The End of Dominance?

Evaluating Measures of Family Background in Stratification Research

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Abstract: We analyze how to best combine information on both parents' socioeconomic status (SES) in intergenerational research. This can be done by utilizing separate measures for either parents, taking averages over parents, or only using the highest value across parents – the latter commonly referred to as the dominance approach. We assess how much of the sibling correlations in education, occupation, and earnings that are explained by parents' SES in the same dimensions using the different operationalizations. The dominance approach performs substantially poorer than the other models. We end with a discussion of the implications for research on mobility and using SES background as a confounder.

Introduction

Mobility research was originally only interested in men and analyzed father-son associations (Goldthorpe, 1983, 1984). While this practice is not yet entirely obsolete, current research has on very good grounds brought mothers and daughters into the analyses. Outcomes for both sons and daughters are now analyzed, and measures of social background also take mother's SES position into account. However, current research often take the highest, or dominating value of SES across father and mother pairs to represent the family, especially for education and occupation. This may more often than not disregard mother's resources and downplay the totality of SES resources. This practice appears to in part be ad hoc based on a long research tradition where the aim was to conceptualize social background by one covariate per parental characteristic. Nevertheless, there is some substantive work that underlies this tradition. McDonald (1977) argued that children orient themselves to the more powerful parents and that his or her SES then becomes the more important. Similarly, Erikson (1984) originally outlined the dominance for social class, arguing that a household's living condition is more often structured by a dominant class position. In common practice, dominance has become equal to the highest of the mother's and father's position.

In this paper, we analyze how information from both mothers and fathers can be combined to measure social background most effectively. We will contrast the *dominance* approach with a model of individual measures for both the mother and father (a *mother/father* model), and a measure that take the average value of the combined parental resources (the *average* model), but also the rarely used *modified dominance* model. We use sibling correlations in outcomes as a benchmark for the total influence of the family, and then assess how much variance the different parental SES measures explain in children's outcomes.

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We find that dominance explain substantially less than the other measures. While the highest level of explained variance is achieved by separate mother/father measures, little is lost by taking averages for education and occupation.

Theoretical background

It is difficult to trace the practice of dominance, or the "highest value approach", back to any single root. Most work using this operationalization does not provide an explicit argument or refer to any specific study. Instead, this may be driven by mimicry of prior published works, which becomes a self-propelling practice once widely used. However, we believe that discussions in the class analysis tradition have been important, where Erikson (1984) probably is the original founder of this approach. Yet, his works was also an amalgamation of the works of e.g., Lockwood and Goldthorpe. It is important to note that Erikson was entirely focused on social class, and not on education, income or a continuous measure of occupational status. In fact, Erikson (1984) never proposed that the dominance principle should be used on other SES factors than a nominal class scheme, and was certainly open for e.g., taking averages for continuous measures. However, research on intergenerational inequality and mobility have, over time, come to refer to the approach of taking the highest value across parents as a dominance coding regardless of the SES factor under study (cf. Korupp *et al.*, 2002, Meraviglia and Buis, 2015). The theoretical as well as the methodological question is whether to measure family SES by individual parent or family measures, and in the latter case, how to operationalize a combined family variable.

Family or individual?

The conventional framework in mobility studies originally assumed that (1) the family in itself was the unit of analysis (cf. Watson and Barth, 1964) and (2) that this unit was either

defined by the male (Goldthorpe, 1983, 1984) or by the exclusionary dominance of one of the parents (Erikson, 1984). Kalmijn (1994) states three reasons for this practice (p. 257):

> First, because maternal and paternal status characteristics are highly correlated, it was often assumed that mother's characteristics would be of little help in explaining additional variance in educational and occupational outcomes. Second, because few mothers were working outside the home when status attainment research was developing, socioeconomic differences among employed mothers were not believed to be as consequential as socioeconomic differences among fathers. Third, data on the socioeconomic characteristics of mothers in nationally representative surveys have been scarce."

In effect, the male centered and the dominance principle alike most often resulted in neglecting women's work and status positions, although the original idea with the dominance approach was not to restrict the analysis to men. However, criticism against this one-sided research practice emerged and included empirical concerns as well as a theoretical critique against the assumption that the family always should be considered as the relevant unit of analysis. Even as far back as in the beginning of the sixties, Watson and Barth (1964), by using household, marital and labor market statistics, noted that the model of a patriarchal nuclear family deviated considerably from empirical data. Watson and Barth argued that social stratification was further complex and scholars had to extend their analysis to within family relationships and thus beyond the conventional male breadwinner approach. Pushing the argument further, Acker (1973) argued that generalizations about population mobility patterns and stratification trends where too narrowly inferred from studies based on white males. Clearly an unsatisfactory state of affairs, Acker called for an abandonment of the assumption of female dependence on males as well as the notion of the family being the unit of analysis, thus paving the way for research on female experiences of stratification.

Along these lines, McDonald (1977) argued instead that adolescents' identified with the most powerful parent, independent of the gender – a framework he labelled the Power model. A couple of years later, Erikson (1984) provided the 'dominance' solution to the problem.

Since social class was nominal, taking average values of different nominal categories would make little sense (but for e.g., income, Erikson had no opposition to average measures). Erikson argued that it was often the class position of one of the family members, i.e. the dominant, that was more decisive for the life chances and socioeconomic situation of the family. The underlying assumption was that "the market situation of the family is more dependent upon the work position of one of the parents than of the other, provided the positions are different" (p. 503), and the dominant position is the one with "the greatest impact upon ideology, attitudes, behavior and consumption patterns of the family members [… and] has most importance for the life chances of the children in the family (p. 504)". In Erikson's operationalization, and to simplify a bit, more qualified jobs dominated over less qualified jobs, non-manual jobs dominated over manual jobs, self-employment dominated over employment, and gainfully employment dominated over persons outside of the labor force. In practice, this meant that mother's class replaces father's class when their class position was higher than their male counterparts. Hence, (only) if the female had a higher ranking class, she would represent the family. Erikson's (1984) analysis clearly suggested that a dominance measure outperformed individual variables for predicting family level outcomes such as living space, standard of equipment, vacation, and cultural activities. But some early findings from the UK showed that women's work mattered over and above the occupational position of their spouses, e.g. in voting and fertility outcomes (Heath and Britten, 1984). Later, Sorensen (1994) however concluded that the conventional or family based approach probably did not lead to grave misrepresentations in empirical research. Nevertheless, she contended that proponents of this framework failed to recognize the research interest of female employment conditions as a value in itself.

One of the driving forces behind the critique of the conventional approach was the massive gain in the level of female employment – rising about 50 percentage points from the

1920´s to the 1980´s in the US (Beller, 2009). The Swedish case was no different, and Sweden now has one of the highest rates of female labor force participation in the world. Another aspect of this development is the clear rise of dominant mothers, i.e., mothers with equal or higher position in education, income, and/or occupation compared to their husbands (Meraviglia and Ganzeboom, 2008). In sum, given such a dramatic change over the 20th century, it is highly likely that both the totality of family resources and thus the variation within families as such should have gained importance over time.

Operationalizing socioeconomic background

The literature on how to best combine information of mothers and fathers into measures of family resources contains four models: separate mother father/measures, taking averages across parents, taking the highest value across parents (dominance), and the so called modified dominance approach in which both parents enter, but not by their gender but by their dominance order. The modified dominance thus contains two measures: the SES of the dominating and non-dominating parent. The case for a mother/father model is often motivated by the need to include including mothers in their own right. However, a one variable measure is often desired for statistical parsimony, easing interpretation, circumventing collinearity, and reducing consumption of degrees of freedom. The choice is then between averaging and dominance. For averaging, one must assume an equal influence of mothers' and fathers' SES.[1] In families with a low educated father and a high educated mother, there will be a large difference between the average and the dominance mode of measurement. In the dominance scheme, this family will appear better much off than in the average scheme.

There is only limited research on how to best combine information of mothers and fathers into measures of family resources. Erikson's (1984) empirical analysis of dominance

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[1] In principle, we could also weight mother and fathers: $SES = w*SES_{father} + (1-w)*SES_{mother}$, $0 < w < 1$. Such a strategy would require calibration of the weight w, and it is likely that w will vary across time and place.

was a rare exception, but was later followed by Korupp, Ganzeboom and Van Der Lippe (2002). Due to data restrictions, Erikson (1984) was unable to analyze children's outcomes, and so whether or not dominance coding also worked for intergenerational transfer of advantage remained unsettled. This is somewhat ironic because the predominant use of dominance is within intergenerational analyses. Korupp, Ganzeboom and Van Der Lippe (2002) on the other hand had an explicit focus on intergenerational effects. They assessed effects of parent's education and occupation on children's' education in the Netherlands, Germany and the US. Their analyses contrasted all of the models outlined above (and some more; they also considered e.g., father/mother only models). They found that modified dominance explained most of children's education, closely followed by the average and in turn the mother/father models. The simple dominance model performed worst of the four models. It is somewhat puzzling then that dominance has remained to be used so widely.

The case for accumulation

Following the discussion above, one of the core question when operationalizing SES of a family is whether parents' resources are cumulative or not. For purely economic variables, resources it is easy to see how adding incomes in a larger and combined pool allows for larger investments and higher levels of consumption. Hence, the totality of the family's combined economic resources produces an economic environment that provides more or less valuable material resources.

Similar implications may also apply for social class. Generally, social class position is perceived as an indicator of economic security, stability and prospects (Goldthorpe and McKnight, 2004). Thus, the status of two parents would be more important for the long-run socioeconomic status of the family than constraining the analysis to a one-parent social class measure. However, a key argument in the dominance tradition relied on a conceptual split

between market situation (distribution of production) and work position (organization of production), where the former can be determined by a family (dominance) unit of analysis and the latter by the individual occupation (Erikson, 1984). However, we argue that there are at least four reasons that both parents' class position are important in present times: (1) major structural changes and higher unemployment rates in the labor market have led to less stable occupational positions (DiPrete and Nonnemaker, 1997), e.g. increasing part time contracts and precarious working conditions (Kalleberg, 2000), indicating that the class status and position of both parents are important as one may stabilize the other or make the household even more vulnerable depending on the respective positions of the partners; (2) further increasing female participation and rising status in the labor market (Meraviglia and Ganzeboom, 2008) would by default suggest that families increasingly rely on both female and male employment; (3) female and male employment status still has remained highly differentiated in many important dimensions, e.g. in terms of sector and industry belonging as well as contract hours (Jarman *et al.*, 2012, Magnusson, 2008), as such the gender aspect of class positions might contain information that is lost by only including a family class variable, and, finally; (4) divorce rates have increased implying that the occurrence of holding on to a particular relationship and household formation over a lifetime is decreasing, thus the home environment and labor market (as well as general market situation) of both parents are important in their own right (Gisselmann, 2007: 17-18, McLanahan and Percheski, 2008).

From an intergenerational perspective, i.e. to operationalize childhood social conditions, the case for accumulation becomes even stronger. For resources that are comprised of behavior and skill transfer, as captured by parents' education, it will matter if the child is exposed to two, rather than only one educated parent, although this also depends on actual patterns of exposure. Even if the family has a highly skilled member, this will not matter much if the member that takes care of the children is lower skilled, for example if the highly

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educated parent is a breadwinner that spends most of the time outside of the family. Based on a similar argument, Murnane *et al.* (1981) argued that mothers' educational attainment was critical in its own right for the child's achievement, as an effect of mothers spending relatively more time with children than fathers.

Another aspect of accumulation is assortative mating. Several studies suggest that increasing female economic independence (i.e. lower gender inequality) is followed by intensified male competition over high-status female partners, which translates into increased homogamy (cf. Schwartz, 2013: 456-457). To the extent that there is a heightened homogamy tendency, the polarization in cumulative resources across families is likely to increase compared to the historical scenario where hypergamous relations (with clearly status dominant males) were more common.

The importance of maternal resources and characteristics

Historically, most research on social stratification have departed from the assumption that fathers are more important than mothers in intergenerational transmission of inequality. This has generated a lot of research on the importance of including women into analyses of inequality. There is now ample evidence to suggest that mothers are more or less influential in their own right, or at least as important as the fathers are. For example, Gisselmann and Hemström (2008) found that maternal working conditions matter independently when accounting for class disparities in a range of different child birth outcomes in Sweden. Kalmijn (1994) showed that correlation between maternal occupational attainment and children's schooling is strong and independent from fathers SES over the children's entire educational career in the US. Similarly, Korupp, Ganzeboom and Van Der Lippe (2002) found that not only was the non-dominant parents' characteristics important in themselves, but mothers' occupational and educational attainment showed a considerable influence on

children's schooling apart from the fathers' resources Netherlands, Germany and the US. Using data from 30 both developed and developing countries, Marks (2008) showed that although fathers' vis-à-vi mothers' occupational status seemed to matter more for children's school performance, mothers education was on the other hand more important compared to fathers' educational attainment. Buis (2012) found that the occupational position of mothers' and fathers' has a similar influence on children's educational attainment in the Netherlands, and over a long period of time. Furthermore, Mood (2017) shows that mother and father social class matter independently to explain child earnings in Swedish context. The literature contains many more references to similar findings.

Diverging trends depending on measurement approach

Trends in inequality over time may be misrepresented when ignoring women. Beller (2009) analyzed trends in US social mobility and found that omission of mothers' class resulted in a bias that substantially alters the conclusions. When including mothers' class position, the social fluidity was found to decline over time, instead of displaying a stable trend, which was the result when merely accounting for fathers. Similarly, Meraviglia and Ganzeboom (2008) found that the trend in intergenerational occupational status mobility differ depending on examining mothers' and/or fathers' occupational position. Meraviglia and Ganzeboom showed that the influence of fathers was weakening, while the opposite was true of mothers. In a comparative study of 30 countries, Marks (2008) observed a trend towards increasing importance of mothers' occupational and educational attainments on students' performances over time. However, Korupp, Ganzeboom and Van Der Lippe (2002) found no diverging trends in educational attainment when adding SES attainment to that of the father, instead the intergenerational association of both parents seemed to weaken over time. Buis (2012) showed that there was no contrasting trends in the influence of and fathers' occupation and

educational attainment on children's schooling in Netherlands. However, Buis found that the influence of maternal and paternal occupational status on child's schooling was similar. Hansen (2010) showed in a trend analysis for Norway that using both mothers' and fathers' earnings indicated a lower level of mobility level compared to only using fathers' earnings.

State of the art in current literature

The use of the dominance approach is widespread in current literature, and as a rule, there is no motivation of this operationalization. We have documented this usage in three journal outlets: European Sociological Review (ESR), American Sociological Review (ASR) and Research in Social Stratification and Mobility (RSSM). While these journal are not representative of all of the intergenerational research, they are typical outlets for such studies. ESR and ASR are general journals, with different emphasis on European and American research, and the RSSM is a specialist journal. We have downloaded all articles in 2017, and screened for quantitative studies using parental SES either as a focal variable or as control. We have then coded these studies by (a) the operationalization mode used, (b) if motivation or references to prior work is included to justify the operationalization, and (c) if any sensitivity analyses are reported.

[Table 1 about here]

When screening for relevant articles, we focus on those that have some form of intergenerational perspective and operationalizes the SES of parents using data from both father and mother. We exclude articles that focus on only one parent, whatever the reason for doing so. While dominance could also be used to link households to other outcomes than

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intergenerational, such as in Erikson's (1984) original analysis, such analyses are rare, and therefore not part of our sample. First, we coded whether the articles were of relevance by the above criterions. For the relevant articles, we then coded if they used dominance, averaging, mother/father specific measures, or some other method of operationalization. We code the mode of operationalization primarily for education or occupation (whatever is present). Income is rarely operationalized in any other way than household income (i.e., an average). Our simple analysis is based on frequency counts in these three dimensions by outlet.

Table 1 shows that the dominance approach is a very common research practice, with a majority of works utilizing this approach. It is also the case that motivations for this is very rare. We do not interpret this as ignorance (simply because space in articles is very limited), but as a further indication how established this practice is: apparently neither reviewers nor editors find dominance any controversial. There appears to be some variation across journals, with dominance being more common in ESR than in the other outlets. This is perhaps not surprising given that Erikson (1984) represents a European research tradition as is best exemplified by Erikson and Goldthorpe (1992). However, given the ad hoc sample, one should not put too much emphasis on this variation, not least because the ASR contained so few relevant articles. We find most studies that use some alternative to dominance predominantly in ASR and RSSM, and it is then primarily separate measures of mothers' and fathers' SES. Averaging is a rarer model of operationalization. Finally, Table 1 also points out that few studies attempt any sensitivity analyses. It should be pointed out that what we include as sensitivity analysis is not the type of analysis as is pursued in this paper, but whether or not dominance is e.g., used together with a mother and father specific analysis. To conclude, our brief review of articles suggest that dominance is indeed dominating in empirical studies, especially for summary measure of parents' education and occupation.

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Analytical strategy

We use sibling correlations as a benchmark of family effects to separate out the relative influence of the different approaches to socioeconomic background operationalization. Sibling correlations capture the variation shared by individuals born in the same family, and represent a broad omnibus measure of the influence of socioeconomic background.

We test how different approaches to measuring socioeconomic background explain sibling correlations in educational, occupational and rank earnings attainment. We compare the performance of four models: (1) The *dominance* approach, which is characterized by using the information of the dominant parent for the specific characteristic; (2) the *average* model used an averaged of both parents' characteristics, and; (3) the *mother/father* framework utilizes simply uses two separate measures for each parents' attainment , and (4) the *modified dominance* approach instead divides these measure by the dominant and non-dominant parent (instead of by gender).

The focus of our analysis is on the dominance approach, which is somewhat casually used in previous literature, and how that compares to the average and mother/father approach. For references purposes, we also compute the modified dominance approach, although it has more rarely been applied in empirical research.

We also do not consider the following common cases: (1) using information on only one parent, whatever the reasons for doing so (2) when information is partially missing for any of the parents. Our approach also measure parental resources regardless of exposure during childhood. For example, to what extent the SES of a non-residential parent matter, or the SES of a step-parent matters, is beyond the scope of our study.

Data

We utilize Swedish register data, and restrict the cohorts in the child generation to be born between 1955 and 1972. We then merge these children to their parents using the Multigenerational register, which provides linkages based on birth records. Information on earnings are based on tax records. In order to construct long-run earnings measures for children, data from 1990 to 2012 is collected for ages 34 to 40. For parents, earnings are measured in similar tax data from 1980 to 1989. To arrive at a less noisy measure, we derive the mean earnings of this period, and then take log values. Education is collected from the education registers from 1990 and onwards for both parents and children, and coded to years of education (we thus require parents to survive until 1990). The analysis is delimited to closely spaced siblings (seven years), since they share more environmental conditions compared to siblings with greater age distance (Eriksson *et al.*, 2016).

For parents, occupation is self-reported and collected from the quintennial censuses (1985 to 1990), and coded to occupational prestige (SIOPS) (Ganzeboom and Treiman, 1996). For children, occupation is collected from the occupation register (2001 and onwards), which consists of employer reports, and coded to SIOPS. We use highest attained SIOPS score for both children and parents.[2] As we stated above, we have delimited the data to cases where information on both parents are available. Table A1 shows the descriptive statistics for the variables used in the models. We account for cohort effects by controlling for year of birth of the children in all models. We have also estimated alternative models, where SES is instead measured as ranks using the cumulative distribution function (Chetty *et al.*, 2014). This coding is straightforward, but whenever we encounter ties (cases with the same values), we take the average rank across all tied values. Ranks are estimated on separate distributions not

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[2] Seen in the light of this article, this choice may itself be subject to further scrutiny. For the purposes of this study, however, we rely on established practice of measuring peak careers, however fragile this may turn out to be.

only for each SES, but also for each variable in the different modes of operationalization (i.e. ranks for mothers, fathers, averages, dominant, and non-dominant all come from their own distribution).

Methods

We employ a multilevel regression framework to model sibling correlations. In the example model, the long-run income (Y) of sibling i is clustered to family j.

$$(1) \quad Y_{ij} = \beta_0 + \boldsymbol{\beta X_{ij}} + \varepsilon_{ij} \, ,$$

$\boldsymbol{X_{ij}}$ defines a vector of independent variables on individual and family level. The residual term of the equation, ε_{ij}, contains two components:

$$(2) \quad \varepsilon_{ij} = a_j + b_{ij} \, .$$

The two components represent a shared family term (a_j) complemented by an individual part (b_{ij}). The variance of the residual term, σ_ε^2 , then translates to the sum of the variances of the individual and family components:

$$(3) \quad \sigma_\varepsilon^2 = \sigma_a^2 + \sigma_b^2 \, .$$

Finally, we assess the intra-class correlation (ICC) among a pair of randomly drawn siblings (ρ), which equals the ratio of family background influence relative to the sum of variances of individual and family components:

(4) $\rho = \frac{\sigma_a^2}{\sigma_a^2 + \sigma_b^2}$,

All singletons are dropped in the analysis, since they do not contribute to the estimation of the intraclass correlation. Solon *et al.* (1991) suggest that including singletons, which may sometimes be used to better estimate the family variance component, carries the risk of introducing outlier biases.

In order to delineate the contributions of different SES components, we use different specifications of the $\boldsymbol{X_{ij}}$ vector in equation (2), which will produce different estimates of the shared family component (Mazumder, 2008). Comparing a baseline estimate with alternative configuration ($\Delta\sigma_a^2 = \sigma_a^2 - \sigma_a^{2*}$) gives the relative explanatory power of the different models. We use this procedure in two separate ways: (1) we add SES factors to an otherwise empty model, and; (2) we remove (jackknife) factors sequentially from a full model (with all SES measures in). The former provides the gross contribution, which may overlap a great deal across SES measures, while the latter (jackknife) method establishes the net contribution: the amount of explained variance in the sibling correlation that uniquely belongs to that specific component, without any overlap with other factors. We focus our analysis on the net measure, but provide the gross measure for reference purposes.

It should also be noted that in the net (jackknife) case, the other SES factors are always measured as extensively as possible, i.e. as the mother/father model. This effectively means, for example, that the net effect of parental SIOPS on a particular outcome is equal to the added amount of explained variance over and above controls for parents' gender specific characteristics in education and earnings.

[Table 2 about here]

The decomposition of sibling correlations in years of education, occupational prestige and log earnings attainment into the specific contributions of parents' SES by the different operationalization models are calculated on mixed siblings, but complementary sensitivity analyzes of brother and sister correlations do not change the conclusions much. These are available in an online appendix (Tables S1 and S2). In that appendix, we also present results from using a rank-rank transformation of the data (Chetty, Hendren, Kline and Saez, 2014), see Tables S3 and S4; these also support our conclusions.

Results

Specific contributions of parents SES by operationalization model

We present out main findings in Table 2. The Table shows the estimated sibling correlations (ICC) and its standard errors and the reductions in ICC by different explanatory factor (↓%). We focus here on the reduction associated with the SES factor and its specific operationalization. In essence, it is the contribution to explaining the sibling correlation, or put in substantive terms, the degree to which it represents how family background structures the outcome. When we contrast the dominance model to the average model, which both collapses data on mothers and fathers into one parental measure but in different ways, the average model outperforms the dominance in explaining net sibling covariation for all outcomes (but this also holds if we focus on gross contributions) for parents education and occupation.

Examining the net contributions in detail, by focusing first on children's years of education (the first column), we find that the average measure of parent's education contributes to the sibling correlations by 9.0 percentage points, while the dominance approach contributes only 6.9 percentage points. For parents' occupation, the average model contributes 2.5 percentage points compared to 1.3 percentage points for the dominance model.

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When we focus on children's occupation in column 2, parents' average education contributes 6.2 percentage points vs. 4.8 percentage points for dominance, and parents' average occupation contributes 4.6 vs. 2.6 percentage points for dominance. Also for children earnings in column 3, this pattern is prevalent, even though the differences are smaller (0.7 percentage points vs. .4 percentage point for average and dominance education, respectively, and 1.4 percentage points vs. .8 percentage points for average and dominance occupation). Hence, the difference in impact sizes is non-negligible, where the average measure ranges from about 29 to 77 percent higher contributions to the sibling correlations. In all these cases, the average model are on a par with the least restrictive model using two variables for mothers' and fathers' SES (e.g., for parents' education/children's education, both contributions are 9.0 percentage points, and for parents occupation/children's occupation, 4.6 vs. 2.6 percentage points).

For parents' earnings in the bottom panel, dominance comes out better. It outperforms the average model for all of the net children's outcomes (but the average model is better in the gross analysis). For the net contributions, a comparison of dominance to the average model of parents earnings gives percentage points contribution of 0.7 vs. 0.5 (children's education), 2.0 vs. 1.7 (children's occupation), and 6.9 vs. 6.7 (children's earnings). However, the dominance model also outperforms mother/father model that utilizes more degrees of freedom. The percentage points comparison is here 0.7 vs. 0.6 (children's education), 2.0 vs. 1.6 (children's occupation), and 6.9 vs. 6.5 (children's earnings). The different results for parents' earnings should be seen in the light of that it is the least important of the SES dimensions, except for explaining children's earnings. Earnings is also more difficult to measure, not least because of its volatility over time, which could play a role here. However, even when we use an equivalent to parents' lifetime income (disposable income measure via tax records from 1968 to 2012, in ages 18 to 65), we find a similar pattern (results not shown).

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Last, we have also computed the contributions of SES using the modified dominance approach with both the dominant and the dominated parent's SES as separate variables. This model consumes more degrees of freedom than the average and dominance models, and should be compared to the mother/father model. For children's education and occupation, the modified dominance is most often inferior to the mother/father model, but for parents education/children's occupation, they are equal. The differences are small for parents' education, and large for parents' occupation (except for children's earnings). For parents' earnings, which is the deviating case, the modified dominance approach outperforms the simple dominance approach for all outcomes.

Total contributions of parents SES by operationalization model

In Table 3, we shift perspective to a more realistic case for research practice: how the choice of operationalization affects all the SES contributions together over the different outcomes. We thus compare how the operationalization models affect the total amount of variation accounted for by parents' education, occupation and income together. We apply the same schemes as above, but also complement with a hybrid that uses dominance for education and earnings, but takes average for the earnings part, where the dominance scheme rarely is applied. We denote this the *standard* model since it is frequently encountered in research.

The results for children's education and occupation are very clear in that the dominance and the standard model performs relatively poorly. There is a dividing line between the dominance and the standard model one the one hand, which explains slightly more than 30 percent of the sibling correlation in education, and about 36-37 percent of the sibling correlation in occupation, and the average model and the two variable approaches of modified dominance and mother/father measures on the other, which explain roughly 35 percent of the sibling correlation in education, and some 40 percent of the sibling correlation in occupation.

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For children's earnings, it is generally a closer call. There is no clear dividing line, but the two variable models perform slightly better than the one variable approaches. There are small differences between dominance and the average model, but the standard model is slightly poorer than the others.

[Table 3 about here]

Discussion

Previous research has highlighted the need to include mothers into the measurement of social background. We have shown that using a dominance approach, i.e., taking the highest value across parents, will result in a suboptimal measure of social background when we analyze children's occupation and education outcomes. For children's earnings, the results are more ambiguous, but with overall small differences across operationalization models. The risks involved with using the dominance approach is that intergenerational associations are underestimated, or that social background functions more poorly as a control for family background as a confounder when analyzing associations between other covariates, which will cause (upward) bias of the association of interest. While the most optimal model generally includes mothers' and fathers' (or dominant and non-dominant) measures independently, we show that taking averages across parents will provide an effective and yet parsimonious middle ground with no loss of explanatory power, when one analyzes children's education and occupation.

Our finding that the dominance model underperforms vis-à-vis the average or mother/father model has important theoretical implications. It supports the accumulation perspective on parental resources, meaning that the family environment is influenced by both of the parents. Families where resources across parents are polarized, such as the type with

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one home-maker low in SES and one breadwinner high in SES, will be a very different environment to a family where both parents are high (or low) in SES. The finding that both parents count may appear trivial, but is clearly at odds with how the established research practice operates. Our results also suggested one anomaly, namely that dominance is a bit superior when operationalizing income. We see no theoretical reason for why the highest income should predict outcomes the best. However, one must take into account that income is perhaps of less relevance in the Swedish context since the wage structure was and still is compressed and redistribution is comparatively strong. Income is simply a less discriminatory measure in the Swedish context. Analyses from other countries are warranted to help solve this puzzle. It should be noted that few if any of previous research has used dominance coding for income.

Our brief review of recent articles suggest that the dominance tradition is strong, despite that the rule is to give no justification to this practice. In light of our results, researchers should cease to use the dominance approach ad hoc without proper motivation. Our results clearly suggest that researchers should pay more attention to operationalization of parents' SES, and evaluate different models or schemes of combining information into variables used for further analyses. Given the widespread use of the dominance approach, the limited literature on this topic is surprising. Further work is needed on other social contexts and for other social processes than the ones we study here. Even if one would not perceive the inferiority of dominance as suggested by our results to be large enough to cause serious biases, there is no reason to use a suboptimal measure. Already some fifteen years ago, Korupp, Ganzeboom and Van Der Lippe (2002) showed that (simple) dominance was an inferior model to use to predict children's education, but somehow research practice did not incorporate this result and change practise. We conclude that the dominance of dominance

must end: averaging and mother and father specific measures for education and occupation

appear as better measures, and they are also accompanied by good theoretical arguments.

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Table 1. Usage of dominance coding in 2017 articles.

	ASR	ESR	RSSM	Total
Relevant articles				
Non-codable	1	2	2	5
Codable	4	14	10	28
Operationalization				
Dominance	1	10	4	15
Averaging	1	2	1	4
Mother/father	2	1	5	8
Other	0	1	0	1
Reference or motivation				
No	4	13	6	23
Yes	0	1	4	5
Sensitivity analysis				
No	3	12	9	24
Yes	1	2	1	4

Note: See text for details on coding

Table 2. Decomposition of sibling correlations in education, occupation, and earnings, by mode of operationalization.

	Childrens…								
	(1) Education (years)			(2) Occupation (SIOPS)			(3) ln Earnings		
	ICC	s.e.	↓%	ICC	s.e.	↓%	ICC	s.e.	↓%
Baseline sibling correlation	0.384	0.001	–	0.295	0.002	–	0.124	0.002	–
Gross contribution of parents' SES:									
Dominance Education[1]	0.285	0.002	25.9	0.213	0.002	27.8	0.111	0.002	10.9
Modified Dom Education[2]	0.267	0.002	30.4	0.200	0.002	32.4	0.108	0.002	12.8
Average Education[1]	0.267	0.002	30.4	0.200	0.002	32.4	0.108	0.002	12.8
Mother/father Education[2]	0.267	0.002	30.4	0.200	0.002	32.4	0.108	0.002	12.8
Dominance SIOPS[1]	0.329	0.001	14.4	0.239	0.002	19.0	0.113	0.002	8.7
Modified Dom SIOPS[2]	0.314	0.002	18.3	0.224	0.002	24.0	0.110	0.002	11.4
Average SIOPS[1]	0.293	0.002	23.7	0.203	0.002	31.2	0.106	0.002	14.5
Mother/father SIOPS[2]	0.293	0.002	23.8	0.203	0.002	31.3	0.106	0.002	14.7
Dominance Earnings[1]	0.337	0.001	12.2	0.241	0.002	18.3	0.101	0.002	19.1
Modified Dom Earnings[2]	0.336	0.001	12.5	0.239	0.002	19.0	0.100	0.002	19.9
Average Earnings[1]	0.338	0.001	12.2	0.241	0.002	18.5	0.100	0.002	19.3
Mother/father Earnings[2]	0.345	0.001	10.3	0.248	0.002	15.9	0.102	0.002	18.0
Net contribution of parents' SES:									
Dominance Education[1]	0.261	0.002	6.9	0.180	0.002	4.8	0.096	0.002	0.4
Modified Dom Education[2]	0.253	0.002	9.0	0.176	0.002	6.2	0.096	0.002	0.7
Average Education[1]	0.253	0.002	9.0	0.176	0.002	6.2	0.096	0.002	0.7
Mother/Father Education[2]	0.252	0.002	9.0	0.176	0.002	6.2	0.096	0.002	0.7
Dominance SIOPS[1]	0.257	0.002	1.3	0.182	0.002	2.6	0.096	0.002	0.8
Modified Dom SIOPS[2]	0.255	0.002	1.9	0.179	0.002	3.4	0.096	0.002	1.2
Average SIOPS[1]	0.253	0.002	2.5	0.176	0.002	4.6	0.096	0.002	1.4
Mother/Father SIOPS[2]	0.252	0.002	2.5	0.176	0.002	4.6	0.096	0.002	1.4
Dominance Earnings[1]	0.252	0.002	0.7	0.175	0.002	2.0	0.095	0.002	6.9
Modified Dom Earnings[2]	0.252	0.002	0.7	0.175	0.002	2.0	0.095	0.002	7.1
Average Earnings[1]	0.253	0.002	0.5	0.176	0.002	1.7	0.095	0.002	6.7
Mother/Father Earnings[2]	0.252	0.002	0.6	0.176	0.002	1.6	0.096	0.002	6.5

Note: the models are estimated for mixed siblings. [1] One variable household measure; [2] Two variable parental measures

Table 3. Decomposition of sibling correlations into total contributions by mode of operationalization.

	Childrens…								
	(1) Education (years)			(2) Occupation (SIOPS)			(3) ln Earnings		
	ICC	s.e.	↓%	ICC	s.e.	↓%	ICC	s.e.	↓%
Baseline sibling correlation	0.390	0.001	–	0.296	0.002	–	0.146	0.002	–
Total contributions of parents' SES:									
Dominance[1]	0.268	0.002	31.3	0.186	0.002	37.2	0.114	0.002	22.0
Modified Dom[2]	0.254	0.002	34.7	0.177	0.002	40.2	0.112	0.002	22.7
Average[1]	0.254	0.002	34.7	0.175	0.002	40.7	0.114	0.002	21.6
Standard[1,a]	0.270	0.002	30.6	0.189	0.002	36.3	0.116	0.002	20.6
Mother/father[2]	0.253	0.002	35.0	0.176	0.002	40.7	0.113	0.002	22.6

Note: the models are estimated for mixed siblings. [1] One variable household measure; [2] Two variable parental measures, [a] Standard model = Dominance principle in education and SIOPS, but averages in earnings.

Table A1. Descriptive statistics.

	n	
Individuals	742809	
Families	384251	

	Mean	St. Dev
Family size	2.4	0.7
Children's characteristics		
Percent female	49.0%	0.5
Years of education	12.5	2.2
SIOPS	47.5	13.3
ln (earnings)	5.3	0.7
Mother's characteristics		
Birth year	1939.0	5.9
Years of education	9.9	3.2
SIOPS	38.8	13.0
ln (earnings)	3.8	0.6
Father's characteristics		
Birth year	1936.2	6.3
Years of education	9.9	3.5
SIOPS	43.2	12.6
ln (earnings)	4.4	0.5

Table S1. Decomposition of sister correlations in ranks of education, occupation, and earnings, by mode of operationalization.

	Sister's…								
	(1) Education (years)			(2) Occupation (SIOPS)			(3) ln Earnings		
	ICC	s.e.	↓%	ICC	s.e.	↓%	ICC	s.e.	↓%
Baseline sister correlation	0.387	0.003	–	0.312	0.003	–	0.132	0.003	–
Gross contribution of parents' SES rank:									
Dominance Education[1]	0.301	0.003	22.1	0.235	0.003	24.9	0.121	0.003	8.8
Modified Dom Education[2]	0.288	0.003	25.6	0.223	0.003	28.7	0.119	0.003	10.4
Average Education[1]	0.288	0.003	25.6	0.223	0.003	28.7	0.119	0.003	10.4
Mother/father Education[2]	0.287	0.003	25.7	0.223	0.003	28.7	0.119	0.003	10.4
Dominance SIOPS[1]	0.335	0.003	13.3	0.256	0.003	18.2	0.122	0.003	7.8
Modified Dom SIOPS[2]	0.324	0.003	16.2	0.244	0.003	21.9	0.120	0.003	9.6
Average SIOPS[1]	0.308	0.003	20.5	0.227	0.003	27.4	0.117	0.003	11.5
Mother/father SIOPS[2]	0.308	0.003	20.5	0.227	0.003	27.4	0.117	0.003	11.5
Dominance Earnings[1]	0.352	0.003	9.0	0.267	0.003	14.5	0.117	0.003	11.9
Modified Dom Earnings[2]	0.351	0.003	9.3	0.265	0.003	15.1	0.115	0.003	13.2
Average Earnings[1]	0.352	0.003	9.0	0.266	0.003	14.9	0.115	0.003	13.4
Mother/father Earnings[2]	0.357	0.003	7.6	0.273	0.003	12.7	0.116	0.003	12.0
Net contribution of parents' SES:									
Dominance Education[1]	0.282	0.003	5.8	0.207	0.003	4.5	0.111	0.003	0.4
Modified Dom Education[2]	0.276	0.003	7.4	0.203	0.003	5.7	0.110	0.003	0.7
Average Education[1]	0.276	0.003	7.4	0.203	0.003	5.7	0.110	0.003	0.7
Mother/Father Education[2]	0.276	0.003	7.6	0.203	0.003	5.7	0.110	0.003	0.7
Dominance SIOPS[1]	0.279	0.003	1.4	0.207	0.003	2.7	0.111	0.003	0.8
Modified Dom SIOPS[2]	0.278	0.003	1.8	0.206	0.003	3.2	0.110	0.003	1.1
Average SIOPS[1]	0.276	0.003	2.4	0.203	0.003	4.1	0.110	0.003	1.2
Mother/Father SIOPS[2]	0.276	0.003	2.4	0.203	0.003	4.1	0.110	0.003	1.2
Dominance Earnings[1]	0.275	0.003	0.2	0.202	0.003	1.2	0.111	0.003	3.4
Modified Dom Earnings[2]	0.275	0.003	0.3	0.202	0.003	1.2	0.110	0.003	3.9
Average Earnings[1]	0.276	0.003	0.1	0.203	0.003	1.0	0.110	0.003	4.0
Mother/Father Earnings[2]	0.276	0.003	0.2	0.203	0.003	0.9	0.110	0.003	3.6

n = 389 373. The sum of brothers and sisters will not exactly correspond to the amount of total siblings, this is because of the definition of closely spaced siblings (7 years) marginally alter which individuals who are included in the analyses. [1] One variable household measure; [2] Two variable parental measures

Table S2. Decomposition of brother correlations in ranks of education, occupation, and earnings, by mode of operationalization.

	Brother's…								
	(1) Education (years)			(2) Occupation (SIOPS)			(3) ln Earnings		
	ICC	s.e.	↓%	ICC	s.e.	↓%	ICC	s.e.	↓%
Baseline brother correlation	0.449	0.002	−	0.327	0.003	−	0.196	0.003	−
Gross contribution of parents' SES rank:									
Dominance Education[1]	0.341	0.003	24.0	0.243	0.003	25.7	0.178	0.003	9.3
Modified Dom Education[2]	0.321	0.003	28.6	0.228	0.003	30.1	0.175	0.003	10.8
Average Education[1]	0.321	0.003	28.6	0.228	0.003	30.1	0.175	0.003	10.8
Mother/father Education[2]	0.321	0.003	28.6	0.228	0.003	30.2	0.175	0.003	10.9
Dominance SIOPS[1]	0.393	0.002	12.5	0.273	0.003	16.3	0.183	0.003	6.5
Modified Dom SIOPS[2]	0.375	0.003	16.6	0.256	0.003	21.7	0.178	0.003	9.2
Average SIOPS[1]	0.351	0.003	22.0	0.232	0.003	28.9	0.172	0.003	12.2
Mother/father SIOPS[2]	0.350	0.003	22.2	0.231	0.003	29.4	0.171	0.003	12.6
Dominance Earnings[1]	0.393	0.002	12.4	0.268	0.003	18.1	0.160	0.003	18.3
Modified Dom Earnings[2]	0.392	0.002	12.7	0.266	0.003	18.6	0.159	0.003	18.7
Average Earnings[1]	0.394	0.002	12.2	0.268	0.003	17.9	0.162	0.003	17.5
Mother/father Earnings[2]	0.402	0.002	10.5	0.275	0.003	15.8	0.162	0.003	17.1
Net contribution of parents' SES:									
Dominance Education[1]	0.312	0.003	6.4	0.206	0.003	4.3	0.155	0.003	0.4
Modified Dom Education[2]	0.302	0.003	8.5	0.202	0.003	5.6	0.155	0.003	0.5
Average Education[1]	0.302	0.003	8.5	0.202	0.003	5.6	0.155	0.003	0.5
Mother/Father Education[2]	0.302	0.003	8.6	0.202	0.003	5.6	0.155	0.003	0.5
Dominance SIOPS[1]	0.308	0.003	1.1	0.209	0.003	2.0	0.156	0.003	0.5
Modified Dom SIOPS[2]	0.305	0.003	1.7	0.206	0.003	2.9	0.155	0.003	0.9
Average SIOPS[1]	0.302	0.003	2.3	0.202	0.003	4.2	0.155	0.003	1.1
Mother/Father SIOPS[2]	0.302	0.003	2.3	0.202	0.003	4.3	0.155	0.003	1.1
Dominance Earnings[1]	0.302	0.003	1.0	0.201	0.003	2.2	0.154	0.003	7.2
Modified Dom Earnings[2]	0.301	0.003	1.0	0.201	0.003	2.2	0.154	0.003	7.3
Average Earnings[1]	0.303	0.003	0.7	0.202	0.003	1.8	0.156	0.003	6.4
Mother/Father Earnings[2]	0.302	0.003	0.9	0.202	0.003	1.8	0.155	0.003	6.9

n = 404 211. The sum of brothers and sisters will not exactly correspond to the amount of total siblings, this is because of the definition of closely spaced siblings (7 years) marginally alter which individuals who are included in the analyses. [1] One variable household measure; [2] Two variable parental measures

Table S3. Decomposition of sibling correlations in ranks of education, occupation, and earnings, by mode of operationalization.

	Children rank in…								
	(1) Education (years)			(2) Occupation (SIOPS)			(3) ln Earnings		
	ICC	s.e.	↓%	ICC	s.e.	↓%	ICC	s.e.	↓%
Baseline sibling correlation	0.386	0.001	–	0.290	0.002	–	0.163	0.002	–
Gross contribution of parents' SES rank:									
Dominance Education[1]	0.284	0.002	26.4	0.207	0.002	28.8	0.139	0.002	14.6
Modified Dom Education[2]	0.273	0.002	29.1	0.198	0.002	31.9	0.137	0.002	16.1
Average Education[1]	0.281	0.002	27.1	0.204	0.002	29.8	0.139	0.002	14.9
Mother/father Education[2]	0.274	0.002	29.0	0.198	0.002	31.7	0.137	0.002	16.1
Dominance SIOPS[1]	0.312	0.001	19.1	0.215	0.002	26.0	0.138	0.002	15.0
Modified Dom SIOPS[2]	0.301	0.002	22.0	0.204	0.002	29.8	0.135	0.002	17.0
Average SIOPS[1]	0.304	0.002	21.3	0.206	0.002	29.0	0.136	0.002	16.6
Mother/father SIOPS[2]	0.300	0.002	22.3	0.203	0.002	29.9	0.135	0.002	17.1
Dominance Earnings[1]	0.333	0.001	13.6	0.231	0.002	20.6	0.126	0.002	22.6
Modified Dom Earnings[2]	0.331	0.001	14.3	0.227	0.002	21.8	0.124	0.002	24.1
Average Earnings[1]	0.333	0.001	13.7	0.228	0.002	21.4	0.125	0.002	23.1
Mother/father Earnings[2]	0.333	0.001	13.8	0.229	0.002	21.2	0.124	0.002	23.7
Net contribution of parents' SES:									
Dominance Education[1]	0.263	0.002	7.1	0.176	0.002	4.9	0.117	0.002	0.8
Modified Dom Education[2]	0.257	0.002	8.4	0.173	0.002	5.9	0.117	0.002	1.0
Average Education[1]	0.261	0.002	7.5	0.174	0.002	5.4	0.117	0.002	0.8
Mother/Father Education[2]	0.258	0.002	8.4	0.173	0.002	5.9	0.117	0.002	1.0
Dominance SIOPS[1]	0.261	0.002	1.4	0.176	0.002	2.6	0.118	0.002	0.6
Modified Dom SIOPS[2]	0.258	0.002	2.1	0.173	0.002	3.8	0.117	0.002	1.1
Average SIOPS[1]	0.258	0.002	2.0	0.173	0.002	3.7	0.117	0.002	1.0
Mother/Father SIOPS[2]	0.258	0.002	2.2	0.173	0.002	3.8	0.117	0.002	1.1
Dominance Earnings[1]	0.257	0.002	1.0	0.172	0.002	2.6	0.118	0.002	7.6
Modified Dom Earnings[2]	0.257	0.002	1.0	0.172	0.002	2.6	0.117	0.002	8.1
Average Earnings[1]	0.259	0.002	0.6	0.173	0.002	2.3	0.118	0.002	7.3
Mother/Father Earnings[2]	0.258	0.002	0.9	0.173	0.002	2.4	0.117	0.002	8.0

Note: the models are estimated for mixed siblings. [1] One variable household measure; [2] Two variable parental measures

Table S4. Decomposition of sibling correlations into total contributions by mode of operationalization for ranked SES.

| | Childrens rank in… | | | | | | | | |
| | (1) Education (years) | | | (2) Occupation (SIOPS) | | | (3) ln Earnings | | |
	ICC	s.e.	↓%	ICC	s.e.	↓%	ICC	s.e.	↓%
Baseline sibling correlation	0.386	0.001	–	0.290	0.002	–	0.163	0.002	–
Total contributions of parents' SES:									
Dominance[1]	0.268	0.002	30.6	0.181	0.002	37.6	0.120	0.002	26.5
Modified Dom[2]	0.257	0.002	33.3	0.172	0.002	40.7	0.117	0.002	28.2
Average[1]	0.263	0.002	31.8	0.175	0.002	39.6	0.119	0.002	27.2
Standard[1,a]	0.269	0.002	30.4	0.181	0.002	37.6	0.119	0.002	26.7
Mother/father[2]	0.258	0.002	33.2	0.173	0.002	40.5	0.117	0.002	28.1

Note: the models are estimated for mixed siblings. [1] One variable household measure; [2] Two variable parental measures, [a] Standard model = Dominance principle in education and SIOPS, but averages in earnings.