Did Local Factors Contribute to the Decline in Bank Branches?

By Rajdeep Sengupta and Jacob Dice

Although the total number of bank branches in the United States increased from the mid-1990s to 2007, this number has declined since the 2007–08 financial crisis. A loss in bank branches is potentially problematic because it may reduce local consumers' access to financial services as well as small businesses' access to credit. National economic conditions, banking regulations, industry trends, and improvements in information technology can all influence a bank's decision to expand or contract its branch network. However, the number of branches varies significantly across geographic areas, suggesting local conditions may also influence bank branching activity. If bank branching adjusts to local factors, then policies that improve local conditions may have the added benefit of attracting bank branches.

In this paper, we examine the relationship between bank branching and local conditions over the last two decades to assess which factors contributed to the decline in bank branches. We find a strong association between the number of branches in a county and that county's population, income, and employment. In addition, we find that the association between local factors and the total number of bank branches has not changed in a meaningful way since the crisis. However, we do find that the relative influence of local competition on branch openings and closings strengthened after the crisis, while the influence of local population, income, and employment weakened.

Section I analyzes trends in bank branching and the factors that likely affect these trends. Section II describes the data used for our

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statistical analysis. Section III examines the factors associated with branch openings and closings as well as whether these associations changed after the crisis.

I. Recent Trends in Bank Branching

The U.S. banking industry has undergone significant restructuring over the last three decades. The number of banks has declined since the mid-1980s. Before the financial crisis, much of this decline was due to merger and acquisition (M&A) activity rather than bank failures (Janicki and Prescott 2006). But after the financial crisis, bank failures and a collapse in the entry of new banks also became prominent reasons for the decline. Entry by newly created banks, commonly called *de novo* banks, has been minimal in the post-crisis recovery (McCord and Prescott 2014).

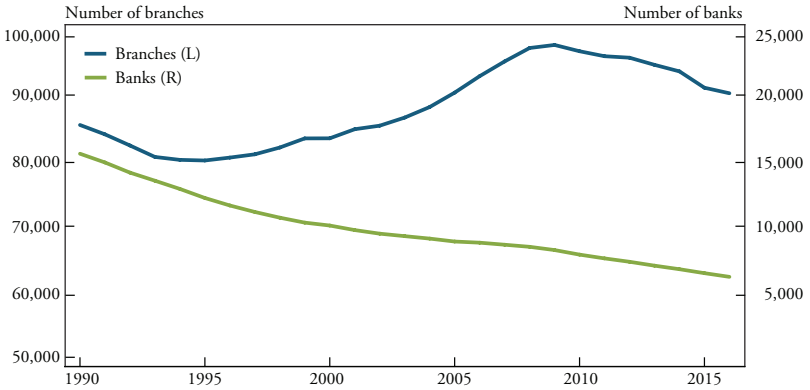
The number of bank branches has also declined since the financial crisis, reversing a decade-long trend. Chart 1 shows that throughout the mid-1990s and early 2000s, the number of brick-and-mortar bank branches trended up even as the number of banks continued to decline. The increase in branches during this period helped mitigate concerns about the consequences of bank consolidation (Avery and others 1999).[1] However, the upward trend in bank branches stalled in 2008 and 2009 and then reversed course from 2010 to 2017.

The reversal in branching trends does not appear to be isolated to only rural or only urban counties. While branching patterns likely differ across individual counties, they follow a surprisingly similar pattern across broad spatial classes of counties. Chart 2 shows the aggregate bank branching trends for rural counties, which have a median population of around 11,500; urban-micropolitan counties, which have a median population of around 36,800; all-urban counties, which combine micropolitan and metropolitan areas and have a median population of around 52,000; and urban-metropolitan counties, which have a median population of around 89,300.[2] Across these broad categories, the trends are similar: a post-crisis reversal in branching trends is accompanied by a secular decline in the number of banks.

Although multiple factors likely influence bank branching decisions, national factors appear to have gained prominence in recent

Chart 1

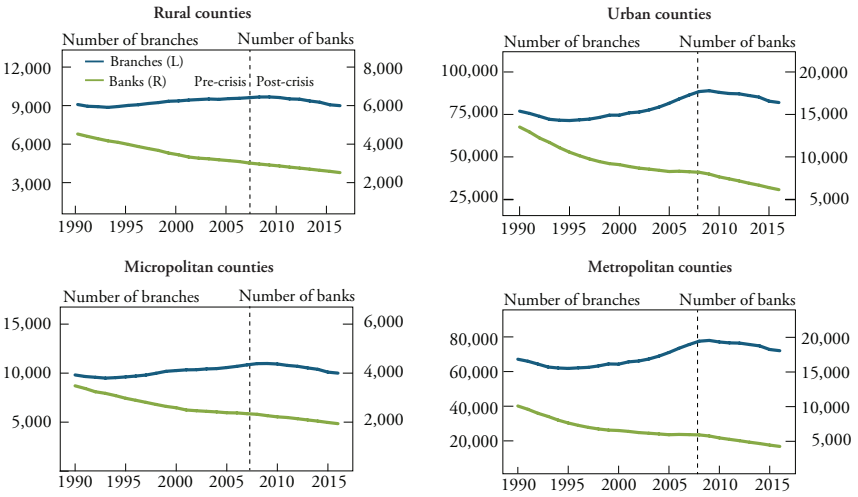
U.S. Banks and Branches, 1990–2016



Source: FDIC.

Chart 2

Banks and Branches by County Type, 1990–2016



Source: FDIC.

years. Interest margins declined industry-wide after the crisis, potentially driving banks to contract their branch networks to reduce noninterest expenses. In addition, bank regulation ramped up after the crisis, and several economists and policymakers have argued that this post-crisis regulation imposed a significant burden, especially on smaller community banks. McCord and others (2015) and Ash, Koch, and Siems (2015), for example, argue that regulatory burden has contributed to the dramatic fall of new bank charters since 2010. The lack of new bank formation may have led to fewer branches overall. Increased regulatory costs may also have raised existing banks' operational costs, thereby leaving fewer resources for them to expand their branching network (Feldman, Heinecke, and Schmidt 2013; DiSalvo and Johnston 2016).

In addition, developments in information technology have arguably diminished the influence of local factors. Banks have invested billions in online financial technology (fintech) services over the years, and an increasingly large fraction of banking transactions are now conducted online (Anenberg and others 2018). In nonfinancial industries, the increase of online retail services has led to a decline in the number of establishments whose products and services are also available online. Likewise, an increasing number of new fintech firms with online banking services may have reduced demand for local branches (Jagtiani and Lemieux 2018).

Despite these developments, geographical proximity to customers remains relevant to banking. Anenberg and others (2018) show that most depositors who use online banking services still make in-branch visits. They also document a broad reliance on branch banking, suggesting online banking is an imperfect substitute for branch banking. In addition, local branches continue to be important to small business lending. Although the share of nonlocal lenders to small businesses has risen in recent years, it still remains quite low. Moreover, Nguyen (2019) demonstrates that unanticipated branch closings can lead to "a sharp and persistent decline in credit supply to local small businesses."

Notwithstanding the role of national factors, it is important to know the extent to which local factors also affect bank branching. Prior research has shown that local conditions drove the rapid proliferation of branches before the crisis as demand for banking services increased (Hannan and Hanweck 2008). Whether local factors also contributed to the reversal of this trend is an empirical question.

II. Measuring Branching Trends and Local Factors

Assessing the relationship between bank branches and local factors requires information about branching and local conditions for a given geographical area over time. We define the U.S. county as the geographical unit of our analysis and use annual data from the Federal Deposit Insurance Corporation's (FDIC) Summary of Deposits (SOD) to count the number of banks, branches, branch openings, and branch closings in each county in the 50 U.S. states and the District of Columbia.

For each county, we consider local demographic, economic, and competitive factors that are likely to influence bank branching. For example, demographic factors, such as the number of people in a county, are likely to affect the demand for branches. Economic factors, such as income and employment in a given county, are also likely to affect demand for banking services. Finally, competitive factors, such as the number of nearby credit unions, may also affect the number of branches in a given county.[3]

To capture these factors in our analysis, we use county-level indicators available on an annual basis for the past two decades. We use county population as our local demographic factor, and we use county-level real personal income (measured in thousands of 2012 U.S. dollars) and total employment (number of jobs) as our local economic factors. These data are obtained from the Local Area Personal Income Accounts of the Bureau of Economic Analysis.[4]

We use measures of competition from both banks and nonbanks as our local competitive factors because they can drive branching in different ways. To measure bank competition, we calculate the Herfindahl-Hirschman Index (HHI) for deposits on an annual basis using SOD data. The HHI is calculated using bank deposit shares within each county. Higher HHIs indicate counties with more concentration and less competition. To measure nonbank competition, we use the number of nonbank depository establishments (NBDs) and the number of other nonbank financial establishments (NBFs) operating within each county. Data on nonbank establishments are obtained from the annual County Business Patterns (CBP) series maintained by the U.S. Census Bureau.[5] NBDs include credit unions, which offer similar services to banks but are nonprofit cooperatives organized around individuals with a common bond or "field of membership." NBFs include all other financial establishments involved in nondepository credit intermediation, such

as financing and leasing companies for credit cards, sales (auto, equipment, and machinery), consumer lending, real estate (construction, farm, home equity), and trade. Table 1 shows a complete list of variables and their sources. Appendix Table A-1 presents summary statistics for the variables listed in Table 1.

III. Trends in County Bank Branches

Our sample comprises a panel of annual observations on 3,068 counties from 1998 to 2016. To assess whether the relationship between local factors and bank branches changed after the crisis, we divide the sample into two subperiods: the pre-crisis period from 1998 to 2008 and the post-crisis period from 2009 to 2016.

Summary data on branching patterns demonstrate the reversal in trends from the pre-crisis to the post-crisis periods. Column 4 of Table 1 presents differences in the unconditional means of the pre-crisis (column 2) and post-crisis (column 3) samples. The difference in the pre- and post-crisis average in the variable "branch net change," defined as the annual change in branches by county, captures the reversal in branching trends. On average, the net change in branches per county is positive in the pre-crisis period but negative in the post-crisis period. Differences in branch net change over the two periods appear to be driven by differences in branch openings rather than branch closings. Columns 2 and 3 of Table 1 show that branch openings declined by a statistically significant amount between the two periods, while branch closings were little changed. In addition, branch turnover, defined as the sum of openings and closings, was higher in the pre-crisis period.

Local demographic and economic factors appear to have trended up throughout our sample period. In particular, average population, employment, and income are all higher in the post-crisis period. However, these factors vary significantly across counties (the standard deviations of these variables are shown in Appendix Table A-1).

Competitive factors do not always exhibit this upward trend. In particular, the failures and mergers of NBFs after the crisis led to fewer nonbanks in the post-crisis period (columns 2 and 3 of Table 1). At first glance, the marginally higher number of banks per county in the post-crisis period may appear inconsistent with the secular decline of banks nationwide. However, local trends differed from the national trend in

Table 1

Variables, Sources, and Difference of Means (Pre-Crisis versus Post-Crisis)

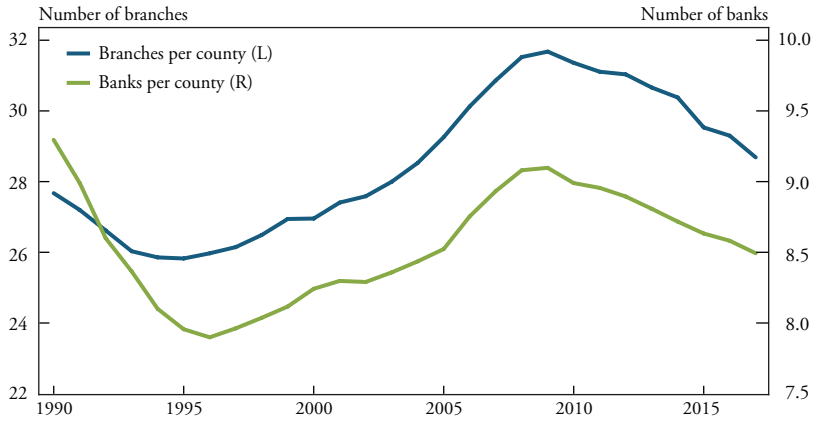
Variable	Source	Full sample (mean) (1)	Pre-crisis (mean) (2)	Post-crisis (mean) (3)	Difference (2)–(3) (4)	Standard error
County-level branching						
Branches (county total)	Summary of Deposits (FDIC)	29.54	28.67	30.75	–2.08***	0.61
Branch net change	Summary of Deposits (FDIC)	0.16	0.49	–0.29	0.78***	0.03
Branch turnover	Summary of Deposits (FDIC)	2.19	2.54	1.71	0.83***	0.06
Branch openings	Summary of Deposits (FDIC)	1.13	1.48	0.65	0.83***	0.03
Branch closings	Summary of Deposits (FDIC)	1.04	1.02	1.07	–0.05	0.03
Demographic and economic factors						
Population (number of persons)	Local Area Personal Income Accounts (BEA)	97,157.84	93,815.04	101,749.61	–7934.57**	2,619.19
Employment (number of jobs)	Local Area Personal Income Accounts (BEA)	56,276.01	54,556.40	58,638.12	–4081.72*	1,636.27
Real personal income (thousands of $)	Local Area Personal Income Accounts (BEA)	4,081,711	3,769,983	4,509,910	–739,926.73***	125,000.19
Competitive factors						
Banks	Summary of Deposits (FDIC)	8.62	8.47	8.83	–0.36***	0.08
Nonbank depository (NBD)	County Business Patterns (U.S. Census Bureau)	5.55	5.28	5.91	–0.62***	0.12
Nonbank financial (NBF)	County Business Patterns (U.S. Census Bureau)	25.88	27.64	23.46	4.18***	0.86
Deposit HHI	Summary of Deposits (FDIC)	3,192.00	3,190.46	3,194.12	–3.66	17.62
Observations		58,135	33,643	24,492	58,135	

* Significant at the 10 percent level
** Significant at the 5 percent level
*** Significant at the 1 percent level

Notes: "Branch net change" reflects the annual change in branches by county averaged over the relevant sample period. "Branch turnover" reflects the sum of a county's branch openings and closings averaged over the relevant sample period.

Chart 3

Branches and Banks per County, 1990–2016



Source: FDIC.

the pre-crisis period. Chart 3 shows that both the number of banks per county and the number of branches per county climbed steadily from the mid-1990s to 2009. During this period, existing banks expanded into newer counties through M&A activity or *de novo* branching, thereby breaking with the nationwide trend of bank consolidation. As a result, both the average number of banks per county and the average number of branches per county trended up in the pre-crisis period. As Chart 3 shows, both series have reversed course in the post-crisis period. However, the average yearly number of branches per county is still higher in the post-crisis sample than in the pre-crisis sample (Table 1).

Factors associated with bank branches

A review of the summary statistics shows that both banks and branches reversed their respective upward trends after the financial crisis. However, this simple descriptive analysis does not control for differences in county demographic, economic, and competitive factors that may also explain branching patterns.

To account for these factors, we estimate a regression model that regresses the number of branches in county i in year t on county demographic, economic, and competitive factors according to:

$$Branches_{it} = \beta^{d} X_{it}^{demographic} + \beta^{e} X_{it}^{economic} + \beta^{c} X_{it}^{competitive} + \mu_{i} + \lambda_{t} + \varepsilon_{it},$$

where $X_{it}^{demographic}$, $X_{it}^{economic}$, and $X_{it}^{competitive}$ are vectors of demographic,

economic, and competitive factors, respectively. The demographic factor is county population, the economic factors are county income and employment, and the competitive factors are county-level deposit HHIs and the number of NBDs and NBFs.

The estimated coefficients, β, are factor elasticities indicating the responsiveness of branches to changes in each factor. For the regression analysis, we transform all variables using the inverse hyperbolic sine (IHS) transformation (MacKinnon and Magee 1990).[6] Except for very small values, the IHS transformation can be interpreted in the same way as a standard logarithmic transformation of the variable. Accordingly, the transformation allows us to interpret the coefficients on the independent variables as factor elasticities—the percent change in county-level branches associated with a 1 percent change in the local factor, holding all other factors fixed.

We use county-specific fixed effects, μ_i, in all regressions to account for persistent differences between counties. Accordingly, the estimated coefficients reflect changes in the number of branches as county conditions improve or deteriorate relative to their county-specific averages.

Table 2 reports the estimated associations for two different models. The first column shows the results for the base model. In addition to the factor variables and county fixed effects, the base model also includes year fixed effects as λ_t, a vector of indicator variables for each year. Year fixed effects absorb, among other things, changes in aggregate banking conditions across the United States and aggregate changes in demographic, economic, and competitive conditions. Given our 1998–2016 sample period, the year fixed effects are necessary to account for changes in aggregate conditions across the United States that affected all counties. The second column in Table 2 shows the results for the Post-Crisis Break (PCB) model. The PCB model allows the coefficients on the explanatory variables in the base model to vary across the pre-crisis and post-crisis periods. To do so, we create an indicator variable, *post-crisis*, that takes a value of 1 for all years after 2008 and 0 otherwise. We then interact this variable with all explanatory variables. This interacted regression allows us to examine the difference between pre- and post-crisis estimates of the explanatory variables and thereby assess whether the association between branches and local factors changed.

Table 2
Determinants of County-Level Bank Branches

Variable	Base model (1)	PCB model (2)
Population	0.364***	0.384***
	(11.33)	(10.88)
Employment	0.182***	0.0983***
	(7.62)	(4.24)
Real personal income	0.0739***	0.0960***
	(4.08)	(6.76)
Nonbank depository	−0.0107**	−0.00432
	(−2.30)	(−0.90)
Nonbank financial	0.00639**	0.0133***
	(2.15)	(4.31)
Deposit HHI	−0.214***	−0.226***
	(−16.28)	(−16.33)
Post-crisis		0.0169
		(0.15)
Post-crisis # population		−0.0403***
		(−3.41)
Post-crisis # employment		0.0454***
		(3.70)
Post-crisis # real personal income		0.00180
		(0.13)
Post-crisis # nonbank depository		−0.0128***
		(−3.67)
Post-crisis # nonbank financial		0.00854***
		(3.11)
Post-crisis # deposit HHI		−0.00988
		(−1.62)
Constant	−2.097***	−1.729***
	(−5.43)	(−4.52)
County fixed effect	Yes	Yes
Year fixed effect	Yes	No
Log-likelihood	48,858.7	47,825.1
P-value	0	1.39e-236
Counties	3,068	3,068
Observations	58,135	58,135

* Significant at the 10 percent level
** Significant at the 5 percent level
*** Significant at the 1 percent level

Note: T-statistics are shown in parentheses.

The number of branches in a county tends to increase as local demographic and economic factors improve. The estimated factor elasticities in Table 2 measure the strength of the association between changes in a local factor and changes in the number of branches within a county, where the change is measured as the percentage deviation from its county mean. In the base model (column 1), a 1 percent increase in population from the county mean is associated with a 0.364 percent increase in branches. In the same vein, a 1 percent increase in employment from the county mean is associated with a 0.182 percent increase in branches.

The number of branches in a county tends to vary with local competition as well. The estimated factor elasticities for the two nonbank competition measures show that an increase in NBDs is associated with a smaller number of bank branches, while an increase in the number of NBFs is associated with a larger number of bank branches. One possible explanation for the negative association between NBDs and bank branches is that credit unions increasingly provide services that are similar to banks, potentially reducing demand for additional branches (Anderson and Liu 2013). The estimated factor elasticity for deposit HHIs is negative, indicating that counties where deposits are more concentrated in a few banks tend to have fewer branches.

Our results from the PCB model suggest that the post-crisis decline in bank branches cannot be attributed to a shift in the associations between branches and local factors. The fully interacted coefficients in column 2 of Table 2 test for statistically significant differences in the PCB model coefficients before and after the crisis. While some of the post-crisis changes in these coefficients are statistically different from zero, in most cases, the magnitude of this change is small. For example, the post-crisis branch elasticity of population changed from its pre-crisis estimate of 0.384 to 0.344 (= 0.387 – 0.0403). The smaller estimated post-crisis elasticity indicates that the association between population and the number of branches weakened slightly after the crisis—specifically, a 1 percent change in population was associated with a 0.0403 percent smaller change in the number of branches after the crisis than before the crisis. In contrast, the association between employment and the number of branches in a county appears to have strengthened slightly after the crisis. The post-crisis branch elasticity of employment changed from its

pre-crisis estimate of 0.0983 to 0.1437 (= 0.0983 + 0.0454). Moreover, much of the negative association between NBDs and bank branches appears to be a post-crisis phenomenon (DiSalvo and Johnston 2017).[7] Lastly, the association between branches and other competitive factors does not appear to have changed much in the post-crisis period. Overall, the association between bank branches and local factors does not appear to have changed in a meaningful way after the financial crisis. As a result, the decline in branches was more likely driven by changes in local factors themselves rather than changes in the relationship between branches and these factors. See Box for a discussion of how the results for the Tenth Federal Reserve District compare with those for the nation as a whole.

IV. Trends in County Branch Openings and Closings

Our results demonstrate a link between changes in local conditions and changes in the aggregate number of branches in a county. However, they do not reveal whether the associated changes in the number of branches were driven by branch openings, branch closings, or both. To examine the isolated links between local conditions and branch openings and closings, we use data on yearly branch openings and closings for each county in our full sample.[8]

The pattern of openings and closings has changed significantly since the financial crisis. Chart 4 shows a scatterplot of the pre-crisis and post-crisis average yearly openings and closings for each county. Each blue dot shows the average yearly openings and closings for the pre-crisis period, while each orange dot shows the same for the post-crisis period. The blue and orange dashed lines are the lines of fit for each period. The green dashed line is a 45-degree line: dots to the left of this line represent counties where the number of branch openings exceeded the number of branch closings; dots to the right of the line represent counties where closings exceeded openings. The chart clearly shows that before the crisis, openings tended to be higher than closings, leading to a net increase in the number of branches. After the crisis, the opposite is true.

Counties with more branch openings typically also have more branch closings and thereby high branch turnover. Although we might expect branch openings and closings to move in opposite directions,

Box

Local Contributions to Changes in Branches in the Tenth Federal Reserve District

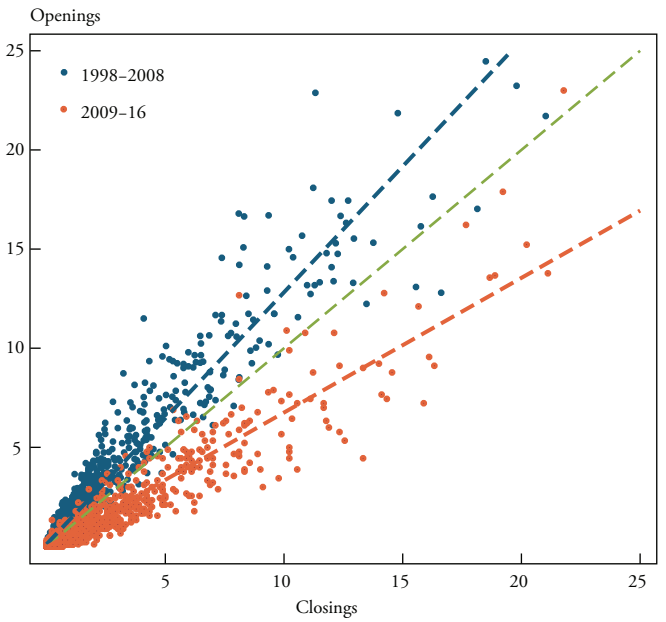
The Tenth Federal Reserve District differs from the nation in terms of banking and local economic conditions. The District—which covers Colorado, Kansas, Nebraska, Oklahoma, Wyoming, and parts of Missouri and New Mexico—has no large banks (with assets above $50 billion) but many community banks with strong ties to the local economy. In addition, many localities in the district are more reliant on the energy and agriculture sectors.

Recognizing these differences, we examine the contributions of local factors to variations in bank branches across Tenth District counties. In unreported results, we find that demographic and competitive factors contributed most to changes in the number of branches in urban counties. For example, changes in county population made the largest contribution to post-crisis changes in the number of branches in Cleveland County (Oklahoma City, OK), Butler County (Wichita, KS), Douglas County (Denver-Aurora-Lakewood, CO), and Clay County (Kansas City, MO). Population increases in these counties contributed positively to the number of bank branches, partly offsetting the post-crisis decline. Competitive forces were more potent in Jefferson County (Denver-Aurora-Lakewood, CO), Wyandotte County (Kansas City, KS), and Jackson County (Kansas City, MO), where an increase in deposit concentration (HHI) after the crisis was associated with a decline in branches.

In contrast, economic factors made the strongest contributions to the number of branches in rural counties. For example, increases in county income in the post-crisis recovery contributed positively to partly offset the decline in branches in Caddo County, OK, and York County, NE. Likewise,

Box (continued)
increases in employment (jobs) in the post-crisis recovery helped to partly offset the decline in branches in Garvin, OK. These county-level results highlight that improvements in local conditions can help to offset the decline in bank branches within a given county.

Chart 4
Branch Openings versus Closings Pre- and Post-Crisis



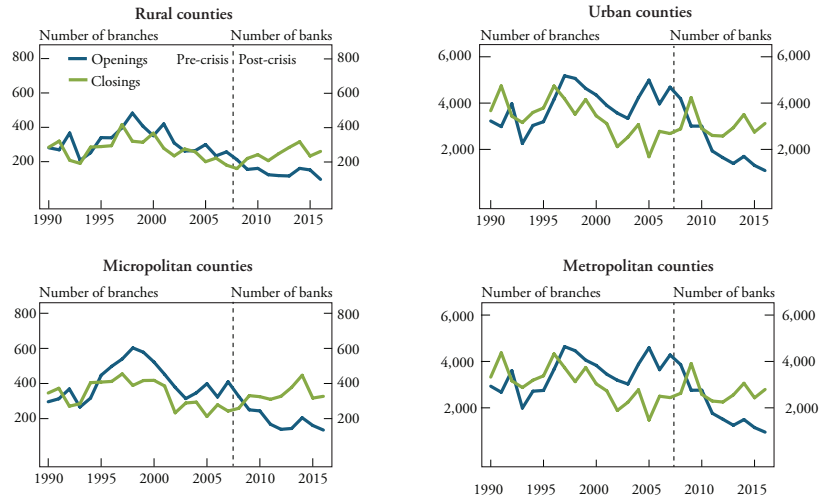
Source: FDIC.

they move in the same direction when turnover is high. In Chart 4, points closer to the bottom-left of the chart indicate low turnover, while those near the top-right indicate high turnover. Most counties in our sample are clustered near the 45-degree line rather than near either axis, implying that most counties have both openings and closings.

The post-crisis trends in branch openings and closings does not appear to be isolated to only rural or only urban counties. Chart 5 shows annual openings and closings by county type from 1990 to 2016. As in Chart 2, openings and closings are similar across county types in

Chart 5

Branch Openings and Closings by County Type, 1990–2016



Source: FDIC.

the post-crisis period. For all county types, branch openings peaked in 2007 and declined steadily thereafter. In contrast, branch closures hit a trough in 2005. Since then, average closures have exceeded their 2005 level each year.

Overall, our summary data reveal that both fewer openings and more closings led to the decline in bank branches. To assess whether these changes were driven by local factors, we run regressions with branch openings and closings as the dependent variables. The regressions use the same demographic, economic, and competitive factors as explanatory variables as in previous sections. We also examine whether the relationship between openings and closings and local factors shifted in the post-crisis period.

Aggregate trends and branch turnover can often confound the estimated association between local factors and branch openings and closings. Table 3 reports the estimated coefficients for the base model and the PCB model with annual branch openings and closings as the dependent variable. The estimated coefficients for some factors in the PCB model are statistically significantly different from those in the base model. This can happen because the PCB model, which does not control for year fixed effects, may pick up the influence of aggregate trends that have little to do with the association between the two variables. As

Table 3

Determinants of Openings and Closings of County-level Bank Branches

	Openings		Closings	
Variable	Base model	PCB model	Base model	PCB model
Population	−1.167*** (−17.41)	−0.0675 (−1.12)	0.243***	0.153**
Employment	−0.0857* (−1.80)	0.163*** (3.68)	0.0533 (1.36)	0.245*** (6.13)
Real personal income	0.499*** (14.37)	−0.261*** (-8.83)	−0.0477* (−1.79)	−0.304*** (-10.74)
Nonbank depository	−0.0338*** (−2.80)	−0.0181 (−1.46)	−0.0101 (−1.00)	−0.0262** (-2.46)
Nonbank financial	0.0733*** (9.39)	0.0188** (2.48)	−0.0237*** (−3.82)	−0.0413*** (−6.27)
Deposit HHI	0.0542** (2.28)	0.0817*** (3.97)	−0.0813*** (−4.31)	−0.0527*** (−2.68)
Post-crisis		1.229*** (4.73)		−0.0337 (−0.14)
Post-crisis # population		0.0147 (0.62)		−0.0657*** (−3.27)
Post-crisis # employment		−0.0865*** (−3.79)		−0.0991*** (−4.57)
Post-crisis # real personal income		−0.0560** (−2.01)		0.135*** (5.27)
Post-crisis # nonbank depository		−0.0237*** (−3.28)		0.0146** (2.06)
Post-crisis # nonbank financial		−0.0139** (−2.48)		0.0144*** (2.65)
Post-crisis # deposit HHI		0.0318** (2.48)		−0.0548*** (−4.29)
Constant	5.528*** (7.34)	3.321*** (5.10)	−1.110* (−1.93)	1.935*** (3.23)
County fixed effect	Yes	Yes	Yes	Yes
Year fixed effect	Yes	No	Yes	No
Log-likelihood	−41,180.4	−40,267.3	−41,816.1	−42,099.6
P-value	0	0	9.16e-128	1.35e-54
Counties	3,068	3,068	3,068	3,068
Observations	58,135	58,135	58,135	58,135

* Significant at the 10 percent level
** Significant at the 5 percent level
*** Significant at the 1 percent level

Note: T-statistics are shown in parentheses.

a result, the base model with year fixed effects is our preferred model for determining the true association of local factors. For some cases in both models, the estimated factor elasticities for branch openings have the same sign as the elasticities for branch closings. In theory, we might expect the estimated elasticities for openings and closings to have opposite signs. For example, if a given factor is associated with a decline in branches, we would expect it to be associated with fewer openings, more closings, or both. In practice, however, the estimated coefficients might reflect the association between high and low turnover and the local factor, leading to coefficients for openings and closings with the same sign.

The results in columns 2 and 4 of Table 3 indicate that the association between demographic and economic factors and branch openings and closings weakened after the crisis. For example, the employment elasticities of openings and closings diminished significantly in the post-crisis period. The income and population elasticities of closings are also significantly lower in the post-crisis period. Taken together, these estimates would suggest that the association of local demographic and economic factors with openings and closings weakened after the financial crisis.

The associations between NBFs and openings and closings also appear to have weakened since the crisis. For example, the negative association between NBFs and closings estimated in the PCB model weakened significantly from –0.0413 in the pre-crisis period to –0.269 in the post-crisis period.

In contrast, the association between other competitive factors and branch openings and closings strengthened in the post-crisis period. Notable among these is the association with deposit HHI, indicating that the same increase in deposit concentration is associated with more openings and fewer closings after the crisis than before the crisis. Moreover, the association between openings and NBDs appears to be largely a post-crisis phenomenon. The estimated coefficient on the uninteracted term in the PCB model is negative but not statistically significant. The coefficient on the interacted term is negative but statistically significant, suggesting the effect is significant in the post-crisis period.

Conclusion

The upward trend in U.S. bank branches from the mid-1990s to the mid-2000s reversed course after the financial crisis. The pattern appears to be widespread across both rural and urban counties. Notwithstanding industry trends and other national factors, understanding how local factors influence branching decisions is important. If branches vary with local conditions, policies aimed at improving local conditions might help reduce the decline in local branches.

Our results show that although local factors are important determinants of bank branching, the relationship between local conditions and the number of bank branches has not changed in a meaningful way since the crisis. Nevertheless, some of the reversal in trends can be attributed to changes in local factors.

Our results also show that the relationship between local factors and branch openings and closings does appear to have shifted since the financial crisis. While the association with demographic and economic factors such as employment appears to have weakened since the crisis, the association with competitive factors such as deposit market concentration strengthened. Taken together, our results suggest that local market competition played a greater role in branch openings and closings after the financial crisis.

The future path of bank branches will depend on both local and national factors. While some trends such as industry consolidation and online banking are likely irreversible, others such as bank performance and bank regulation are more likely to evolve. Improvements in bank profitability and the rollback in post-crisis regulation for small and medium-sized banks might slow or even reverse the current downward trend in branching nationwide. However, local conditions also influence whether a community sheds or retains its local branches, making changes in local policies all the more relevant.

Appendix
Summary Statistics

Table A-1

Summary Statistics of Variables Pre- and Post-Crisis

	Full sample				Pre-crisis			
Variable	Mean	Standard deviation	Minimum	Maximum	Mean	Standard deviation	Minimum	Maximum
County-level branching								
Branches (total)	29.54	72.28	0	1,808	28.67	68.46	0	1,750
Branch net change	0.16	3.03	–137	191	0.49	3.57	–137	191
Branch turnover	2.19	6.77	0	257	2.54	7.64	0	257
Branch openings	1.13	3.80	0	194	1.48	4.55	0	194
Branch closings	1.04	3.39	0	206	1.02	3.54	0	206
Demographic and economic factors								
Population (persons)	97,158	311,845	421	10,200,000	93,815	302,210	421	9,793,263
Employment (jobs)	56,276	194,812	226	6,357,376	54,556	187,970	226	5,693,811
Real personal income (thousands of $)	4,081,711	14,888,199	8,016	545,091,322	3,769,983	13,674,452	8,016	448,616,071
Competitive factors (thousands)								
Banks	8.62	9.54	1	228	8.47	9.62	1	228
Nonbank depository institutions (NBD)	5.55	14.70	0	331	5.28	14.38	0	331
Nonbank financial institutions (NBF)	25.88	102.81	0	3,816	27.64	110.57	0	3,816
Deposit HHI	3,192.00	2,097.55	423.58	10,000	3,190.46	2,103.75	423.58	10,000
Observations	58,135				33,643			

Note: "Branch net change" reflects the annual change in branches by county averaged over the relevant sample period. "Branch turnover" reflects the sum of a county's branch openings and closings averaged over the relevant sample period.
Sources: FDIC, BEA, and U.S. Census Bureau.

Table A-1 (continued)

	Post-crisis			
Variable	Mean	Standard deviation	Minimum	Maximum
County-level branching				
Branches (total)	30.75	77.21	0	1,808
Branch net change	−0.29	2.00	−45	29
Branch turnover	1.71	5.32	0	170
Branch openings	0.65	2.32	0	78
Branch closings	1.07	3.16	0	88
Demographic and economic factors				
Population (persons)	101,750	324,563	442	10,200,000
Employment (jobs)	58,638	203,816	241	6,357,376
Real personal income (thousands of $)	4,509,910	16,400,367	12,112	545,091,322
Market factors				
Banks	8.83	9.43	1.00	174
Nonbank depository institutions (NBD)	5.91	15.12	0.00	312
Nonbank financial institutions (NBF)	23.46	91.02	0.00	2,799
Deposit HHI	3,194.12	2,089.04	468.39	10,000
Observations	33,643			

Notes: "Branch net change" reflects the annual change in branches by county averaged over the relevant sample period.
"Branch turnover" reflects the sum of a county's branch openings and closings averaged over the relevant sample period.
Sources: FDIC, BEA, and U.S. Census Bureau.

Endnotes

[1]Following Avery and others (1999), we define both commercial banks and savings associations as banks in this study. Although they may differ in their offerings of commercial loan services, both institutions offer the same range of retail services at their branches.

[2]Median populations are calculated for all years since 1990. We use 2013 delineation files to determine whether a county is designated as a metropolitan or micropolitan county. However, the county designation does not change over the years in our sample. See https://www.census.gov/programs-surveys/metro-micro/guidance.html for details.

[3]While credit unions provide similar services to banks at their branches, the motivation behind their branch creation and location differs somewhat. Credit unions are nonprofits, and their customer base is typically set by their field of membership, which determines who is eligible to join the credit union (DiSalvo and Johnston 2017). For this reason, we do not consider branches of credit unions in our count of bank branches.

[4]Local economic data for personal income, population, and employment are obtained under the series Economic Profile of the County (CAINC30), available at https://apps.bea.gov/regional/downloadzip.cfm

[5]NBDs include credit unions (NAICS code 522130) and other establishments involved in depository credit intermediation (NAICS code 522190). NBFs include all establishments involved in nondepository credit intermediation (NAICS code 5222) and activities related to credit intermediation (NAICS code 5223).

[6]The IHS transformation allows us to account for the counties in our sample with no openings or closings as well as the presence of outliers in our outcome variable.

[7]Compared with the estimated coefficient on the pre-crisis (uninteracted) term for NBDs, the coefficient on the post-crisis interaction term is larger and also statistically significant.

[8]We define a branch closing as the termination of a bank branch at a given location. We account for situations in which a bank moves a branch from one location to another by tracking branches with their FDIC branch number. In this way, we avoid counting branch relocations and changes of branch ownership as openings or closings.

References

Anderson Richard G., and Yang Liu. 2013. "Banks and Credit Unions: Competition Not Going Away." Federal Reserve Bank of St. Louis, *The Regional Economist*, April.

Anenberg, Elliot, Andrew C. Chang, Serafin Grundl, Kevin B. Moore, and Richard Windle. 2018. "The Branch Puzzle: Why are There Still Bank Branches?" Board of Governors of the Federal Reserve System, *FEDS Notes*, August. Available at https://doi.org/10.17016/2380-7172.2206

Ash, Preston, Christoffer Koch, and Thomas F. Siems. 2015. "Too Small to Succeed?—Community Banks in a New Regulatory Environment." Federal Reserve Bank of Dallas, *Financial Insights*, vol. 4, no. 4, pp. 1–4.

Avery, Robert B., Raphael W. Bostic, Paul S. Calem, and Glenn B. Canner. 1999. "Consolidation and Bank Branching Patterns." *Journal of Banking and Finance*, vol. 23, no. 2–4, pp. 497–532. Available at https://doi.org/10.1016/S0378-4266(98)00094-6

DiSalvo, James, and Ryan Johnston. 2017. "Credit Unions' Expanding Footprint." Federal Reserve Bank of Philadelphia, *Economic Insights*, vol. 2, no. 1, pp. 17–25.

———. 2016. "How Dodd–Frank Affects Small Bank Costs." Federal Reserve Bank of Philadelphia, *Banking Trends*, First Quarter, pp. 14–19.

Feldman, Ron J., Ken Heinecke, and Jason Schmidt. 2013. "Quantifying the Costs of Additional Regulation on Community Banks." Federal Reserve Bank of Minneapolis, Economic Policy Paper no. 13-3.

Hannan, Timothy, and Gerald Hanweck. 2008. "Recent Trends in the Number and Size of Bank Branches: An Examination Of Likely Determinants." Capco Institute, *Journal of Financial Transformation*, vol. 23, pp. 155–164.

Jagtiani, Julapa, and Catharine Lemieux. 2018. "Do Fintech Lenders Penetrate Areas that Are Underserved by Traditional Banks?" Federal Reserve Bank of Philadelphia, Working Paper no. 18-13. Available at https://doi.org/10.21799/frbp.wp.2018.13

Janicki, Hubert, and Edward Prescott. 2006. "Changes in the Size Distribution of U.S. Banks: 1960–2005." Federal Reserve Bank of Richmond, *Economic Quarterly*, vol. 92, no. 4, pp. 291–316.

MacKinnon, James G., and Lonnie Magee. 1990. "Transforming the Dependent Variable in Regression Models." *International Economic Review*, vol. 31, no. 2, pp. 315–339. Available at https://doi.org/10.2307/2526842

McCord, Roisin, Edward Simpson Prescott, and Tim Sablik. 2015. "Explaining the Decline in the Number of Banks since the Great Recession." Federal Reserve Bank of Richmond, *Economic Brief*, no. 15-03, March, pp. 1–5.

McCord, Roisin, and Edward Simpson Prescott. 2014. "The Financial Crisis, the Collapse of Bank Entry, and Changes in the Size Distribution of Banks." Federal Reserve Bank of Richmond, *Economic Quarterly*, vol. 100, no. 1, pp. 23–50.

Nguyen, Hoai-Luu Q. 2019. "Are Credit Markets Still Local? Evidence from Bank Branch Closings." *American Economic Journal*: *Applied Economics*, vol. 11, no. 1, pp. 1–32, January. Available at https://doi.org/10.1257/app.20170543