

Bank geographic expansion, unemployment, and credit card debt

Chintal A. Desai*

Department of Finance, Insurance and Real Estate
School of Business
Virginia Commonwealth University

Abstract

In this paper, I evaluate the notion that a gainfully-employed household is less likely to use expensive credit card debt. I use removal of state barriers on a bank's geographic expansion as a quasi-natural experiment. The results show that a bank's ability to open branches across state lines has positive effects on lowering the unemployment rate; which in turn, helps reduce the outstanding balance on a bank issued credit card. The availability of unique data from a credit bureau makes this paper the first to study the role of bank expansion on the usage of unsecured consumer credit.

December 17, 2023

JEL Codes: G510; D14; K230.

Keywords: Consumer credit; Unemployment rate; Bank geographic deregulation.

* I thank Bhavin Parikh (discussant) and participants at the Financial Management Association's annual meetings 2019 for helpful comments. Corresponding address: 301 West Main Street, Box 844000, Richmond, VA-23284; Tel.: +1 804 828 7194; fax: +1 804 828 3972; Email: cdesai2@vcu.edu

1. Introduction

The US banking sector experienced geographic expansion in two waves. In the first wave, between 1970 and 1994, most states removed barriers for an in-state bank to open branches anywhere within the state (intrastate branching). The Interstate Banking and Branching Efficiency Act (IBBEA) of 1994 commenced the second wave and that lasted over a decade. On the one hand, the IBBEA allowed a bank to open branches anywhere in the US (interstate branching). On the other hand, it permitted a state to erect entry barriers for an out-of-state bank through regulatory constraints. These are (1) minimum age of a target bank must be three to five years, (2) opening of a de novo branch is not allowed, (3) acquisition of an individual branch of an in-state bank is not allowed, and (4) deposit share after a merger with an in-state bank must be below 30 percent. The heterogeneity in the total number of barriers erected by the 50 US states and the District of Columbia during the period 1995-2005 helps a researcher to perform a quasi-natural experiment. They can study the causal relationship, if any, between the bank expansion (interstate branching) and an economic outcome of interest.

The extant research has analyzed the impact of the bank expansion on a household's balance sheet. Célerier and Matray (2019) find that a household's wealth through purchase of durable assets increases after interstate branching. Brown *et al.* (2019) show that a household's propensity to hold debt and the amount of household leverage increase after interstate branching. Favara and Imbs (2015) show that the interstate branching causes an increase in mortgage lending, which in turn, helps increase the house prices. I focus on household credit card debt.

Unlike mortgage debt and other closed-end installment loans to finance durable assets, the credit card debt is an open line of revolving credit. In addition, it is an unsecured loan, the consumer lender gets repaid only when the borrower does not default. The borrower-friendly

Chapter 7 personal bankruptcy code of the US provides almost a complete discharge from the credit card debt. Thus, credit card debt is more expensive.

From the borrower's perspective, they are more likely to use the credit card debt to finance their immediate consumption and for liquidity reasons. If a householder is gainfully-employed in a labor market, then they may be less-likely liquidity constrained and their accumulated savings can help them finance their immediate consumption. Therefore, one can expect a lower usage of credit card debt in a regime with lower unemployment rate.

The literature intersecting banking and corporate finance suggests that the interstate branching has a positive effect on the overall economy. Rice and Strahan (2010) show that interstate branching increases a small firm's access to credit and it also reduces cost of credit. Krishnan *et al.* (2014) show that a firm's productivity improves after interstate branching. Basu *et al.* (2021) show that the non-financial firms' risk-taking decreases with interstate branching. This evidence indicates that a household's employment opportunity increases after interstate branching, which allows me to form the following hypothesis: Interstate branching helps reduce the amount of credit card debt through the employment channel.

The availability of county-level data on the actual amount of credit card debt for the period 1994 to 2005 helps assess the above-mentioned hypothesis. The dependent variable is the outstanding balance on a credit card issued by a bank per bank card borrower. The independent variable of interest is the deregulation index, which is computed as four minus the restriction index of Johnson and Rice (2008). I find that the removal of entry barriers for an out-of-state bank decreases the bank issued credit card debt. On a placebo sample of revolving credit issued by retail stores, the interstate branching effect is insignificant, which validates the identification strategy of using interstate branching. Finally, I show that a decline in a county's unemployment rate

following interstate branching leads to a decline in credit card debt, which provides supporting evidence to the hypothesis. The bank geographic expansion helps reduce the amount of credit card debt through the employment channel.

The possible explanations for our findings are the following: (1) With the increase in the number of branches, the bank has more information about a borrower's financials. This additional information can help make better decisions at the time of extending a loan and better monitoring for an existing loan. (2) From a borrower's perspective, the positive economic effects of bank geographic deregulation can reduce their dependence on the expensive credit card debt for consumption smoothing and/or to wither away transitory income and expense shocks. The combined effect is to reduce the usage of credit card debt.

The rest of the paper is organized as follows. Section 2 documents the motivation of my study. A brief overview of geographical bank deregulation in the US is provided in Section 3. Section 4 highlights data and variables. The results are in Section 5, followed by the conclusions in Section 6.

2. Motivation

The mainstream finance provides research papers on the questions related to either the asset categories of a household balance sheet such as stock market participation, retirement savings, wealth accumulation or the secured debt of the liability side (Gomes *et al.* 2021). Regarding the usage of unsecured debt by a household, for example the credit card debt, the quantitative models from macroeconomics can help our understanding.¹

¹ For a comprehensive survey on the quantitative models on unsecured revolving credit and defaults, I refer a reader to Athreya (2005), Livshits (2015), and Exler and Tertilt (2020).

At the core of quantitative models on the usage of credit card debt and defaulting on loan obligations is the trade-off between the intertemporal consumption smoothing provided by credit availability and the intra-temporal consumption insurance provided by the default on that loan. This is in the spirit of Eaton and Gersovitz (1981). The credit card debt helps households to 'buy now and pay later'. They can draw upon the revolving credit limit provided by their credit card to finance their current consumption needs. If they make the payment within the credit period, then their credit limit will be restored back to the original limit. The borrower has an option to extend the credit period by paying the minimum payment. In that case, on the remaining balance they incur the finance charges (interest costs). For intertemporal consumption smoothing, a lower interest rate on the outstanding balance is beneficial.

The dire economic circumstances can put a household in financial hardships. The incompleteness of financial markets precludes a household either from buying private insurance or issuing a state-contingent bond to manage this financial distress. An option to default on unsecured credit card debt helps overcome the market incompleteness and provides the household with partial insurance to smooth consumption across the states of nature within a given time period. However, the default option increases the cost of lending. The consumer lender recovers their principal amount only in those states of nature when a borrower does not default (Adler *et al.* 2000). The higher interest rates on credit card debt reduces the value of intertemporal consumption smoothing. Therefore, from a consumer's perspective, it makes sense to use the credit card debt mainly to wither away transitory income and expense shocks such as temporary joblessness and medical bills, etc.

The financial innovations in lending technology, for example credit scoring method, can impact the amount of credit card debt. Livshits *et al.* (2016) build a two-period model of an

incomplete market where a borrower's second period endowment is uncertain. They incorporate two key aspects of a revolving credit transaction in their model. First, a borrower has more information regarding her likelihood of receiving high versus low income in the second period than the lender. Second, a consumer credit contract is seldom borrower-specific but it is mostly differentiated catering to a group of borrowers with similar risk characteristics; the lender incurs a fixed cost in designing a credit card contract. Using their framework, they show financial innovations can increase revolving credit by improving upon two frictions. These are (1) reduction in fixed cost of designing a credit card contract and (2) improved accuracy in lenders' predictions on a borrower's default risk.

Livshits *et al.* (2016) suggest that their model provides a theoretical mechanism to the results of Dick and Lehnert (2010), who document that interstate banking deregulation increases Chapter 7 bankruptcy filings.² On page 1676, they write, “by lowering barriers to interstate banking, deregulation ... leads to the extension of credit to riskier borrowers, resulting in more bankruptcies.” I think that the interstate branching deregulation is better suited to test the proposition of Livshits *et al.* (2016) than the interstate banking or intrastate branching deregulations. This is mainly due to the fact that the less-aggregated data on revolving credit at a county-level are available only after the first quarter of 1992 (Barron *et al.* 2000).

The labor market conditions of an economy can have broader implications on the usage of credit card debt. At a macro level, throughout 1977 to 2010, the fraction of unemployed households who borrow using their credit cards has grown from 10 percent to 33 percent. Herkenhoff (2019) builds a model drawing the literatures of (a) search and matching models and (b) defaultable debt

² Desai and Downs (2022) find that intrastate branching increases mortgage supply, which in turn, causes a rise in Chapter 13 filings. They find an insignificant effect of interstate banking on Chapter 7 filings.

models. In the basic set up, three events occur in the first part of any given time period -- (a) the agent searches for an asset and a match with a dealer takes place, (b) agent decides to borrow, and (c) they decide to default. In the second part, the agent looks for a job and matches with an employer. Finally, in the third part of the time period, the expense shock uncertainty is resolved. The findings of Herkenhoff (2019) suggest that the impact of an economic recession is lower in an economy with the availability of credit card debt. Similarly, Bethune *et al.* (2015) show that the rise in revolving credit can account for approximately 70 percent decline in long term unemployment rate.

Therefore, it is plausible that whether a householder is gainfully-employed or not can influence their decision to borrow using their credit card. I test that proposition using the exogenous event of interstate branching as a quasi-natural experiment.

3. Geographic bank deregulation in the US

This subsection provides a brief overview of bank deregulation through which a bank can expand geographically in the US. The terms interstate banking, intrastate branching, and interstate branching are frequently used in the law and banking literature to describe geographic bank deregulation.

The dual banking system of the US allows a bank to obtain a charter issued by either a state banking agency or federal agency. Interstate banking refers to the ability of an out-of-state bank to offer banking services in a target state by either acquiring an existing bank of that state or setting up a de novo bank after obtaining a charter of that state. Intrastate branching refers to the ability of an in-state bank to expand its operations within its home state by acquiring existing branches or

setting up a de novo branch. For more details on interstate banking and intrastate branching, I refer an interested reader to the works of Kane (1996), Ginsburg (1980, 1983), Amel and Liang (1992), Kroszner and Strahan (1999), Desai and Downs (2022), and others. This paper focuses on interstate branching.

Interstate branching refers to the ability of an out-of-state bank to expand its operations in a state other than its home state by either acquiring existing branches or setting up de novo branches. Until 1994, whether to allow an out-of-state bank to have a branch in a state was predominantly under the purview of the state legislature. Only 62 out-of-state banks existed in small number of states in 1994, however, that number was 24,728 by 2005 (Johnson & Rice 2008). The reason for this surge is the passage of federal legislation Riegle-Neal Interstate Banking and Branching Efficiency Act (IBBEA) of 1994. It allowed a bank to open branches anywhere in the US.

Although IBBEA essentially removed all branching and banking restrictions on a bank, it also permitted a state to erect barriers for an out-of-state bank to open a branch. These barriers are of four kinds: (1) preventing de-novo branching (2) putting an age limit of 3 to 5 years for a target branch (3) reducing the deposit share after merger with an in-state bank to below 30 percent, and (4) disallowing acquisition of individual branches in the preferred location. Johnson and Rice (2008) construct a restriction index based on whether a state has erected any of these four barriers. They assign binary value to each of these four barriers. The restriction index value of four indicates that a state in a given year has erected each of the four barriers, and the index value of zero shows that a state in a given year has not erected any of the four barriers. Their restriction index value is zero for each state prior to 1994, as reflected in the trivial number of out-of-state branches. By

2005, most states allowed an out-of-state bank to open branches in their jurisdictions under the reciprocity arrangement.³ Therefore, the value of restriction index is four for each state after 2005.

4. Data and variables

Panel A of Table 1 describes the main variables of our study along with their data sources. The sample involves panel data of 3,109 counties from the first quarter of 1994 to the fourth quarter of 2005. The data on credit card debt (revolving credit) are from TrenData database. It tracks consumers' credit use and payment behavior at various levels of geographic aggregation using the credit reporting files of TransUnion LLC.⁴ As per TrenData, the revolving credit is the open line of credit issued by any kind of business (i.e., bank, clothing, credit union, department store, finance company, S&L, etc.). Retail credit is the revolving account issued by one of the following kinds of business: camera, clothing, computer, departmental store, jewelry, or sporting goods. The difference between revolving credit and retail credit can serve as a proxy for credit card debt issued by a bank. The dependent variable 'BkcBal' is the ratio of amount of outstanding revolving credit issued by a bank to the number of bank card borrowers. A bank card is the revolving account issued by a bank or S&L.

[Insert Table 1 here]

I obtain the bank deregulation index (variable 'DeregIndex') by going over Appendix A of Johnson and Rice (2008), Table I of Rice and Strahan (2010), and the replication kit of Favara and

³ In a reciprocity arrangement, a bank of State X can acquire or open branches anywhere in State Y. However, State X must allow permissions to any given bank of State Y to open and acquire branches in its jurisdiction.

⁴ TrenData is based on a time-series of large random samples of US consumer credit histories. Each quarterly sample starting from 1992 contains approximately 30 million anonymous credit reports. From this database, variables related to a borrower's debt and payment behavior are built and aggregated at the county, state, and national levels. See Barron *et al.* (2000) for further discussion on TrenData.

Imbs (2015). Since the dependent variable is measured at each quarter, I manually make necessary changes to the annual deregulation index of Favara and Imbs (2015), for the year in which the state legislation becomes effective. As an example, Florida changed its deregulation index from zero to one as on the effective date 6/1/1997. The annual dataset of Favara and Imbs (2015) makes the required change starting 1998. I make the required change starting the third quarter of 1997. The independent variable of interest is the categorical variable, deregulation index ‘DeregIndex’, that measures the degree of a state’s interstate branching bank deregulation. Following Favara and Imbs (2015), the deregulation index is calculated as four minus the restriction index of Johnson and Rice (2008). The highest value of the four indicates that the state has removed each barrier against the entry of out-of-state banks. The lowest value of zero indicates that the state has erected all four possible barriers to stop an out-of-state bank’s entry into the state after the IBBEA.

The control variables reflect a county’s income conditions and demographics. The variable ‘Income’ is the per capita annual income of a county, and the variable ‘IncGrwth’ is the change in per capita income over the previous year. These two variables are from the Bureau of Economic Analysis (BEA). The lifecycle characteristics of an individual influences their consumption and usage of credit card debt. The variable ‘Age25_44’ is the ratio of the population in the age group of 25 to 44 over the total population. In a comparable manner, the variables ‘Age15_24’, ‘Age45_64’, and ‘Age65plus’ are computed. The omitted category is the age group below 14. These age demographics are from the US Census.⁵

⁵ In the case of Virginia, there are 24 instances when the local area definitions of the BEA and Census/TrenData differ. This is because the BEA does not separately report per capita income of a city engulfed by a county. Using the approach of Moody’s analytics, the population, unemployment, and default data are aggregated to conform to the BEA’s local area definitions, see <https://www.economy.com/support/blog/buffet.aspx?did=869A03D1-5D74-4376-A606-00A8C64DDB0B>. (Last accessed on 4/29/2023).

Panel B of Table 1 reports the summary statistics. In a typical county, the mean and median amount of credit card debt per borrower are \$5,396 and \$4,999, respectively. The average income growth is around 4 percent. The average percentage of population in age group of 25 to 44 is 27% of a county. Individuals in this age group of 25 to 44 are more likely to use consumer credit to meet consumption needs of their growing families.

5. Results

5.1. Effects of interstate branching on credit card debt

5.1.1. Results using the main sample

Following Célerier and Matray (2019), I use the following difference-in-differences (diff-in-diff) model using the panel data of all U.S. counties.

$$\ln(Y_{c,t}) = \alpha + \beta \times \text{DeregIndex}_{s,t} + \delta X_{c,t} + A_c + B_t + \varepsilon_{c,t}, \quad (1)$$

where the dependent variable, $Y_{c,t}$, is the measure of credit card debt (BkcBal) of county c for a given quarter t . The variable of interest, $\text{DeregIndex}_{s,t}$, is the deregulation index for a given state, s , in a quarter t . The vector, $X_{c,t}$, is for the annual time-variant controls of a county. The vectors A_c and B_t are the dummy variables controlling for county and time (year-quarter) fixed effects, respectively, and the error term is ε . The coefficient β is the estimate of diff-in-diff. Each regression uses the robust standard errors clustered at the state level.

[Insert Table 2 here]

Table 2 reports results of regressions using the three specifications of Equation (1). The first specification (base) includes DeregIndex and time and county fixed effects. The second specification includes deregulation index and a county's annual income characteristics along with time and county fixed effects. Finally, the third all-inclusive specification includes not only

DeregIndex but also county controls of income and demographics with time and county fixed effects. The dependent variable is the natural logarithm of the amount of outstanding credit card debt per bank card borrower (BkcBal). As shown in regressions (1) to (3), the coefficient on deregulation index is negative and statistically significant, suggesting the interstate branching effects on credit card debt. The coefficient on DeregIndex is -0.023. This diff-in-diff result indicates that if a state decides to change from its initial position of no entry for an out-of-state bank to the position where it removes all the four barriers for an out-of-state bank's entry, then the outstanding credit card debt per bank card borrower can decline by 2.3 percent. This change is statistically significant at the 1% level with t-statistics in range of 3.2 to 3.6 depending on the empirical specification.

5.1.2. Dynamic impact of interstate branching on credit card debt

This subsection reports the results of analysis on the effects of interstate branching on credit card debt in a dynamic setting. This exercise allows us to check the evidence of anticipatory effects prior to the actual branch deregulation event and whether the parallel trend assumption is satisfied in the data.

Since the deregulation index is a categorical variable, for this analysis, it needs to be converted to a dummy variable. Following Celerier and Matray (2019), I consider the deregulation event as the quarter in which the state makes effective at least two of the four components of the deregulation index (DeregIndex). The dummy variable, D , that takes on a value of one for the quarters for which the categorical variable, DeregIndex, is greater than or equal to two. Based on the reciprocity arrangement among states, I assume that starting the first quarter of 2006, each state

removed all the barriers of interstate branching (DeregIndex = 4). Then, the following diff-in-diff regression with leads and lags for the outstanding credit card balance gives dynamic effects.

$$\text{Ln } Y_{c,t} = \alpha + \beta_1 D_{st}^{-9} + \dots + \beta_9 D_{st}^{-1} + \beta_{11} D_{st}^{+1} + \dots + \beta_{27} D_{st}^{+17} + A_c + B_t + \varepsilon_{c,t}, \quad (2)$$

where the dummy variable $D^{\mp J}$ takes on a value of one if the quarter t is J quarters prior to or posterior to the interstate branching (event) quarter of the state s . The negative sign is for the prior year and the positive sign is for the posterior quarter. I consider a 24-quarter span starting from the eighth quarter prior to and ending on the 16th quarter posterior to the interstate branching quarter. For the quarters before the eighth quarter prior to the interstate branching, the dummy variable D_{st}^{-9} takes on a value of one. Similarly, for the quarters after the 16th quarter posterior to the event quarter, the dummy variable D_{st}^{+17} takes on a value of one. The omitted quarter "0" is the interstate branching (event) period. The coefficients, β , on the dummy variables $D^{\mp J}$ are the parameters of interest. Their significance indicates whether the average value of credit card debt in a given quarter differs from that in the interstate branching (event) quarter.

[Insert Figure 1 here]

Figure 1 plots a trend in the effect of interstate branch deregulation on credit card debt. The y-axis shows the change in average value of natural logarithm of a credit card debt per borrower relative to that during the quarter of interstate branching event. The black dots are the magnitude of the coefficients on dummy variables, $D^{\mp J}$ of Equation (2), and the dashed vertical spikes refer to the 95% confidence interval. The effect is significant if the vertical spike fails to cross the horizontal line passing from zero.

As shown in Figure 1, during the period prior to interstate branching deregulation by a state, the average value of credit card debt per borrower is marginally higher than that in the interstate branching (deregulation) quarter, although the difference is not statistically significant.

This trend shows that, in our data, there is no evidence for anticipatory effects prior to the occurrence of the branch deregulation event as far as credit card debt is concerned. It also indicates that the common (parallel) trend assumption is satisfied in our data. However, after a state relaxes restrictions on interstate branching, the average values of credit card debt gradually decrease. In all but two posterior quarters, the 95% confidence intervals, as shown by the vertical spikes, are below the horizontal line passing from zero. It shows that the average credit card debt per borrower for any given quarter after a state relaxes restrictions on bank branching is significantly lower than that for the quarter in which the branching legislation was made effective.

5.1.3. Results using the placebo sample

To have a meaningful conclusion on our finding that interstate branching decreases revolving credit, in this subsection I report the results of our analysis on the placebo sample of retail credit. The retail credit data for county-quarters are also from TrenData. Retail credit is a type of revolving credit issued by one of the following kinds of business: camera, clothing, computer, department stores, jewelry, or sporting goods. Since IBBEA's impact is supposedly on the commercial banks, one expects insignificant effects of interstate branching on revolving credit issued by the retail sector. The variable 'RetBal' is the outstanding retail credit per retail borrower. Appendix Table A1 provides the variable description and its summary statistics. The outstanding balance on a retail credit is \$532.

[Insert Table 3 here]

Table 3 reports the results of diff-in-diff analysis of Equation (1) on the placebo sample of retail credit. As shown in all regressions, the coefficients on 'DeregIndex' is statistically indistinguishable from zero. This finding suggest that there is no noticeable change in revolving

credit issued by the retail sector after a state allows an out-of-state bank to open branches anywhere in the state.

To summarize subsection 5.1, the results based on all county-quarter observations indicate that removal of regulatory constraints on an out-of-state bank's ability to open branches anywhere in the state leads to a decrease in the amount of credit card debt per borrower.

5.2. Effects of a county's unemployment rate on its credit card debt

The previous subsection documents that the relaxation of regulatory constraints on interstate branching by a state causes a decrease in credit card debt in that state. In this subsection, I assess whether the change in unemployment rate, if any, following a state's loosening of its multi-branch banking rule helps to explain the observed decline in credit card debt. I first assess whether interstate branching has any effect on a county's unemployment rate. Next, I use the instrumental variable (IV) approach to see whether the unemployment rate helps explain a county's credit card debt after interstate branching.

A county's monthly unemployment data are from Bureau of Labor Statistics (BLS). The unemployment rate, variable 'Unemp', of a county is the ratio of number of unemployed to the total number of individuals in the labor market. For the period first quarter of 1994 to the fourth quarter of 2005, for 149,098 county-quarter observations, the mean, median, standard deviation, 10th percentile, 25th percentile, 75th percentile, and 90th percentile values of the unemployment rate (in percent) are 5.53, 5.00, 2.75, 2.84, 3.73, 6.65, and 8.75, respectively [These statistics are not tabulated].

5.2.1. Interstate branching and unemployment rate

[Insert Table 4 here]

Table 4 reports the results of diff-in-diff analysis of Equation (1), where the dependent variable is the natural logarithm of unemployment rate. As shown in regression (3) of Table 4, the coefficient on variable ‘DeregIndex’ is -0.027 and it is statistically significant at the 1 percent level. This finding shows that the unemployment rate on average reduces by approximately 2.7%, if the state, following the passage of the IBBEA, removes at least one entry barrier for an out-of-state bank to open branches anywhere in the state.

5.2.2. Effects of unemployment rate on credit card debt after interstate branching – IV approach

This subsection documents the results of analyses on whether a decline in unemployment after interstate branching has any contributing effect on the decline in credit card debt. For that, I follow Favara and Imbs (2015) and perform the following instrumental variable (IV) estimation:

$$\text{Ln}(Y_{c,t}) = \alpha + \kappa \times \text{I. Ln}(Unemp_{c,t}) + \delta_2 X_{cst} + A_c + B_t + \varepsilon_{c,t}, \quad (3)$$

where the notation $\text{I. Ln}(Unempl_{c,t})$ is the instrumented value of unemployment rate. This value is the predicted value, $\text{Ln}(\widehat{Unemp}_{c,t})$, from the following first-stage regression,

$$\text{Ln}(Unemp_{c,t}) = \alpha + \beta \times \text{DeregIndex}_{s,t} + \delta X_{c,t} + A_c + B_t + \varepsilon_{c,t}, \quad (4)$$

where the notations of variables $Y_{c,t}$, $\text{DeregIndex}_{s,t}$, $X_{c,t}$, A_c , and B_t are the same as those shown earlier in Equation (1). The robust standard errors ε are clustered at the state level. The coefficient κ is of interest. It captures the magnitude of the change in the revolving credit for a given change in unemployment rate triggered by the interstate branching. Its positive value provides supporting evidence to the hypothesis: The bank geographic expansion reduces the dependence on credit card debt through the employment channel.

[Insert Table 5 here]

Table 5 reports the results of the instrumental variable (IV) analysis determining the role of unemployment on credit card debt after interstate branching. The regressions (1), (2), and (3) use instrumented (I.) values of natural logarithm of unemployment rate (Unemp). The coefficients on instrumented values of unemployment rate are positive and statistically significant. As shown in regression (1), the coefficient of $I.Ln(Unemp)$ is 0.865. It is the estimated elasticity of outstanding credit card balance per borrower with respect to unemployment rate. The interpretation is that following interstate branching, a 1 percent decline in a county's unemployment rate decreases its credit card debt per borrower by 0.86 percent.⁶ This change is statistically significant at the 1 percent level (z -statistic = 2.81). This provides evidence of the employment channel. The decrease in the unemployment rate triggered by a state's decision to allow entry of an out-of-state bank helps decrease its credit card debt.

6. Conclusions

In this paper, I study the effects of the bank geographic expansion on credit card debt. Specifically, I evaluate the hypothesis that bank geographic deregulation has, in general, a positive impact on an economy, for example, higher employment opportunities. This can disincentivize a borrower to resort to an expensive form of credit such as credit card debt. I use federal legislation the Interstate Banking and Branching Efficiency Act (IBBEA) of 1994 as an identification strategy. The IBBEA essentially removed legislative barriers for a bank's geographic expansion by allowing it to operate anywhere in the US. However, it allowed a state to put regulatory

⁶ More specifically, it is $e^{1.164 \times \ln 0.99} - 1$.

constraints for an out-of-state bank to open branches in that state. The availability of quarterly data aggregated at the county-level for the period 1992 onwards help to execute the research idea. I find that the removal of branching restrictions on an out-of-state bank's entry (interstate branching) decreases the level of credit card debt. Further, the decreased unemployment rate triggered by the interstate branching helps reduce the amount of credit card debt. The availability of unique data from a credit reporting agency makes this paper the first one to establish a causal relationship between bank geographic expansion and credit card debt.

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Table 1: Variable description and summary statistics

Panel A: Variable description

Variable name	Variable definition	Data source
<u>Dependent variable</u>		
BkcBal	Amount of bank card balance per bank card borrower	TrenData
<u>Independent variables</u>		
DeregIndex	State level bank deregulation index which is four minus the restriction index of Johnson and Rice (2008)	Rice and Strahan (2010)
Income	Personal income per capita	BEA
IncGrwth	Growth in per capita income during the year	U.S. Census
Age15_24	Fraction of population in the age group of 15 to 24	Census
Age25_44	Fraction of population in the age group of 25 to 44	Census
Age45_64	Fraction of population in the age group of 45 to 64	Census
Age65plus	Fraction of population in the age group of 65 and above	Census

Panel B: Descriptive statistics

Variables	Mean	SD	Median	P10	P25	P75	P90	N
BkcBal	5,396	2,308	4,999	3,045	3,886	6,432	8,138	149,091
Income	23,382	6,378	22,499	16,605	19,095	26,454	30,923	37,285
IncGrwth	0.043	0.051	0.042	-0.000	0.023	0.062	0.086	37,285
Age15_24	0.136	0.033	0.130	0.108	0.118	0.144	0.164	37,285
Age25_44	0.274	0.035	0.272	0.231	0.251	0.294	0.316	37,285
Age45_64	0.233	0.032	0.232	0.196	0.212	0.253	0.273	37,285
Age65plus	0.149	0.042	0.145	0.099	0.121	0.172	0.204	37,285
DeregIndex	1.43	1.49	1.00	0.00	0.00	3.00	4.00	2,448

Notes: This table describes data and variables of the study. Panel A describes variables and their data sources. Panel B reports summary statistics of variables used in empirical analyses. The sample period is from the first quarter of 1994 to the fourth quarter of 2005. N is the number of county-quarter observations for the dependent variable BkcBal. For covariates Income, IncGrwth, Age15_24, Age25_44, Age45_64, and Age65plus, N denotes county-year observations. For deregulation index, N denotes state-year observations, which include 50 states plus the District of Columbia. SD and P are abbreviations for standard deviation and percentile, respectively.

Table 2: Effects of geographic bank deregulation on consumer revolving credit

	(1)	(2)	(3)
DeregIndex	-0.023*** (3.22)	-0.023*** (3.25)	-0.023*** (3.62)
Ln(Income)		-0.028 (0.46)	-0.041 (0.61)
IncGrwth		-0.030 (0.96)	-0.014 (0.42)
Age15_24			-1.577* (1.83)
Age25_44			-3.726*** (4.60)
Age45_64			-1.177 (1.61)
Age65plus			-2.483*** (3.82)
Constant	7.969*** (550.57)	8.240*** (13.93)	10.274*** (11.45)
Observations	149,065	149,065	149,065
U.S. States + DC	51	51	51
Counties	3,109	3,109	3,109
Overall R-squared	0.355	0.346	0.274

Notes: This table reports the effects of removal of geographic barriers on a bank to open branches anywhere in a state (interstate branching) on revolving consumer credit given by a bank. The dependent variable is the natural logarithm of variable BkcBal. The definitions of variables and summary statistics are given in Table 1. DeregIndex is measured at the beginning of a period. All regressions control for time (year-quarter) and county fixed effects. The absolute value of t-statistics, based on the robust standard errors clustered at the state level, are reported in the parentheses below the coefficients. The symbols * and *** denote the statistical significance at 10% and 1%, respectively.

Table 3: Effects of geographic bank deregulation on retail consumer credit (placebo sample)

	(1)	(2)	(3)
DeregIndex	0.002 (0.26)	0.002 (0.27)	0.002 (0.31)
Ln(Income)		-0.143** (2.01)	-0.119* (1.72)
IncGrwth		0.078 (1.58)	0.073 (1.40)
Age15_24			0.473 (0.75)
Age25_44			1.012 (1.66)
Age45_64			-0.090 (0.14)
Age65plus			-0.105 (0.20)
Constant	6.213*** (576.32)	7.607*** (10.95)	7.049*** (9.00)
Observations	149,059	149,059	149,059
U.S. States + DC	51	51	51
# counties	3,109	3,109	3,109
Overall R-squared	0.170	0.209	0.247

Notes: This table reports the effects of removal of geographic barriers on a bank to open branches anywhere in a state (interstate branching) on the placebo sample of retail consumer credit. The dependent variable is the natural logarithm of variable RetBal. The description and summary statistics of retail consumer credit variables are shown in Appendix Table A1, whereas those for the independent variables are shown in Table 1. DeregIndex is measured at the beginning of a period. All regressions control for time and county fixed effects. The absolute value of t-statistics, based on the robust standard errors clustered at the state level, are reported in the parentheses below the coefficients. The symbols * and *** denote the statistical significance at 10% and 1%, respectively.

Table 4: Effects of geographic bank deregulation on unemployment

	(1)	(2)	(3)
DeregIndex	-0.027*** (3.21)	-0.027*** (3.15)	-0.027*** (3.38)
Ln(Income)		-0.490*** (3.91)	-0.444*** (3.56)
IncGrwth		-0.037 (0.54)	-0.013 (0.21)
Age15_24			-2.057 (1.44)
Age25_44			-7.845*** (6.95)
Age45_64			-6.267*** (5.22)
Age65plus			-6.215*** (6.73)
Constant	-2.684*** (132.41)	2.122* (1.72)	6.440*** (3.92)
Observations	149,069	149,069	149,069
States + DC	51	51	51
# counties	3,109	3,109	3,109
Overall R2	0.081	0.219	0.117

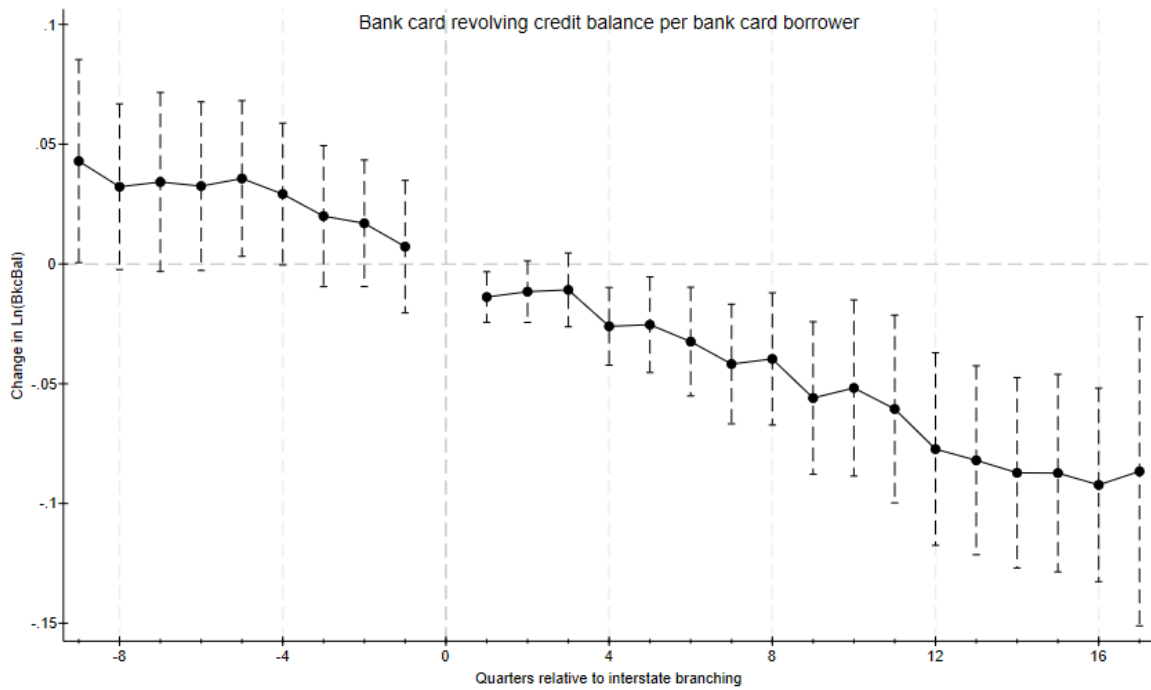
Notes: This table documents the effects of removal of geographic barriers on interstate branching on unemployment rate. The dependent variable is the natural logarithm of a county's unemployment rate. A county's unemployment rate is calculated as the ratio of number of unemployed to the number of individuals in the labor force. The variable DeregIndex is measured at the beginning of a period. The definitions of independent variables and their summary statistics are given in Table 1. All regressions control for time (year-quarter) and county fixed effects. The summary statistics of unemployment rate are not-tabulated and given in the main document. The absolute values of t-statistics, based on robust standard errors clustered at the state level, are reported in the parentheses below the coefficients. The symbols * and *** denote the statistical significance at 10% and 1%, respectively.

Table 5: Interstate branching, unemployment rate, and revolving credit - IV regression

	(1)	(2)	(3)
I.Ln(Unemp)	0.865*** (2.81)	0.859*** (2.68)	0.870*** (2.68)
Ln(Income)		0.394** (2.26)	0.345** (2.30)
IncGrwth		0.001 (0.01)	-0.002 (0.04)
Age15_24			0.221 (0.16)
Age25_44			3.109 (1.22)
Age45_64			4.277** (2.00)
Age65plus			2.926 (1.26)
Constant	10.291*** (12.31)	6.417*** (5.85)	4.667** (2.17)
Observations	149,058	149,058	149,058
States + DC	51	51	51
Counties	3,109	3,109	3,109
Overall R2	0.140	0.208	0.175

Notes: This table reports results of the instrumental variable regression on quarterly county-level revolving credit measure using unemployment rate as an instrument. The empirical specification is given in Equation (3). The dependent variable is the log of amount of bank card credit balance per bank card borrower (BkcBal). The independent variable of interest is the unemployment rate, which is the ratio of number of unemployed to total individuals in the labor market. The instrumented (I.) variable measure is the natural logarithm of unemployment rate. The variable definitions and summary statistics of controls are given in Table 1. All regressions control for time (year-quarter) and county fixed effects. The absolute value of z-statistics, based on the robust standard errors clustered at the state level, are in the parentheses below the coefficients. The symbols ** and *** denote statistical significance at 5% and 1%, respectively.

Figure 1: Dynamic effects of interstate branching on bank card revolving credit balance



Notes: The figure plots a dynamic effect of interstate branching on the bank card revolving credit balance using the county level data. The black dots are the coefficients on dummy variables $D^{\pm J}$ of Equation (2). That dummy variable takes on a value of one if the given quarter is Jth quarter prior to or posterior to the interstate branch deregulation (event) quarter of the state s . The omitted quarter "0" is the event period. Following Celerier and Matray (2019), I consider the deregulation event as the quarter in which the state makes effective at least two of the four components of the deregulation index (DeregIndex). The negative sign is for the prior quarter and the positive sign is for the posterior quarter. The dashed vertical spike represents the 95% confidence interval.

Appendix Table A1: Variable description and summary statistics for retail credit

Panel A: Variable description

Variable name	Variable definition	Data source
RetBal	Retail debt outstanding per retail borrower	TrenData

Panel B: Descriptive statistics

Variable	Mean	SD	Median	P10	P25	P75	P90	N
RetBal	532	196	507	320	399	637	772	149,091

Notes: This table describes data and variables of the placebo sample of retail credit. Retail credit is a type of revolving credit issued by one of the following kinds of business: camera, clothing, computer, department stores, jewelry, or sporting goods. Panel A describes variables and their data sources. Panel B reports summary statistics of these variables. The sample period is from the first quarter of 1994 to the fourth quarter of 2005. N is the number of county-quarter observations. The data include 50 states plus the District of Columbia. SD and P are abbreviations for standard deviation and percentile, respectively.