Inequality of Opportunity and Aggregate Economic Performance

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Economists have developed an extensive literature examining the relationships between inequality of outcomes and growth, but few research papers have investigated the relationship between inequality of opportunity and growth. That extensive literature finds both positive and negative effects of inequality on growth, as theory predicts. By contrast, inequality of opportunity should be a drag on growth, as it represents less than full utilization of potential resources. Using recently released data on intergenerational mobility in commuting zones within the United States, this paper investigates the relationship between intergenerational mobility measures (as indicators of inequality of opportunity) and economic growth and finds that local areas with higher intergenerational mobility display faster economic growth over the 2000–2013 and 2007–2013 periods. This is true when intergenerational mobility is measured in both relative and, especially, absolute terms. In the reverse direction, the paper provides suggestive evidence that faster growth enhances economic opportunity.

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, as well as 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 nexus between inequality of opportunity and economic performance implicit in many analyses of inequality and economic growth, even in some of the earliest related research.

The modern economic literature on the relationship between economic growth and income inequality starts with Simon Kuznets's

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1954 American Economic Association Presidential address, in which he not only described the relationship, but also proposed explanations for the patterns he uncovered in the data (Kuznets 1955). He argued that inequality tends to rise in a country's early stages of economic development and observed 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 discussed 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 distribution. However, finding no such widening—indeed documenting declines in inequality in the United States and United Kingdom from the 1920s through 1950—he argued that the inequality-worsening factors were counteracted by other forces embodied in "the dynamism of a *growing* and free economic society" (11, emphasis added).

Among the factors Kuznets cited 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" (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 posited 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" (15). Kuznets saw 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 sixty years since Kuznets's pathbreaking address, a voluminous research literature has developed on the relationship between growth and inequality, and the debate is ongoing 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, 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, inequality might be either positively or negatively related to growth, causality running in either direction, for a number of reasons. 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. Given that some mechanisms point to a trade-off between greater equality and growth and others to a complementary relationship, the nature of the relationship is fundamentally a question that must be answered empirically, and may vary over time and space depending on the economic and institutional context. Not surprisingly, researchers in this area have not yet reached a consensus. 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—both theoretically and empirically—that inequality of opportunity has a negative effect on economic growth. Because social justice motivations are involved in seeking greater equality of opportunity, it is useful to quantify and distinguish its (positive) role in growth from the mixed role of broader inequality (of outcomes).

In this paper, we review the research literature on the relationship between inequality of

opportunity and economic growth and provide new empirical evidence.[1]

ECONOMIC GROWTH AND INEQUALITY (OF OUTCOMES)

We first 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 (post-Kuznets) 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 performance in the subsequent section. Our review of the literature is by no means comprehensive; readers are 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 from growth to inequality, and then examine mechanisms in the opposite direction.

How Does Economic Growth Affect Inequality of Outcomes?

The increase in inequality that accompanies industrialization in Kuznets' theory is essentially due to technological change. Agreement is widespread that the surge in earnings inequality 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 benefited 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 complement 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. Claudia Goldin and Lawrence Katz (2008) depict relative wages in the United States over the course of the twentieth century as being determined by the outcome of a race between technological change and increases in educational attainment. Skill-biased technological change increases 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 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, at least through the 1990s, 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 in-

equality 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. By contrast, Thomas Piketty's (2014) hypothesis that inequality among wealth holders rises whenever the rate of return on financial capital exceeds the rate of economic growth implies that strong growth can *reduce* inequality, other things (including the financial rate of return) equal.

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 indirectly through 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. Frank Levy and Peter 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 in-

centives created by skill-biased technical change. Philippe Aghion, Eve Caroli, and Cecilia 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 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 because family background is playing an increasingly important role in educational attainment

in the United States. Martha Bailey and Susan Dynarski (2011) find that college completion rates are higher for the U.S. cohort born around 1980 than 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 their low-income counterparts. Philippe Belley and Lance 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. Gonzalo Castex and Evgenia 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. Mary Anne Fox, Brooke Connolly, and Thomas Snyder (2005) report NCES data indicating that only 29 percent of low-SES children with eighth grade test scores in the top quartile in 1988 attained a bachelor's degree (BA) by 2000, but that 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 are 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 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" (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. Joseph Stiglitz argues that "inequality is associated with more frequent and more severe boom-and-bust cycles that make our economy more volatile and vulnerable" (2013). Michael Kumhof and Romain Ranciere (2010) and Barry Cynamon and Steven Fazzari (2013) put forward models of this process. The degree to which this volatility manifests itself solely in more frequent or wider-swinging business cycles is beyond the scope of this paper, but several of these authors argue that such volatility also reduces long-term growth at the least by slowing the recovery after downturns.

A fourth channel is via inequality's effect on demand. Sarah 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 rich's having a lower marginal propensity to consume than those further down the income ladder (see Dynan, Skinner, and Zeldes 2004). Laura Carvalho and Armon Rezai (2015) document that "lowering wage income inequality always increases aggregate demand."

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 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. Daron Acemoglu and James 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 redistributive policies and institutions arise in response to increased inequality, they may nonetheless affect the relationship between growth and inequality. Gary Burtless (2003) maintains that the relatively modest transfer system and labor market regulations in the United States compared with 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 United States. 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 United States 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 Organization for Economic Cooperation and Development report (2012) attempts to identify policy changes that can "yield a double dividend in terms of boosting the gross domestic product (GDP) per capita and reducing income inequality" (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 Voitchovsky (2009) discusses 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, the causal direction between growth and inequality may run either or both ways. Given the theoretical ambiguity regarding the relationship, the lack of a clear consensus on the empirical relationship between growth and inequality is not surprising.

Most of the empirical literature attempts to identify the causal effect of inequality on growth. Abhijit Banerjee and Esther 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 nonmonotonic 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. Federico Cingano argues that "what matters most [for the negative effect of income inequality on growth] is the gap between low-income households and the rest of the population"; he finds evidence that "increased income disparities depress skills development among individuals with poorer parental education background, both in terms of the quantity of education attained (for example, years of schooling), and in terms of its quality (that is, skill proficiency)" (2014, 6). Era Dabla-Norris and her colleagues (2015) similarly find that an increase in the income share of the bottom 20 percent of the income distribution (the poor) is associated with higher GDP growth in a cross section of nations, and that growth in the top income share reduces it.

In a recent working paper, Jonathan Ostry, Andrew Berg, and Charalambos 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 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 by damping 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 intranational comparisons. Using a panel of data on U.S. states, Ugo 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, Mark 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. In a similar vein, Roy van der Wiede and Branko Milanovic (2014) investigate how inequality affects growth, but broaden the focus to examine growth at a range of income percentiles, using state-level measures within the United States. They find that high overall inequality hurts income growth among the poor and, in most specifications, helps income growth among the rich. When they disaggregate inequality into top-half and bottom-half inequality (measured over the richest and poorest 40 percent, respectively), they find it is mostly inequality among the rich that is holding back income growth among the poor.

In addition to academic papers that estimate empirical relationships, two recent policy-oriented literature reviews offer frameworks within which to interpret much of the literature discussed above. Heather Boushey and Carter Price (2014) note that a great deal of research lines up behind the empirical regularity that long-term economic growth is harmed by inequality, but that this is not the case for short-term growth.

Jared Bernstein (2013) posits four classes of causal mechanisms to categorize the forces discussed that link inequality and growth: supply side (how inequality affects the quality and quantity of inputs and hence growth), demand side (lower marginal propensity to consume among the rich slows growth as inequality rises), political economy (rising inequality augments the political and economic power of the

rich who reduce investment in shared prosperity), and credit bubbles and busts (inequality leads the poor to borrow to maintain consumption, making them vulnerable to downturns and the economy more volatile).

One would expect the causal channels relating intranational inequality to intranational growth to differ somewhat from those relating inequality and growth across nations. 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 intranational level than they are across countries. One implication is that the savings channel is likely to be less important at the intranational level. This is also true of the demand channel, though perhaps to a somewhat lesser extent. Endogeneity of inequality may also be more of a problem in intranational data than at the national level. The easy geographic mobility of workers within countries provides another potential channel relating inequality and growth, though 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.

RELATIONSHIP BETWEEN INEQUALITY OF OPPORTUNITY AND GROWTH

Virtually all of the empirical work relating inequality of opportunity and macroeconomic growth examines causation running from inequality of opportunity to growth.

How Does Inequality of Opportunity Affect Growth?

The underlying causal mechanism for inequality of opportunity to influence growth is that inequality of opportunity prevents some potential workers or entrepreneurs in the economy from developing their full capacity, generating wasted resources and hence lower-than-possible output. As discussed, for example, the inefficiencies represented by unequal access to education constitute a drag on growth. By improving the efficiency of resource use, 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 use their talents also affects the rate of technological change or generates externalities, as Robert Lucas (1988) finds, then a sustained higher rate of growth may result. Although 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 earlier) 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. Chang-Tai Hsieh and his colleagues (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 nonwhite or nonmale 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' preferences, or discrimination in either education or hiring.

The authors estimate how much occupational barriers declined over the almost fifty years they study and what that decline contributed to productivity. They find that changes in occupational barriers facing blacks and women "account for 15 to 20 percent of growth in aggregate output per worker since 1960" (Hsieh et al. 2013, 1).[2] 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 make up a much larger proportion 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. In concluding, they say that though 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 (2013, 43).

Gustavo Marrero and Juan Rodriguez (2013) and Francisco Ferreira and his colleagues (2014) take a very different approach from Hsieh and his colleagues (2013) in 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.[3] Inequality resulting from differential effort (as described in the earlier discussion of inequality of outcomes and growth) is seen as providing incentives for people to work hard, take risks, and invest in education, and hence is expected to promote growth.

Following much of the literature on inequality of opportunity (as discussed in the introduction to this issue), 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

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2. They also note that reducing barriers to zero would provide further productivity gains.

3. Hsieh and colleagues build their paper on the idea that occupational choice may be constrained by circumstances. However, because *effort* is measured as a residual component of inequality, this apparent disagreement is irrelevant in the current context.

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 and his colleagues (2014) use gender, race or ethnicity, the language spoken at home, religion, caste, nationality of origin, immigration status, and region of birth or of 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, leaving "too much" inequality for the residual.

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 (such as 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, because it is a residual category, it will also reflect unmeasured aspects of inequality of opportunity (circumstances), the effects of institutions and policies that affect income, luck, and other factors not associated with effort, 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 edu-

cation and to exert an effort, while inequality of opportunity may not favor human and physical capital accumulation in the more talented individuals." 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" (2013, 120).[4]

Marrero and Rodriguez say that their results call for proper design of policy, in the sense that improving equality of opportunity has positive benefits and that 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 Voitchovsky observes, a highly unequal playing field also discourages effort among the disadvantaged, contributing to inefficiency.

Ferreira and his colleagues (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)" they expect, like Marrero and Rodriguez, to find the former has a negative effect on growth and the latter a positive effect (2014, 2). Their failure to find support for either of these hypothesized relationships in two panels of nations may reflect the 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 estimated relationships do not apply across nations with different institutional backdrops.

With these papers as background, we exam-

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4. 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.

ine the relationship between inequality of opportunity and growth in a cross section of U.S. commuting zones (CZs), geographic areas representing aggregations of counties that coincide with metropolitan areas where they exist, and exhaust U.S. territory by also including rural areas.[5] This level of geography is one the earlier research has not examined. In addition, we use measures of inequality of opportunity new to this literature. Using rich and extensive tax return data for thirty-year-old "children" in 2011–2012 matched to their parents' tax returns when they were growing up, Raj Chetty and his colleagues (2014a) calculate various measures of intergenerational mobility, indicating how the thirty-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 she or 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.[6] However, as discussed in the introduction, measures of intergenerational mobility and indices of inequality of opportunity, such as those both Marrero and Rodriguez and Ferreira and his colleagues use, capture somewhat different concepts. Measures of inequality of opportunity depend on inequality of circumstances as well as the relationship between circumstances and outcomes; only the latter is captured by measures of intergenerational mobility. Nonetheless, Miles Corak reviews the literature and concludes that "indices of inequality of opportunity are in fact strongly correlated with indicators of intergenerational mobility, be it in earnings or education" (2013, 85).

We focus on Chetty and colleagues' (2014a) preferred measure of "absolute upward mobility," which indicates the rank in the national children's income distribution (around age thirty) 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 reranking of children's income relative to the ordering of their parents' income.

We also present results using the Chetty and colleagues' measure of relative mobility, which is based on the difference in outcomes between children from the top of the income distribution within a CZ and those at the bottom of the distribution. As Chetty and his colleagues 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. Following Jo Blanden, Paul Gregg, and Lindsey Macmillan (2007), we rescale Chetty and colleagues' relative measure so that it is higher when intergenerational mobility is greater.[7]

We combine economic data from the U.S. Bureau of Economic Analysis (2014) and demographic data from decennial censuses (U.S. Census Bureau 2014), in both cases aggregated to CZs from the county level, with mobility and inequality measures from Chetty and his colleagues (2014c). Table A1 reports the sample characteristics of the variables included in the analysis. Because the mobility measures refer to one cohort (children born in the early 1980s

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5. Our analysis includes only 709 of 741 CZs nationwide, because it is limited to the CZs for which Chetty and his colleagues (2014c) 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.

6. Paolo Brunori, Francisco Ferreira, and Vito 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.

7. Chetty and colleagues' (2014a) relative measure is the elasticity of child rank with respect to parent rank (in their corresponding national income distributions) and hence is higher when children's and parents' situations are more closely tied, that is, when intergenerational mobility is lower.

who are about age thirty in 2011–2012), we estimate a growth model in the cross section.

Table 1 reports selected coefficient estimates from a simplified growth model. Following Marrero and Rodriguez and Ferreira and colleagues, the dependent variable is growth in per capita income; in panel A, growth is measured from 2000 to 2013; in panel B, the period is shortened, from 2007 to 2013. The first explanatory variable is the mobility measure, proxying inequality of opportunity. The other explanatory variables represent conditions in the CZ at the beginning of the growth period; for inequality, it is the Gini measure of overall 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 beginning-of-period 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.[8] For estimated coefficients, see table 1.

In all the regressions, we include regional fixed effects for the nine census divisions. The regressions in columns 2 and 4 for both periods also include a set of demographic control variables: the age mix of the CZ 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 to 2013 regressions). Because inequality of op-

portunity 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.[9] The complete regression results, including the estimated coefficients on these demographic variables, are available from the authors on request.

The estimates in columns 1 and 2 show a statistically significant positive coefficient on absolute mobility in explaining economic growth in either period, indicating a strongly negative effect of inequality of opportunity on growth. Columns 1 and 2 also document a modest positive effect on 2000 to 2013 growth of overall inequality (Gini), but not for 2007 to 2013 growth (panel B). Relative mobility (columns 3 and 4) obtains moderately positive estimated coefficients in the growth equations, except in column 4 of panel B—for growth from 2007 to 2013 and including demographic controls—where the estimated coefficient is indistinguishable from zero. Unexpectedly, the estimated coefficient on the Gini (overall inequality) is negative when controlling for relative rather than absolute mobility (columns 3 and 4).

The effect of both relative and absolute mobility on growth is what the literature hypothesizes; the effect of overall inequality, however, does not consistently match the hypothesized positive incentive effects of inequality on growth. 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. The beginning-of-period per capita income level is negatively as-

8. 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 the 2001 to 2010 span and CZ industry mix refers to 2001 in the 2000 to 2010 regression because the Bureau of Economic Analysis shifted from the Standard Industrial Classification (SIC) system to the North American Industry Classification System (NAICS) in 2001; the U.S. growth rates are between 2007 and 2012 for the 2007 to 2012 growth period.

9. 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 twenty-five and older (the child generation is age eighteen or nineteen in 2000).

Table 1. Regressions of Growth on Mobility

	(1)	(2)	(3)	(4)
Panel A	Per capita income growth, 2000–2013			
Absolute mobility	2.353***	2.498***		
	(0.188)	(0.212)		
Relative mobility			0.529***	0.338*
			(0.159)	(0.161)
Gini (inequality) of parental income	23.502[+]	31.384*	–31.070*	–16.086
	(13.338)	(14.509)	(13.797)	(15.273)
Per capita income, 2000	–1.664***	–1.228***	–1.425***	–0.734*
	(0.178)	(0.304)	(0.195)	(0.330)
Per capita income growth, 1990–2000	–0.310***	–0.266***	–0.400***	–0.369***
	(0.080)	(0.077)	(0.088)	(0.084)
Predicted employment growth, 2001–2013	1.057***	0.882***	1.301***	1.275***
	(0.196)	(0.204)	(0.216)	(0.220)
Constant	2.519	–17.287	85.198***	44.712
	(12.505)	(36.576)	(14.146)	(40.639)
2000 demographics[a]	No	Yes	No	Yes
Regional fixed effects	Yes	Yes	Yes	Yes
Observations	709	709	709	709
R^2	0.500	0.548	0.397	0.460
Panel B	Per capita income growth, 2007–2013			
Absolute mobility	1.145***	1.145***		
	(0.105)	(0.118)		
Relative mobility			0.215*	0.124
			(0.084)	(0.084)
Gini (inequality) of parental income	–8.324	–0.934	–38.064***	–25.666**
	(7.250)	(8.027)	(7.199)	(8.121)
Per capita income, 2007	–0.641***	–0.386**	–0.516***	–0.220[+]
	(0.070)	(0.117)	(0.075)	(0.123)
Per capita income growth, 2000–2007	0.279***	0.161**	0.398***	0.250***
	(0.051)	(0.055)	(0.054)	(0.058)
Predicted employment growth, 2007–2013	0.757***	0.690***	0.767***	0.873***
	(0.179)	(0.179)	(0.193)	(0.190)
Constant	–12.561[+]	–17.312	25.152***	10.652
	(6.466)	(19.256)	(7.437)	(20.939)
2000 demographics[a]	No	Yes	No	Yes
Regional fixed effects	Yes	Yes	Yes	Yes
Observations	709	709	709	709
R^2	0.485	0.535	0.403	0.473

Source: Authors' calculations based on U.S. Census Bureau 2014, U.S. Bureau of Economic Analysis 2014, and Chetty, Hendren, Kline, and Saez 2014c.

[a]2000 demographics include proportion of population with less than and more than a high school degree, proportion of population under age fifteen, age fifteen to twenty-four, and over age fifty-four, male and female labor force participation rates, and logarithm of population. For the 2007–2013 growth regressions (panel B), the population measure refers to 2007.

[+]$p < 0.10$; *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$

sociated 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 to 2013 period and a positive coefficient for growth between 2007 and 2013; the latter period is only six years, starts at the pre-recession peak, and covers the Great Recession and 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 to 2013 period. The additional growth regressions that follow analyze only the longer 2000 to 2013 period because previous research suggests that it is in the longer term that inequality (in our case, inequality of opportunity proxied by mobility) affects growth. Indeed, even the 2000 to 2013 period might be construed as only medium term, but we are constrained by the timing of our mobility measures and beginning in 2000 allows the growth period to be, to some degree, later than the mobility period (mid-1990s to 2011).

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 2 displays regression results when we explore alternative measures of inequality, focused on different parts of the income distribution. That is, rather than controlling only for overall inequality (Gini) and mobility in the growth regressions, we examine also the impact on growth of inequality measured at the bottom, middle, or top of the distribution. A simple bottom- and top-inequality measure is the ratio of 90th to 50th percentile (parent) income and the ratio of 50th to 10th percentile income in the CZ. Alternatively, a middle-class variable measures the proportion of the CZ (parental generation) population with incomes between the 25th and 75th percentiles of the nationwide parental distribution. A measure of very-top-income tallies the fraction of CZ income held by the richest 1 percent of parents.

Both the middle-class proportion and the top 1 percent share of income obtain negative coefficients when controlling for absolute mobility (column 1), but coefficients indistin-

guishable from zero when relative mobility is included (column 3). 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 (versus 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 proportion middle class tallies the proportion of CZ residents in the middle range of the *national* parental 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.

Greater inequality in both the top and bottom of the income distribution enhances growth when controlling also for absolute mobility (column 3) but has effects indistinguishable from zero when relative mobility is included (column 4). Any of these alternative inequality measures leave the estimated coefficients on relative or absolute mobility positive and significantly different from zero.

As noted earlier, the absolute mobility measure includes changes in ranks of CZ children relative to their parents, which will partially reflect 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 1 is due solely to the undoubted correlation between

Table 2. Regressions of Growth on Mobility and Alternative Inequality Measures

	Dependent Variable: Per Capita Income Growth, 2000–2013				
	(1)	(2)	(3)	(4)	(5)
Absolute mobility	2.886***		2.934***		
	(0.233)		(0.223)		
Relative mobility		0.288[+]		0.380*	
		(0.172)		(0.168)	
Residuals (see text)					1.892***
					(0.350)
Gini (inequality) of parental income	55.014*	–10.219			14.960
	(26.139)	(28.431)			(16.252)
Parental middle class	–51.486**	18.887			
	(19.784)	(21.235)			
Top 1 percent income share	–0.523[+]	–0.001			
	(0.287)	(0.316)			
Parent income ratio 90th percentile to 50th			17.295***	2.236	
			(3.312)	(3.515)	
Parent income ratio 50th percentile to 10th			9.083***	–0.531	
			(2.416)	(2.605)	
Per capita income, 2000	–1.151***	–0.721*	–1.408***	–0.819*	–1.294***
	(0.321)	(0.354)	(0.299)	(0.329)	(0.338)
Per capita income growth, 1990–2000	–0.260***	–0.361***	–0.280***	–0.392***	–0.309***
	(0.077)	(0.085)	(0.076)	(0.084)	(0.083)
Predicted employment growth, 2001–2013	0.792***	1.283***	0.789***	1.302***	1.194***
	(0.203)	(0.221)	(0.205)	(0.226)	(0.216)
Constant	2.943	33.724	–108.468**	46.050	55.939
	(39.011)	(43.686)	(41.912)	(46.822)	(38.562)
2000 demographics[a]	Yes	Yes	Yes	Yes	Yes
Regional fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	709	709	709	709	709
R^2	0.557	0.461	0.565	0.460	0.479

Source: Authors' calculations based on U.S. Census Bureau 2014, U.S. Bureau of Economic Analysis 2014, and Chetty, Hendren, Kline, and Saez 2014c.

[a]2000 demographics include proportion of population with less than and more than a high school degree, proportion of population under age fifteen, age fifteen to twenty-four, and over age fifty-four, male and female labor force participation rates, and logarithm of population.

[+]$p < 0.10$; *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$

that component of the mobility measure and income growth in the CZ (the dependent variable), we reestimate the regression in table 2 column 2, including 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 1, but still significantly different from zero at the 0.1 percent confidence level. The ratio of median incomes also obtains a positive coefficient estimate that is significantly different from zero.[10] Another indicator that the par-

10. The ratio of medians is not an exogenous variable, since the period between when the parent and child incomes are observed (late 1990s to between 2011 and 2012) overlaps the growth period (2000 to 2013) and hence directly measures some of what the dependent variable measures. That relationship should bias upward the

tially endogenous increase in income of children relative to parents in the CZ is not wholly responsible for absolute mobility's significant positive effect on CZ income growth between 2000 and 2013 is provided by substituting the residuals from a regression of absolute mobility on the ratio of child to parent median income for the absolute mobility measure in the growth regression. Those estimated coefficients are shown in table 2 column 5 and indicate a positive effect of growth-purged absolute mobility on economic growth that is significantly different from zero with better than 99.9 percent confidence.

A more comprehensive approach addresses these concerns as well as the overlap in timing of the mobility and growth measures by treating the mobility measures as endogenous in the growth equation. As instruments for mobility, we include measures of family structure, segregation, and earlier foreign immigration. Although we hypothesize that these variables influence mobility but not growth (other than indirectly via mobility), it is also possible that the instrumental variables are correlated with a latent factor, such as social capital, that also affects growth. Selected estimated coefficients from these two-stage least squares regressions are shown in table 3. The estimated coefficient on the endogenous absolute mobility variable is positive and significantly different from zero, but the coefficient on relative mobility is statistically indistinguishable from zero when the variable is treated as endogenous.

The equations reported in tables 1 through 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 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" (2009, 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, caution in interpreting the estimates is important. 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 some concern remains 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 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 (or endogenous current growth) is associated with mobility.

All in, the estimates in tables 1 through 3 provide some confirmation of the results in Marrero and Rodriguez, indicating that inequality of opportunity may hinder growth.[11] At least across commuting zones, the positive relationship between absolute upward mobility and growth in the 2000s (both 2000 to 2013 and 2007 to 2013) is quite robust to inclusion

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estimated coefficient of the ratio of medians on CZ income growth. The point of reporting these results is to make clear that even controlling for shifts in the central tendency of children's income relative to parents' income, absolute mobility still contributes positively to growth.

11. The results are also consistent, in a more indirect way, with Hsieh and colleagues' findings of significant negative effects on output of inequality of opportunity in occupational choice.

Table 3. Two–Stage Least Squares Regressions of Growth on Mobility

	Dependent Variable: Per Capita Income Growth, 2000–2013	
	(1)	(2)
Absolute mobility[a]	0.882*	
	(0.397)	
Relative mobility[a]		0.156
		(0.284)
Gini (inequality) of parental income	–2.544	–18.762
	(16.425)	(15.439)
Per capita income, 2000	–0.924**	–0.747*
	(0.318)	(0.325)
Per capita income growth, 1990–2000	–0.325***	–0.363***
	(0.080)	(0.083)
Predicted employment growth, 2001–2013	1.170***	1.303***
	(0.217)	(0.220)
Constant	37.422	56.874
	(39.143)	(43.001)
2000 demographics[b]	Yes	Yes
Regional fixed effects	Yes	Yes
Observations	709	709
R^2	0.510	0.459

Source: Authors' calculations based on U.S. Census Bureau 2014, U.S. Bureau of Economic Analysis 2014, and Chetty, Hendren, Kline, and Saez 2014c.
[a]Absolute mobility and relative mobility are treated as endogenous variables in two-stage least squares estimation. Instruments for both measures include 1990 and 1980 proportion foreign-born, proportion commuting less than fifteen minutes, and proportion of households with children that have female head and no spouse present.
[b]2000 demographics include proportion of population with less than and more than a high school degree, proportion of population under age fifteen, age fifteen to twenty-four, and over age fifty-four, male and female labor force participation rates, and logarithm of population.
+$p < 0.10$; *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$

of other CZ characteristics. The relative mobility results are somewhat less conclusive, but generally also find a positive relationship between relative mobility and growth.

How Does Growth Affect Inequality of Opportunity?
We next turn briefly to the reverse direction of causation: the effects of growth on inequality of opportunity.[12] The only paper we have found

that directly investigates this topic is that of 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 opportu-

12. 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 in the introduction, growth could have indirect effects on inequality of opportunity as well as the direct effects discussed immediately below. For ex-

nity and the change in inequality of effort, implying that growth reduces both components of inequality.

Chetty and his colleagues (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.[13] One class of variables they include in their correlation analysis (Chetty et al. 2014b) is local (CZ) labor market conditions, but none of these variables—labor force participation rate, fraction working in manufacturing, growth in Chinese imports, and young teen (ages fourteen to fifteen) 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, are less able to make those investments privately.[14] 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 regressions of absolute or relative mobility on per capita income growth in an earlier period (earlier than the mid-1990s to 2012 period in which the mobility is occurring) or contemporaneous growth treated endogenously, plus selected control variables that might influence mobility. However, we are not able to control for welfare and health expenditure or availability of consumer credit at the CZ level, two macro factors that Marrero and Rodriguez (2013) find are associated with lower inequality of opportunity.

In columns 1 and 2, earlier-period growth has a positive estimated coefficient when explaining mobility (absolute or relative); however, the estimated coefficient is significantly different from zero when 1980 demographics are controlled for (and the earlier period is 1970 to 1980) but not when 1990 demographics are controlled for and the earlier period is 1980 to 1990 (that is, panel B, not panel A). When we also include per capita income growth between 2000 and 2013 treated as an endogenous variable in columns 3 and 4, early-period growth remains important in explaining mobility, but contemporaneous growth adds a further positive effect only when controlling for 1990 demographics (panel A).[15]

All in all, we find that earlier economic growth (and in some cases contemporaneous economic growth) is positively associated with mobility, suggesting that faster growth enhances economic opportunity. However, lack-

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ample, 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, and so on (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" (Stiglitz 2012).

13. 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.

14. 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.

15. We instrument for the endogenous growth variable with variables expected to influence growth but not mobility, including predicted employment growth, per capita income at the beginning of the growth period (2000), and the age mix of the CZ population.

Table 4. Coefficients on Economic Growth in Mobility Regressions

	OLS		2SLS	
	(1)	(2)	(3)	(4)
	Absolute Mobility	Relative Mobility	Absolute Mobility	Relative Mobility
Panel A				
Per capita income growth, 1980–1990	0.011[+]	0.010	0.027***	0.020[+]
	(0.006)	(0.009)	(0.007)	(0.011)
Per capita income growth, 2000–2013[a]			0.087***	0.056[+]
			(0.018)	(0.029)
Constant	33.224***	79.590***	34.444***	80.374***
	(4.558)	(6.723)	(4.077)	(6.706)
Parental inequality measures[b]	Yes	Yes	Yes	Yes
1990 demographics[c]	Yes	Yes	Yes	Yes
Regional fixed effects	Yes	Yes	Yes	Yes
Observations	709	709	709	709
R^2	0.792	0.652	0.829	0.644
Panel B				
Per capita income growth, 1970–1980	0.017***	0.028***	0.016**	0.030**
	(0.004)	(0.007)	(0.006)	(0.009)
Per capita income growth, 2000–2013[a]			0.005	−0.012
			(0.023)	(0.037)
Constant	27.994***	68.971***	28.386***	68.024***
	(4.095)	(6.524)	(4.360)	(7.064)
Parental inequality measures[b]	Yes	Yes	Yes	Yes
1980 demographics[c]	Yes	Yes	Yes	Yes
Regional fixed effects	Yes	Yes	Yes	Yes
Observations	709	709	709	709
R^2	0.823	0.655	0.828	0.653

Source: Authors' calculations based on U.S. Census Bureau 2014, U.S. Bureau of Economic Analysis 2014, and Chetty, Hendren, Kline, and Saez 2014c.

[a]Per capita income growth 2000–2013 is treated as an endogenous variable in two–stage least squares estimation. Instruments include predicted employment growth, per capita income, and age mix of the population at beginning of growth period (2000).

[b]Parental inequality measures are Gini coefficient, proportion middle class, and top 1 percent income share.

[c]Demographic variables (1980 or 1990) include per capita income, proportion foreign born, proportion commuting less than fifteen minutes, proportion of households with children that have female head and no spouse present, proportion population with education less than high school, proportion population with greater than high school education, male labor force participation rate, female labor force participation rate, log of population size.

[+]$p < 0.10$; *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$

ing 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 and might better be viewed as partial correlations, rather than being given a causal interpretation.

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 limited empirical literature investigating this relationship is also somewhat mixed, though two of the three existing papers we cite find a negative effect. This paper adds to that literature, also finding a negative effect of low mobility (high inequality of opportunity) on growth. In addition, we provide suggestive evidence that faster growth boosts intergenerational mobility.

Unequal opportunity represents inefficiency because 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 equality 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 by the improved operation 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 increased equality of opportunity on growth, separately identifying the direct effects and the spillovers.

Another important area for further investigation is which aspects of inequality of opportunity are most detrimental to economic growth. This insight is needed to give policymakers a guide to which set of opportunity-enhancing policies is likely to be most effective in boosting growth. The existing research we summarize and our own analysis do not shed light on specific policy tools that enhance both equal opportunity and 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. As Federico Cingano notes, "policies that help limiting or—ideally—reversing the long-run rise in inequality would not only make societies less unfair, but also richer" (2014, 28). However, the moral and ethical dimension of the policy goal is important to remember. On 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.

APPENDIX

Table A1. Summary Statistics

	Mean	SD
Absolute mobility	43.94	5.681
Relative mobility	67.49	6.479
Gini (inequality) of parental income	0.410	0.0792
Parental middle class	0.550	0.0786
Top 1 percent income share	10.84	5.049
Parent income ratio 90th percentile to 50th	2.283	0.378
Parent income ratio 50th percentile to 10th	3.276	0.424
Per capita income, 1980	8.538	1.777
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, 1970–1980	149.2	26.42
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
Per capita income growth, 2000–2013	63.09	26.16
Per capita income growth, 2007–2013	21.94	13.94
Predicted employment growth, 2001–2013	8.676	4.200
Predicted employment growth, 2007–2013	0.694	2.407
Residuals (see text)	0.000	4.214
Foreign born, 1980	0.0252	0.0318
Foreign born, 1990	0.0275	0.0391
Workers with commute < fifteen minutes, 1980	0.508	0.142
Workers with commute < fifteen minutes, 1990	0.489	0.139
Households with kids headed by single mom, 1980	0.0491	0.0168
Households with kids headed by single mom, 1990	0.0582	0.0194
Less than high school, 1980	0.381	0.110
Less than high school, 1990	0.287	0.0907
Less than high school, 2000	0.215	0.0760
More than high school, 1980	0.399	0.0809
More than high school, 1990	0.441	0.0912
More than high school, 2000	0.452	0.0946
Age less than fifteen, 2000	0.210	0.0268
Age fifteen to twenty-four, 2000	0.143	0.0282
Age greater than fifty-four, 2000	0.238	0.0485
Male labor force participation rate, 1980	72.27	6.050
Male labor force participation rate, 1990	70.62	5.787
Male labor force participation rate, 2000	67.82	6.573
Female labor force participation rate, 1980	46.07	5.966
Female labor force participation rate, 1990	52.87	6.206
Female labor force participation rate, 2000	55.65	5.786
Logarithm of population, 1980	11.57	1.406
Logarithm of population, 1990	11.60	1.454
Logarithm of population, 2000	11.69	1.488
Logarithm of population, 2007	11.72	1.525
Observations	709	

Source: Authors' calculations based on U.S. Census Bureau 2014, U.S. Bureau of Economic Analysis 2014, and Chetty, Hendren, Kline, and Saez 2014c.

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