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Social Capital UnMASCed: The Role of Social Capital in State-Level Economic Growth

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Social Capital UnMASCed: The Role of Social Capital in State-Level Economic Growth

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Abstract

While the examination of social capital in social science research has expanded since the 1990s, little is known about its development over time or contributions to economic growth, particularly at the community level. I create a state-level index of social capital from 2008 to 2019 to analyze its evolution across the United States since the Great Recession. After analyzing the different rates of social capital improvement across the country, I then integrate the index in the production function and a growth accounting framework alongside capital and labor. I find that social capital is not only significant as a factor of production, but also as a component of economic growth during this period that justifies its examination separate from total factor productivity. These results can inform public policy at all levels to improve economic and social well-being.

Acknowledgements

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1 Introduction

The U.S. has experienced unprecedented economic growth since the last recession, but the coronavirus recession, an extreme, low-probability disaster, has challenged much of that progress. Furthermore, while social networks are integral in determining a community's disaster-resilience, the policies necessary for fighting the virus have led to severe social and economic dislocation. This moment in history allows us to contrast the unveiling of cracks in social structures that occurs during crises with the contribution that strong social networks make to economic recovery. Cultural developments since the financial crisis likely left different communities with varied abilities to fight off this crisis and will contribute to how we grow out of it. Measuring such changes and understanding whether they help to explain recent economic growth could have important implications for public policy at all levels. Our current understanding of social, political, and economic phenomena relies on measurable issues, but issues that are not so easily measured make substantial contributions to societal advancement. While measurements of underlying cultural change may never be complete, they can help us better comprehend improvements that can be made on a local, state, or national scale.

This project addresses how social capital should be measured in order to appropriately estimate its role in explaining economic growth since 2008. I build on prior research on social capital to construct an index that measures social capital at the U.S. state level annually between 2008 and 2019. While many studies consider the endowment of social capital at one point in time, this time series approach emphasizes social capital generation, transformation, and disintegration, hoping to understand cultural evolution, as well as the unequal distribution of social capital across states. This unique measurement of social capital attempts to address the shortcomings of traditional economic theory, particularly the ignorance of the social and cultural factors that may

help explain economic growth. I include the index in a traditional production function and an accompanying growth accounting framework to substantiate the treatment of social capital both as a factor of production with positive returns and as a significant element of total factor productivity. This research shows that by considering social capital to be a measurable phenomenon, we can analyze the social forces behind economic activity alongside labor and physical capital. It provides a new mechanism for estimating the marginal benefits of social change without potentially incorrectly attributing them to technology. Only once we comprehend the economic importance of social capital can it inform policies to increase economic activity and improve well-being.

I will first evaluate the existing literature on social capital and explain the proposed relationship between social capital and economic outcomes. I will then introduce a new measure of social capital and illustrate its varying evolution across the country since 2008. Ultimately, I will incorporate this measure into the production function and a growth accounting framework to capture the significance of social capital in explaining variations in output unaccounted for by physical capital and labor.

1.1 Introduction to Social Capital

Robert Putnam (1992) popularized the term social capital in the 1990s as the “features of social organization, such as trust, norms, and networks that can improve the efficiency of society by facilitating coordinated actions” (167). His book *Bowling Alone* examines the decline of social capital in America in communities that tend to spend more time alone, when compared to communities with vibrant political, religious, or other organizations, or communities that tend to engage in more informal social experiences, such as bowling (Putnam 2000). The definition of social capital as a concept has historically lacked consensus, weakening support for its role in

social science research. Most authors acknowledge that a single complete measure of social capital probably does not exist. The limited availability of both cross-sectional and time series data for the potential determinants of social capital limits the extent to which it can be measured, particularly on a small geographic scale and at a high frequency (Rupasingha et al. 2006).

Social capital is heavily dependent on context, and, in the context of the financial crisis and the COVID-19 pandemic, it can be understood as “how the density of social ties in a community affects the response of community actors when faced with acute economic crises” (Safford 2004, 7). Relating to models of economic growth, I would consider social capital as a “web of social relationships that influences individual behavior and thereby affects economic growth” (Pennar 1997, 154) and “the set of elements of the social structure that affects relations among people and are inputs or arguments of the production and/or utility function” (Schiff 1992, 160). Furthermore, Kenneth Arrow (1972) argues that

Virtually every commercial transaction has within itself an element of trust, certainly any transaction conducted over a period of time. It can be plausibly argued that much of the economic backwardness in the world can be explained by the lack of mutual confidence (345).

Our roles within families, neighborhoods, and broader associations of people create the ties that make positive outcomes possible.

Social capital prioritizes people, the individual and collective drivers of the economy, as we determine how to spend our time, engage with our communities, invest in our relationships, and express what we care about. This information stretches far beyond any measure of pure economic activity, representing how individuals and communities optimize not only their participation in the economy, but also their holistic well-being. Social capital summarizes the

process of establishing, continuing, and expanding our contributions to society over a lifetime of critical events and societal developments, because personal interactions, and the trust that emanates from them, help us fulfill goals and endure hardships that we could not or should not experience alone. Social capital encompasses formal and informal human interactions, both in quality and quantity, that create networks of opportunity and thus benefit social and economic dimensions of well-being and quality of life. Measuring the influence of such interactions should profoundly enhance our ability to explain the evolution of the economy.

1.2 Social Capital, Public Policy, and COVID-19

As social science research on social capital has exploded in the last few decades, it has caught the attention of U.S. policymakers, namely the Joint Economic Committee (JEC) formerly chaired by Senator Mike Lee (R-UT). Senator Lee began the Social Capital Project in 2017 as a multi-year research project to investigate associational life in America through our institutions that are “critical to forming our character..., providing us with meaning and purpose, and for addressing the many challenges we face” (The Joint Economic Committee, Republicans 2019). The JEC emphasizes the importance of measuring our endowments of social capital in order to understand the economic well-being of the country and the ways in which the growth and strength of social networks can expand economic opportunities for all Americans. They constructed a new index of social capital by county and state, shown in Appendix A, using data primarily from 2013-2016, although some of the components of the index date back to 2006. They focus on aggregate measures of family unity, family interaction, social support, community health, institutional health, collective efficacy, and philanthropic health to explore the distribution of social capital. This knowledge could inform the creation of different policy solutions for issues like child care and

education, the opioid epidemic, or police reform based on variations in existing social capital across regions of the country (U.S. Congress 2018).

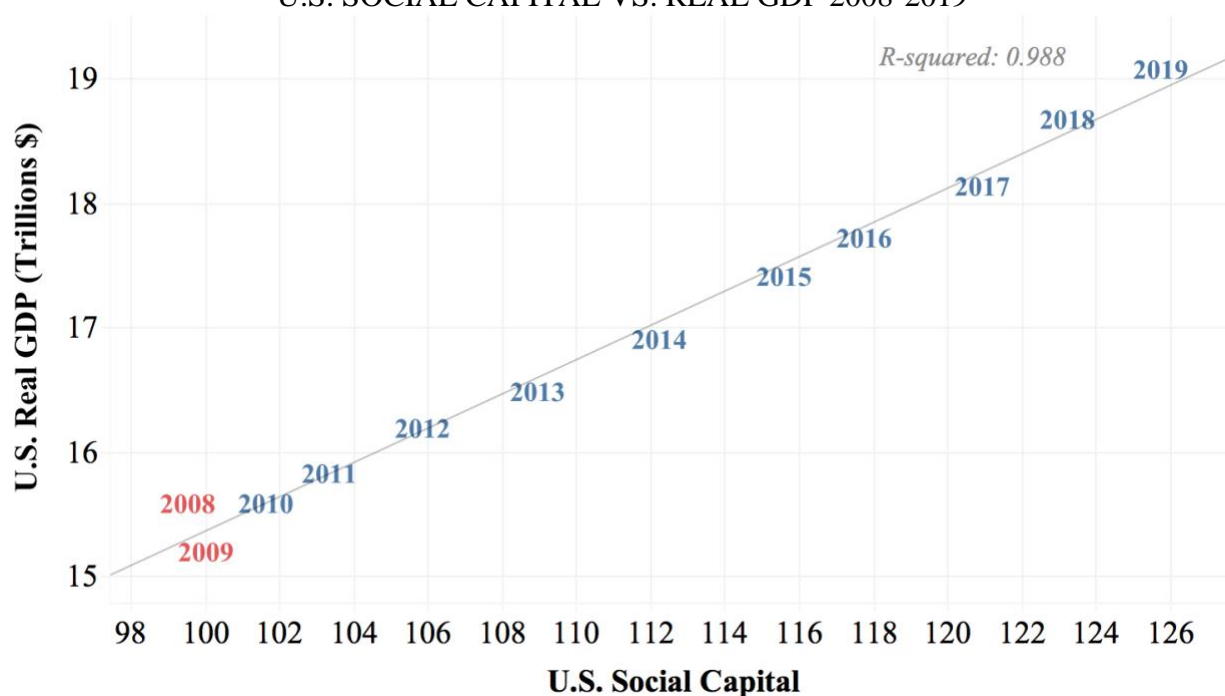
Borgonovi and Andrieu (2020) utilize this recent measurement of social capital to examine the relationship between social capital and mobility within different communities in America in early to mid-March 2020, as COVID-19 restrictions came into place. They discover that, in the language of Putnam, communities that tend to “bowl together,” exhibiting the highest levels of social capital, were best prepared and able to “bowl alone” as the pandemic struck the U.S. They better initiated and respected social distancing guidelines necessary to protect their communities. The effect on mobility of a one standard deviation difference in social capital in one county is equivalent to the effect of 18 additional COVID-19 cases in that county. The authors propose social capital as a determinant of when to relax social distancing guidelines and regard the reinforcement of social capital during a period of dissociation, either government-imposed or self-enforced, as just as important as the supply of masks or COVID-19 tests in local hospitals. They hope that social capital in communities can “buffer” the negative consequences of policies meant to keep us physically healthy. Thus, a new measurement of social capital over time and estimation of its contributions to recent economic growth, despite the various imperfect methods of measurement, are important contributions to our understanding of social structures and their role in explaining growth across the country prior to 2020.

1.3 U.S. Social Capital and the Economic Recovery from 2008

Before uncovering the evolution of social capital at the state level and modeling economic growth over this period, it is important to acknowledge that social capital likely has macro consequences. Figure 1 shows the strong relationship between U.S. social capital, including all 50 states and the

District of Columbia, and U.S. real GDP over the period of interest. The growth in social capital mirrors the slow initial recovery from the recession and steady growth following, particularly where the rise in social capital picks up in 2012.¹ Although it is a phenomenon best captured on a small scale where the formal and informal networks that reflect the well-being of society are developed, the aggregation of these networks into nationwide social capital, and the social fabric that binds us together across geographic, cultural, and economic differences, should be strongly related to how we perform as a country by facilitating the exchange of ideas.

FIGURE 1
U.S. SOCIAL CAPITAL VS. REAL GDP 2008-2019



During this period, rapid technological change has transformed how we communicate and build social networks, not just in our own communities, but across the country and the world. Given constant changes in modes and ease of connection, we should want to capture how the

¹ Due to the very high R-squared between social capital and real GDP, I used Dickey-Fuller tests to confirm that both series exhibit unit roots. I then conducted a cointegration test and could not reject the null hypothesis that the two series are cointegrated, and the relationship between them is thus not spurious.

nature of our social fabric adapts, especially emerging from disruptive health and economic shocks, and quantify the effects of complex technologies on success and happiness. For now, we can emphasize that communities play a part in the optimal production of goods and services. The evolution of cultural norms and greater social cohesion inform demand, spark innovation, and reduce time and resource costs. Investing in social capital through community engagement and individual decision-making can influence economic processes, small and large, as well as the goals and achievement of the country. Section 2 determines how to measure these relationships on a smaller geographic scale, and Section 3 considers how measuring social capital can enhance our understanding of real state output.

2 Measuring Social Capital

2.1 Existing Social Capital Indices

Putnam's (2000) index of social capital uses indicators on the state level that measure voter turnout, volunteerism, and engagement in associational activities, such as sports clubs, political organizations, and bowling leagues. Most of his indicators, coming from the annual General Social Survey, span from 1972 to 1994 and are drawn from questions on political participation, voter turnout, volunteering, trust, and social and associational characteristics. He uses the results to explain variation in outcomes such as education and crime among states. Three of the main reasons he offers for the decline in social capital include: increasing female labor force participation, demographic shifts, and technological change. As more women enter the workforce, they have less time to devote to civic activities, and the takeover of some housework by men has decreased male social engagement. With fewer marriages, higher divorce rates, fewer children, and an aging population, as well as economic shifts toward large national chains and even electronic shopping,

the segment of the population most civically engaged and the reasons for such engagement are declining. He argues the following about the effects of technology on our consumption of leisure:

Television has made our communities (or, rather, what we experience as our communities) wider and shallower. In the language of economics, electronic technology enables individual tastes to be satisfied more fully, but at the cost of the positive social externalities associated with more primitive forms of entertainment. The same logic applies to the replacement of vaudeville by the movies and now of movies by the VCR. The new “virtual reality” helmets that we will soon don to be entertained in total isolation are merely the latest extension of this trend. Is technology thus driving a wedge between our individual interests and our collective interests? (Putnam 1995, 75)

The television hypothesis is consistent with the systematic change that has occurred since this study took place, through the development of technologies, such as social media and streaming platforms that both connect and disrupt society.

Hawes et al. (2012) emphasize the measurement of social capital across time by state, using biannual survey data on 20,000 individuals from MediaMark Research, Inc. to measure the “non attitudinal” aspects of social capital, or those dimensions separate from feelings of trust. They create annual estimates of civic engagement, organizational membership, and volunteerism by state for 1986 to 2004 based on club memberships, voting, donations, etc. They use factor analysis to construct the index over time and argue that prioritizing time dependence is the only way to understand the dynamic nature of social capital described by Putnam (2000) in his evaluation of its decline. Measuring change over time is essential for understanding the implications of social capital for economic, political, and social conditions. They find varied trends in social capital among the states, anticipating that further research could help inform public policy decisions.

Rupasingha et al. (2006) developed the first county-level social capital index, emphasizing the creation of social capital in communities through the facilitation of collective action. Using data from the U.S. Census Bureau, County Business Patterns, and other sources, they construct an associational density variable, shown in Appendix B, based on the number of civic organizations, bowling centers, golf clubs, fitness centers, sports organizations, religious organizations, political organizations, labor organizations, business organizations, and professional organizations per 10,000 people in each county. The social capital index, also shown in Appendix B, relies on principal component analysis to combine this associational density variable with presidential election voter turnout, census response rates, and the number of non-profit organizations. The authors use the index as a dependent variable in a regression, modeled on ethnic diversity, income inequality (the ratio of mean to median household income), education, community attachment (level of migration), female labor force participation, percentage of family households, average number of children per family, age, level of suburbanization, employment type, and homeownership. They find the most significant relationships between social capital and educational attainment, age, and community attachment, concluding that education is “perhaps the single most important determinant of social capital” and suggesting that the most educated individuals in society better understand the positive impacts of broader, stronger social networks (95). The significance of ethnic diversity declined between 1980 and 1997, while the significance of income inequality increased in predicting this social capital index. They confirm that more urban areas have lower levels of social capital and find that female labor force participation increases social capital, disputing Putnam’s earlier hypothesis. Counties with an older average population and counties with more families do tend to have more associational groups. They also find that more homogeneous communities have higher social capital; more racially and economically

diverse communities have much more limited social interactions. Overall, this study uses different data sources to complement the results of Putnam (2000) and Alesina and La Ferrara (2000).

TABLE 1
STUDIES ON SOCIAL CAPITAL INDICES

Study	Geographic Level	Method	Key Variables/Subindices	Results
Putnam (2000)	State	PCA & Sum of means	GSS questions on percentage of individuals who served on a committee of a local organization in the last year, civic and social organizations per 1000, mean number of group memberships	Social capital and its factors such as social trust are rapidly declining in America
Alesina and La Ferrara (2000)	State	PCA	Percentage of people in the state who belong to a group, percentage who trust others, and percentage who voted in the last presidential election	High social capital in North/Northwest, low in South
Rupasingha et al. (2006)	County	PCA	Associational density, presidential election voter turnout, census response rates, non-profits	Strong relationship between social capital and education, age, and community attachment
Hawes et al. (2012)	State	Factor analysis	Club memberships, donating, voting	Differences in social capital across states between 1986 and 2004
Senate JEC (2017)	State and County	PCA	Family unity, family interaction, social support, community health, institutional health, collective efficacy, philanthropic health	The Mid-Continent North and Northern New England have strongest social capital, with the South and New York at the bottom, and three distinct tiers in between

Beyond the development of social capital indices, past examination of social capital has revealed its role during economic crises and evaluated its relationship with growth. Horisch and Obert (2020) examine the disruption of the “virtuous circle of social capital” during a crisis like the Great Recession and the government’s influence over the stability of social capital in such a

crisis. Casey and Christ (2005) recreate Putnam's index of social capital for 1972-2000 and include the index in models of economic activity, alongside physical capital and human capital. Social capital is not found to significantly affect employment or output, but does impact economic equality and employment stability. Whiteley (2000) finds a highly significant relationship between social capital and economic growth in 34 countries when adding social capital as a factor of production to a neoclassical growth model.

2.2 Existing Index Formulas

Indices measure social capital by combining empirical measures and controlling for differences in units or variability in a way that extracts the common signal of social capital from the inherent noise associated with any cultural or behavioral change. An index quantifies an unobservable concept such as social capital, including its creation and maintenance over time, better than any single measure could due to its complex and holistic nature. Indices are well-defined tools for reducing the underlying movement of many dimensions of social capital into a single dimension (Tantawichet 2006). The calculation of an index can take many forms, beginning with a simple average. The main drawback of any approach that gives equal weight to each indicator, particularly for a time series index, is that indicators with more drastic volatility over time are weighted the same as indicators with a more constant trend, creating a much more volatile index that is harder to interpret. Another common index formula, particularly for indices that have been created in 2020 in response to COVID-19, such as the CNN/Moody's Back to Normal Index, converts input data into percentage changes since a beginning level, such as March 1, 2020, for comparison. The indicators in the Back to Normal Index, including the daily Moody's GDP model, employment, seated restaurant diners, airline travelers, workplace mobility, railroad traffic, unemployment

insurance claims, MBA applications, and business confidence, are then combined at any weight and rescaled for the index to equal 100 when the economy is “back to normal” (Zandi et al. 2020).

The most prevalent method for social capital indices is principal component analysis (PCA), with the first principal component usually serving as the index. The St. Louis Fed’s financial stress index and the New York Fed’s Weekly Economic Index (WEI) also use this method. PCA is based on an empirical analysis of the relationships among variables and trades some accuracy for simplicity in order to make the data easier to analyze. It reduces the number of variables while ensuring the variables are independent of one another. The variables are standardized to be on comparable scales to prevent variables with large variation from dominating. From a covariance matrix, principal components are computed as linear combinations of the variables, all uncorrelated and summarizing most of the information held in the individual variables. The number of principal components equals the number of variables. Although principle components preserve most of the information, individually they have little intuitive meaning as the transformed variables become less interpretable. The first principal component is most important because it captures the largest variance in the data. Although PCA is a common method, its abstraction from the interpretation of each indicator complicates the creation of a dynamic index with factors that may change in interpretation over time. PCA also requires data to be balanced, with each indicator beginning and ending at the same period, in the same frequency, which further reduces the ability to add new indicators over time or include data with varied frequencies.

2.2 Index Methodology and Data Considerations

After considering these other methods and their inabilities to account for indicator volatility, I have chosen the composite index formula that the Conference Board uses to produce the index of

leading economic indicators, and that the Colby Economic Outlook uses to explain and forecast the Maine economy. A similar method was first used by Stock and Watson (1991) to create a composite coincident economic index to summarize the overall “state” of the economy. A coincident index such as this replaces the assumption in PCA that factors are independent over time with a more dynamic specification. The Stock/Watson index relies on a process called Kalman filtering to deal with the variability of a series. It extracts the estimated “common factor” as a dynamic measure of something unobservable, such as the state of the economy or social capital. In the context of social capital, each indicator would be decomposed into an idiosyncratic component unique to that indicator (volatility), and a social capital component, the autoregressive “common factor” (Tantawichet 2006). However, the ideal filter for one indicator or geographic region often cannot be applied across the others.

The Conference Board’s index of leading economic indicators and the Colby Coincident Index preserve the important qualities of the Stock/Watson index in a simpler way than relying on Kalman filtering. Appendix C explains the process in more detail. The composite index acts as a weighted average of indicators, with weights applied to symmetric period-to-period percent changes based on the relative volatility of the indicator’s fluctuations during the time period. These weights can change given swings in volatility and the addition of new indicators over time. After multiplying each indicator by its weight and summing across the indicators for each period, the raw index is calculated as a symmetric percent change of that sum from the previous period. It is finally adjusted to equal 100 in a chosen base period. I chose 2009 as the base period for my index so that it can be interpreted relative to the depth of the financial crisis. Overall, it can create an easy interpretation of the stock of social capital over time that deals with volatility, does not require the data’s time periods to be balanced, and allows indicators to be reported at different frequencies.

After investigating the data reported in U.S. Census Bureau surveys, such as the American Community Survey (ACS), the Current Population Survey (CPS) and its supplements, the American Time Use Survey (ATUS), and County Business Patterns (CBP), each of which provides information on demographics, household characteristics, work status, earnings, education, etc. based on different questions asked at various frequencies and geospatial dimensions, I chose to focus on combining indicators from the ACS 1-year estimates with other indicators independent of Census surveys. The ACS 1-year estimates, published by the U.S. Census Bureau for geographic areas with populations of at least 65,000, reflect the most current data for each calendar year and show year-to-year fluctuations that the 3- and 5-year estimates do not; however, they do sacrifice some accuracy by relying on small samples. Because of the importance of time in this index, the 1-year estimates were preferable. The next section discusses these choices in detail.

2.4 The M. Allen Social Capital (MASC) Index

The MASC index is calculated annually from 2008 to 2019 at the state level in the U.S. The indicators included in the index are measures of social change that could either accelerate or constrain economic growth, highlighting cultural factors that may contribute to GDP growth. My final indicators, shown in Table 1, include the population with health insurance coverage, population with a bachelor's degree or higher, the University of Michigan's Index of Consumer Sentiment, violent crime rate per 100,000, population living in poverty, number of births in the past year to unmarried mothers, and cumulative bankruptcy filings.² When considering ideal indicators of social capital, it can be more intuitive to think in terms of broader themes with a

² This includes Chapter 7, 11, and 13 bankruptcies, with the combination of personal and commercial bankruptcy representing both individual and community outcomes.

positive or negative impact encompassing ideas more tangible than social capital that undoubtedly contribute to it. These ideas could be overall economic well-being (employment, wages and salaries), family life (family size, marital status, divorce rate), demographics (age, race), or community health (religious participation, volunteering, educational attainment, health care, political participation, student debt). Such subcategories thus informed the justifications for including each final indicator, along with achieving a balance between individual and communal characteristics, and considering the explanations used in prior attempts to measure social capital. Availability of data at the state level over this entire time period also heavily influenced my decisions. Some indicators theoretically positively represent social capital through their enhancement of social structures and indication of a productive society. Alternatively, some indicators detract from social ideals, such as the strength of family, social or institutional trust, and economic security. Mathematically, I incorporate these negative indicators as a symmetric decline so that increasing indicators correspond to increasing social capital.

Beginning with the more economy-oriented indicators, I considered the total number of bankruptcies to be an aggregate well-being measure based on actual behavior, representative of personal interactions and relationships in a local economic setting that contribute to the rise and fall of economic institutions in a community. Stronger social networks would consequently be inversely related with the number of bankruptcies in a state, so bankruptcies have a negative impact on the level of a state's social capital as reported in Table 2. I included the University of Michigan's Index of Consumer Sentiment as a complement to bankruptcies, comprising household and national level current attitudes and expectations for the future.³ It is a national index that is also

³ The Index of Consumer Sentiment is based on a five question survey of consumers across the U.S. The questions encompass household's attitudes about their current economic situation relative to a year ago and what they expect in the next year, their economic expectations nationally for the next year and the next five years, and whether now is a good or bad time to purchase durable goods.

calculated regionally by the four Census Bureau regions. Increases in consumer sentiment represent an increase in the self-reported level of well-being in the region, so it factors positively into social capital. While consumer sentiment adds a subjective measure, the population living below the poverty line represents tangible economic conditions within a household and its ability to contribute financially and socially to its community. Individuals and families experience poverty at a personal level with broader consequences perceived to negatively affect a state's endowment and development of social capital.

TABLE 2
INDICATORS OF SOCIAL CAPITAL

Indicator	Geographic level	Contribution to Social Capital	Average Index Weight	Source
Population with Health Insurance Coverage	State	Positive	0.37	American Community Survey 1-Year Estimates (Social Explorer Table A20001)
Population with a Bachelor's Degree or Higher	State	Positive	0.29	American Community Survey 1-Year Estimates (Social Explorer Table A12001)
Index of Consumer Sentiment	Region*	Positive	0.10	University of Michigan Surveys of Consumers
Violent Crimes per 100,000	State	Negative	0.09	FBI Uniform Crime Reporting
Population Living in Poverty	State	Negative	0.08	American Community Survey 1-Year Estimates (Table B06012)
Births to Unmarried Mothers	State	Negative	0.04	American Community Survey 1-Year Estimates (Table B13002)
Cumulative Bankruptcy Filings	State	Negative	0.04	American Bankruptcy Institute

*Northeast, Midwest, South, and West

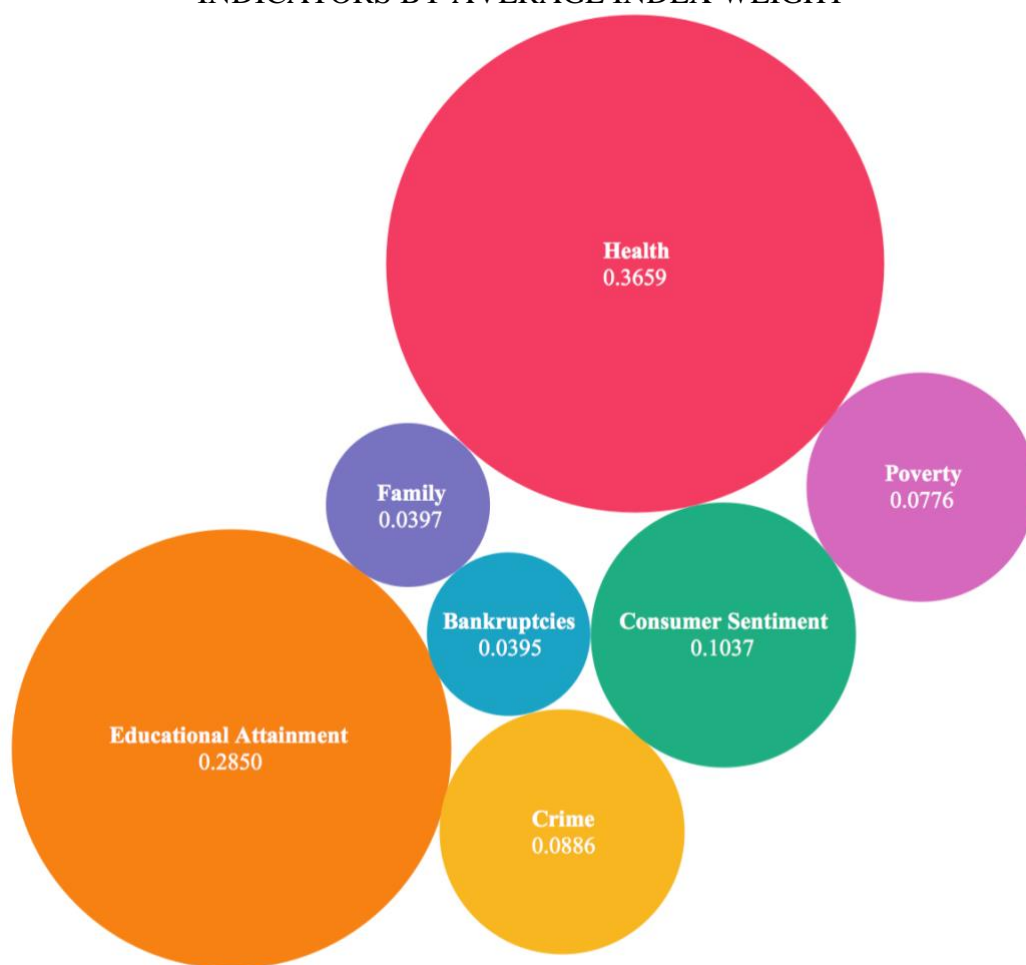
I borrowed my ideas of family unity and collective efficacy from the Senate JEC's index (2018). First, family is an integral social factor in explaining economic outcomes, even at a macro level. The births to unmarried mothers statistic was consistently reported in the ACS and

potentially captures more state-by-state variation when compared to alternatives, such as marriage statistics. The Senate's social capital report (2018) also notes a high correlation between this statistic and other family characteristics. The number of births to single mothers each year could have a significant impact on the productive capacity of a community, and could have implications for a child's development and his/her future contributions to society. The Senate index also incorporated the violent crime rate, which was a proxy for "collective efficacy," explaining how the safety of a community can enhance or restrict community members' ability to work together towards the improvement of social and economic outcomes. The JEC uses violent crimes because they are reported better than general crimes. While violent crime is a measure of safety and social order, I would also consider it to be motivated by a lack of social and possibly institutional trust which is not well represented by the other indicators yet is a fundamental component in the development of social capital. Messner et al. (2004) describe how trust is a prerequisite for the establishment of formal and informal social networks; without trust, strong norms are harder to form, and destructive behaviors are more likely to emerge, particularly among youth. Thus, crime reflects a shortage of these positive attributes and the obstacles to attaining higher social capital.

Two more beneficial contributions to social capital that operate primarily at the individual level with broader implications are educational attainment and health. While educational attainment, here measured by those who have obtained a bachelor's degree or higher, is often a measure of human capital, I incorporated it in social capital because of Rupasingha et al.'s (2006) conclusion that those with higher education better understand the benefits of social networks. More educated individuals may be more compelled to participate more widely in their community, and, through their education and returns to such education, may be better able to make productive contributions in different dimensions of society. Finally, I chose the health insurance coverage

metric in particular as an interesting focus over this time period during which the Affordable Care Act was passed. Health is a critical measure of an individual's well-being, determining our physical and mental capacity for contributing to society. Higher participation in the health care market could indicate greater economic and institutional stability, while allowing households to minimize concerns over personal health shocks.

FIGURE 2
INDICATORS BY AVERAGE INDEX WEIGHT



I combined these seven indicators into an index using the process defined in Section 2.3. The size of each bubble in Figure 2 reflects the average index weight reported in Table 2. This value represents the average contribution of each indicator to the index across all 50 states, with greater weight assigned to indicators with relatively low volatility during the period of interest. On

average, health insurance coverage has inherently low volatility given its consistent upward trend, and educational attainment was less volatile than health insurance coverage in some states. On the other hand, bankruptcies were heavily impacted during the 2008-2011 business cycle, and births to unmarried mothers do not exhibit any trend in many states and often fluctuate significantly. These indicators inherit much smaller weights as a result of the index formula, as it attempts to extract stronger trends from noise. Regardless, as explained above, each of these indicators is driving some intuitive dimension of social capital, either positively or negatively.

Before discussing the results of this index, I should acknowledge the potential weaknesses of this measure. It is a strong representation of the definition of social capital presented, especially given the time and space dimensions I deemed essential for determining what it means over time and why it matters. These dimensions make the index capable of explaining annual economic growth during this period. Nevertheless, these necessary characteristics imposed several limitations that measures of community health at a moment in time or at a broader geographic level would not suffer from. While I wanted to use the CPS Volunteering and Civic Life and Civic Engagement Supplements to capture elements of community interaction, the infrequent nature of individual questions and inconsistent availability of responses across small geographic levels complicated their use. These civic engagement components would better encapsulate type, quantity, and quality of interactions in communities than the indicators I have used. The index also lacks a direct measure of confidence in institutions. This is an aspect of social capital that has been in decline over time, but it is not reported for states and must be substituted by things like crime and consumer sentiment. Additionally, I had hoped to include data from social media or Google Trends to reflect the rise in technology use that has defined the period since 2008 by reimagining how we are able to interact. My exploration of Google Trends data revealed that subindices of

groups of search terms could be so volatile that they would obtain insignificant weights in the chosen index formula, so I proceeded with the more traditional survey-based indicators. With the seven final indicators available annually at the state level, I was able to establish a sufficient historical period for this analysis with the immediate intention of applying a rather micro level concept to enhance our macro perspective of how different states have recovered from the Great Recession. While it is not a perfect measure of social capital, it has achieved appropriate proxies worthy of being explored further in an empirical analysis to consider the extent to which it helps determine economic outcomes and well-being.

2.5 Index Results: The Evolution of State-Level Social Capital

To consider how social capital could strengthen our understanding of the economy since 2008, I will rely on the underlying details behind Figure 3, which shows the evolution of the index by state and region, and Figure 4, which shows snapshots of social capital across the country in 2008, 2012, 2016, and 2019. What follows is an in-depth description of the MASC index overtime, followed by some broader conclusions.

The index is based to 100 for each state in 2009, as shown by the constant color in Figure 3. Thus, we are able to see minor differences across states prior to the crisis, followed by varied recoveries that significantly diverge beginning in about 2013 through 2019. In 2009, the U.S. experienced the depth of the recession across industries, so with the proposed correlation between social capital and GDP, we might expect the index to be above 100 in 2008, fall in 2009, and begin to pick up again slowly before more rapid growth returned and was sustained until 2020, with the rates of growth varying across regions and among states within regions. In 2008, the average social capital index was 100.04, with a minimum of 97.58 in Louisiana and a maximum of 102.17 in

Kansas. Social capital declined in 24 states between 2008 and 2009, mirroring the effects of the financial crisis, while the remaining 26 states experienced an increase in social capital in 2009, propelling them into and perhaps through the recession. Change in social capital between 2008 and 2009 is not a clear regional story, with states evenly split between growth and decline. For example, much of the northeast skews toward growth into 2009, exhibiting a deeper red in 2008 particularly in New York, Pennsylvania, and Maine, while others including Kansas, West Virginia, New Hampshire, and Iowa begin a brighter red than the 2009 baseline in Figure 3.

Progressing into 2010, the range of social capital values expands compared to pre-recession, spanning from 96.92 in Rhode Island (a 3.08 point decline from 2009) to 105.40 in Nevada (a 5.4 point increase from 2009). With average social capital of 101.47, only five states fell below or stayed at the 100 value in 2010; Rhode Island was the only state to fall by more than 0.45. On the upper end, Montana and Alabama were not too far behind Nevada, all three of which did fall between 2008 and 2009. Each experienced noticeable increases in the number of people with at least a bachelor's degree in 2010, having a strong positive effect on the index given the relatively high weight of educational attainment. The midwest and west appear the "brightest" in 2010, with the south and northeast experiencing more consistent dark spots that persist through a majority of this period. Rhode Island (97.98) and Maine (99.96) are the only states remaining below the 100 base value in 2011, and all northeastern states with the exception of Vermont are below the national average in 2011. The Northeast possessed the lowest index of consumer sentiment in 2011 and 2012, reflecting collective concern in the region about the way forward, along with an increase in violent crime rates and births to unmarried mothers unmatched by most of the country. This could indicate declining trust and family strength corresponding to economic uncertainty. Rhode Island retains the minimum social capital until Maine replaces it in 2014, still

at only 106.75. The less than optimal level of social capital in Maine through 2015 can potentially help explain why Maine tends to recover slowly from recessions.

In 2011, North Dakota and Louisiana also stand out on the low end. Some states in the years after the recession seem to have experienced subsequent social dislocation, with social capital falling slightly in some states, including Alabama. On the other hand, Virginia and Texas stand out as having considerable growth in social capital between 2010 and 2011, with Texas rising over three points, reflecting the largest rise in health insurance coverage in the country in 2011. Virginia rose nearly four points, likely related to the largest decline in the poverty rate. This growth continues steadily for Virginia through 2014, with another year of five point growth, driven by the largest drop in both the poverty rate and births to unmarried mothers. This is followed by a three point collapse in 2016, when Virginia experiences the largest increase in the poverty rate and births to unmarried mothers, and a decline in educational attainment and health insurance coverage. After a few years of slower growth, another decline comes in 2019, leaving Virginia with the second lowest social capital at the end of the period. Thus, Virginia's relatively quick growth in social capital is not well sustained through more recent years, with the weakening of social factors occurring through nearly every dimension, potentially leaving the state in a less than optimal position for the challenges of the COVID-19 pandemic.

Figure 4 shows Nevada and Texas standing out at the upper end in 2012, as Texas rose nearly four points into 2012 and over four into 2013. The states start to truly diverge in 2013, when the south and some states in the middle of the country and west surge; most southern and western states rise above the national average. While Nevada remains the maximum at 113.53 (nearly as high as Wisconsin in 2019), Wyoming increases over five and a half points to 110.99, with the most significant increase in both educational attainment and health insurance coverage, and second

highest reduction in poverty. North and South Carolina and Hawaii rise over four points, and Nebraska rises almost four points. The gap between the maximum and minimum continues to widen in 2014; however, both increase over four points from 2013, representing a year of strong growth at both poles, indicative of country-wide trends. Nevada remains on top, and Maine still lags behind despite a three point increase over 2013. The West experiences vast growth in 2014, some of which can be attributed to a widespread increase in health insurance coverage and decreasing bankruptcies; Arizona, California, Colorado, and Washington all exhibit growth over four points, beginning their tracks toward the much higher end of social capital in the country.

Social capital continues to rise nationwide, with the pronounced split between east and west, evident in Figure 4, persisting. The states that turn blue in Figure 3 in 2015 maintain the highest social capital through 2019. While Nevada falls behind, Florida takes over and remains highest, with Texas, North Carolina, and South Carolina closely following. Florida experiences the largest drop in bankruptcies in 2016, as well as a considerable reduction in the violent crime rate. Its growth is largest in 2017, increasing social capital by over five points to 130.63, at which point it is already well ahead of most of the country's 2019 social capital, ultimately reaching 137.33. Texas' index similarly increases by nearly five points in 2017 to 128.45, securing its place behind Florida for the rest of the period. Both of these trends are supported by the significant increase in the index of consumer sentiment in the south in 2017. While that increase is likely a reflection of many factors, including political ones following 2016, it could also partially incorporate the population influx into these states. Because the index is calculated largely based on raw population numbers rather than shares of the population, some of the strongest growth in social capital can be attributed to population growth. This is a positive characteristic of the index

given that this movement itself can reveal aspects of the higher social capital and greater economic opportunities and well-being available in these states.

While growth in 2016 remained strong, with social capital rising by around three points on average, it then starts to slow in many states. This is consistent with concern among economists at the very end of the decade about the recovery beginning to slow, and the slowing down of social capital growth could help explain this trend. Wisconsin has the lowest index in 2017 and again in 2019, decreasing with a reduction in educational attainment of nearly four percent, while Alaska also lags behind, stagnant between 2016 and 2018 with very minimal changes in nearly every indicator. 2018 is a year with a lot of approximately one point increases in social capital, with multiple states, including Hawaii, Arizona, Idaho, Montana, Nevada, Massachusetts, Connecticut, Pennsylvania, and New York hardly changing and even a slight decline in Kansas given a significant rise in crime. Additionally, what had been a steady increase in the range of social capital across the country becomes more substantial from a difference of 14 in 2016 to 20 in 2017, before finally widening further to 24 in 2019, making the regional gap in social capital development more prominent. The entire northeast is below average social capital in 2017, with most of the south and farthest west states in the top half. The index of consumer sentiment then declines in the northeast in 2018, preempting a national decrease in 2019. By 2019, almost the entire north with the exception New Hampshire and Washington remains below average, along with the southern states bordering Texas. The states in an orange or very pale shade in 2019 of Figure 4 either started out slow, rarely experiencing increases in social capital comparable to others, or perhaps even saw a reduction in social capital during certain years. Meanwhile, the states in the deepest blue did not emerge as leaders until more drastic changes started occurring across the country in 2013.

States experiencing more noticeable social capital gains, such as Nevada with its high bankruptcies and high crime rates, may have started the period with considerably low social capital and had more room to grow, resulting in a higher index over time relative to the initial conditions. Alternatively, states mainly on the east coast may not have seen the same growth in social capital if their social capital was already high prior to the crisis, with relatively higher rates of health insurance coverage and educational attainment that make up a majority of many states' indices. The consistent increase in these larger indicators nationwide explains the general upward trends, with the intuitively positive components ultimately mattering more in the direction of social capital due to less fluctuation. When a state's social capital did decline in a certain year, this was likely due to multiple considerably large negative changes occurring simultaneously. Despite Putnam's (2000) original argument that social capital is on the decline in America, this new measurement, that encompasses proxies for many of the fundamental aspects of social capital, finds evidence for increasing social capital and a strengthening of investment in individuals and relationships that could improve our ability to adapt to and recover from past and future economic shocks.

Overall, while the index does not represent differences in well-being across states at a point in time, the figures do importantly depict the relative improvement of social capital across the country since 2008. They most importantly show the heterogeneity in the way that different states experience social capital, which confirms that social capital should be measured at a level smaller than national, and translates well into accounting for economic growth and illustrating why social capital matters. The next section will examine the extent to which the development of social capital since the financial crisis, particularly the differences in social capital growth during this period, can contribute to our knowledge of the evolution of each state's economy.

FIGURE 3
SOCIAL CAPITAL HEAT MAP

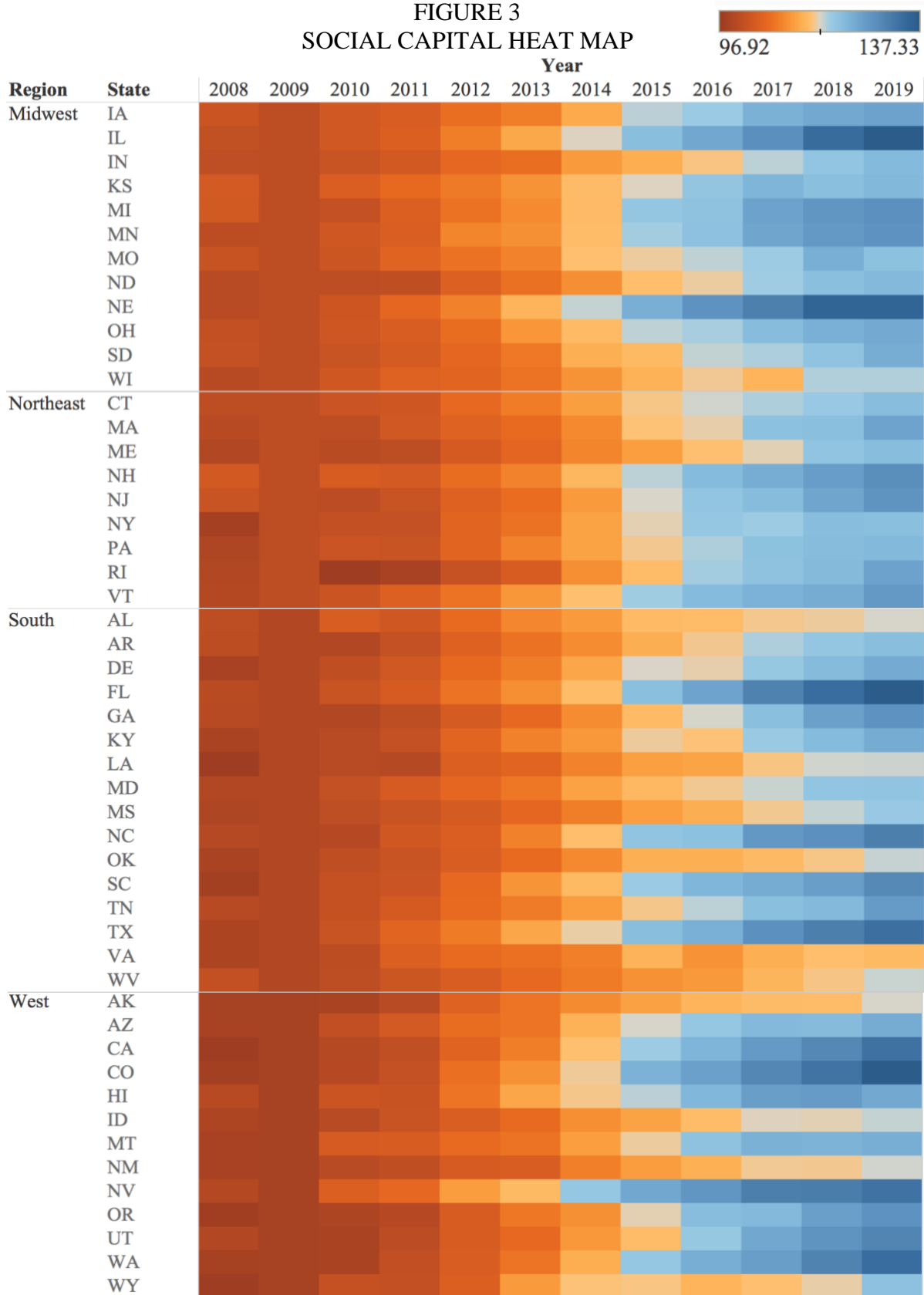
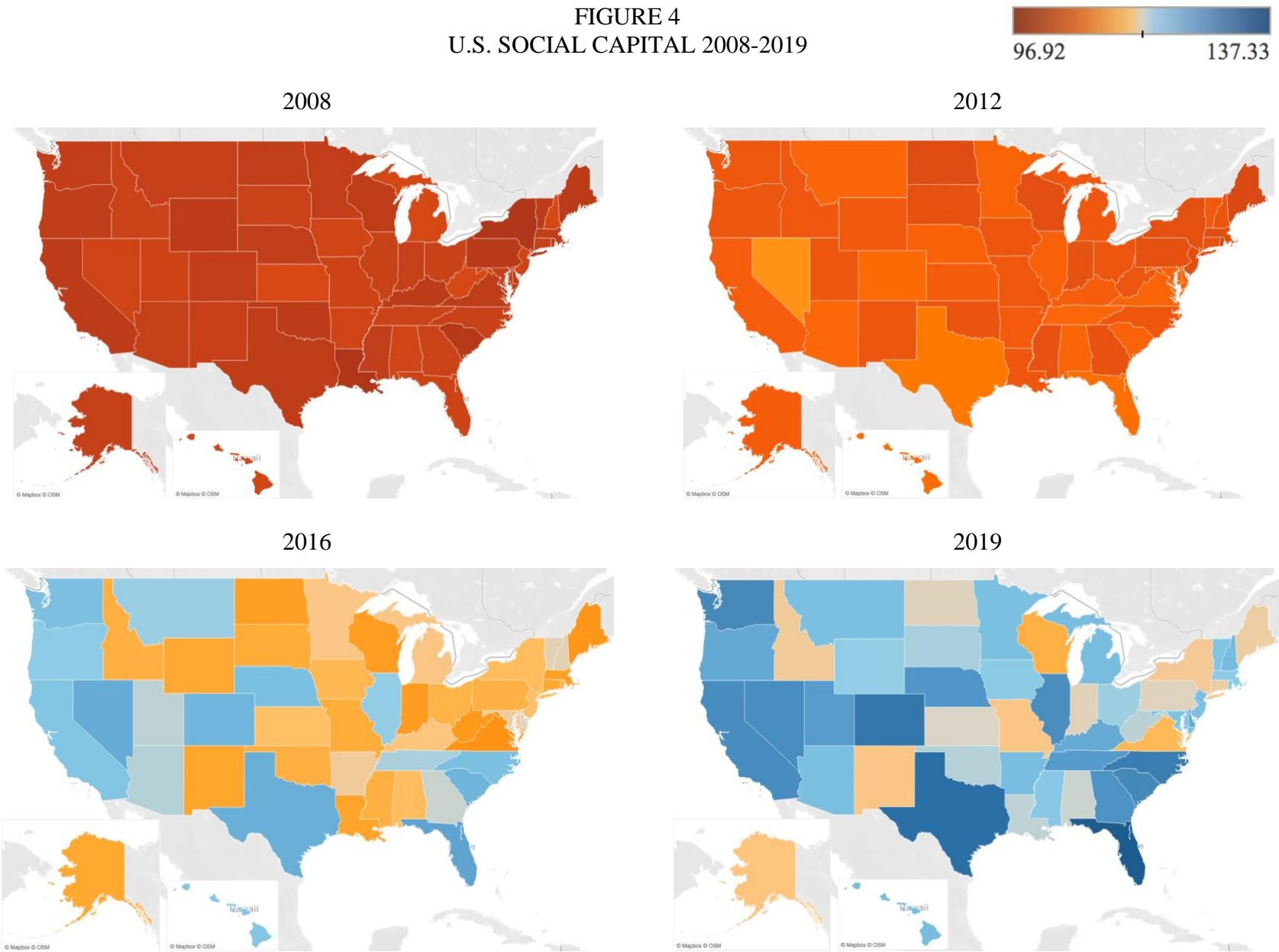


FIGURE 4
U.S. SOCIAL CAPITAL 2008-2019



3 Social Capital and Economic Growth

3.1 Introduction to Growth Accounting

Developing an index of social capital allows for the investigation of its role in explaining variations in output across states in the years since the Great Recession. The measurement of social capital in a state during a particular year becomes even more critical if it can be understood to contribute to the state's economic outcomes, improving traditional models of economic growth and welfare. Beyond validation of the index itself as an accurate measure of social capital that could be well-accepted as a time series approach to this increasingly important topic, the significant integration of the index in growth accounting frameworks should further validate the perceived importance of social capital and the necessity of measuring it for use in quantitative analysis such as explaining past and future state level growth.

The years following the Great Recession marked a period of strong, consistent economic growth in the U.S. Growth accounting, which was first explored by Abramovitz (1956) and Solow (1957), provides a method for determining how much of the growth that we have experienced can be attributed to each factor of production, or to other forces. Given that I have attempted to measure social capital, I can consider its role as a factor of production or as a component of those unmeasurable forces driving productivity. Previous work, most famously by Mankiw et al. (1992), has considered how measures like human capital contribute to the production function using different growth accounting methods, finding support for the theoretical association between education and GDP. Beyond the returns to human capital, Mankiw et al., Klenow and Rodriguez-Clare (1997), and Hall and Jones (1999) also contribute to the literature surrounding growth accounting that focuses on a cross-country analysis of long-term productivity; growth accounts are meant to be descriptive and not causal by definition, but they are valuable for comparing economic

performance across locations. Because I believe social capital is a mechanism that operates at a level much smaller than national, and have created an index that highlights its existence within U.S. state boundaries, my analysis focuses on the integration of social factors in explanations of state level real GDP and real GDP growth, in addition to physical capital and labor. Literature on state level growth accounting is incredibly sparse, but the nature of social capital justifies and necessitates this methodology that emphasizes differences across states. This empirical exercise extends the idea of social capital as an impactful measure of well-being, quantifying its impact on how productive we can be as a society.

3.2 Data

The panel data used for this analysis, apart from the social capital index, were obtained primarily from the U.S. Bureau of Economic Analysis (BEA) for the years 2008 to 2019. This includes annual real GDP by state in chained 2012 dollars and total annual employment by state. The BEA does not report measures of the capital stock at the state level, so I used the procedure developed by Garofalo and Yamarik (2002) to obtain state-by-state capital stock. Mine varies slightly since it is based in the period after the Census Bureau implemented the North American Industry Classification System (NAICS). State capital stock is calculated using the following equations:

$$k_{ij}(t) = \left[\frac{y_{ij}(t)}{Y_i(t)} \right] K_i(t)$$

$$k_j(t) = \sum_{i=1}^{19} k_{ij}(t),$$

where i refers to the two-digit NAICS industry ($i = 1, \dots, 19$) and j represents the state ($j = 1, \dots, 50$). The lowercase letters represent values for state j , and the uppercase letters represent national values for industry i . First, I calculate the share of national real GDP made up by each state's real

GDP in each of the 19 two-digit NAICS industries.⁴ Each share is multiplied by the national capital stock in each industry, which is a chain-type quantity index of the net stock of private fixed assets reported by the BEA. State capital stock is then the sum of these 19 sector estimates.⁵ The two approaches follow from these measures of output, labor, physical capital, and social capital.

The following procedure incorporates two separate models: a production function approach that estimates the relative contribution of social capital as a factor of production, and a Solow residual analysis that considers whether social capital could be a significant component of total factor productivity (TFP) in a growth accounting framework. Both models reflect well-established empirical applications of output determination that try to include all the measurable aspects of output or economic growth, with the goal of determining whether social capital has a significant role in explaining the unexplained portion of output or output growth that cannot be accounted for by state level capital or employment, or by the growth in these factors.

3.3 Social Capital as a Factor of Production

3.3.1 Methodology

This model, whose results are reported in Table 4, first assumes a standard Cobb-Douglas production function,

$$Y_{j,t} = AK_{j,t}^{\alpha}L_{j,t}^{\beta} \quad (1)$$

⁴ The 19 sectors with their codes are agriculture, forestry, fishing and hunting (11); mining, quarrying, and oil and gas extraction (21); utilities (22); construction (23); manufacturing (31-33); wholesale trade (42); retail trade (44-45); transportation and warehousing (48-49); information (51); finance and insurance (52); real estate and rental and leasing (53); professional, scientific, and technical services (54); management of companies and enterprises (55); administrative and support and waste management and remediation services (56); educational services (61); health care and social assistance (62); arts, entertainment, and recreation (71); accommodation and food services (72); other services (except government and government enterprises (81).

⁵ This “procedure assumes that the output-to-capital ratio within each industry is the same across U.S. states. This assumption implies that each industry is in a common steady state” (Garofalo and Yamarik, 2012).

representing output (Y) as a function of productivity (A), physical capital (K), and labor (L) at time t in state j . After taking logs of the production function, I conduct a panel estimation of the returns to physical capital and labor, with and without state fixed effects (Π_j):

$$\log(Y_{j,t}) = \theta + \alpha \log(K_{j,t}) + \beta \log(L_{j,t}) + \varepsilon_{j,t} \quad (2.1)$$

$$\log(Y_{j,t}) = \theta + \alpha \log(K_{j,t}) + \beta \log(L_{j,t}) + \Pi_j + \varepsilon_{j,t}. \quad (2.2)$$

The goal of this model is to show the contribution of social capital to production, so integrating the social capital index in the production function with a return of γ yields the new equation

$$Y_{j,t} = AK_{j,t}^\alpha S_{j,t}^\gamma L_{j,t}^\beta, \quad (3)$$

with S representing social capital.⁶ Thus, I estimate the following equations:

$$\log(Y_{j,t}) = \theta + \alpha \log(K_{j,t}) + \gamma \log(S_{j,t}) + \beta \log(L_{j,t}) + \varepsilon_{j,t} \quad (4.1)$$

$$\log(Y_{j,t}) = \theta + \alpha \log(K_{j,t}) + \gamma \log(S_{j,t}) + \beta \log(L_{j,t}) + \Pi_j + \varepsilon_{j,t} \quad (4.2)$$

to determine the magnitude and significance of γ , anticipating a positive effect of social and cultural attributes on economic activity, and can compare the goodness of fit of the regression when considering social factors. Adding social capital further decomposes differences in output across states beyond the traditional factors of production, with the state fixed effects controlling for heterogeneity across states that does not vary over time. The heterogeneity in Figures 3 and 4 provide rationale for the state fixed effects, as states are experiencing social capital differently.

⁶ These production functions do not assume constant returns to scale, as the model does not empirically exhibit constant returns to scale, and imposing the constant returns to scale restriction forces the parameter estimate for social capital to be negative. This could be due to the state rather than national level nature of the analysis, and the resulting estimation of both physical capital and social capital. The constant returns to scale assumption may not fit well in this model because of its implications for the application of social capital; social capital is an aspect of well-being that goes beyond individuals, incorporating innovation in communities and integrating institutions and firms, unable to be applied just to units of labor as human capital is.

3.3.2 Results

This section focuses on the results reported in Table 3, which establishes how well the traditional factors of production explain differences in output across states since 2008 before considering the additional explanatory power contributed by social capital. Estimating Equation 2.1, a one percent increase in capital corresponds to a 0.672 percent increase in output, while a one percent increase in labor corresponds to a 0.386 percent increase in output, all else fixed. Both coefficients are statistically significant at the one percent level in a two-tailed test. This regression does not exhibit constant returns to scale as might be expected, and capital seems to have a larger role than labor in explaining variations in output across states. With state fixed effects, the coefficients remain positive and statistically significant, with returns to physical capital and labor of .592 percent and .614 percent, respectively. Now estimating Equation 4.1, including the contributions of social capital accumulation without state fixed effects, social capital has a coefficient of 0.072 with a p-value of 0.046 in a one-tailed test. More importantly, adding state fixed effects to account for the unmeasured, unchanging characteristics of a state that determine its level of real GDP, I find that a one percent increase in social capital corresponds to a 0.138 percent increase in state real GDP, *ceteris paribus*, significant at the one percent level with the anticipated positive sign. This result does not significantly change the returns to physical capital but reduces the returns to labor relative to the fixed effects estimate in Specification 2, from 0.614 to 0.424 percent.

While incorporating social capital in the production function minimally increases the adjusted R^2 statistic in the fixed effects specifications, from 0.933 to 0.938, social capital is a theoretically and empirically significant factor helping to explain real GDP at the state level. Without it, the returns to labor were potentially overestimated in Specification 2 from attributing the positive effects of social capital to labor, and were consequently revised down with the

inclusion of social capital. The magnitude of the returns is not as large as for physical capital or labor, but the significance of social capital nonetheless confirms the hypothesis that social and cultural factors, approximated by this index, have an important role in economic outcomes following the financial crisis, as measured by GDP.

TABLE 3
MODEL 1 COEFFICIENT ESTIMATES

VARIABLES	(1) Eq. 2.1	(2) Eq. 2.2	(3) Eq. 4.1	(4) Eq. 4.2
Constant	18.36*** (0.204)	15.12*** (0.316)	18.03*** (0.282)	17.23*** (0.440)
log(K _{j,t})	0.672*** (0.0175)	0.592*** (0.0183)	0.671*** (0.0175)	0.601*** (0.0177)
log(L _{j,t})	0.376*** (0.0176)	0.614*** (0.0246)	0.376*** (0.0176)	0.424*** (0.0372)
log(S _{j,t})			0.0720* (0.0427)	0.138*** (0.0208)
Observations	600	600	600	600
Adjusted R ²	0.994	0.933	0.994	0.938
Number of State FE		50		50

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

3.4 Social Capital and TFP

3.4.1 Methodology

The second model again assumes the Cobb-Douglas production function from Equation 1 but extends the transformation to the difference of logs, such that growth in GDP is a function of the growth rates of its components, labor and capital, plus the Solow residual understood as productivity growth or technology:

$$\Delta \log(Y_{j,t}) = \theta + \alpha_K \Delta \log(K_{j,t}) + \alpha_L \Delta \log(L_{j,t}) + R_{j,t} \quad (5.1)$$

I also estimate Equation 5.1 with state fixed effects:

$$\Delta \log(Y_{j,t}) = \theta + \alpha_K \Delta \log(K_{j,t}) + \alpha_L \Delta \log(L_{j,t}) + \Pi_j + R_{j,t} \quad (5.2)$$

The residual, $R_{j,t}$, includes the unmeasured technology component that remains after growth in the factors of production is accounted for. It is an estimate of the unexplained variation in output, and because I have created a reasonable measure of social capital, the previously unmeasured effects of social capital can be pulled out of this residual to analyze the role of social capital independent of technology while re-estimating the technology effect. Thus, I include social capital in Equations 6.1 and 6.2 to decompose the Solow residual and examine whether social capital contributes to this unexplained variation:

$$\Delta \log(Y_{j,t}) = \theta + \alpha_K \Delta \log(K_{j,t}) + \alpha_S \Delta \log(S_{j,t}) + \alpha_L \Delta \log(L_{j,t}) + Z_{j,t} \quad (6.1)$$

$$\Delta \log(Y_{j,t}) = \theta + \alpha_K \Delta \log(K_{j,t}) + \alpha_S \Delta \log(S_{j,t}) + \alpha_L \Delta \log(L_{j,t}) + \Pi_j + Z_{j,t}. \quad (6.2)$$

3.4.2 Results

The results reported in Table 4 show estimates of the equations from the previous section to consider the role of the index of social capital as it contributes to an alternate estimate of TFP. Beginning with Equation 5.1, without social capital and without state fixed effects, the coefficients for the rates of growth of physical capital and labor are positive and statistically significant as anticipated, with labor inheriting a larger coefficient of 0.695. These coefficients remain significant when adding the state fixed effects in Equation 5.2, with the capital estimate revising slightly downward from 0.463 to 0.449, and the labor estimate revising upward minimally.

Now adding social capital without fixed effects, it has a positive coefficient, significant at the five percent level, such that a percent increase in social capital growth corresponds to a 0.12 percent increase in state real GDP growth, *ceteris paribus*. This result leaves the capital coefficient the same, but reduces the labor coefficient by 0.044. The adjusted R^2 increases from 0.69 to 0.693 with the addition of social capital. In the fixed effects model, the social capital coefficient becomes

significant at the one percent level with an even greater coefficient, corresponding to a 0.14 percent increase in state real GDP growth. The physical capital coefficient again does not change, and the labor coefficient is reduced by 0.052 to 0.663. The adjusted R^2 rises from 0.672 to 0.677. These statistically significant results demonstrate that, for all the reasons social capital can be deemed important as a combination of the social norms and relationships that enhance economic potential in a community, social capital impacts growth independent of technology. This growth accounting procedure attempts to attribute unexplained variations in output to social capital and ultimately proves that social capital, to the extent that it can be adequately measured, should not remain undefined within TFP. Although the imperfections of the social capital measurement are now left in the residual, this integration of social capital into a traditional growth framework verifies its consequential role in economic growth between 2008 and 2019.

TABLE 4
MODEL 2 COEFFICIENT ESTIMATES

VARIABLES	(1) Eq. 5.1	(2) Eq. 5.2	(3) Eq. 6.1	(4) Eq. 6.2
Constant	0.00194*** (0.000684)	0.00194*** (0.000703)	0.000268 (0.000965)	- (0.00100)
$\Delta \log(K_{j,t})$	0.463*** (0.0229)	0.449*** (0.0248)	0.463*** (0.0228)	0.449*** (0.0246)
$\Delta \log(L_{j,t})$	0.695*** (0.0382)	0.715*** (0.0399)	0.651*** (0.0421)	0.663*** (0.0434)
$\Delta \log(S_{j,t})$			0.116** (0.0475)	0.143*** (0.0493)
Observations	600	600	600	600
Adjusted R^2	0.690	0.672	0.693	0.677
Number of State FE		50		50

Standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

4 Conclusion

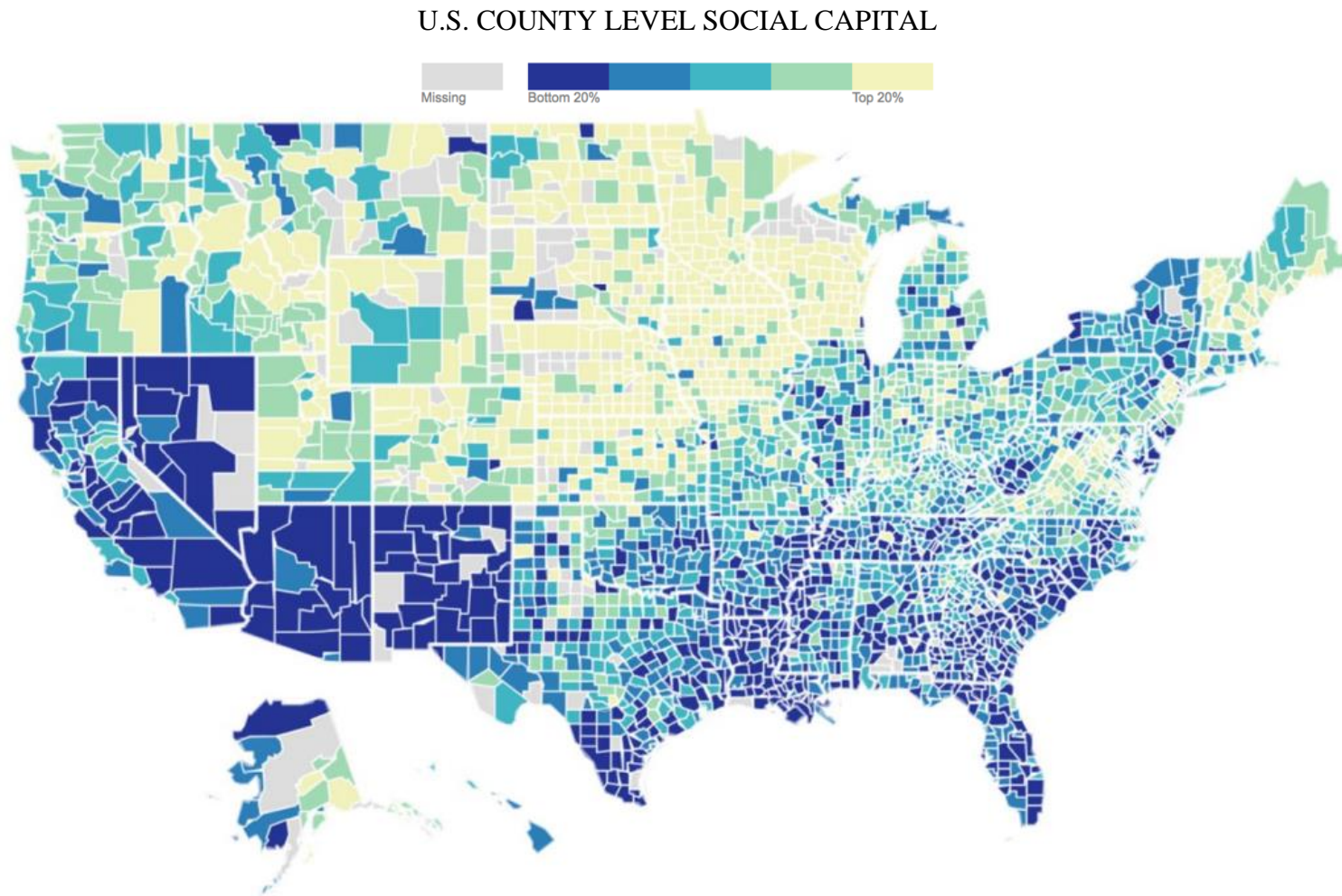
This paper begins by considering the importance of social capital in American communities in the twenty-first century, during a period of unprecedented economic growth between two major recessions. Social capital has been hypothesized to contribute to economic growth and development, as social and cultural factors determine the environment in which economic interactions take place, building a marketplace of ideas for advancing society, made stronger by individuals' investments in themselves and their communities. The MASC index is an appropriate measure for empirically analyzing the contributions of these social factors to our economic well-being over time. Calculated based on seven indicators theorized to contribute either positively or negatively to the development of empowered individuals and strong communal ties, it illustrates the relative improvements in social capital in states across the country. Between 2008 and 2019, western states generally exhibit greater social capital based on the annual growth and decline of its indicators, while the northeast lagged behind as a whole. Regardless, increases in social capital nationally could be a reason for the strong growth that characterizes this period. Social capital is a significant factor in the production function independent of labor and physical capital. Additionally, some of the unexplained variation in state real GDP growth, traditionally ascribed to productivity growth, can be attributed to growth in social capital, justifying its use in growth accounts. These significant results thus encourage continued measurement of social capital to enable the examination of its role in future growth beyond 2019.

Much of the interesting data produced today did not exist even 18 months ago, and as the availability of data on our social interactions increases, the accuracy of social capital measures should also improve by relying on measures of actual human behavior rather than information self-reported in government surveys. The importance of social capital for growth in the last 12 years

could additionally have implications for the recovery from the COVID-19 recession, a period that has redefined social interaction and potentially the makeup and trajectory of the economy. The modern workplace has been transformed, allowing for the ease of virtual meetings and remote work that may strengthen family life while restricting the productive benefits of in-person communication. The MASC index, by depicting patterns of social capital improvement prior to the pandemic, establishes a baseline level of social capital for contemplating social preparedness for the subsequent social and economic dislocation. Furthermore, the regression results that ultimately validate the role of social capital in the production function and in growth accounts may necessitate policies that support social capital development at the state level, not only to assist the recovery, but also to prepare for the next crisis.

5 Appendix

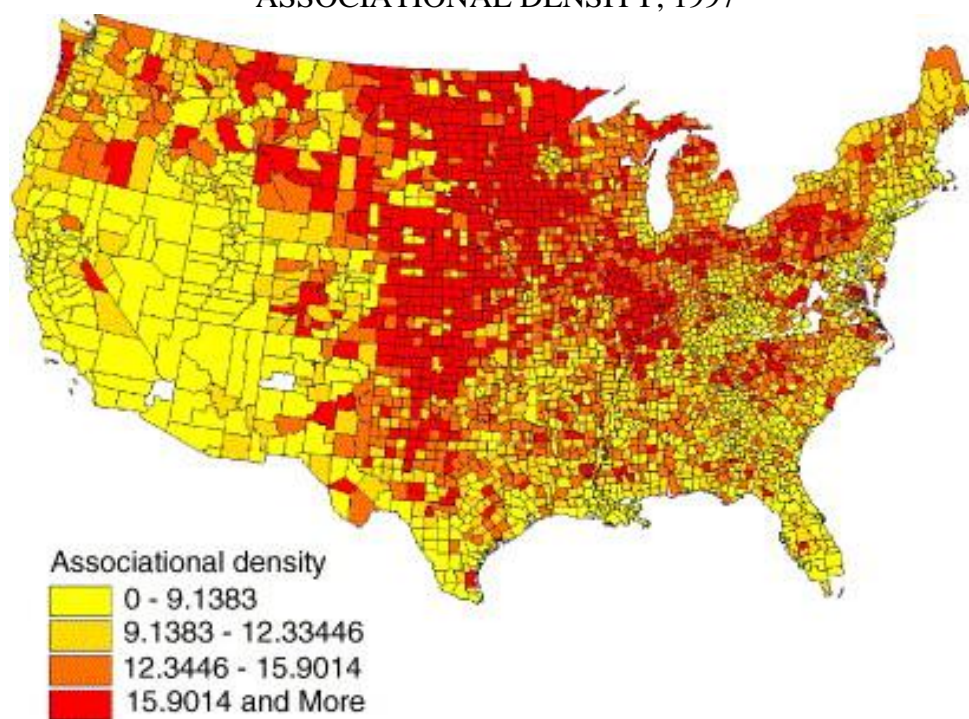
Appendix A



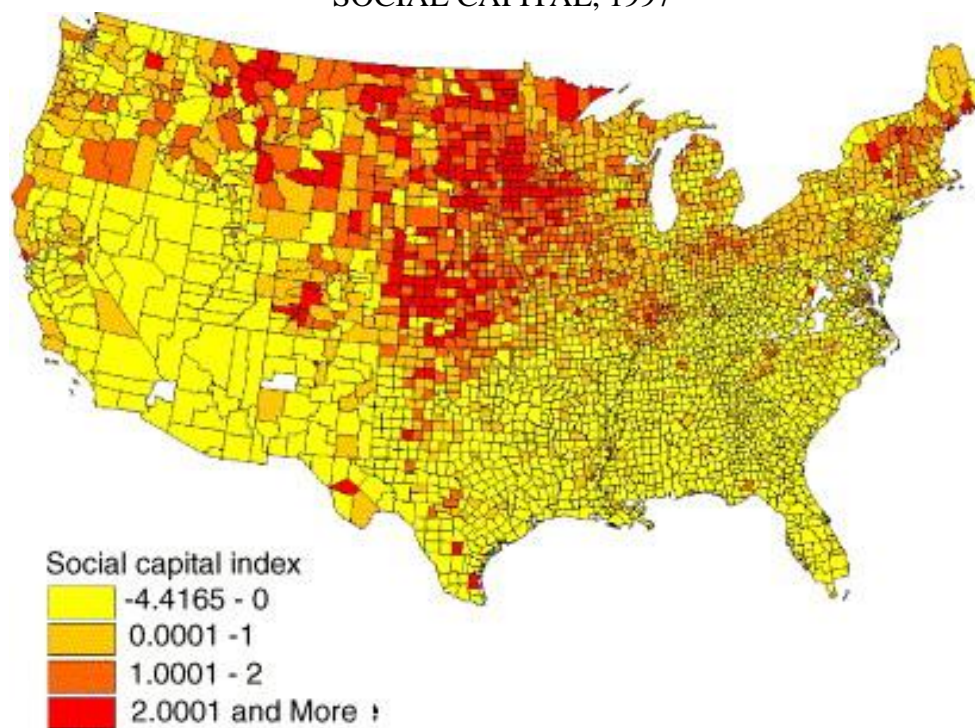
Source: U.S. Congress 2018, pp. 24

Appendix B

ASSOCIATIONAL DENSITY, 1997



SOCIAL CAPITAL, 1997



Source: Rupasingha et al. 2006, pp. 89-90

Appendix C

Step-by-Step Composite Index Calculation (“Calculating the Composite Indexes.”)

1. Compute period-to-period changes for each indicator
 - a. $x_t = 200 * (X_t - X_{t-1}) / (X_t + X_{t-1})$
 - i. Multiply by -200 for the negatively contributing indicators
 - ii. Use a simple difference for the index of consumer sentiment
2. Adjust monthly contributions to equalize indicator volatility
 - a. Calculate standard deviation of each indicator, with the inverse of the standard deviation representing the indicator’s volatility
 - b. Sum volatilities
 - c. The weight of the indicator in the index is the volatility of each indicator divided by the sum of the volatilities
3. Calculate period-to-period growth rate of the index
 - a. Multiply weights determined in step (2) by the adjusted values from step (1) and sum across each indicator for each period (sum = C_t)
4. Calculate level of the index with symmetric percent change formula
 - a. First period’s value = 100
 - b. $I_t = I_{t-1} * (200 + C_t) / (200 - C_t)$
5. Rebase the index to equal 100 in the base period (2009)
 - a. Divide each period’s raw index value from step (4) by the chosen base period and multiply by 100
 - i. Interpreted in comparison to the 100 average value in the base period

6 References

Abramovitz, Moses. 1956. "Resource and Output Trends in the United States since 1870."

American Economic Review 46: 5-23.

Alesina, Alberto, and Eliana La Ferrara. 2000. "Participation in Heterogeneous

Communities." *Quarterly Journal of Economics* 115 (3): 847–904.

<https://doi.org/10.1162/003355300554935>.

American Bankruptcy Institute. *State and District Bankruptcy Statistics*.

Arrow, Kenneth J. 1972. "Gifts and Exchanges." *Philosophy and Public Affairs* 1 (4): 343-62.

Borgonovi, Francesca, and Elodie Andrieu. 2020. "Bowling Together by Bowling Alone: Social Capital and COVID-19." *Covid Economics* 17: 73-96.

"Calculating the Composite Indexes." n.d. The Conference Board. Accessed November 1, 2020.

<https://www.conference-board.org/data/bci/index.cfm?id=2154>.

Casey, Terrence, and Kevin Christ. 2005. "Social Capital and Economic Performance in the American States." *Social Science Quarterly* 86(4): 826-845.

<https://doi.org/10.1111/j.0038-4941.2005.00358.x>.

Garofalo, Gasper A., and Steven Yamarik. 2002. "Regional Convergence: Evidence from a New State-By-State Capital Stock Series." *The Review of Economics and Statistics* 84(2): 316-323). <https://doi.org/10.1162/003465302317411569>.

Hall, Robert E., and Jones, Charles I. 1999. "Why Do Some Countries Produce So Much More Output per Worker than Others?" *Quarterly Journal of Economics* 114(1): 83-116.

Hawes, Daniel, Rene Rocha, and Kenneth Meier. 2012. "Social Capital in the 50 States." *State Politics & Policy Quarterly* 13 (1): 121–38. <https://doi.org/10.1177/1532440012460057>.

Hörisch, Felix, and Peter Obert. 2020. "Social Capital and the Impact of the Recent Economic

- Crisis: Comparing the Effects of Economic and Fiscal Policy Developments.” *Social Policy & Administration* 54 (7): 1141–59. <https://doi.org/10.1111/spol.12590>.
- Klenow, Peter J., and Rodriguez-Clare, Andres. 1997. “The Neoclassical Revival in Growth Economics: Has It Gone Too Far?” *NBER Macroeconomics Annual* 12: 73-103.
- Mankiw, N. Gregory, David Romer, and David N. Weil. 1992. “A Contribution to the Empirics of Economic Growth.” *The Quarterly Journal of Economics* 107 (2): 407-437. <https://doi.org/10.2307/2118477>.
- Messner, Steven F., Eric P. Baumer, and Richard Rosenfeld. 2004. “Dimensions of Social Capital and Rates of Criminal Homicide.” *American Sociological Review* 69 (6): 882-903. <https://doi.org/10.1177/000312240406900607>.
- Pennar, K. 1997. “The Ties That Lead to Prosperity: The Economic Value of Social Bonds is Only Beginning to be Measured.” *Business Week*, December 15: 153-155.
- Putnam, Robert. 1992. *Making Democracy Work: Civic Traditions in Modern Italy*. USA: Princeton Univ. Press.
- Putnam, Robert D. 1995. “Bowling Alone: America’s Declining Social Capital.” *Journal of Democracy* 6 (1): 65–78. <https://doi.org/10.1353/jod.1995.0002>.
- Putnam, Robert D. 2000. *Bowling Alone: the Collapse and Revival of American Community*. London: Simon & Schuster.
- Rupasingha, Anil, Stephan J. Goetz, and David Freshwater. 2006. “The Production of Social Capital in US Counties.” *The Journal of Socio-Economics* 35 (1): 83–101. <https://doi.org/10.1016/j.socec.2005.11.001>.
- Safford, Sean. 2004. “Why the Garden Club Couldn’t Save Youngstown: Civic Infrastructure and Mobilization in Economic Crises.” MIT Working Paper IPC-04-002.

- Schiff, Maurice. 1992. "Social Capital, Labor Mobility, and Welfare." *Rationality and Society* 4 (2): 157–75. <https://doi.org/10.1177/1043463192004002003>.
- Solow, Robert M. 1957. "Technical Change and the Aggregate Production Function." *Review of Economics and Statistics* 39: 312-320.
- Stock, James H., and Mark W. Watson. 1991. "A Probability Model of the Coincident Economic Indicators." In *Leading Economic Indicators: New Approaches and Forecasting Records*, edited by Kajal Lahiri and Geoffrey H. Moore, 63–90. Cambridge: Cambridge University Press. <https://doi.org/10.1017/cbo9781139173735.005>.
- Tantawichet, Ekarat. 2006. "Empirical Studies on Social Capital in the United States." PhD diss., The Claremont Graduate University.
- The Joint Economic Committee, Republicans. 2019. "The Social Capital Project with JEC Chairman Mike Lee." Video, 2:32. https://www.youtube.com/watch?v=JMjYbcPPs4E&feature=emb_logo.
- University of Michigan. "Table 4: The Index of Consumer Sentiment Within Regions, Annual." *Surveys of Consumers*.
- U.S. Bureau of Economic Analysis. "SAEMP25N Total Full-Time and Part-Time Employment by NAICS Industry." Accessed February 22, 2021. <https://apps.bea.gov/itable/itable.cfm?ReqID=70&step=1&acrdrn=1>
- U.S. Bureau of Economic Analysis. "SAGDP9N Real GDP by state." Accessed February 22, 2021. <https://apps.bea.gov/itable/itable.cfm?ReqID=70&step=1&acrdrn=1>.
- U.S. Bureau of Economic Analysis. "Table 3.2ESI. Chain-Type Quantity Indexes for Net Stock of Private Fixed Assets by Industry." Accessed March 3, 2021. <https://apps.bea.gov/itable/itable.cfm?ReqID=10&step=2>

U.S. Census Bureau. *American Community Survey 1-Year Estimates*. Prepared by Social Explorer.

U.S. Congress. Joint Economic Committee, Social Capital Project. 2018. "The Geography of Social Capital in America." SCP Report No. 1-18.

<http://lee.senate.gov/scp/socialcapitalindex>.

U.S. Federal Bureau of Investigation. *Uniform Crime Reporting*.

Whiteley, Paul F. 2000. "Economic Growth and Social Capital." *Political Studies*, 48(3): 443-466. <https://doi.org/10.1111/1467-9248.00269>.

Zandi, Mark, Dante DeAntonio, and Matt Colyar. 2020. "Moody's Analytics & CNN Business Back-to-Normal Index." Accessed October 16, 2020.

<https://www.moodyanalytics.com/-/media/whitepaper/2020/back-to-normal-Index-methodology>.