Essays on Intergenerational Income Mobility, Geographical Mobility, and Education

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Für Papa
ABSTRACT

In Paper [I] we analyze the implications of social identity and self-categorization for optimal redistributive income taxation. A two-type model is supplemented by an assumption that individuals select themselves into social categories, in which norms are formed and education effort choices partly depend on these norms. The results show, among other things, that externality correction by a welfarist government leads to an element of tax progression that serves to reduce the discrepancy between the effort norm and the actual effort chosen by low-productivity individuals in the high-effort group. Furthermore, if the preference for social identity is sufficiently strong, increased wage-inequality leads to higher social welfare through a relaxation of the selection constraint. It may thus be desirable to use publicly provided education to induce more wage-inequality, even if higher wage-inequality increases the intrinsic utility of a potential mimicker.

In Paper [II] I employ high quality register data to present new facts about income mobility in Sweden. The focus of the paper is regional differences in mobility, using a novel approach based on a multilevel model. This method is well-suited when regions differ greatly in population size as is the case in Sweden. The maximum likelihood estimates are substantially more precise than those obtained by running separate OLS regressions. I find small regional differences in income mobility when measured in relative terms. Regional differences are large when adopting an absolute measure and focusing on children with below-median parent income. On the national level I find that the association between parent and child income ranks has decreased over time, implying increased mobility.

In Paper [III] I study the long term effects of inter-municipal moving during childhood on income using Swedish register data. Due to the richness of the data I am able to control for important sources of selection into moving, such as parent separation, parents' unemployment, education, long run income, and immigration background. I find that children's long run incomes are significantly negatively affected by moving during childhood, and the effect is larger for those who move more often. For children who move once, I also estimate the effect of the timing and the quality of the move. I measure the quality of each neighborhood based on the adult outcomes for individuals who never move. The quality of a move is defined as the difference in quality between the origin and
the destination. Given that a family moves, I find that the negative effect of childhood moving on adult income is increasing in age at move. Children benefit economically from the quality of the region they move to only if they move before age 12 (sons) and age 16 (daughters).

Applied research on the association between parent and child lifetime income is relying on income data that covers only part of the life cycle which may lead to misleading estimates of the intergenerational elasticity (IGE). In Paper [IV] I study the bias of IGE estimates for different missing-data scenarios based on simulated income processes. Using an income process from the income dynamics and risks literature to generate two linked generations’ complete income histories, I use Monte Carlo methods to study the relationship between available data patterns and the bias of the IGE. I find that the traditional approach using the average of the typically available log income observations leads to IGE estimates that are around 40 percent too small. Moreover, I show that the attenuation bias is not reduced by averaging over many father income observations. Using just one income observation for each generation at the optimal age (as discussed in the paper) or using weighted instead of unweighted averages can reduce the bias. In addition, the rank-rank slope is found to be clearly less sensitive to missing data.
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Stefanie
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This thesis consists of an introduction, a summary of the papers, and the following four self-contained papers:


INTRODUCTION

This thesis consists of four independent papers in the areas of labor and public economics. A common theme of these papers is the question how long-term economic outcomes are determined by family- and socio economic background, and by individuals’ choices. Some policy implications thereof are also addressed.

A strand of the economics literature that focuses on precisely the tension between free choice and background dependence is the literature on equality of opportunity.¹ The concept of equality of opportunity has traditionally been closely connected to anti-discrimination. Every person should be judged according to his/her abilities, and not according to “irrelevant” characteristics such as race, gender, or religion. Milton and Rose Friedman discussed this notion of equality of opportunity in relation to equality of outcomes in their book “Free to Choose” in 1979. They advocated a free market society with only a minimum amount of public regulation. John Roemer (inspired by Rawls, 1971; Sen, 1985; and Dworkin, 1981a and 1981b) developed a more detailed theory of equality of opportunity (1993, 1996), arguing that a society should guarantee its members equal access to advantage, regardless of their circumstances, while holding them responsible for turning that access into actual advantage by the application of effort. The distinction between circumstances that are outside of someone’s control on the one side, and personal effort on the other side is argued to be the key to determine the degree of equality of opportunity in a society or in a given situation.

In practice, measuring (in-) equality of opportunity is very difficult, if not to say impossible. The researcher needs to define opportunity sets for groups of individuals with the same circumstances. The relevant circumstances are often approximated by socio-economic background, and socio-economic background itself is often approximated by the education level of the father. Besides the pitfalls arising due to these potentially imprecise approximations, it is in many cases extremely difficult to draw the line between circumstance on the one hand, and own effort or choice, on the other hand. Do an individual’s high school grades depend on the genes and study ethics obtained from the parents (and thereby considered circumstances), or should the individual be held accountable for her grades since a 17-year-old person can reasonably be assumed to understand the importance of school grades for adult outcomes, independent of the

¹ For the record, it was also this literature that initially spurred my interest in pursuing a Ph.D. in economics.
parents? How accountable are the parents, how accountable is the student? Most people will tend to agree that it is probably a combination of both which is at work. However, when trying to measure equality of opportunity, the researcher has to make a decision not only about which circumstances to include, but also how to define and measure them. Moreover, the more “circumstances” that are added to the model, the more unequal will the sample under study appear in terms of opportunity (since allowing for finer and finer distinctions between groups will tend to explain variation in income to a higher and higher degree, leaving less leeway for unaccounted differences between individuals which are typically interpreted as personal effort). In the extreme case, individuals cannot be held responsible for any outcome since most events in life can be traced to family background, genes, childhood environment, or immutable characteristics such as gender and age.

Obviously, translating philosophical principles underlying a fair society with equal chances for success for everyone into hard science, and measuring opportunities, effort, fairness, and free choice in numbers is a very ambitious project (some might say hopeless). This does not mean, however, that we should stop trying. A fruitful direction appears to be to study in depth the aspects of childhood which are most crucial for long run adult outcomes. As noted for instance by James Heckman, the accident of birth is a major source of inequality. Since we cannot choose our parents, a fair society might want to support children with less favorable circumstances as early as possible in their lives, in order to improve the children’s opportunities later in life.

James Heckman and his collaborators have produced a tremendous amount of work examining the origins of inequality, the determinants of social mobility, and the links among different stages of the life cycle. A large part of this work which has been produced within the Center for the Economics of Human Development at the University of Chicago. Heckman and co-authors have for example shown that the positive effects of early intervention programs, such as the Perry Preschool program, mostly worked through non-cognitive skill development, and not IQ enhancement (Heckman et al., 2013). Conti, Heckman and Urzua (2013) have highlighted the important role played by the early years in producing health. Since health bequests better educational outcomes, and better outcomes bequest better health, improving the conditions in early life appears to be an effective strategy to promote adult well-being.
The social environment

In very recent work, Chetty, Hendren, and Katz (2015) have shown that moving poor families to richer neighborhoods results in higher high school completion rates and higher adult income for the children. The positive effects were however absent if children moved after the age of 13. Chetty and Hendren (2015) found similar results studying families that move across the US: the earlier a child moves to a better region, the more her adult outcomes improve compared to the outcomes of children in her original region.

However, there is an alternative explanation for this result: instead of benefits being lower the later a child moves, one could equally well interpret this as the costs of moving being higher for children who move later. In addition, neighborhoods might matter for different reasons for child human capital production at different ages. For example, schools, teachers, and direct neighbors can be assumed to matter even for a young child, while peers, social networks and role models might become more important during teenage years. If children’s development of identity and sense of self is particularly vulnerable to disruptions from age 13 onwards, we would expect to see large disruption costs even when moving to a very good neighborhood.

Paper [III] in this thesis attempts to shed light on this question by studying families that move across municipalities and counties in Sweden. Comparing children that never moved, to similar children that moved at least once during childhood, I find significant differences in their long-term adult incomes. Moving seems to be costly for Swedish children. Controlling for the type of move (i.e. if a family moves to a relatively better or worse region) as well as the age of the child when moving, I find that the move’s quality does matter for adult outcomes, but only when moving occurs before a certain age.

This finding is well in line with research showing that social identity is an important motivating factor and source of well-being for individuals. Akerlof and Kranton (2002) studied how social identity and self-image can affect individuals’ outcomes. In their model, students choose effort in school and divide themselves into three social categories with different study norms. Importantly, an individual’s utility depends on how well she conforms to the group’s social norm, here in terms of study effort. Their paper is based on a large literature in sociology and psychology where the fact that individuals make choices dependent on their social reference group has been acknowledged and studied for a long time. Paper [I] in this thesis contributes to the literature on social identity and schooling by studying optimal redistributive income tax and publicly provided education when individuals compare themselves to a social group.
If social identity matters for individuals’ choices, it is important to think about how social groups (and therefore the social norms associated with each such group) are chosen and can be influenced by, for example, parents and society. In the case of moving, we can assume that the social identity that was built up in the original location is lost when the child moves to a new place. Even if it is possible to “join” a new group at the new location, it is reasonable to think that social identity has to be rebuilt. The older a child is, the more social identity will be lost by moving, and the harder it might be to be accepted into a new social group. Social identity theory seems important to be taken into account when studying childhood environment and childhood human capital production.

*From inequality to intergenerational income mobility in Sweden*

Sweden is usually cited as an example of a coherent society with small differences between the poorest and the richest citizens. Education and health care is publicly provided, free of charge, and cheap student loans are available and accessible for everyone. Nonetheless, Sweden has recently been receiving attention due to its increasing levels of income inequality (OECD, 2011). Real household income increased in Sweden between 1985 and 2000 by around 2.4 percent per year for households in the top decile of the distribution, but only by 0.4 percent annually for households in the bottom decile. Despite the still low absolute level of income inequality, judged by international standards, researchers and politicians are showing great interest in the drivers and effects of this development for different groups in society.

One hypothesis why Americans seem to tolerate more inequality compared to citizens in for example Sweden, is what Bénabou and Ok (2001) termed the prospect of upward mobility. Believing in the American Dream, i.e. a society where you can accomplish almost anything if you just work hard enough, can consistently lead low income individuals to turn against highly redistributive policies. Given the belief that you (or at least your children) will climb up the ladder in society by hard work, there is no reason to support low income individuals with generous social benefits.

Economists have developed the concept of income mobility to refer to the degree to which an individual’s income depends on family background and especially parent income, as opposed to just own effort. In a recent summary of the literature, Corak (2013) examined the link between income mobility and income inequality for a number of OECD countries and sheds light on what has been called the “Great Gatsby Curve”. This curve illustrates the negative relationship between mobility and inequality found in the data. The less income mobility in a country, the higher is income inequality. Corak writes:
“Inequality lowers mobility because it shapes opportunity. It heightens the income consequences of innate differences between individuals; it also changes opportunities, incentives, and institutions that form, develop, and transmit characteristics and skills valued in the labor market; and it shifts the balance of power so that some groups are in a position to structure policies or otherwise support their children’s achievement independent of talent.” According to this line of argument, rising income inequality can very well be accompanied by decreasing mobility which gives the accident of birth a larger weight among the drivers of a child’s long run outcomes. Consequently, the growth in income inequality has also increased the public interest in the opportunities for Swedish children to improve their financial situation in relation to the financial situation of their parents.

The study of intergenerational income mobility represents a particular perspective on the tension between individuals’ own choices and their pre-determined opportunities. In the literature on intergenerational mobility, researchers are interested in the association between parent outcomes and child outcomes. Even though we perhaps ultimately should be interested in how the well-being of parents translate into the well-being of the children, i.e. the transmission of utility across generations, the literature has focused on the transmission of income and wealth across generations since income and wealth is assumed to be a good predictor of well-being. If there is a close relationship between parent and child adult outcome, there is said to be low intergenerational (income) mobility. On the other hand, if parent outcome does not predict child outcome very well, intergenerational (income) mobility is considered high.

One of the very first empirical studies of intergenerational income mobility was conducted by Soltow (1965), who found a very low association between father and son income for a sample of families living in a city in southern Norway. Since then, researchers in all parts of the world have added to the literature by estimating the relationship between parent and child income for different samples. Recent reviews of the literature can be found in Black & Devereux (2011) and Jäntti & Jenkins (2015). A general pattern of those estimates is that the predictability of son income from father income is higher in the US and the UK (implying low mobility), and lower in the Nordic countries (implying a higher mobility).

Importantly, there is no level of mobility that is considered unequivocally optimal. The problem is easy to grasp when thinking about the desirable degree of meritocracy in a society. Most would agree that very talented and knowledgeable individuals should hold positions of power, in the public and the private sector. Moreover, since talent depends
on parents’ genes, and talent makes it easier to successfully undergo a difficult education and obtain expert skills, a meritocratic society where people are matched to positions depending solely on their skills, will have a strictly positive association between parent and child outcomes. Thus, maximum mobility does not seem desirable based on principles of fairness and economic efficiency. Zero mobility on the other hand, implying that an individual’s outcome is completely determined at birth, seems likewise undesirable and we might only want to agree on a degree of mobility that is somewhere in between 0 and 100. Estimates of intergenerational mobility might therefore be most useful when seen in relation to each other, for example in terms of the development over time or a comparison between regions.

Paper [II] in this thesis is contributing to the literature of intergenerational mobility by providing the first regional estimates for two different mobility measures for Sweden. Since all data stems from the same national registers, the resulting mobility estimates are highly comparable.

The measurement problem in the literature on intergenerational mobility

The income path over the life cycle for a given individual consists of a deterministic trend depending on factors such as education, age, and labor market experience, as well as the economic cycle and smaller and larger shocks that can vary in their persistence. Therefore, one annual income observation might not be very informative about an individual’s lifetime income. In the best of worlds, estimates of intergenerational income mobility should be based on individuals’ complete income histories. However, due to the inability of researchers to observe the complete income history of each individual across their lifecycles, approximations of lifetime income must be used based on the often limited number of income observations available.

These measurement problems make it particularly difficult to compare mobility estimates between different countries, since different countries have different types of data available. In the Nordic countries, population registers with detailed information about annual earned income, capital income, and transfers are available since the 1960’s. In other countries, the data is usually less detailed and available for a shorter time span. In order to make meaningful comparisons, the influence of redistributive policies has to be taken into account. Estimates based on before-tax income will give very different results compared to after-tax income. The same holds for income measures including or excluding social insurance transfers such as unemployment benefits or parental benefits. In addition, using different cohorts is problematic due to business cycles affecting
different cohorts differently, as well as changing institutions and policies over time. The implications of finding two different values of mobility in two countries are therefore far from clear.

In spite of the challenges discussed here, I believe that measuring intergenerational mobility is a worthy exercise. In a given country, estimates of mobility can be interpreted in the light of existing policies and economic structure. A particularly fruitful direction is to study how mobility differs across regions. This provides a way of relating estimates of mobility to regional factors while not running into the data-related and institutional issues that hamper comparability between cross-country estimates of mobility. It is one potential tool to monitor a country’s development in terms of balancing the tradeoff between holding individuals responsible for their outcomes, and acknowledging limits to the opportunity sets imposed by the accident of birth.

Paper [IV] is another contribution to the literature of intergenerational mobility. Here, I employ simulations to illustrate how approximations of lifetime income affect estimates of the intergenerational elasticity as well as the association between long run income ranks between fathers and sons. Because of the typical concave pattern of annual incomes over the lifecycle, income measured during young ages usually underestimates average lifetime income, and income measured during middle ages tends to overestimate average lifetime income. In more or less much all previous papers, life time income has been approximated by using the average over all available income observations in the data. My results show that such approximations may lead to severe measurement errors of lifetime income, and to overestimation of intergenerational mobility.

Measuring the state of income mobility in a society is a very difficult task. Exposing the different channels through which individuals’ long-term outcomes are shaped, probably an even harder one. In order to design policies and give advice how to foster equal opportunity, we need to further improve our understanding of the many mechanisms that determine adult outcomes given background, institutions, and effort. My thesis hopefully constitutes a small step towards reaching this goal.
SUMMARY OF THE PAPERS

Paper [I]: Social Identity, Taxation, and Publicly Provided Education

In Paper [I] we analyze the implications of social identity and self-categorization for optimal redistributive income taxation and publicly provided education. In psychology and sociology, social identity theory has long been used to explain human behavior (see, e.g., Hogg & Reid, 2006; Tajfel & Turner, 1979). Social identity can be defined in terms of how a person’s sense of self depends on the group (or groups) which the person associates with (e.g., social reference groups such as family, colleagues, friends, social class, etc.).

In economics, education is usually described as an investment that pays off in the future through higher wages. However, if people self-select into social categories where certain types of behavior are desirable, e.g., due to category-specific norms, the incentives underlying effort choices may differ substantially from those that follow from standard economic investment-models. Our study departs from a model of educational choice and social identity presented in Akerlof and Kranton (2002), where study effort depends on such category-specific norms.

We consider a model with two productivity-types, where individual productivity is private information, along the lines of Stern (1982) and Stiglitz (1982). Public education is modeled as a publicly provided input good (financed through the tax system). Each individual lives for two periods; attains education in the first and earns labor income in the second. This model is here extended to accommodate social identity by allowing each individual, when young, to select into one of two social groups, which differ with respect to the prescribed study effort. Furthermore, the social norms are themselves endogenous variables.

The model assumes that individuals differ in two ways. First, we assume that individuals differ in terms of innate ability, and that this ability is private information. Second, we introduce an element of social inertia by assuming that individuals differ with respect to their preferences for the social group they want to be associated with. Our model contains two such social identity groups in which norms regarding study effort are formed. Individuals will then select into one of the groups depending on ability and preferences, and they will make educational (effort) choices based on their ability and the group norm. We study the optimal tax and expenditure policy for both a welfarist and a paternalist that does not share the consumer preference for social identity.
We find that the consumer preference for social identity leads to corrective as well as redistributive motives for income taxation, and also influences the optimal provision of public education. First, externality correction by a welfarist government leads in itself to an element of tax progression that serves to reduce the discrepancy between the effort norm and the actual effort chosen by low-productivity individuals in the high-effort group. In turn, this effect is counteracted by the government’s desire to relax the self-selection constraint, since increases in the effort norms contribute to make mimicking less attractive. Second, if the preference for social identity is sufficiently strong, increased wage-inequality leads to higher social welfare through a relaxation of the selection constraint. It may thus be desirable to use publicly provided education to induce more wage-inequality than in the absence of self-categorization, even if such inequality increases the intrinsic utility of a potential mimicker. Third, the policy rule for publicly provided education does not depend on whether the government has a welfarist or paternalist objective. However, the marginal tax policy differs between the two types of government in a fundamental way, primarily because the paternalist government has a motive to correct effort choices to “undo” the effects of self-categorization.

**Paper [II]: Intergenerational Mobility in Sweden: a Regional Perspective**

This paper analyzes regional differences of intergenerational income mobility in Sweden. My data set allows me to analyze national and regional mobility measures very precisely for the Swedish population born between 1968 and 1976. Income mobility refers broadly to the extent child income is associated with parent income. The by far most commonly employed mobility measure in the literature is the intergenerational elasticity (IGE). This is simply the slope parameter of a regression of log lifetime income of generation \( t \) on log lifetime income of generation \( t-1 \). A small IGE means that it is harder to predict child income using parent income, and that income mobility is higher. Estimates of the IGE in the literature center around 0.4 with higher estimates for the US, and usually smaller estimates for the European and especially the Nordic countries (see Björklund & Jäntti, 1997; Solon, 1992; Solon, 1999; Solon, 2004; Mazumder, 2005).

In addition to traditional IGE measures, I compute regional and national measures of mobility based on income ranks. For the regional analysis I employ two different mobility measures based on income ranks. The first one is “relative mobility”
which describes the mean difference in outcomes between children with parents in the
top and bottom of the income distribution, respectively. The second one is “upward
mobility” which measures the mean absolute outcome of children from families with
below-median income levels and, importantly, focuses exclusively on the regional
differences in outcomes of children in the poorer half of the population.

The geographical unit I use in the regional analysis is the “local labor market”, which
is an aggregation of municipalities defined by commuting patterns. In comparison to the
commuting zones in the US, there is much more variation between different Swedish
local labor markets in terms of population size. I show that this aspect of the data results
in imprecise estimates. To remedy this problem, I propose a joint estimation technique
using maximum likelihood, referred to as a multilevel (or hierarchical) model. The
multilevel model allows me to make a comparison between the different regional mobility
measures in a statistically rigorous way. For example, I can test if the mobility estimate
of one particular region is statistically significantly different from the national average.
For completeness however, I also report and discuss results based on separate OLS
regressions by region.

I find that relative mobility is quite homogeneous across Sweden. The difference of
mean son income rank between families at the very top and the very bottom of the income
distribution, respectively, is 22.2 percentile ranks in most local labor markets. Only 9
areas out of 112 show significantly lower or higher relative mobility. Stockholm ranks at
the bottom with the lowest relative mobility, and the Umeå region in northern Sweden
shows the highest relative mobility.

Upward mobility, the expected outcome for sons from below-median income families,
varies considerably more across Swedish local labor market areas, from 36.32 percentile
ranks in Torsby to 50.77 in Hylte. This corresponds to an income difference of 32.842
SEK per year (≈ 3.839 USD). In addition, children who spend a significant part of their
childhood in very rural areas of Sweden generally have significantly worse outcomes
compared to children growing up in urban areas. This result can be explained in part by
the large fraction of children from rural areas that do not move into cities as adults.
However, those who do move, do on average even better than the city natives.

Sweden is considered to be a country with exemplary high levels of intergenerational
income mobility. My results show that there are large differences in terms of mobility
across Sweden and that location does matter. The evidence provided here indicates that
there are particularly large differences in the expected outcomes for children from the
lower half of the income distribution, depending on childhood region and moving
patterns. A general lesson of this study is that country-wide measures of income mobility might say very little about the state of mobility at a particular location within the country. Cross-country comparisons of income mobility should therefore be interpreted with caution.

**Paper [III]: The Effect of Moving during Childhood on Long Run Income: Evidence from Swedish Register Data**

In Paper [III] I use Swedish register data for nine cohorts born 1968 to 1976 to study the effect of moving between regions during childhood on long run adult income. In addition, I analyzed the effect of the timing and quality of the move. Childhood is a very important phase during human capital development, since many skills that are capitalized during adulthood are obtained early in life. As Cunha & Heckman (2007) pointed out, skills produced at an earlier point in life will not only augment the skills attained at a later stage, but also increase the returns to later skill investments.

Recent evidence stresses the importance of neighborhood quality for children's long run outcomes (see Chetty et al., 2014; Chetty & Hendren, 2015; Chetty et al., 2016; Heidrich, 2015). Identifying certain neighborhoods that are better or worse for a child's development leads, however, to another question: what is the effect of moving from one neighborhood to another? If neighborhoods matter, moving to a better area can be thought to be beneficial for a child. However, there might also be disruption costs from moving.

The literature on childhood human capital production suggests that shocks to the skill formation process can result in large differences in the stock of adult human capital. Moving is one such potential shock. The child is taken out of her usual environment and needs to re-build a social identity at the new home, get to know her new class mates, teachers, and neighborhoods. Research in sociology for example indicates negative effects of moving on academic performance (Hagan, 1996). Early-intervention program evaluations have shown that the childhood environment strongly affects children's non-cognitive skills and social attachment, which are both very important for adult outcomes (Heckman & Carneiro, 2003).

I define moving costs as the effect of childhood moving on long run adult income. I show not only that such costs exist and that their size is increasing in the number of times a child moves, but also that the timing of the move matters. The results are well in line with predictions from the human capital literature where shocks in the skill formation
process can accumulate to large differences in adult outcome (see for instance Cunha & Heckman, 2007; Currie & Almond, 2011; Heckman, 2006; Heckman et al., 2013).

The main difficulty when trying to measure the costs of moving is selection. In observational data, we will suspect differences between families that move different numbers of times, as well as non-randomness in the type of location families move to and from. Parent income, for instance, is an important factor to take into consideration since higher income families are able to better compensate for disruption effects suffered by the child. Other transitions in family life that occur at a similar time as the move have the potential to confound the true effect of moving. Parental separation or unemployment are two common reasons to move, which, however, also affect children’s outcomes independently of moving. The richness of my data allows me to control for many factors that would otherwise bias the results, such as parent unemployment and separation during childhood, immigration background, and education level. An additional aspect to consider is that children can be expected to have only a minor say in when or where to move. That is, children are usually tied to their parents which suggests that any selection effect left can reasonably be assumed to be smaller compared to studying the effect of migration on adults (even if some families move because of their child).

My results suggest significant negative effects of moving during childhood on long run adult income. The effects differ by gender and parent income. Studying family moves between Swedish counties instead of municipalities (that is, moves that cover on average longer distances), I find that the costs of moving on child long run outcome are very robust to the geographic unit chosen.

Focusing on a reduced sample containing only families that move exactly once during childhood, I can control for the type of move, i.e. if families move to areas that are relatively better or relatively worse for the child compared to their region of origin. The quality of a region is computed as the average long run adult income of similar children who spent their entire childhood in this region. I find that the negative effect of childhood moving on adult income is increasing in the age at the time of the move. I also show that moving to a region with a higher quality increases a child’s long run outcome, given that the family moves. However, sons have to move before the age of 12 in order to benefit from the better region. From age 12, the quality of the new region has no significant effect. Daughters have to move before the age of 16 in order to benefit from a better quality region. In general, the effects on daughters’ adult income are smaller compared to sons.
Paper [IV]: A Study of the Missing Data Problem for Intergenerational Mobility using Simulations

Paper [IV] is a simulation study dealing with the measurement of income when estimating the intergenerational elasticity (IGE). In order for the IGE to be unbiased, the researcher needs to observe the income histories over the complete life cycle for two linked generations. In practice, this is impossible today since income records have not been kept for a long enough time span yet. I borrow a well-established income process from the macroeconomics literature to simulate the complete income trajectories for two generations. Based on the incomes generated from this income process I study the bias of the IGE for different missing-data scenarios.

Snapshots of individual incomes are not necessarily a good indicator of permanent or average life time income. Individuals usually experience both a certain pattern of income growth depending on age, education, and other variables, as well as more or less persistent income shocks. Thus, in order for the IGE to be meaningful, some measure of long run income must be employed. The early studies in intergenerational mobility used just the few available income snapshots for sons and fathers to estimate the IGE. Later studies acknowledged that using income snapshots will not give an accurate description of intergenerational mobility, but the deviations between annual and long run average income were assumed to be random. However, as Nybom et al. (2016) pointed out, the shape of the child's income path over the life cycle depends on education and other background variables, which are related to their parents.

My simulated earnings data reproduces all earlier findings in the literature regarding the bias of the IGE, such as left-hand side measurement error which is negative when son income is observed at young ages, and positive when son income is observed at old ages. I show that having left-hand side measurement error based on “nearly complete” income histories of the two generations as in Nybom et al. (2016) still significantly underestimates the IGE. As long as incomes for sons at older ages (and for fathers at young ages) are missing, the estimates will be severely biased even though there are around 30 observations available for each generation.

I find that, in principle, there exist many different age combinations at which the IGE will be unbiased. As a general rule, IGE estimates are only very little biased when income observations for son and father at the same age are used. This is a consequence of the assumption in my data generating process that the income paths of son and father are correlated, by imposing family-specific returns to experience. The fact that the shape of
the income profile over the life cycle depends on family background variables has been demonstrated by Nybom et al. (2016) based on Swedish register data.

Moreover, I find no evidence that using the average over a large number of father income observations diminishes attenuation bias, contrary to the result in Solon (1992). This is possibly due to the fact that Solon assumed the deviations between annual and average lifetime income to be independent random errors, which does not hold in general.

I also find that the rank-rank slope (the association between the average life time income ranks of fathers and sons) is much less sensitive to missing data than the IGE.

In the last part of the analysis, I mimic the typical data that is available to a researcher attempting to estimate the IGE or the rank-rank slope. Income is observed for the son and the father generation during the same years and thus during very different ages. Parents get children at different ages which implies that the age of the fathers during the years for which income observations are available differs greatly. I find that using the average of all available log income observations for sons and fathers (as traditionally done in the literature) leads to IGE estimates that are on average 41 percent too small. This approach thus heavily overstates income mobility. Using only the last available observation for the son and only the earliest available observation for the father gives IGE estimates that are on average 1 percentage point less biased. Using a weighted average of the available observations where the later (earlier) observations for the son (father) are weighted more heavily, reduces the bias by two more percentage points.

Using income ranks, the true value of the rank-rank slope is underestimated by just 5 percent when using the simple average. The first-last observation method yields equally good results. A weighted average of the available income ranks is found to perform best, underestimating the true value by just 4 percent.
BIBLIOGRAPHY


