

**Online Appendix for “The Contribution of National Income Inequality to Regional
Economic Divergence”**

APPENDIX 1: Trends in Regional Divergence Measured Using BEA Data on Commuting Zone Per Capita Personal Income

Here I replicate my descriptive analysis of trends in regional economic divergence using data from the US Bureau of Economic Analysis Regional Economic Accounts. This data source captures a greater portion of the total economic activity in the country than the Census data that I use in my main analysis does. However, the BEA data only provide the total and mean income for each region, which makes it impossible to conduct my counterfactual analysis.

Figure A1.1, analogous to Figure 1 in the main text, shows trends in sigma divergence measures using the BEA data. As in the Census data, there has been a substantial increase in the amount of cross-sectional variation in per capita income across Commuting Zones since 1980. The coefficient of variation of per capita personal income across Commuting Zones increased by 23% from 1980-2013.

A1.1. Selected measures of sigma divergence in Commuting Zone per capita personal income, 1969-2015

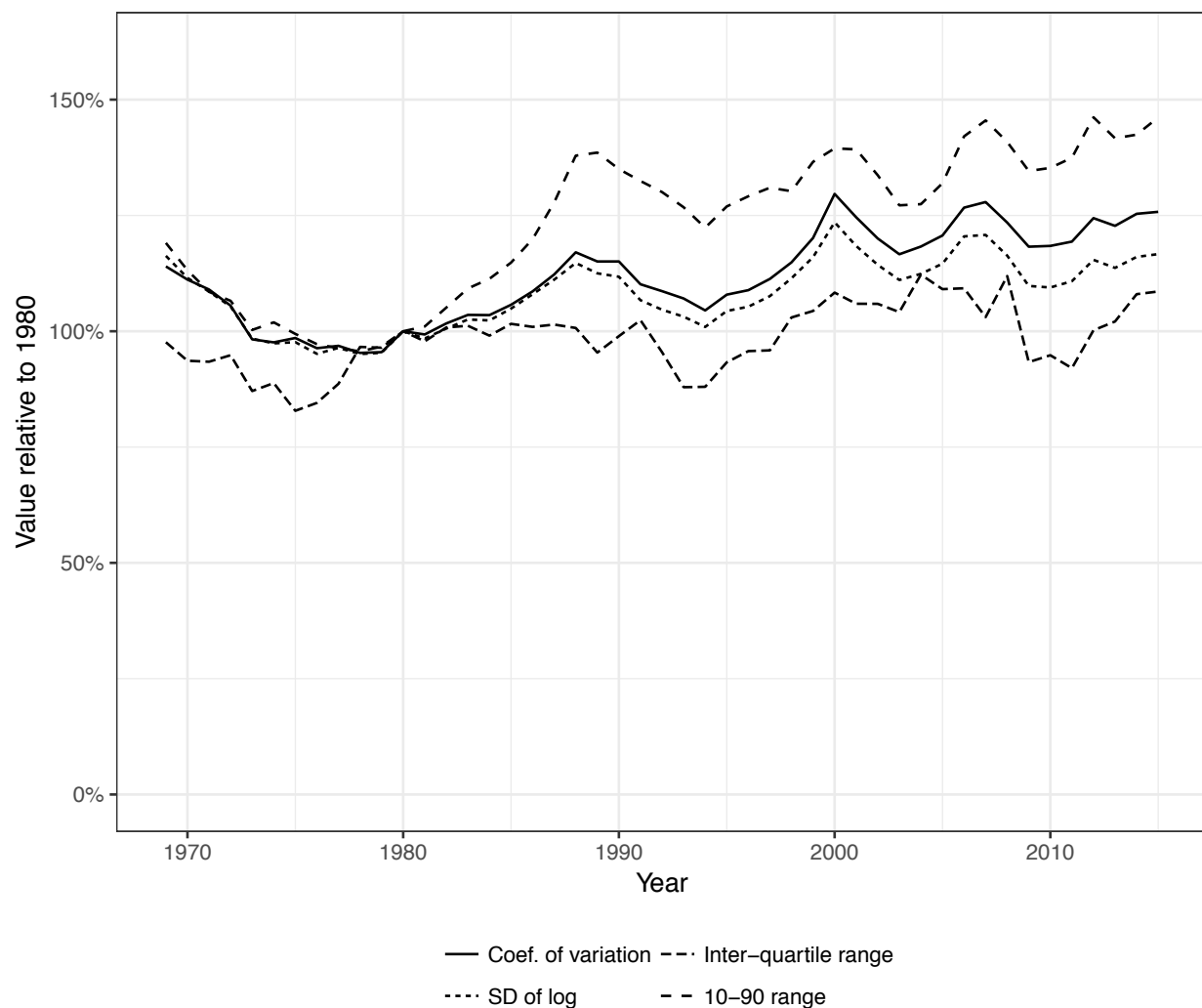
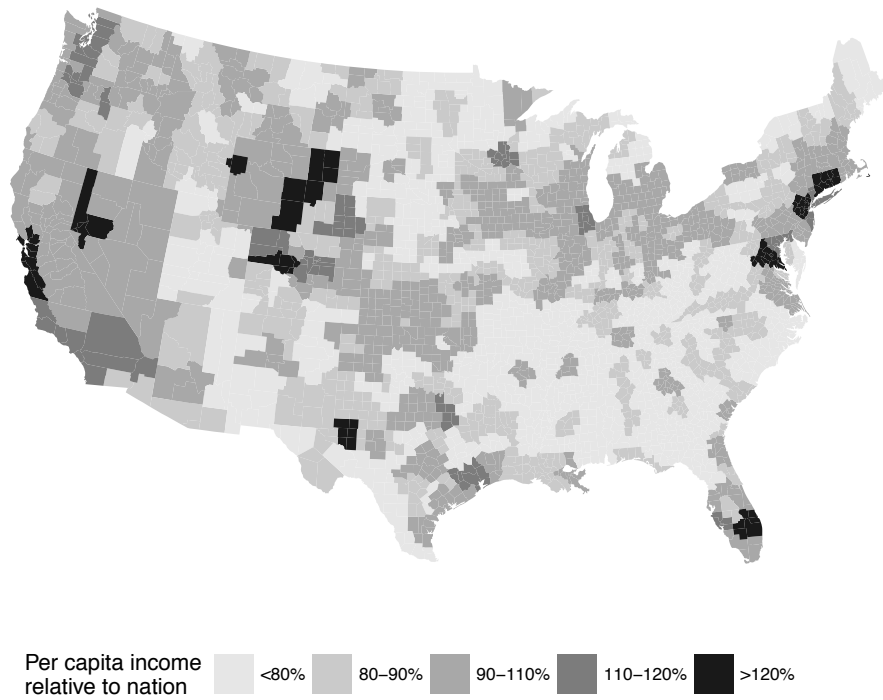


Figure A1.2 maps Commuting Zone per capita personal income as a fraction of national per capita income. Panels A and B show per capita incomes in 1980 and 2013 respectively. The divergence is similar to the maps in Figure 2 of the main text, though the trend is somewhat less visible due to the presence of rural areas in the high plains and interior west that fall into the top income category—these are either resort areas or places with high levels of mineral extraction. Rural parts of the upper Midwest and Upstate New York also show relative increases in per capita personal income during this time, which do not appear in the Census data, but these are counterweighted by relative income declines Western states.

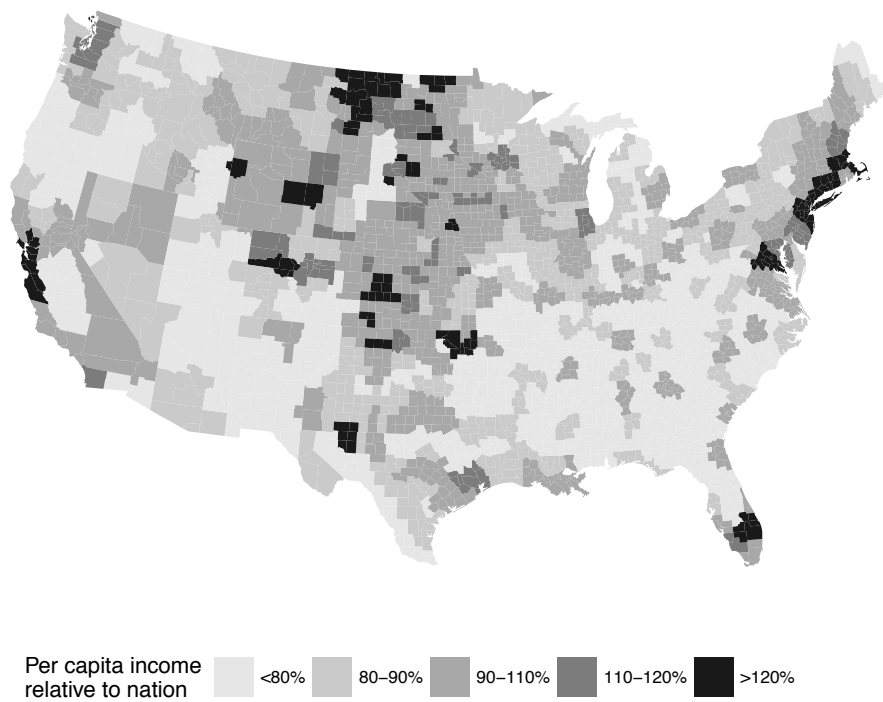
The BEA data, which are available yearly, vary somewhat from year to year. Panels C and D of Figure A1.2 show Commuting Zone per capita personal incomes in 1975 and 2015 respectively. In these panels the economic bifurcation of the country, the hollowing out of rural areas, and the growing wealth of coastal cities is more readily apparent. This is true even though the overall level of sigma divergence as shown in Figure A1.1 was almost exactly identical in 1975 and 1980.

Figure A1.2. Maps of Commuting Zone per capita personal income

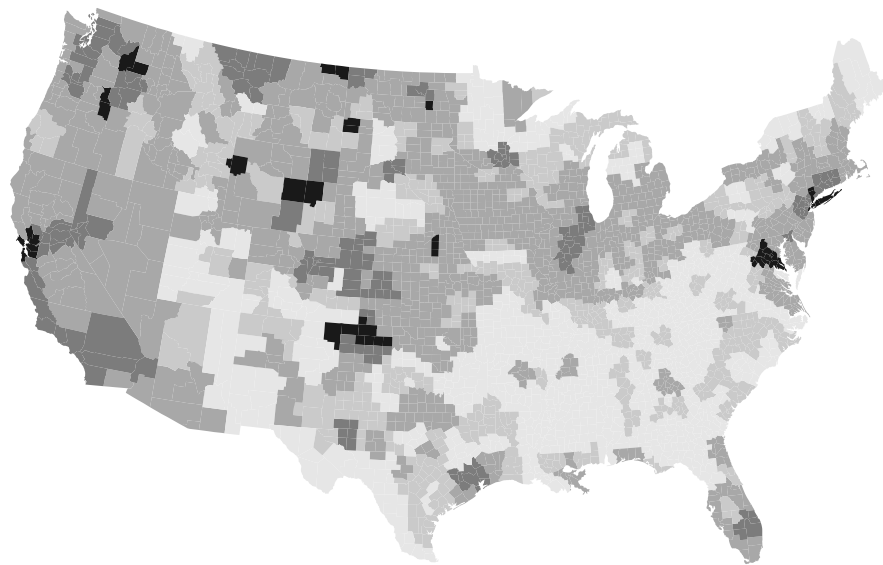
A. 1980



B. 2013



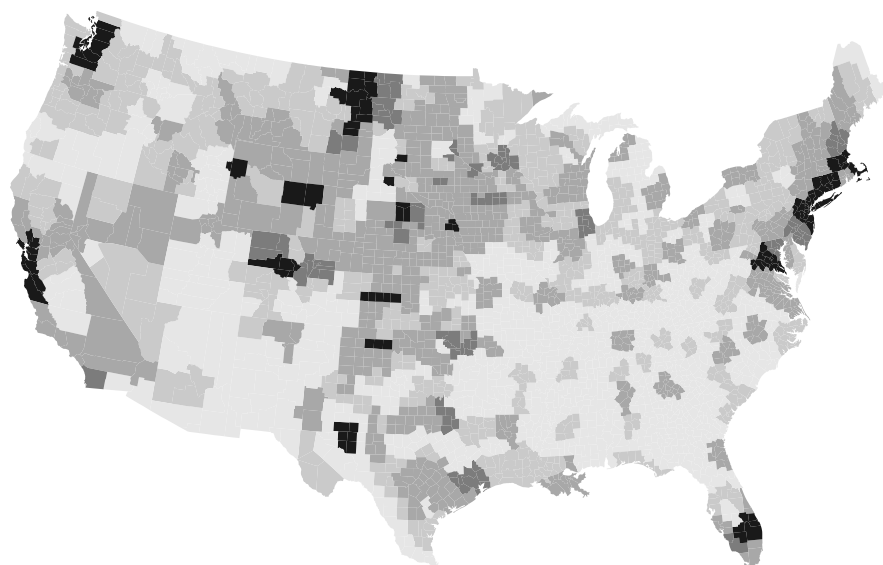
C. 1975



Per capita income
relative to nation

<80%	80-90%	90-110%	110-120%	>120%
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D. 2015

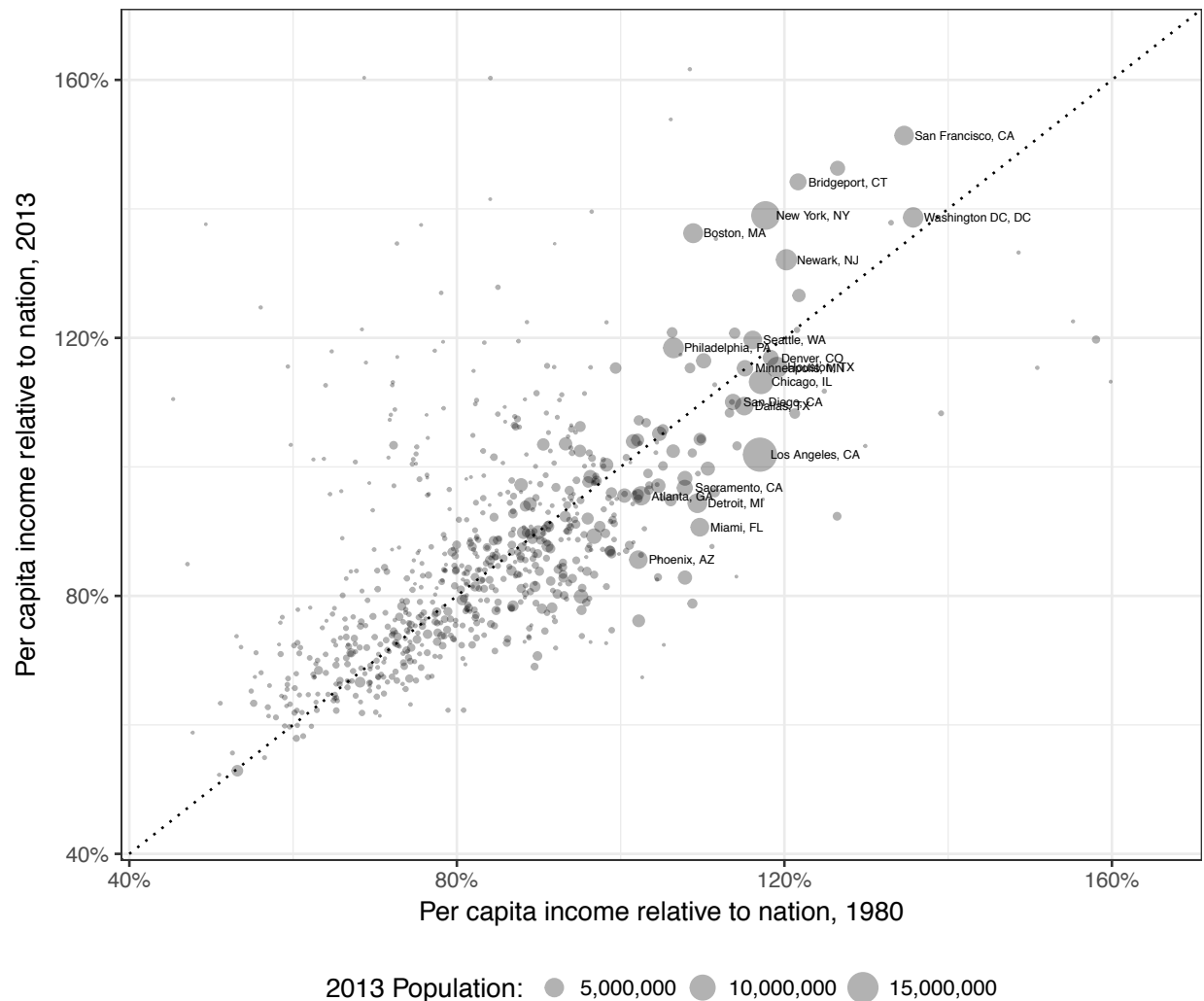


Per capita income
relative to nation

<80%	80-90%	90-110%	110-120%	>120%
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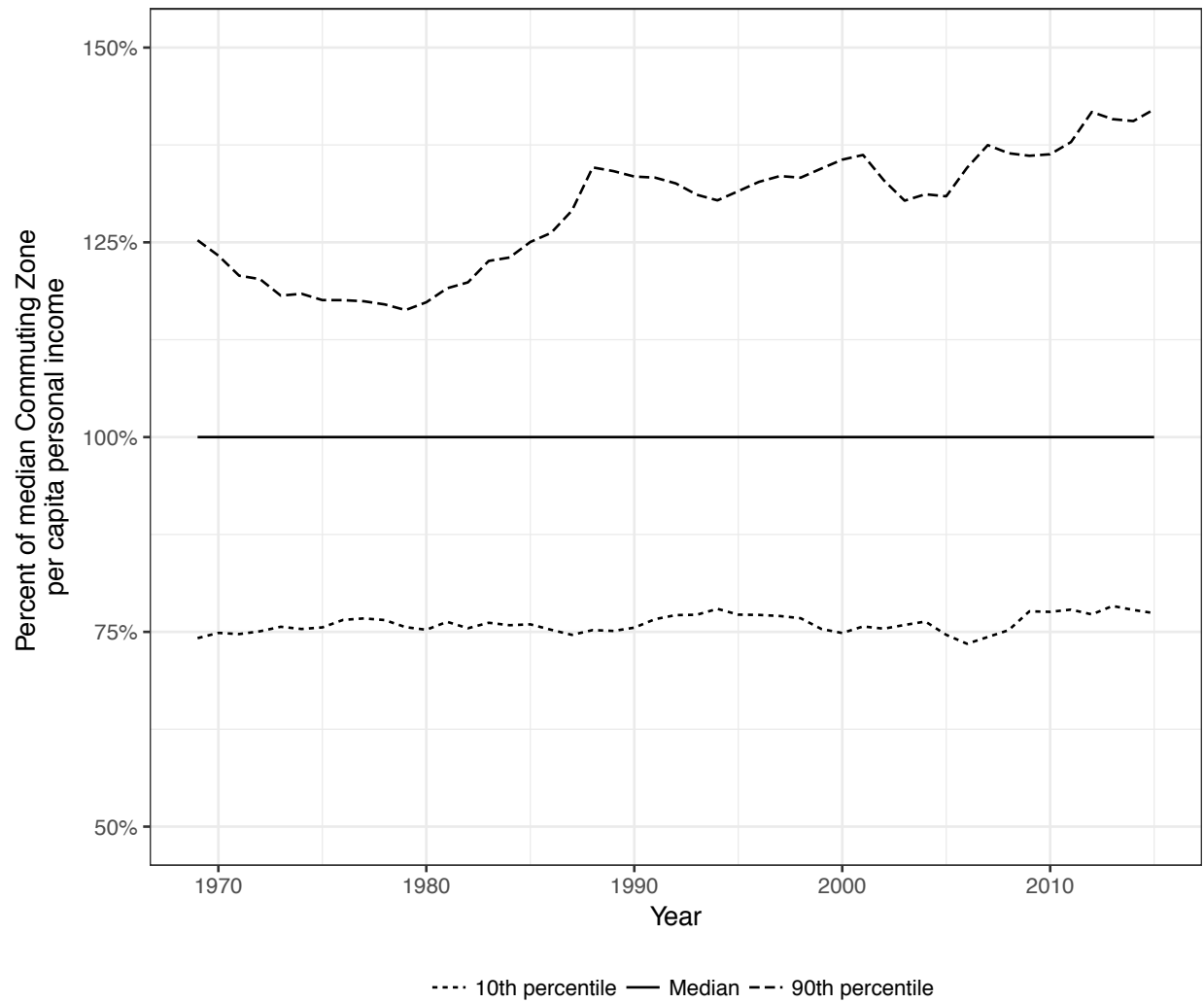
Figure A1.3 plots Commuting Zone per capita personal income as a fraction of national per capita personal income in 1980 and 2013. As in Figure 4 of the main text, the relationship is largely linear, with the main exceptions being several large Commuting Zones in the top right of the graph, which had above average income growth in 1980 but saw their relative position improve over the next 30 years. These include San Francisco, New York City, and Boston.

Figure A1.3. Changes in Commuting Zone per capita personal income relative to nation, 1980-2013



Finally, Figure A1.4, which does not have an analogue in the text, highlights the role of rich metros in driving divergence by plotting the 10th and 90th percentiles of Commuting Zone per capita income (weighted by population) as a fraction of the median over time. While the ratio of the 10th to 50th percentiles is roughly constant from 1970-2015 at 75%, the ratio of the 90th to 50th percentiles increases dramatically during this period, from 117% in 1980 to 141% in 2013.

Figure A1.4. 90th and 10th percentiles of Commuting Zone per capita personal income as a proportion of median Commuting Zone, 1973-2015



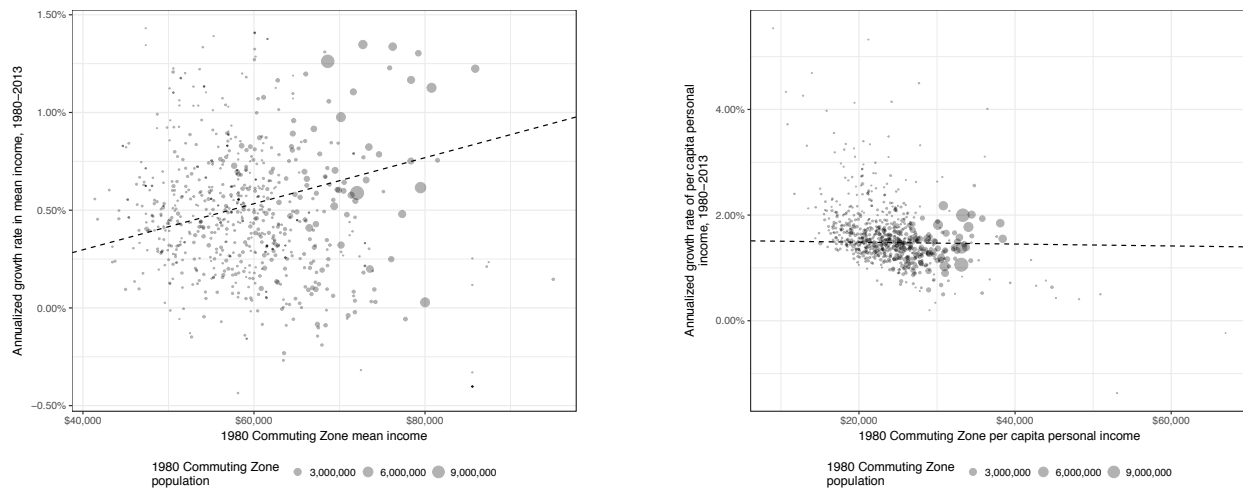
APPENDIX 2: Analysis of Beta Divergence

In this paper I have focused on sigma divergence, measuring the change in cross-sectional variation across Commuting Zones over time. An alternative approach is to measure beta divergence, the extent to which regional income growth during a period is correlated with income level at the beginning of that period. This approach has been prominent in research on divergence within economics, but suffers from a lack of temporal detail. Here I replicate my main findings using measures of beta divergence rather than sigma divergence.

Observed patterns

Figure A2.1 shows beta divergence among Commuting Zones from 1980-2013, using mean family income from the Census in Panel A and per capita personal income from the BEA data (described in Appendix 1) in Panel B. The x-axis shows income in 1980 (normalized to 2015 dollars using the CPI-U-RS) while the y-axis shows the real annualized income growth rate from 1980-2013. Each dot represents one Commuting Zone, with size proportional to 1980 population. The dashed lines are regression lines weighted by 1980 population. A positive slope on the line indicates that growth from 1980-2013 was positively correlated with income in 1980, meaning that regions diverged during this period. A negative slope indicates regional convergence—that poor regions caught up to rich ones.

Figure A2.1. Beta divergence across Commuting Zones in mean family income



A. Mean family income, Census

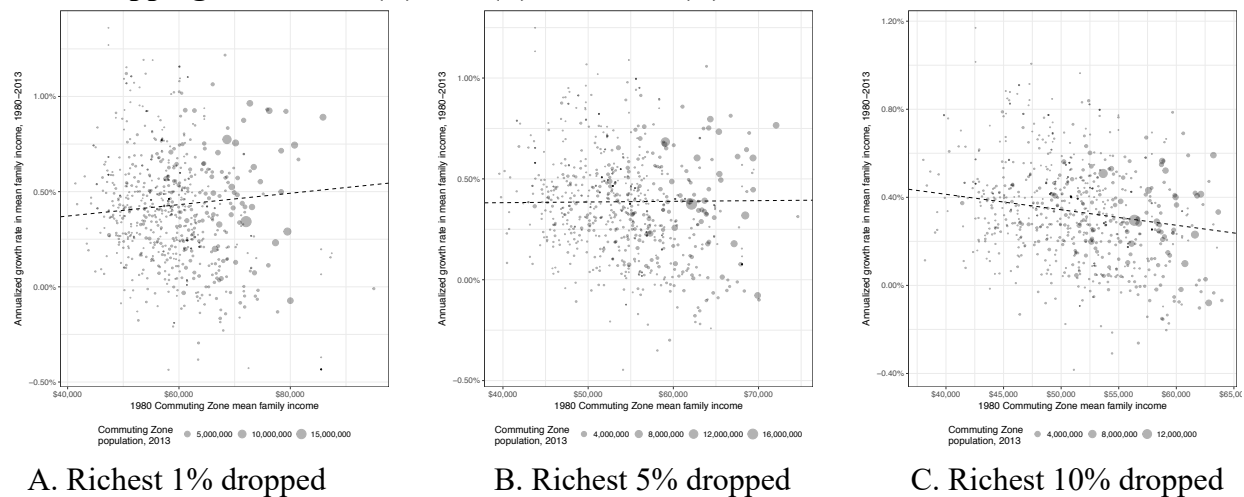
B. Per capita personal income, BEA

Panel A shows that there was divergence in mean family income across Commuting Zones from 1980-2013. Panel B shows that there time there was relatively little convergence or divergence in per capita personal income during this period.

Divergence and the top of the income distribution

I next turn to the question of whether divergence is driven more by the rich surging ahead or the poor falling behind. Here I calculate beta divergence after first removing the richest 1%, 5%, and 10% of families from the sample. The results are shown in Figure A2.2. While there was a strong trend of divergence in mean family income among the full IPUMS sample, this trend moderates substantially once the richest few percent of families are removed. Merely dropping the richest 1% of families drops the slope by more than half (panel A), while removing the top 5% of families results in a slope that is almost perfectly flat (panel B). Among the bottom 90% of families there was *convergence* in incomes across Commuting Zones during this time (panel C).

Figure A2.2. Simulated beta divergence in family income across Commuting Zones, 1980-2013, dropping richest 1% (A), 5% (B), and 10% (C) of families.



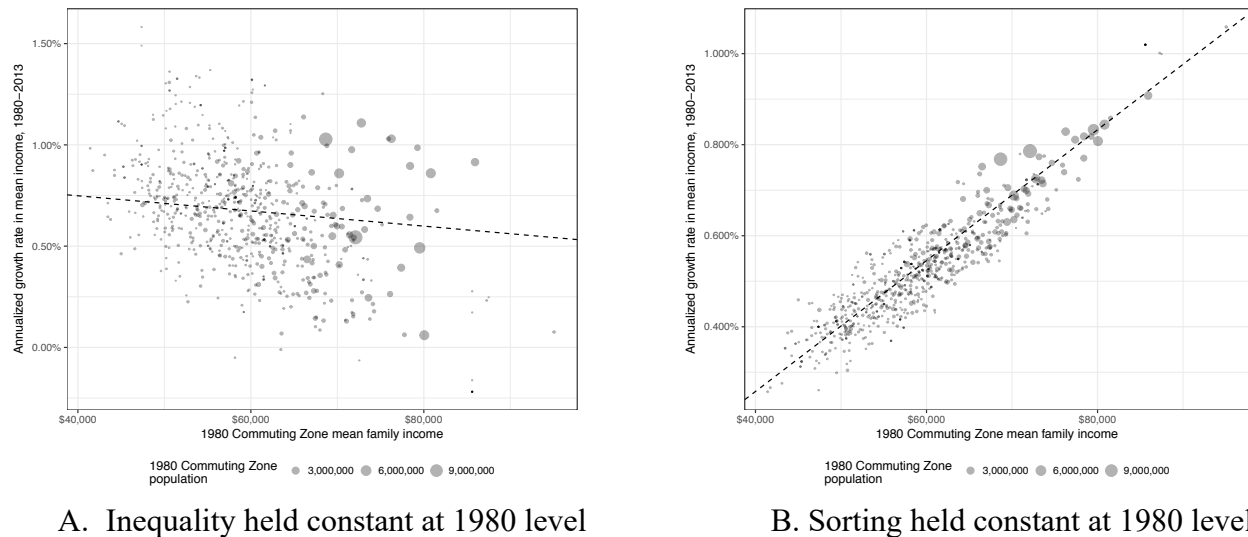
Sorting and inequality as contributors to regional economic divergence

Finally I replicate my analysis of the relative importance of sorting and inequality as drivers of regional divergence. I create counterfactual income distributions for each Commuting Zone using the technique described in the main text, but here I compute the counterfactual beta divergence measures by comparing observed income in 1980 to the simulated income growth from 1980-2013 in each scenario.

Panel A of Figure A2.3 shows what beta divergence would have been had inequality remained at its 1980 level. If there had been no rise in inequality, sorting alone would have resulted in regional convergence, not divergence. This is because there was a certain amount of regional shuffling in income rank during this time. Comparing Figure A2.3A with the line for “observed geography, 1980 income” in Figure 7 of the main text, we can say that income sorting alone would have resulted in a moderate increase in the amount of dispersion across Commuting Zones from 1980-2013, but that many of the cities that had high incomes at the end of the period would be different from those who were prosperous at the beginning of the period. This can be seen by comparing the map in Panel B of Figure 8 in the main text with that in Panel B of Figure 1. If

there had been no change in income sorting after 1980, Chicago, Detroit, and Houston would be among the richest cities in the country, while Boston would not.

Figure A2.3. Simulated beta divergence in mean family income across Commuting Zones, 1980-2013, with inequality (A) and sorting (B) held constant.



As shown in Panel B, however, the moderately converging effect of income sorting was more than negated by the strong diverging effect of rising inequality. If there had been no sorting, there would have been an almost perfect positive correlation between Commuting Zone mean family income in 1980 and growth in that measure from 1980-2013. This makes sense because without any changes to the geography of which income percentiles are found where, rising inequality would result in metropolitan income growth that was strongly correlated with initial income rank. Combining panels A and B, we again see that the role of income sorting in driving divergence is much smaller than that of rising income inequality.