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Inequality of Opportunity and Aggregate Economic Performance

Katharine Bradbury and Robert K. Triest*

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Introduction

Income inequality has grown dramatically within many countries in recent decades, raising the question of whether inequality is an integral part of the economic growth process. Paralleling the growth of inequality, and also the growth of research on inequality and economic growth, has been the emergence of a substantial research literature on inequality of opportunity. Although inequality of opportunity has long been a subject of concern to policymakers and commentators, it is only relatively recently that a formal conceptual and empirical research literature on this topic has developed, and few research papers have explicitly addressed the relationship between inequality of opportunity and economic growth. Despite this, one can see elements of the inequality of opportunity implicit in many analyses of inequality and economic growth, starting from the genesis of research on this topic.

The modern economic literature on the relationship between economic growth and income inequality starts with Simon Kuznets' 1954 American Economic Association Presidential address (Kuznets, 1955), where he not only describes the relationship, but also proposes explanations for the patterns he uncovered in the data. He argues that inequality tends to rise in a country's early stages of economic development and he observes that it then appears to stabilize and decline as developed nations' economies continue to grow and mature (giving rise to what is now known as the Kuznets curve). Kuznets discusses two major factors involved in the evolution of incomes in developed nations—the cumulative effects of a concentration of savings among high earners and the industrial shift from agriculture to industrial urban settings—both of which would lead to continued widening of the income

*Senior Economist and Policy Advisor and Vice President and Economist, respectively, at the Federal Reserve Bank of Boston. The views expressed herein are those of the authors and do not necessarily represent the positions of the Federal Reserve Bank of Boston or the Federal Reserve System.

distribution. However, finding no such widening—indeed documenting declines in inequality in the United States and United Kingdom from the 1920s through 1950—he argues that the inequality-worsening factors were counteracted by other forces embodied in "the dynamism of a *growing* and free economic society" (p. 11, emphasis added).

Among the factors that Kuznets cites as contributing to reduced income inequality as growth progresses is the greater ability of people born into an urban industrial economy to "…take advantage of opportunities of city life…" (p. 15) relative to those who migrated from rural agricultural areas, suggesting that growth might lead to a reduction in what we would now call inequality of opportunity, with a consequent decrease in inequality of outcomes. Kuznets also posits a role for an endogenous policy shift that led to reduced income inequality: "…in democratic societies the growing political power of the urban lower-income groups led to a variety of protective and supporting legislation, much of it aimed to counteract the worst effects of rapid industrialization and urbanization and to support the claims of the broad masses for more adequate shares of the growing income of the country." (p. 15). Kuznets sees the "long swing" he observed in inequality as part of the wider process of economic growth and development, with causation running from growth (development) to inequality.

In the 60 years since Kuznets' path-breaking address, a voluminous research literature has developed on the relationship between growth and inequality, and there is still an ongoing debate regarding the extent to which the Kuznets curve pattern describes the relationship between growth and inequality as a country develops. Even if the Kuznets curve arguably describes how inequality evolves as an economy progresses from a low level of development to an industrial economy, it is clear that a quite different relationship describes the relationship between growth and inequality in high-income countries in recent decades. The pattern of declining inequality in pre-tax pre-transfer family incomes that Kuznets described in 1954 continued in the United States through the 1970s, but has reversed markedly since then, with the distribution of U.S. family and household incomes becoming more unequal in the 1980s, 1990s, and 2000s even as average real incomes have continued to rise.

On a theoretical level, there are reasons that inequality might be either positively or negatively

related to growth, with causality running in either direction. Inequality may be associated with incentives for work, risk taking, and savings, leading to greater economic growth. Or inequality may be associated with loss of social capital and diminished capacity for efficient investment among the poor, leading to diminished economic growth. The nature of the relationship is fundamentally a question that must be answered empirically, and there is not yet a consensus among researchers in this area. However, the range of mechanisms through which inequality *of opportunity* may be related to economic growth is more limited, and we argue in this paper that inequality of opportunity has a clearly negative effect on economic growth. The effect of economic growth on inequality of opportunity is less clear-cut, and there is not convincing evidence of a causal link in that direction.

In this paper, we review the research literature on the relationship between inequality of opportunity and economic growth, and also provide new empirical evidence. We first briefly examine research on the relationship between economic growth and inequality of outcomes before turning our attention to inequality of opportunity.[1] After reviewing the literature on, and providing new empirical evidence on, the relationship between inequality of opportunity and economic growth, we also briefly examine the relationship between inequality of outcomes and inequality of opportunity. The paper concludes with a discussion of the main findings and their implications.

The relationship between economic growth and inequality (of outcomes)

In this section, we highlight some of the themes and findings in the research literature on growth and inequality of outcomes that are most pertinent to understanding the relationship between aggregate economic performance and inequality of opportunity, particularly in the recent era of growth accompanying increased inequality of outcomes in advanced economies. We turn to the literature that explicitly focuses on the relationship between inequality of opportunity and aggregate economic

[1] Research on the relationship between inequality and growth at a business cycle frequency is beyond the scope of the paper. Earlier research documented an empirical regularity: inequality rose during recessions and tended to fall during expansions; this empirical regularity broke down after the 1980s, as inequality rose during expansions as well as recessions.

performance in the subsequent section. Our review of the literature is by no means comprehensive; the reader is referred to the articles and books cited here for additional references.

The main driving forces behind economic growth are increases in the factors of production, including human capital, and changes in technology, operating within an institutional context. To the extent that growth causes changes in income inequality, this causal relationship is likely to come about from inequality being affected by technological change or by factor accumulation and investment. The causality may also run in the opposite direction, with inequality affecting technological change or factor investment. We first consider causal mechanisms running from growth to inequality, and then examine mechanisms running in the opposite direction.

How does economic growth affect inequality of outcomes?

The main driving forces behind economic growth are increases in the factors of production, including human capital, and changes in technology, operating within an institutional context. To the extent that growth causes changes in income inequality, this causal relationship is likely to come about from inequality being affected by technological change or by factor accumulation and investment. The causality may also run in the opposite direction, with inequality affecting technological change or factor investment. We first consider causal mechanisms running from growth to inequality, and then examine mechanisms running in the opposite direction.

The increase in inequality that accompanies industrialization in Kuznets' theory is essentially due to technological change. There is widespread agreement that the surge in earnings inequality that occurred over the past few decades is due, at least in part, to another technological revolution: changes in information technology that have generated increases in educational and technical skill premiums. Like industrialization, the revolution in information technology has benefitted entrepreneurs and investors in sectors related to information technology and in sectors that exploit the new technology in production, as well as workers whose skills are complementary to the new technologies. Something like the mechanism posited by Kuznets with respect to the shift from rural farm to industrial city seems to be in effect, but

occurring at an advanced stage of development. In this case, it is not growth *per se*, but the specific source of economic growth, skill-biased technical change, that generates inequality.

Skill-biased technical change does not necessarily result in an increase in income inequality. Goldin and Katz (2008) depict relative wages in the United States over the course of the 20th century as being determined by the outcome of a race between technological change and increases in educational attainment. Skill-biased technological change works toward increasing demand for and hence the wages of highly educated workers relative to their less educated counterparts, leading toward an increase in earnings inequality. Increased educational attainment raises the supply of highly educated workers relative to less educated workers and leads toward a compression of relative wages across educational groups. Goldin and Katz (2008) argue that during roughly the first three-quarters of the century, increases in educational attainment outpaced the increase in demand for highly educated workers in the United States, leading to a decrease in inequality. However, in recent decades the demand for highly educated workers generated by technological change has dominated the increase in educational attainment, leading to an increase in the educational wage premium and a consequent increase in earnings inequality.

Both technological change and increases in educational attainment generate economic growth. That growth, however, increases inequality only if increases in educational attainment do not keep up with the increase in demand for highly educated workers that accompanies skill-biased technological change, or if other aspects of the growth process generate higher inequality.

In addition to industrialization, Kuznets' conception of growth also involved the accumulation of savings to fund investment; he saw such accumulation as an additional force elevating inequality as development proceeded. Growth allowed high-income individuals to save, and savings concentrations both raised investment levels, augmenting growth, and fed back to widen inequality as investment returns accrued to the high-income investors.

Kuznets and other researchers suggest another path through which growth can affect inequality: as economic growth raises incomes in a democracy, expanding political power of lower income groups can bring about a shift in policy toward "sharing the wealth" either directly through taxes and transfers or via

public financing of investments in both physical and human capital. More generally, the growth process itself may bring about institutional changes that can alter the distribution of economic rewards. Levy and Temin (2007) attribute much of the increase in American inequality since 1980 to policy changes that occurred in the 1970s and 1980s, including a falling real minimum wage and a weakening of unions. They attribute the policy changes, in turn, to the post-1973 productivity slowdown and stagflation of the 1970s. In their model, slow growth led to policy changes that increased inequality.

How does inequality affect economic growth?

Skill-biased technical change appears to be a key driving force behind growth and recent increases in inequality, but inequality in turn may affect the investment response to the incentives created by skill-biased technical change. Aghion, Caroli and Garcia-Penalosa (1999) present a growth model in which they assume away opportunities for borrowing and lending. The lack of a borrowing and lending market results in wealthy individuals facing a lower marginal return on investment (because of decreasing returns) than do poor individuals who by definition have limited funds to invest. In this model—and another in which the authors examine capital market "imperfections"— inequality reduces aggregate productivity and growth because it results in an inefficient allocation of investment; in this context, they note that redistribution can create investment opportunities and enhance growth. The form of inequality that matters here is essentially inequality of opportunity. Inequality, combined with imperfect capital markets or frictions, may interfere with efficient investment in areas such as schooling, health, and entrepreneurship. The friction that prevents the poor from taking advantage of investment opportunities may literally be a borrowing constraint, or it may be a related factor such as lack of information about investment opportunities, greater perceived level of risk associated with the investment, or insufficient availability of family resources to insure against possible downside risks of the investment. When inequality prevents efficient investments from being undertaken, growth is reduced relative to what it would otherwise be.

Educational attainment provides an example of such missed investment opportunities. College-

going and completion result from decisions made by students and their families, the opportunities for schooling that they encounter, and public policies that shape those opportunities. The increase in the educational wage premium provides an incentive for people to invest in more years of schooling, but recent research, often based on a comparison across cohorts in the National Longitudinal Survey of Youth, suggests that students from relatively disadvantaged backgrounds are not able to take full advantage of the high expected rate of return to educational attainment, as family background is playing an increasingly important role in educational attainment in the U.S. Bailey and Dynarski (2011) find that college completion rates are higher for the U.S. cohort born around 1980 compared to those for the cohort born in the early 1960s, but that the increase is much greater for children born in high-income families than for those born in low-income families. Belley and Lochner (2007) find a similar empirical pattern, and develop a model that allows for borrowing constraints to play a role in college attendance. They conclude that their data are consistent with borrowing constraints having become more widespread over time. Castex and Dechter (2014) find that although the economic return to formal education increased between the two cohorts, the return to cognitive ability (measured by aptitude test scores) decreased, suggesting that barriers to formal educational attainment are now more costly to students who confront them. Fox, Connolly, and Snyder (2005) report NCES data indicating that only 29 percent of low-SES children with 8th grade test scores in the top quartile in 1988 attained a BA by 2000, while 74 percent of high-SES high test-score children did so; indeed, the low-SES children with high test scores were less likely to attain a BA than high SES children with test scores in the lowest quartile (30 percent). The inefficiencies represented by such wasted resources constitute a drag on growth.

One of the key pathways through which economists hypothesize that inequality positively affects growth is its role in creating incentives for effort and risk-taking. That is, when an economy's reward structure provides greater returns to those who work hard or to those who take risk than to those who do not, inequality is higher and the induced extra effort and/or risk-taking helps propel the economy forward. Arthur Okun (1975) wrote of "the big tradeoff" between equality and efficiency: "The contrasts between American families in living standards and in material wealth reflect a system of rewards and penalties that

is intended to encourage effort and channel it into socially productive activity." (p. 1).

In addition to inefficient investment on the downside and growth-promoting incentives on the upside, inequality may influence growth via its effects on volatility. Aghion, Caroli, and Garcia-Penalosa (1999) model the way in which unequal access to investment opportunities and credit market imperfections can lead to persistent credit cycles and macroeconomic volatility. Stiglitz argues that "inequality is associated with more frequent and more severe boom-and-bust cycles that make our economy more volatile and vulnerable."[2] Jared Bernstein (2013) cites models of this process put forward by Kumhof and Ranciere (2010) and Cynamon and Fazzari (2013).

A fourth channel is via inequality's effect on demand. Voitchovsky's 2009 *Handbook* overview says that lower inequality in the form of a strong middle class (in terms of numbers and income levels) supports demand for a nation's output, necessary to maintain growth. Stiglitz (2012) argues that the weakness of the U.S. middle class led to soft consumer demand and held back the recovery from the Great Recession. To the degree that inequality takes the form of larger increases in income among the rich, these theories build on the fact that the rich have a lower marginal propensity to consume than those further down the income ladder.[3]

Another channel through which inequality may affect growth is through increasing the demand for policies that attenuate inequality. Kuznets (1955) saw this as one of the mechanisms that would eventually lead to reduced inequality as economies develop. Voitchovsky (2009) provides a thoughtful review of the literature, and notes that the relationship between inequality and growth through the redistribution channel is ambiguous. Although high marginal tax rates may discourage capital investment, risk taking, and labor supply (reducing growth), some redistributive spending may be growth enhancing. For example, spending on subsidized education for low-income families may reduce inefficiencies arising from inequality of opportunity. Moreover, increased inequality may not result in increased political pressure for redistribution. Indeed, among some commentators in the United States in

[2] Joseph Stiglitz, "Inequality is Holding Back the Recovery." *New York Times Opinionator,* January 29, 2014.
[3] See Dynan Skinner, and Zeldes, 2004.

recent years, concern has focused on the opposite outcome: they ask whether inequality has risen so high that the rich have been able to take over political institutions and shift policy-making in their favor to such a degree that it contributes to greater inequality? Acemoglu and Robinson (2012) emphasize the importance of institutions in the growth process, contrasting the generally negative effect on growth of "extractive" institutions that mainly benefit the small, closed group that controls them with the positive effect on growth of "inclusive" institutions that are controlled by and benefit a large open group. Increases in high-end inequality might result in the concentration of political power among a fairly small group controlling a large share of income and wealth, with the potential for the creation and control of extractive economic and political institutions by this group. Along these lines, Stiglitz (2012) argues that pressure for tax cuts for corporations and wealthy individuals has undermined the ability of the government to fund public infrastructure as well as income-support programs, the lack of which harms growth.

Whether or not redistributive policies and institutions arise in response to increased inequality, they may nonetheless affect the relationship between growth and inequality. Burtless (2003) maintains that the relatively modest transfer system and labor market regulations in the U.S. compared to other G7 countries likely both boosted U.S. employment growth relative to the other countries and also resulted in a greater increase in inequality in the U.S. compared to the other G7 countries. Burtless notes that, for the most part, U.S. labor market policies and institutions did not directly cause the increase in inequality. Instead, the U.S. policies resulted in the economic forces pushing toward greater inequality having a greater impact in the U.S. than they did in other countries with more generous transfer systems and more restrictive regulations and institutions. In his view, U.S. policies resulted in a more positive correlation between growth and inequality than existed in other advanced economies. A recent OECD report (2012) attempts to identify policy changes that can "yield a double dividend in terms of boosting GDP per capita and reducing income inequality." (p. 181).

Finally, inequality is part of the economic setting in which growth occurs. In addition to the potential for high inequality to result in redistributive policies that could hinder growth by reducing

incentives to make effort and take risk, high inequality might result in other changes to the economic environment that are not conducive to growth. Among the factors discussed by Voitchovsky (2009) as being potentially exacerbated by increased inequality are political instability, loss of social capital, corruption, and crime rates.

What are the empirical relationships?

The conceptual and theoretical literature provides explanations for why growth and inequality may be either positively or negatively related, with the sign possibly varying over countries or over time for any given country. As discussed above, the causal direction between growth and inequality may run either or both ways. Given the theoretical ambiguity regarding the relationship, it is not surprising that there is not a clear consensus view on the empirical relationship between growth and inequality.

Most of the empirical literature attempts to identify the causal effect of inequality on growth. Banerjee and Duflo (2003) review many of the econometric specifications used by previous researchers, and find them all wanting. Their most basic criticism is that researchers have generally estimated linear specifications, but the theories that Banerjee and Duflo review lead to nonlinear and possibly non-monotonic relationships. Banerjee and Duflo present results from nonparametric estimation of the relationship, showing that growth is an inverted U-shaped function of changes (rather than levels) in inequality, with the peak of the curve at close to the point with no change in inequality. This implies that either increases or decreases in inequality will result in lower growth. Banerjee and Duflo caution against giving a causal interpretation to this empirical relationship due to identification problems.

Voitchovsky (2005) explores whether the effect of inequality on growth varies by the type of inequality. She finds that inequality at the top of the distribution, which might reflect incentives for investment and risk taking, is positively associated with growth. In contrast, inequality lower in the distribution is negatively associated with growth. This might reflect lack of opportunities for educational investment by the poor and possible social or political unrest associated with inequality.

In a recent working paper, Ostry, Berg and Tsangarides (2014) investigate the empirical

relationship between inequality and growth using a dataset that allows them to separate inequality in market (pre-tax and transfer) income from the redistribution that occurs through the tax and transfer system. They find that net (after tax and transfer) inequality is negatively related to economic growth. Redistribution through the tax and transfer system is found to be positively related to growth for most of the range of distribution observed in the data, but is negatively related to growth for the most strongly redistributive countries. This suggests that the effect of redistribution on enhanced opportunities for lower income families and on social and political stability outweighs any negative effects on growth through a damping of incentives.

Although most of the research on the effect of inequality on growth uses cross-country data, a small number of papers estimate the relationship based on intra-national comparisons. Using a panel of data on U.S. states, Panizza (2002) finds some evidence of a negative association between inequality and growth. However, he notes that the results are not robust to changes in specification, Also using U.S. state-level panel data, Frank (2009) estimates a positive effect of inequality on growth. Frank's finding is driven by inequality in the upper end of the income distribution, and data limitations prevent him from investigating the effect of low-end inequality. Citing Voitchovsky (2005) Frank acknowledges that inequality in the lower end of the income distribution might have the opposite effect.

One would expect the causal channels relating intra-national inequality to intra-national growth to differ somewhat from those relating inequality and growth at the national level. A key reason for this difference is that trade of goods and services, and flows of financial capital and workers, are much greater at the intra-national level than they are across countries. One implication of this is that the savings channel is likely to be less important at the intra-national level. This is also true of the demand channel, although perhaps to a somewhat lesser extent. Endogeneity of inequality may also be more of a problem in intra-national data than at the national level. The easy geographic mobility of workers within countries provides another potential channel relating inequality and growth, although this seems most likely to be in the growth to inequality direction. If high growth attracts relatively low-income migrants seeking economic opportunity, this might lead to a positive relationship between growth and inequality of

outcomes. However, the enhanced labor market prospects associated with growth might be associated with reduced inequality of opportunity.

The Relationship between Inequality of Opportunity and Growth

How does inequality of opportunity affect growth?

Turning to the influence of inequality of opportunity on growth, the underlying causal mechanism proposed is that inequality of opportunity prevents some potential workers in the economy from developing their full capacity, generating wasted resources and hence lower-than-possible output. By improving the utilization of resources, increased equality of opportunity increases steady state output in the economy, and increases the economy's growth rate during the transition to the higher steady state. To the extent that opening up opportunities for individuals to develop and utilize their talents also affects the rate of technological change or generates externalities, as in Lucas (1988), then a sustained higher rate of growth may result. While various mechanisms suggest both positive and negative effects of inequality of outcomes on growth, the arguments for how inequality might increase growth are not applicable to inequality of opportunity. Theory suggests that inequality of opportunity will have a negative effect on economic growth.

Three recent papers attempt to quantify the effect of inequality of opportunity on economic performance. One aims to measure directly the output added via the increased opportunity gained by women and blacks over the period since 1960 in the United States. The other two grew out of the much larger literature (discussed above) examining the effect of inequality (of outcomes) on growth. The authors of both of these latter papers decompose total inequality into two components—one of which measures inequality of opportunity—and investigate their effects on growth.

Voitchovsky's (2009) *Handbook* review includes a discussion of how inequality at the bottom of the distribution is often associated with inequality of opportunity, which in turn keeps the poor from contributing fully to the nation's accumulation process and thereby stunts growth. In addition to credit

constraints, which might prevent investment in education and also stunt entrepreneurship, those at the bottom of the distribution may face diminished incentives and opportunities to engage in productive economic activity. Voitchovsky cites relatively high rates of criminal activity and childbearing as resulting from the poor facing a diminished opportunity cost of forgoing market work. More generally, inequality of opportunity may be detrimental to the functioning of a market economy by diluting social capital and the sense of trust and fair dealing that is necessary for well-functioning markets.

One way in which inequality of opportunity may arise is through unequal access to advantageous professions. Hsieh, Hurst, Jones, and Klenow (2013) measure "the macroeconomic consequences of the remarkable convergence in the occupational distribution between 1960 and 2008." They start from the premise that innate talent for different types of work cannot possibly be so differentially distributed across race and gender as to explain the very unbalanced occupational distributions in 1960 of white women, black women, and black men, compared with white men. They note, for example, that 94 percent of doctors and lawyers were men in 1960. Therefore, they argue, these groups were not able to contribute their full potential to the economy, held back by occupational barriers. These barriers may reflect differences in access (geographic or social) to high quality K-12 schools, social forces steering some individuals into particular occupations, differential early-life investments in health or other important inputs into human capital, workers' own preferences, or discrimination in either education or hiring.

The authors use an augmented Roy model to estimate how much occupational barriers declined over the almost 50 years they study and what that decline contributed to productivity. They find that changes in occupational barriers facing blacks and women "potentially explain 15 to 20 percent of aggregate growth in output per worker between 1960 and 2008."[4] They go on to note that three-quarters of the gain reflects the movement of white women into high-skilled occupations, largely because white women represent a much larger fraction of the population than blacks. They indicate that these productivity gains can come from reducing misallocation across occupations and from boosting average human capital investments, and go on to estimate that most of the gains come from reduced misallocation.

[4] They also note that reducing barriers to zero would provide further productivity gains.

In concluding, they say that while the paper focuses on the gains from reducing barriers facing women and blacks, they "suspect that barriers facing children from less affluent families and regions have worsened in the last few decades," leaving the issue for future work.

Marrero and Rodriguez (2013) and Ferreira, Lakner, Lugo, and Ozler (2014) take a very different approach from Hsieh et al. (2013) to estimating the impact of inequality of opportunity on growth. These two papers have similar methodologies, the former applying it to panel data on selected U.S. states, the latter to panel data on nations around the globe. The growth models in these papers posit that growth in any period is influenced by many beginning-of-period characteristics and conditions, including the degree of inequality in the economy.

In these papers, the inequality of opportunity concept builds on a literature (especially Roemer, 1993) that distinguishes individual circumstances—such as race and parental socioeconomic status—which are not in an individual's control, and individual "effort," which stands in for the range of factors influencing economic success that an individual can make decisions about, including occupational choice and hours of work.[5] Inequality resulting from differential effort (as described above in the discussion of inequality of outcomes and growth) is seen as providing incentives for people to work hard, take risks, invest in education and hence is expected to promote growth. Following much of the literature on inequality of opportunity, the authors decompose total inequality into a component associated with inequality of opportunity and a residual component that is labeled inequality of effort. The measure of inequality of opportunity used in these studies is based on determining how much of overall inequality is due to a set of measured circumstances beyond the individual's control; both papers take the ex ante type-compensation approach to measuring inequality of opportunity (see Roemer and Trannoy, forthcoming). Marrero and Rodriguez (2013) use father's education and race as the circumstances they use to compute their measure of inequality of opportunity; Ferreira et al (2014) use gender, race or ethnicity, the language spoken at home, religion, caste, nationality of origin, immigration status, and region of birth or of

[5] Hsieh et al., as noted above, build their paper on the idea that occupational choice may be constrained by "circumstances." However, since "effort" is measured as a residual component of inequality, this apparent disagreement is irrelevant in the current context.

residence (with two to five of these indicators available for each nation). As the authors acknowledge, the inequality associated with a limited set of circumstances will tend to underestimate true inequality of opportunity. Although the residual inequality is termed inequality of effort, it actually includes the effects of unmeasured circumstances (unmeasured inequality of opportunity), the effects of institutions and policies that affect income, and luck as well as individuals' effort.

Once they decompose total inequality into components associated with opportunity and effort, the authors expect inequality of opportunity to exert a negative influence on growth and inequality of effort to add positively to growth. Measured inequality of opportunity is likely to reflect factors that are associated with reduced growth, such as market imperfections that lead to too little investment in the human capital of low-circumstance children (e.g., children with low-education parents or children of disadvantaged minority parents) relative to children with more positive circumstances. The association between measured inequality of effort and growth is less clear. Measured inequality of effort will partly reflect the incentives to work hard and take risks, which will be positively correlated with economic activity. However, since it is a residual category, it will also reflect unmeasured aspects of inequality of opportunity and other factors not associated with effort, and so its overall correlation with economic activity is not clear.

Marrero and Rodriguez, using data from the Panel Study of Income Dynamics for a subset of U.S. states with adequate numbers of observations, find "robust support for a negative relationship between inequality of opportunity and growth and a positive relationship between inequality of effort and growth." They interpret their findings as follows: "returns to effort may encourage people to invest in education and to exert an effort, while inequality of opportunity may not favor human and physical capital accumulation in the more talented individuals. In fact, Van de Gaer et al. (2001) have pointed out that inequality of opportunity reduces the role that talent plays in competing for a position by worsening intergenerational mobility." (p.120). Marrero and Rodriguez further argue that their results are consistent with "prediction of [theoretical] models with multiple steady states and borrowing constraints. …people with initial adverse circumstances would be likely exposed to barriers for accessing credit or education,

independently of their talent or effort, which would undermine subsequent economic growth." (p.120).[6]

Marrero and Rodriguez say that their results call for proper design of policy, in the sense that improving equality of opportunity has positive benefits while policies that interfere with incentives on the effort side may have negative consequences. They note that affirmative action, which is an attempt to reduce inequality of opportunity, is seen by some as reverse discrimination which may have negative effects on effort across the board. But, as noted above in Voitchovsky's view, a highly unequal playing field also discourages effort among the disadvantaged, contributing to inefficiency.

Ferreira et al. (2014) characterize the literature as having two basic foci, one in which the effects of inequality operate through markets and the other in which they operate through the political process. But once they decompose total inequality into "a component associated with inequality of opportunity and a residual component (notionally related to inequality arising from effort differences)" (p. 2) they expect, like Marrero and Rodriguez, to find the former has a negative effect on growth and the latter a positive effect. Their failure to find support for either of these hypothesized relationships in two different panels of nations may reflect the very spotty set of circumstance variables they eke out of their income and expenditure survey sample and their demographic and health survey sample. Or it may be that the relationships estimated by Marrero and Rodriguez do not apply across nations with different institutional backdrops.

With these papers as background, we examine the relationship between inequality of opportunity and growth in a cross-section of U.S. "commuting zones" (CZs), geographic areas representing aggregations of counties which coincide with metropolitan areas where they exist, and exhaust U.S. territory by also including rural areas.[7] This is a level of geography the research described above has not examined. In addition, we use measures of inequality of opportunity that are new to this literature. Using rich and extensive tax return data for 30-year-old "children" in 2011-2012 matched to their parents' tax

[6] Marrero and Rodriguez note that Barro's result of negative relationship between growth and inequality in less developed nations might reflect a bigger role of inequality of opportunity there.

[7] Our analysis includes only 709 of 741 CZs nationwide, because it is limited to the CZs for which Chetty et al. (2014a) publish measures of mobility, which they do only for CZs with at least 250 observations on children matched to parents' tax forms. These 709 CZs contain 99.96 percent of the U.S. population in 2000.

returns when they were growing up, Chetty et al. (2014a) calculate various measures of intergenerational mobility, indicating how the 30-year-olds have fared economically, compared with their parents' place in the U.S. income distribution during their childhood. Intergenerational mobility is strongly related to equality of opportunity, with the income of an individual's parents when s/he was growing up taken as the measure of circumstances. That is, intergenerational mobility quantifies the differences in adult outcomes between children of rich and poor parents, just as a between-group measure of inequality of opportunity would for circumstance groups defined by parental income.[8] However, measures of intergenerational mobility and indicies of inequality of opportunity, such as those used by Marrero and Rodriguez and Ferreira et al., capture somewhat different concepts. Measures of inequality of opportunity depend on inequality of circumstances as well as the relationship between circumstances and outcomes (which is captured by measures of intergenerational mobility). For example, a low level of intergenerational mobility might be consistent with a low level of inequality of opportunity if there is relatively little inequality in the distribution of parents' incomes (here taken as the children's circumstances). Nonetheless, Corak (2013) reviews the literature and concludes that "…indicies of inequality of opportunity are in fact strongly correlated with indicators of intergenerational mobility, be it in earnings or education (p. 85).

We focus on Chetty et al.'s preferred measure of absolute mobility but also examine relative mobility. Their measure of "absolute upward mobility" indicates the rank in the national children's income distribution (around age 30) expected for a child growing up in a specific CZ whose parent was at the 25th percentile of the national parent distribution. Because it measures absolute mobility, it captures the effects of both the rate of income growth within a CZ compared with the nation (because parent and child ranks are measured in the national distributions) and the degree of re-ranking of children's income relative to the ordering of their parents' income. We also present results using Chetty et al.'s measure of relative mobility, which is based on the difference in outcomes between children from the top of the

[8] Brunori, Ferreira, and Peragine (2013) note that the intergenerational elasticity is "very closely related to" between-group inequality when the groups are defined in terms of parental income.

income distribution within a CZ and those at the bottom of the distribution. As Chetty et al. point out, this measure may be driven by high levels of absolute (downward) mobility among the rich as well as by high degrees of absolute (upward) mobility among the poor.

We combine economic data from the Bureau of Economic Analysis and demographic data from decennial Censuses, in both cases aggregated to CZs from the county level, with mobility and inequality measures as well as a rich set of covariates from Chetty et al. (2014a). Table 1 displays the sample characteristics of the variables included in the analysis. Because the mobility measures refer to one cohort (children born in the early 1980s who are about age 30 in 2011-2012), we estimate a growth model in the cross section.

Table 2 presents a simplified growth model, which, in columns 1 and 5, includes only the mobility measure (proxying inequality of opportunity), the gini measure of overall inequality, beginning-of-period per capita income, "predicted" employment growth, and the lagged dependent variable. Following Marrero and Rodriguez and Ferreira et al., the dependent variable is growth in per capita income; in columns 1–4, growth is measured from 2000 to 2010; in columns 5–8, the period is from 2007 to 2012. The explanatory variables represent conditions in the CZ at the beginning of the growth period; for inequality, it is inequality measured across the parental generation in the CZ and hence the inequality experienced by the children's generation when they were growing up with their parents. Like other authors, we include initial per capita income in the growth regressions to allow for convergence. We include the lagged dependent variable to control for persistent unmeasured CZ specific influences on growth because we lack the ability to estimate panel regressions. To control for exogenous (to the CZ) factors related to the CZ's industry mix, we include a variable equal to the pace of employment growth that would occur if each industry in the CZ grew at its U.S. pace.[9]

Columns 2 and 6 also include a set of demographic control variables: the age mix of the CZ

[9] That is, predicted employment growth is equal to the weighted average of U.S. industry growth rates, where the weights are the fraction of CZ employment in each industry. Industries for which a CZ's data are missing are assumed to grow at the overall U.S. pace. The U.S. growth rates refer to 2001-2010 and CZ industry mix refers to 2001 in the 2000-2010 regression because BEA shifted from SIC to NAICS industries in 2001; the U.S. growth rates are 2007-2012 for the 2007-2012 growth period.

population, the mix of educational attainments in the CZ population, and the labor force participation rates of men and women in the CZ, all as of the beginning of the period in 2000 (or before the beginning of the period in the case of the 2007-2012 regressions). They include regional fixed effects for the nine Census divisions as well. Because inequality of opportunity is hypothesized to affect economic growth through its negative effect on human capital accumulation especially among the poor (those with limited opportunities), it is important to control for such human capital characteristics in the CZ at the start of the growth period.[10]

The estimates in columns 1, 2, 5, and 6 show a strongly positive effect of absolute mobility on economic growth, indicating a negative and significant effect of inequality of opportunity on growth. They also document an effect on growth of overall inequality that is generally indistinguishable from zero. The effect of mobility on growth is what the literature hypothesizes; the effect of overall inequality, however, is unexpectedly not positive.[11]

As noted earlier, the absolute mobility measure includes changes in ranks of CZ children relative to their parents associated with faster or slower growth of incomes in a CZ relative to the nation. To test whether the positive relationship between absolute mobility and growth documented in Table 2 is due solely to the undoubted correlation between that component of the mobility measure and income growth in the CZ (the dependent variable), we re-estimate the regressions including also the ratio of child median income to parent median income in the CZ. In these estimates (not shown), the estimated coefficient on absolute mobility is smaller than in Table 2, but still significantly different from zero at better than the 1 percent confidence level. The ratio of median incomes also obtains a positive coefficient estimate that is significantly different from zero.[12]

[10] Note also that the 2000 educational composition data do not reflect the educational attainment of the child generation whose mobility is being measured, because the Census reports education data for population age 25 and older (the child generation is age 18-19 in 2000).

[11] In column 5, the gini measure is marginally significant (at better than 10 percent significance) for growth during the 2007-2012 period, but the negative sign does not match the hypothesized positive "incentive" effects of inequality on growth. (The negative coefficients on the gini in columns 4 and 8 are discussed several paragraphs below.)

[12] The ratio of medians is not an exogenous variable, since the time period between when the parent and child

The beginning-of-period per capita income level is negatively associated with subsequent growth in both periods, suggesting income convergence over time among the CZs, other things equal. The lagged dependent variable obtains a negative coefficient in the 2000-2010 period and a positive or zero coefficient for growth between 2007 and 2012; the latter period is only five years long, starts at the pre-recession peak, and covers the Great Recession and first several years of recovery, so the estimates may reflect cyclical responses as well as (or instead of) the longer term relationships likely to be captured in the 2000-2010 period. Predicted employment growth obtains a positive coefficient (significantly different from zero in both periods), suggesting that industry mix (and the national performance of each industry) has a strong influence on area per capita income growth.

In the spirit of the decompositions used by Marrero and Rodriguez and Ferreira et al., columns 3 and 7 replace the gini measure (overall inequality in the parental generation) with a measure of income inequality in the child generation, specifically the ratio of mean to median income measured across the CZ's children around age 30.[13] While an additive decomposition is not possible because the scale and nature of the inequality of opportunity (absolute mobility) measure and the overall inequality measure differ, the absolute mobility measure is an indicator of the inequality within the children's generation that is attributable to their differing parental income circumstances. These estimates are consistent with Marrero and Rodriguez's results, suggesting that total inequality (of outcomes for the children) is good for growth, controlling for the portion of that inequality that is attributable to parental income circumstances; that is, the estimated coefficient on overall inequality in the child generation is positive and significant while mobility remains strongly positive as well.

While the results in columns 3 and 7 are consistent with theoretical expectations and Marrero and Rodriguez, these are not our preferred versions because the child-generation income inequality measure

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incomes are observed overlaps the growth periods and hence directly measures some of what the dependent variable measures. That relationship should bias upward the estimated "effect" of the ratio of medians on CZ income growth. The point of reporting these results is to make clear that even controlling for any shifts in the central tendency of children's income relative to parents' income, absolute mobility still contributes positively to growth.

[13] Chetty et al. do not publish a gini measure for the child generation. For the parent generation, the correlation between the gini and the ratio of mean to median income is 0.81.

suffers from a timing problem—it is measured after the growth (in the dependent variable) has occurred; by contrast, parental inequality (the gini in columns 1-3 and 5-7) is measured before the growth. In addition, some members of a CZs "child" generation no longer reside in the CZ when their inequality is measured. That is, all of them grew up there (lived there in the mid-1990s when their parents listed them as dependents on their tax returns) but by age 30 over one-third have moved away; hence the inequality measure does not measure inequality strictly in the CZ.

Columns 4 and 8 substitute Chetty et al.'s *relative* mobility measure for the absolute mobility measure used in the remainder of Table 2; these equations are otherwise identical to those reported in columns 2 and 6. The relative mobility measure is the slope of a CZ-specific regression of child income rank on parent income rank; as such, it is similar to an intergenerational elasticity (estimated in terms of rank rather than log income). Thus its sign is opposite to that of the absolute mobility measure; the rank-rank slope is higher where a child's income rank is more tied to his/her parents' income rank and hence where intergenerational mobility is lower. The relative mobility measure obtains a negative coefficient in both periods, suggesting that inequality of opportunity slows growth; however, unlike absolute mobility, the relative mobility measure obtains an estimated coefficient significantly different from zero only for the 2007-2012 growth period. When relative mobility is included in the regression, the gini measure of inequality obtains a negative and significant coefficient, counter to the theoretical expectation of positive "incentive" effects, and counter to the zero effect found in columns 1, 2, 5, and 6, when it is included with the absolute mobility measure.

Building on Sarah Voitchovsky's (2009) insight that the effect of inequality on growth differs depending on the part of the income distribution on which the inequality measure focuses, Table 3 displays regression results when we include two additional measures of inequality, focused on the middle and the top of the income distribution. That is, rather than controlling only for overall inequality and mobility in the growth regressions, we examine also the impact on growth of inequality measured at the middle and top of the distribution (with the absolute mobility measure indicating inequality of opportunity at the bottom). The middle class variable measures the fraction of the CZ (parental

generation) population with incomes between the 25th and 75th percentiles of the nationwide parental distribution. The top-income variable reports the fraction of CZ income held by the richest 1 percent of parents.

Both the middle-class fraction and the top-1-percent share of income obtain negative coefficients in both periods (columns 1 and 4), but the middle class fraction coefficient is significantly different from zero only in the 2000-2010 period, while the estimated coefficient on the top-1-percent fraction of income is significantly different from zero only in the 2007-2012 period. Voitchovsky cites reasons for either positive or negative effects on growth of a concentration of income at the top, and the negative estimated coefficient provides support for her political-economy story of co-option of government tax and transfer policy by the rich to the detriment of investments in both human and physical capital (infrastructure) that might benefit middle class and lower-income residents and thereby foster growth.

The negative sign on the middle class is the opposite of what would be expected based on Voitchovsky's "channels," which posit that the size and income level of the middle class should be positively associated with growth for both political economy reasons and via the strength of consumer demand. However, a demand-based argument is much weaker for relatively small, open-economy areas like commuting zones (as compared with nations), where the strength of local demand is not likely to have a direct influence on growth by stimulating local production. Furthermore, while the gini and the top-1-percent measures reflect the income distribution within the CZ, the fraction middle class tallies the fraction of residents in the middle-range of the *national* income distribution, which reflects the degree to which the central tendency of the CZ distribution differs from the national as well as how bunched CZ residents are in the local "middle". For these reasons, columns 2 and 5 drop the middle class fraction. In both periods, reducing the number of inequality concepts considered slightly decreases the size of the coefficient on mobility and increases the size of the coefficient estimates on both the top-1-percent-share and the gini, leaving both coefficients significantly different from zero in both periods. Higher overall inequality enhances growth, while a concentration of income at the very top restrains growth. The absolute mobility measure retains its robust positive coefficient across columns 1, 2, 4, and 5, indicating

that the negative effects on growth of inequality of opportunity are measurable in both periods, controlling for other components or aspects of inequality as well as demographic mix.

Columns 3 and 6 of Table 3 report estimates from regressions similar to columns 2 and 5, substituting the relative mobility measure for absolute mobility. Similar to columns 4 and 8 in Table 2, the estimated coefficient on the relative mobility measure is significantly different from zero only in the 2007-2012 growth period. When relative mobility is included, the estimated coefficient on overall inequality (gini) is negatively related to growth and the top-1-percent income share is unrelated to CZ economic growth—the estimated coefficient is indistinguishable from zero.

The equations reported in Tables 2 and 3 suffer from various robustness issues. One key issue arises because the equations are estimated in the cross-section. When cross-section studies omit some time-invariant characteristics that are associated with both inequality and growth, it can bias the inequality coefficients downward. Voitchovsky (2009) points out that "the negative effect [of inequality on growth] reported in cross-section studies is usually found to be sensitive to the inclusion of regional dummies, of other explanatory variables, or to sample composition." (p. 565). Some of these concerns, at least regarding mobility results, should be assuaged by the fact that the estimates are largely invariant to inclusion of a variety of demographic control variables and regional fixed effects. Furthermore, we address the concern of Banerjee and Duflo (2003) regarding an assumption of linearity of inequality's effects on growth by including several measures of inequality at different points in the income distribution; Voitchovsky makes the same claim.

That said, one should exercise caution in interpreting the estimates. The mobility coefficients are likely driven by a host of factors associated with inequality of opportunity, such as the quality of schools available to poor children, access to higher education and training, and low barriers of entry into desirable occupations and employment. Most of these factors are temporally predetermined, but there is still some concern that unobserved (by us) determinants of growth may be correlated with unobserved determinants of inequality of opportunity. For example, persistent positive shocks to a CZ's competitiveness may lead to both enhanced labor market opportunities for young workers and also increased per capita income

growth, leading to upward bias in the estimator of the mobility coefficient in a growth regression. We address this concern to some extent in the next section, where we empirically examine whether past growth is associated with mobility.

All in, the estimates in Tables 2 and 3 provide some confirmation of the results in Marrero and Rodriguez, indicating that inequality of opportunity may hinder growth.[14] At least across commuting zones, the positive relationship between absolute upward mobility and growth in the 2000s (both 2000-2010 or 2007-2012) is quite robust to inclusion of other CZ characteristics. The relative mobility results are more inconclusive, confirming a positive relationship between mobility and growth only during the 2007-2012 period.

How does growth affect inequality of opportunity?

We next turn to the reverse direction of causation: the effects of growth on inequality of opportunity, or at least the direct effects.[15] The only research paper that we have found that directly investigates this topic is Marrero and Rodriguez (2012), who use U.S. time series data to model the macroeconomic determinants of both inequality of opportunity and inequality of effort (the residual category). After statistically adjusting their data to extract the "trend-cycle" components, they find that the change in lagged real GDP has a statistically significant negative coefficient in regressions for both the change in inequality of opportunity and the change in inequality of effort, implying that growth reduces both components of inequality.

[14] The results are also consistent, in a more indirect way, with Hsieh et al.'s findings of significant negative effects on output of inequality of opportunity in occupational choice.

[15] To the degree that growth affects overall inequality (inequality of outcomes) as discussed above, and inequality of outcomes in turn affects inequality of opportunity, as discussed below, growth could have indirect effects on inequality of opportunity. For example, some see signs of a negative reinforcing cycle in recent years along the following lines: as the rich benefit disproportionately from growth (growth leads to increased inequality of outcomes), it augments their degree of control over the political process. This increased control, in turn, allows them to induce policy changes that cut back on (equalizing) redistribution via taxes and spending, which makes it more difficult for the poor to gain access to education, preventive health care, etc. (increasing inequality of opportunity). Stiglitz, for example, says "…the rich, needing few public services and worried that a strong government might redistribute income, use their political influence to cut taxes and curtail government spending. This leads to underinvestment in infrastructure, education, and technology, impeding the engines of growth." (Joseph Stiglitz, "The price of inequality," *Project Syndicate*, June 5, 2012).

Chetty et al. (2014a) discuss correlations of their absolute mobility measure with a variety of other CZ characteristics. But they do not look at economic growth except as a possible measurement problem.[16] One class of variables they include in their correlation analysis is local (CZ) labor market conditions, but none of these variables—labor force participation rate, fraction working in manufacturing, growth in Chinese imports, and very-young-teen (ages 14-15) participation rate—are indicators of economic growth.

The channels through which economic growth might enhance or weaken equality of opportunity include the political sphere: A fast-growing area might have more resources to share, via the public sector, with all residents. That is, faster economic growth might lead to greater public investments, including investment in the human capital of low-income residents who, as discussed above, are less able to make those investments privately.[17] Fast-growing areas might also provide better labor market opportunities to disadvantaged groups that extend beyond the effect on human capital investments. Tight labor markets may induce firms to offer jobs or promotions to employees who would be passed over in slower growing localities, effectively reducing the role of circumstances.

Table 4 reports estimated coefficients from some simple regressions of absolute mobility on per capita income growth in an earlier period (earlier than the mid-1990s to 2012 period in which the mobility is occurring) and selected control variables which might influence inequality of opportunity. In both Table 4 and Table 5 below, with mobility as the dependent variable, the estimates should be viewed as partial correlations, rather than being given a causal interpretation. The existing literature and this paper focus on factors influencing growth; the literature is much thinner for explaining mobility. Moreover, we are not able to control for welfare and health expenditure or availability of consumer credit at the CZ level, two factors that Marrero and Rodriguez (2102) find are associated with lower inequality of opportunity.

[16] They are concerned that economic growth differentials may be responsible for the spatial variation in upward mobility. But they check on income growth, residuals from a mobility-on-growth regression, and cost-of-living differences and find that none of the adjustments substantially alter absolute mobility's spatial patterns.

[17] As discussed earlier, this is one of the arguments made by Kuznets as to why inequality did not continue expanding indefinitely as growth proceeded in an advanced economy.

Absolute mobility is higher in smaller (population) CZs and in CZs with higher 1990 per capita incomes, but seems unrelated to CZ income growth in the 1980-90 decade (column 1). This zero growth coefficient provides a weak check on the causal interpretation of the positive coefficient on mobility in the growth regressions reported in Tables 2 and 3. That is, if the relationship found in Tables 2 and 3 simply reflected a long-term positive correlation between growth and mobility with causation potentially pointing in either direction, we would expect the coefficients on growth in Table 4 to be positive as well.[18]

Column 2 of Table 4 includes demographic indicators for the CZ population that might plausibly be related to mobility, all measured for 1990, before the mobility occurs: age mix, educational attainment mix, and men's and women's labor force participation rates. These results suggest that absolute mobility is lower in CZs with more high school dropouts relative to more educated residents, and in CZs with more older residents compared with prime-working-age population.[19] Higher male labor force participation and lower female labor force participation are associated with higher absolute mobility, probably because some upward mobility may have resulted from women's increasing participation in the labor force during the 1980s and 1990s and these increases may have been larger in areas that initially had lower women's participation rates. Indeed, column 3 substitutes 1980-90 changes in participation rates for the levels in column 2, and we see opposite signs, suggesting that prior increases in women's participation (and declines in men's participation) were associated with the absolute upward mobility of the following generation.

Columns 4 and 5 repeat the regressions of columns 1 and 3, substituting Chetty et al.'s relative mobility measure for absolute mobility as the dependent variable. Recall that the signs change by definition; that is, the relative mobility measure is higher when children's income is more tied to their parent's income and hence mobility is lower. These results are similar to those for the absolute mobility

[18] The positive coefficient on initial income level may indicate that richer areas—even if not fast-growth ones—are more able to promote upward mobility, but the coefficient is not consistently distinguishable from zero in a statistical sense.

[19] These coefficients are sensitive to the inclusion of regional fixed effects, however, reflecting the different ranges of within-region vs. across-region variation in these demographic characteristics.

measure, with significance on the demographic and control variables mostly in line with the absolute mobility results and growth obtaining a zero estimated coefficient.

All in, we find essentially zero association between earlier economic growth and mobility. Intergenerational mobility does vary across areas in line with human capital differences. However, lacking any direct measures of redistribution and tightness of local labor markets, through which faster growth might translate into more equal opportunity, these estimates are only weakly suggestive.

The relationship between inequality of outcomes and inequality of opportunity

An additional question has risen in importance in the current U.S. context of rising inequality of outcomes, which is also important in gaining understanding about how inequality of opportunity and growth are related more generally: What impact does inequality of outcomes have on inequality of opportunity and vice versa? In simple terms, the outcomes-affects-opportunity hypothesis is that as the overall distribution of outcomes becomes more unequal, it reduces low-income children's access to education and other opportunities to accumulate human capital and move up the income ladder, meanwhile increasing high-income children's access to "enrichment" beyond schooling which enhances their ability to stay at the top. Both these changes tie individuals' economic prospects more tightly to their parents' economic success.

Several research papers explore this question, focusing on how unequal outcomes lead to unequal opportunity or how unequal outcomes reduce mobility, which is interpreted as indicating unequal opportunity. Miles Corak (2013) explores a variety of mechanisms that link "income inequality, equality of opportunity, and intergenerational mobility."[20] Introducing his analysis, he notes, "an emerging body of evidence suggests that more inequality of incomes in the present is likely to make family background play a stronger role in the adult outcomes of young people, with their own hard work playing a commensurately weaker role." (p. 79) Corak first establishes the empirical regularity—labeled the "Great

[20] In his *Journal of Economic Perspectives* article of that title.

Gatsby curve" by Alan Krueger—that countries with greater inequality of incomes at a point in time also "tend to be countries in which a greater fraction of economic advantage and disadvantage is passed on between parents and their children." (p. 80) Corak goes on to note that while an intergenerational income elasticity is a good summary statistic for inequality of opportunity, this mobility measure in fact reflects the outcome of both circumstances and choices (in Roemer's terms), to the degree that those choices are correlated with parental advantage and disadvantage.

To understand the *causal* links, Corak then investigates the various channels through which parents' income can influence their children's accumulation of human capital and their adult outcomes, influences that are mediated by the different balance struck between family, labor market, and public policy in determining outcomes across countries. For example, high returns to education not only make the income distribution more unequal and thereby provide rich families with relatively more resources to invest in their children, but also increase the incentive for the rich to make such investments.[21] Corak argues that parents with high incomes create advantages for their children both through monetary investments (better schools, "enrichment" experiences) and by passing along nonmonetary advantages—behavior, motivation, aspirations, as well as connections. One example of nonmonetary advantage is the guidance and culture supportive of college attendance.

Corak also discusses public policies that can either "accentuate or dampen" labor market inequality, such as public provision of early childhood education, and notes that public policies outside of education, e.g., in health care and fiscal (tax and transfer) policy, can also intervene or not between parental income and children's outcomes. He argues that public policies in the United States, including even public K-12 schooling, are particularly tilted toward the advantaged. He also notes that public provision of health care, as in most non-U.S. developed nations, helps to level the playing field, leading to more preventative care for those with low incomes and hence fewer negative health shocks that "could have longer-term consequences." (p. 97)

Corak concludes that "inequality lowers mobility because it shapes opportunity. It heightens the

[21] Corak cites Solon (2004) in discussing the educational wage premium.

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." (p. 98). Regarding policies to address inequality of opportunity, he reminds us of Roemer's argument that policy should offset only those aspects of differential success that relate to circumstances, and argues that different nations may well make different judgment calls regarding which circumstances are appropriate to offset.

In a sense, this is where Brunori, Ferreira, and Peragine (2013) begin their analysis, citing behavioral economics experiments that indicate individuals do distinguish between factors over which individuals have control and those they don't when evaluating the fairness of the distribution of outcomes. They use these findings to argue that inequality should be evaluated not only from the point of view of its direct impact on growth or other aspects of the economy but also in terms of fairness. In particular, they say that inequality reflecting circumstances beyond the individual's control is widely viewed as unfair. Their paper then reports two measures related to inequality of opportunity, with the quantitative measures drawn from earlier papers, and describes differences across countries. They focus on one of the two measures, an ex-ante measure of inequality of opportunity used by others in the literature (including Ferreira et al. and Marrero and Rodriguez, discussed above), which is between-group inequality where groups are defined as equal-circumstance groups.

Their paper examines the cross-sectional correlations between the inequality of opportunity measure and other country characteristics, including per capita output, inequality, and intergenerational mobility. Like Corak, they find a positive relationship between inequality of opportunity and income inequality. They also note a positive correlation between this between-group inequality of opportunity measure and the standard intergenerational mobility measure (the intergenerational elasticity of income) as well as the intergenerational correlation of education, even when the measures come from different papers and are based on different data sources. They conclude by saying, "... inequality of opportunity is the missing link between the concepts of income inequality and social mobility. If higher inequality

makes intergenerational mobility more difficult, it is likely because opportunities for economic advancement are more unequally distributed among children. Conversely, the way lower mobility may contribute to the persistence of income inequality is through making opportunity sets very different among the children of the rich and the children of the poor." (p. 17.)

Mitnick, Cumberworth, and Grusky (2013) "eke out as much evidence on [whether opportunities to get ahead are growing more unequal] as the available data will allow" (p. 1). They focus on measuring the trend in intergenerational *social-class* mobility and attempt to sort out two main influences on the mobility trend in the United States: rising educational attainment—especially "mass education"—hypothesized to increase mobility largely through a composition effect;[22] and rising inequality (what they call "the takeoff" in inequality, which represents "an unprecedented infusion of additional resources among the higher reaches of the class structure" p. 3), hypothesized to reduce social mobility. Within the latter "income" hypothesis, they ask whether the phenomenon is occurring most strongly between the professional and managerial class and everyone else or throughout the distribution. Examining three overlapping age groups and men and women (for whom the timing of the rise in educational attainment differed) separately, they find evidence of "rigidification" in the U.S. class structure recently. The negative trend in class mobility is especially pronounced among younger cohorts for whom the inequality takeoff would have had maximum influence during childhood, and focused on professional and managerial parents, who have increasingly been successful in passing along status to their children.

Deirdre Bloome (2014) provides a comprehensive and careful recent addition to this literature, examining how the intergenerational elasticity may vary with state-level inequality of outcomes. Using individual data from the PSID and NLSY, she regresses children's adult incomes on their parents' incomes interacted with inequality observed in their state of residence when the children were growing up.[23] She finds that "the best available data cannot confirm the hypothesis that inequality and mobility are

[22] That is, as a greater fraction of the population finish high school and go on to college and higher degrees, higher educational attainment will be less concentrated among the children of highly educated parents.

[23] In addition to simple interaction terms, she allows the intergenerational coefficient to vary with inequality through the use of state fixed effects and random coefficients' estimates. She examines inequality when the children were

systematically linked in the U.S." (p. 19). Given that she has improved considerably on the precision of earlier estimates, if a relationship exists, she argues that it must be quite small. She also notes that the estimated relationship may reflect countervailing trends; for example (much as Corak noted), inequality-associated higher barriers to college completion among the poor may be partially offset by inequality's increased incentives to attempt a college degree.

Our own analysis begins where Corak does, by establishing the empirical relationship; Figures 1 and 2 plot mobility and inequality of income across commuting zone areas, with Chetty et al.'s relative mobility (Figure 1) and absolute mobility (Figure 2) measures on the vertical axis and the parental-generation gini on the horizontal axis. The "standard" Great Gatsby curve has the intergenerational income elasticity on the vertical axis, which is similar to Chetty et al.'s relative mobility measure (Chetty et al.'s slope is estimated in rank rather than log-income terms). Figure 1 displays the standard upward slope; the corresponding regression line is also shown. (Figure 2 has an inverse slope because absolute mobility is inversely related to the elasticity or slope.) As in Corak's depiction, both figures indicate that places with greater inequality of income also display less mobility, both relative and absolute. Figure 3 uses the size of the middle class as the indicator of inequality (inverse) and similarly shows a fairly strong relationship with absolute mobility—places with a larger middle class display more absolute mobility. One of the issues raised by those who have challenged the import of Corak's empirical relationship relates to timing: critics argue that the inequality measure should refer to the period when the children whose mobility is measured were growing up. This is exactly what these scatter plots refer to—the inequality of parent income when those whose outcomes as 30-year-olds are measured were in their mid-teens living with their parents. Nonetheless, scatter plots are simple correlations and not evidence of causation.[24]

Table 5 picks up where Table 4 left off, with column 1 adding the gini measure of overall parental income inequality in the CZ to the earlier regression, which included initial income levels, population size, and demographics, as well as prior-period income growth. Column 2 includes also the fraction of CZ

teens and, alternatively, when they were infants.

[24] Chetty et al. (2014a) report the same look at the "Great Gatsby curve" across the 709 CZs except via regression coefficients (their Table V) rather than scatter plots.

parents with middle-class incomes and the top-1-percent income share. Column 3 drops the middle-class fraction for the same reasons we dropped it in Table 3. Columns 4-6 repeat the exercise with relative mobility as the dependent variable. Across the columns, overall parental income inequality (gini) is negatively associated with mobility, the fraction of parents in the middle class is very strongly positively associated, and the top income share also is positively associated with mobility, whether absolute or relative.[25] Thus, we observe a fairly robust negative relationship between inequality among parents and their children's absolute mobility, although inequality in the form of concentration of income at the top is not negatively related to mobility. Thus, the simple correlation represented by the "Great Gatsby" relationship persists even in the presence of demographic controls and the use of a parental inequality measure that predates the mobility period for the children However, Bloome's (2014) careful analysis with no such finding reinforces the "partial correlation" idea that our results should be seen as largely descriptive.

Nonetheless, even if increased inequality of outcomes does not cause a reduction in mobility, it still likely causes an increase in inequality of opportunity. The reason for this is simply that the parents' generation's outcomes are very closely related to the children's generation's circumstances. Inequality of opportunity will increase with a widening of the distribution of circumstances even if the relationship between circumstances and outcomes (intergenerational mobility) does not change. As Bloome notes, while inequality of outcomes may not *cause* a reduction in mobility, "the economic consequences of growing up rich or poor have risen, simply because the distance between the rich and poor has increased." (p. 25).[26] Furthermore, the ongoing rise in inequality of outcomes in the United States (and other nations) makes more important the pursuit of further research to understand the mechanisms that underlie the observed relationships.

[25] Recall the opposite signs on the two mobility measures.

[26] Chetty et al. (2014b) make a similar comment in their abstract: "However, because inequality has risen, the consequences of the "birth lottery" – the parents to whom a child is born – are larger today than in the past."

Discussion and Conclusion

Although a rich literature has developed on the relationship between inequality of outcomes and economic growth, a consensus has not yet emerged from this literature. Theory suggests that the relationship is complex and empirical results on this relationship are notoriously mixed. By contrast, inequality of opportunity is generally theorized to be a drag on growth. The very limited empirical literature investigating this relationship is also somewhat mixed, although two of the three existing papers we cite find a negative effect. This paper adds to that literature, also finding a negative effect. Our investigation of growth's impact on intergenerational mobility yields less clear results, and similarly the impact of inequality of outcomes on mobility.

Unequal opportunity represents inefficiency as barriers prevent the most productive use of human and other resources. It has long been recognized that at a microeconomic level policies that relax barriers to opportunity will also enhance economic efficiency. The interesting result that appears to be emerging from the nascent research literature on inequality of opportunity and economic growth is that the strength of the efficiency effect is strong enough to be picked up at an aggregate level. The finding that inequality of opportunity has a negative effect on growth suggests that relaxing barriers to opportunity may be a viable strategy for promoting economic growth.

An important unanswered question is to what extent does the increased economic growth that results from reduced inequality of opportunity accrue to those who directly benefit from enhanced opportunities, and to what extent does it spill over to other economic actors? One obvious source of positive spillovers is through fiscal externalities. The improved economic outcomes of those facing enhanced opportunities would result in their paying higher taxes and receiving fewer public transfers and services. However, externalities from increased inequality of opportunity may also operate in more subtle ways. Complementarities between the human capital investments made by those with enhanced opportunities and the productivity of other workers (and capital) may be another potential source of positive spillovers. Thinking more broadly, positive externalities may also be generated through the

improved working of market mechanisms resulting from higher levels of trust and sense of fairness in an economy with fewer barriers to opportunity. An interesting task for future research will be to unravel the source of the effect of reduced inequality of opportunity on growth, separately identifying the direct effects and the spillovers.

Another important area for further investigation is to determine which aspects of inequality of opportunity are most detrimental to economic growth. This is needed to give policymakers a guide to which set of opportunity-enhancing policies is likely to be most effective in boosting growth. Understanding which aspects of enhanced opportunities are likely to generate the greatest spillovers would also be an important input into the policy process.

Equality of opportunity is almost universally viewed as a desirable goal on ethical and moral grounds. The finding that reduced inequality of opportunity is associated with increased economic growth suggests that pursuing this goal may have a lower cost than one might otherwise have calculated. However, it is important to remember the moral and ethical dimension of the policy goal. Upon close inspection, some barriers to opportunity may turn out to be more closely associated with growth than are others, but relaxing barriers to opportunity may still be very desirable on ethical grounds even when the resulting effect on economic growth is minor or nonexistent.

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Table 1: Summary Statistics

	Mean	Std. Dev.
Per Capita Income Growth, 2000-2010	42.19	14.99
Per Capita Income Growth, 2007-2012	18.30	13.28
Absolute Mobility	43.94	5.681
Relative Mobility	32.51	6.479
Child Mean to Median Ratio	1.309	0.116
Gini	0.410	0.0792
Frac. Between p25 and p75	0.550	0.0786
Top 1 Percent Income Share	10.84	5.049
Per Capita Income, 1990	15.88	2.989
Per Capita Income, 2000	24.43	4.766
Per Capita Income, 2007	32.52	6.491
Per Capita Income Growth, 1980-1990	87.68	20.83
Per Capita Income Growth, 1990-2000	54.14	9.944
Per Capita Income Growth, 2000-2007	33.42	9.304
Predicted Employment Growth, 2001-2010	3.437	3.390
Predicted Employment Growth, 2007-2012	-0.899	1.598
Less than High School, 1990	0.287	0.0907
Less than High School, 2000	0.215	0.0760
Greater than High School, 1990	0.441	0.0912
Greater than High School, 2000	0.452	0.0946
Age less than 15, 1990	0.226	0.0306
Age less than 15, 2000	0.210	0.0268
Age 15-24, 1990	0.143	0.0293
Age 15-24, 2000	0.143	0.0282
Age greater than 54, 1990	0.235	0.0516
Age greater than 54, 2000	0.238	0.0485
LFPR: Male, 1990	70.62	5.787
LFPR: Male, 2000	67.82	6.573
LFPR: Female, 1990	52.87	6.206
LFPR: Female, 2000	55.65	5.786
Change in LFPR: Male, 1980-1990	-1.650	2.840
Change in LFPR: Female, 1980-1990	6.797	2.199
Log of Total Population, 1990	11.60	1.454
Log of Total Population, 2000	11.69	1.488
Log of Total Population, 2007	11.72	1.525
Observations	709	

Note: Relative mobility is the Chetty et al. measure rescaled by multiplying by 100.

Table 2: Regression of Growth on Mobility

	Per Capita Income Growth, 2000-2010				Per Capita Income Growth, 2007-2012			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Absolute Mobility	1.145***	1.082***	1.589***		1.120***	1.153***	1.728***	
	(0.090)	(0.115)	(0.130)		(0.095)	(0.114)	(0.131)	
Relative Mobility				-0.071				-0.206*
				(0.085)				(0.082)
Gini	6.089	2.393		-19.366*	-10.580+	-8.438		-32.470***
	(6.504)	(7.928)		(8.110)	(6.382)	(7.752)		(7.856)
Child Mean to Median Ratio			41.331***				39.177***	
			(5.979)				(5.879)	
Per Capita Income, 2000	-1.478***	-1.072***	-1.242***	-0.849***				
	(0.090)	(0.166)	(0.159)	(0.174)				
Per Capita Income Growth, 1990-2000	-0.099*	-0.084*	-0.098*	-0.130**				
	(0.043)	(0.042)	(0.040)	(0.045)				
Predicted Employment Growth, 2001-2010	1.417***	1.324***	1.317***	1.524***				
	(0.127)	(0.148)	(0.143)	(0.156)				
Per Capita Income, 2007					-0.625***	-0.399***	-0.588***	-0.227+
					(0.065)	(0.113)	(0.107)	(0.119)
Per Capita Income Growth, 2000-2007					0.228***	0.201***	0.160**	0.290***
					(0.049)	(0.053)	(0.052)	(0.056)
Predicted Employment Growth, 2007-2012					0.873**	1.126***	1.295***	1.355***
					(0.270)	(0.269)	(0.260)	(0.286)
Less than High School, 2000		17.381	12.963	38.618**		43.603***	33.322**	63.619***
		(13.531)	(12.566)	(14.283)		(12.934)	(12.002)	(13.695)
Greater than High School, 2000		26.654*	15.331	31.740**		28.405**	15.350	30.767**
		(11.017)	(10.394)	(11.878)		(10.100)	(9.551)	(10.972)
Age less than 15, 2000		153.128***	117.193***	112.705***		81.137**	51.887*	40.477
		(26.509)	(26.156)	(28.028)		(25.534)	(25.153)	(27.043)
Age 15-24, 2000		-12.762	-27.123	13.907		-33.297	-51.304*	-7.366
		(22.968)	(22.201)	(24.202)		(21.715)	(21.003)	(23.017)
Age greater than 54, 2000		23.898	20.415	53.178*		11.818	7.969	39.726+
		(21.485)	(20.674)	(22.565)		(20.345)	(19.659)	(21.513)
LFPR: Male, 2000		-0.464***	-0.279*	-0.194+		-0.367***	-0.194+	-0.111
		(0.110)	(0.110)	(0.114)		(0.105)	(0.105)	(0.109)
LFPR: Female, 2000		0.332*	0.383*	0.227		0.426**	0.495***	0.336*
		(0.165)	(0.160)	(0.176)		(0.155)	(0.149)	(0.165)
Log of Total Population, 2000		-1.484***	-1.404***	-2.259***				
		(0.403)	(0.384)	(0.421)				
Log of Total Population, 2007						-1.637***	-1.691***	-2.231***
						(0.373)	(0.355)	(0.393)
Constant	25.966***	4.164	-66.730**	45.000*	-13.113*	-36.713*	-106.504***	7.382
	(6.139)	(19.948)	(21.849)	(20.903)	(5.664)	(18.557)	(20.684)	(19.541)
Regional Fixed Effects	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Observations	709	709	709	709	709	709	709	709
R-squared	0.489	0.589	0.615	0.536	0.393	0.522	0.550	0.456

Note: Significance is denoted as follows: $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 3: Regression of Growth on Mobility and Other Inequality

	Per Capita Income Growth, 2000-2010			Per Capita Income Growth, 2007-2012		
	(1)	(2)	(3)	(4)	(5)	(6)
Absolute Mobility	1.282***	1.173***		1.307***	1.275***	
	(0.127)	(0.121)		(0.126)	(0.118)	
Relative Mobility			-0.061			-0.230**
			(0.089)			(0.085)
Gini	10.786	27.029*	-23.851+	21.368	25.692*	-21.841+
	(14.325)	(13.006)	(13.184)	(13.661)	(12.365)	(12.568)
Top 1 Percent Income Share	-0.222	-0.357*	0.068	-0.466**	-0.501***	-0.165
	(0.157)	(0.150)	(0.157)	(0.150)	(0.142)	(0.152)
Frac. Between p25 and p75	-28.735**			-7.699		
	(10.838)			(10.327)		
Per Capita Income, 2000	-1.050***	-0.954***	-0.875***			
	(0.175)	(0.172)	(0.185)			
Per Capita Income Growth, 1990-2000	-0.083*	-0.076+	-0.130**			
	(0.042)	(0.042)	(0.045)			
Predicted Employment Growth, 2001-2010	1.247***	1.274***	1.532***			
	(0.148)	(0.149)	(0.157)			
Per Capita Income, 2007				-0.280*	-0.261*	-0.176
				(0.121)	(0.119)	(0.128)
Per Capita Income Growth, 2000-2007				0.167**	0.165**	0.281***
				(0.054)	(0.054)	(0.056)
Predicted Employment Growth, 2007-2012				1.012***	1.026***	1.329***
				(0.269)	(0.268)	(0.287)
Less than High School, 2000	-0.930	12.830	39.378**	33.868*	37.678**	61.932***
	(14.520)	(13.620)	(14.400)	(13.914)	(12.937)	(13.782)
Greater than High School, 2000	15.204	23.588*	32.487**	20.640+	23.012*	28.603*
	(11.451)	(11.054)	(12.010)	(10.624)	(10.133)	(11.151)
Age less than 15, 2000	142.300***	150.334***	113.409***	76.690**	78.446**	39.105
	(26.503)	(26.445)	(28.092)	(25.454)	(25.336)	(27.069)
Age 15-24, 2000	-11.423	-14.219	13.720	-32.412	-33.297	-6.422
	(22.823)	(22.898)	(24.221)	(21.576)	(21.536)	(23.031)
Age greater than 54, 2000	24.522	19.268	53.614*	8.301	6.793	39.062+
	(21.498)	(21.500)	(22.601)	(20.336)	(20.228)	(21.519)
LFPR: Male, 2000	-0.415***	-0.462***	-0.196+	-0.352***	-0.363***	-0.104
	(0.111)	(0.110)	(0.114)	(0.105)	(0.104)	(0.109)
LFPR: Female, 2000	0.345*	0.330*	0.227	0.437**	0.432**	0.339*
	(0.164)	(0.165)	(0.176)	(0.153)	(0.153)	(0.165)
Log of Total Population, 2000	-1.529***	-1.684***	-2.214***			
	(0.413)	(0.410)	(0.434)			
Log of Total Population, 2007				-1.837***	-1.876***	-2.320***
				(0.379)	(0.376)	(0.402)
Constant	17.135	-2.485	45.316*	-41.263*	-46.201*	6.305
	(21.314)	(20.075)	(20.928)	(19.750)	(18.600)	(19.563)
Regional Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	709	709	709	709	709	709
R-squared	0.596	0.592	0.537	0.531	0.531	0.457

Note: Significance is denoted as follows: + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 4: Regression of Mobility on Growth

	Absolute Mobility			Relative Mobility	
	(1)	(2)	(3)	(4)	(5)
Per Capita Income Growth, 1980-1990	0.009	0.008	0.014	-0.010	-0.018
	(0.009)	(0.008)	(0.009)	(0.011)	(0.012)
Per Capita Income, 1990	0.380***	0.103	0.420***	-0.256**	0.066
	(0.062)	(0.091)	(0.089)	(0.080)	(0.121)
Less than High School, 1990		-10.240*	-9.398*		2.937
		(4.092)	(4.304)		(5.816)
Greater than High School, 1990		2.171	-6.262		-11.577*
		(3.839)	(3.897)		(5.266)
Age less than 15, 1990		-19.394*	5.137		30.616**
		(8.618)	(8.414)		(11.369)
Age 15-24, 1990		17.168*	30.043***		1.150
		(8.497)	(8.797)		(11.887)
Age greater than 54, 1990		17.623*	30.404***		4.303
		(7.237)	(6.335)		(8.560)
LFPR: Male, 1990		0.458***			
		(0.041)			
LFPR: Female, 1990		-0.393***			
		(0.047)			
Change in LFPR: Male, 1980-1990			-0.425***		0.189*
			(0.059)		(0.079)
Change in LFPR: Female, 1980-1990			0.428***		-0.264**
			(0.073)		(0.099)
Log of Total Population, 1990	-1.285***	-1.154***	-0.947***	0.645***	0.806***
	(0.129)	(0.128)	(0.134)	(0.165)	(0.181)
Constant	51.019***	42.188***	34.870***	28.377***	20.804**
	(1.993)	(6.584)	(5.777)	(2.561)	(7.806)
Regional Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	709	709	709	709	709
R-squared	0.551	0.651	0.620	0.429	0.467

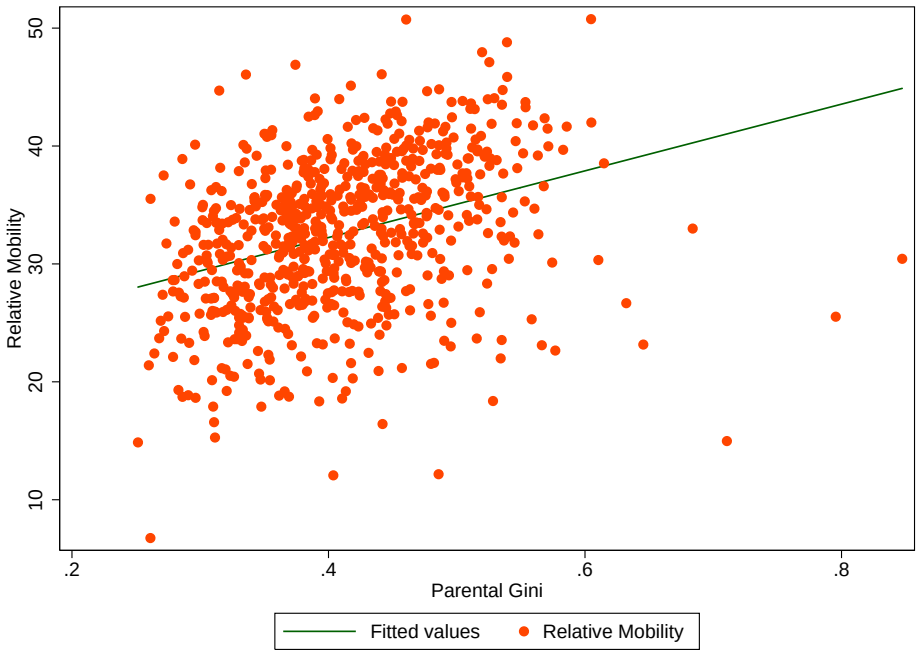
Note: Significance is denoted as follows: $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 5: Regression of Mobility on Inequality of Outcomes

	Absolute Mobility			Relative Mobility		
	(1)	(2)	(3)	(4)	(5)	(6)
Per Capita Income Growth, 1980-1990	0.021*	0.012	0.018*	-0.022+	-0.013	-0.018
	(0.009)	(0.008)	(0.008)	(0.012)	(0.012)	(0.012)
Per Capita Income, 1990	0.417***	0.391***	0.280***	0.068	0.132	0.231+
	(0.086)	(0.080)	(0.084)	(0.120)	(0.118)	(0.119)
Gini	-19.332***	-20.514***	-42.772***	10.433**	18.487**	38.369***
	(2.507)	(4.348)	(3.768)	(3.508)	(6.376)	(5.341)
Frac. Between p25 and p75		27.867***			-24.893***	
		(3.111)			(4.562)	
Top 1 Percent Income Share		0.190***	0.360***		-0.278***	-0.429***
		(0.046)	(0.045)		(0.068)	(0.063)
Less than High School, 1990	-0.227	18.110***	3.073	-2.013	-19.377**	-5.946
	(4.300)	(4.259)	(4.134)	(6.018)	(6.246)	(5.859)
Greater than High School, 1990	2.714	13.629***	4.457	-16.421**	-26.692***	-18.499***
	(3.919)	(3.700)	(3.755)	(5.484)	(5.426)	(5.322)
Age less than 15, 1990	5.333	19.682**	12.771	30.510**	15.473	21.646+
	(8.079)	(7.410)	(7.783)	(11.305)	(10.867)	(11.031)
Age 15-24, 1990	28.710***	28.696***	31.786***	1.869	0.964	-1.796
	(8.449)	(7.669)	(8.090)	(11.823)	(11.246)	(11.468)
Age greater than 54, 1990	31.757***	29.603***	35.344***	3.573	4.426	-0.702
	(6.085)	(5.565)	(5.837)	(8.515)	(8.160)	(8.274)
Change in LFPR: Male, 1980-1990	-0.394***	-0.318***	-0.372***	0.172*	0.097	0.146+
	(0.056)	(0.051)	(0.054)	(0.079)	(0.075)	(0.077)
Change in LFPR: Female, 1980-1990	0.365***	0.303***	0.337***	-0.230*	-0.166+	-0.197*
	(0.071)	(0.064)	(0.068)	(0.099)	(0.095)	(0.096)
Log of Total Population, 1990	-0.614***	-0.403**	-0.384**	0.627**	0.370*	0.353+
	(0.136)	(0.126)	(0.133)	(0.190)	(0.185)	(0.189)
Constant	32.064***	2.352	33.082***	22.318**	48.555***	21.105**
	(5.559)	(6.094)	(5.319)	(7.779)	(8.936)	(7.539)
Regional Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	709	709	709	709	709	709
R-squared	0.650	0.714	0.680	0.473	0.527	0.506

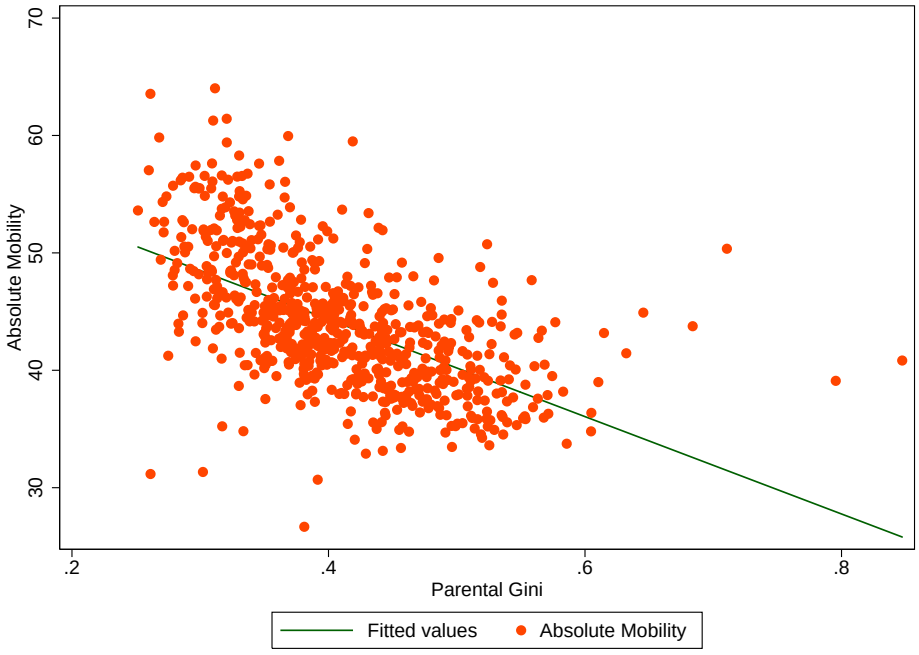
Note: Significance is denoted as follows: $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Figure 1: Relative Mobility and Inequality of Income



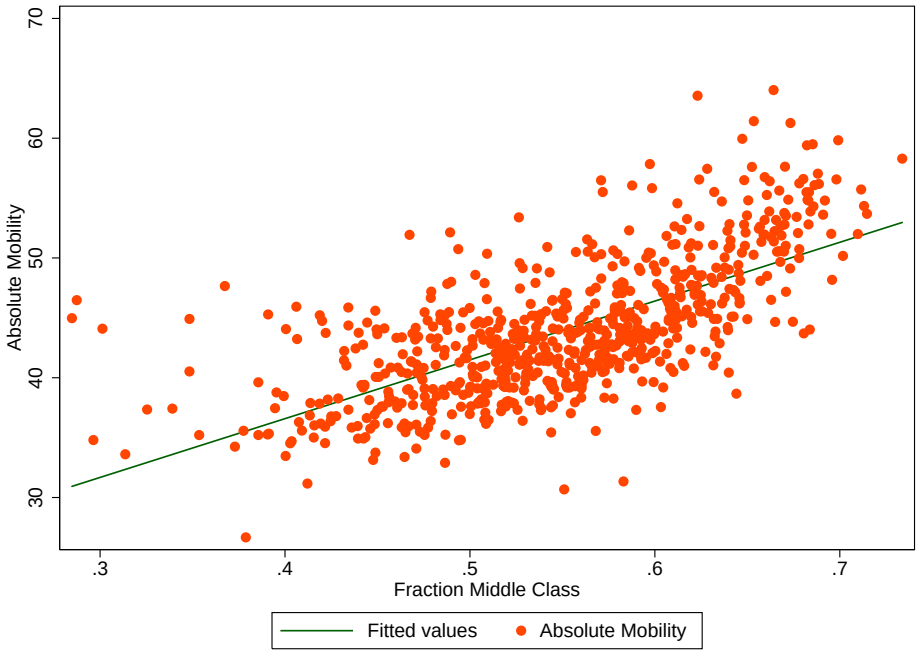
RM = 0.21*** + 0.28***gini (*** denotes p<0.001) R-squared = 0.12

Figure 2: Absolute Mobility and Inequality of Income



AM = 60.93*** - 41.56***gini (*** denotes p<0.001) R-squared = 0.33

Figure 3: Absolute Mobility and Size of the Middle Class



AM = 16.95*** + 49.08***gini (*** denotes p<0.001) R-squared = 0.46