Inequality, Relative Income and Newborn Health

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Abstract: A major concern over rising inequality is its potential to reduce intergenerational mobility, leading to even greater inequality in the next generation. We estimate the impact of rising inequality over the period 1970-2010 on offspring health at birth, a measure of human capital that has been shown to be highly correlated with future education, IQ and income. We define inequality both at the aggregate level and at the individual level: as a group-level measure (the Gini coefficient for each state or county), and as individual level measures of relative income (relative deprivation, rank, and relative income distance). We document a strong negative relationship between the Gini and newborn health in the cross section, but find that including a modest set of controls, or limiting variation to changes in inequality over time within an area, or instrumenting for inequality eliminates the relationship between the Gini and newborn health completely. However, this null result likely reflects heterogeneity in the effect of rising inequality. When we estimate the impact of relative income on newborn health, we find negative and significant effects of having relatively less income than one's neighbors on birth weight, even after controlling for area fixed effects and instrumenting for differences in the income distribution.

I. Introduction

Income inequality has been on the rise in most industrialized nations since the 1970s, with the Gini coefficient increasing in the U.S. from .39 in 1970 to .47 by 2010. There has been considerable discussion of the causes of the rise in income inequality. Most research based on developed countries points to the increase in skill-biased technological change and globalization as the most important factors.[1]

Less has been written about the consequences of rising inequality. In this paper we consider the impact of inequality on health at birth – a measure of the initial human capital of the next generation. We focus on health at birth for multiple reasons. First, newborn health is sensitive to changes in short term conditions (eg, Almond, 2006). This makes it easier to isolate the economic conditions affecting health. Second, health at birth has been shown to be an important determinant of long term outcomes such as educational attainment, IQ and earnings (Black, Devereaux and Salvanes, 2007). Third, individual-level data on birth outcomes has been collected and reported consistently at a local geographic level (county) for the period 1970-2010, allowing one to estimate the impact of increases in inequality and relative income at a local level on individual outcomes. Finally, by examining the impact of inequality on newborn health, we can learn not only about how inequality affects health, but how it might affect intergenerational mobility and inequality of the next generation.

In our estimates of the impact of rising inequality on health at birth, we define inequality in two ways. In the first part of the paper we define it as the Gini coefficient for the local area (state or county). This measure is common to all individuals in the area. However, because the Gini

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[1] Consistent with this, between 1979 and 2002, the causal return to education increased by 40 percent (Deschenes, 2006).

likely reflects underlying and potentially unobserved characteristics of the population which may be correlated with poor health, these estimates may be biased. To address this, in contrast to much of the existing empirical work that relies on cross sectional variation, we utilize a 40 year panel data which allow us to include area fixed effects, thereby limiting variation to that within an area over time and reducing potential omitted variable bias. We also instrument for inequality following Boustan, Ferreira, Winkler and Zolt (2013). The instrument allows us to isolate the change in the local income distribution that is driven by national shifts in the income distribution over time, not changes in the underlying composition of the area. More specifically, we construct an instrument for local, (state or county-level), distribution of income by holding local area income fixed at the 1970 distribution and match this initial distribution to national patterns in income growth for different points in the distribution of income.[2]

In initial results using aggregated natality data, we find a negative relationship between the Gini coefficient and newborn health (birth weight and an indicator for low birth weight). However, as we include even a parsimonious set of controls, the effect declines in magnitude and when we include area fixed effects thereby limiting variation to that within an area over time and/or instrument for the Gini, the estimated effect is neither large nor significant. When we repeat the analysis with individual level data that includes maternal income, we find the same pattern. This is consistent with either no causal effect of inequality on health, or significant heterogeneity in the effect with some positively affected and others negatively affected, so that on average, we observe no effect of inequality on health.

[2] For example, consider two counties, A and B. In 1970, county A had a disproportionate share of people in the bottom quartile of the (national) income distribution at the time, while county B had a disproportionate share of people in the top quartile of the (national) income distribution. By 1980, the distribution of income in county A had changed so that it is more similar to the distribution of income in county B. However the instrument for the distribution of income in county A is calculated by holding the distribution of income fixed at the 1970 level and then predicting the income distribution based on national trends in income growth for the initial distribution of income.

To explore this potential heterogeneity, in the second part of the paper, we turn to three individual level measures of relative income. The first measure is an ordinal measure: rank, which is defined as your position in the income distribution of the state. We find that conditional on absolute income, rank is related to newborn health and that the effect is non-linear, with greater effects for those at the bottom. The second measure of relative income a measure of relative deprivation (defined by Yitzhaki, 1979) which reflects the average distance between an individual's own income and the income of those above her, adjusted by the probability of comparing one's income to those above. When we estimate the impact of relative deprivation on newborn health controlling for individual characteristics and own absolute income, including area fixed effects, we find that the one's relative deprivation is negatively associated to newborn health. We finally use a third measure, the relative income distance, which is the first component of Yitzhaki's relative deprivation, and measures a mother's family income distance from the expected income of families who earn more than her family. The rationale for using this measure is that we can construct an instrument for this measure based on the synthetic income distribution as described above. When we estimate the impact of relative income distance on newborn health, we find negative and significant effects of having relatively less income than one's neighbors on birth weight, conditional on rank and absolute income, even after controlling for area fixed effects and instrumenting for differences in the income distribution.

These findings suggest that for the poor, rising inequality reduces the initial human capital of the next generation. Whether it ultimately reduces their intergenerational mobility remains for future research.

The rest of the paper is organized as follows. In section II we provide background information on the literature on inequality and intergenerational mobility, and the mechanisms and evidence on the relationship between inequality, relative income and health. Section III describes the empirical strategy and data, and Section IV presents our results. Section V concludes.

II. Background

A. Inequality and the Intergenerational Transmission of Economic Status

There is a considerable theoretical literature on the relationship between income inequality and intergenerational mobility, largely in the macroeconomics literature (see Piketty (1998) for a review). In general, the research suggests that greater inequality should reduce intergenerational mobility and growth. There are a number of mechanisms. The first has to do with imperfect credit markets and investments in human capital. Galor and Moav (2004) posit that because of credit constraints, in an unequal society there will be suboptimal investment in the human capital of the next generation (see Burtless and Jenckes (2003) for a more microeconomic perspective). Not only will this lead to greater inequality in the next generation, but also to reduced overall growth. A second potential mechanism relates to segregation. Durlauf (1996) argues that greater inequality will lead to greater segregation by income which will have the effect of reducing the human and social capital of the next generation. Finally, models of statistical discrimination can also explain how greater inequality in one generation will lead to reduced mobility and increased inequality in the next generation. In the presence of both inequality and statistical discrimination, if employers discriminate in their hiring of the relatively disadvantaged, this will lead to reduced human capital investments among the discriminated group (the disadvantaged) and even greater inequality in the next generation (Arrow, 1973, Piketty, 1998).

While there is considerable theoretical work on this topic, the empirical work characterizing the relationship between inequality and intergenerational mobility is relatively under-developed. Corak (2012) shows that across OECD countries, there is a strong correlation between measures of inequality (the Gini) and intergenerational transmission of earnings. While the evidence he presents is suggestive, questions remain: whether and to what extent this relationship exists at a more micro level, what underlies this relationship, and whether this relationship can be characterized as causal. More recent work (Chetty et al, 2014) uses administrative records for the US population and finds that while areas in the US characterized by greater inequality (Gini) are also characterized by lower intergenerational mobility, the increase in inequality over the past 20-40 years has not lead to a decline in intergenerational mobility for the 1971-1993 birth cohorts.

In this paper we attempt to shed greater light on this by estimating whether inequality affects the initial human capital of the next generation – thereby providing a mechanism by which inequality of one generation may lead to lower intergenerational mobility. We do so in the context of newborn health. While there does not yet appear to be any empirical analysis looking at this specific question, there is a substantial empirical literature looking at inequality and health more generally which we review below.

B. Inequality, Relative Income and Health: Mechanisms

Inequality and relative income or relative deprivation are closely related but distinct concepts. Areas characterized by greater inequality have higher relative deprivation. However, inequality characterizes an entire group of individuals, whereas relative income or relative deprivation is specific to an individual within a group.

There are three reasons why inequality could be related to health. The first has to do with non-linearities in the production of health. If maternal income produces child health (see Case, Lubotsky and Paxson, 2002), but is marginally more productive at low levels of income than at high levels, then an increase in inequality would reduce average health. This could explain the link between income inequality and mortality that is observed in aggregate data at the country, state or metropolitan level. Miller (2002) presents evidence that non-linearities in the relationship between income and health can explain much of the observed relationship between the Gini and health in the context of adult mortality. We refer to this channel as an "indirect" effect.

The second has to do with relative status and the higher levels of psychological stress that characterize those who are relatively worse off than their peers. In this formulation, relative deprivation may be measured in terms of income, education, social or political status, all of which are correlated. Individuals who feel greater stress because of their lower status may be stressed and/or depressed and also more likely to engage in behaviors that negatively affect health (poor eating and exercise habits, smoking, etc). In previous work, Aizer, Stroud and Buka (2012) found that the stress hormone cortisol is higher in poor women and that higher levels of cortisol during the prenatal period is associated with worse outcomes for the offspring (lower IQ, worse health and less completed schooling). These data, however, did not allow for the examination of the direct role or impact of inequality on cortisol levels and offspring outcomes.

Much of the evidence regarding a causal impact of social status on health is drawn from research on primates (Sapolsky et al, 1997; Cohen et al, 1997). In this work, researchers have documented a strong relationship between social status within a group and health outcomes. This relationship has been found to persist even after experimental manipulation of a primate's rank or status within a group, something that is impossible to do with humans.[3] The stress mechanism might manifest itself in reductions in healthy behaviors. Previous work by Eibner and Evans (2005) has found that relative deprivation is correlated with worse health behaviors such as smoking and eating/exercise in US men. More recently, Balsa et al. (2014) relate relative deprivation with risky behaviors among adolescents.

A third and final reason why inequality and health might be related are the externalities associated with having richer neighbors. Depending on the nature of the externality, however, having wealthy neighbors could be either beneficial or harmful to the less wealthy. Examples of a positive externality include an increase in the availability of certain medical services that have high fixed costs and as a result only locate in counties with high average levels of income (assuming the services are normal goods). As a result, relatively poor individuals in the same county benefit from the increased availability of this service. A second example of a positive externality might be reductions in pollution - a public good that is also a normal good. An example of a negative externality is when an increase in average income in an area is associated with an increase in private expenditures on health and offsetting reduction in public expenditures on health, making the relatively poor worse off. Another potential negative externality would be

[3] These mechanisms assume that people know the income distribution of their neighbors. Recent work by Chambers, Swan and Heesacker (2013) finds that people do estimate the income distribution in the US reasonably well, though they tend to slightly overestimate the share in the bottom of the income distribution and underestimate the share at the top. While the authors interpret this as evidence of "distorted perceptions," the differences between the "estimated" and actual distributions of income are pretty small, suggesting that Americans have a relatively good sense of the income distribution of others.

an increase in segregation in unequal areas that can negatively affect access to goods and services and social capital among the poor (Durlauf, 1996).[4]

Of the three potential mechanisms by which inequality might be associated with health, the first is relevant only in the context of aggregate data. Because we have individual data that can be aggregated, we can explore the extent to which non-linearities in the production of health can explain the relationship between the Gini and average health observed in aggregate data. With respect to the other two mechanisms, stress and externalities, we will be able to shed some light on the relative importance of the latter by examining how inequality affects NICU availability (a service with high fixed costs), and segregation of the poor in separate hospitals.

C. Inequality, Relative Income and Health: Previous Empirical Evidence

Empirical evidence of a relationship between inequality and health was first presented by Rodgers in 1979 who conducted cross-country analyses of the relationship between Gini coefficients, GNP and multiple measures of health (infant mortality, life expectancy of birth) and found a strong relationship between both income and inequality and health. Kennedy (1996) provided evidence of a strong relationship between mortality and inequality across the 50 US states. Since then, many others have conducted within country, cross-area analyses of the relationship between inequality and health. These studies have been reviewed elsewhere (Subramanian and Kawachi, 2004). In sum, evidence of a relationship between inequality and health is not conclusive but the estimated effects are strongest in the US and other more unequal

[4] The policy implications of the first and the last two mechanisms differ. With respect to the first mechanism (heterogeneity and non-linearities in the production of health), increasing the wealth of the wealthiest individuals would not affect health. In contrast, for the latter two mechanisms, it would.

countries, though there are also US based studies that find no relationship between inequality and health.

Nearly all of the existing analyses are based on cross sectional comparisons of adult mortality, which may be subject to considerable omitted variable bias. Indeed, Deaton and Lubotsky (2002) show that for the cross-state and cross-MSA level analyses for the US, once one controls for the share of the local area that is black, the negative relationship between inequality and average mortality disappears. This is due to the fact that inequality is higher in areas with a greater share of black residents and so is mortality (for both blacks and whites), though for reasons unknown. As such, the share of residents who are black is an important omitted variable in analyses of the relationship between inequality and average health.

There is less work examining the impact of relative deprivation. Wagstaff and Van Doorslaer (2000) review the literature and find that there is no evidence to support the relative income, deprivation or the relative position hypotheses to explain the association between population health and income inequality, but point to the need to further analyze these hypotheses using individual level data. Eibner and Evans (2005) estimate the impact of relative deprivation on mortality from cardio-vascular disease using NHIS survey data linked with mortality data from the period 1988-1991. They define a reference group as those of the same race, age and education class in one’s own state of residence. They find that relative deprivation is predictive of higher mortality, worse self-reported death, higher BMI and riskier behavior, controlling for own income. Subramanyam et al. (2009) find an association between relative deprivation and poor self-rated health using CPS data, and, more recently, Balsa et al. (2014) relate relative deprivation with risky behaviors among adolescents.

Miller and Paxson (2006) also estimate the impact of relative income on mortality in an effort to explain black-white differences in mortality. Specifically, they assess the extent to which blacks' lower relative income can explain their higher rates of mortality. Using mortality data at the county level and census data on income at the puma (county-group) level, they find that within local area, the average income of blacks affects the black mortality rate, but that the average income of whites in the county also affects the black mortality rate. In fact, for black men, an increase in the average income of white residents of the same county increases the black mortality rate by about half as much as a similar-size decrease in black income.

Most directly related to this work is work by Reagan, Salsberry and Olsen (2007) who examine the relationship between relative income and Intrauterine Growth Retardation (IUGR) using individual data from the NLSY79. They calculate multiple measures of relative income (Yitzhaki, Deaton and log difference by state and year). They find that both absolute and relative income are negatively related to IUGR. The present work expands upon this work by examining both aggregate and individual-level measures of inequality and relative income, expanding the time frame and, most importantly, introducing exogenous sources of variation in inequality for identification, as discussed in the next section.

III. Empirical Strategy and Data

A. Empirical Strategy

Our analysis consists of two parts. First we estimate the impact of the Gini on newborn health, as measured bybirth weight and low birth weight. We define the reference group (the population over which we construct the Gini) as all households in the state or all households in the county (excluding the top one percent and only for those counties with at least 100,000 residents). We begin with the most parsimonious regression based on aggregate data, and sequentially add control variables and area fixed effects. Finally, in another specification we instrument for the Gini. Both, including area fixed effect in the regression and the IV strategies, are designed to address the potential problem of omitted variable bias, since unobserved characteristics of the area may be correlated with both inequality and health (i.e. share black). Because we focus on newborn health, we are not concerned with reverse causality, that is, newborn health is not influencing inequality in any way in this setting.

The IV strategy exploits national or aggregate variation in the growth of the Gini over time (1970-2010). Starting from the initial distribution of income (in 1970) in a local area, we apply national trends in income growth or returns to skill. Specifically, to construct the instrument we follow Boustan et al (2013) and hold the income distribution of the county (or state) fixed at its 1970 level and predict changes in the distribution of income, based on the initial income distribution in 1970 and national trends in income growth over this period. In this way, to borrow the language of Boustan et al (2013), we construct a "synthetic" version of the income distribution in each area that is not a function of the changing composition of the area.

In the second part of the paper, we estimate the relationship between relative income and newborn health. We construct three measures of relative income: Rank, relative deprivation and relative income distance. Rank is an ordinal measure that reflects one's relative position within one's reference group, but is unaffected by the distance between one and one's neighbor. This measure is based on the notion that health is affected not only by the absolute level of living standard, but also by the effect of social position (Wilkinson, 1996). Animal studies, for example, have shown that “social status” involve the manipulation of an ordinal measure of rank (Sapolsky et al, 1997).

However, as mentioned above, rank measures only the relative position of the individual, and not the distance between he or she and her neighbors. To understand the role played by distance between an individual and its peers in the group, we calculate a second measure of relative income based on the work by Runciman (1966) and Yitzhaki (1979): the Yitzhaki relative deprivation (YRD), defined as:

$$YRD_i = \frac{1}{N}\sum_j (Y_j - Y_i) \quad \forall\, Y_j > Y_i,$$

where Yi is one’s own income, Yj is the income of someone with equal or higher income and N is the number of all individuals in the area (not just all those with higher income).Intuitively this measure captures the average distance between an individual’s own income and that of everybody with higher income in her area (state or county). This measure implicitly assigns to all those with lower income (than one’s own) a distance of zero. YRD, thus, reflects not only average (income) distance to those above, but also the number of people with higher income than one’s own. Dividing by N, the number of individual in the area, adjusts the measure so that it can also be interpreted as the probability of comparing one’s income to those above.[5] We modify the above measure for computational ease along the lines of those proposed by Eibner and Evans (2005), and assume that income is log-normally distributed to find a closed form solution to the expression above.

[5] The YRD is an individual measure but very much related to the Gini, as the average YRD in a society is equal to μ*Gini (Yitzhaki, 1979).

In essence, the relative deprivation measure combines the relative position of an individual and the distance from the individual's income to those above her. It is hard to generate an instrument for this measure, therefore, we decompose YRD into its two constitutive terms: the relative position (rank) and relative income distance. Income distance, in our sample, measures a mother's family income distance from the expected family income of other mothers who earn more than her.

In the empirical analysis we instrument for income distance using the synthetic distribution of income, as we did in the previous analyses on the Gini, as described above. The synthetic income distance captures the change in the relative income distance driven by changes in national trends in income growth, and not changes in the underlying composition of the area.

It is important to note that this IV strategy does not readily allow for the instrumentation of own income. By instrumenting for relative income distance and controlling for own income and rank, we are implicitly comparing newborn health of mothers with the same level of income and rank in areas with large versus small predicted increases in income inequality.

B. Data and Construction of Key Measures

1. Data on birth outcomes and maternal characteristics

Aggregate Analysis. The data on newborn health (birth weight and low birth weight) come from vital statistics birth records for 1970, 1980, 1990, 2000 and 2010. These data include the education, age, race and marital status of the mother as well as county-identifiers for counties with a population of at least 100,000.[6] The most notable absence from these data is information on maternal income.

We aggregate these data to the state (county) year level and merge them with characteristics of the state (county) from decennial census data. From the natality files we have for each state (county)-year characteristics of the mothers including: share black, share Hispanic, share married, share teen mothers, average age, share over 35, share with less than High School education , share with High School education, share some college education, share with college education or more. From census data we measure: population size, share black, share poor, share elderly, average and median income. Appendix Table 1 presents descriptive statistics for this sample. The aggregate data only allow us to explore the relationship between the Gini and newborn health, we cannot examine any measures of relative income, which requires individual-level data on income.

Individual-level Analysis.

We use individual-level data that includes information on newborn health, maternal income and residence from the NLSY79 and NLS97. The advantage of these data is that because they are panels they allow one to address endogenous migration by potentially fixing a mother's residence at her residence when she was between 14 and 21 years old. They also allow one to calculate two measures of income: contemporaneous income (annual income in the year prior to birth) and to address measurement error in spot measures of income. We can also calculate a second measure of permanent income which is the average income over the three years prior to

[6] Data on smoking was not collected until 1990 and data on Hispanic origin was not collected until 1980, though prior to 1980, there were few births to Hispanic women and in 2000 paternal education was not collected.

the birth. The disadvantage of these data is that because it is a panel, the mothers are aging over the course of the sample period (1979-1998). To address this we include controls for both age and year and use the sample weights that are designed to yield estimates based on the general population. We present descriptive statistics of this sample in Appendix Table 2.

2. Constructing the Gini coefficient and the instruments

We construct Gini coefficients for each state and county in 1970, 1980, 1990, 2000 and 2010 using data from the decennial census. For the analysis based on the NLSY79 and NLSY97, we create linear interpolations of the income distribution for inter-censal years. Following Chetty et al. (2014), we construct the Gini index by state or county and year, excluding individuals in the top one percent of the income distribution.

To calculate an instrument for the Gini, we construct a Gini based on a "synthetic cohort." To do so we hold constant the area's distribution of income at its 1970 level and predict changes in the distribution of income based on national trends in income growth over this period (Boustan et al, 2013). This synthetic Gini captures the change in inequality driven by changes in national trends in income growth, not changes in the underlying characteristics or composition of the area. We use this second measure as an instrument for the Gini. Figure 1 illustrates a strong relationship between the Gini and the synthetic Gini measured at the level of the county. The first stage estimates can be found in the Appendix Table 4.

3. Changes in the Production of Health as a Result of Inequality

In order to assess the extent to which inequality may change either the way that care is delivered or the provision of public goods that might directly affect outcomes, we collected data on hospital adoption of technology related to newborn care and the degree of segregation of low income patients in different hospitals. Our measure of technology adoption is the number of NICU beds per 1000 births in each county and year from annual AHA survey data. The measure of segregation is a dissimilarity index (that ranges from 0 to 1) and is also constructed from hospital data that includes the share of all admissions to a given hospital (with at least 10 births per year) that are Medicaid admissions (from 1980 on).[7] Based on this we can calculate for each county of residence the degree to which Medicaid patients tend to be treated in the same hospitals as the private pay patients. Note that counties with only 1 hospital will be perfectly integrated. However, mothers need not have delivered in a hospital located in their county of residence, introducing some measurement error.

IV. Results

A. The Relationship between Income and Health at Birth

As previous work has shown, any estimated relationship between the Gini and health may simply reflect a non-linearity in the relationship between income and health. In other words: if income has a non-linear relationship with health (eg, a larger positive effect at low levels of income and a smaller positive effect a higher levels of income), then an increase in the Gini can, mechanically, lead to a reduction in health. To explore this, we plot the relationship between

[7] Actually these data are not available until 1981, but we assume levels in 1980 are similar.

income (current and the three year average) and a measure of newborn health – birth weight. As can be seen in Figure 1the non-linear relationship is clear: income is strongly associated with increases in birth weight at income levels below $50,000 (in 2010 $). Above $50,000, the relationship is largely flat, until $100,000, at which point, the graph suggests that additional income leads to declines in birth weight. The same relationship exists for share low birth weight (LBW) defined as birth weight below 2500 grams (Figure 2). The relationships are similar if we plot the three year average income, as opposed to contemporaneous income. This supports the inclusion of controls for income in a flexible (ie, non-linear) way in in any estimate of the relationship between the Gini and newborn health.

B. Changes in the Gini Over time

Table 1 shows descriptive statistics for the distribution of the Gini coefficient across counties and over time. There is a considerable variation both over time and across counties within each year in the Gini coefficient.[8]

Next, we try to estimate the extent to which certain characteristics of an area can predict changes in inequality, as measured by the Gini, over the period 1970-2010. For this, we regress the Gini on the following characteristics of the state or county: size (population), share black, share Hispanic, share elderly, share poor, the average and median income of the area, and area fixed effects.

[8] The Gini as we calculate it is lower than most other measures in the literature, since we exclude the top 1% of income.

Areas that have a greater share of Blacks and Hispanics are more likely to see increases in the Gini over time (Appendix Table 3, columns 1 and 3). This is not surprising given that wages grew less fast for this population. Regarding income, the measure most highly correlated with widening inequality is lower median income. This is consistent with an increase in inequality being driven by increases in income at the top of the distribution. Interestingly, while the share elderly is positively correlated with increases in inequality over time at the level of the state, this relationship does not exist at the level of the county.

In columns 2 and 4 we add an additional regressor: the predicted Gini based on the synthetic distribution of income. This is essentially a first stage for the later IV estimates. The predicted Gini is strongly predictive of the actual Gini and more so at the level of the county than the state.

C. The Gini and Health at Birth

In Figure 3, we present scatter plots of the relationship between average birth weight and the Gini at the level of the county for each year. In 1970, the relationship between the Gini and average birth weight is quite small, but each decade becomes increasingly larger and more negative. Below we examine whether this relationship remains once we include adequate controls for potential confounders in a regression analysis.

Analysis Based on Aggregate Natality Data

The aggregate analysis is based on the same empirical strategy used in most existing work looking at mortality. We estimate the following equation: :

$$Newborn\ health_{ct} = \beta_0 + \beta_1 Gini_{ct} + \beta_2 X_{ct} + \beta_3 G_{ct} + \gamma_t + \gamma_c + \varepsilon \quad (1)$$

Where individual level data has been aggregated up to the level of the state or county, indexed by c, and t indexes the years 1970, 1980, 1990, 2000 and 2010. $Newborn\ health$ is measured as either continuous birth weight in grams or the share of births below low birth weight (<2500 grams). X_{ct} is a vector of maternal controls characterizing her age, race, marital status and education (from vital statistics records). G_{ct} is vector of area-level (state or county, depending on the specification) controls from the census (population size, share black, share Hispanic, poverty rate, mean income, median income and share over 65), following Boustan et al (2013). We include year FE in all specifications and area FE in some, as specified below.

We present OLS estimates of the above equation defining the area as the state in Table 2. In the first column, we include only the Gini coefficient, year fixed effects, and no other controls. We then include increasingly more controls until we have included all controls indicated above. In column 1, we see a negative and significant relationship between the Gini and average birth weight in the state: a 0.10 increase in the Gini is associated with a decline in average birth weight of 90 grams. In column 2 we include controls for the average state characteristics from the census, including share poor (but not average or median income), share black, share elderly and share Hispanic, and the resulting estimate is slightly larger and still significant. Adding controls for maternal characteristics (column 3) reduces the effect and it is no longer significantly different from zero. Adding income does little to change the relationship between Gini and birth weight (column 4). We include all controls and state fixed effects (column 5), and all controls with region fixed effects (column 6), and the estimated effect is still insignificant. In columns 7 through 9 we instrument for the Gini, adding sequentially region fixed effects and region×year fixed effects and the results remain insignificant.

We repeat the analysis at the level of the county and present the results in Table 3. These regressions are based only on those counties with a population of at least 100,000. In column 1, the relationship between the Gini and average birth weight at the county level is negative and significant, and of similar magnitude to the state level results. However, as we include a set of controls, county, state and region fixed effects, and finally instrument for the Gini, the relation ceases to be significant and is no longer negative. These results are extremely similar to the results based on state level data.

These results suggest that when we include even a parsimonious set of controls to account for underlying characteristics of areas with high rates of inequality, and instrument for the Gini, there is no longer a negative relationship between the Gini and newborn health.

We re-estimate the equation for a different but related outcome: the share of babies born low birth weight. (LBW). We do this because the lower tail of births that is birth weight distribution may be most likely to be affected by an increase in inequality. The estimates (Table 4) are very similar to those for birth weight. A strong relationship between the Gini and the share LBW exists when no controls, except for year FE are included, but as soon as even a parsimonious set of controls is included, the estimated relationship between the Gini and low birth weight falls to basically zero.

Analysis Based on Individual-Level Panel Data

We now proceed to analyze the relationship between the Gini and newborn health with individual-level panel data. These data have the advantage of allowing us to address endogenous migration of individuals across areas, by holding fixed a mother's location (county) at her residence when she was 14-21 years old in 1979. Panel data also allows us to calculate a measure of permanent income: the average income for each woman over three years prior to the birth. In Table 5 we explore which measure of income (current or three year average) is more predictive of newborn health..

In the top panel we regress birth weight on the two measures of income and an increasingly comprehensive set of individual controls. When no controls are included (column 1), the results suggest a significant and non-linear relationship between birth weight and income, though the magnitude is not very large: a 10,000 increase in income increases birth weight by 10 grams. The relationship appears to be twice as strong when we measure income as the average over the past three years (column 2). In the remaining columns, we include increasingly more controls (county characteristics and maternal characteristics) and the estimated relationship declines in magnitude and significance.

When we consider low birth weight as the dependent variable, the estimated relationship between income and the probability of low birth weight is strong – an additional $1,000 in income reduces the probability of LBW by 3.5 percentage points for current income or 6.9 percentage points for average past income. This relationship also declines in magnitude once additional controls are included, but less so in the case of average past income (Tale 5, panel B, column 8). In the following analyses we present results using both measures of income.

The relationship between the Gini and birth weight based on individual data from the NLSY is remarkably similar to that based on aggregate vital statistics data (Table 6, Panel A, column 1). When we re-estimate equation (1) and w including a quadratic term in maternal income (column

2), the estimated relationship between the Gini (defined at the level of the state) and birth weight declines from -1003 to -962. However, including controls for state characteristics turns the coefficient non-significant (column 3), as does the inclusion of other maternal characteristics (columns 4 and 5), state or region fixed effects (columns 6 and 7). The estimate continues to be non-significant once the Gini is instrumented, and region or state fixed effects are included (columns 8 through 11). The analysis of the relation between Gini and the probability of low birth weight (Table 6, Panel B) does not render precise estimates.

When we define the Gini at the level of the county (Table 6, Panel C), we observe a negative relationship between the Gini and birth weight, even after controlling for maternal income, but it disappears with the inclusion of controls for county characteristics (columns 1-4). Including county fixed effects or instrumenting for the Gini eliminates the relationship between the Gini and birth weight altogether. In Table 6, Panel D we present estimates of the relationship between the Gini defined at the level of the county and the probability of low birth weight – the results are qualitatively similar to those for birth weight.

Inequality and the Production of Health Care

We now turn to analyze whether income inequality affects the way that health is produced. Specifically, we look at the relationship between income inequality measured at the county level and the segregation of poor mothers (proxied by Medicaid), as well as technology adoption (the number of NICU beds per 1000 births in a county), in hospitals within each county.

In the cross section, there appears to be a relationship between the Gini on and both segregation and the adoption of technology (Table 7). But once we include county FE and/or instrument for the Gini, the estimated effects decline in magnitude and are no longer significant.

How should we interpret these results? One possibility is that any observed relationship between rising inequality in income as measured by the Gini and health is purely correlation. Another possibility is that the effect is heterogeneous, with positive effects for some and negative effects for others, leading to overall null effects on average. Below we consider the latter interpretation by estimating whether two measures of relative income affect newborn health.

D. Rank and Newborn Health

Rank (which ranges from 0, lowest rank, to 100, highest rank) is an ordinal measure that reflects one's relative position within one's reference group, but not the distance between one and one's neighbors. We estimate the following equation based on the individual level data:

$$Newborn\ health_{ict} = \beta_0 + \beta_1 Rank_{ict} + \beta_2 Income_{ict} + \beta_3 Income^2{}_{ict}$$

$$+\beta_4 X_{ict} + \beta_5 G_{ct} + \gamma_t + \gamma_c + \varepsilon \qquad (2)$$

The results based on the NLSY data suggest that rank (defined within one's state) is positively associated with birth weight (Table 8, Panel A, Column 1) and that unlike the analysis based on the Gini, the relationship is not diminished much once controls for state characteristics, maternal income and other maternal characteristics are included (Table 8, Panel A, columns 1-4).

Moreover, the effects are nonlinear: the relationship between rank and birth weight is much stronger at low ranks than high ranks as evidenced by the inclusion of a quadratic term in rank (column 5 Table 8). For example, going from the a rank of zero to 33 is associated with an increase of 125 grams, while going from zero to 66 is associated with an increase in birth weight of 156 grams. Panel B in Table 8 repeats the analysis calculating rank using permanent income (the average of the past three years' income), and results are similar to the ones described above.

E. Relative Deprivation and Newborn Health

We present OLS estimates of the relationship between relative deprivation and birth weight using the NLSY in Table 9, using an equation similar to the one above.

The results suggest a negative association between relative deprivation and birth weight. Based on the IV-FE estimates in column 4, increasing relative deprivation by one standard deviation will reduce birth weight by between 27 grams and 42 grams, depending on the specification). Using permanent income to calculate relative deprivation suggests a slightly larger effect, an average birth weight increase of 52 grams is associated with an increase of relative deprivation of one standard deviation.

Next, in table 10 we present evidence suggesting positive relationship between relative deprivation and the probability of a low birth weight (LBW) birth. To calculate relative deprivation we use current income in Panel A and permanent income in Panel B). Estimates using current income are not precise, but when permanent income is used to compute relative deprivation we observe a statistically significant association. The results in column 1 (Table 10, Panel B) suggest that conditional on absolute level of income, relative deprivation matters: if the average difference between one's income and those above increases by one standard deviation, the probability of a LBW birth increases by 1.5 percentage point. These results hold when we include state FE (column 2) or region FE (column 3).

E. Relative Income Distance and Newborn Health – IV specification

Results above suggest a positive association between rank and newborn health, and a negative association between relative deprivation and newborn health. We now turn to an IV strategy to further delve into these relationships.

The analysis is again based on an empirical strategy similar to the one above:

$$Newbornhealth_{ict} = \beta_0 + \beta_1 RelIncomeDist_{ict} + \beta_2 Rank_{ict} + \beta_3 Income_{ict} + \beta_4 {Income^2}_{ict} + \beta_5 X_{ict} + \beta_6 G_{ct} + \gamma_t + \gamma_c + \varepsilon \quad (3)$$

where $RelIncomeDist$ measures a mother's family income distance from the expected income of families who earn more than her family, and $Rank$ is the ordinal measure of rank used in equation (2).

We present estimates of the relationship between relative income distance and birth weight in Table 11. The results suggest that conditional on rank (and absolute income level), one's relative income distance is negatively related to newborn health. This relationship persists regardless of which of our measures of income we use to calculate relative income distance: current income (Panel A) or permanent income (Panel B). It also persists and changes only slightly if we include comprehensive controls for mother and state characteristics (column 1), state FE (column 2), region FE (column 3), as well as instrument for relative income distance using the synthetic distribution of income (column 4), including state and region FE (columns 5 and 6). First stage estimates are presented in Appendix Table 6.

These results suggest that increasing relative income distance by one standard deviation will reduce birth weight by approximately 45 grams (this is based on the IV-FE estimates in columns 5 in Panel B).

V. Conclusion

Rising inequality has the potential to reduce intergenerational mobility if those at the bottom of the income distribution are increasing less able to invest in their offspring's human capital. In this paper, we explore this possibility empirically using both aggregate and individual-level data on newborn health, maternal income and the income distribution of one's local area. The main contribution of this exercise is to exploit plausibly exogenous variation in the income distribution that occurs over time across areas. Two main conclusions can be drawn from our analysis. First, aggregate measures of inequality (the Gini) are not predictive of worse newborn health in either aggregate or individual level data once one includes controls for area characteristics that might be correlated with health and inequality. Second, relative income, as measured by rank, relative deprivation or relative income distance, do appear to be negatively related to newborn health. Importantly, this relationship is observed even after controlling for area characteristics and instrumenting for the differences in the income distribution over time. Moreover, these effects are not linear or symmetric: those at the bottom of the distribution suffer more from a decline in relative position than those closer to the top. The latter is consistent with the strongly non-linear relationship between income and newborn health.

What is less clear is the mechanism(s) underlying this relationship. We found no evidence that inequality affected either segregation or availability of new technologies. Nor does the non-linearity in the relationship between maternal income and newborn health explain much of the relationship between the Gini and newborn health. One remaining mechanism is that of stress. Previous work by Eibner and Evans (2005) documented a strong relationship between relative income and poor behavior such as smoking and eating/exercise that would be consistent with a stress mechanism. Recent work by Black, Devereaux and Salvanes (2014) and Rossin-Slater (2014) showing that the death of a mother's relative during pregnancy has a negative effect on newborn health would also be consistent with a stress mechanism. We will attempt to investigate this mechanism more directly in future research.

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Table 1: Gini over time

Panel A: State

Year	Gini				
	Mean	10%	25%	75%	90%
1970	0.34	0.31	0.32	0.35	0.37
1980	0.35	0.33	0.34	0.36	0.37
1990	0.36	0.34	0.35	0.37	0.39
2000	0.38	0.35	0.36	0.40	0.40
2010	0.42	0.39	0.41	0.44	0.44

Panel B: County

Year	Gini				
	Mean	10%	25%	75%	90%
1970	0.32	0.29	0.30	0.34	0.36
1980	0.34	0.31	0.32	0.36	0.37
1990	0.35	0.31	0.33	0.38	0.39
2000	0.37	0.33	0.35	0.39	0.41
2010	0.39	0.35	0.37	0.41	0.43

Notes. This table reports the Gini from decennial census data, excluding the top one percent of income. Small counties with less than 100,000 population are dropped.

Table 2: Gini at the State Level and Birth Weight - Aggregate Data

State

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dependent variable: average birth weight	OLS	OLS	OLS	OLS	State FE	Region FE	IV	Region FE-IV	Region*year FE-IV
Gini coefficient	-897.9	-1,129	-481.1	-558.0	-100.5	-441.9	-283.8	-1,803	-934.6
	(179.3)	(214.7)	(247.2)	(243.4)	(157.4)	(199.5)	(483.6)	(911.9)	(694.4)
Mean income (2010 USD)				0.543	6.384	1.265	-0.322	6.299	1.246
				(2.572)	(1.462)	(1.752)	(2.699)	(3.576)	(3.259)
Mean income squared (2010 USD)				0.000678	-0.0268	-0.00614	0.00467	-0.0290	-0.00664
				(0.0133)	(0.00740)	(0.00900)	(0.0140)	(0.0167)	(0.0154)
Population		0.00146	0.00181	0.00187	-0.00360	-0.00102	0.00181	-0.000508	-0.000514
		(0.000541)	(0.000387)	(0.000445)	(0.000722)	(0.000307)	(0.000439)	(0.000428)	(0.000355)
Share of the elderly		258.6	90.21	147.6	474.0	155.0	102.1	315.4	119.9
		(159.1)	(121.3)	(126.8)	(144.0)	(103.5)	(142.9)	(156.5)	(128.2)
Share of the Hispanic		41.17	-262.5	-270.3	137.2	-67.80	-285.1	-41.82	-55.50
		(40.46)	(35.04)	(35.74)	(61.46)	(37.47)	(41.80)	(43.01)	(37.04)
Poverty rate		-121.2	152.8	298.1	488.6	354.0	145.0	1,108	467.7
		(116.3)	(125.7)	(190.5)	(112.8)	(160.4)	(275.3)	(511.9)	(429.4)
Share of moms less than high school			42.02	24.92	-2.357	16.79	32.33	-20.24	27.31
			(39.15)	(40.53)	(22.74)	(29.43)	(38.72)	(33.95)	(32.80)
Share of moms HS graduates			-77.50	-69.35	-12.78	-26.52	-74.78	3.300	-42.02
			(35.02)	(36.80)	(13.61)	(25.54)	(33.50)	(29.47)	(31.01)
Share of moms with some college			39.86	50.54	52.37	26.42	51.46	29.82	53.34
			(60.12)	(61.30)	(35.05)	(48.17)	(58.24)	(48.29)	(47.60)
Share of moms over 35			907.4	817.9	438.1	624.5	718.8	1,153	285.4
			(294.8)	(366.7)	(173.1)	(221.0)	(414.3)	(405.2)	(450.3)
Share of black mothers			-249.3	-251.5	-87.85	-99.34	-262.8	-76.92	-102.9
			(41.84)	(42.14)	(83.15)	(43.33)	(43.71)	(45.95)	(40.00)
Share of white mothers			50.80	56.90	75.35	185.6	57.04	197.7	176.2
			(43.45)	(44.08)	(67.69)	(32.27)	(41.76)	(33.79)	(29.86)
Average maternal age			-11.58	-13.39	4.967	6.731	-11.23	-4.599	21.55
			(10.48)	(12.19)	(6.617)	(8.099)	(12.74)	(10.73)	(11.95)
Share of mothers married			80.58	82.44	92.75	63.55	74.32	48.65	-20.61
			(57.41)	(64.16)	(36.23)	(57.35)	(62.93)	(59.35)	(61.54)
Observations	252	252	252	252	252	252	252	252	252
R-squared	0.463	0.542	0.782	0.784	0.975	0.893	0.783	0.875	0.911
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Maternal Characteristics	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State Characteristics	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State Income	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	No	No	No	No	No	Yes	No	Yes	Yes
Region*year FE	No	No	No	No	No	No	No	No	Yes
State FE	No	No	No	No	Yes	No	No	No	No

Notes. This table shows the relationship between the state-level inequality as measured in Gini coefficient and the average state-level birth weight. Column (1) does not add any controls except for the year fixed effects. Column (2) adds state demographic characteristics and column (3) also adds state-level maternal characteristics. Column (4) adds state-level mean income and squared mean income. Columns (5) and (6) add state and region fixed effects respectively. Columns (7) to (9) are 2SLS results with no fixed effects, region fixed effects and region-year fixed effects respectively. All regressions are weighted by state population.

Table 3: Gini at the County Level and Birth Weight - Aggregate Data

County

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Dependent variable: average birth weight	OLS	OLS	OLS	OLS	County FE	State FE	Region FE	IV	Region FE-IV	Rgion*year FE-IV	State FE-IV	State*year FE-IV
Gini coefficient	-908.6	-724.7	-198.9	-206.2	21.49	-52.00	-86.63	-114.4	144.5	190.1	135.6	233.2
	(82.80)	(135.2)	(58.55)	(65.07)	(104.0)	(50.91)	(54.88)	(119.7)	(111.6)	(105.7)	(122.3)	(105.2)
Mean income (2010 USD)				0.0312	-0.196	-0.0155	-0.0171	-0.0107	-0.114	-0.0789	-0.0893	-0.0720
				(0.190)	(0.157)	(0.112)	(0.123)	(0.182)	(0.119)	(0.130)	(0.112)	(0.121)
Mean income squared (2010 USD)				-6.24e-05	0.00232	-2.84e-05	0.000292	-0.000106	0.000112	-0.000179	-0.000195	-0.000641
				(0.00109)	(0.00122)	(0.000832)	(0.000800)	(0.00102)	(0.000747)	(0.000762)	(0.000781)	(0.000740)
Population		0.000262	0.00220	0.00227	-0.00978	-0.00173	-0.000731	0.00193	-0.00165	-0.00171	-0.00247	-0.00266
		(0.00149)	(0.000672)	(0.000718)	(0.00324)	(0.000650)	(0.000864)	(0.000777)	(0.000876)	(0.000798)	(0.000776)	(0.000701)
Share of the elderly		108.7	-101.6	-99.08	-89.06	-174.5	-134.3	-113.0	-172.3	-180.4	-203.9	-230.3
		(36.19)	(27.02)	(29.46)	(62.07)	(27.94)	(24.48)	(34.08)	(28.23)	(27.28)	(31.22)	(29.36)
Share of the Hispanic		111.9	-122.2	-122.3	-23.08	-101.9	-108.7	-124.6	-111.2	-111.6	-102.7	-109.1
		(17.86)	(13.62)	(13.62)	(28.05)	(14.13)	(12.06)	(13.80)	(12.10)	(11.22)	(13.91)	(13.79)
Poverty rate		-329.8	164.1	170.6	153.2	90.29	138.1	122.5	15.41	-11.59	-8.592	-47.98
		(74.58)	(38.50)	(49.02)	(69.30)	(41.28)	(42.28)	(69.67)	(63.04)	(62.63)	(69.61)	(62.43)
Share of moms less than high school			-1.596	-2.104	-31.88	-11.68	-10.72	-1.320	-8.334	-3.088	-9.606	8.922
			(15.85)	(15.91)	(14.68)	(13.97)	(14.62)	(15.71)	(14.34)	(15.66)	(13.82)	(26.87)
Share of moms HS graduates			-33.03	-32.92	7.130	-7.734	-9.928	-32.53	-11.79	-15.61	-9.920	9.962
			(11.78)	(11.88)	(10.26)	(11.50)	(13.01)	(11.79)	(12.80)	(14.31)	(11.35)	(22.28)
Share of moms with some college			-16.51	-16.23	-6.762	7.882	11.48	-16.04	13.43	27.12	12.04	35.45
			(21.55)	(21.45)	(17.29)	(18.45)	(22.44)	(21.26)	(22.34)	(21.40)	(18.31)	(31.65)
Share of over 35			-28.16	-30.41	-54.93	-8.053	-38.07	-32.12	-29.95	-141.4	5.899	-167.0
			(75.77)	(79.12)	(78.21)	(65.25)	(72.74)	(78.22)	(71.68)	(72.50)	(64.34)	(71.95)
Share of black mothers			-203.9	-203.6	-77.03	-55.74	-85.06	-206.0	-93.27	-97.85	-66.83	-72.08
			(18.90)	(18.97)	(36.96)	(21.32)	(16.57)	(19.30)	(17.62)	(17.83)	(22.25)	(19.80)
Share of white mothers			92.74	92.78	162.6	187.2	187.9	94.13	188.7	189.6	185.0	188.4
			(18.18)	(18.17)	(32.87)	(18.46)	(13.27)	(18.16)	(13.77)	(14.17)	(18.40)	(16.77)
Average maternal age			14.32	14.23	12.82	10.89	12.54	14.41	12.32	15.27	10.41	16.70
			(2.601)	(2.607)	(4.014)	(2.462)	(2.596)	(2.592)	(2.562)	(2.632)	(2.444)	(2.960)
Share of mothers married			2.732	3.111	64.33	78.98	53.42	2.826	55.20	47.71	79.25	70.28
			(12.89)	(13.15)	(13.87)	(13.36)	(12.48)	(13.14)	(12.59)	(12.84)	(13.40)	(14.32)
Observations	2,118	2,118	2,116	2,116	2,116	2,116	2,116	2,116	2,116	2,116	2,116	2,116
R-squared	0.447	0.495	0.763	0.763	0.941	0.886	0.845	0.762	0.843	0.857	0.885	0.910
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Maternal Characteristics	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County Characteristics	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County Income	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	No	No	No	No	No	No	Yes	No	Yes	Yes	No	No
Region*year FE	No	No	No	No	No	No	No	No	No	Yes	No	No
State FE	No	No	No	No	No	Yes	No	No	No	No	Yes	Yes
State*year FE	No	No	No	No	No	No	No	No	No	No	No	Yes
County FE	No	No	No	No	Yes	No	No	No	No	No	No	No

Notes. This table shows the relationship between the county-level inequality as measured in Gini coefficient and the average county-level birth weight. Column (1) does not add any controls except for the year fixed effects. Column (2) adds county demographic characteristics and column (3) also adds county-level maternal characteristics. Column (4) adds county-level mean income and squared mean income. Columns (5) to (7) add county, state and region fixed effects respectively. Columns (8) to (12) are 2SLS results. All regressions are weighted by county population and only counties with at least 100,000 population are kept.

Table 4: Gini at the State/County Level and Low Birth Weight - Aggregate Data

	Dependent variable: low birth weight rate								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: State	OLS	OLS	OLS	OLS	State FE	Region FE	IV	Region FE-IV	Region*year FE-IV
Gini (state-level)	0.163	0.271	0.0665	0.0571	0.000648	0.0454	-0.0698	-0.0465	-0.0908
	(0.0466)	(0.0478)	(0.0414)	(0.0424)	(0.0342)	(0.0380)	(0.0845)	(0.149)	(0.113)
Observations	252	252	252	252	252	252	252	252	252
R-squared	0.397	0.617	0.873	0.874	0.971	0.922	0.870	0.920	0.934
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Maternal Characteristics	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State Characteristics	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State Income	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	No	No	No	No	No	Yes	No	Yes	Yes
Region*year FE	No	No	No	No	No	No	No	No	Yes
State FE	No	No	No	No	Yes	No	No	No	No

	Dependent variable: low birth weight rate											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Panel B: County	OLS	OLS	OLS	OLS	County FE	State FE	Region FE	IV	Region FE-IV	Region*year FE-IV	State FE-IV	State*year FE-IV
Gini (county-level)	0.183	0.156	0.0202	0.0175	0.00629	0.00324	0.00842	-0.0310	-0.0344	-0.0303	-0.0357	-0.0292
	(0.0222)	(0.0300)	(0.0125)	(0.0142)	(0.0223)	(0.0116)	(0.0128)	(0.0247)	(0.0243)	(0.0230)	(0.0244)	(0.0212)
Observations	2,118	2,118	2,116	2,116	2,116	2,116	2,116	2,116	2,116	2,116	2,116	2,116
R-squared	0.345	0.507	0.821	0.821	0.926	0.877	0.855	0.819	0.854	0.861	0.876	0.897
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Maternal Characteristics	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County Characteristics	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County Income	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	No	No	No	No	No	No	Yes	No	Yes	Yes	No	No
Region*year FE	No	No	No	No	No	No	No	No	No	Yes	No	No
State FE	No	No	No	No	No	Yes	No	No	No	No	Yes	Yes
State*year FE	No	No	No	No	No	No	No	No	No	No	No	Yes
County FE	No	No	No	No	Yes	No	No	No	No	No	No	No

Notes. This table reports the relationship between the inequality as measured in Gini coefficient and the low birth weight rate. Panel A is at the state level, and panel B is at the county level. Column (1) does not add any controls except for the year fixed effects. Column (2) adds state/county demographic characteristics and column (3) also adds state/county maternal characteristics. Column (4) adds state/county mean income and squared mean income. Panel A's columns (5) and (6) add state and region fixed effects respectively. Columns (7) to (9) are 2SLS results with no fixed effects, region fixed effects and region-year fixed effects respectively. Panel B's columns (5) to (7) add county, state and region fixed effects respectively. Columns (8) to (12) are 2SLS results. All regressions are weighted by state/county population, and only counties with at least 100,000 population are kept.

Table 5: Income and Birth Weight - Individual Level Data

Panel A: Birth Weight	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Current income in 1000s ($1998)	0.953		0.864		0.104		0.247	
	[0.175]		[0.182]		[0.197]		[0.233]	
Current income squared	-0.00105		-0.000975		-0.000304		-0.000939	
	[0.000238]		[0.000243]		[0.000250]		[0.000414]	
Current income cubed	7.54e-08		6.98e-08		2.25e-08		7.05e-08	
	[1.76e-08]		[1.80e-08]		[1.84e-08]		[3.09e-08]	
Average past income in 1000s ($1998)		1.973		1.650		0.512		0.488
		[0.251]		[0.264]		[0.291]		[0.320]
Average past income squared		-0.00260		-0.00212		-0.000784		-0.000710
		[0.000477]		[0.000489]		[0.000510]		[0.000532]
Average past income cubed		7.16e-07		5.77e-07		2.31e-07		2.08e-07
		[1.61e-07]		[1.64e-07]		[1.68e-07]		[1.73e-07]
Observations	10,521	10,995	9,726	10,134	9,684	10,087	9,684	10,087
R-squared	0.012	0.015	0.021	0.022	0.045	0.045	0.212	0.207
Year FE	yes	yes	yes	yes	yes	yes	yes	yes
County Characteristics	no	no	yes	yes	yes	yes	yes	yes
Maternal Characteristics	no	no	no	no	yes	yes	yes	yes
County FE	no	no	no	no	no	no	yes	yes

Standard errors in brackets

Panel B: Low Birth Weight	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Current income in 1000s ($1998)	-0.0356		-0.0318		-0.0139		-0.0131	
	[0.00755]		[0.00784]		[0.00851]		[0.0103]	
Current income squared	3.55e-05		3.16e-05		1.58e-05		3.45e-05	
	[1.03e-05]		[1.05e-05]		[1.09e-05]		[1.84e-05]	
Current income cubed	-2.53e-09		-2.25e-09		-1.14e-09		-2.58e-09	
	[7.62e-10]		[7.77e-10]		[8.01e-10]		[1.38e-09]	
Average past income in 1000s ($1998)		-0.0689		-0.0564		-0.0302		-0.0223
		[0.0107]		[0.0113]		[0.0125]		[0.0140]
Average past income squared		8.16e-05		6.38e-05		3.32e-05		1.64e-05
		[2.06e-05]		[2.12e-05]		[2.22e-05]		[2.36e-05]
Average past income cubed		-2.18e-08		-1.67e-08		-8.82e-09		-3.50e-09
		[6.98e-09]		[7.13e-09]		[7.35e-09]		[7.69e-09]
Observations	10,700	11,239	9,904	10,369	9,862	10,322	9,862	10,322
R-squared	0.006	0.008	0.010	0.011	0.018	0.019	0.152	0.149
Year FE	yes	yes	yes	yes	yes	yes	yes	yes
County Characteristics	no	no	yes	yes	yes	yes	yes	yes
Maternal Characteristics	no	no	no	no	yes	yes	yes	yes
County FE	no	no	no	no	no	no	yes	yes

Standard errors in brackets

County Characteristics include share black, share hispanic, share elderly, share poor, mean income, median income

Table 6: Gini at the State Level and Birth Weight - Individual Level Data

	State										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	OLS	OLS	OLS	OLS	OLS	State FE	Region FE	IV	State FE-IV	Region FE-IV	Region*year FE-IV
Panel A: dependent variable: birth weight											
Gini	-1,003	-962.1	-504.5	-55.31	-69.51	-1,906	-781.0	-1,000	-19,055	-1,498	-437.4
	(354.1)	(395.7)	(1,067)	(369.1)	(1,147)	(2,166)	(1,297)	(2,265)	(12,016)	(4,146)	(3,922)
Panel B: dependent variable: low birth weight											
Gini	0.224	0.122	0.162	0.00340	-0.110	1.564	0.0705	0.558	8.069	0.556	0.439
	(0.150)	(0.167)	(0.443)	(0.156)	(0.483)	(0.885)	(0.545)	(0.962)	(5.308)	(1.697)	(1.604)
Observations	12,529	10,286	12,529	12,468	10,246	10,246	10,246	10,246	10,246	10,246	10,246
R-squared	0.004	0.008	0.006	0.018	0.021	0.028	0.022	0.020	0.022	0.022	0.059
Year FE	yes	yes	yes	yes	yes	yes	yes	yes	Yes	Yes	Yes
Maternal Income	no	yes	no	no	yes	yes	yes	yes	yes	yes	yes
State Characteristics	no	no	yes	no	yes	yes	yes	yes	yes	yes	yes
Maternal Characteristics	no	no	no	yes	yes	yes	yes	yes	yes	yes	yes
State FE	no	no	no	no	no	yes	no	no	yes	no	no
Region FE	no	no	no	no	no	no	yes	no	no	yes	no
Region*year FE	no	no	no	no	no	no	no	no	no	no	yes

	County															
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	OLS	OLS	OLS	OLS	OLS	County FE	County FE 2	State FE	Region FE	IV	County FE-IV	County FE2-IV	Region FE-IV	Region*year FE-IV	State FE-IV	State*year FE-IV
Panel C: dependent variable: birth weight																
Gini	-1,226	-1,166	-743.2	-368.6	-955.1	358.6	1,139	-1,430	-1,387	-772.1	7,599	9,067	-3,970	-3,418	-1,106	878.4
	(232.6)	(258.3)	(644.3)	(250.7)	(700.9)	(2,115)	(2,215)	(818.7)	(744.0)	(1,377)	(9,880)	(9,855)	(1,935)	(1,973)	(2,235)	(2,310)
Panel D: dependent variable: low birth weight																
Gini	0.337	0.290	0.437	0.140	0.700	1.278	1.006	0.978	0.892	0.326	-9.094	-9.535	1.117	0.950	0.506	0.306
	(0.0951)	(0.104)	(0.286)	(0.103)	(0.316)	(0.916)	(0.978)	(0.363)	(0.328)	(0.590)	(4.080)	(4.007)	(0.828)	(0.846)	(0.932)	(0.951)
Observations	9,033	7,369	9,033	8,997	7,344	7,344	6,501	7,344	7,344	7,344	7,344	6,501	7,344	7,344	7,344	7,344
R-squared	0.006	0.010	0.008	0.020	0.024	0.092	0.069	0.032	0.026	0.023	0.070	0.046	0.026	0.076	0.031	0.213
Year FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	Yes	Yes	Yes	Yes
Maternal Income	no	yes	no	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
County Characteristics	no	no	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Maternal Characteristics	no	no	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
County FE	no	no	no	no	no	yes	yes	no	no	no	yes	yes	no	no	no	no
State FE	no	no	no	no	no	no	no	yes	no	no	no	no	no	no	yes	no
State*year FE	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	yes
Region FE	no	no	no	no	no	no	no	no	yes	no	no	no	yes	no	no	no
Region*year FE	no	no	no	no	no	no	no	no	no	no	no	no	no	yes	no	no
More than 10 individuals	no	no	no	no	no	no	yes	no	no	no	no	yes	no	no	no	no

Notes. This table shows the relationship between the state/county inequality and individual birth weight and low birth weight, using the linked NLSY 79 & 97 sample with the intepolated census data. Panel A and panel B are at the state level, with the dependent variable of birth weight and low birth weight respectively. Columns (1) to (5) are OLS results with different state and/or maternal characteristics added as controls. Columns (6) and (7) add state and region fixed effects. Columns (8) to (11) are 2SLS estimations with different fixed effects. Panel C and D are at the county level. Columns (1) to (5) are OLS results with different county and/or maternal characteristics added as controls. Colomns (6) to (9) add county, state and region fixed effects. Columns (10) to (16) are 2SLS results with different fixed effects. Column (7) and (12) restrict the sample to the counties with at least 10 individuals are surveyed in the NLSY 79 & 97. Only counties with at least 100,000 population are kept for analysis. All regressions are weighted by individual sampling weights provided by the NLSY.

Table 7: Gini and Mediating Factors - Hospital Segregation and NICU availability

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	OLS	County FE	Region FE	IV	County FE-IV	Region FE-IV	Region*year FE-IV
Panel A: Segregation							
Gini (county-level)	0.265	0.703	0.351	-1.141	-2.212	-0.348	0.106
	(0.383)	(0.729)	(0.417)	(0.643)	(2.360)	(0.736)	(0.714)
R-squared	0.296	0.576	0.336	0.286	0.566	0.334	0.374
Panel B: NICU beds/ 10,000							
Gini (county-level)	2.047	0.528	2.210	0.559	8.105	1.741	1.374
	(0.388)	(0.622)	(0.423)	(0.768)	(2.126)	(0.872)	(0.849)
R-squared	0.339	0.740	0.359	0.335	0.713	0.359	0.383
Observations	2,669	2,669	2,669	2,669	2,669	2,669	2,669

Notes. This table reports the relationship between county-level inequality and hospital segragation (panel A) and technology adoption (panel B) as measured by the number of NICU beds per 10,000 people. Columns (1) to (3) are OLS results without fixed effects, county fixed effects and region fixed effects. Columns (4) to (7) are 2SLS estimations without fixed effects, with county fixed effects, region fixed effects and region-year fixed effects. Control variables are county-level population, share of the elderly, share of black, share of Hispanic, poverty rate, mean and squared mean income (in 2010 USD). Only counties with at least 100,000 population are kept for analysis, and all the regressions are weighted by the county population.

Table 8: Individual Rank and Birth Weight

	Dependent variable: birth weight				
	(1)	(2)	(3)	(4)	(5)
	OLS	OLS	OLS	FE	FE
Panel A: Current income					
Rank in state	2.274	3.074	1.720	1.829	5.237
	(0.263)	(0.443)	(0.488)	(0.494)	(1.028)
Rank squared					-0.0436
					(0.0116)
Observations	10,086	10,086	10,046	10,046	10,046
R-squared	0.023	0.024	0.050	0.061	0.063
Panel B: Permanent income					
Rank in state	2.364	3.353	2.051	2.137	4.832
	(0.256)	(0.388)	(0.437)	(0.438)	(1.001)
Rank squared					-0.0324
					(0.0109)
Observations	11,691	11,691	11,637	11,637	11,637
R-squared	0.022	0.024	0.047	0.058	0.059
Year FE	yes	yes	yes	yes	yes
Maternal Income	no	yes	yes	yes	yes
State Characteristics	no	no	yes	yes	yes
Maternal Characteristics	no	no	yes	yes	yes
State FE	no	no	no	yes	yes

Notes. This table reports the relationship between mother's rank and baby's birth weight. Panel A calculates rank by someone's current income, and panel B calculates rank by someone's permanent income (the average of the past three years' income). Columns (1) to (3) report OLS estimates with different controls. Column (4) adds state fixed effects. Column (5) not only adds state fixed effects but also adds squared rank as an additional control variable to test if there is nonlinear relationship between rank and birth weight. Column (6) and column (7) report estimations seperately for states with low and high income variance, where the cutoff is the national average income variance. Maternal controls are family income, squared family income, education attainment, teen birth or not, race, age, squared age, marital status and baby's birth order. State controls are share of black, share of Hispanic, share of the elderly, poverty rate, mean and median income. All the income measures are converted to 2010 US dollars. All the regressions are weighted by the individual sampling weights provided by the NLSY data.

Table 9: Relative Deprivation and Birth Weight

	Dependent variable: birth weight					
	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	State FE	Region FE	IV	State FE-IV	Region FE-IV
Panel A: current income						
YRD/10000	-27.52	-30.86	-29.88	-27.30	-32.37	-29.93
	(8.042)	(8.151)	(8.058)	(8.226)	(8.303)	(8.222)
Observations	10,046	10,046	10,046	10,046	10,046	10,046
R-squared	0.049	0.062	0.053	0.049	0.062	0.053
Panel B: permanent income						
YRD/10000	-30.35	-32.69	-32.18	-31.14	-34.85	-32.82
	(7.116)	(7.116)	(7.111)	(7.230)	(7.232)	(7.213)
Observations	11,637	11,637	11,637	11,637	11,637	11,637
R-squared	0.046	0.057	0.049	0.046	0.057	0.049
Year FE	yes	yes	yes	yes	yes	yes
Maternal Income	yes	yes	yes	yes	yes	yes
State Characteristics	yes	yes	yes	yes	yes	yes
Maternal Characteristics	yes	yes	yes	yes	yes	yes
State FE	no	yes	no	no	yes	no
Region FE	no	no	yes	no	no	yes

Notes. This table shows the relationship between mother's relative deprivation (in her state) and her baby's birth weight. Panel A uses individuals' current family income to calculate YRD and predicted YRD, and panel B uses permanent income. Columns (1) to (3) are OLS results without fixed effects, with state fixed effects and with region fixed effects. Columns (4) to (6) are 2SLS estimations without fixed effects, with state and with region fixed effects. The instrumental variable is predicted YRD. Individual control variables are family income, squared income, education attainment, teen birth or not, race, age, squared age, marital status and baby's birth order. State controls are share of black, share of Hispanic, share of the elderly, poverty rate, mean income and median income. All the income measures are converted to 2010 US dollars. All regressions are weighted by individual sampling weights provided by the NLSY data.

Table 10: Relative Deprivation and Low Birth Weight

	Dependent variable: low birth weight					
	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	State FE	Region FE	IV	FE-IV	Region FE-IV
Panel A: current income						
YRD/10000	0.00668	0.00740	0.00690	0.00648	0.00769	0.00682
	(0.00308)	(0.00311)	(0.00306)	(0.00317)	(0.00317)	(0.00313)
Observations	10,246	10,246	10,246	10,246	10,246	10,246
R-squared	0.021	0.028	0.022	0.021	0.028	0.022
Panel B: permanent income						
YRD/10000	0.00917	0.00977	0.00942	0.00914	0.0102	0.00939
	(0.00325)	(0.00325)	(0.00323)	(0.00328)	(0.00330)	(0.00325)
Observations	11,921	11,921	11,921	11,921	11,921	11,921
R-squared	0.019	0.025	0.020	0.019	0.025	0.020
Year FE	yes	yes	yes	yes	yes	yes
Maternal Income	yes	yes	yes	yes	yes	yes
State Characteristics	yes	yes	yes	yes	yes	yes
Maternal Characteristics	yes	yes	yes	yes	yes	yes
State FE	no	yes	no	no	yes	no
Region FE	no	no	yes	no	no	yes

Notes. This table shows the relationship between mother's relative deprivation (in her state) and whether her baby is low birth weight. Panel A uses individuals' current family income to calculate YRD and predicted YRD, and panel B uses permanent income. Columns (1) to (3) are OLS results without fixed effects, with state fixed effects and with region fixed effects. Columns (4) to (6) are 2SLS estimations without fixed effects, with state and with region fixed effects. The instrumental variable is predicted YRD. Individual control variables are family income, squared income, education attainment, teen birth or not, race, age, squared age, marital status and baby's birth order. State controls are share of black, share of Hispanic, share of the elderly, poverty rate, mean income and median income. All the income measures are converted to 2010 US dollars. All regressions are weighted by individual sampling weights provided by the NLSY data.

Table 11: Relative Income Distance and Birth Weight

	Dependent variable: birth weight					
	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	State FE	Region FE	IV	State FE-IV	Region FE-IV
Panel A: current income						
Distance/10000	-25.88	-28.61	-29.09	-34.43	-42.81	-37.45
	(10.73)	(10.78)	(10.68)	(12.87)	(12.42)	(12.71)
Rank	1.654	1.765	1.727	1.632	1.733	1.706
	(0.476)	(0.480)	(0.475)	(0.470)	(0.472)	(0.469)
Observations	10,046	10,046	10,046	10,046	10,046	10,046
R-squared	0.050	0.062	0.055	0.050	0.062	0.054
Panel B: permanent income						
Distance/10000	-27.23	-28.14	-29.07	-27.79	-33.46	-28.09
	(9.839)	(9.922)	(9.830)	(11.58)	(11.23)	(11.49)
Rank	2.134	2.228	2.204	2.136	2.245	2.201
	(0.428)	(0.430)	(0.429)	(0.428)	(0.428)	(0.428)
Observations	11,637	11,637	11,637	11,637	11,637	11,637
R-squared	0.048	0.059	0.051	0.048	0.059	0.051
Observations	11,637	11,637	11,637	11,637	11,637	11,637
R-squared	0.048	0.059	0.051	0.048	0.059	0.051
Year FE	yes	yes	yes	yes	yes	yes
Maternal Income	yes	yes	yes	yes	yes	yes
State Characteristics	yes	yes	yes	yes	yes	yes
Maternal Characteristics	yes	yes	yes	yes	yes	yes
State FE	no	yes	no	no	yes	no
Region FE	no	no	yes	no	no	yes

Notes. This table shows the relationship between mother's relative income distance (in her state) and her baby's birth weight. Panel A uses individuals' current family income to calculate income distance and predicted income distance, and panel B uses permanent income. Both panels add rank as a control variable. Columns (1) to (3) are OLS results without fixed effects, with state fixed effects and with region fixed effects. Columns (4) to (6) are 2SLS estimations without fixed effects, with state and with region fixed effects. The instrumental variable is predicted income distance. Individual control variables are family income, squared income, education attainment, teen birth or not, race, age, squared age, marital status and baby's birth order. State controls are share of black, share of Hispanic, share of the elderly, poverty rate, mean income and median income. All the income measures are converted to 2010 US dollars. All regressions are weighted by individual sampling weights provided by the NLSY data.

Appendix Table 1: Descriptive Statistics - Aggregate level Data

	State	County
Census		
State/county characterisitcs		
Actual Gini	0.37	0.36
Predicted Gini (new)	0.38	0.37
Predicted Gini (old)	0.36	0.35
Population (in 1,000)	11100.00	1311.28
Share of over 65	0.12	0.11
Share of Hispanic	0.10	0.12
Share of black	0.12	0.14
Poverty rate	0.13	0.12
Mean income (in 2010 USD)	77397.73	82445.62
Median income (in 2010 USD)	60668.80	68116.74
Sample size	255	2,319
Vital Statistics		
Outcome variables		
Average birth weight	3328.06	3331.65
Low birth weight rate	0.06	0.06
Average mom charateristics		
Share of moms: less than high school	0.20	0.19
Share of moms: high school graduates	0.31	0.29
Share of moms: some college	0.19	0.19
Share of moms: over 35	0.10	0.11
Share of black moms	0.17	0.16
Share of white moms	0.78	0.79
Average age	26.42	26.67
Married rate	0.72	0.71
Teen birth rate*	0.002	0.002
Sample size	252	2,118

Notes. This table reports summary statistics for decennial census and vital statistics data from 1970 to 2010. All descriptive statistics are population weighted to produce nationally representative estimates of means. Small counties with less than 100,000 population are dropped. Teen birth rate is not used for regression analyses.

State

Year	Birth weight		Low birth weight	
	Mean	s.d.	Mean	s.d.
1970	3275.64	39.85	0.08	0.01
1980	3357.92	43.84	0.06	0.01
1990	3358.12	43.25	0.06	0.01
2000	3347.89	44.90	0.06	0.01
2010	3298.43	45.96	0.06	0.01

County **Conty**

Year	Birth weight		Low birth weight	
	Mean	s.d.	Mean	s.d.
1970	3273.00	52.26	0.08	0.01
1980	3357.70	60.10	0.06	0.01
1990	3370.16	64.60	0.06	0.02
2000	3356.60	61.46	0.06	0.01
2010	3302.33	57.04	0.06	0.01

Appendix Table 2: Descriptive Statistics - Individual Level Data

	Obs	Mean	Std. Dev.
Outcome variable			
birth weight	12,228	3341.43	588.52
low birth weight	12,529	0.07	0.26
Individual characteristics			
Current family income (in 2010 USD)	10,286	63469.63	103258.90
Permanent family income (in 2010 USD)	11,975	64916.06	95239.96
Rank (by current income)	10,286	48.39	27.58
Rank (by permanent income)	11,975	49.19	26.36
YRD (by current income)	10,286	26606.14	16809.03
YRD (by permanent income)	11,975	26007.75	16001.99
Predicted YRD (by current income)	10,286	26625.36	16384.64
Predicted YRD (by permanent income)	11,975	26017.72	15571.91
Relative income distance (by current income	10,286	50491.77	13100.31
Relative income distance (by permanent inc	11,975	50059.31	13646.39
Predicted income distance (by current incor	10,286	51634.48	13277.76
Predicted income distance (by permanent ir	11,975	50812.83	13447.99
Less than high school	12,468	0.15	0.36
High school graduate	12,468	0.46	0.50
Some college	12,529	0.18	0.38
Teen birth	12,529	0.08	0.28
Black	12,529	0.18	0.38
White	12,529	0.73	0.45
Age	12,529	24.98	4.73
Marital stauts	12,529	0.65	0.48
Baby birth order	12,529	1.82	0.99

Notes. This table reports summary statistics for the National Longitudinal Survey of Youth (NLSY) 1979 and 1997 sample which are sucessfully matched with the census data. Individual sampling weights are used to provide nationally representative statistics. Permanent income is the mean of the past three years' income. Rank is an individual's family income standing in her state, ranged from 0 to 100. Yitzhaki relative deprivation (YRD) is calculated by formula.

Appendix Table 3: Correlates of Growth in Gini Over Time

	(1) State	(2) State	(3) County	(4) County
Predicted Gini		0.396		0.658
		[0.135]		[0.0544]
Population	-4.02e-06	-4.03e-06	-2.04E-05	-2.32E-05
	[3.63e-06]	[3.55e-06]	[9.69e-06]	[9.26e-06]
Share 65 and over	0.166	0.177	0.00392	0.00064
	[0.0792]	[0.0775]	[0.0194]	[0.0185]
Share Hispanic	0.0995	0.109	0.0543	0.0522
	[0.0295]	[0.0290]	[0.00793]	[0.00757]
Share Black	0.0737	0.0839	0.0524	0.0541
	[0.0419]	[0.0410]	[0.00784]	[0.00749]
Poverty rate	-6.02e-05	-0.000551	-0.0005	-0.00087
	[0.000330]	[0.000363]	[0.000105]	[0.000105]
Avg Income	0.648	1.167	-0.00031	-0.00029
	[0.658]	[0.667]	[4.32e-05]	[4.13e-05]
Avg Income Squared	1.14e-08	7.34e-09	5.52E-06	5.30E-06
	[3.37e-09]	[3.56e-09]	[3.45e-07]	[3.30e-07]
Median Inomce	-0.00401	-0.00393	-0.00202	-0.00204
	[0.000327]	[0.000320]	[7.13e-05]	[6.81e-05]
Observations	221	221	1,913	1,913
R-squared	0.978	0.979	0.964	0.967

Appendix Table 4: First Stage Regressions - Aggregate Data

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		State				County		
Dependent variable: Gini	OLS	Region FE	Region*year FE	OLS	Region FE	Region*year FE	State FE	State*year FE
Predicted Gini	0.285	0.203	0.303	0.357	0.372	0.381	0.356	0.380
	(0.0371)	(0.0541)	(0.0637)	(0.0233)	(0.0292)	(0.0296)	(0.0313)	(0.0343)
Mean income (2010 USD)	0.00287	0.00320	0.00358	0.000458	0.000449	0.000521	0.000434	0.000597
	(0.000512)	(0.000511)	(0.000493)	(0.000169)	(0.000160)	(0.000144)	(0.000146)	(0.000150)
Mean income squared (2010 USD)	-1.27e-05	-1.43e-05	-1.58e-05	-5.31e-07	-5.11e-07	-8.76e-07	-4.69e-07	-1.24e-06
	(2.71e-06)	(2.66e-06)	(2.41e-06)	(9.03e-07)	(8.63e-07)	(7.86e-07)	(8.28e-07)	(8.15e-07)
Population	3.19e-07	3.63e-07	4.03e-07	3.64e-06	3.59e-06	3.59e-06	3.67e-06	3.64e-06
	(6.86e-08)	(9.79e-08)	(8.23e-08)	(3.95e-07)	(3.64e-07)	(3.35e-07)	(3.54e-07)	(3.43e-07)
Share of the elderly	0.0607	0.0645	0.0392	0.0520	0.0551	0.0516	0.0778	0.0784
	(0.0362)	(0.0363)	(0.0320)	(0.0139)	(0.0140)	(0.0137)	(0.0154)	(0.0158)
Share of the Hispanic	0.0184	0.0136	-0.00149	0.00553	0.00331	0.00548	0.00166	0.0114
	(0.00928)	(0.0115)	(0.00990)	(0.00522)	(0.00525)	(0.00527)	(0.00625)	(0.00669)
Poverty rate	0.477	0.499	0.472	0.390	0.373	0.363	0.374	0.343
	(0.0379)	(0.0400)	(0.0517)	(0.0220)	(0.0202)	(0.0208)	(0.0195)	(0.0219)
Share of moms less than high school	-0.0246	-0.0270	-0.0172	-0.00303	-0.00150	0.00510	-0.00344	0.00218
	(0.0108)	(0.0115)	(0.0104)	(0.00846)	(0.00783)	(0.00766)	(0.00771)	(0.0122)
Share of moms HS graduates	0.0220	0.0217	0.0228	0.00417	0.00435	0.00962	0.00697	0.0176
	(0.00795)	(0.00870)	(0.00806)	(0.00564)	(0.00557)	(0.00609)	(0.00561)	(0.0127)
Share of moms with some college	-0.0100	0.000664	-0.00674	-0.0175	-0.0150	-0.0181	-0.0211	-0.0345
	(0.0119)	(0.0133)	(0.0139)	(0.00894)	(0.00935)	(0.00872)	(0.00990)	(0.0175)
Share of over 35	0.315	0.349	0.369	-0.0189	-0.0214	-0.00369	-0.0506	-0.0421
	(0.0686)	(0.0757)	(0.0929)	(0.0387)	(0.0361)	(0.0385)	(0.0375)	(0.0406)
Share of black mothers	0.0211	0.0156	0.00868	0.0162	0.0263	0.0248	0.0239	0.0105
	(0.00907)	(0.0117)	(0.0112)	(0.00689)	(0.00859)	(0.00808)	(0.00993)	(0.0110)
Share of white mothers	0.0145	0.0141	0.0184	-0.00807	-0.00651	-0.00891	-0.0136	-0.0302
	(0.00846)	(0.00929)	(0.00933)	(0.00646)	(0.00731)	(0.00684)	(0.00857)	(0.00927)
Average maternal age	-0.00522	-0.00736	-0.00936	0.00152	0.00114	0.000736	0.00193	0.00145
	(0.00239)	(0.00294)	(0.00326)	(0.00101)	(0.00100)	(0.00109)	(0.00102)	(0.00124)
Share of mothers married	-0.00526	-0.0101	-0.00701	-0.0161	-0.0127	-0.00970	-0.00809	-0.00754
	(0.0130)	(0.0145)	(0.0137)	(0.00590)	(0.00579)	(0.00559)	(0.00583)	(0.00642)
Observations	252	252	252	2,116	2,116	2,116	2,116	2,116
R-squared	0.976	0.978	0.986	0.920	0.923	0.928	0.928	0.940
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	No	Yes	Yes	No	Yes	Yes	No	No
Region*year FE	No	No	Yes	No	No	Yes	No	No
State FE	No	No	No	No	No	No	Yes	Yes
State*year FE	No	No	No	No	No	No	No	Yes

Notes. This table reports the first-stage relationship between Gini coefficient and predicted Gini coefficient. Decennial census and vital statistics data from 1970 to 2010 are used. Columns (1) to (3) are on the state level, and columns (4) to (8) are on the county level. Only counties with at least 100,000 population are kept for analysis. State/county controls and maternal controls can be seen from the table. Different fixed effects are used to control for unobserved constant characteristics that may affect Gini coefficients. All regressions are weighted by population.

Appendix Table 5: First Stage Regressions - Individual Level Data

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	State				County						
Dependent variable: Gini	OLS	State FE	Region FE	Region-year FE	OLS	County FE	County FE 2	Region FE	Region-year FE	State FE	State-year FE
Predicted Gini	0.235	-0.282	0.254	0.270	0.288	0.332	0.362	0.271	0.267	0.258	0.253
	(0.00559)	(0.0228)	(0.0115)	(0.0110)	(0.00717)	(0.0328)	(0.0340)	(0.0104)	(0.0104)	(0.0115)	(0.0120)
Individual income (2010 USD)	-1.90e-07	-7.65e-07	-3.57e-07	-1.11e-06	2.48e-06	2.44e-06	2.88e-06	2.00e-06	1.37e-06	2.51e-08	1.83e-06
	(1.44e-06)	(8.73e-07)	(1.31e-06)	(1.09e-06)	(3.60e-06)	(1.33e-06)	(1.41e-06)	(3.64e-06)	(3.51e-06)	(3.51e-06)	(3.58e-06)
invidual income squared	4.50e-10	3.96e-10	2.07e-10	7.54e-10	-5.21e-10	-1.27e-09	-1.48e-09	-3.97e-10	7.81e-11	7.24e-10	3.85e-10
	(1.06e-09)	(5.67e-10)	(9.19e-10)	(7.12e-10)	(2.82e-09)	(8.83e-10)	(9.24e-10)	(2.74e-09)	(2.65e-09)	(2.62e-09)	(2.47e-09)
Share of black	0.0159	0.0182	-0.00279	-0.00702	0.0266	0.0131	0.0109	0.0338	0.0334	0.0418	0.0432
	(0.00151)	(0.0107)	(0.00180)	(0.00162)	(0.00249)	(0.00574)	(0.00583)	(0.00302)	(0.00300)	(0.00309)	(0.00344)
Share of Hispanic	0.0276	0.0976	0.0250	0.0206	0.0155	0.00708	0.00410	0.0100	0.0102	0.0179	0.0168
	(0.00134)	(0.00423)	(0.00138)	(0.00135)	(0.00219)	(0.00416)	(0.00423)	(0.00224)	(0.00223)	(0.00260)	(0.00274)
Share of over 65	0.138	0.214	0.0880	0.0861	0.125	0.0705	0.0877	0.141	0.148	0.140	0.154
	(0.00303)	(0.0182)	(0.00500)	(0.00506)	(0.00596)	(0.0140)	(0.0142)	(0.00692)	(0.00660)	(0.00779)	(0.00781)
Poverty rate	0.579	0.460	0.594	0.614	0.566	0.472	0.467	0.555	0.559	0.534	0.538
	(0.00623)	(0.0104)	(0.00740)	(0.00813)	(0.0105)	(0.0112)	(0.0115)	(0.0124)	(0.0124)	(0.0130)	(0.0141)
Mean income (2010 USD)	0.00358	-2.05e-05	0.00341	0.00376	0.00320	0.000487	0.000526	0.00303	0.00317	0.00292	0.00318
	(7.11e-05)	(0.000126)	(8.10e-05)	(7.67e-05)	(9.12e-05)	(0.000126)	(0.000130)	(0.000102)	(9.24e-05)	(0.000111)	(0.000111)
Mean income squared (2010 USD)	-1.46e-05	4.43e-06	-1.40e-05	-1.58e-05	-1.28e-05	-1.26e-06	-1.53e-06	-1.20e-05	-1.26e-05	-1.14e-05	-1.26e-05
	(4.09e-07)	(6.44e-07)	(4.30e-07)	(4.12e-07)	(4.79e-07)	(5.84e-07)	(6.05e-07)	(5.12e-07)	(4.56e-07)	(5.49e-07)	(5.41e-07)
Individual: less then HS	0.000300	-7.20e-05	-1.32e-05	-0.000297	0.00106	0.000123	0.000114	0.00104	0.000941	0.000978	0.00124
	(0.000240)	(0.000141)	(0.000224)	(0.000192)	(0.000517)	(0.000216)	(0.000223)	(0.000512)	(0.000508)	(0.000498)	(0.000509)
Individual: HS graduate	0.000416	0.000226	0.000245	-3.66e-05	0.000935	0.000315	0.000277	0.000843	0.000773	0.000873	0.000793
	(0.000191)	(0.000110)	(0.000178)	(0.000151)	(0.000417)	(0.000168)	(0.000176)	(0.000411)	(0.000407)	(0.000393)	(0.000397)
Individual: some college	0.000367	0.000162	0.000250	-9.91e-05	0.000396	-0.000328	-0.000367	0.000305	0.000298	0.000194	0.000637
	(0.000216)	(0.000121)	(0.000200)	(0.000165)	(0.000454)	(0.000188)	(0.000197)	(0.000453)	(0.000446)	(0.000427)	(0.000428)
Teen birth	-3.62e-05	0.000238	-5.24e-05	0.000117	-0.000676	0.000340	0.000303	-0.000530	-0.000335	-0.000452	-0.000739
	(0.000316)	(0.000222)	(0.000301)	(0.000262)	(0.000711)	(0.000352)	(0.000352)	(0.000703)	(0.000691)	(0.000668)	(0.000659)
Race: black	-0.000578	-0.000490	-0.000616	-0.000323	0.000631	0.000342	0.000291	0.000591	0.000580	0.000276	0.000181
	(0.000191)	(0.000116)	(0.000176)	(0.000145)	(0.000449)	(0.000201)	(0.000202)	(0.000447)	(0.000436)	(0.000423)	(0.000438)
Race: white	-0.000200	-0.000306	-0.000163	4.50e-05	0.000461	0.000512	0.000543	0.000314	0.000379	0.000135	4.24e-05
	(0.000164)	(0.000104)	(0.000151)	(0.000120)	(0.000397)	(0.000184)	(0.000189)	(0.000395)	(0.000389)	(0.000381)	(0.000398)
Maternal age	0.000251	-8.11e-06	0.000134	5.19e-05	7.19e-05	0.000271	0.000150	8.73e-05	8.66e-05	2.08e-05	-0.000164
	(0.000193)	(0.000126)	(0.000187)	(0.000164)	(0.000484)	(0.000197)	(0.000207)	(0.000475)	(0.000464)	(0.000460)	(0.000444)
Maternal age squared	-4.85e-06	-1.11e-07	-3.00e-06	-9.85e-07	-2.89e-06	-4.78e-06	-2.72e-06	-2.29e-06	-2.38e-06	-1.13e-06	2.06e-06
	(3.60e-06)	(2.33e-06)	(3.51e-06)	(3.08e-06)	(9.08e-06)	(3.66e-06)	(3.88e-06)	(8.92e-06)	(8.69e-06)	(8.68e-06)	(8.34e-06)
Marital status	-0.000510	-0.000432	-0.000552	-0.000189	-0.000230	-0.000164	-0.000140	-0.000156	4.78e-05	-0.000278	-0.000220
	(0.000144)	(8.80e-05)	(0.000136)	(0.000115)	(0.000315)	(0.000134)	(0.000139)	(0.000311)	(0.000308)	(0.000293)	(0.000302)
Birth order	0.000104	2.65e-05	0.000157	0.000168	0.000106	-9.60e-05	-7.05e-05	3.74e-05	8.34e-05	3.79e-05	3.34e-05
	(6.43e-05)	(3.77e-05)	(6.03e-05)	(5.26e-05)	(0.000143)	(5.77e-05)	(5.95e-05)	(0.000142)	(0.000142)	(0.000134)	(0.000136)
Observations	10,246	10,246	10,246	10,246	7,344	7,344	6,501	7,344	7,344	7,344	7,344
R-squared	0.964	0.987	0.968	0.978	0.925	0.990	0.990	0.927	0.934	0.936	0.953

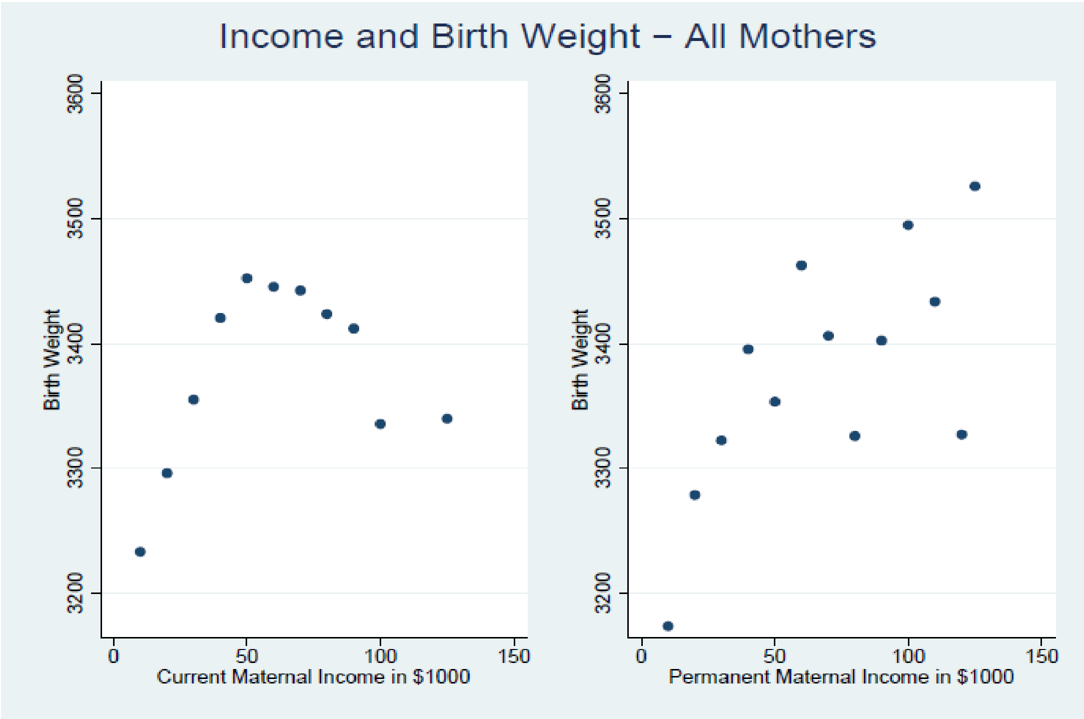
Notes. This table reports the first-stage relationship between Gini coefficient and predicted Gini coefficient. Individuals in the NLSY 79 & 97 sample are linked with the linearly interpolated census data to get state/county Gini coefficient and other state/county characteristics. Columns (1) to (4) are at the state level, and columns (5) to (11) are at the county level. Column (7) restricts the sample to the counties with at least 10 individuals are surveyed in the NLSY 79 & 97. Only counties with at least 100,000 population are kept for analysis. State/county controls and maternal controls can be seen from the table. Different fixed effects are used to control for unobserved characteristics that may affect Gini coefficients. All regressions are weighted by individual sampling weights provided by the NLSY.

Appendix Table 6: First Stage Regressions - Relative Income Distance

	Dependent variable: relative income distance					
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: rank only	OLS-current	State FE-current	Region FE-current	OLS-permanent	State FE-permanent	Region FE-permanent
Predicted distance	0.604	0.659	0.620	0.669	0.727	0.685
	(0.0199)	(0.0213)	(0.0201)	(0.0226)	(0.0249)	(0.0229)
Rank	0.00291	0.00314	0.00303	0.000186	-0.000412	0.000128
	(0.000696)	(0.000779)	(0.000715)	(0.000454)	(0.000468)	(0.000440)
Individual income (2010 USD)	-6.87e-06	-7.12e-06	-6.97e-06	-3.56e-06	-3.35e-06	-3.54e-06
	(6.18e-07)	(6.82e-07)	(6.32e-07)	(4.43e-07)	(4.57e-07)	(4.34e-07)
invidual income squared	0	0	0	0	0	0
	(0)	(0)	(0)	(0)	(0)	(0)
Share of black	0.221	-2.405	-0.613	-0.0333	-1.528	-0.937
	(0.110)	(0.907)	(0.121)	(0.124)	(0.680)	(0.135)
Share of Hispanic	-0.441	1.220	0.0771	-0.638	1.211	-0.115
	(0.131)	(0.464)	(0.142)	(0.123)	(0.320)	(0.122)
Share of over 65	-3.019	-4.281	-4.311	-4.065	-6.166	-5.734
	(0.407)	(1.393)	(0.417)	(0.389)	(1.121)	(0.356)
Poverty rate	0.993	-1.496	0.415	1.127	-1.221	0.0230
	(0.429)	(0.907)	(0.505)	(0.401)	(0.727)	(0.478)
State mean income (2010 USD)	0.114	0.129	0.0971	0.115	0.128	0.100
	(0.00456)	(0.00652)	(0.00438)	(0.00453)	(0.00482)	(0.00494)
State median income (2010 USD)	-0.0909	-0.0796	-0.0705	-0.0993	-0.0843	-0.0822
	(0.00628)	(0.00942)	(0.00613)	(0.00583)	(0.00656)	(0.00595)
Individual: less then HS	-0.0158	-0.00933	-0.0189	-0.000265	-0.00368	-0.00518
	(0.0190)	(0.0171)	(0.0184)	(0.0184)	(0.0160)	(0.0176)
Individual: HS graduate	-0.0382	-0.0240	-0.0290	-0.0340	-0.0238	-0.0260
	(0.0178)	(0.0170)	(0.0176)	(0.0165)	(0.0158)	(0.0163)
Individual: some college	-0.0284	-0.0213	-0.0201	-0.0371	-0.0293	-0.0286
	(0.0200)	(0.0191)	(0.0198)	(0.0159)	(0.0150)	(0.0155)
Teen birth	-0.0529	-0.0475	-0.0500	-0.0326	-0.0257	-0.0283
	(0.0228)	(0.0205)	(0.0224)	(0.0233)	(0.0226)	(0.0229)
Race: black	-0.00363	-0.00708	-0.00185	0.0215	0.0177	0.0197
	(0.0144)	(0.0128)	(0.0140)	(0.0122)	(0.0109)	(0.0118)
Race: white	-0.0233	-0.0259	-0.0278	0.00351	0.00352	-0.00135
	(0.0135)	(0.0125)	(0.0132)	(0.0106)	(0.00950)	(0.0102)
Maternal age	-0.0502	-0.0343	-0.0470	0.00152	0.0213	0.00712
	(0.0227)	(0.0214)	(0.0224)	(0.0283)	(0.0283)	(0.0282)
Maternal age squared	0.000914	0.000629	0.000857	-8.90e-05	-0.000449	-0.000195
	(0.000446)	(0.000421)	(0.000439)	(0.000558)	(0.000560)	(0.000554)
Marital status	-0.0449	-0.0416	-0.0467	-0.0156	-0.0132	-0.0191
	(0.0114)	(0.0103)	(0.0110)	(0.0101)	(0.00927)	(0.00975)
Birth order	-0.0112	-0.00766	-0.00743	-0.00763	-0.00560	-0.00380
	(0.00743)	(0.00710)	(0.00731)	(0.00524)	(0.00489)	(0.00509)
Observations	10,246	10,246	10,246	11,921	11,921	11,921
R-squared	0.845	0.855	0.849	0.927	0.945	0.934

Notes. This table reports the first-stage relationship between relative income distance and predicted income distance, using people from a same state as the reference group. Panel A adds rank as a control, and panel B adds squared rank in addition to rank as another contorl. Columns (1) to (3) use individuals' current family income to calculate relative income distance and columns (4) to (6) use permanent income (the average of past three years' income). State controls and maternal controls can be seen from the table. State or region fixed effects are used to control for unobserved constant characteristics that may affect individuals' relative income distance. All regressions are weighted by individual sampling weights provided by the NLSY.

Figure 1



Income and Birth Weight – All Mothers
Birth Weight
3200
3300
3400
3500
3600
0
50
100
150
Current Maternal Income in $1000
Birth Weight
3200
3300
3400
3500
3600
0
50
100
150
Permanent Maternal Income in $1000

Figure 2

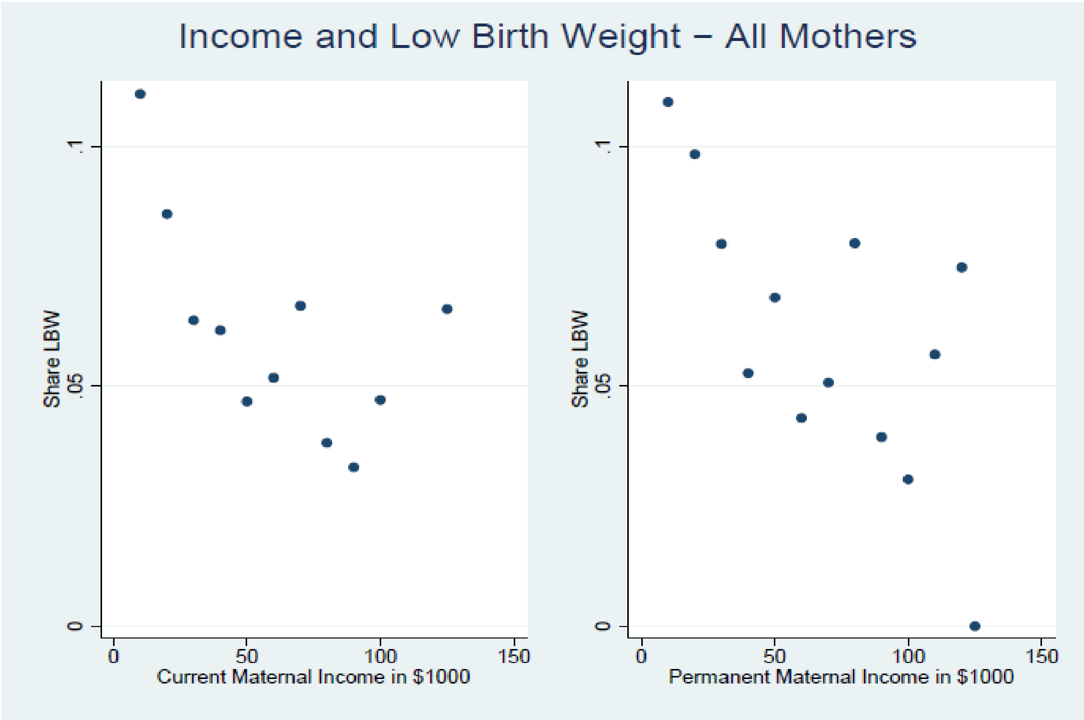

Income and Low Birth Weight – All Mothers
Share LBW
0
.05
.1
0
50
100
150
Current Maternal Income in $1000
Share LBW
0
.05
.1
0
50
100
150
Permanent Maternal Income in $1000

Figure 3

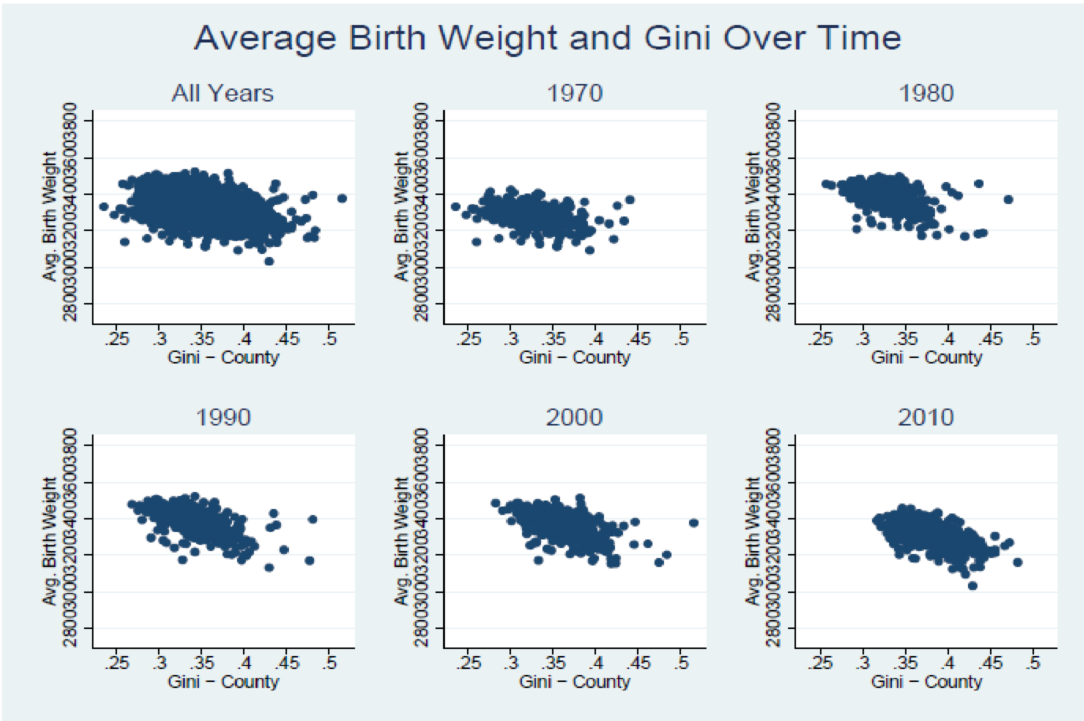
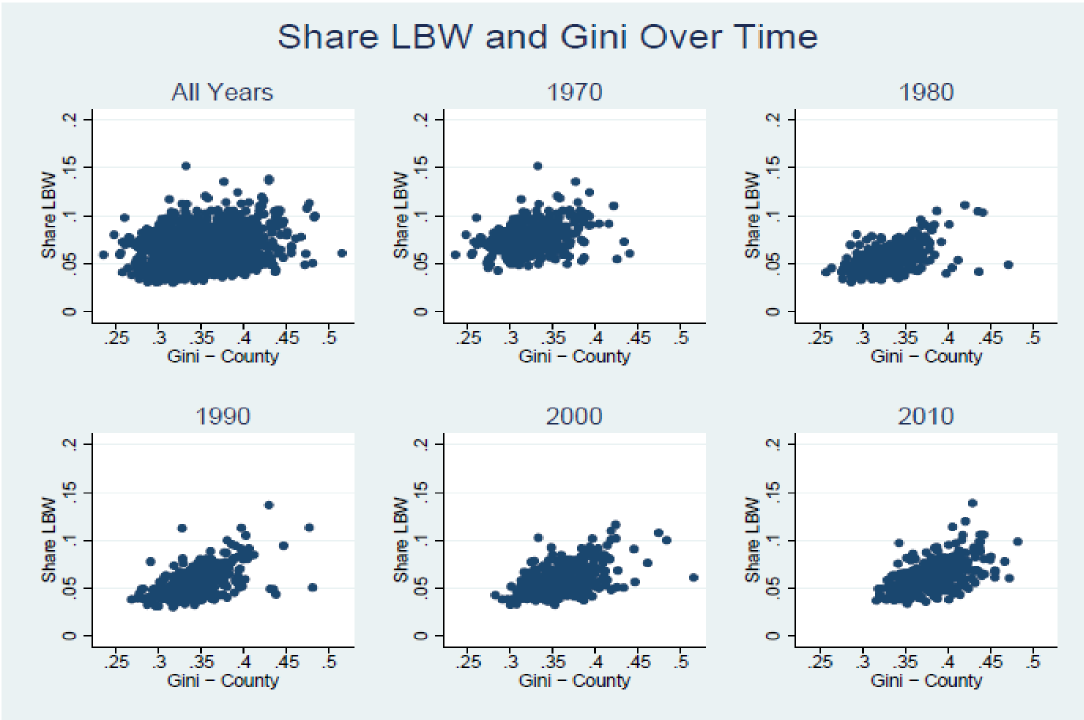

Average Birth Weight and Gini Over Time
All Years
1970
1980
1990
2000
2010
Avg. Birth Weight
.25
.3
.35
.4
.45
.5
Gini − County

Figure 4


Share LBW and Gini Over Time
All Years
1970
1980
1990
2000
2010
Share LBW
Gini − County
0
.05
.1
.15
.2
.25
.3
.35
.4
.45
.5