Small Banks and Big Boxes: Real Sector Industrial Organization and Financial Consolidation *

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Abstract

The industrial and banking sectors have each seen consolidation over the past twenty years, with small institutions taking an ever-shrinking share. Existing literature argues that small banks' comparative advantages lie in small business finance. We argue that some of the consolidation in the banking sector is a consequence of changes to the industrial organization of the real economy. We use a Bartik-like instrument and variation in exposure to industries with different patterns of small business growth to show that the real-side demand for small bank products is partially responsible for the relative decline in small bank deposits and branches. We do not find that small business growth impacts large banks nor do we find that large business growth affects small bank growth. We find that the result is driven in large part by the propensity of small bank's to be acquired, consistent with the view that small banks comparative advantage lies in small business finance.

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I. Introduction

Over the past fifteen years, the role of small banks in the banking sector has declined dramatically around the United States. In 2002, the average county share of bank deposits held at banks with less than $1 billion in assets[1] was approximately 65 percent. By 2017, the average county share of bank deposits held at small banks had fallen to about 50 percent.[2] Among the leading explanations for the consolidation of the financial services industry are regulatory changes, technological advances in lending, and changes to scale economies.[3] Given the outsized role that small banks play in small-business lending[4], academics and policy-makers have expressed concern that the trends in the banking industry may have pernicious effects on small business and the economy. Taking as given the technological and regulatory factors that influence financial firms, existing literature examines how financial sector trends have affected small firms and economic growth.[5] In this paper, we examine to what extent the causality might run in the opposite direction. That is, to what extent have trends in the organizational structure of the real economy contributed to changes in the organizational structure of the banking industry.

Figure 1 shows the secular decline of national small-firm (< 250 employees) employment shares and small-bank (< $1 billion in assets) deposit shares from 2000 through 2017.[6] Although small-firm employment shares initially rise during the time period, they fall nearly two percentage points in share going into the 2008 financial crisis. During the recession, small-firm employment shares increase slightly before continuing on a downward trend from 2011 through 2017. Meanwhile, small-bank deposit shares have seen continual decline from

[1] All nominal dollar values in the paper are expressed in constant 2002 dollars.

[2] The decline in the national small-bank share of deposits has been similarly large, falling from about 24 percent to just 10 percent.

[3] Although it predates the time period of interest in this study, Berger, Demsetz, and Strahan (1999) and references therein provide a nice review of leading theories on financial consolidation that continue to form the basis of much discussion.

[4] For example, see the literature review in Elyasiani and Goldberg (2004) and references therein.

[5] E.g. Cetorelli and Strahan (2006), Sapienza (2002)

[6] Some county data is not available in 2000 (including for some entire states). We fix the set of counties to the 2000 sample for construction of national data throughout the paper to ensure that trends are not driven by changes in reporting counties. From this, some entire states are excluded.

2000 through 2017, falling by approximately fourteen percentage points.

Our paper rests on two distinct observations from the literature. The first is that small banks' comparative advantages lie in their services to small businesses.[7] The second is that, at least in part, shocks to the real economy have resulted in the loss of small businesses and a change in the organizational structure of industry. From that premise, shocks to the real economy that induce a (relative) reduction in small businesses would be expected to induce a reduction in demand for financial services from those firms. If small banks disproportionately serve the negatively impacted small firms, then small banks will disproportionately be affected. For example, advances in inventory management and vertical supply chains may contribute to the success of big box retailers' abilities to exploit economies of densities, whose expansion comes at the expense of small local retailers.[8] To the extent that national retailers access credit through large banks or capital markets and local retailers seek credit from local financial institutions, we would expect these technological changes to lead to a decrease in the demand for small-bank financial services. Similarly in agriculture, the Kansas City Federal Reserve Bank Ag Finance Databook reports in July 2018, "the size of livestock loans also has been trending higher, suggesting that consolidation has contributed to fewer, larger farms with larger lending needs." The Kansas City Federal Reserve Ten Magazine November 2017 edition ponders "does farm expansion make owners think the small community bank can no longer provide them the amount of credit and services they need?"

The empirical challenge to assess the impact of small firm outcomes on small bank outcomes is that theory and existing evidence in the literature suggest that small bank outcomes affect small firm outcomes. We expect that known technological and regulatory changes affecting small banks reduce the small-bank supply of financial services to their customers, who are disproportionately small firms. Stated differently, this paper aims to evaluate the effects of the *demand* for small-bank financial services on small-bank outcomes, which must be disentangled from small-banks' *supply* of financial services. To resolve this challenge empirically

[7] As of 2017, small banks comprised 8.6 percent all banking assets, but held 21.5 percent of all small commercial loans (i.e. less than $1 million in 2017 dollars) made by banks. Source: Call Reports.

[8] See, Holmes (2011) and Jia (2008).

we rely on a Bartik-like instrument. In our primary specification, we construct a county-year level Bartik instrument using annual national industry growth from 2003 through 2017 (such that 2003 reflects 2002-2003 growth) weighted by year 2000 county industry shares. The Bartik instrument relies on ex-ante variation in industry shares and the identification assumption for the purposes of this paper is that this variation does not predict innovations to small-bank financial services supply, given the other controls. We discuss this assumption and associated diagnostic tests suggested by Goldsmith-Pinkham, Sorkin, and Swift (2019) in Section VI.

We find that changes in small-firm employment are statistically and economically significant factors to changes in small-bank deposits and branches. Across specifications, we find that a one percent decrease in small-firm employment is associated with approximately a 1.2 percent decrease in small-bank deposits. This coefficient implies that moving from the 75th percentile county-year small-firm employment growth (3.4 percent) to the 25th percentile county-year small-firm employment growth (-3.0 percent), is associated with a 7.7 percent decrease in small-bank deposit growth. Similarly, we find that a one percentage point decrease in small-firm employment growth is associated with a 0.3 percent decrease in small-bank branch growth. In contrast, we find that large-firm employment has no statistically or economically significant relationship with small-bank deposits or branches, suggesting that our results are not driven by general improvements to the local economy. In addition, we find that small-firm employment growth is not statistically or economically related to large-bank deposit or branch growth. Together, our results are consistent with theories and evidence on relationship banking. In particular, small firms rely disproportionately on small, local banks, while large firms do not rely on local finance and large banks do not rely on local firms (relative to small banks' reliance) in their business model.

We then examine the mechanisms through which small-bank deposits and branches are affected by changes to small-firm employment. In particular, we examine the relationship between small-firm employment growth and the propensity of small banks to be acquired, to grow through acquisition, and to fail. Our findings demonstrate that our main results

are driven by the propensity of small banks to be acquired in the face of declines of small firm employment (or, in contrast, a lesser propensity to be acquired in the presence of small-firm employment growth). Again, our results are consistent with the view that small banks specialize in lending to small businesses and that in the absence of small business financial service demand, economies-of-scale from a larger bank model may be more profitable than a small-bank business model.

This paper relates to strands of literature on bank consolidation, industrial sector consolidation, and relationship banking. The literature on bank consolidation is extensive and well-established. Berger, Demsetz, and Strahan (1999) provide a summary of the literature, highlighting leading theories of consolidation through the time of publication. Among the leading explanations the authors present are increased economies-of-scale from technological innovation, international consolidation of markets, and deregulation. Radecki, Wenninger, and Orlow (1997) argue that alternative delivery of deposit services (e.g. ATMs) may improve economies of scale. Similarly, Petersen and Rajan (2002) and Berger and Frame (2007) discuss developments in small-business credit scoring and the associated economies-of-scale. Arguments that bank consolidation is a consequence of deregulation follows from major legislation passed in the 1990s that removed barriers to bank size. Among the barriers lifted by legislation were laws limiting interstate bank branches (Riegle Neale Act of 1994) and prohibitions on affiliations with certain nonbank financial intermediaries (Gramm Leach Bliley Act of 1999). Consistent with this theory, Jayaratne and Strahan (1998) show that removal of interstate restrictions on branching resulted in increase merger and acquisitions. More recently, Cyree (2016) argues that post-crisis financial regulation is associated with fixed compliance costs that further increase economies-of-scale and limit the profitability of small banks. Such an argument was, at least in part, the rationale behind the passage of the Economic Growth, Regulatory Relief and Consumer Protection Act of 2018.[9]

Regarding industrial consolidation, both theoretical and empirical literature demonstrate

[9]See Crapo (R-Idaho), Chairman of the U.S. Senate Committee on Banking, Housing and Urban Affairs remarks on October 2, 2018.

effects of real-side consolidation. Goldmanis, Hortascu, Syverson, and Emre (2010) show that e-commerce contributes to decreased profitability of small firms. Jia (2008) finds that Walmart entry is responsible for approximately 50 percent of the nationwide decline in small discount retailers. More generally, Grullon, Larkin, and Michaely (2019) look at publicly traded firms in Compustat and find that large firm shares and market concentration have generally increased across industries, with "surges" in various measures of consolidation and concentration beginning in the late 1990s or early 2000s. They find that market share for the largest four firms increased in more than 80 percent of industries and that for 21 of 65 industries, the largest four firms' collective market share increased by more than 40 percentage points. Similarly, Council of Economic Advisers (2016) and citations therein document declining competition across industries. The report notes that a "natural question is whether increased concentration in one area of the supply chain leads to increased concentration in other parts of the supply chain." Relatedly, Crawford and Yurukoglu (2012) and Gowrisankaran, Nevo, and Town (2015) examine the downstream effects of consolidation of television and managed care industries, respectively.

Underpinning the narrative of this paper is the literature on small ("community") banks' and their comparative advantage in relationship lending. Relationship banking is defined as financial services that invest in customer-specific information, with the profitability of investments evaluated across repeated customer interactions (Boot (1999)). Berger et al. (2005) and Chakraborty and Hu (2006) argue that the proprietary information gained through relationship banking gives community banks a distinct comparative advantage over their large-bank competitors. Consistent with the view that community banks have a comparative advantage in relationship lending, Carter and McNulty (2005) finds that community banks outperform their peers in the more informationally opaque small business lending market. Community banks' comparative informational advantage in small business and relationship lending may emanate, in part, from their distinct knowledge of local markets. Through their abilities to acquire "soft" information, community banks expand access to credit. The organizational structure typically exhibited within community banks may provide them advantages in re-

lationship lending compared to larger banks. Career paths for loan officers at community banks and larger banks differ, with the larger banks offering more intrafirm location and position mobility. As a result, loan officers at community banks may have more incentive to create long-term lending relationships Petersen and Rajan (1995). Agency frictions between loan officers and management may also be better mitigated through the flatter organizational structure of community banks the close proximity of senior management and the loan office reduces intrafirm monitoring costs. Stein (2002) contends that a flat organizational structure is better than a hierarchical structure at producing "soft" information, while large hierarchies perform better when information can be "hardened." Recognizing that the comparative advantage is neither static (Berger, Cowan, and Frame (2011)) nor uniform across the industry (Federal Deposit Insurance Corporation (2018)), we rely on the view from the relationship lending literature that, in comparison to large banks, small banks disproportionately serve small business customers.

The rest of the paper is organized as follows. Section II discusses the data used in the analysis. Section III discusses the Bartik methdology and the diagnostic tests performed (and to be performed) to assess the validity of the instrument. Section IV discusses the results. Section V discusses how our small business employment measure relates to measures of small business lending. Section VI unpacks the Bartik instrument to gain a better understanding of the implicit identification assumptions in our estimator. Section VII concludes.

II. Data

Our paper assumes that small banks have a comparative advantage in serving small businesses and, consequently, that shocks to small businesses disproportionate affects small banks. Primarily, the narrative and the literature focus on this comparative as emanating through small business lending. While this forms the basis of our hypothesis, small business performance might also affect small bank growth through other banking services, including small business deposits (Kennickell, Kwast, and Pogach (2015)) or lending to households (e.g. home equity

line of credit) whose ultimate purpose is to support a small business (see Robb and Robinson (2014) and Avery, Bostic, and Samolyk (1998)).

To measure small businesses, which serve as a proxy for banking services demand, we use Census Quarterly Workforce Indicators (QWI) data on firm employment.[10] QWI provide local labor market statistics by industry and are sourced from the Longitudinal Employer-Household Dynamics (LEHD) linked employer-employee microdata. LEHD covers over 95 percent of U.S. private sector jobs and and is itself sourced from administrative records on employment. For this paper, the critical information provided by the employer based records is the number of employees in a county by the size of the firm. Note that we use firm size, rather than establishment (physical place of work) size because our narrative revolves around the premise that the banking decisions are made at a firm, rather than an establishment, level. For example, as of January 2017, Target Corporation had 323,000 employees and 1,803 stores, approximately 180 employees per store.[11] We view the relevant measure for Target with regard to its choice of financial services to be 323,000, not 180. Thus, we want our measure of local firm employment for a county with a single Target store to assign 180 employees to a firm of size 323,000 employees, consistent with the measurement in QWI. QWI includes data on the number of employees by industry by five different firm sizes: 0-19 employees, 20-49 employees, 50-249 employees, 250-499 employees, and 500+ employees. Through the rest of the paper, we use these size categories to define small (<250) and large firms (>500), designating firms with 250 to 499 employees as neither small nor large.[12] We use June data from each year for all specifications to align with the timing of the branch data, discussed below.

In Figure 2, we plot industry employment growth and changes in small-firm employment shares by industry (plots normalized to 0 in year 2000). First, we note that there is consider-

[10] In unreported analysis, we show that county level small firm employment growth is strongly correlated with small business credit growth, as measured in Community Reinvestment Act (CRA) data. However, CRA data does not include banks below the $1 billion threshold and is therefore not a viable source of data for small bank loan supply for this study.

[11] Target Corporation, 2016 Annual Report.

[12] We use 250 as the benchmark for small firms rather than 500 to avoid a mechanical relationship between small firm shares large firm shares.

able variation across industries in growth rates, changes in small-firm employment shares, and the relationship between the two. For example, the retail industry (NAICS 44-45) saw virtually no cumulative growth in employment between 2000 and 2017. However, small retail-firm employment shares fell by nearly ten percentage points over the period, the largest decline in small-firm employment shares of any industry. Manufacturing (NAICS 31-33), which experienced one of the largest employment declines during the period, saw a slight increase in small-firm employment shares. Meanwhile, the industry with the largest increase in small-firm employment share, Mining (NAICS 21), also had increase in overall employment.

For bank data, we primarily use Summary of Deposits data from the Federal Deposit Insurance Corporation. Summary of Deposits includes bank branch location and branch deposits. The data are collected for all FDIC-insured institutions, which includes thrifts, but does not include credit unions. The data is collected annually as of June 30. The reporting allows for consolidation of deposit accounts across offices, but only within a county. For this paper, we aggregate deposits to the county level by bank when computing measures of competition and across all branches in a county by size for computing large- and small-bank deposit and branch shares. We also rely upon Reports of Condition and Income (Call Reports) to measure bank level variables, most importantly assets. For most of the analysis, we define banks as "small" if they have less than $1 billion (2002 dollars) in assets and "large" if they have more than $50 billion. The $1 billion cutoff for small banks is common in the literature[13] and for regulatory purposes.[14] Meanwhile, the $50 billion definition for large is consistent with the definition of large banks requiring additional oversight in the Dodd-Frank Act in 2010.

In Figure 3 we plot average national changes in the small-firm employment shares and small-bank deposit shares across counties. The time series plots suggest that there is a strong temporal correlation between small-firm employment shares and small-bank deposit shares. Small bank and small firm shares both tended to decline from 2000 to 2017, though declines

[13]For example, Berger et al. (2005) and also is a common benchmark for regulatory purposes.

[14]For example, Community Reinvestment Act requires that assets of more than (approximately) $1 billion collect and report data on small business, small farm, and community development lending.

for both were steepest in the boom leading up to the 2008 financial crisis and the post-crisis recovery. Declines were the smallest (even increasing in some years) for small firms and small banks at the tail end of the 2001 recession and during the Great Recession.

We report summary statistics in Table I for the main sample period 2003 to 2017. The annual average decline of small-bank deposit shares across counties is 74 bps, while the average decline in small-firm employment share across counties is nearly 10 bps. In the case of banks, we find that the decline of small bank share is nearly 90 percent accounted for by the rise in large-bank deposit share (which is not mechanical, given that banks between $1 billion and $50 billion are included in neither definition). In the case of real businesses, approximately 75 percent of the decrease in small firm employment share is accounted for from an increase in large firm share (7.6 bps). Changes in small-firm employment and small bank shares can also be observed through the log differences of businesses (growth). Average annual growth for large firms across county-years is approximately 129 bps during this period, though only about 10 bps for small firms. Meanwhile, both small bank deposits and small bank branches shrunk on average across county-years by about 187 bps and 183 bps, respectively. In contrast, large bank deposits grew on average by 1543 bps across county-years and large bank branches grew by 237 bps. Collectively, both the real and banking industries saw stagnant growth if not declines in smaller institutions and considerable growth in larger institutions. We also report values of pre-sample controls from the year 2000: population (Census), unemployment rate (BLS), indicator for urban (Census), income per capita (Haver), number of branches (SOD), and small bank deposit share (SOD).

In Table II we present five year growth statistics for our variables of interest to show how the trends from Table I differ across the pre-crisis, crisis, and post-crisis periods. In each of the five year periods, small-firm employment and small-bank deposit shares fell, though the dynamics differed across periods. Prior to the financial crisis, the average county saw growth in both small-bank deposits (7.9 percent) and small-firm employment (4.6 percent). However, both saw their relative shares decline as larger institutions grew even faster, with (180 percent for large-bank deposits and 8.2 percent for large-firm employment). These trends led to

average declines in small-bank deposit shares of 3.2 percent and small-firm employment share of 0.19 percent across counties. During the five-year period encompassing the 2008 financial crisis and associated recession period (June 2007 through June 2012), the average county saw an absolute decline in both small-bank deposits (11.8 percent) and small-firm employment (5 percent). In both cases, large-firm employment growth (2.8 percent) and large-bank deposit growth (48 percent) continued, albeit at slower rates than in the expansion period. In the recovery period (June 2012 to June 2017), small firms continued to lose employment share (0.65 percent), driven by large-firm employment growth outpacing small-firm employment growth (8.9 percent to 2.1 percent), similar to the pre-crisis period. For banks in the recovery period, the average county saw declines in small-bank deposit share as small-bank deposits shrunk at a faster rate than they did for large banks (24 and 3.9 percent, respectively).

In Figures 4 and 5 we map the county trends in small-firm employment growth and small-bank deposit growth, respectively. Starting with Figure 4, we show that county level small-firm employment grew the 2002 to 2017 most in the Mountain Region (e.g. CO, UT, NV) with strong growth in counties across southern Texas and western North Dakota. Areas in Appalacchia, the Midwest, and the Plains also appear to generally have lower small-firm employment growth compared to the rest of the country, despite reasonably strong small-firm employment growth in the urban areas in these regions (e.g. Indianapolis, Columbus, Pittsburgh). In Figure 5, we map small-bank deposit growth across counties in the United States from 2002 to 2017. In some areas, small-bank deposit growth resembles that of small-firm employment growth. Texas and Western North Dakota have notably strong small bank deposit growth, while Appalachia generally has weaker small-bank deposit growth. However, small-bank deposit growth and small-firm employment growth have notable differences in the Heartland and rural versus urban areas. Whereas small-business employment growth seems weakest in the Heartland and rural areas, this is where small-bank deposit growth is strongest.

In Table III we show that the correlations suggested Figures 4 and 5 are borne out statistically. In Column 1 we show results from a univariate regression of small-bank deposit growth on small-firm employment growth for 2003 through 2017 and find a statistically significant

relationship at the 5 percent level. The coefficient of 0.16 implies that a 1 percent growth in county small firm employment is associated with a 16 bps increase in county small bank deposit growth. In Column 2 we show that the result is similar in magnitude and significance when including year fixed effects. In Column 3 we similar show that the association persists at a similar magnitude and significance when adding controls from 2000, including log population, unemployment rate, an urban indicator variable, log income per capital, log number of branches and the small bank deposit share. Of the controls, only log number of branches and log population are statistically significant, with larger counties by population associated with slower deposit growth and larger counties measured by branches associated with larger small bank deposit growth. In Column 4 we find similar associations in magnitude and statistical significance when adding state fixed effects. In Columns 5 through 8 we run a similar analysis but use large-firm employment growth rather than small firm employment growth as an explanatory variable. In none of the specifications is large-firm employment growth statistically or economically significance in its association with small bank deposit growth. Thus, the regressions suggest that the association between small-bank deposit growth and small-firm employment growth not a function of a relationship of small-bank deposit growth to economic growth in general, but is instead specific to small-firm growth.

III. Methodology

We use a Bartik-like approach to estimate the effect of small-firm performance on small-bank performance. We are interested in the following kind of equation:

$$y_{ct} = \rho D_{ct} + x_{ct}\beta_0 + \epsilon_{it} \tag{1}$$

where c are counties, t is year, y_{ct} are bank outcomes, D_{ct} is a vector of controls, x_{ct} are real sector outcomes, and ϵ_{ct} is a structural error term. In our primary analysis, we are interested in small-bank deposit log differences as the y_{ct} variable and real small-firm log differences

as the x_{ct} variable. The identification challenge from the above equation is that small-firm outcomes may be driven by small-bank outcomes, rather than the reverse, which biases the OLS parameter estimate of β_0. Indeed, established literature (e.g. Cetorelli and Strahan (2006)) suggests that shocks to small bank operations (e.g. mergers) affect small businesses.

The Bartik instrument is constructed by taking the inner product of county-specific industry shares and and national real industry-period growth rates (for the variable of interest). As discussed in Goldsmith-Pinkham, Sorkin, and Swift (2019), the underlying assumption from this approach is that the industry shares are exogenous (conditional on the controls) to innovations in the outcome variable (e.g. small-bank deposit growth).[15] Namely, the Bartik instrument is constructed as:

$$B_{ct} = Z_{c0} G_t = \sum_k z_{ck0} g_{kt} \tag{2}$$

where G_t is a $1 \times K$ vector of national real (i.e. nonfinance) industry small business growth rates in year t, Z_{c0} is a $1 \times K$ vector of initial (year 2000) industry shares for county c. This produces a standard two-stage least squares estimation, where the first stage regresses the explanatory variable of interest (county c small firm growth in period t) on the controls and the Bartik instrument:

$$x_{ct} = D_{ct}\tau + B_{ct}\gamma + \eta_{ct}. \tag{3}$$

For control variables D_{ct} we include time dummies and year 2000 county controls, namely: log population, log income per capital, an urban indicator variable, log bank branches, and small bank deposit share. We assume that these variables are strictly exogenous for this methodology. While this is a strong assumption, it is standard for this environment and we lag our estimation time frame (2002 to 2003 growth rates being the earliest period in our sample data) from the initial period (2000) to mitigate concerns about the violation of this

[15] Note that we are using log differences rather than levels, similar to Autor, Dorn, and Hanson (2013).

assumption.

In Table IV we report regressions of the small-firm county-year growth on the Bartik instrument. First, in Column 1 we report the relationship between the instrumented variable, small-firm employment growth, and the controls. Small firm employment growth has strong positive correlations with a number of control variables. Small firm growth is positively correlated with 2000 values of log county population, an urban indicator, and log income per capita and negatively correlated with 2000 values of unemployment and log bank branches. In Column 2 we report the results of a regression of small firm employment growth on the Bartik instrument, with year fixed effects only. The coefficient on the Bartik instrument is approximately 1, with a F-statistic of 33. Results are similar when we include the year 2000 county controls in Column 3. In Columns 4, 5, and 6 we report regression results of small firm employment on the Bartik instrument for the separate five year samples 2003-2007, 2008-2012, and 2013-2017 (all years inclusive). In each case, the F-statistics for the associated regressions are 7.6, 46, and 10, respectively.

The question that this paper considers is whether the decreased role of small banks in the banking industry is a consequence of *demand* for small bank financial services emanating from real side shocks to small firms. For the Bartik instrument to be valid, the identifying assumption is that industry composition does not predict innovations to the supply of small bank financial services. While this assumption is not directly testable, we perform a number of diagnostic tests to assess the validity of the estimator.

First, we would expect that one of the primary drivers of the supply of small bank financial services would come from household deposit supply. Two natural channels through which household deposit supply be influenced are population growth and increases in wealth (per capita income). In Table V we show in Column (1) that small bank deposit growth is strongly correlated with both of these demographic variables, though the regression does not distinguish whether this correlation is driven by changes to the supply or demand of deposits. In Column (2) we show that the Bartik instrument constructed using national industrial trends on small firm employment and year 2000 county-level industrial shares does

not predict county population growth. In contrast, in Column (3), we show that a Bartik instrument constructed on large firm employment trends does predict population growth. In a regression jointly estimating the relationship of Bartik instruments constructed with small and large employment growth in Column (4), we find that the small firm employment Bartik instrument actually has a negative relationship with population growth, after controlling for the large firm employment Bartik instrument. In Columns (5) through (7) of Table V we perform a similar exercise to Columns (2) through (4), using income per capita growth as the dependent variable rather than population growth. Columns (5) and (6) show that Bartik instruments using both small firm and large firm employment growth, respectively, have a strong positive association with per capita income growth. However, in Column (7) we show that this correlation is driven primarily by the variation in the large firm employment instrument. Naturally, growth in per capita income may itself be the consequence of changes to the real side demand for labor. In robustness analysis we use the Bartik instrument for large firm employment to provide insights on how our results may be driven by innovations to household deposit supply. In addition to examining factors that affect the supply of small bank financial services, we further explore the validity of our instrument using the analysis of Goldsmith-Pinkham, Sorkin, and Swift (2019) in Section VI.

IV. Results

In Table VI we report the results of our main specification of small bank deposit and branch growth on instrumented small firm employment growth. In Column 1, we report the results of an OLS regression of small bank deposit growth on the Bartik instrument. The coefficient on the Bartik instrument is 1.3 and statistically significant at the five percent level. The result suggests that a one percent increase in annual county small firm employment growth is associated with 1.3 percent increase in county small bank deposit growth. Similarly, using a two-stage least square approach in Column 2, we find that county small firm employment growth is associated with a 1.2 percent increase in small bank deposit growth, again significant

at the 5 percent threshold. In Column 3, we report results of a two stage least squares regression of small bank deposit growth on large firm growth, instrumenting with a similarly constructed Bartik instrument for large firms. The association of small bank deposit growth and large firm growth is less than half as large (0.49) and marginally significant. In Columns 4, 5, and 6 we report results from similar regressions to Columns 1, 2, and 3, using small bank branch growth rather than small bank deposit growth as the dependent variable. In Column 4, we find that a one percentage point increase in Bartik instrument for small firm employment growth is associated with a 0.34 percent increase in small bank branch growth, significant at the five percent level. Using the Bartik instrument for small firm growth in a two-stage least squares, we report in Column 5 an coefficient of 0.31, also significant at the five percent level. We report in Column 6 no statistically significant relationship between instrumented large firm growth and small bank branch growth, with a coefficient of 0.09. In unreported results, we find similar coefficients both in magnitude and statistical significance when using 3-digit NAICS codes as the basis of our construction of the Bartik-instrument.

In Table VII we examine a number of alternative specifications relative to the baseline. In Column (1) we report results of the baseline Bartik two stage least squares specification using small bank deposits as the dependent variable, but weighting observations by county population. The point estimate (1.3) and the statistical significance (5 percent) of the weighted two stage least square are similar to that of the unweighted regression. In Column (2) we report results of the baseling Bartik two stage least squares specification using small bank branches as the dependent variable, but weighting observations by county population. Like the small bank deposit specification, the point estimate (0.35) and statistical significance (5 percent) are similar to the unweighted specification. In Column (3) we report an OLS regression of change in county level HHI on small firm employment growth. We find no significant relationship between changes to HHI and small firm employment, suggesting that our baseline results are not leading to changes in how many banks are competing in a county, but rather which banks are competing in a county. In Column (4) and (5), we report the results of an OLS regression of large bank (>\$50 billion in assets) deposits and branches, respectively, on

small firm employment. In neither case is there an economically or statistically significant relationship between small firm employment and large bank growth variables. These regressions suggest that our main specifications are not driven by a general increase in demand for banking services associated with small firm growth.

Given our definition of "small" banks as those below $1 billion, the county-level small bank measurements can be affected by small firm employment growth through at least four distinct mechanisms. Small banks could be acquired by larger banks, ceasing to be designated as "small." Small banks could themselves acquire other small banks to grow out of the small bank classification. Small banks can fail. Finally, small banks can organically grow out of the definition. Theories and existing literature on relationship banking suggests that the first mechanism, acquisition by another bank, is the most likely mechanism through which small firm employment affects small banks. In particular, our paper relies on the view that small banks have a comparative advantage in small business lending. If small business lending struggles, then a small bank would not be expected to capitalize on this advantage through organic growth or acquisition. For example, Berger, Saunders, Scalise, and Udell (1998) find that acquired institutions adopt the lending strategies of their acquirer. Thus, a small bank facing a decline in small firm customers would be unlikely to capitalize on their comparative advantage through acquiring another institution. While it seems theoretically possible for small firm employment to affect small bank deposit and branches through failure, we expect that failures are more likely the consequence of larger regional and macroeconomic trends.

To examine the mechanisms through which small bank deposit and branch growth may occur, we measure small bank deposits (branches) affected from acquisition,[16] acquiring another institution, and failing, as a proportion of county deposits. In Table VIII we relate these measures to small firm employment growth. We use both an OLS regression and also a Tobit regression to account for the fact that the county measures of affected small bank deposits (branches) is bounded below by zero and, for many county-years, is exactly equal to

[16]We exclude intracompany merger in our merger definition, where an "intracompany" acquisition is defined as a merger in which the institutions belonged to the same holding company for less than one year prior to the merger.

zero. In Columns (1) and (2) we analyze the relationship between small-firm employment and acquired small-bank deposits. In Column (3) and (4) we analyze the relationship between small-firm employment and acquiring small-bank deposits. In Column (5) and (6) we analyze the relationship between small-firm employment and failed small-bank deposits. Columns (1) and (2) suggest in both OLS and Tobit regressions a strong statistical relationship between small-firm employment growth and the propensity for small bank deposits to be acquired: Counties experiencing a one percent decrease in small firm employment are expected to see 2 bps (OLS) and 28 bps (Tobit) of small-bank deposits be acquired, relative to county deposits. In Column (3) we find that small-firm employment growth is positively associated with small banks engaging as an acquiring institution, though the result is not robust to a Tobit specification. In Columns (5) and (6) we do not find a statistically significant relationship between small-firm employment growth and small bank deposits associated with a failure.

While our results suggest that shocks to small firms affect small banks on the external margin (e.g. deposit growth, branch growth, mergers), it may also be the case the small-firm outcomes affect small banks on the internal margin. For example, small banks may shift their business strategies in response to changes in the organizational structure of the real economy. As the role small firms declines, banks may shift their portfolios away from small-business lending and move toward other activities, such as residential real estate lending.

Empirically, one challenge with assessing the relationship between small firm outcomes and small bank business strategies is that other than the number of branches and deposits, data for banks tends to be available at the bank level rather than the bank-location level. This is particularly true for small banks that are not subject to Community Reinvestment Act reporting requirements (see Section V). However, survey data from Federal Deposit Insurance Corporation (2018) finds that more than 70 percent of small banks focus their small business lending portfolio at the county-level or finer. Consequently, to analyze small bank portfolio decisions, we focus exclusively on small banks with a geographical presence in a single county,[17] understanding as a limitation that some portion of banks portfolios may ex-

[17]This is the case for 54 percent of small banks in the data.

tend beyond their branch footprint. We use data from Call Reports to measure the banks' portfolios.

For small banks operating in single counties, we examine the relationship of industrial organization on small banks by regressing bank portfolio allocations on small-business firm employment growth, including bank fixed effects. We run the regression both as OLS and as two stage least squares regressions, using a small-firm Bartik instrument (national industry small-firm employment growth weighted by year 2000 county-industry shares). We report the results in Table IX In the odd numbered columns we report results from the OLS specification and in the even numbered columns we report specifications from the two-stage least squares specification. Columns 1 and 2 use core deposits to liabilities as the independent variable; Columns 3 and 4 use small-business lending (measured using the Call Report data as loans less than $1 million to businesses plus loans less than $500 thousand to farms);[18] Columns 5 and 6 use commercial and industrial loans to total loans as the independent variable; and Columns 7 and 8 use residential real estate loans to total loans as the independent variable. We find in Columns 1 and 2 that the proportion of core deposit liabilities increases with small firm growth. In Columns 3 and 4, we find in both the OLS and 2SLS specifications that the proportion of the loan portfolio devoted to small business lending are statistically associated with small firm growth. In Columns 5 and 6, we show that the results from Columns 3 and 4 are specific to small business lending and do not apply to the commercial and industrial loan portfolio more generally. In particular, the parameter estimate from Column 5 on the relationship of small firm employment growth on the commercial loan portfolio is quantitatively similar to that in Column 3, which includes only small business loans. Moreover, the results from the 2SLS specification for small business loans does not carry over to the commercial loan portfolio more generally in Column 6. In Columns 7 and 8, we show that the residential real estate lending portfolio is negatively associated with small firm employment growth and that the magnitudes of this relationship is almost exactly the

[18]Most studies (e.g. Cortés et al. (2019)) loan size as a proxy for firm size absent a better measure. Federal Deposit Insurance Corporation (2018) discuss the limitations of this approach.

reverse of the estimates for the small business lending portfolio. Thus, our results suggest that when small firm employment decreases, bank loan portfolios shift from small business loans to residential real estate loans.

In Table X we examine to what extent the results from Table IX are particular to small-firm employment growth. To test this, we consider similar OLS regressions to Table IX. In the odd number columns, we report results from OLS regressions of bank portfolio composition on large firm employment growth. In even number columns, we report results from OLS regressions of bank portfolio composition on both large and small firm employment growth. In the odd numbered columns, we observe that large firm employment growth is positively associated with core deposit funding for banks, but unrelated to bank portfolio allocations. When we include both small firm and large firm employment growth, we observe that the former is of similar (if not larger) magnitude and statistical significance after including the latter. In addition, the magnitudes of the coefficients are greater for small firm employment growth than large firm employment growth. Small firm employment is associated with more than three times the increase in core deposits to liabilities ratio than is large firm employment growth (Column 2); more than four times the increase of small business loans to total loans than is large firm employment growth (Column 4); more than five times the increase in commercial loans to total loans than is large firm employment growth (Column 6); and more than eight times the decrease in residential real estate loans to total loans than is large firm employment growth (Column 8).

V. Employment and Small Business Lending

In our analysis, we rely upon QWI data on employment by firm size to measure changes in the aggregate size and performance of small businesses. Meanwhile, our narrative focuses on changes in the demand for financial services from small businesses. While this may include a variety of services, the extant literature points to small business loans as an integral part of small business finance. In this section, we examine how our measure of small business financial

services demand from the QWI data corresponds to measures of small business borrowing.

To assess the relationship between small firm employment and small business borrower, we rely upon data from the Community Reinvestment Act (CRA). CRA is intended to encourage depository institutions to help meet the credit needs of the communities in which they operate, including low- and moderate-income neighborhoods. All banks that meet an asset size threshold are subject to data collection and reporting requirements. As of December 31, 2017, the asset size threshold that triggers data collection and reporting for all agencies is $1.226 billion, and generally increases year-on-year at about the rate of inflation. CRA data includes bank loans of certain size thresholds aggregated to the county level on an annual basis. Consequently, a limitation of the data is that it does not measure loans to small businesses per se, but rather small loans, independent of firm size. Nevertheless, CRA data has commonly been used in the literature to proxy for small business lending (e.g., Cortés et al. (2019) and references therein).

For the purposes of our study, the asset size threshold is problematic to measure small business lending by small banks because it explicitly excludes those banks in which we are interested. However, under the assumption that the county-level demand for small business loans is correlated across large and small institutions, we use the CRA data to inform to what extent the demand for small business loans from small banks is correlated to our primary variable of interest, growth in small firm employment.

In Table XI we report results of regressions of county-level small business lending from CRA on our measure of county-level small business employment from QWI. In Column 1, we report results of county-aggregate CRA loan volume growth regressed on small firm employment growth from QWI and year 2000 county controls. We find that CRA lending is strongly correlated with small firm employment. In Column 2, we find a similarly strong relationship using county fixed effects in place of year 2000 county controls. In Column 3, we add large firm employment growth as a control and find that it is an order of magnitude smaller in explaining CRA county lending growth than small firm employment growth and is marginally significant. In Columns 4 through 8, we use bank-county-year data to examine the

relationship between small firm employment growth and small business lending. In Column 4, we show that our specification from Column 1 yields similar results in the bank-county-year data.

One challenge with the CRA data is that reporting specifically excludes smaller banks. As a result, CRA county aggregates are in part a consequence of which bank report within a county. In Columns 5 through 8 we exploit the structure of the CRA data to assess the relationship of small business lending and small business employment within bank. In Column 5, we show that the relationship between QWI small firm employment growth and CRA lending growth are strongly related after controlling for bank fixed effects. In Column 6, we should that the relationship holds across counties within a bank-year. In Column 7, we show that the relationship holds within a bank-year after controlling for county fixed effects. Finally, in Column 8, we show that the effect persists after controlling for changes in log large-firm employment. Although large firm employment is statistically related to small business loans measures with CRA data, the relationship between small firm employment and small business lending is an order of magnitude larger and also statistically much stronger. Together, the results of this sections suggest that small firm employment is strongly related to small business loan demand.

VI. Bartik Diagnostics

Goldsmith-Pinkham, Sorkin, and Swift (2019) (GSS) show how to construct Rotemberg weights which allow us to better understand which industries are primarily driving the estimates, and to make more concrete the set of specification tests that support the research design. In this section, we discuss the Rotemberg weights associated with our instruments.

In particular, GSS show that the Bartik instrument is effectively a weighted sum of just-identified instrumental variable estimators where each industry's share can be considered as its own instrument. They then show that the Bartik estimator ($\hat{\beta}_{Bartik}$) can be rewritten as

a weighted sum of the just-identified estimators. Mathematically:

$$\hat{\beta}_{Bartik} = \sum_t \sum_k \hat{\alpha}_{kt} \hat{\beta}_k$$

$$where$$

$$\hat{\beta}_k = (Z_k' X^{\perp})^{-1} Z_k' Y^{\perp} \text{ and } \hat{\alpha}_{kt} = \frac{g_{kt} Z_k' X^{\perp}}{\sum_t \sum_{k'} g_{k't} Z_k' X^{\perp}}$$

$$so \text{ that } \sum_t \sum_k \hat{\alpha}_{kt} = 1$$

where Z_k are year 2000 county shares of industry k, g_{kt} is the national small firm growth rate of industry k in year t demeaned by the industry average,[19] X is a matrix of county small-firm employment growth rates, Y is a matrix of small bank deposit growth rates, and $X^{\perp} = M_D X$ where M_D is the annhilator matrix for controls D, $M_D = I - D(D'D)^{-1}D'$ and I is the identity matrix. Denote $\hat{\alpha}_k = \sum_t \hat{\alpha}_{kt}$.

We interpret the Bartik instrument in this paper as reflecting variation in 2000 county-industry shares. Thus, the implicit assumption in this paper is that those county-industry shares are exogenous to future small bank deposit growth conditional on the other covariates. The Rotemberg weights provide insight into which of the assumptions of exogeneity of county-industry shares are most important for the empirical design or, alternatively, the assumption for which our design is most sensitive to mis-specification. In Table XII and Figures 6 and 7, we report diagnostics of Rotemberg weights as suggested by GSS.

Panel A of Table XII shows that the bulk of the absolute weight of the estimator is absorbed by industries that receive positive weights. In Panel B, we show that the high weight industries are not necessarily higher or lower growth industries, with a correlation coefficient of -0.082. However, the high weight industries are highly correlated with first-stage F-statistics, which is also borne out in Figure 6. This is an important diagnostic, as

[19] When the industry shares sum to one within a location, the instruments are linearly dependent. To address this issue, we follow GSS, and report Rotemberg weights that come from demeaning the (unweighted) industry growth rates.

it reveals that the high-weight industries act as strong instruments. In addition, the high-weight industries are also associated with industries with more industry share variation across counties (correlation coefficient 0.450). In Panel C, we show that much of the absolute weight of the instrument is absorbed by two years in the data, 2009 and 2016. Panel D of Table XII indicates that, consistent with Figure 6 the top five industries absorb nearly the entirety of the absolute weight of the estimator and the top two industries (Mining, Quarrying, and Gas Extraction; and Manufacturing) receive more than 80 percent of the absolute weight of the estimator. Thus, our identifying assumption can be best understood as an assumption that conditional on other covariates, county employment shares for these two industries in 2000 is not driven by future innovations to small bank deposit growth, especially for 2009 and 2016. Panel D also shows that the point estimates across the top-five industries are similar to one another and to the overall Bartik estimator. Furthermore, the highest two weight industries those with below average county-small-firm-employment growth, so that our identification is coming from counties where small-firm employment has relatively declined.

In Figure 7 we plot the first-stage F-statistics against the just-identified estimators β_k to understand the heterogeneity of the just-identified instruments. We restrict attention to only those instruments with a first-stage F-statistic greater than 5, consistent with GSS. The circles in the graph represent industries with positive Rotemberg weights, while the diamonds reflect industries with negative Rotemberg weights and the size of the shapes reflect the magnitude of the weight $\hat{\alpha}_k$. The plot demonstrates that the strongest first-stage industries in our analysis tend to produce estimates similar to our Bartik estimator (i.e. centered around 1) and one another.

VII. Conclusions

In this paper, we argue that the financial consolidation is, in part, a consequence of real consolidation. Given that extant literature finds that the bank consolidation reduces small-business lending, our results suggest that there is a feedback loop between the real and

financial sectors. Our findings complement existing views that regulation and technology have contributed to bank and real-side consolidation. The results highlight that the viability of small banks may depend on the viability of small firms.

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Table I: Source: Census, QWI, and SOD data. Difference variables expressed as annual differences (e.g. the difference between 2003 and 2002).

	Annual County Data, 2003-2017			
	mean	p50	sd	County-Years
$\text{Ln(Pop}_{2000}\text{)}$	10.3	10.2	1.4	39,341
$\text{Unemployment}_{2000}$	4.23	3.90	1.60	39,341
Urban_{2000}	0.139	0	0.346	39,341
$\text{Ln(Per Capita Inc}_{2000}\text{)}$	10.1	10.1	0.2	39,341
$\text{Ln(Branch}_{2000}\text{)}$	2.48	2.40	1.21	39,341
$\text{Small Bank Share}_{2000}$	0.63	0.68	0.32	39,341
ΔSmall Bank Share*100	(0.74)	0	7.56	39,341
ΔSmall Firm Share*100	(0.10)	(0.07)	2.49	39,341
ΔLarge Bank Share*100	0.66	0	6.05	39,341
ΔLarge Firm Share*100	0.08	0.03	2.17	39,341
ΔLn(Small Firm Emp)*100	0.11	0.42	7.96	39,341
ΔLn(Large Firm Emp)*100	1.29	0.86	31.6	39,341
ΔLn(Small Bank Dep)*100	(1.87)	2.94	89.6	39,341
ΔLn(Large Bank Dep)*100	15.43	0	154.9	39,341
ΔLn(Small Bank Branches)*100	(1.83)	0	15.2	39,341
ΔLn(Large Bank Branches)*100	2.37	0	19.9	39,341
Small Bank Deposits Acquired/Total County Deposits*100	3.44	0	10.7	39,341
Small Bank Branches Acquired/Total County Branches*100	3.57	0	10.0	39,341
Deposits of Acquiring Small Banks/Total County Deposits*100	1.52	0	6.87	39,341
Branches of Acquiring Small Banks/Total County Branches*100	1.63	0	6.49	39,341
Deposits of Failed Small Banks/Total County Deposits*100	1.93	0	8.12	39,341
Branches of Failed Small Banks/Total County Branches*100	1.95	0	7.48	39,341

Table II: Source: Census, QWI, and SOD data. Cumulative 5 year changes.

	2002-2007				2007-2012				2012-2017			
	mean	p50	sd	count	mean	p50	sd	count	mean	p50	sd	count
ΔSmall Bank Share*100	(3.19)	0	16.6	2,575	(3.38)	0	15.0	2,604	(4.46)	(0)	15.1	2,546
ΔSmall Firm Share*100	(0.19)	(0.27)	4.16	2,575	(0.62)	(0.61)	3.98	2,604	(0.64)	(0.50)	3.64	2,546
ΔLarge Bank Share*100	6.36	0	14.1	2,575	2.96	0	11.0	2,604	0.58	0	8.9	2,546
ΔLarge Firm Share*100	0.02	0.04	3.91	2,575	0.57	0.53	3.61	2,604	0.53	0.40	3.31	2,546
ΔLn(Small Firm Emp)*100	4.61	3.46	14.3	2,575	(4.97)	(5.51)	14.9	2,604	2.12	2.72	13.6	2,546
ΔLn(Large Firm Emp)*100	6.85	4.67	53.6	2,575	3.21	0.00	52.3	2,604	8.90	7.98	40.5	2,546
ΔLn(Small Bank Dep)*100	7.85	16.33	164.0	2,575	(11.83)	13.59	166.2	2,604	(24.47)	4.20	207.9	2,546
ΔLn(Large Bank Dep)*100	187.7	14.04	392.7	2,575	47.3	0.00	231.6	2,604	(3.9)	0.00	231.2	2,546
ΔLn(Small Bank Branches)*100	(1.88)	0	32.8	2,575	(10.19)	0	31.4	2,604	(15.57)	0	33.9	2,546
ΔLn(Large Bank Branches)*100	30.56	0	49.5	2,575	10.91	0	34.2	2,604	(5.82)	0	26.8	2,546

Table III: Multivariate regressions of small bank deposit growth. Errors clustered at the state level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ΔLn(Small Firm Emp)	0.165**	0.161**	0.169**	0.161**				
	(0.0654)	(0.0644)	(0.0634)	(0.0637)				
ΔLn(Large Firm Emp)					-0.00121	0.000365	0.000982	0.000893
					(0.0117)	(0.0119)	(0.0121)	(0.0122)
$\text{Ln(Pop}_{2000}\text{)}$			-0.0392***	-0.0182**			-0.0384***	-0.0176*
			(0.0133)	(0.00900)			(0.0134)	(0.00910)
$\text{Unemployment}_{2000}$			-0.00244	-0.000912			-0.00266	-0.00118
			(0.00369)	(0.00307)			(0.00368)	(0.00308)
Urban_{2000}			0.00184	-0.0167			0.00280	-0.0158
			(0.0165)	(0.0106)			(0.0165)	(0.0106)
$\text{Ln(Per Capita Inc}_{2000}\text{)}$			-0.0486	0.00355			-0.0475	0.00455
			(0.0326)	(0.0324)			(0.0327)	(0.0324)
$\text{Ln(Branch}_{2000}\text{)}$			0.0543***	0.0256**			0.0532***	0.0249**
			(0.0168)	(0.0103)			(0.0169)	(0.0104)
$\text{Small Bank Share}_{2000}$			0.0162	-0.0524*			0.0159	-0.0523*
			(0.0258)	(0.0263)			(0.0260)	(0.0263)
Observations	39,341	39,341	39,341	39,341	39,341	39,341	39,341	39,341
R-squared	0.000	0.002	0.002	0.006	0.000	0.001	0.002	0.006
REG	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS
YEAR	NO	YES	YES	YES	NO	YES	YES	YES
STATE FE	NO	NO	NO	YES	NO	NO	NO	YES
YRS	2003-2017	2003-2017	2003-2017	2003-2017	2003-2017	2003-2017	2003-2017	2003-2017

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Table IV: Multivariate regressions of small firm employment growth. The Bartik instrument is constructed as the weighted sum of national industry small employment growth, where the weights are year 2000 county industry shares. Column (1) reports regression results of small firm employment growth on year 2000 controls. Column (2) reports regression of small firm employment growth on the Bartik instrument. Column (3) reports regression results of small firm employment on the Bartik instrument and year 2000 controls, corresponding to the first-stage regression in our baseline specification. Columns (4) through (6) report results of the baseline first stage specification for 2003-2007, 2008-2012, and 2013-2017, respectively. Errors clustered at the state level.

	(1)	(2)	(3)	(4)	(5)	(6)
Bartik		1.010***	1.019***	0.626***	1.038***	1.065***
		(0.175)	(0.176)	(0.227)	(0.153)	(0.336)
$\text{Ln(Pop}_{2000}\text{)}$	0.00433**		0.00473***	0.00889***	-0.00531	0.0107***
	(0.00183)		(0.00168)	(0.00179)	(0.00473)	(0.00212)
$\text{Unemployment}_{2000}$	-0.00131***		-0.00170***	-0.00213***	-0.00126**	-0.00161**
	(0.000434)		(0.000408)	(0.000679)	(0.000547)	(0.000780)
Urban_{2000}	0.00578***		0.00549***	0.00596**	0.00193	0.00881***
	(0.00158)		(0.00162)	(0.00227)	(0.00230)	(0.00256)
$\text{Ln(Per Capita Inc}_{2000}\text{)}$	0.00704***		0.00426*	0.00268	0.00404	0.00717
	(0.00235)		(0.00223)	(0.00404)	(0.00500)	(0.00563)
$\text{Ln(Branch}_{2000}\text{)}$	-0.00620***		-0.00616***	-0.0127***	0.00506	-0.0111***
	(0.00197)		(0.00169)	(0.00167)	(0.00479)	(0.00207)
$\text{Small Bank Share}_{2000}$	-0.00177		-0.00108	-0.00513	0.00639	-0.00471
	(0.00258)		(0.00239)	(0.00446)	(0.00525)	(0.00358)
Observations	39,341	39,341	39,341	13,108	13,153	13,080
R-squared	0.057	0.065	0.068	0.011	0.137	0.036
REG	OLS	OLS	OLS	OLS	OLS	OLS
YEAR	YES	YES	YES	YES	YES	YES
YRS	2003-2017	2003-2017	2003-2017	2003-2007	2008-2012	2013-2017

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Table V: Small Bank Deposit Supply. In this table we examine how the Bartik instrument relates to possible measures of small bank deposit supply. All regressions are OLS. Column (1) regresses the independent variable in our main specification, small bank deposit growth, on contemporaneous demographic growth measures and year 2000 controls from our baseline specification. Columns (2) and (3) relate county population growth to the small-firm and large-firm employment growth Bartik instruments, respectively. Columns (4) and (5) relate per capital income growth to the small-firm and large-firm employment growth Bartik instruments, respectively. Columns (6) and (7) relate population growth and per capital income growth, respectively, to both small-firm and large-firm employment growth Bartik instruments Errors clustered at the state level.

VARIABLES	(1) ΔLn(Small Bank Dep)	(2) ΔLn(Pop)	(3) ΔLn(Pop)	(4) ΔLn(Pop)	(5) ΔLn(GDP per cap)	(6) ΔLn(GDP per cap)	(7) ΔLn(GDP per cap)
ΔLn(GDP per cap)	0.312***						
	(0.106)						
ΔLn(Pop)	0.515**						
	(0.241)						
Bartik(small firm)		0.0136		-0.0444**	0.595***		0.190
		(0.0176)		(0.0203)	(0.202)		(0.154)
Bartik(large firm)			0.0519**	0.0780***		0.657***	0.545***
			(0.0205)	(0.0254)		(0.180)	(0.130)
$\text{Ln(Pop}_{2000}\text{)}$	-0.0405***	0.00764***	0.00768***	0.00769***	-0.00387***	-0.00347***	-0.00350***
	(0.0131)	(0.000560)	(0.000558)	(0.000559)	(0.00107)	(0.00105)	(0.00103)
$\text{Unemployment}_{2000}$	-0.00262	-0.00106***	-0.00109***	-0.00108***	7.27e-05	-4.06e-05	-5.56e-05
	(0.00376)	(0.000300)	(0.000297)	(0.000296)	(0.000259)	(0.000202)	(0.000208)
Urban_{2000}	0.000222	0.00314**	0.00307**	0.00304**	0.000486	-0.000362	-0.000241
	(0.0166)	(0.00140)	(0.00141)	(0.00140)	(0.000655)	(0.000693)	(0.000700)
$\text{Ln(Per Capita Inc}_{2000}\text{)}$	-0.0491	0.00207	0.00184	0.00183	0.00140	-0.000274	-0.000242
	(0.0323)	(0.00178)	(0.00177)	(0.00177)	(0.00233)	(0.00217)	(0.00216)
$\text{Ln(Branch}_{2000}\text{)}$	0.0558***	-0.00705***	-0.00705***	-0.00705***	0.00237**	0.00243**	0.00243**
	(0.0164)	(0.000586)	(0.000584)	(0.000585)	(0.000975)	(0.000905)	(0.000902)
$\text{Small Bank Share}_{2000}$	0.0150	-0.00146	-0.00140	-0.00140	0.000686	0.00113	0.00111
	(0.0257)	(0.00151)	(0.00149)	(0.00149)	(0.000962)	(0.00101)	(0.000991)
Observations	39,432	39,432	39,432	39,432	39,432	39,432	39,432
R-squared	0.002	0.113	0.114	0.115	0.151	0.155	0.156
REG	OLS	OLS	OLS	OLS	OLS	OLS	OLS
YEAR FE	YES	YES	YES	YES	YES	YES	YES
YRS	2003-2017	2003-2017	2003-2017	2003-2017	2003-2017	2003-2017	2003-2017

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Table VI: Regressions of small bank growth variables on small firm employment growth. Column (1)-(3) use deposits as the dependent variable. Column (4)-(6) use branches as the dependent variable. Column (1) and (4) use an OLS specification with the Bartik instrument constructed as national industry small firm employment shares weighted by year 2000 industry shares. Columns (2) and (4) use a two stage least squares approach where the first stage regression is county small firm shares on the Bartik instrument. Columns (3) and (6) use national large firm employment growth to construct the Bartik instrument and county level large firm shares as the Bartik instrument. Errors clustered at the state level.

	ΔLn(Small Bank Deposits)			ΔLn(Small Bank Branches)		
	(1)	(2)	(3)	(4)	(5)	(6)
Bartik (Small Firm Emp Gr)	1.342**			0.339**		
	(0.560)			(0.131)		
ΔLn(Small Firm Emp)		1.191**			0.311**	
		(0.583)			(0.142)	
ΔLn(Large Firm Emp)			0.491*			0.0976
			(0.283)			(0.0741)
$\text{Ln(Pop}_{2000}\text{)}$	-0.0374***	-0.0436***	-0.0384***	-0.00519**	-0.00677**	-0.00541**
	(0.0134)	(0.0143)	(0.0132)	(0.00250)	(0.00279)	(0.00249)
$\text{Unemployment}_{2000}$	-0.00358	-0.00110	-0.00251	-0.00113	-0.000537	-0.000914
	(0.00363)	(0.00371)	(0.00366)	(0.000934)	(0.000977)	(0.000947)
Urban_{2000}	0.00169	-0.00407	-0.00169	-0.00425	-0.00583	-0.00493
	(0.0164)	(0.0154)	(0.0155)	(0.00469)	(0.00449)	(0.00444)
$\text{Ln(Per Capita Inc}_{2000}\text{)}$	-0.0509	-0.0558*	-0.0573*	-0.0139*	-0.0154**	-0.0152**
	(0.0329)	(0.0331)	(0.0338)	(0.00762)	(0.00759)	(0.00754)
$\text{Ln(Branch}_{2000}\text{)}$	0.0529***	0.0606***	0.0571***	-0.000414	0.00164	0.000472
	(0.0169)	(0.0186)	(0.0179)	(0.00256)	(0.00303)	(0.00289)
$\text{Small Bank Share}_{2000}$	0.0153	0.0180	0.0178	-0.00951*	-0.00892*	-0.00909*
	(0.0258)	(0.0244)	(0.0245)	(0.00478)	(0.00463)	(0.00472)
Observations	39,432	39,341	39,341	39,432	39,341	39,341
REG	OLS	2SLS	2SLS	OLS	2SLS	2SLS
YEAR FE	YES	YES	YES	YES	YES	YES
YRS	2003-2017	2003-2017	2003-2017	2003-2017	2003-2017	2003-2017

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Table VII: Alternative Specifications. Column (1) reports regression results of the baseline two-stage regression of small bank deposit growth on small firm employment growth using the Bartik-instrument, but weighting by county population. Column (2) reports regression results of the baseline two-stage regression of small bank branch growth on small firm employment growth using the Bartik-instrument, but weighting by county population. Column (3) reports regression results of a two-stage regression of county bank deposit HHI on small firm employment growth using the Bartik-instrument. Column (4) reports regression results of a two-stage regression of large bank deposit growth (large > $50 billion) on small firm employment growth using the Bartik-instrument. Column (5) reports regression results of a two-stage regression of large bank branch growth (large > $50 billion) on small firm employment growth using the Bartik-instrument. Errors are clustered at the state level.

VARIABLES	(1) ΔLn(Sm Bank Dep) - Wght	(2) ΔLn(Sm Bank Brch) - Wght	(3) ΔHHI	(4) ΔLn(Lg Bank Dep)	(5) ΔLn(Lg Bank Brch)
ΔLn(Small Firm Emp)	1.257**	0.348**	0.00310	0.0377	-0.00720
	(0.585)	(0.151)	(0.00298)	(0.0820)	(0.0128)
Ln(Pop_{2000})	-0.0443***	-0.00746**	-0.00184***	0.0123	0.00816**
	(0.0144)	(0.00301)	(0.000352)	(0.0267)	(0.00313)
$Unemployment_{2000}$	-0.000896	-0.000529	0.000354***	-0.00956	-0.00194
	(0.00373)	(0.00105)	(0.000116)	(0.0107)	(0.00143)
$Urban_{2000}$	-0.00554	-0.00618	0.000854*	-0.0173	0.00201
	(0.0153)	(0.00455)	(0.000488)	(0.0319)	(0.00559)
Ln(Per Capita Inc_{2000})	-0.0505	-0.0154**	-0.00235**	-0.0718	0.00589
	(0.0323)	(0.00782)	(0.00102)	(0.0794)	(0.0114)
Ln($Branch_{2000}$)	0.0617***	0.00239	0.00280***	-0.00818	-0.00148
	(0.0191)	(0.00326)	(0.000487)	(0.0282)	(0.00332)
Small Bank $Share_{2000}$	0.0190	-0.00960**	0.00178***	-0.103*	-0.0176**
	(0.0233)	(0.00486)	(0.000581)	(0.0523)	(0.00652)
Observations	39,341	39,341	39,341	39,341	39,341
R-squared			0.005	0.023	0.053
REG	2SLS	2SLS	OLS	OLS	OLS
YEAR FE	YES	YES	YES	YES	YES
YRS	2003-2017	2003-2017	2003-2017	2003-2017	2003-2017

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Table VIII: Drivers of Small Bank Deposit Changes. In this table we regress small bank deposits affected by structural changes in bank ownership as a proportion of total county bank deposits. For example, Columns (1) reports results of an OLS regression of acquired small bank deposits relative to total bank deposits on changes to small firm employment and county-level controls from 2000. For a county where no small bank deposits exited as a result of being acquired, this value is zero. Because there are many counties where no small bank deposits are acquired, we also report results from an analogous Tobit specification in Column (2). In Columns (3) and (4) we report results from similar specifications where the independent variable is the proportion of total county small bank deposits belonging to an acquiring small bank to total county deposits. Columns (5) and (6) similarly look at total county failed small bank deposits to total county deposits, but we restrict attention to 2008 to 2015 due to limited failures outside of this time horizon. Errors are clustered at the state level.

VARIABLES	(1) Acquired	(2) Acquired	(3) Acquiring	(4) Acquiring	(5) Failed	(6) Failed
ΔLn(Small Firm Emp)	-0.0187***	-0.281***	0.0131**	-0.0360	-0.00757	-0.295
	(0.00609)	(0.108)	(0.00522)	(0.101)	(0.00653)	(0.187)
Ln(Pop_{2000})	0.00182	-0.0365	-0.00334*	-0.0595**	0.00196	-0.0985**
	(0.00135)	(0.0246)	(0.00165)	(0.0258)	(0.00174)	(0.0410)
$Unemployment_{2000}$	-0.000600	0.00376	-0.00100**	-0.00558	3.39e-05	0.0154
	(0.000417)	(0.00842)	(0.000428)	(0.0116)	(0.000282)	(0.0191)
$Urban_{2000}$	0.00217	-0.0541	-0.00150	-0.147	0.00323	-0.00812
	(0.00144)	(0.0476)	(0.00234)	(0.101)	(0.00274)	(0.140)
Ln(Per Capita Inc_{2000})	0.00290	-0.227***	-0.00204	-0.457***	-0.000162	-0.250
	(0.00338)	(0.0855)	(0.00330)	(0.0645)	(0.00160)	(0.247)
Ln($Branch_{2000}$)	-0.00297*	-0.367***	0.00310*	-0.311***	-0.00256	-0.324***
	(0.00148)	(0.0315)	(0.00180)	(0.0293)	(0.00226)	(0.0586)
Small Bank $Share_{2000}$	0.0133***	0.226***	0.0210***	0.306***	0.00180	0.242**
	(0.00178)	(0.0463)	(0.00199)	(0.0507)	(0.00138)	(0.117)
Observations	39,341	5,748	39,341	5,651	21,037	717
R-squared	0.007		0.012		0.010	
REG	OLS	Tobit	OLS	Tobit	OLS	Tobit
YEAR FE	YES	YES	YES	YES	YES	YES
YRS	2003-2017	2003-2017	2003-2017	2003-2017	2008-2015	2008-2015

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Table IX: Bank Level Regressions of Bank Portfolios on Small Business Growth. The sample is restricted to bank-years of small banks operating with branches in a singly county. Odd numbered columns are OLS regressions of the independent variable on changes in county-level small firm employment. Even numbered columns report the results of two stage least squares regressions of the independent variable on small firm employment growth using the small firm Bartik-instrument (national industry small firm growth rates weighted by year 2000 county-industry shares). All regressions include year and bank fixed effects. Columns 1 and 2 reports regression results of core deposits to liabilities on small firm employment growth. Columns 3 and 4 reports regression results of small business lending (measured as the sum of small industrial and agricultural loans) as a fraction of total loans. Columns 5 and 6 reports regression results of commercial and industrial loans as a fraction of total loans. Columns 7 and 8 reports regression results of residential real estate loans as a fraction of total loans. Errors are clustered at the bank level.

VARIABLES	(1) $\frac{CoreDep}{Liab}$	(2) $\frac{CoreDep}{Liab}$	(3) $\frac{SmBusLoan}{Loans}$	(4) $\frac{SmBusLoan}{Loans}$	(5) $\frac{CI}{Loans}$	(6) $\frac{CI}{Loans}$	(7) $\frac{ResRE}{Loans}$	(8) $\frac{ResRE}{Loans}$
ΔLn(SmallFirm)	0.0151***	0.121*	0.0128***	0.180**	0.0153***	0.0971	-0.0113**	-0.205***
	(0.00490)	(0.0723)	(0.00495)	(0.0746)	(0.00427)	(0.0630)	(0.00455)	(0.0681)
Observations	52,917	52,917	52,917	52,917	52,917	52,917	52,917	52,917
R-squared	0.348		0.102		0.017		0.019	
Number of cert	5,381	5,381	5,381	5,381	5,381	5,381	5,381	5,381
REG	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
YEAR FE	YES	YES	YES	YES	YES	YES	YES	YES
BANK FE	YES	YES	YES	YES	YES	YES	YES	YES
YRS	2002-2017	2002-2017	2002-2017	2002-2017	2002-2017	2002-2017	2002-2017	2002-2017

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Table X: Bank Level Regressions of Bank Portfolios on Large Business Growth. The sample is restricted to bank-years of small banks operating with branches in a singly county. Odd numbered columns are OLS regressions of the independent variable on changes in county-level large firm employment. Even numbered columns report the results of two stage least squares regressions of the independent variable on large firm employment growth using the large firm Bartik-instrument (national industry large firm growth rates weighted by year 2000 county-industry shares). All regressions include year and bank fixed effects. Columns 1 and 2 reports regression results of core deposits to liabilities on small firm employment growth. Columns 3 and 4 reports regression results of small business lending (measured as the sum of small industrial and agricultural loans) as a fraction of total loans. Columns 5 and 6 reports regression results of commercial and industrial loans as a fraction of total loans. Columns 7 and 8 reports regression results of residential real estate loans as a fraction of total loans. Errors are clustered at the bank level.

VARIABLES	(1) $\frac{CoreDep}{Liab}$	(2) $\frac{CoreDep}{Liab}$	(3) $\frac{SmBusLoan}{Loans}$	(4) $\frac{SmBusLoan}{Loans}$	(5) $\frac{CI}{Loans}$	(6) $\frac{CI}{Loans}$	(7) $\frac{ResRE}{Loans}$	(8) $\frac{ResRE}{Loans}$
ΔLn(LargeFirm)	0.00416***	0.00575***	0.00216	0.00343**	0.00125	0.00267*	-0.000484	-0.00150
	(0.00130)	(0.00145)	(0.00155)	(0.00173)	(0.00120)	(0.00136)	(0.00116)	(0.00131)
ΔLn(SmallFirm)		0.0195***		0.0155***		0.0174***		-0.0125**
		(0.00526)		(0.00548)		(0.00472)		(0.00496)
Observations	52,917	52,917	52,917	52,917	52,917	52,917	52,917	52,917
R-squared	0.348	0.348	0.102	0.102	0.017	0.017	0.019	0.019
Number of cert	5,381	5,381	5,381	5,381	5,381	5,381	5,381	5,381
REG	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
YEAR FE	YES	YES	YES	YES	YES	YES	YES	YES
BANK FE	YES	YES	YES	YES	YES	YES	YES	YES
YRS	2002-2017	2002-2017	2002-2017	2002-2017	2002-2017	2002-2017	2002-2017	2002-2017

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Table XI: OLS regressions of County Small Business Lending on County Small Firm Employment. In each specification, the independent variable is the log change in small business lending. County small business lending is measured using Community Reinvestment Act data and is aggregated to the county-year level for Columns 1-3 and the bank-county-year for Columns 4-8. Errors clustered at the state level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ΔLn(Small Firm Emp)	0.137***	0.111**	0.116**	0.124***	0.123***	0.135***	0.112***	0.115***
	(0.0453)	(0.0458)	(0.0456)	(0.0253)	(0.0247)	(0.0240)	(0.0239)	(0.0236)
ΔLn(Large Firm Emp)			0.0215*					0.0193**
			(0.0123)					(0.00720)
$\text{Ln(Pop}_{2000}\text{)}$	0.00351			0.0159***	0.0178***	0.0172***		
	(0.00336)			(0.00306)	(0.00216)	(0.00211)		
$\text{Unemployment}_{2000}$	0.00133			-0.00247**	-0.00286***	-0.00300***		
	(0.00112)			(0.00100)	(0.000748)	(0.000696)		
Urban_{2000}	0.0161***			0.00668**	0.0116***	0.0114***		
	(0.00286)			(0.00314)	(0.00306)	(0.00296)		
$\text{Ln(Per Capita Inc}_{2000}\text{)}$	0.0145			-0.00346	0.00744	0.00498		
	(0.00874)			(0.00644)	(0.00598)	(0.00591)		
$\text{Ln(Branch}_{2000}\text{)}$	-0.00638			-0.00540*	-0.00388	-0.00462*		
	(0.00401)			(0.00268)	(0.00232)	(0.00236)		
$\text{Small Bank Share}_{2000}$	0.0134*			-0.00667	-0.00392	-0.00559		
	(0.00758)			(0.00475)	(0.00375)	(0.00387)		
Observations	39,912	39,912	39,912	860,141	860,141	860,141	859,578	859,578
R-squared	0.149	0.161	0.162	0.029	0.052	0.171	0.171	0.171
REG	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS
YEAR FE	YES	YES	YES	YES	YES	Abs	Abs	Abs
COUNTY FE	NO	YES	YES	NO	NO	NO	NO	YES
BANK FE	N/A	N/A	N/A	NO	YES	Abs	Abs	Abs
YRS	2002-2017	2002-2017	2002-2017	2002-2017	2002-2017	2002-2017	2002-2017	2002-2017
BANK-YEAR FE	N/A	N/A	N/A	NO	NO	YES	YES	YES

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Table XII: This table reports statistics about the Rotemberg weights. When we report statistics about industry weights, we report aggregates across years. Panel A reports the share and sum of negative Rotemberg weights. Panel B reports correlations between the weights (α^k), the national component of growth (g^k), the just-identified coefficient estimates (β^k) , the first-stage F-statistic of the industry share (F^k), and the variation in the industry shares across locations ($Var(z^k)$). Panel C reports variation in the weights across years. Panel D reports the top five industries according to the Rotemberg weights. The g^k is the national industry growth rate, β^k is the coefficient from the just-identified regression, the 95% confidence interval is the weak instrument robust confidence interval using the method from Chernozhukov and Hansen (2009) over a range from -10 to 10, and Ind Share is the industry share (multiplied by 100 for legibility). Panel E reports statistics about how the values of (β^k) vary with the positive and negative Rotemberg weights.

Panel A: Negative and positive weights

	Sum	Mean	Share
Negative	-0.039	-0.006	0.036
Positive	1.039	0.094	0.964

Panel B: Correlations of Industry Aggregates

	α_k	g_k	β_k	F_k	Var(z_k)
α_k	1				
g_k	-0.082	1			
β_k	0.011	0.130	1		
F_k	0.771	0.152	0.013	1	
Var(z_k)	0.450	0.186	0.034	0.749	1

Panel C: Variation across years in α_k

	Sum	Mean
2002	0.097	0.005
2003	-0.014	-0.001
2004	-0.002	-0.000
2005	0.021	0.001
2006	0.074	0.004
2007	0.029	0.002
2008	0.024	0.001
2009	0.212	0.012
2010	0.033	0.002
2011	0.040	0.002
2012	0.092	0.005
2013	0.020	0.001
2014	0.003	0.000
2015	0.052	0.003
2016	0.286	0.016
2017	0.034	0.002

Panel D: Top 5 Rotemberg weight industries

	$\hat{\alpha}_k$	g_k	$\hat{\beta}_k$	95 % CI	Ind Share
Mining, Quarrying, Gas Extraction	0.559	-0.090	0.65	(0.30,1.00)	1.625
Manufacturing	0.248	-0.065	1.80	(0.60,3.00)	21.686
Construction	0.092	-0.028	1.30	(-0.10,2.70)	6.798
Health Care, Social Assistance	0.053	0.098	1.55	(-0.20,3.30)	13.043
Agriculture, Forestry, Fishing, Hunting	0.033	0.021	1.20	(-2.90,5.30)	3.369

Panel E: Estimates of β_k for positive and negative weights

	α-weighted Sum	Share of overall β	Mean
Negative	-0.006	-0.007	-0.880
Positive	0.916	1.007	1.874

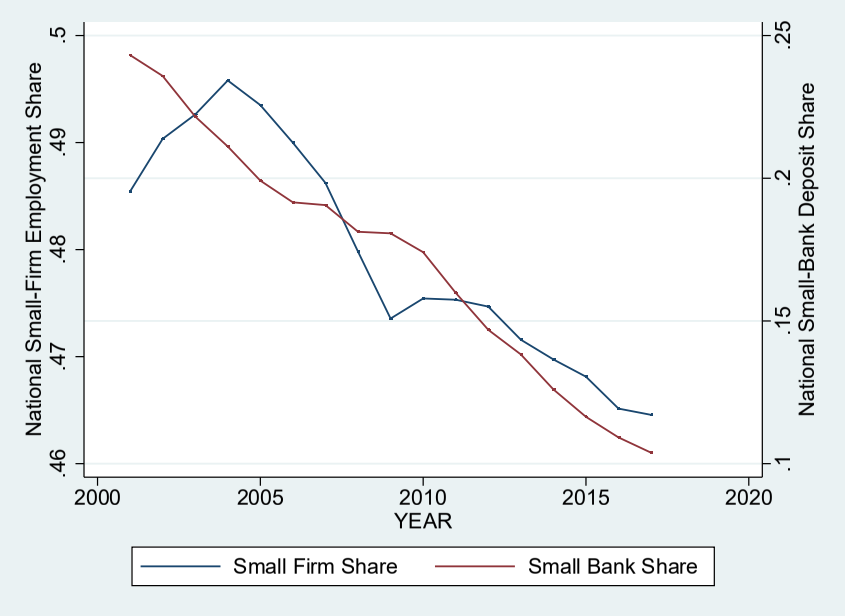

Figure 1: Source: Census Quarterly Workforce Indicators (Firm Shares). FDIC Summary of Deposits (Deposit Shares). Small Firms are defined as those with < 250 employees. Small banks are defined as those with $<$ \$1 billion in assets (constant 2010 dollars).

Figure 2: Source: Census Quarterly Workforce Indicators (Firm Shares). Small Firms are defined as those with < 250 employees. Sector 11: Agriculture, Forestry, Fishing and Hunting. Sector 21: Mining, Quarrying, and Oil and Gas Extraction. Sector 22: Utilities. Sector 23: Construction. Sector 31-33: Manufacturing. Sector 42: Wholesale Trade. Sector 44-45: Retail Trade. Sector 48-49: Transportation and Warehousing. Sector 51: Information. Sector 53: Real Estate and Rental and Leasing. Sector 54: Professional, Scientific, and Technical Services. Sector 55: Management of Companies and Enterprises. Sector 56: Administrative and Support and Waste Management and Remediation Services Sector 61: Educational Services. Sector 62: Health Care and Social Assistance. Sector 71: Arts, Entertainment, and Recreation. Sector 72: Accommodation and Food Services. Sector 81: Other Services (except Public Administration). Note that Sector 52: Finance and Insurance is excluded.

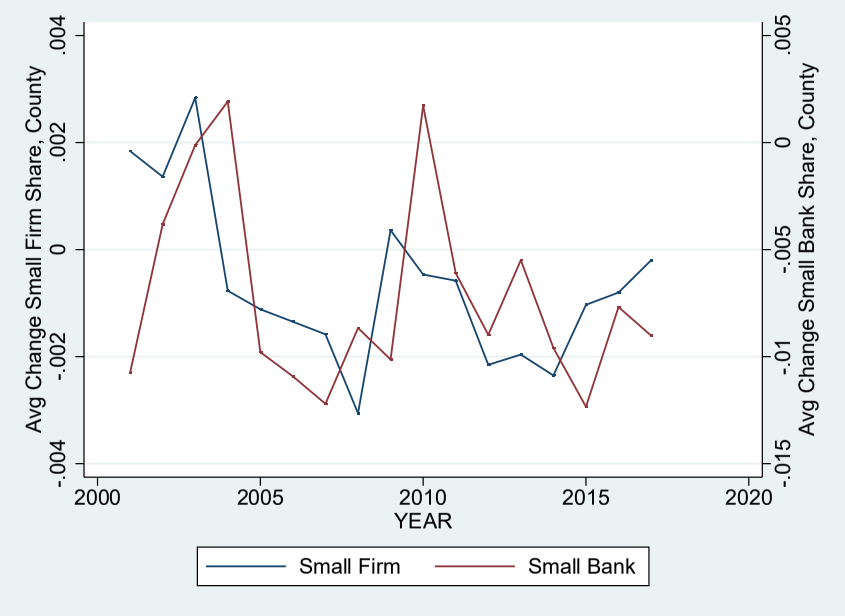

Figure 3: Source: Census Quarterly Workforce Indicators (Firm Shares). FDIC Summary of Deposits (Deposit Shares). Small Firms are defined as those with < 250 employees. Small banks are defined as those with $<$ \$1 billion in assets (constant 2010 dollars).

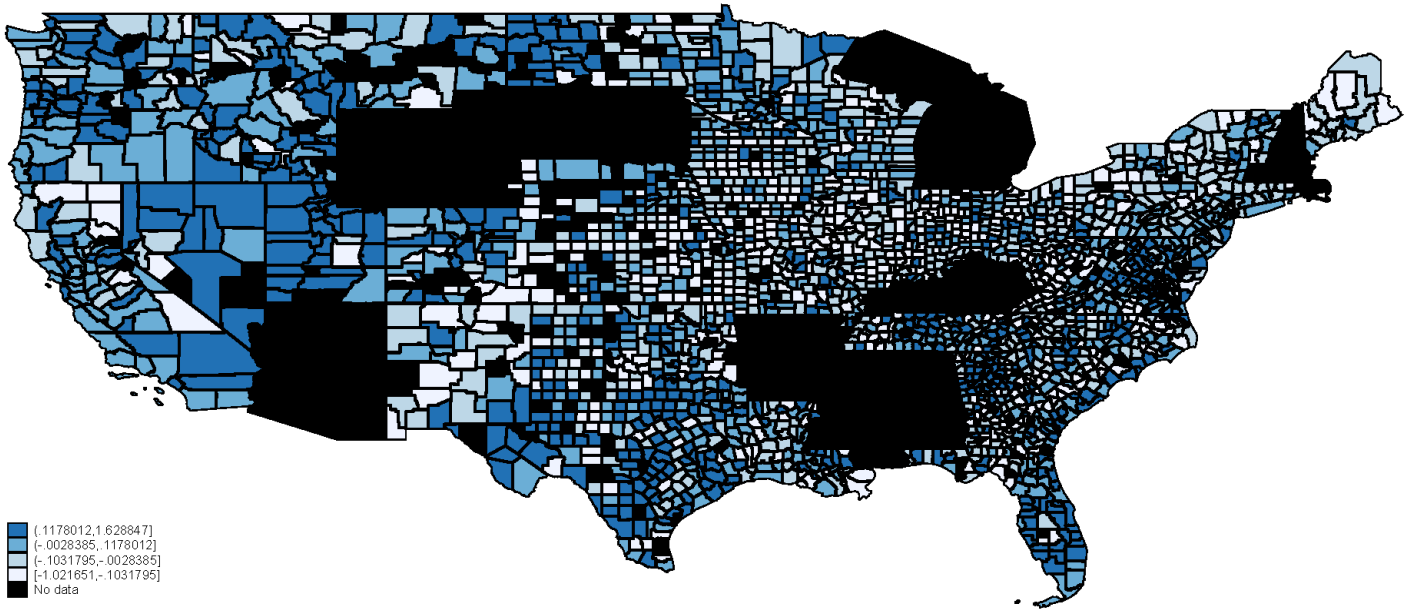

Figure 4: Source: Census Quarterly Workforce Indicators. 2002-2017 log changes in small firm employment. Small Firms are defined as those with < 250 employees.

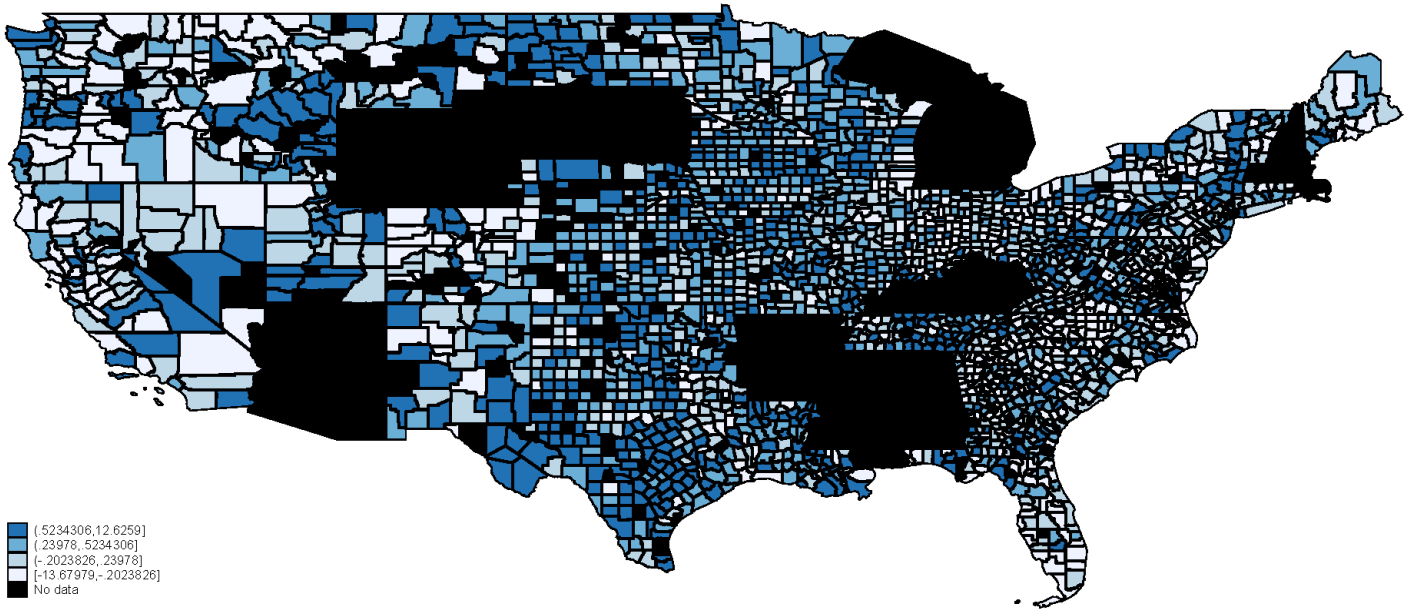

Figure 5: Source: Summary of Deposits. 2002-2017 log changes in small bank deposits. Small banks are defined as those with $<$ \$1 billion in assets.

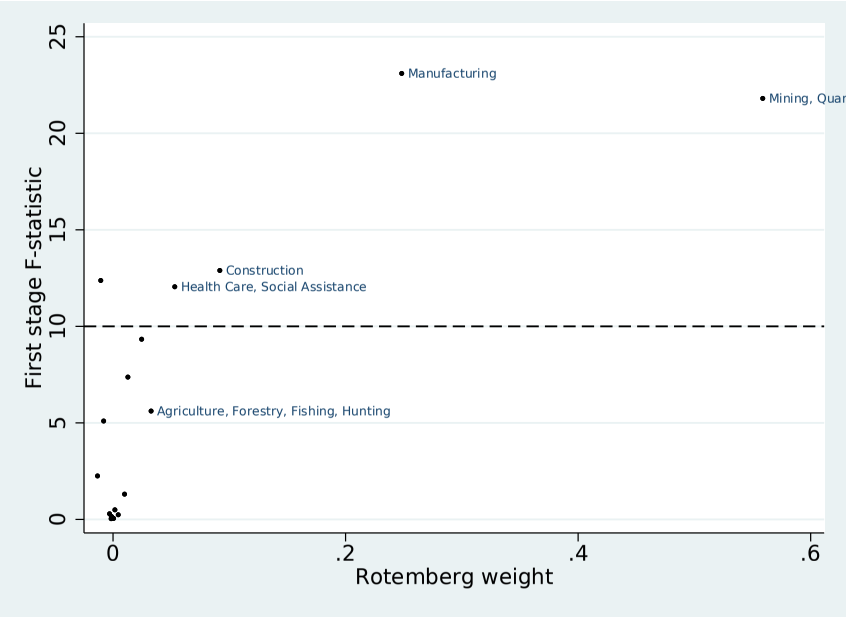

Figure 6: This figure plots the relationship between each instruments' β^k, first stage F-statistics and the Rotemberg weights. Each point is a separate instrument's estimates (industry share). The figure plots the estimated β^k for each instrument on the y-axis and the estimated first-stage F-statistic on the x-axis. The size of the points are scaled by the magnitude of the Rotemberg weights, with the circles denoting positive Rotemberg weights and the diamonds denoting negative weights. The horizontal dashed line is plotted at the value of the overall β^k. The figure excludes instruments with first-stage F-statistics below 5.

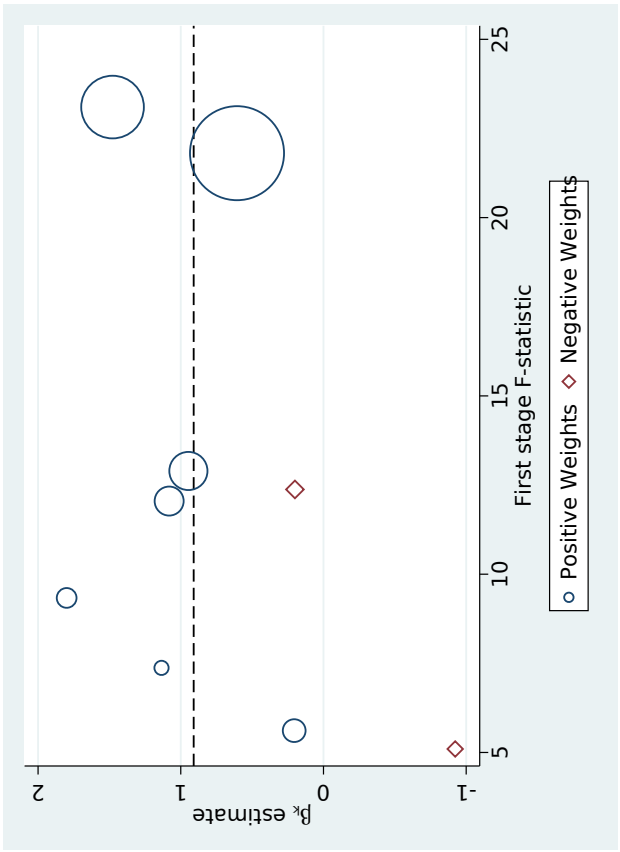

Figure 7: Heterogeneity of Just-Identified County-Share Instruments

Appendix A. Concentration versus Consolidation

In this appendix, we separate and define two related, but different concepts related to competition in the banking industry: consolidation and concentration. Although often used interchangeably, for the purposes of this paper, the distinction is important. The first, consolidation, is the focus of this paper. We define "consolidation" as the agglomeration of smaller firms into larger firms and measure the concept in this paper by measuring small (or conversely, large) market shares. In contrast, we use the term "concentration" to refer to the competitiveness of a particular market. Following the literature, when discussed in this paper we use the Herfindahl-Hirschman Index (HHI) as a market concentration measure. While consolidation and concentration are clearly related concepts, they may exhibit materially different properties because HHI is defined for a given geographical market, while firm size is defined independent of the geographical market. For this paper, this distinction is important because our question revolves around the definition of *which* banks are competitive in an area given trends in the real economy and not about how competitive is the banking sector given those real economic trends.

To see how this distinction matters we plot in Figure A.1 the average county HHI and small bank shares from 2000 through 2017. Whereas the average county small bank deposit shares exhibit a monotonic secular decline in the 2000s thus far, average county HHI fell (i.e. the average county became more competitive) leading up to the 2008 financial crisis before rising back to approximately where it started at the turn of the century. That is, while the average county in the United States experienced no overall change in market concentration, the set of banks competing in the average county shifted from smaller to larger institutions.

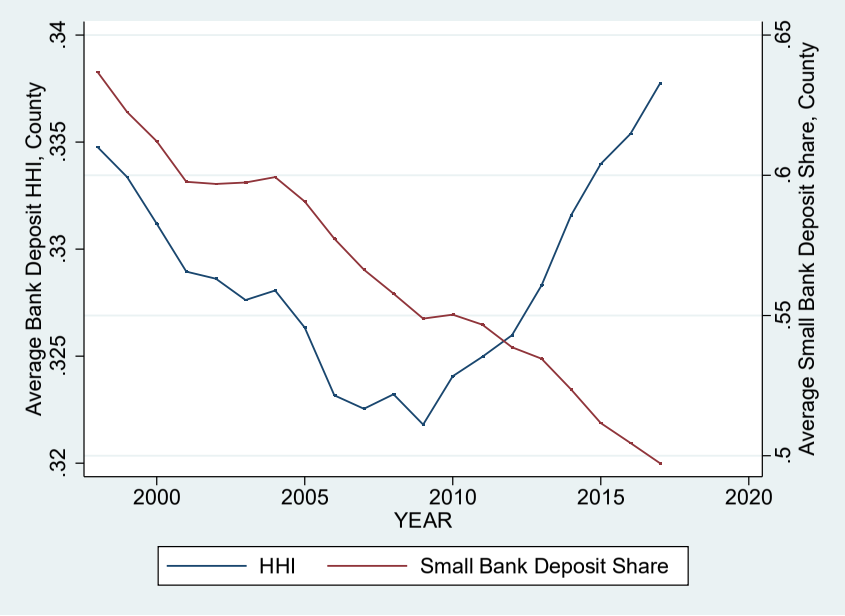

Figure A.1: Source: Summary of Deposits. Small banks are defined as those with $<$ \$1 billion in assets.