more intermediary cases of FSIOPS or FISEI, e.g. dropping all cases where the status or prestige is in the middle range [40; 70], so that a score below 40 is classified as low and a score above 70 as high. However, to apply the same exercise to the FEGP10 variable is not possible, because there is no clear cut category which represents the intermediary group. The point to keep in mind is that the differences we find in educational and occupational mobility between the two groups high and low must be taken as a lower bound: if we really had the opportunity to make a clear cut division between homogeneous low and high social background groups, taking into account all that is relevant to make such a division, then we might expect more marked differences compared with our analysis which also includes the intermediary cases. [For those who find this unsatisfactory, we refer to the Appendix, where we have performed the analysis for all countries lumped together, but using a combination of different variables to construct two rather homogeneous groups, but at the expense of the loss of a great number of observations.]

There is, however, one additional variable which we should take into account, the years of education of the respondents' father (FEDUCYR). The percentage of missing values for this variable is 51%, which is twice as high as for the occupational variables FSIOPS, FISEI and FEGP10. The remaining 49% is distributed as follows: 6 years of education or less (41%), 7-8 years (23.7%), 9-10 years (12.5%), 11-12 years (8.4%), and more than 13 or more years (10.4%). Taking again the 45:55 division as a benchmark, we define the group of low social background if the father has 6 or less years of education, that is, only primary school, comprising 41% of the cases with non-missing values for fathers' education, and the group of high social background if the number of years of education is more than 6 years.¹⁶ This division leads to a value for θ of 0.20.

¹⁵ In effect, choosing the cut-off points so that quantitatively the same division between low and high results, means that θ is the same, whatever variable we use to define class of origin. Because class of origin is based on the variables FEGP10, FISEI or FSIOPS, choosing the cut-off points in such a way that approximately equal sized high and low classes of social background results enhances the comparison of segregation indices between the different classifications of class of origin.

¹⁶ Combining the occupational variables FSIOPS, FISEI and FEGP10 with FEDUCYR gives the following possibility to increase the homogeneity of both groups, with only a modest loss of observations: If FEDUCYR has a missing value, then we proceed as above by using either FSIOPS, FISEI or FEGP10. However, if FEDUCYR is known, a respondent is assigned a low class origin only if both FEDUCYR is low (6 years or less) and the class, prestige or status of the occupational variable (FEGP10, FSIOPS or FISEI) is low, with the boundary between low and high as defined above. The cases which are eliminated by this procedure are therefore those for which either FEDUCYR is low but the value for the occupational variable is high, or the other way around. In the Appendix we do something similar, but more radical still (see Appendix B).

5. Mobility and status quo maintenance: empirical results

Brute facts about mobility are fascinating in themselves. This section provides such facts, the next section contains the more technical segregation indices. Tables 1 to 3 present the mobility figures for the USA, Germany and the United Kingdom, corresponding to Tables 1 to 3 of section 2. Some preliminary remarks are in order. We defined the occupational status of the respondent and his or her father as low if the score on the variable ISEI and FISEI was 33 or less, and the occupational status as high if the score is 50 or higher. As a consequence, all cases where either ISEI or FISEI is in between the range [34; 49] are left out of the picture. Admittedly, this leads to a considerable loss of observations, but the gain is also considerable because now the dichotomy between low and high status is quite sharp, that is, without intermediary cases which might blur the picture.¹⁷ The boundaries 33 and 50 for the occupational status score variable are chosen such that, over all three countries, we get approximately a 60/40 low/high split for the occupational status of the fathers, and a 50/50 split for the occupational status of the respondents.

Table 1. Intergenerational occupational mobility in USA, Germany and UK

Occupational status respondent	Occupational status father											
	Low				High				Row totals			
		USA	GER	UK		USA	GER	UK		USA	GER	UK
Low	L ₁	36	51	42	H ₁	7	5	6	T ₁	42	56	48
High	L ₂	26	18	14	H ₂	32	26	38	T ₂	58	44	52
Column totals	L _.	62	69	56	H _.	38	31	44	T _.	100	100	100

According to Table 1, for an Englishman whose father has a low occupational status, the chance to attain a high occupational status is only 25% (14/56). However, if one is born into an English family where the father has a high occupational status, the chance to reach that same status is 86% (38/44). Analogously, three out of four born into a family where the occupational status of the father is low also end up with a low occupational status, but if the father's occupational status is high, only one out of seven (14% or 6/44) end up low. The latter figure is one out of six for Germany (5/31) and one out of five for the USA (7/38). Clearly, occupational mobility rates are highest in the USA, not so much because downward mobility is high but mainly because the chance to end up high while one's father's status is low is rather high, more than 40% (26/62), compared to only 26% in Germany and 25% in the UK.

In section 2 we formulated three expectations concerning Table 1. These were:

1. Overall maintenance of status quo is higher than overall class mobility, $(L_1+H_2)/T_1 > (H_1+L_2)/T_2$. In the UK, status quo maintenance is highest, 80%, against 68% in the USA, and Germany in between.
2. For both groups of respondents the maintenance of the status quo outweighs occupational mobility, $L_1/L_1 > L_2/L_2$ and $H_2/H_2 > H_1/H_1$. In each of the three countries status quo maintenance is more likely than mobility, both for those of low class origin and for those of high class origin. Therefore, these expectations are also met.
3. The degree of upward mobility is higher than the degree of downward mobility, $L_2/L_1 > H_1/H_2$. This expectation states that it is more likely that fathers of low status see their children climb the

occupational ladder than that fathers of high status see their children descend the occupational ladder. The expectation is met because upward mobility is always higher than 25%, whereas downward mobility is always less than 18%. The USA is here the most extreme case, with both upward and downward mobility the highest among the three countries.

Summarizing we might say that besides status quo maintenance, which is predominant, there is considerable mobility. To know to what extent status quo maintenance and mobility is meritocratic, in the sense of mediated by educational achievements, we have to dig one level deeper.

Table 2 introduces one more dimension, that of the educational level of respondents. To get a clear dichotomy between a low and a high educational status, a similar procedure is followed as above in constructing the occupational status. If the number of years of education is 9 or less, the educational status is low, and when it is 12 or more, it is high. The respondents whose educational level falls into the intermediary range of 10 and 11 years of education are therefore left out. The division of occupational status into low and high in Table 2 is the same as underlying Table 1. Because the indicators listed in Table 3 are derived straightforwardly from the figures of Table 2, the results of both tables are discussed simultaneously.

Table 2. Intergenerational occupational and educational mobility

Status respondent		Occupational status father								Row totals			
Education	Occupation	Low	USA	GER	UK	High	USA	GER	UK		USA	GER	UK
Low	Low	L ₁₁	21	50	41	H ₁₁	1	5	6	T ₁₁	22	54	46
High	Low	L ₂₁	15	1	1	H ₂₁	6	1	1	T ₂₁	21	2	2
Low	High	L ₁₂	3	12	9	H ₁₂	1	6	9	T ₁₂	3	18	18
High	High	L ₂₂	23	6	4	H ₂₂	31	20	29	T ₂₂	54	26	34
Column totals		L _{..}	62	69	55	H _{..}	38	31	45	T _{..}	100	100	100

To start with what the countries have in common, the great majority of cases is where the educational status is in accordance with the occupational status of the respondents, either the education-occupation combination low-low (T₁₁) or high-high (T₂₂). This is measured by the indicator MM in Table 3, representing the share of meritocratic matches. In all three countries, more than three quarter of all cases have a meritocratic nexus. Also, in all three countries the likelihood that both respondents' educational and occupational status is low, while father's occupational status is high, is extremely low (see the percentages for H₁₁). The opposite is not true, at least not for the USA, where more than one third of the respondents with a low social background (23 out of 62) reaches a high educational as well as a high occupational status (L₂₂), compared to less than one out of ten in Germany (6/69) and the UK (4/55). H₁₁ and L₂₂ together comprise the category of status reversals of Table 3, which is most frequent in the USA.

The most remarkable divergence between the USA on the one hand and Germany and the UK on the other occurs in the cells L₂₁ and H₁₂, which correspond to the situation of Adam and David, as described in section 2. The situation of Adam is more prevalent in the USA whereas the situation of David is more prevalent in Europe. Together they comprise the category of topsy turvy. That cases like Adam occur frequently in the USA means that a high educational degree is no guarantee for a good job. This is

¹⁷ For the segregation analysis presented in section 6 we proceeded as explained in the previous section.

further reconfirmed by the fact that in the USA even the combination of a high social background and a high educational degree is not a guarantee for a good job (H_{21}/H_2 is about one sixth in the USA, but less than one out of twenty in Germany and the UK. In Europe, obtaining a high educational status is almost a guarantee (or requisite) for obtaining a high occupational status. In the UK only 2 out of 36 ($(L_{21}+H_{21})/T_2$) and in Germany 2 out of 28 persons with a high educational degree end up low occupationally. In the US, for more than a quarter, 21 out of 75, a high educational status is not connected to a high occupational status. Similarly, that cases like David occur frequently in Europe, but not in the USA, suggests that a favourable class origin can still be passed on to the children despite that they do not manage to get high educational degrees.

Table 3. Indicators for social stratification

<i>Indicator*</i>	<i>USA</i>	<i>GER</i>	<i>UK</i>	<i>NET</i>
$MM = T_{11}+T_{22}$	76	81	80	82
$UM = T_{21}+T_{12}$	24	20	20	18
	100	100	100	100
$NMS = H_{.1}+L_{.2}$	33	23	20	26
$TT = H_{21}+L_{12}$	27 (8)	54 (13)	50 (10)	34 (9)
$SR = H_{11}+L_{22}$	73 (25)	46 (11)	50 (10)	66 (17)
	100	100	100	100
$MS = L_{.1}+H_{.2}$	67	77	80	74
$UMS = L_{21}+H_{12}$	21 (16)	9 (7)	13 (10)	12 (9)
$MMS = L_{11}+H_{22}$	79 (51)	91 (70)	87 (70)	88 (65)
	100	100	100	100
$TM = H_{.1}+L_{.2}$	33	23	20	26
$DM = H_{.1}/H_{.}$	21 (7)	26 (6)	35 (7)	27 (7)
$UM = L_{.2}/L_{.}$	79 (26)	78 (18)	65 (13)	73 (19)
	100	100	100	100

Regarding Table 3, the five expectations formulated in section 2 were:

1. $MM > UM$
2. $SR > TT$
3. $MS > NMS$
4. $MMS > UMS$
5. $UM > DM$

It can easily be checked that these expectations, except for the second one for Germany and the UK, are verified. That the category of Topsy-turvy is more prevalent in Germany and the UK than we expected is largely due to the high incidence of L_{12} , both absolutely and relatively (as a fraction of $L_{.1}$). In England and Germany approximately one out of five with a low educational degree and a low social background manage to get good jobs, against only one out of eight in the US. Mobility is highest, and therefore status quo maintenance lowest, in the USA. The lion share of status quo maintenance can be seen as meritocratic: MMS is about four to ten times higher than UMS.

6. Presorting and postsorting: empirical results

Figure 1A depicts for the USA the two alternative postsorting indices and the presorting indicator for the period 1954-1990. Although there is a difference between both postsorting indicators, they move quite closely in tandem. What emerges from Figure 1A is that presorting stays constant over time, but that postsorting seems to decline. Given the fact that there is no declining trend in ES, this means that class privilege remains important for educational achievements, and through presorting, for occupational destinations. However, the declining tendency of both indices of postsorting suggests that the direct (unmediated) impact of social background status on occupational status becomes less over time.

