A NEW MEASURE OF DIGITAL PARTICIPATION AND ITS IMPACT ON ECONOMIC OPPORTUNITY

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In this study we analyze new data on over 20 million ventures in the United States, defined as domain name websites and their redirects. Through collaboration with GoDaddy, the world's largest registrar of domain names, the researchers gained access to de-identified data on ventures from November 2018. A venture is the term used by GoDaddy to describe discrete domain name websites that are actively being used. Ventures may be businesses, nonprofits, causes or ideas that owners put online. We ask how the density of domain name websites in a community (the number of ventures per 100 people in a county or a zip code), is related to local prosperity and economic opportunity.

The density of domain name websites represents a new measure of digital participation in communities. Activities on the internet are an expression of "digital citizenship" or an individual's ability to participate in society online (Mossberger, Tolbert and McNeal 2008). This requires effective access and the skills to use technology. Similarly, digital participation in communities requires broadband access, adoption, digital skills, and technology use. At the local level, government data has measured the availability of infrastructure, and more recently, the percentage of the population with broadband subscriptions (adoption). What we have lacked is data on technology use, indicating a requisite level of skill and capacity in communities. The density of websites indicates the extent of online activity in the aggregate, providing new insight into a previously unmeasured dimension of local technology use and capacity. It offers for the first time a clear view of a hidden aspect of communities in the digital economy, unknown because of a lack of publicly available data.

Exploring this digitally-enabled activity is important for understanding the full impact of technology and future evolution of the economy. This is especially true in the context of rising inequality across places and its consequences for economic opportunity. First, we explore these contemporary trends toward inequality before turning to our analysis of this new data and its implications for communities. Our analysis suggests ways in which digital resources make it possible to build more prosperous communities and economic opportunity for all, beyond the limited number of superstar cities with concentrations of technology firms.

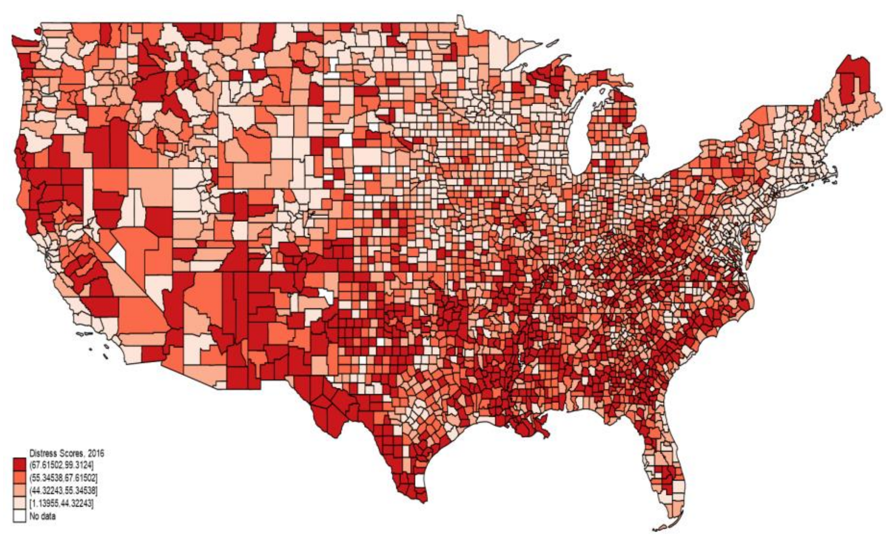
Growing Inequality Across Places

Concerns about places and people left behind are increasingly part of national debates in the press, in Washington and city halls, and in academic research. Trends in earnings and income since the 1980s show that there is greater income inequality (Rose 2018; Bartels 2008) that is not just due to rising fortunes at the top (Krause and Sawhill 2018). Upward mobility has declined as well in recent decades. Only a little over half of the age cohort born around 1980 earn more than their parents did, in comparison with nearly 90% of children born in the 1940s (Chetty et al. 2017). As Chetty and colleagues have argued, such developments strike at the heart of the American dream and optimism about the future.

This dwindling opportunity is unequally distributed across the landscape and affects places as well as individuals. Figure 1 maps US counties based on the Distressed Communities Index (Economic Innovation Group 2018). The index, which is based on multiple factors drawn from Census data, will be discussed in more detail below and is used to track outcomes for counties and zip codes. The most distressed places (the darkest red in the map) have on average 22% of residents without a high school diploma, 26% of the population living in poverty, and nearly 42% of working-age adults who are not employed. There are 50 million Americans living in distressed zip codes. Since the recession, distressed communities have become more rural, though they are found in urban and suburban areas as well (EIG 2018, 4-6). Racial and ethnic minorities are also over-represented in distressed zip codes (EIG 2018, 11).

The county map in Figure 1 displays an obvious regional pattern, with more distressed places in the South and Southwest, as well as some rural parts of the West.

Figure 1. Distressed Communities Index by County, 2016



Source: Authors' map based on raw data from Economic Innovation Group (2018).

Metropolitan regions are the drivers of the national economy (Katz & Bradley 2013). Table 1 below shows that the digital economy has flourished in some metropolitan areas, creating concentrations of technology investment and employment. While the most prosperous zip codes tend to be in suburban communities, not all metropolitan areas have thrived equally in recent years. The Economic Innovation Group identifies the 10 metros with the highest percentage of the population in prosperous zip codes, the top quintile on their index. The list includes cities and regions with booming high-tech economies: San Francisco, Silicon Valley, Boston, Washington, D.C., Austin-Round Rock and the rising technology hubs Provo and Denver (see also Moretti 2013; Florida 2017; Jackson et al. 2019). These places have highly educated populations, as the table below the map shows; only Des Moines and Provo have citywide college graduation rates below 40%. The upper Midwest includes three prosperous metros, two of them with flagship universities.

Table 1. Ranking for Most Prosperous Zip Codes, Major Metropolitan Areas

Prosperity Rank	Metro Area	% Population in Prosperous Zip Code	% Population with bachelor's degree or Higher	Education Attainment Rank
1	Minneapolis-St. Paul-Bloomington, MN-WI	64.5%	40.0%	12
2	Madison, WI	63.0%	43.9%	8
3	Provo-Orem, UT	61.9%	37.7%	16
4	San Francisco-Oakland Hayward, CA	61.7%	46.6%	3
5	Des Moines- West Des Moines, IA	57.9%	35.9%	23
6	Austin-Round Rock, TX	57.0%	42.0%	9
7	Washington-Arlington-Alexandria, DC-VA-MD-WV	56.7%	49.4%	1
8	Denver-Aurora-Lakewood, CO	56.6%	41.3%	10
9	San Jose-Sunnyvale-Santa Clara, CA	55.0%	48.3%	2
10	Boston-Cambridge-Newton, MA-NH	54.8%	45.4%	6

Source: Economic Innovation Group 2018, 24.

Note: Prosperous zip codes are in the top quintile on the distressed communities index (EIG 2018, 5).

Technology and the Increased Significance of Place

While the economies of a select group of "superstar cities" (Henrickson, Muro and Galston 2018; Florida 2017, 6) are booming on the coasts and in other IT hubs, many cities and towns in the Midwest and South, along with rural areas, have lagged in economic growth and incomes. Economist Enrico Moretti has called this the "great divergence" (Moretti 2013, 73) and noted that differences across metropolitan areas are now greater than those within them. The Economic Innovation Group tracks the impact on rural communities as well and has referred to the era since the recession as the "great reshuffling" (EIG 2018, 1).

Growing inequality across communities preceded the recession, however, and is a result of structural changes in the economy (Giannone 2017; Moretti 2013, 105). Following World War II, wage gaps narrowed across communities, but have progressively widened since the 1980s, due to skill-biased technological change and increasing returns to education (Giannone 2017). The Bureau of Labor Statistics reports growing wage gaps between people with and without college degrees (Torpey 2018). Unemployment rates are lowest for individuals with the highest educational attainment.

Information technology is one of the factors driving these trends, geographically concentrating activity to a greater extent than manufacturing or other industries. Knowledge-intensive industries, including technology firms, cluster in ecosystems of innovation (Moretti 2013, chapter 4) where workers have higher levels of education and skill. Agglomeration economies result from the concentration of talent, interactions between firms, and the exchange of ideas.

Ironically, given a technology that can overcome the effects of distance, geography matters more in the digital era, not less.

Place-based inequalities we witness today portend longer-term effects. As Chetty and Hendren (2017) have shown, the places where children grow up have lifelong consequences, influencing their incomes as adults. Their research provides evidence that places have a causal influence on economic opportunity, and that community-level trends and outcomes are critical for public policy and the nation's future.

Searching for Economic Opportunity and Inclusive Growth

The challenge for local communities across the country is how to create opportunity for businesses and residents in this shifting environment. A large country such as the United States is composed of diverse regional and local economies, influenced by different contexts and state policies. In recent decades, economic development policy is increasingly a matter of local initiative and leadership (Clarke and Gaile 1992; Katz and Bradley 2013), with jobs and the quality of local services at stake.

One response on the part of local governments has been to compete for high-tech investment, engaging in bidding wars to lure technology firms or big projects like Google Fiber. Even if communities are successful in landing such businesses, there is a danger that the inducements they offer cost more than the benefits the community will gain – much like the smokestack chasing of earlier eras. Moreover, the high returns to agglomeration in the digital economy present a dilemma for communities – not every place can be a tech hub. Are there other paths offered by information technology? Are there ways to encourage local economic development, including the growth of new business activity in many different types of communities – whether large or small, urban or rural?

Measuring a New Dimension of Digital Community Participation

The digital economy at the local scale is often measured by the share of employment in information technology, or by venture capital investments in IT (see Jackson et al. 2019; Moretti 2013). We have lacked good measures to track how technology is being used in other ways at the local level. This is a missing piece of the puzzle, though one that has long interested researchers and policymakers.

Public policies supporting broadband use, such as the National Broadband Plan, have assumed that internet access has many benefits for economic growth and for individual opportunity (Federal Communications Commission 2010). There is indeed evidence that broadband infrastructure generates local economic benefits, though the exact outcomes differ across communities (Lehr et al. 2006; Holt and Jamison 2009; Kolko 2010; Jayakar and Park 2013; Atasoy 2013; Mack 2014; see also Falck 2017, Bertschek et al. 2016 and Abrardi and Cambini 2019 for international overviews). But there is also agreement among policymakers and the research community that more granular data is needed on how technology is ***being used*** at the local level, beyond just the availability of broadband internet (National Telecommunications and Information Administration/National Science Foundation 2017, 3).

New data on broadband subscriptions at the subnational level in the 2017 5-year American Community Survey offer better measures of technology adoption at the community level than at any time in the past, down to the census tract. Yet the American Community Survey counts only households with broadband subscriptions and devices.

Another way to gauge technology use and its impact is to measure activities online as human capital in communities. Activities online can be viewed as indicators of digital skill and a form of human capital (Bach, Shaffer and Wolfson 2013). Research has shown, for example, that internet use on the job affects wages for individuals, even for those with only a high school degree (DiMaggio and Bonikowski 2008; Mossberger, Tolbert and McNeal 2008; Muro et al. 2017). Content creation online is less prevalent than information use (Hargittai and Walejko 2008). Website creation and content management represent more demanding skills than common uses of the internet such as email, as they entail strategic use of technology (Van Deursen and Van Dijk 2011). But there has been a lack of systematic nationwide data to measure online participation at the community level, since most surveys of online activities don't have sample sizes sufficient to measure all local communities.

Data on domain name websites and their redirects (i.e. "ventures"), as used in this study, track the effective use of technology in communities. Aggregated to the community level, the density of domain websites is an expression of human capital as digital community participation. Human capital is the main driver of economic growth and prosperity, differentiating outcomes across communities (Moretti 2013). Like educational attainment in the population, digital community participation can be expected to create spillover benefits for communities as well as individual opportunity. This study hypotheses that communities with higher levels of digital community participation will have stronger economies, all else equal. Digital community participation is operationalized by both 1) broadband subscriptions and the 2) density of websites in communities.

Directly measuring the density of domain name websites for local communities avoids many methodological problems with survey data. Individual-level data on digital skills is often self-reported and may be subject to bias (Hargittai 2005; Van Deursen and Van Dijk 2011). Because we use commercial website data rather than surveys, we have demonstrated evidence of digital capacity in communities. Census data on the technology use of firms, which has been analyzed in the past (Forman, Goldfarb and Greenstein 2012) captures only a part of the digital activity, missing the role of microbusinesses and entrepreneurial efforts in the gig economy, for example.

The density of domain name websites measures the level of technology use in communities and is a better measure than broadband subscriptions alone. Beyond the tech hubs, does technology use lead to economic opportunity – for local brick and mortar businesses that have new ways to advertise and grow, for rural artisans selling their work, for neighborhood entrepreneurs launching their ideas into the wider world online? Domain name websites are an especially appropriate measure of this activity online; unlike social network sites, they are public rather than restricted to personal networks, and potentially broader in their intent and reach. These websites represent a measure of economic participation that is absent from Census data on firms, small businesses, or entrepreneurs.

Businesses and governments have increasingly employed data mining, machine learning, and predictive analytics to generate new forms of data or new empirical insights. The data analyzed in this study is raw, de-identified data geo-coded by the zip code of the site's owner. The analysis reported here focuses on the *characteristics of the communities* in which these ventures are located (rather than the characteristics of the owners).

GoDaddy approached the researchers and offered to share their data because of a common interest in understanding how technology use affects community outcomes. They sought an independent, methodologically rigorous analysis of their customer data. The company views its customers as "everyday entrepreneurs" translating their ideas into action, with potentially broader impacts for their surroundings and for public policy. Beyond this general interest, they have not determined the questions that we have asked or how the data is analyzed.

Data: Density of Domain Name Websites or Ventures

The data used for this analysis are drawn from over 20 million ventures in the United States as of November 2018. A venture is the term used by GoDaddy to describe a domain name website and its redirects that are actively being used—one venture may include a half dozen or hundreds of redirects to one main website. Domain names are the underlying address book of the internet and governed by the global Internet Corporation for Assigned Names and Numbers (ICANN).[1] Ventures include services attached to websites, (such as email, payments, and social media) and they vary in terms of these optional services. Ventures may be businesses, nonprofits, causes or ideas that owners put online. Text analysis of U.S. venture websites reveal that the majority (80%) are commercial or business-related.[2]

A venture (website) is a business, nonprofit, cause or an idea that a GoDaddy customer is working on, as represented by a discrete website and/or a domain name with services attached (email, payments, social media).

The unit of analysis used here is the number of ventures per county or zip code divided by the population to create a density measure – ventures per 100 people. County-level and zip code level comparisons are often used for economic data, such as County Business Patterns and Zip Business Patterns. Counties have been used by other researchers to represent local geographies (Chetty and Hendren 2017). They are local governments with responsibilities for service delivery and policy, including local economic development. Counties are relatively large units of analysis, while zip codes are used here to approximate neighborhoods, especially in dense urban areas. Zip codes also depict greater variation in ventures or outcomes within geographically large counties (especially in the West). Some counties in Arizona, for example, show a high density of ventures over a large geographic area in the county map (Figure 2), but when this is broken down by zip code (Figure 3), more variation within the county is visible.

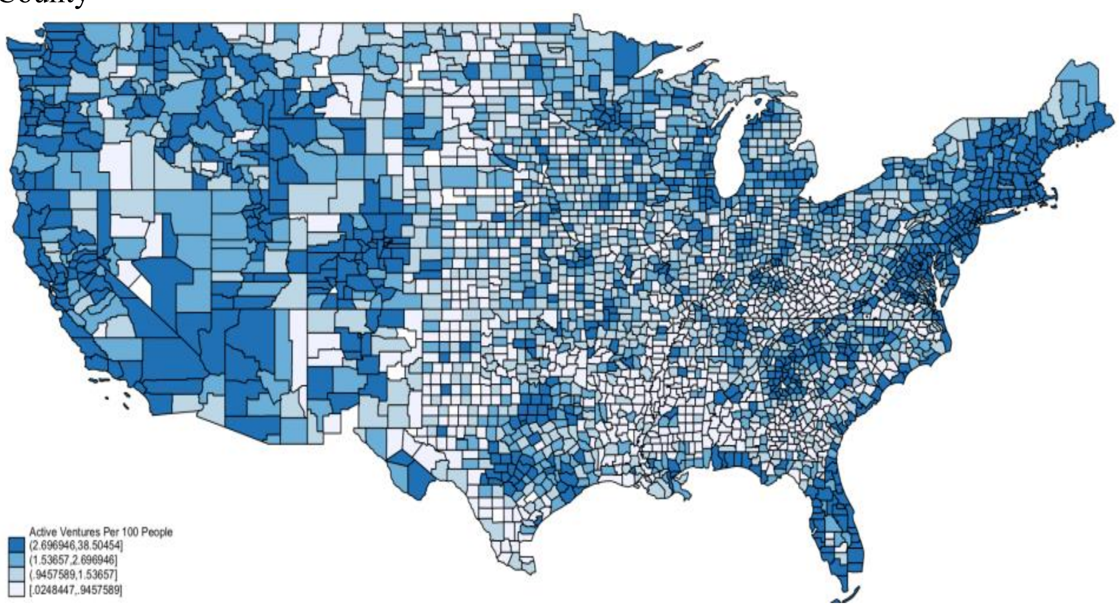
[1] https://www.icann.org/resources/pages/welcome-2012-02-25-en

[2] GoDaddy data scientists used Word2Vec plus a deep model (Recurrent Neural Network) with specialized memory units (LSTM) that improve learning the context from text to classify domains over 265 industry categories. A random sample survey of GoDaddy's US customers conducted in August 2019 yielded similar results.

Which Communities Have Digital Participation? Diversity Beyond Tech Hubs

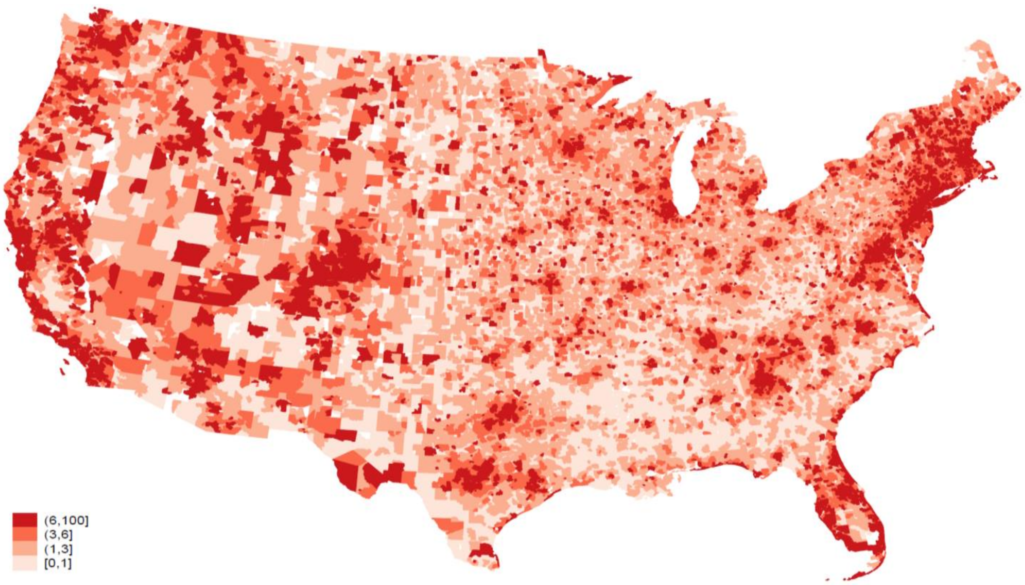
Figures 2 and 3 below show the density of domain name websites (ventures) per 100 people for the 3,007 counties and 30,000 zip codes in the United States for which we have data[3]. In Figure 2, counties with a higher density of ventures, in darker shades of blue, are visible across much of the nation's interior as well as along the coasts. Metropolitan areas tend to be darker blue, but evidence of activity stretches out well beyond the immediate counties around Midwestern cities like Detroit and borderland regions near El Paso. The heavy presence of ventures in parts of the West, Texas, mid-South, and Florida includes rural areas. Communities with high digital capacity are diffused around the country, with concentrations evident in some rural counties and in all types of cities and towns.

Figure 2. Density of Ventures (Domain Name Websites and their Redirects) per 100 people, by County



[3] Not all zip codes are inhabited, and while there are over 35,000 zip codes, venture data only exists for approximately 30,000.

Figure 3. Density of Ventures (Domain Name Websites and their Redirects) per 100 people, by Zip Code



Displaying ventures by zip code shows a less solid wall of activity in the West, and more variation in other regions as well. Yet this doesn't change the pattern of diffusion across all kinds of communities in the US. There is some concentration along the coasts, especially in the Northeast and the West Coast, and substantial activity in the interior as well, especially in the West and Southwest, Florida and the mid-South. Ventures serve diverse communities and are not confined to areas more traditionally associated with the digital economy, such as tech hubs.

Measuring Levels of Venture Activity

In addition to measuring the density of ventures, we differentiate their distribution and outcomes by the level of activity in the ventures. Activity is measured by venture age, demand (How busy is the venture in terms of traffic and economic footprint with commercial data?), by connection (How networked is the venture across the internet, both in links and out-links?), and by breadth (How built-out is the venture? Have there been upgrades, downgrades or products added or subtracted?). Cluster analysis was used to sort the ventures into four distinct groups (or clusters) of low activity, low-moderate activity, high activity and very high activity. Together these three dimensions characterize the level of venture activity.

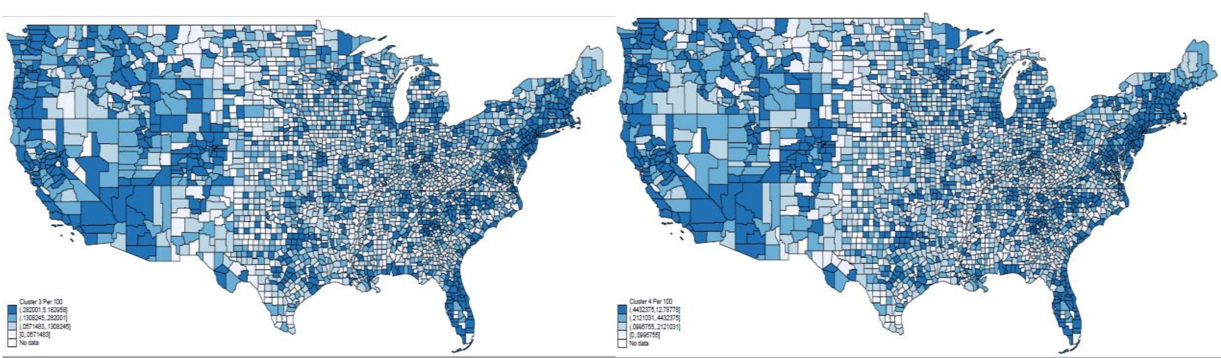
Ventures cluster into four groups, based on this activity (see Table 2) drawn from data measuring ventures over four time periods (May 2018-May 2019). Cluster #1, with low levels of activity, represents about a third of all ventures. Cluster #2, with low-moderate activity is a little over a third of total ventures. Cluster #3, with moderate-high levels of activity, represents just over a quarter of the ventures. Very high-activity ventures, in Cluster #4, comprise between 8-12% of the total depending on the time period. The majority – 2/3 of ventures - are described by the first two categories, with low to moderate levels of activity. In the analysis that follows, we group together clusters 3 and 4, which represent 1/3 of ventures as "high activity ventures." Places with more highly active ventures should have stronger economic outcomes.

Table 2. Distribution of Domain Name Websites/Ventures by Venture Activity

Cluster Number		May 2018	Nov 2018	Feb 2019	May 2019
1	% of Total Ventures	27.84%	25.67%	31.42%	30.33%
	Venture Count	5,628,374	5,265,889	6,550,162	6,269,331
2	% of Total Ventures	36.17%	37.46%	30.45%	30.98%
	Venture Count	7,310,958	7,684,520	6,347,890	6,403,991
3	% of Total Ventures	28.18%	26.08%	26.79%	27.02%
	Venture Count	5,696,744	5,348,738	5,586,077	5,584,923
4	% of Total Ventures	7.81%	10.79%	11.34%	11.66%
	Venture Count	1,577,696	2,213,055	2,363,903	2,410,068
Grand Total	% of Total Ventures	100.00%	100.00%	100.00%	100.00%
	Venture Count	20,213,772	20,512,202	20,848,032	20,668,313

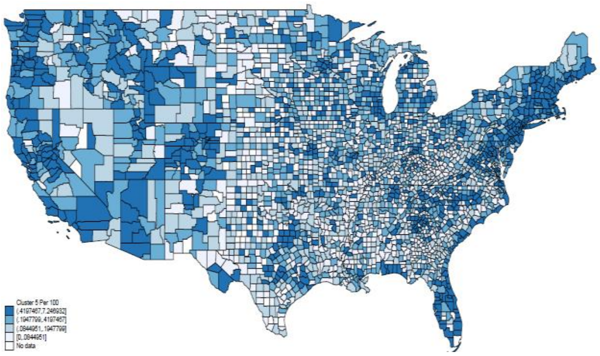
Figures 4 and 5, drawn from November 2018 data, demonstrate that the geographic distribution for the 4 clusters is comparable across counties and zip codes, with similar patterns of density for ventures overall. Places that have many ventures with low to moderate activity also have many highly active ventures. The zip code maps show more variation in the West again, compared to the county maps, but clusters do not differ greatly by region or by level of analysis (county or zip code).

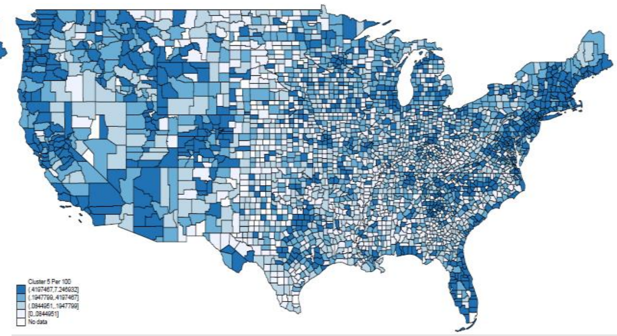
Figure 4. Density of Venture by Activity Level/Clusters and County, Nov 2018



Cluster 1 – low activity

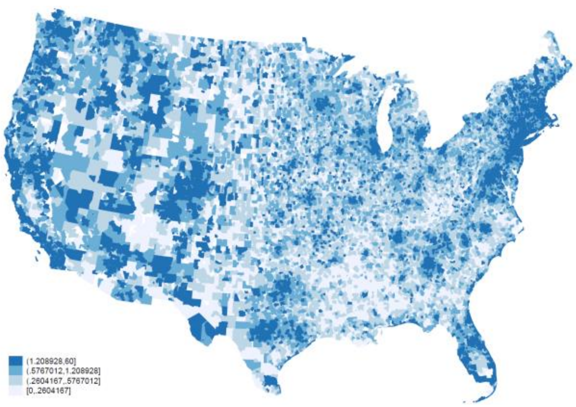
Cluster 2- low/moderate activity

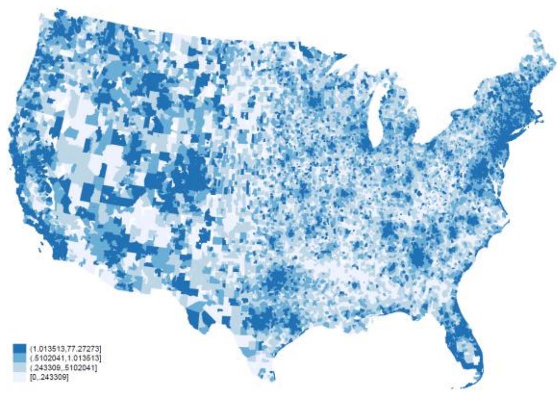




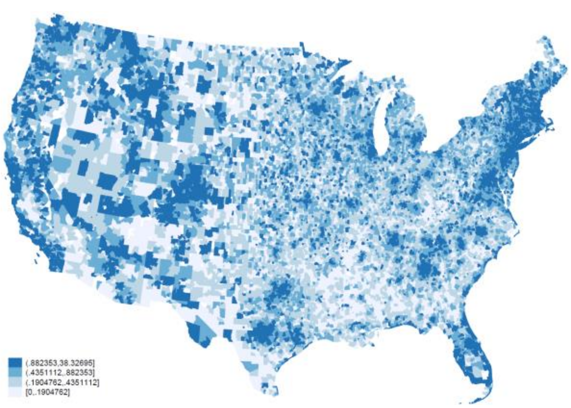
Cluster 3 – moderate/high activity Cluster 4 – high activity

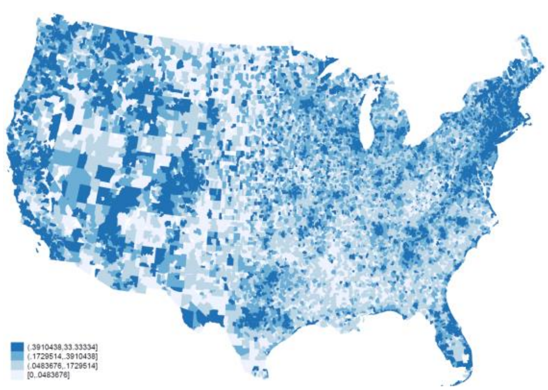
Figure 5. Density of Venture by Activity Level/Clusters and Zip Code, Nov 2018





Cluster 1 – low activity Cluster 2 – low/moderate activity





Cluster 3 – moderate/high activity Cluster 4 – high activity

How is this Measure of Digital Community Participation New?

To what extent is this measure of digital community participation or venture density describing something new? Data on broadband subscriptions is now available from the Census at the community level (December 2018 for all US counties). Is this merely another way of measuring broadband connectivity? Reviewing the map indicates that venture density isn't confined to centers of the IT industry, but to what extent does it overlap with tech employment more generally? The Census also publishes data on small businesses. Perhaps venture data merely reflect small business activity?

To answer these questions, we compared our new measure of digital community participation/venture density with data on IT employment, broadband subscriptions, and small businesses at the county and zip code level. There is only a .37 correlation with the percentage of the population employed in IT jobs and the density of ventures for counties.[4] The density of highly active ventures (clusters 3 and 4) and IT jobs is .34 across counties. This is a moderate correlation, suggesting these are quite different measures. At the zip code level this correlation is only .24 for venture density and .21 for highly active venture density. The correlation between venture density and the percent of the population with broadband subscriptions[5] is .53 at the county level. While broadband enables the creation and use of websites, venture density measures participation online beyond internet access.

There is a moderate correlation between small businesses and ventures, as would be expected, since many small businesses have websites. Despite some overlap, the measures here capture something other than the small businesses counted by the Census,[6] whether small businesses are defined as having 100 employees or less (correlation with ventures is 0.43) or even 10 employees or less (at 0.53) at the county level. The measure of small business density used in this study is the number of businesses with 50 or fewer employees per 100 people. These differences are still moderate even if we focus on correlations with more active ventures, which may be more established businesses. Correlation between small businesses and the combined category of highly active and very highly active ventures (clusters 3 and 4) is 0.43.

Figure 6 maps by county the density of small businesses with fewer than 50 employees and can be compared with Figure 7. The latter shows the *ratio* of venture density to small business density, also by county. In Figure 7, counties shaded in blue have more ventures than small businesses, with darker blue counties having the highest ratios of ventures to small businesses. Those colored in pink have roughly equal shares of ventures and small businesses, while counties in red have higher proportions of traditional small businesses compared to ventures. Small businesses are everywhere, but places in blue have even more ventures than the small businesses traditionally measured by the Census. Similar patterns are found in the zip code maps.

Ventures outnumber small businesses in much of the West, some areas in Texas, the Great Lakes, Northeast, Florida, and parts of the South (see Figure 7). Regions with higher levels of small business development compared to ventures are in some areas of the South and a wide swath running north to south across the central plains. Still, the blue in this mosaic is widespread and confirms that ventures as a group differ from the population of small businesses, and they are in all areas. Ventures represent businesses both large and small, including microbusinesses

[4] As measured by the US Bureau of the Census North American Industrial Classification System (NAICS) data aggregated at the county level.

[5] As measured by 2017 5-year estimates American Community Survey data on broadband subscriptions for zip code or county codes.

[6] Economic Census, Bureau of the Census, 2018.

that are too small to be counted by the Census, as well as non-commercial websites. The balance of this paper explores whether or how the density of domain name websites matters for communities. What can this new digital footprint of grassroots economic activity tell us?

Figure 6. Distribution of Small Businesses (50 employees or less) by County

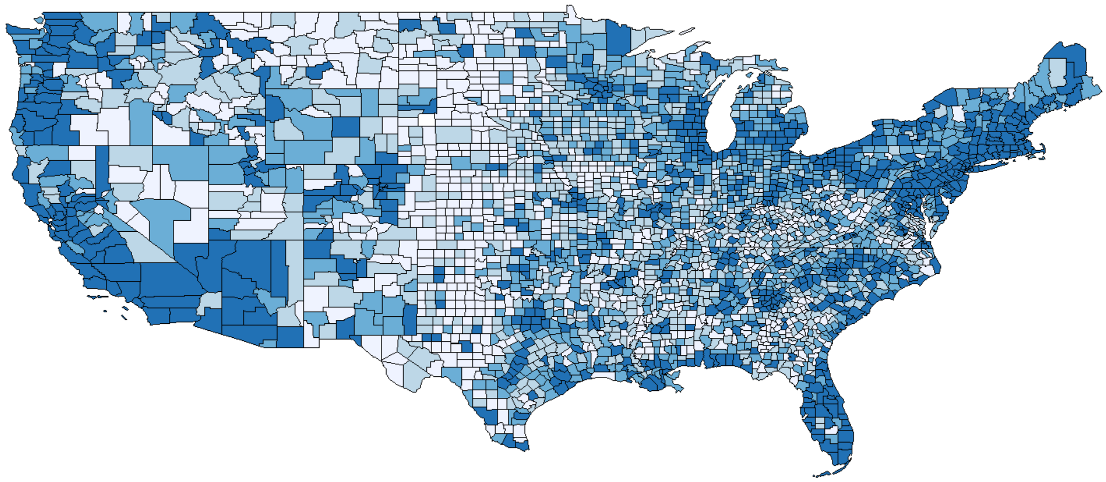
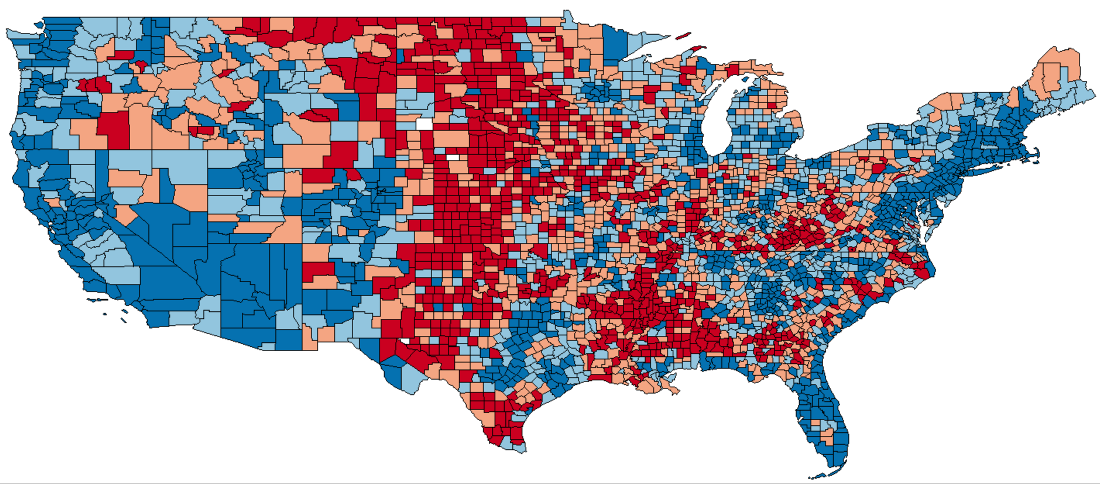


Figure 7. Ratio of Density of Ventures to Small Businesses (more ventures in blue) by County



Ventures and Community Outcomes

This study tests relationships between digital community participation and three different outcomes (dependent variables). We ask whether the density of ventures in a community is related to: 1) economic prosperity; 2) change in prosperity/recovery from the recession; and 3) annual change in median household income. We use multivariate regression to control for other factors related to these outcomes, so the relationships we investigate go beyond correlation. Additionally, we examine relationships between ventures and prosperity with two-stage models that further distinguish the effects of ventures from small businesses, broadband and affluence in the community. Incorporating change in measuring economic prosperity from two time periods (2007-2011 and 2012-2016) is especially important for addressing whether venture density has a causal influence on local economies, as well as recovery from the recession. Measuring change, whether change in prosperity or median income, helps controls for endogeneity. Most of the explanation for median income in 2017, for example, can be attributed to the zip code or county median income in the previous year (2016) so by examining change in outcomes, we are controlling for the effects of income or prosperity in the earlier time period.

- *Controlling for other factors (through multivariate regression) isolates the effects of ventures from other influences*
- *Measuring change and using two-stage models address the issue of causation*

Measuring Economic Prosperity—Outcome Variable

The measure of economic prosperity used here compares across communities and over time and is a modification of the Distressed Communities Index constructed by the Economic Innovation Group (EIG) (see Figure 1). They classify communities along a continuum ranging from "distressed" to "prosperous." We are interested in what contributes to prosperity rather than distress, and so we have inverted the index. The distress scores presented by EIG range from zero to 100, for counties and zip codes. Our Economic Prosperity Index (EPI) measure is 100 minus the distress score calculated by Economic Innovation Group.

The index includes data on seven component metrics by zip code and county, which we use in the analysis here.[7] The data are drawn from the U.S. Bureau of the Census, from the American Community Survey 5-year estimates and from annual County and Zip Code Business Patterns. The index is a "comparative measure of the economic vitality and well-being of U.S. communities" (EIG 2018, 2). They include a measure of recovery from the recession that compares local performance on the seven metrics in 2007-2011 to 2012-2016.[8]
The seven indicators that comprise the index[9] are weighted equally and include:

- Percent of the adult population without a high school diploma (or equivalent)
- Housing vacancy rate
- Percent of the population ages 25-64 not in the work force
- Poverty rate
- Median household income as a ratio (percentage) of the state median household income (to adjust for cost of living differences)
- Percent change in the number of jobs
- Percent change in the number of business establishments

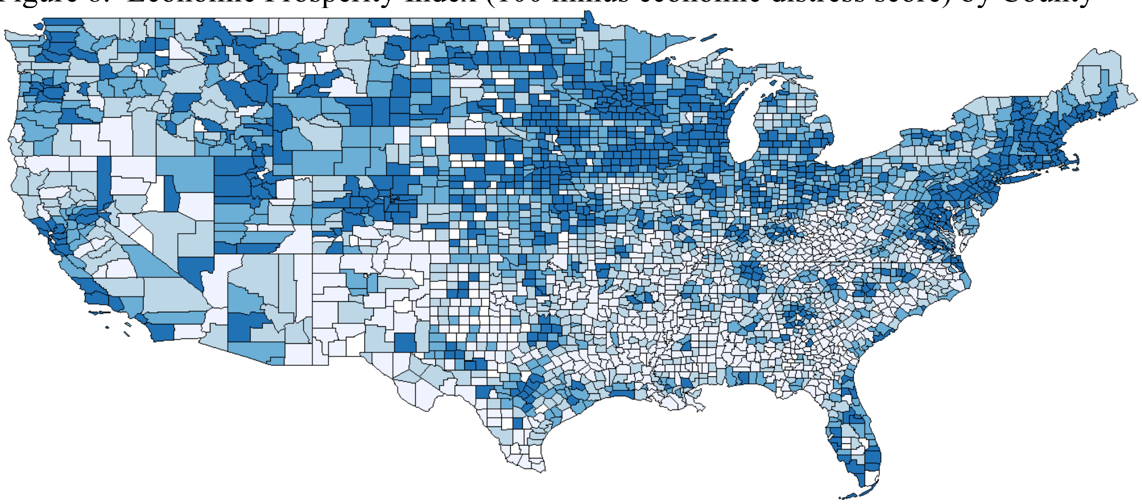
[7] EIG also calculates the index for cities and Congressional Districts.
[8] https://eig.org/dci/methodology
[9] To derive the distress score, "Each component is weighted equally in the index, which is calculated by ranking communities on each of the seven metrics, taking the average of those ranks, and then normalizing the average to be equivalent to a percentile," according to EIG (2018, 3).

For our purposes, the indicators include outcomes for business as well as for the population more generally. Some prior national research on the impact of broadband infrastructure in communities has demonstrated that business investment increased in those areas, but local employment did not (Kolko 2010). The EIG measures include relevant outcomes for businesses and residents, and for the health of the local economy overall. Figure 8 shows the modified

The Prosperity Index is an inclusive measure of outcomes for the local population as well as businesses, tracking a broad set of indicators for the health of the local economy

Economic Prosperity Index that we use as a primary dependent or outcome variable. Counties shaded darker blue have higher levels of prosperity.

Figure 8. Economic Prosperity Index (100 minus economic distress score) by County



Methods

We use a number of statistical models to examine the relationships between the density of ventures and community prosperity, change in prosperity (recovery from the recession), and change in median income. We are interested in the extent to which ventures predict these outcomes. We conduct all analysis using multivariate regression, which controls for other factors—demographics (race, ethnicity, age cohorts), educational attainment, percent of the population employed in different economic sectors—that could be expected to influence prosperity. As shown in Table 1 in this report, prosperity scores are likely related to educational attainment in the community. The models we use control for education, testing whether ventures still have a statistically significant effect on prosperity scores or change in median income. Including age cohort controls for the share of the population of working age, but also permits us to examine the effects of millennial presence. Metropolitan areas with more dynamic local economies have attracted millennials in recent years (Frey 2018), and this may also be related to economic growth, with rising areas attracting young people in the early stages of their careers (Frey 2018). We also control for population size using statistical weights.

We are interested in the density of domain name websites/venture density as a more precise measure of digital skill and participation online, but broadband subscriptions also measure technology use and are needed to create and maintain ventures. Previous research on the local level in the US has indicated that the availability of broadband is positively related to a variety of economic outcomes such as business investment, employment, etc. (Lehr et al. 2006; Kolko 2010; Atasoy 2013; Mack 2014). One study that compared local data on both subscriptions and infrastructure in rural areas found stronger relationships between subscriptions (adoption) and economic outcomes (Whitacre et al. 2014).

Broadband subscription is a key variable included in the models and is measured using 5-year estimates from the American Community Survey (2017) for counties and zip codes. The ACS asks respondents what kind of broadband subscription they have, through a home wireline connection or through a cell phone plan. We measure broadband subscriptions of any type including a cell phone in the statistical models. This varies widely, even comparing major cities in the US (Mossberger, Tolbert and Franko 2013). The 5-year estimates from the ACS show that only about half of Detroit's residents have broadband at home, and this rises only to 65% if cell phones are included. In contrast, Seattle has 85% with broadband at home and 91% including smart phones.

Other control variables used in the analysis have been shown to influence local economies in prior research. Human capital plays a central role in economic development and innovation (Moretti 2013) and has become even more critical in recent decades because of skill-biased technological change (Giannone 2017). The percentage of the population employed in various industries represents the structure of the local economy and opportunities for residents. The relative industry mix can affect local growth and decline for businesses and jobs as well as wages (Kemeny and Storper 2015). We include data on employment by 16 major industry sectors, using the high-level 2-digit classifications in the North American Industry Classification System (NAICS) codes from the Census.

We also estimate a two-stage model to control for confounding factors that increase both economic prosperity and the number of ventures found in a community. The first stage of the model predicts the number of ventures per 100 people, with broadband access, small businesses, and median income being used to predict active ventures, and the second stage predicting economic prosperity. This approach allows us to estimate the relationship between venture density and economic prosperity after accounting for what causes more ventures to form in the first place.

Results: Does Digital Community Participation Impact Local Economic Prosperity?

We begin the analysis of outcomes by asking whether the density of ventures increases prosperity in local communities. Beyond economic outcomes for individuals and their families, do ventures add to local prosperity and economic opportunity? We examine these questions for all ventures and for highly activated ventures (clusters 3 and 4). For the analysis here, we examine outcomes at the county level. Similar analysis (not shown here) was conducted at the zip code level, with parallel results.

Table 3: Predicting Economic Prosperity and Change in Prosperity

	(1) Prosperity Index	(2) Change Prosperity Index 2007-2016	(3) Prosperity Index	(4) Change Prosperity Index 2007-2016
Number Highly Active Ventures per 100 people	1.3768*	2.8493*		
	(0.6981)	(0.6428)		
Number of Ventures per 100 people			0.3910*	0.5277*
			(0.1349)	(0.1363)
Broadband Subscriptions	0.6073*	0.0984*	0.5928*	0.0907*
	(0.0671)	(0.0369)	(0.0680)	(0.0368)
Percent Black	-0.1945*	0.0313*	-0.2055*	0.0175
	(0.0380)	(0.0186)	(0.0384)	(0.0179)
Percent Native	-0.2484*	0.0684*	-0.2648*	0.0620*
	(0.0675)	(0.0319)	(0.0667)	(0.0323)
Percent Asian	0.1194	0.0847	0.0978	0.0530
	(0.0883)	(0.0778)	(0.0928)	(0.0771)
Percent Hispanic	0.0944*	0.0424*	0.0831*	0.0344*
	(0.0300)	(0.0161)	(0.0295)	(0.0161)
Percent Agriculture	-0.3630*	-0.3581*	-0.3407*	-0.3328*
	(0.0973)	(0.0571)	(0.0969)	(0.0560)
Percent Construction	1.0214*	0.4145*	1.0307*	0.4060*
	(0.1966)	(0.1196)	(0.1950)	(0.1146)
Percent Wholesale	0.1416	0.1301	0.1127	0.0685
	(0.4759)	(0.2688)	(0.4768)	(0.2748)
Percent Retail	-0.6535*	0.4390*	-0.6789*	0.4342*
	(0.2060)	(0.1107)	(0.2051)	(0.1127)
Percent Transport	-0.1496	-0.5713*	-0.1683	-0.6391*
	(0.2024)	(0.1284)	(0.1977)	(0.1440)
Percent Info	0.3750	-0.6372*	0.5984	-0.1832
	(0.4927)	(0.3826)	(0.4586)	(0.3398)
Percent Finance	-0.1718	-0.1448	-0.0859	-0.0049
	(0.1800)	(0.1605)	(0.1809)	(0.1385)
Percent Prof	-0.9916*	0.2784*	-1.0554*	0.2302*
	(0.1696)	(0.1169)	(0.1658)	(0.1197)
Percent Educ	-0.4868*	-0.3215*	-0.4738*	-0.3377*
	(0.1067)	(0.0627)	(0.1061)	(0.0609)
Percent Other	-0.1950	-0.5599*	-0.3358	-0.7145*
	(0.3803)	(0.2610)	(0.3776)	(0.2491)
Percent Public	-0.4256*	-0.1975*	-0.3837*	-0.1806*
	(0.1274)	(0.0894)	(0.1241)	(0.0886)
Percent High School	1.2009*	0.0556	1.1714*	0.0187
	(0.1049)	(0.0634)	(0.1012)	(0.0602)
Percent College	0.5955*	-0.1917*	0.5955*	-0.1797*
	(0.0830)	(0.0509)	(0.0821)	(0.0506)
Percent Millennial	-0.9151*	-0.1132	-0.8491*	0.0187
	(0.1768)	(0.1241)	(0.1699)	(0.1046)
Percent Gen X	0.5270*	-0.3969*	0.5384*	-0.3819*
	(0.2306)	(0.1344)	(0.2272)	(0.1344)
Percent Baby Boomer	-1.2660*	-0.0472	-1.2277*	0.0555
	(0.1522)	(0.1182)	(0.1482)	(0.1048)
Constant	-51.4713*	10.3163	-50.2738*	9.5605

	(15.7466)	(9.2447)	(15.4015)	(9.0698)
Observations	2958	2958	2949	2949

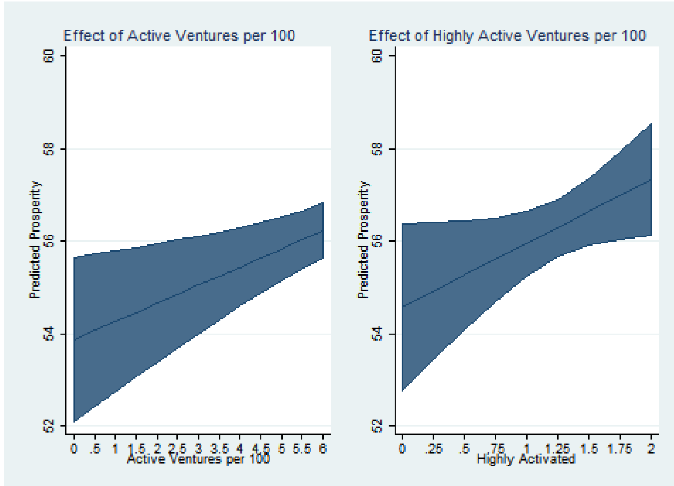
The multivariate regression model, on the right, shows that the density of ventures per 100 residents is indeed a significant predictor of county prosperity, controlling for other factors. The relationship is positive and statistically significant. The effects are even stronger, however, for highly active ventures (in clusters 3 and 4), shown in the column on the left. For each additional highly active venture, a county's prosperity score increases by 1.4 points, all else equal. Most counties have a prosperity score that ranges from 25-58 (25^{th} to 75^{th} percentile), so this is a large substantive impact from just one entrepreneurial activity. As broadband subscriptions increase in a county, economic prosperity increases as well. These additive results suggest that digital community participation—technology adoption and use—is critical in local economic development today.

The density of ventures matters for prosperity, and the density of highly active ventures matters even more

The graphs in Figure 9 below show the relationship between the density of ventures and a county's economic prosperity score, with all other variables held constant at mean values. The graph on the right, for highly active ventures, slopes more sharply upward compared to the graph for all active ventures on the left. Adding one more highly active venture to a county increases the prosperity score by an average of 1.37 points on the index (compared to 0.39 points for all ventures). Put another way, as highly active ventures in a county rise from 0 to 2, the average prosperity score rises from 55 to nearly 58 – an almost 3 percentage point increase from the addition of only two ventures. The results are not only statistically significant, but substantively quite large, given the number of factors that affect complex economic development processes and outcomes such as local prosperity. Fifty percent of counties have prosperity scores that range between 25 (25^{th}percentile) and 58 (75^{th}percentile). **[NOTE: These models were replicated using newly released data from the 2018 American Community Survey, and the results hold for both ventures and highly active ventures.]**

Adding two highly active ventures in a county increases the prosperity score nearly 3 percentage points on average. This is a statistically significant and substantively large effect from a small change.

Figure 9. Effects of Ventures and Highly Active Ventures per 100 County Residents



As expected, broadband subscriptions are also significantly related to county prosperity, independent of ventures; a 1 percent increase in broadband subscriptions leads to a 0.6 increase on the prosperity index, all else equal. Highly active ventures, however, have a large effect on prosperity beyond internet access. This indicates that this measure of ventures is a distinct measure of digital capacity. Communities with higher rates of broadband subscriptions are more prosperous but using this connectivity to create commercial and civic activity has an even larger effect on prosperity.

Communities with larger Black or Native American populations tend to have lower economic prosperity scores, as do communities that are more reliant on agriculture, retail, professional services, education, and the public sector for employment. Higher levels of education are also associated with prosperity.

A Stronger Empirical Test of Community Capacity and Economic Outcomes: Two-Stage Models

To provide stronger evidence that ventures are a cause of prosperity, we analyze the data using a two-stage regression model (see Appendix Table 3 for the raw output). This allows us to test whether in fact it is some other variable, such as small business, that is responsible for the prosperity results. We estimate a two-stage model where small business density, median household income and the percent of the population with broadband subscriptions are used to predict the density of ventures per county. Controlling for these factors in the first stage, we model the effect of ventures on economic prosperity in the second stage. After "stripping out" the influence of small business, median income, and broadband in the second stage, the relationship between ventures and economic prosperity in fact becomes stronger. In the two-stage model, adding one more venture per 100 residents in a county increases the prosperity score by 1.3 points (rather than 0.39). In other words, moving from 0 to 6 ventures in a county

Two-stage models show that once we account for possible connections between ventures and small business, broadband, and median income, the effects for ventures are even larger

Adding 6 ventures increases prosperity scores by 8 percentage points on average - this is for all ventures rather than only highly active ones

increases the prosperity score on average 8 points, from 48 to 56.

As most counties vary from a score between 25 and 58, an 8-point increase on the index is quite a large change. With the two-stage models, in Appendix Table 3, we have better evidence that it is ventures are linked to change in the prosperity score rather than other potential explanations such as small business or high incomes.

Ventures Matter Even More in Some Communities

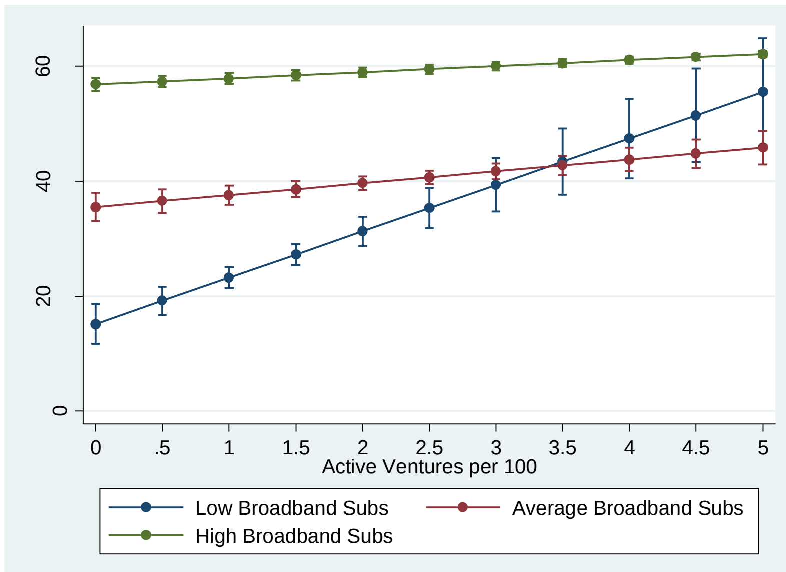
While we have greater confidence from the two-stage models that ventures have an influence on county prosperity that is different from broadband use, it is possible that the effects of ventures are greater in combination with higher broadband adoption in the population. To understand how ventures and broadband subscriptions might affect each other, we create models that include "interaction terms" for broadband subscriptions (broken down into low, median and high categories) and the density of ventures (See Appendix Table 4). How does the combination of broadband subscriptions and ventures relate to community prosperity?

Ventures surprisingly make a greater difference in counties with low rates of broadband connectivity – that is counties that are poor (and often rural). Figure 10 demonstrates that in counties with high broadband adoption (with 60% of the population with a home connection, illustrated at the top of the figure with the nearly flat green line), adding more ventures does not significantly increase county prosperity scores. These are counties that have higher numbers of ventures as well as broadband. But, it is in the most disadvantaged counties, with low rates of broadband adoption, that adding more ventures significantly boosts economic prosperity.

Counties with lower rates of broadband adoption in fact gain the most from ventures

The blue line at the bottom of Figure 10 shows a sharp upward trend in prosperity for less-connected counties as the number of ventures rises. Despite the challenges of lower rates of broadband connectivity, ventures may be adding new economic activity in these counties. For example, in rural areas where local markets are sparse, ventures may be able to connect with customers outside the immediate area and promote business development for local benefit. The multivariate models for the interactions are in Appendix Table 4. Building digital community participation especially matters for disadvantaged places.

Figure 10. Interaction of Broadband Subscriptions and Ventures on County Prosperity



Venture Density and Recovery from the 2008 Recession

Another way of addressing whether digital community participation is related to economic outcomes it to measure change over time. The Economic Innovation Group includes outcomes for two time periods (2007-2011, and 2012-2016). This provides a measure of recovery from the 2008 recession. Additionally, examining change allows us to control for differences across communities in the earlier period, and to strengthen causal explanations for the relationships we uncover.

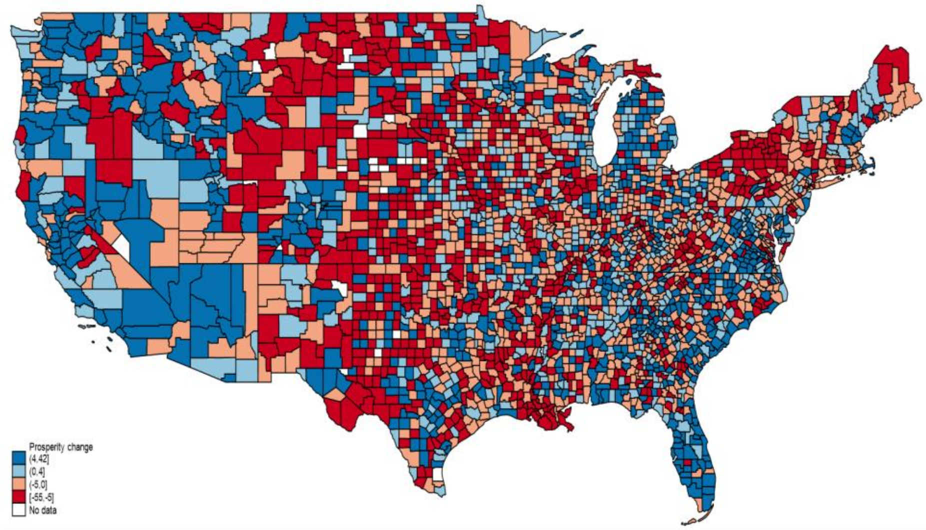
Table 4 indicates that counties that experienced the greatest recovery from the recession had nearly twice as many ventures and highly active ventures in 2018, compared with the counties that recovered the least. Broadband subscriptions were slightly lower in the counties with the most vigorous recovery.

Table 4. Comparing Recovery in Counties: 2007-2011 to 2012-2016

	Top 10% Counties	Bottom 10% Counties
Mean Change in Prosperity	15.4	-17.8
Mean Ventures per 100 People	3.6	1.9
Mean Highly-Active Ventures per 100 People	.84	.43
Mean Broadband Subscription Rates	68%	72%

The map in Figure 11 shows general patterns of change in prosperity, or recovery, by US counties. From North to South, the midsection of the country is substantially red, with less recovery. Consistent with the argument that places are diverging, in the decade after the recession some areas that were prosperous in the past, such as the upper Midwest, have not completely regained their footing. County averages provide some insights into these processes, but multivariate regression analysis is needed to investigate the association between the density of domain name websites and changes in prosperity in a systematic way.

Figure 11. Change in Economic Prosperity, 2007-2016

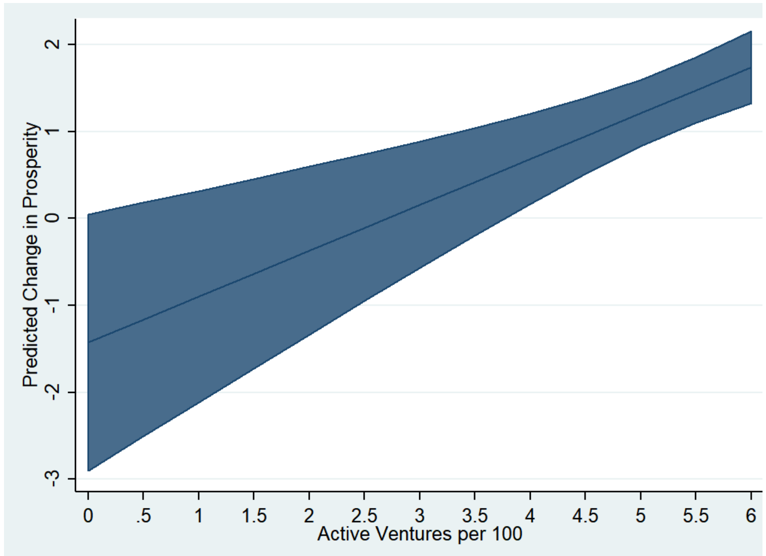


Results from the multivariate regresion model shown in Table 3 demonstrate that both venture density and broadband subscriptions are positive and significant predictors of changes in prosperity over this period, when other factors are held constant.

Not only do prosperity scores rise with broadband adoption in a county, but the density of domain name websites is also a significant predictor of change in the prosperity score. Venture density is one factor causing change in prosperity and contributing to the county's recovery from the recession. Highly active ventures (clusters 3 and 4) contribute even more to changes in prosperity and to recovery.

Figure 12 graphs the relationship between active ventures and the change in prosperity, which is positive and statistically significant based on the multivariate regression model, with all other factors held contstant. Places with more ventures (with at least 2.5 ventures on average) experienced a greater increase in prosperity between 2007 and 2016, and recovered more fully from the recession.

Figure 12. Counties with More Ventures Recovered More



Venture Density and Annual Change in Median Income

The prosperity index includes multiple outcomes, and a central one of concern to policymakers and their communities is whether economic activity increases household income. We therefore examine separately the relationship between venture density, broadband subscriptions and changes in median household income across counties, holding other factors constant. We ask what factors account for changes in median household income from 2016 to 2017. By measuring change in median income, we control for the fact that places with high incomes in 2016 are likely to also have high incomes in 2017; this more favorable starting position may be responsible for the median income in 2017 rather than ventures. We are therefore interested in what role ventures might have in growth or decline.

On average, across the counties, median household income increased by $1700 between 2016 and 2017. Two-thirds of counties experienced a change between 0 and $3400, with some outlier counties that increased median household income by more than $10,000 and others that saw income decline.

For each highly active venture added to a county, median income increased by $331 from 2016 to 2017; a 19 percentage point increase controlling for other factors

The multivariate regression models (see Appendix Table 1 and Table 2) indicate that for every new venture in a county, median household income increases by $46, controlling for broadband subscriptions, small business density, demographics, education, industry mix, etc. But, highly active ventures (clusters 3 and 4) have a much stronger effect. Controlling for the same variables mentioned above, median household income rises by $331 for each highly active venture in the county. Since the average county increase is $1700, this is a substantively large increase of 19 percentage points. Broadband subscriptions are also a positive and statistically significantly predictor of annual income growth. These statistical models also control for the density of small businesses with 50 or fewer employees and other factors. Ventures have a positive effect on growth in median income over and above small businesses. **[NOTE: The analysis was replicated for 2016-2018 using recently released data from the 2018 American Community Survey. Each highly active venture was associated with a $408 boost in median household income across counties for the two-year period. Thus, the 2016-2018 results are even stronger.]**

Conclusion: Ventures as Measures of Grassroots Opportunity and Inclusive Growth

Digital community participation as measured by venture density is a missing element in our knowledge of communities, for policy decisions as well as research. Current government data fails to fully capture the evolution of the economy, including microbusinesses and fledgling startups online, and the added value of having a digital presence for other small businesses, nonprofits or even larger establishments. Ventures offer a new measure of online participation in communities, beyond broadband connectivity, IT employment and traditional measures of business activity. Mapping shows their distribution differs significantly from places where small businesses are concentrated – they are the footprint of a more digitally-enabled economy that has previously been difficult to track. They are significant predictors of community prosperity, controlling for other influences on local economies. The analysis in this report (using two-stage causal models and change over time) suggests that they are in fact one of the causes contributing to community prosperity and economic opportunity today.

Digital community participation measured by the density of ventures (domain name websites) is significantly associated with higher scores on an index of prosperity, using measures from the Economic Innovation Group. The use of two-stage models to isolate the effects of ventures from other economic influences, such as broadband adoption, small business, and median income, in fact strengthened the relationship we observed and supports the case for causal impact. Moreover, places with more ventures per capita recovered more fully from the recession. And poor counties with lower rates of broadband adoption experienced the largest gain from venture density, indicating that ventures may be filling an unmet need in these places.

Economic development does not always benefit residents, if they are unable to obtain the jobs that are generated or to raise their standard of living. The outcomes we measure affect economic opportunity and quality of life for the community, as well as business development. They include poverty, housing vacancy, median household income, and workforce participation rates as well as changes in the number of jobs and business establishments. Apart from increases in the prosperity index, the addition of each venture also added $331 to a county's median household income, over and above the average increase of $1700 from 2016 to 2017. These results are consistent and robust for counties or zip codes, for total ventures or highly active ventures, with different control variables, and different economic outcomes. They withstand scrutiny using two-stage models and measures of change.

Technology adoption (broadband subscriptions) and use (ventures) make a difference in communities in the nation's heartland as well as along the coasts, in rural communities as well as tech hubs. This suggests that inclusive growth and development is possible in the digitally enabled economy, and that supporting online participation for businesses and residents is one strategy for promoting economic opportunity and thriving communities. Public policy needs to take the digital divide and associated skills divide (unequal access to technology and the skills to use it) seriously, to improve outcomes for all communities.

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Appendix

Table 1: Using Active Ventures and to Predict Annual Change in Median Income

	(1) Annual Change Median Income	(2) Annual Change Median Income	(3) Annual Change Median Income
Active Ventures per 100	46.2737*	51.7759*	40.2953*
	(21.0976)	(21.6913)	(19.8822)
Broadband Subscriptions	23.1032*		23.5855*
	(6.7372)		(6.8116)
Small Businesses per 100	-16.8410	-19.6761	
	(12.8063)	(12.9720)	
Percent Black	-14.3932*	-17.1832*	-14.5463*
	(3.4201)	(3.2351)	(3.3651)
Percent Native	-10.0444*	-18.0151*	-9.9380*
	(5.3652)	(5.2619)	(5.2760)
Percent Asian	62.7107*	68.1664*	63.6873*
	(17.2040)	(16.3008)	(17.1230)
Percent Hispanic	-6.7572*	-4.2516	-6.7699*
	(3.0521)	(3.4485)	(3.0351)
Percent Agricul	4.1357	2.1423	0.6889
	(10.8930)	(10.7631)	(10.9190)
Percent Construction	64.3883*	65.6650*	62.5577*
	(16.7359)	(17.4761)	(16.7077)
Percent Wholesale	-15.1511	9.4245	-21.9222
	(45.0298)	(45.9588)	(45.1156)
Percent Retail	-0.0059	7.8712	-2.7114
	(17.8293)	(17.7974)	(18.0122)
Percent Transport	4.9557	1.1622	6.5040
	(20.2741)	(20.8724)	(20.0896)
Percent Info	47.3180	53.0333	37.1506
	(59.7323)	(58.3614)	(61.2653)
Percent Finance	-30.7912	-26.8931	-31.5861
	(20.7248)	(20.7743)	(20.8843)
Percent Prof	-5.2075	1.8344	-0.6191
	(25.2291)	(24.2465)	(24.2852)
Percent Educ	-20.6667*	-18.3289*	-19.0341*
	(8.6418)	(8.8361)	(8.4642)
Percent Other	-132.1155*	-124.7750*	-137.2550*
	(50.4198)	(50.5823)	(50.4756)
Percent Public	-11.9060	-5.3144	-9.6019
	(12.3370)	(12.7602)	(12.0894)
Percent Gen X	43.3223*	52.4485*	44.5012*
	(20.6079)	(20.1386)	(20.4464)
Percent Baby Boomer	-2.9683	-7.4835	-8.0660
	(18.4874)	(18.8780)	(19.3112)
Percent High School	-18.3527*	1.0553	-19.8286*
	(10.5747)	(10.5659)	(10.3287)
Percent College	27.6439*	31.9030*	23.9094*
	(8.2678)	(8.5225)	(7.7710)
Percent Millennial	-11.6733	-12.6363	-13.8915
	(23.7839)	(23.7041)	(24.0638)
constant	1563.5104	854.6387	1700.8082
	(1628.1312)	(1632.2809)	(1641.2156)
Observations	2950	2950	2950

Table 2: Using Highly Active Ventures and to Predict Change in Income

	(1) Change Income	(2) Change Income	(3) Change Income
Highly Activated Ventures per 100	331.6513*	361.4044*	292.9237*
	(98.2440)	(100.2829)	(89.9846)
Broadband Subscriptions	20.9021*		21.8457*
	(6.3633)		(6.3918)
Small Businesses per 100	-18.8652*	-22.8320*	
	(10.7813)	(10.8959)	
Percent Black	-14.2719*	-16.6228*	-14.3845*
	(3.1580)	(3.0595)	(3.1456)
Percent Native	-11.2012*	-18.3952*	-11.0340*
	(5.2516)	(5.1299)	(5.1522)
Percent Asian	61.9785*	67.3571*	63.5953*
	(17.0558)	(16.1117)	(17.0586)
Percent Hispanic	-6.9580*	-4.6080	-7.0442*
	(3.1117)	(3.4181)	(3.0763)
Percent Agriculture	5.0079	3.2233	0.9327
	(11.0774)	(10.9431)	(10.7615)
Percent Construction	62.2892*	63.4919*	61.1518*
	(16.8529)	(17.4016)	(16.9497)
Percent Wholesale	-11.8169	11.5200	-18.3958
	(44.5232)	(44.8663)	(44.7302)
Percent Retail	-5.8679	1.7571	-7.6782
	(17.8438)	(17.3469)	(17.8684)
Percent Transport	11.0643	8.1935	12.3727
	(20.3162)	(20.5588)	(20.2152)
Percent Info	38.7733	39.9594	24.5710
	(59.5329)	(58.0074)	(58.9550)
Percent Finance	-27.2032	-24.9414	-30.2177
	(19.5287)	(19.4856)	(19.3870)
Percent Prof	-3.9910	2.3735	1.2909
	(23.8271)	(22.9407)	(23.4893)
Percent Educ	-18.7384*	-16.5239*	-16.3908*
	(9.2370)	(9.3121)	(8.9837)
Percent Other	-137.8834*	-129.1372*	-141.6357*
	(47.1020)	(47.3528)	(47.5543)
Percent Public	-9.0966	-3.4126	-6.6546
	(12.1034)	(12.5264)	(11.8977)
Percent Gen X	43.5034*	51.2713*	44.2019*
	(19.5634)	(19.3870)	(19.6094)
Percent Baby Boomer	-5.8599	-10.8377	-12.8042
	(16.7562)	(17.1709)	(16.6231)
Percent High School	-18.8296*	-0.6827	-20.1106*
	(10.4958)	(9.8176)	(10.3289)
Percent College	25.6937*	29.7119*	21.4351*
	(7.9128)	(8.1013)	(7.8672)
Percent Millennial	-15.5432	-18.0147	-19.1029
	(20.5201)	(20.7444)	(20.4261)
constant	1860.7799	1228.1249	2000.5164
	(1581.6659)	(1583.9849)	(1584.7959)
Observations	2959	2959	2959

Table 3: Two-Stage Model for Economic Prosperity

	Stage 1- Active Ventures	Stage 2 Prosperity
Active Ventures per 100		1.2967*
		(0.3520)
Percent Black	.003	-0.2831*
	(.009)	(0.0406)
Percent Native	.081*	-0.5336*
	(.016)	(0.0724)
Percent Asian	.002	0.2720*
	(.04)	(0.1242)
Percent Hispanic	.049*	0.0987*
	(.016)	(0.0429)
Percent Agriculture	.092*	-0.3616*
	(.03)	(0.1056)
Percent Construction	.13	1.1779*
	(.084)	(0.2345)
Percent Wholesale	.196	0.7656
	(.22)	(0.5564)
Percent Retail	.017	-0.5470*
	(.069)	(0.1954)
Percent Transport	-.09	-0.1378
	(.102)	(0.2492)
Percent Info	.292	0.2747
	(.232)	(0.5856)
Percent Finance	.071	-0.0774
	(.077)	(0.2038)
Percent Prof	.289*	-1.0574*
	(.077)	(0.2258)
Percent Educ	-.185*	-0.2227
	(.052)	(0.1566)
Percent Other	.1	-0.3776
	(.135)	(0.4352)
Percent Public	.141*	-0.0243
	(.046)	(0.1635)
Percent High School	.00037	1.6203*
	(.039)	(0.1055)
Percent College	.039	0.6189*
	(.025)	(0.0834)
Percent Millennial	.112	-1.0779*
	(.065)	(0.2056)
Percent Gen X	.119	0.7024*
	(.089)	(0.2520)
Percent Baby Boomer	.145*	-1.6039*
	(.067)	(0.1930)
Broadband Subscriptions	.06*	
	(.02)	
Small Businesses per 100	.28*	
	(.04)	
Median Income	.000039*	
	(.000013)	
constant	8.469	-56.1744*
	(5.713)	(17.3095)
Observations		2949

*p<.05

Table 4: Interaction of High, Low, and Medium Broadband Communities

	(1) Prosperity
Medium Broadband	8.5222*
	(2.0008)
High Broadband	18.2690*
	(1.9657)
Active Ventures per 100	2.8872*
	(0.8842)
Medium Broadband # Active Ventures	-1.8368*
	(0.9832)
High Broadband # Active Ventures	-2.1693*
	(0.8963)
Percent White	0.0813*
	(0.0297)
Percent Agriculture	0.1500
	(0.1002)
Percent Construction	0.9192*
	(0.2510)
Percent Wholesale	0.9400
	(0.6048)
Percent Retail	-0.9849*
	(0.2324)
Percent Transport	-1.0829*
	(0.2927)
Percent Info	2.1540*
	(0.5674)
Percent Finance	0.0001
	(0.2111)
Percent Prof	0.3291*
	(0.1876)
Percent Educ	-0.1171
	(0.1204)
Percent Other	-0.3603
	(0.5674)
Percent Public	-0.4602*
	(0.1574)
Percent High School	1.3747*
	(0.1051)
Percent Millennial	-1.1675*
	(0.2126)
Percent Gen X	0.7373*
	(0.3006)
Percent Baby Boomer	-1.7902*
	(0.2071)
constant	-39.2815*
	(17.9214)
Observations	2949

Predicted Prosperity in 2-Stage Model

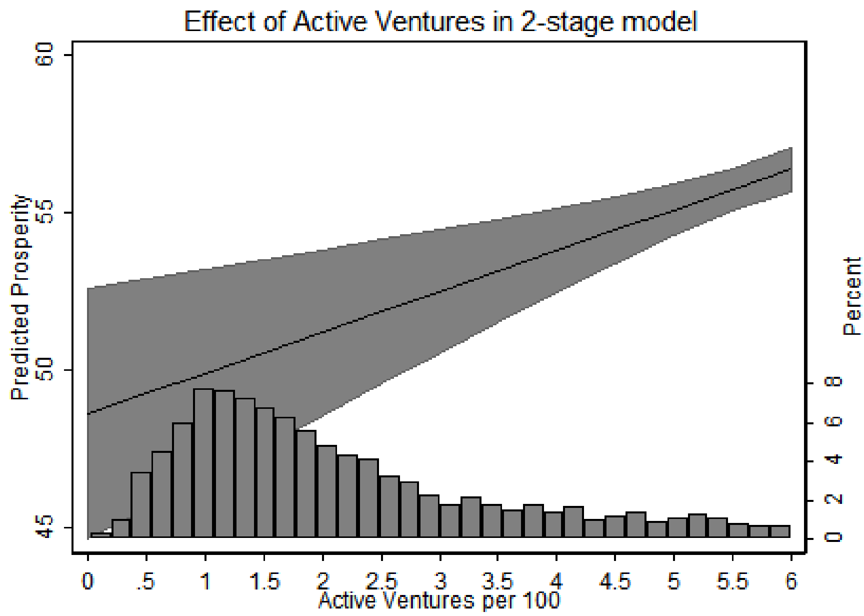

Table 5: Summary Statistics

Variable	N	Mean	SD	Min	Max
Economic Prosperity Index	2958	42.12	21.40	0.47	96.47
Venture Density	3093	2.70	2.43	0.02	18.67
Highly Activate Venture Density	3104	0.61	0.61	0.00	8.15
Broadband Subscription	2959	60.60	11.32	22.30	91.30
Percent Black	2959	8.85	14.29	0.00	86.18
Percent Native	2959	1.54	6.30	0.00	81.31
Percent Asian	2959	1.20	2.25	0.00	34.15
Percent Hispanic	2959	8.84	13.45	0.00	98.96
Percent Agricul	2959	6.62	6.97	0.00	59.30
Percent Construction	2959	7.17	2.24	0.70	22.50
Percent College	2959	20.72	9.01	4.90	73.70
Percent Wholesale	2959	2.41	1.16	0.00	20.50
Percent Retail	2959	11.48	2.29	1.40	30.90
Percent Transport	2959	5.42	1.94	0.00	22.50
Percent Info	2959	1.42	0.81	0.00	15.80
Percent Finance	2959	4.61	1.87	0.00	20.60
Percent Prof	2959	6.78	3.07	0.00	28.70
Percent Educ	2959	23.16	4.46	9.10	45.50
Percent Other	2959	4.69	1.18	0.00	11.50
Percent Public	2959	5.51	3.04	0.00	34.00
Percent Millennial	2959	18.02	3.81	6.10	43.90
Percent Gen X	2959	25.24	2.35	13.40	34.10
Percent Baby Boomer	2959	23.91	4.31	6.20	49.90