Gary Becker's Legacy on Intergenerational Mobility

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1 Introduction

How well do parents' education, earnings, income and wealth predict the same outcomes for their children? Scientists have been trying to answer this question for a long time. Francis Galton (1822-1911) was the first to apply statistical methods to tackle this question. Centuries earlier, the great Arab scholar Ibn Khaldun (1332-1406) famously observed that the prestige lasted at best four generations in one lineage.[1] The standard method used to measure intergenerational persistence is to relate outcomes across generations, such as income, with a regression-to-the-mean model

$$\ln I_{i,t} = \alpha + \beta \ln I_{i,t-1} + \varepsilon_i, \tag{1}$$

*ICREA-MOVE, Universitat Autonoma de Barcelona, and Barcelona GSE (email: nezih.guner@movebarcelona.eu). Financial support by the European Research Council (ERC) Grant 263600 is gratefully acknowledged. This short note is not meant to be an exhaustive review of the literature on intergenerational mobility that follows Gary Becker's work. It aims to provide a broad overview and highlight a set of recent contributions, mainly from the theoretical and quantitative macroeconomics literature. Corak (2013) provides an excellent review of empirical work on intergenerational mobility. I would like to thank David de la Croix, Matt Delventhal, Jeremy Greenwood, Christopher Rauh and Gustavo Ventura for comments. The usual disclaimers apply.

[1] Ibn Khaldun, who is regarded as one of the founding fathers of modern sociology, historiography and economics, states in his famous book, the Muqaddimah, that: "Prestige is an accident that affects human beings. It comes into being and decays inevitably....It reaches its end in a single family within four successive generations. This is as follows: The builder of the glory (of the family) knows what it cost him to do the work, and he keeps the qualities that created his glory and made it last. The son who comes after him had personal contact with his father and thus learned those things from him. However, he is inferior in this respect to (his father), in as much as a person who learns things through study is inferior to a person who knows them from practical application. The third generation must be content with imitation and, in particular, with reliance upon tradition. This member is inferior to him of the second generation, in as much as a person who relies (blindly) upon tradition is inferior to a person who exercises independent judgment." (http://www.muslimphilosophy.com/ik/Muqaddimah/Chapter2/Ch_2_14.htm). I would like to thank Matt Delventhal for bringing Ibn Khaldun's work to my attention.

where $I_{i,t-1}$ and $I_{i,t}$ measure the permanent incomes of parents and children, usually fathers and sons in applied work, and ε_i is an error term, unrelated to parental income, that captures other factors that affect children's incomes. The parameter β, the intergenerational income elasticity, is a measure of how much of the relative position of a father his son is expected to inherit on average. If $\beta = 0.4$, for example, a child, whose parents' income is 100% above the mean in the parental generation, is expected to be only 40% above the mean in his generation. In two generations, i.e. with the grandchildren, the fortunes of this dynasty will be just about 16% above the mean. As β approaches to zero, families rise and fall much faster. If β were 0.2, then the grandchildren would be just 4% above the mean.

The economics profession and the general public is interested in intergenerational mobility now more than ever. Several factors have contributed to this growing interest. First, recent evidence suggests that intergenerational mobility in the U.S. is considerably lower than previous estimates suggested. Mazumder (2005) estimates β to be around 0.6. Hence a dynasty that is 100% above the mean today is expected to be, not 4% or 16%, but 36% above the mean in two generations. Estimating β is a challenging task that requires panel data that links the economic status of children to that of their parents.[2] Guell, Rodriguez-Mora and Telmer (2014) as well as Clark (2014) propose a new methodology for measuring intergenerational mobility that exploits the joint distribution of surnames and economic outcomes and can be implemented without panel data. Based on this methodology, Clark (2014) documents that there has been very little change in social mobility over the last few centuries.

Second, recent evidence also shows that there is a strong correlation between inequality in a society at a given point in time and intergenerational persistence of income, a relationship that has been called "The Great Gatsby Curve" – Corak (2013).[3] Countries that are more unequal, such as the US and the UK, are exactly the countries that have a high persistence of income across generations. More equal countries on the other hand, such as Denmark and Norway, are also the ones with higher mobility.[4] Together with the fact that income

[2] Solon (1992) and Zimmerman (1992) are the classic studies that provide earlier estimates of β and discuss related econometric issues.

[3] Note that the Great Gatsby curve can result from simple statistical mechanics. Imagine that persistence across generations follows a first-order autoregressive process. Then, the stationary distribution has a higher variance when persistence is higher.

[4] Aaronson and Mazumder (2008) show that there has been a decline in intergenerational mobility since 1980 in the US exactly when inequality started to rise. Lee and Solon (2009) and Chetty et al (2014b), on

inequality is growing, these observations cast doubt on the accessibility of the American Dream, the ideal of a society characterized by significant upward mobility.

Finally, a growing body of literature in economics and other social sciences suggests that the initial conditions under which children grow up matter greatly for their well-being as adults. Carneiro and Heckman (2003) and Cunha, Heckman, Lochner and Masterov (2006), among others, show that differences between children, both in their cognitive and non-cognitive skills, appear at very early ages and that the family environment plays a significant role in generating these differences. Heckman and Cunha (2007) and Cunha, Heckman and Schennach (2010) emphasize the importance of early childhood investments, and how early childhood investment matters for the effectiveness of investment at later ages.[5] On the other hand, Caucutt and Lochner (2012) document that many young and middle-aged parents are borrowing constrained and, as a result, might not able to make efficient early investment in their children. Indeed, Mazumder (2005) finds that intergenerational mobility is particularly low for families with little or no wealth, who are more likely to face borrowing constraints. How much do differences in initial conditions matter for lifetime inequality? Huggett, Ventura and Yaron (2011) show that the initial conditions at labor market entry, ages 20 to 25, can account for about 60 percent of the variation in lifetime earnings– considerably more than shocks received during the working lifetime.[6] The question then is, of course, what determines these initial conditions, and as a result, persistence in outcomes across generations?

2 Becker and Tomes

In their seminal contributions, Becker and Tomes (1979 and 1986) build a theoretical framework to answer this question. Together with Loury (1981), their framework remains the main building block of research on intergenerational mobility.[7] Mulligan (1997), Mulligan (1999), Han and Mulligan (2001) and Solon (2004) provide excellent analyses of the basic Becker and

the other hand, do not find changes in intergenerational mobility over time.

[5] Cunha and Heckman (2009) provide an excellent review.

[6] Keane and Wolpin (1997) find an even larger effect of initial conditions.

[7] Other important theoretical contributions are Banerjee and Newman (1993), who present a model of occupational choice, and Galor and Zeira (1993), who present a model in which human capital investment is indivisible. In both papers, wealth distribution today affects the decisions of the agents, and wealth inequality can lead to long-run stagnation.

Tomes model of intergenerational mobility. Aiyagari, Greenwood and Seshadri (2002) characterize efficient allocations and contrast them to market allocations with different degrees of market completeness.

At the core of the Becker and Tomes model are altruistic parents who, given their preferences and constraints, decide how much resources to invest in their children. Let I_t be parents' income. Parents can spend this income for their own consumption, C_t, for human capital investment on their children, h_{t+1}, or for making financial transfers to them, X_{t+1}. Parents also transmit endowments to their children, e_{t+1}. Children's endowments and parental investment in human capital, together with government spending on education, G_{t+1}, determine how much human capital the children will have in the next period. Parents care about their own consumption and the consumption of their children and solve

$$\max_{C_t, C_{t+1}, h_{t+1}, X_{t+1}} U(C_t, C_{t+1}),$$

subject to

$$C_t + X_{t+1} + h_{t+1} = I_t,$$

$$I_{t+1} = w_{t+1} H(h_{t+1}, G_{t+1}, e_{t+1}) + (1+r) X_{t+1} + u_{t+1},$$

and

$$X_{t+1} \geq 0,$$

where w_{t+1} is the return to human capital next period, $H(.)$ is the human capital production function, r is the interest rate and u_{t+1} is the idiosyncratic component of children's income, which may be thought of as luck. The last constraint, $X_{t+1} \geq 0$, implies that parents can only leave positive bequests to their children. If it binds, parents are borrowing constrained.

The endowment is often interpreted as ability that is passed imperfectly from generation to generation. This ability determines how productive the parental investment h_{t+1} is in creating human capital. With specific assumptions on functional forms, see e.g. Solon (2004), it is possible to map β into the structural parameters of the model and show that β, the intergenerational persistence of income, should be higher whenever i) endowments (abilities) are more correlated across generations, ii) h_{t+1} has a larger impact on children's human capital, iii) the returns to human capital are higher, and iv) public investment in education is less progressive.

Lee and Seshadri (2014) integrate the Becker and Tomes framework into a standard life-cycle economy in which both parents and children live for multiple periods. Parents decide how much time and goods to invest in their children's education. This investment is made over several periods, and past investment increases the effectiveness of current investment. Parents also leave bequests for their children but, given the full-blown life-cycle structure, this happens later than the investment in education. Adults (parents) go through the stages of the life-cycle: they work, raise children and retire. Parents also invest time and resources to improve their own skills. The model can jointly explain the intergenerational elasticities of lifetime earnings, education, poverty and wealth, while remaining empirically consistent with cross-sectional inequality. Their results also suggest that investment in children and parents' human capital, rather than the persistence of innate abilities, are what have the largest impact on equilibrium intergenerational elasticities. Caucutt and Lochner (2012) also study a model economy with multi-period human capital investment. They study the effects of education subsidies, loans, and transfers offered at different ages on early and late human capital investments. Due to the interaction between early and late investment, and early borrowing constraints, early interventions tend to be more successful than later interventions at improving human capital outcomes. In an earlier paper, Restuccia and Urruttia (2004) reach the same conclusion with a model economy in which parents make investments over two periods. In contrast to these papers, De Nardi (2004) and Castaneda, Diaz-Gimenez and Rios-Rull (2003), following a line of research going back to Laitner (1979), abstract from human capital investment and focus on financial transfers. In their frameworks, bequests, both accidental and voluntary, and the transmission of earnings ability link generations. Their models are able to generate a very skewed wealth distribution, as observed in the data.[8]

3 And Beyond

The Becker and Tomes framework provides a very natural environment in which to study intergenerational mobility and it has also been expanded in several directions in recent years.

[8] Castaneda, Diaz-Gimenez and Rios-Rull (2003) and De Nardi and Yang (2014) also study estate taxation and how it can affect, by reducing the concentration of wealth, the role of parental background in determining children's incomes. Caballe and Moro-Egido (2014) analyze how the intergenerational wealth mobility is affected by aspirations, i.e. the dependence of one's utility on his parent's consumption, and habits, i.e. the dependence of one's utility on his past consumption.

While some of these extensions were explicitly discussed by Becker and Tomes (1979 and 1986), others go beyond.

It is important to highlight the fact that Becker and Tomes (1979) had a much broader notion of endowments: "*The concept of the endowment is also a fundamental part of our analysis. Children are assumed to receive endowments of capital that are determined by the reputation and "connections" of their families, contribution to the ability, race, and other characteristics of children from the genetic constitutions of their families, and the learning, skills, goals, and other "family commodities" acquired through belonging to a particular family culture. Obviously, endowments depend on many characteristics of parents, grandparents, and other family members and may also be culturally influenced by other families.*" – Becker and Tomes (1979, page 1158). They assume that endowments for the next generation are determined by

$$e_{t+1} = (1 - h + f)\overline{e}_t + he_t + v_{t+1},$$

where h measures the fraction of e_t transmitted to children, $\overline{e}_t$ is the average endowment in generation t, f is the rate of growth of $\overline{e}_t$, $(1 - h + f)\overline{e}_t$ is a simple way of incorporating the influence of other families, and v_{t+1} is a shock capturing other factors that affect e_{t+1}. Hence endowments include not just cognitive skills but also non-cognitive skills and other traits, such as goals. It can also be affected by other families.

Non-Cognitive Skills Still, children's endowments in Becker and Tomes are not directly affected by parental decisions. Furthermore, children's human capital is a one-dimensional object that represents general human capital. Recent evidence presented by Heckman, Stixrud and Urzua (2006) and Heckman, Pinto and Savelyev (2013) and others, however, show that noncognitive skills, which include traits such as perseverance, motivation, self-esteem, trustworthiness, self-control, and forward-looking behavior, are as powerful predictors of children's future success as cognitive skills.

Cunha and Heckman (2007) present a life-cycle economy in which parents facing borrowing constraints invest in both the cognitive and non-cognitive skills of their children. The human skill formation processes for both cognitive and non-cognitive skills is governed by a multistage technology. They call the stages that are more effective in producing certain skills "sensitive periods". If one stage alone is effective in producing a skill, it is called a "critical period" for that skill. Furthermore, skills produced at one stage augment the skills attained

at later stages and skills produced at one stage raise the productivity of investment at subsequent stages. They label these features as self-productivity and dynamic complementarity, respectively. Their model demonstrates how family resources and market constraints can account for several well-established facts from the child development and child intervention literatures, such as the opening of gaps in both cognitive and non-cognitive skills among children at a very early age, very high returns to remedial investment in young disadvantaged children, and the importance of remedial investment in non-cognitive skills.

Incentives of parents to invest in their children's skills, cognitive or non-cognitive, ultimately depend on what their expectations are about the effectiveness of such investment. For a sample of socioeconomically disadvantaged African-American women in the US, Cunha, Elo and Jennifer (2013) find that the median subjective expectation about the elasticity of child development with respect to investments is between 4% and 19%. In contrast, they find that the elasticity is estimated to be between 18% and 26% in the data. They calculate that the maternal investments would go up by between 4% and 24%, if the parents had the right expectations. Such beliefs can also be transmitted from generation to generation. It is well documented, for example, that there is a strong intergenerational correlation in various types of welfare use. Using Norwegian data, Dahl, Kostøl and Mogstad (2014) find suggestive evidence that parents' use of a particular welfare program, the disability insurance, might affect their children's beliefs about their chances of getting the same welfare, and also might change their attitudes about program participation and its stigma.

Preference Formation If non-cognitive skills are so important, how can parents make their children more motivated, improve self-control, and encourage them to be more forward-looking? Is parenting, as Cunha and Heckman (2009, page 330) state, "more important than cash"? Fernandez-Villaverde, Greenwood and Guner (2014) and Doepke and Zilibotti (2014) present economic models in which parents try to affect their children's preferences. Fernandez-Villaverde, Greenwood and Guner (2014) study an overlapping generations economy in which parents mold the preferences of their daughters for premarital sex by making premarital sex less or more of a taboo for them. This is costly in terms of effort for parents, but parents do this because they care about the future well-being of their daughters. They investigates how changes in the economic environment, such as the improvements in the contraceptive technology, affect parents' incentives to shape their children's preferences. In

Doepke and Zilibotti (2014), parents decide how to best influence their children's choices, by influencing their preferences or by restricting their choice sets. Economic environment affects the parenting styles. They show that a lower level of inequality results in more permissive parenting as stakes are lower, a prediction supported by the empirical evidence. In both papers, parents are paternalistic, i.e. they disagree with their children's preferences.

Family Structure The Becker and Tomes model is populated by households that consist of a parent and a child. Aiyagari, Greenwood and Guner (2000) and Greenwood, Guner and Knowles (2003) embed a model of investment in children with a model of marriage and divorce. In their environment, some children are born into households with two parents, while others are born to single mothers. Some children experience the divorce of their parents, while others live in intact families all their lives. As a result, family structure, who is single, who is married and who is married with whom, all directly affect the resources, both time and money, that children receive during their childhood.

Recent evidence suggests that these concerns are becoming increasingly relevant. Greenwood, Guner, Kocharkov and Santos (2014), for example, document that educational assortative mating increased in the US between 1960 and 2005. Fernandez and Rogerson (2001) and Fernandez, Guner and Knowles (2005) study models in which there is a direct link between assortative mating and intergenerational mobility. Imagine a world that consists of two education groups, skilled and unskilled. Higher assortative mating means that there are fewer households in which parents have different education levels. If more educated parents have fewer children, this also means a higher number of children are concentrated in households in which both parents have lower education and lower income.

Neighborhoods, Schools and Votes If family background is one determinant of children's success, schooling quality is another one. Since primary and secondary education are largely financed by local taxes in the US, differences in school quality reflect differences in average incomes levels across communities. Communities can also affect children more directly by shaping both their skills and their goals. As a result, growing residential segregation in the U.S., as documented by Murray (2012), can be expected to have significant effects on intergenerational mobility. It is therefore not surprising that Chetty, Hendren, Kline and Saez (2014a), who show that there is a large geographic variation in intergenerational mobility

within the U.S., find that high mobility areas have less residential segregation, less income inequality, better primary schools, greater social capital, and greater family stability.[9]

Benabou (1996), Durlauf (1996), and Fernandez and Rogerson (1996) study models in which parents decide where to live and vote on a level of local taxes to finance public education for their children. In these environments richer families can segregate themselves in equilibrium into economically homogeneous enclaves, and public policies that encourage more locational mixing across income groups or a move to economy-wide financing of education can be welfare improving in the long-run.

Others have also focused on how public policies can affect intergenerational mobility within models that abstract from local public goods. Based on a quantitative version of the Becker and Tomes model, Herrington (2014) shows that differences in taxes and public education spending can account for about 35 percent of differences in earnings inequality and 15 percent of differences in intergenerational earnings persistence between the U.S. and Norway. Ichino, Karabarbounis and Moretti (2011) introduce voting into a model of intergenerational mobility in which parents not only decide how much to invest in their children's human capital but also vote on public education. In their framework, two societies with similar economic fundamentals may have different degrees of intergenerational mobility depending on their political institutions. Along similar lines, Rauh (2014) studies the political economy of early and college education in the presence of dynamic complementarities in human capital investment in children. In the data, high earnings inequality goes hand in hand with low intergenerational earnings mobility. At the same time, public expenditure on education, which could mitigate this relationship, is negatively correlated with inequality across countries. He shows that cross country differences in voter turnout by educational attainment, meaning the degree to which more educated individuals are more or less likely to vote than less educated individuals, can reconcile these two facts.

4 Conclusions

To quote Becker and Tomes (1986, p.S3): "*An analysis that is adequate to cope with the many aspects of the rise and fall of families must incorporate concerns by parents for chil-*

[9]Social capital is measured as an index based on voter turnout rates, the fraction of people who return their census forms, and various measures of participation in community organizations.

dren as expressed in altruism toward children, investments in the human capital of children, assortative mating in marriage markets, the demand for children, and expectations about events in the next or even later generations. Although these and other aspects of behavior are incorporated into a consistent framework based on maximizing behavior, we do not pretend to handle them all in a satisfactory manner. However, our approach indicates how a more complete analysis can be developed in the future." The economics profession has been working hard to fulfill their expectations.

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