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**THE IMPACT OF STUDENT LOAN DEBT**
**ON SMALL BUSINESS FORMATION**

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## Abstract

Small businesses are the backbone of the U.S. economy and account for approximately one-half of the private-sector economy and 99% of all businesses. To start a small business, individuals need access to capital. Given the importance of an entrepreneur's personal debt capacity in financing a startup business, student loan debt, which is difficult to discharge via bankruptcy, can have lasting effects and may have an impact on the ability of future small business owners to raise capital. This study examines the impact of the growth in student debt on net small business formation. We find a significant and economically meaningful negative correlation between changes in student loan debt and net business formation for the smallest group of small businesses, those employing one to four employees. This is important since these small businesses depend heavily on personal debt to finance new business formation. Based on our model, an increase of one standard deviation in student debt reduced the number of businesses with one to four employees by 14% on average between 2000 and 2010. The effect on larger firm formation decreased with firm size, which we interpret to mean that these firms have greater access to outside capital.

*Keywords:* student loans, small business finance, debt capacity

*JEL Classifications:* D1, I22, I25, I28; H31, R2

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## 1. Introduction

Small businesses are the backbone of the U.S. economy. The U.S. Small Business Administration (SBA) documents that small businesses account for approximately one-half of the private-sector economy and 99% of all businesses. Furthermore, approximately 60% of new jobs in the private sector are created by small businesses. To launch a small business, individuals need access to capital. The SBA reports that small businesses receive approximately 75% of this capital from banks in the form of loans, credit cards, and lines of credit, which often have personal liability attached. In a recent survey of 2004 startup firms, Robb and Robinson (2014) report that the average financial capital for the smallest of small businesses (those with no employees) was $44,793, with debt financing accounting for 53% of capital requirements. Furthermore, Robb and Robinson (2014) note that debt financing remains a critical component for business growth in the years following establishment.[1]

Given the importance of an entrepreneur's personal debt capacity in financing a startup business, personal debt that is incurred early in life and that restricts a person's ability to take on future debt can have profound implications for the growth in small businesses. In particular, student loan debt can have lasting effects. Individuals often acquire student loans to finance the acquisition of human capital to be used later in life. While many studies show that the returns on higher education can be significant, the use of student debt to finance higher education can alter future employment and occupational decisions as student loans reduce individual future debt capacity. Given the enormous growth in the use of student debt in recent years, the issue of whether it may impact future small business formation is becoming critically important.

As growth in higher education costs exceeded the rate of inflation over the previous two decades, the role of student loans in financing education has become a national debate. To see the importance of student loans in the economy, consider that, from the start of our sample in 1999 through 2012, aggregate student loan debt as reported in Figure 1 increased almost 10 times and is now approximately $1 trillion (Brown et al., 2014). What is remarkable about the growth in student debt is that, while other forms of consumer debt (home equity loans, auto loans, and credit card debt) declined during the recent financial crisis, student loan debt almost doubled from $547 billion in 2007. What is more, by 2012, student loans accounted for 10% of all

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[1] The importance of debt financing for small businesses is not restricted to U.S. firms; Cosh, Cumming, and Hughes (2009) also report that bank capital is important in financing small business startups in Great Britain.

consumer debt, up dramatically from 2.9% in 2000, even though only 16% of borrowers held student debt in 2012.[2]

While the growth in aggregate student loans underscores the degree to which student debt has become a significant factor in the capital markets, the impact of student debt on individual personal financial conditions is also material. For example, Avery and Turner (2012) report that the average student loan debt amount for a bachelor's degree was $15,562 per graduate. However, the average amount underrepresents the significance of student loans on individuals who use debt to obtain higher education. For example, after conditioning on individuals who used student debt, Avery and Turner (2012) find that the average graduate had $24,437 in outstanding student loans. Furthermore, student debt amounts vary significantly based on the type of institution the individual attended. Using data from 2004, Avery and Turner note that 61% of all students attending public four-year colleges had student loan debt, while 89% of students enrolled in private, for-profit four-year colleges had student loans.[3] In fact, they note that the average debt amount for students at public four-year colleges was $11,706 versus $19,726 for students at private for-profit four-year colleges.[4] Not surprisingly, amassing such a significant amount of personal debt can have serious implications for future career opportunities.

The growth in student debt over the past 10 years corresponds to an increase in student loans that are either delinquent or have a deferral or forbearance status. The analysis by Brown et al. (2014) reports that 17% of student loans are currently delinquent, and another 44% were not being repaid due to the borrowers either still being in school or having received a repayment deferral or forbearance.

As a result of the expansion in student debt and the resulting increase in student loan defaults, economists are studying the causes and consequences associated with this growth. Recent analysis indicates that student debt has an impact on career choices following graduation

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[2] These figures are extrapolated from the Federal Reserve Bank of New York Consumer Credit Panel/Equifax, which is a 5% random sample of all borrowers found in Equifax credit reports who have Social Security numbers. This panel is a widely cited source of aggregate student loan and consumer debt information. For a discussion of this database see Lee and van der Klaauw (2010).

[3] The distinction between public and private, for-profit institutions becomes even more significant for the graduation rates at private, for-profit institutions, which is significantly below that of traditional public colleges. As a result, students at private, for-profit institutions are often amassing significant debt burdens without achieving the end degree that will help make such an investment profitable.

[4] The contrast is even starker after conditioning on individuals who completed bachelor's degrees; 59% of graduates from public four-year institutions left school with an average debt of $12,922 in student loans, while 92% of graduates from private, for-profit four-year institutions had an average amount of $45,042 in debt.

(Rothstein and Rouse, 2011). Other studies have focused on the returns to student debt (Oreopoulos and Salvanes, 2011, and Avery and Turner, 2012). More recent studies have focused on the effect of student loan debt in explaining the decline in homeownership. Brown and Caldwell (2013) find that, as a result of tighter underwriting standards; consumers with educational debt may have more limited access to housing and auto debt despite their comparatively high earning potential. Houle and Berger (2014) also find that student loan debt had a significant effect on the decline in homeownership among young adults, but they find this effect to be small.

Although previous research studied the impact of student debt on borrowers' future employment opportunities or the ability to obtain future credit, no research to date has examined the impact of student debt on small business formation. Since small business formation is essential to the economic growth of the U.S. and those formations often depend on access to personal debt, the growth in student loans may impact the ability of future small business owners to raise capital. This study fills a void by examining the impact of growth in student debt on net small business formation.

To preview our results, we find a significant and economically meaningful negative correlation between changes in student loan debt and net business formation for the smallest group of small businesses, those with one to four employees. This is important because these small businesses depend on personal debt the most to finance new businesses. Across all counties, we see that an increase of one standard deviation in student debt uses results in a decrease of 70 new small businesses per county, a decline of approximately 14.4%. In contrast, for firms in the largest size category, those with 20 or more employees, an increase of one standard deviation in student debt uses results in a decline of 10 new firms, or approximately 6.2%. We interpret this difference to be consistent with the hypothesis that these larger firms have greater access to outside finance and thus the growth in student debt has less of an impact on their formation.

Our paper proceeds as follows. Section 2 discusses the three data sets used to measure student debt usage and issues with obtaining our ideal data set, which is a borrower-level data set that includes data on borrowers' educational choices and outcomes. Section 3 describes the research question and empirical model. Section 4 presents the primary empirical results, and

Section 5 extends the analysis to examine the geographical dispersion in student debt use. Finally, Section 6 concludes.

## 2. Data and Summary Statistics

To examine the effect of student debt on small business formation, we assemble data from three sources. First, we use the County Business Patterns (CBP) database from the U.S. Census Bureau to obtain state- and county-level statistics on business establishments. The CBP reports the number of net firms (new business formations less old business retirements) by industry, size category, and year. We focus on the net number of business formations between 2000 and 2010. We use the CBP firm size categories to isolate the impact of changes in relative student loan debt at the county level on business formation by firm size. Thus, we track net businesses based on number of employees. The CBP defines firm size using the following categories: one to four employees, five to nine employees, 10 to 19 employees, and 20 or more employees.[5] Since our focus is on the impact that student debt has on the formation of small businesses, where entrepreneurs often rely on personal credit to finance business startups, our analysis concentrates on the businesses in the groups with one to four and five to nine employees. However, we use the larger firm size categories in falsification tests because personal student debt usage should have a smaller impact on the establishment of larger firms that have access to more capital sources.

Our second data source is a large representative panel data set of consumer credit reports from the Federal Reserve Bank of New York Consumer Credit Panel/Equifax (FRBNY CCP/Equifax), one of the three national credit bureaus. The data set contains longitudinal statistics of consumer characteristics and their debt performance for a 5% sample of the U.S. population. The data include the outstanding balance, payments, and delinquency status of student loans and at the loan level by individual; other types of consumer credit are also aggregated by individual. We aggregate the consumer debt data to the county level to obtain the total amount of consumer debt by category as well as their overall performance at year-end from 1999 and 2009. These data include the balances, payments, and delinquency status of seven

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[5] The CBP actually tracks larger firm size categories; however, for our purpose, firms with 20 or more employees are sufficiently large that the amount of student debt carried by the owner/founder is unlikely to impact the firm's access to capital.

types of consumer loans — student loans, auto loans, credit card loans, mortgages, home equity loans and home equity lines of credit (HELOCs), and other consumer retail loans.[6]

To compare student debt usage across states and counties, we compute the relative amount of student debt in 1999 and 2009 by dividing the total amount of student debt by the total amount of all consumer debt. We then examine the growth in relative student debt usage over the decade from 1999 to 2009, which corresponds to a lag in student debt growth when compared with new firm establishments. Other tests look more directly at student debt usage by interacting changes in student debt use with new business firm size or regressing student debt usage on house price changes.

Finally, we use data from the 2000 and 2010 decennial census from the U.S. Census Bureau to control for differences in population and demographic makeup of the state and county locations. We add a number of additional county risk measures to control for local economic conditions. We use county-level unemployment rate data from the U.S. Bureau of Labor Statistics. We also use county- or state-level house price data from a repeat sales series from CoreLogic.[7] With this series, we create two house price variables for each county. The first measures house price growth from the start of the period in 2000 to the peak of the house price series in each county. The second measures the drop in house prices in each county from the peak to either the house price trough or the end of 2010. In this way, we capture the effects of the housing boom and bust so emblematic of the decade. Our final panel contains 2,716 counties.

Our ideal database would be to match the anonymized individual credit bureau data with anonymized information on individual borrower education outcomes so we could link educational outcomes directly with net small business formation, controlling for individual characteristics. Efforts to create a student unit record system have been strongly advocated by several educational industry organizations. However, Congress banned the creation of such a database for privacy concerns. Congress even banned linking data it presently collects on individuals across different databases for the U.S. Department of Education and state agencies (McCann and Laitinen, 2014). As a result, we aggregated borrower debt information from

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[6] In the subsequent analysis, we combine home equity loans and home equity lines of credit into the category "second-lien mortgages" since these debts are collateralized by real property but junior in standing to first mortgage debt.

[7] CoreLogic is one of the major providers of house price indexes (HPIs) derived from public records data. Where the county house price series is unavailable because of insufficient repeat sales observations, we use state-level data. In our sample, the 1,154 largest counties have county-level data; we use state-level data for the remaining.

FRBNY CCP/Equifax to the county level to match these up with the county-level CBP and Census data. Heterogeneity among counties is then captured through census data and county-level fixed effects.

To start our analysis, we note that the student loan usage increased dramatically across all counties between 2000 and 2010, as depicted in Figure 1. On average, student debt increased 760% between 2000 and 2010, while total consumer debt increased 150%. As a result, the relative share of student debt to total debt increased 4.7 percentage points on average between 2000 and 2010. Thus, to analyze the effects of increases in student debt on new business formation, we compare the *relative* increases in student debt across counties.

We segment counties based on the change in student debt use relative to the overall change in student debt across all counties. To measure the relative change in student debt between 1999 and 2009, we rank each county based on total student loans outstanding as a percentage of total consumer debt outstanding in 1999 and 2009. We then take the difference in each county's 2009 rank and 1999 rank. Figure 2 shows the frequency distribution of the county rank migrations. Counties that have no difference in 1999 and 2009 ranks experienced no change in their *relative* student debt outstanding. In contrast, counties with a positive difference experienced an increase in student debt usage relative to other counties, while counties with a negative difference had a decline in student debt percentage relative to other counties. Counties with migration values of ±9 moved from the lowest (highest) student debt rank to the highest (lowest) debt rank, while counties with migration values of ±1 had relatively minor changes in their relative student debt usage and only moved up or down one place. Obviously, the largest category (554 observations) corresponds to counties that did not change their debt usage relative to other counties. The overall distribution is symmetric.

Using the migration in student debt ranks as a demarcation, Table 1 shows the differences in net growth in firms and in debt growth and changes in our key modeling variables across counties that increased, decreased, or did not change their relative position in student debt usage. As noted in the symmetric distribution in Figure 2, 1,083 counties had a decline in student debt usage relative to other counties, while 1,080 counties had an increase.

Panel A of Table 1 reveals striking differences in net firm formation between 2000 and 2010, both across firm size categories and with our three student loan groupings. Across all counties, we see a net growth of 388 for the smallest firms (one to four employees) but very little

net growth in the other categories: 90 firms (five to nine employees), 79 firms (10 to 19 employees), and 55 firms (20 or more employees). Clearly, the largest growth of new firms occurred in the group with the smallest number of employees (one to four). We expected this group to be funded much more by personal debt than any of the other groups.

Most striking are the relative differences in net firm growth across the three categories of student debt usage. First, while net growth in firms with one to four employees increased by 388 overall, counties that had a relative decline in student debt usage experienced an increase of 582 net firms and those with no change saw growth of 373 firms, but those counties with increased student debt usage showed only 201 net new firms. To put this into perspective, the 582 firms in counties that had a decline in relative student debt usage represent a 40% increase in the number of firms over the baseline level in 2000, while the 373 net new firms in counties that increased relative student debt usage represent just a 28% increase over the year 2000 base. It's also striking that in every category of net growth in firms, counties in which student debt usage increased saw significantly fewer new businesses formed. Yet, when viewed as a percentage change over the year 2000 base, the differences between the three categories of student loan debt are less dramatic in the larger firm groups.

Panel B of Table 1 shows that student debt usage (student debt as a percentage of total debt) increased by 2.5% (from 3.4% to 5.9%) in counties that had a decline in their student debt use rank. In contrast, counties that had no change in their student debt ranking experienced a 4.8% increase (from 3.3% in 1999 to 8.1% in 2009) in their student debt usage. Finally, counties that saw an increase in their student debt use rank had a 6.7% increase (from 2% in 1999 to 8.7% in 2009) in student debt usage. The F-statistic for the test of the null hypothesis of equality of means is statistically significant at the 1% level, which indicates that we can reject the null hypothesis that the change in student debt usage is constant across the three groups.

Equally important is the composition of growth in student debt and growth in total debt. Not surprisingly, we note that student debt growth was the smallest in the decreasing student debt usage group and significantly so. This relatively lower student debt growth is also coupled with significantly higher *total* debt growth in the declining group. For example, Table 1 shows that the mean total debt amount for counties with a drop in their student debt use ranking increased from $2.53 billion in 1999 to $6.70 billion in 2009. This shows that the numerator and

denominator of the student debt usage calculation are each contributing factors to the decreasing group.

Panel B in Table 1 also reports the summary statistics regarding debt usage between 1999 and 2009. Note that we lag the debt variables by one year relative to the firm establishment census. Consistent with the summary statistics discussed in the introduction, Panel B shows that total household debt increased 150% in real terms between 1999 and 2009 (from $1,739 million to $4,342 million). However, while total household debt usage was increasing during the decade, the makeup of that debt changed significantly, with student debt growing as a proportion of total debt. Averaging across all counties, student debt as a percentage of total household debt was 2.8% in 1999. By 2009, student debt as a percentage of total debt increased to 7.5%. Comparing the changes in debt composition based on whether the county experienced a relative increase or decrease in its student debt usage reveals a number of interesting insights. First, counties that experienced an increase in relative student debt usage rank versus all other counties had significantly lower total debt amounts than did counties that had a decrease in relative student debt usage rank. For example, in 2009, counties with an increase in student debt use rank had a total debt average of $2,292 million, while counties that decreased in relative student debt use rank had a total debt average of $6,701 million. Furthermore, even though the average amount of total debt in 2009 for counties that had a decline in student debt rank is higher than for counties with an increase in student debt use rank, the relative growth in total debt from 1999 to 2009 is higher in counties that experienced a decline in their student debt usage rank. Thus, the reason for the decline in relative student debt use is not from a decline in actual student debt amounts, but rather from increases in other forms of household debt. As will be discussed next, the primary driver of the increase in total debt in these counties is tied to real estate lending (mortgages and home equity credit).

The business growth figures in Table 1, Panel A combined with the figures on debt growth in Panel B suggest that personal debt composition could be playing a significant role in net business formation of small firms. Our hypothesis is that overall personal debt growth contributes positively to the growth of firms with one to four employees, because the formation of small firms relies extensively on personal credit for startup capital. Higher shares of student debt relative to total debt, however, have significantly negative effects on the establishment of small firms. Although intriguing and generally supportive of the debt capacity hypothesis, the

summary statistics in Table 1 do not establish a causal link since counties that experienced a change in their relative student debt ranking could also have significant differences in demographic and economic conditions that might explain the relative growth in new business establishments. Thus, in the following section, we rigorously test the debt capacity hypothesis with appropriate controls for differences in county demographic factors and risk measures.

In Table 2, we report on differences in various demographic factors and housing market indicators for the counties based on their relative student debt usage. Overall, the demographic factors appear to be relatively worse in counties in which student debt usage increased. Panel A of Table 2 shows that population growth was the smallest in counties with high student loan growth — 4.4% versus 7.5% and 8.0%, respectively, in the declining and unchanged counties. These differences are highly significant, both statistically and economically. The median age also increased significantly more in the counties with an increase in student debt usage rank but only marginally so. However, the growth of 18- to 21-year-olds showed no significant differences, suggesting that the growth in traditional college-age populations does not account for the variation in student debt usage. Panel B of Table 2 shows a more mixed picture for the risk measures. For example, average unemployment rates from 2000 to 2010 were higher over the entire period in counties in which student debt usage increased. Again, this is consistent with counties with lower unemployment being able to support greater debt usage. Looking at average credit scores, we see that counties that experienced an increase in student debt had significantly lower average credit scores in 2000 than counties that had a decrease or saw no change in student debt use. However, we note that there was no statistically significant difference in the change in credit scores between 2000 and 2010. Turning to the factors representing the housing market, we note that house price growth from 2000 to the peak in each county was significantly lower in counties that experienced an increase in the relative ranking of student debt use.

Correspondingly, declines in house prices following the peak were also lower in high student debt growth states, yet the differences in house price declines were much smaller, suggesting that counties with large student loan growth did not experience the very volatile house price swings found elsewhere. We also report the percentage growth in vacant housing across counties and find no differences among them.

### 3. Research Question

Our analysis of whether the increase in student loan debt affects the formation of small businesses relies upon the debt capacity argument that utilization of student debt early in a person's life may adversely affect his or her future ability to access personal credit to start a small business. The debt capacity hypothesis rests on the assumption that the marginal costs associated with new debt increase with debt utilization. Thus, if we are correct that the growth in student loan debt negatively impacts future opportunities, then we should observe a reduction in small business establishments in areas with significant growth in student debt.

To motivate the analysis, we make the simple but not unrealistic assumption that the number of firms in a county in a particular year $t$ is a function of the size of the county (population) as well as the lagged aggregate debt in that county:

$$Firms_i^t = f(Debt_i^{t-1}, Population_i^t) \qquad\qquad (1)$$

The assumption that the number of firms is related to debt relies on the fact that firms use equity and debt in their capital structure. However, as noted previously, not all debt is useful in financing businesses. In particular, personal debt used to finance the acquisition of human capital (i.e., student loans) may hinder the formation of smaller firms if our debt capacity argument is correct. It is also possible that the acquisition of human capital (financed with debt) may lead to a higher productive workforce that ultimately leads to more entrepreneurial activity. Thus, whether student debt has a positive or negative impact on business formation is ultimately an empirical question. Therefore, if we segment aggregate debt into student debt and nonstudent debt, then, for the 2000 and 2010 census dates, we have the following:

$$Firms_{ij}^{2000} = f(StudentDebt_i^{1999}, OtherDebt_i^{1999}, Population_i^{2000}) \qquad (2)$$

$$Firms_{ij}^{2010} = f(StudentDebt_i^{2009}, OtherDebt_i^{2009}, Population_i^{2010}) \qquad (3)$$

where the subscript $i$ refers to the county and $j$ is the firm size category. To formally test whether the change in the number of firms is related to the growth in student debt, we assume a linear relationship between the number of firms and debt and population levels. Subtracting equation (2) from equation (3) and dividing by the county population in 2000 implies that the change in

per capita firms is a function of the change in per capita debt and population growth. Thus, adopting a research strategy similar to that employed by Adelino, Schoar, and Severino (2013), who examine the impact of real estate prices on employment by small businesses, we estimate the following regression:

$$\frac{\Delta Firms_{ij}}{Pop_i^{2000}} = \alpha + \beta_1 1_j + \beta_2 \frac{\Delta StudentDebt_i}{Pop_i^{2000}} + \beta_3 \frac{\Delta StudentDebt_{i*}1_j}{Pop_i^{2000}} \tag{4}$$

$$+\delta_1 \frac{\Delta OtherDebt_i}{Pop_i^{2000}} + \delta_2 \frac{\Delta OtherDebt_i * 1_j}{Pop_i^{2000}} + \pi \frac{\Delta Pop_i}{Pop_i^{2000}} + \gamma X_i + \varepsilon_{ij}$$

where $X_i$ represents the county fixed-effects that capture unobserved differences across counties. We also include a series of dummy variables ($1_j$) that denote the four business size categories (one to four employees, five to nine employees, 10 to 19 employees, and 20 or more employees). We exclude the 20 or more employee category and make that our baseline. If changes in relative student debt levels at the county level do impact small business formation, then we should observe a positive and significant coefficient for $\Delta StudentDebt_i$.

## 4. Results

Our primary hypothesis is that growth in student debt usage results in lower overall debt capacity and, as a result, individuals with higher levels of student debt have less financial flexibility to take on personal debt to finance small business startups. Since we do not have access to data about individuals who started small businesses, we aggregate student loan usage and study net business formations at the county level. If our primary hypothesis is correct, then we should observe fewer new small business formations in counties with higher relative student debt usage. We begin by estimating equation (4) using aggregate data on firms across all industries. Table 3 reports the estimated coefficients for the model with state- and county-level fixed effects. Focusing on the student debt model (column 1), we see that the variable for growth in student loans is not significant. However, we do find significant effects on the interaction of firm size and student debt growth. The estimated coefficient for small firm size ($1_1$) interacted with student debt growth is negative and significant (at the 1% level), indicating that counties that experienced an increase in student debt saw a decline in net small business formation. The estimated coefficients for the interaction of student debt with the other firm size categories are also negative and significant, but they are on an order of magnitude smaller than the estimated effect for the small firm category. Taken together, these estimates imply that growth in student

loans adversely affected the ability of counties to foster growth in the smallest size category of firm establishments.

In contrast to the results for student loans, we see that the estimated coefficients for the interaction of the nonstudent loan debt variable and the firm size dummy variables are generally positive and significant. In column (1), the other debt variable comprises all nonstudent loan debt (e.g., auto loans, unsecured loans (credit cards and personal debt), first-lien mortgages and second-lien mortgages (home equity loans and lines of credit)). Thus, the positive coefficients for the interactions of $1_1$ and $1_2$ with other debt are consistent with the theory that entrepreneurs use other forms of debt to finance small business formations. The positive coefficients imply that the overall increase in consumer debt helped facilitate the formation of small businesses, consistent with the notion that individuals rely on access to personal credit to start new businesses. Furthermore, consistent with the findings of Robb and Robinson (2014), the insignificant coefficient for the interaction of the dummy variable for a larger firm size category ($1_3$) suggests that growth in personal debt does not impact new business formations for larger firms (those with 10 or more employees). In addition, we see that the coefficient for the smallest firm category is an order of magnitude larger than the coefficient for the next firm size category (five to nine employees), which is consistent with the notion that the very small firms (one to four employees) are the most dependent on personal debt capacity to finance their activities.

Since the results for the nonstudent loan debt imply a positive relation with debt use and small firm formation, we further investigate this effect by replicating the estimation of equation (4) by replacing student debt with each form of debt (and redefining the other debt variables accordingly.) The results for auto loans, unsecured debt (credit cards and personal loans), first-lien mortgage debt, and second-lien mortgage debt are reported in columns (2) through (5), respectively. Interestingly, we also find a marginally significant negative coefficient for auto debt interacted with the smallest firm size group ($1_1$), suggesting that areas with higher concentrations of individuals using auto debt also have lower rates of small business formation. In contrast, we find positive and significant coefficients for the interaction of unsecured, mortgage, and second-lien debt with the smallest firm size group. The positive coefficients are consistent with the theory that individuals use unsecured personal debt (mostly credit cards) and home equity to finance small business startups.

To summarize our findings, comparing the results of the growth in student debt with the growth in total debt on net business formations, we see that student debt differs from overall consumer credit. While student debt is used to fund increases in human capital (education), the utilization of student debt reduces an individual's ability to access other forms of credit. As a result, the findings suggest a debt tradeoff in which larger amounts of student debt lower an individual's ability to start a new small business.

Because each form of consumer debt is significant when interacted with the coefficient for small firm size $(1_1)$, we enter each form of debt separately in a multivariate regression in Table 4. In this specification, student debt interacted with firm size enters in significantly for all three groups. The effect of student debt is largest in magnitude for the interaction with the firm size category of one to four employees and smaller for businesses with more employees. The coefficient for auto loans is still negative but is now insignificant. The coefficient for unsecured debt (mainly credit card debt) is positive and strongly significant for the smallest firm category, consistent with it being a source of financing for small businesses. Both forms of mortgage debt are now significant only for the smallest firms. The coefficient for home equity loans is especially strong and is again consistent with junior liens on properties being a source of financing for small business formation for the smallest firms. The significance of the first-lien variable suggests a possible correlation with equity extraction, something we explore in more detail in the next section.

To provide some context for the magnitude of the effect of student debt on small business formation, we report in Table 5 the predicted number of new firms by size category when evaluated at the sample means as well as assuming an increase of one standard deviation in student debt use while holding all other values constant. As previously noted, the relative level of student debt increased from 2.8% of total personal debt in 1999 to 7.5% in 2009, on average. Thus, across all counties, the average increase in the relative amount of student debt was 4.7%, with a standard deviation of 3.3%. The net firm predictions compared in Table 5 shows that an increase of one standard deviation in relative student debt (i.e., changing the growth in relative student debt from a 4.7% increase to an 8.0% increase) corresponds to a reduction of 70 (or 14.4%) small firms (those with one to four employees) from the predictions at the sample means. In contrast, and consistent with the lack of significance of the coefficients for the interaction of relative student debt usage and firm size, we see that an increase of one standard deviation in

relative student debt use has a relatively minor effect on larger firms. For example, the marginal impact reported in Table 5 implies that counties would lose 10 new firms (a 6% decrease) in the firm size category of 20 or more employees, on average, for an increase of one standard deviation in relative student debt use.

Table 5 also reports the marginal effect of an increase of one standard deviation in the relative use of student debt for the counties segmented by whether relative rank for student debt usage increased, remained constant, or decreased.[8] Counties that moved up in the ranking of student debt usage saw student debt as a percentage of total debt increase 6.7% (from 2% in 1999 to 8.7% in 2009, on average) with a standard deviation of 2.7%. Thus, for the small firm category, we see that the marginal impact of an increase of one standard deviation in the growth in relative student debt (from a 6.7% increase to a 9.4% increase) in these counties results in a decrease of about 17% in the number of new small businesses (from 284 to 235). In contrast, counties that declined in the rankings of student debt usage, on average, experienced an increase in relative student debt use of 2.5% (from 3.4% in 1999 to 5.9% in 2009) with a standard deviation of 2.7%. Thus, the marginal effect of an increase of one standard deviation in the relative student debt use (from 2.5% to 5.2%) results in a decrease of 12% in the number of net firms (from 737 to 649). Thus, the comparisons in predicted net firms contained in Table 5 clearly show that relatively small differences in student debt use across counties can have a large impact on small business formation, affirming our central hypothesis that the growth in student debt has curtailed access to personal debt, which is a critical source of capital necessary to the formation of new small businesses.

### 5. Geographical Dispersion in Student Debt

The results presented in the previous section point to a link between the growth in student debt and small business formation. To further investigate this link, we look at the geographical dispersion of student debt usage based on the division of counties according to their change in

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[8] The predicted values are based on the means for the subsamples.

relative rank. Figure 3 shows the map of student debt usage by county for our three groups (increased, decreased, and no change) and the map of county counts of net business formation for firms with one to four employees. While both maps show wide dispersion, two general patterns are evident. First, counties that declined in student debt usage rank tend to be more concentrated on the coasts and in the western states. This same pattern is evident for counties that had more than 25 net firms. Second, counties that increased in student debt usage rank are concentrated in the eastern and Midwestern regions of the country, particularly in the Rust Belt in the northern Midwest. These areas also appeared to have created fewer new small businesses.

One other observation is that the coastal areas also coincided with the greatest house price appreciation during the housing boom (and the greatest declines during the bust). This observation leads to the question of whether equity extraction from greater house price appreciation was a major funding source for college education. While a definitive causal link cannot be established without account-level data, an increase in total debt from equity extraction of housing wealth is certainly a plausible explanation for a major funding source of educational expenses.

As an empirical test of the conjecture that individuals in areas with higher house price appreciation were able to use other sources of capital to fund higher education, we estimated the following simple model of growth in student debt:

$$\Delta StudentDebt_i^{10-00} = \alpha + \beta_1 \Delta HPI_i^{XX-00} + \beta_2 \Delta HPI_i^{10-XX} + \delta X_i + \gamma S_i + \varepsilon_i, \quad (5)$$

where $\Delta StudentDebt_i^{10-00}$ represents the growth in student debt in county $i$ over the decade from 2000 to 2010; $\Delta HPI_i^{XX-00}$ represents the growth in county $i$'s home price index from 2000 to the peak of the index; $\Delta HPI_i^{10-XX}$ represents the change in county $i$'s home price index from the peak to either the trough or the end of 2010; $X_i$ represents a set of control variables designed to capture differences in county demographic factors (change in population, change in median age, growth in income, and average unemployment rate); and $S_i$ represents a set of state-level fixed effects. The coefficients $\beta_1$ and $\beta_2$ capture the sensitivity of the relative change in student debt usage to the overall boom-bust cycle experienced in the housing market during the last

decade. To the extent that households used growing home equity to fund higher education expenses, we should find negative coefficients for $\beta_1$ and $\beta_2$.[9]

Table 6 reports the estimated coefficients. Model (1) reports the estimated coefficients for the base model without county demographic control variables, while model (2) repeats the analysis by including county-level demographic controls. As anticipated, the negative and statistically significant coefficients imply that counties that experienced greater house price increases during the boom period had lower relative increases in student debt use, while counties that experienced greater declines in house prices following the peak had larger increases in relative student debt use.

In model (2), we note that the control variables are highly significant and have the anticipated sign. For example, the positive coefficient on growth in total debt indicates that areas with significant growth in consumer debt (including mortgages) saw an increase in the relative use of student debt. Furthermore, areas with larger increases in population bases between 2000 and 2010 have greater increases in student debt usage, and counties that had an increase in average age also experienced an increase in relative student debt use.

As a final test of the link between changes in house prices and changes in student debt use, we estimate the following models linked to the period when the county experienced the peak house price level:

$$\Delta StudentDebt_i^{XX-00} = \alpha + \beta \Delta HPI_i^{XX-00} + \gamma \log(pop_i) + \delta S_i + \varepsilon_i \qquad (6)$$
$$\Delta StudentDebt_i^{10-XX} = \alpha + \beta \Delta HPI_i^{10-XX} + \gamma \log(pop_i) + \delta S_i + \varepsilon_i, \qquad (7)$$

where $\Delta StudentDebt_i^{XX-00}$ represents the growth in student debt as a percentage of total debt from 2000 to the year XX corresponding to the peak of the housing market in county $i$, and $\Delta HPI_i^{XX-00}$ represents the growth in county $i$ home price index from 2000 to the peak year. $\Delta StudentDebt_i^{10-XX}$ represents the growth in student debt as a percentage of total debt from the year XX corresponding to the peak of the housing market in county $i$ to 2010, and $\Delta HPI_i^{10-XX}$ represents the decline in county $i$'s home price index from the peak level in year XX to either the trough or 2010. We include the log of the county population in 2000 and state-level fixed effects as control variables.

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[9] Note that a negative coefficient on $\beta_2$ implies an *increase* in student debt because $\Delta HPI_i$ is negative.

Tables 7 and 8 report the estimated coefficients. In Table 7, the negative but insignificant coefficient for $\Delta HPI_i^{XX-00}$ implies that there is no relation between home price index (HPI) growth and changes in student debt. However, the negative and significant coefficient in Table 8 for $\Delta HPI_i^{10-XX}$ confirms that counties that experienced greater house price declines following the market peak saw greater increases in relative student debt usage. Thus, these results are consistent with the hypothesis that individuals used more student debt in areas with less access to other capital sources, such as home equity extraction resulting from the increase in home prices.

## 6. Conclusion

Since small businesses account for approximately 60% of net employment activity in the U.S. and the majority of small businesses rely on personal debt for startup capital, understanding the impact that the growth in student debt has on small business formation is critically important to policymakers. Unlike other forms of personal debt, student debt is difficult to discharge via personal bankruptcy and thus limits a person's access to future debt until it is eliminated. As a result, individuals with significant amounts of student debt may find that they are unable to access the capital markets to finance the startup of new business ventures.

In this study, we document the extent to which the relative growth in student debt has impacted net business formations most reliant on personal debt — namely, those small businesses with one to four employees. Our results indicate that student debt differs from overall consumer credit. While student debt is used to fund increases in human capital (education), the utilization of student debt reduces an individual's ability to access other forms of credit. These results suggest a debt tradeoff for new small firms in which a larger amount of student debt lowers individuals' ability to start new small businesses. We find a significant and economically meaningful negative correlation between changes in student loan debt and net business formation for those firms with one to four employees. This is important because these small businesses depend on personal debt the most to finance new businesses. Based on our model, an increase of one standard deviation in student debt reduced the formation of new businesses with one to four employees by 14% on average in each county between 2000 and 2010. However, for firms with 20 or more employees, an increase of one standard deviation in student debt use resulted in a decline of 10 new firms, or approximately 6.2%. We interpret this difference to be consistent

with the hypothesis that these larger firms have greater access to outside finance and thus the growth in student debt has less of an impact on their formation.

An obvious limitation of our study is our inability to link individual consumer credit data with anonymized educational data at the borrower level. The increasing importance of understanding how rapidly increasing student debt affects economic activity, including its effects on small business formation and access to credit, argues for Congress to make more data available to policymakers.

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**Figure 1: Major Types of Consumer Loans Trend**
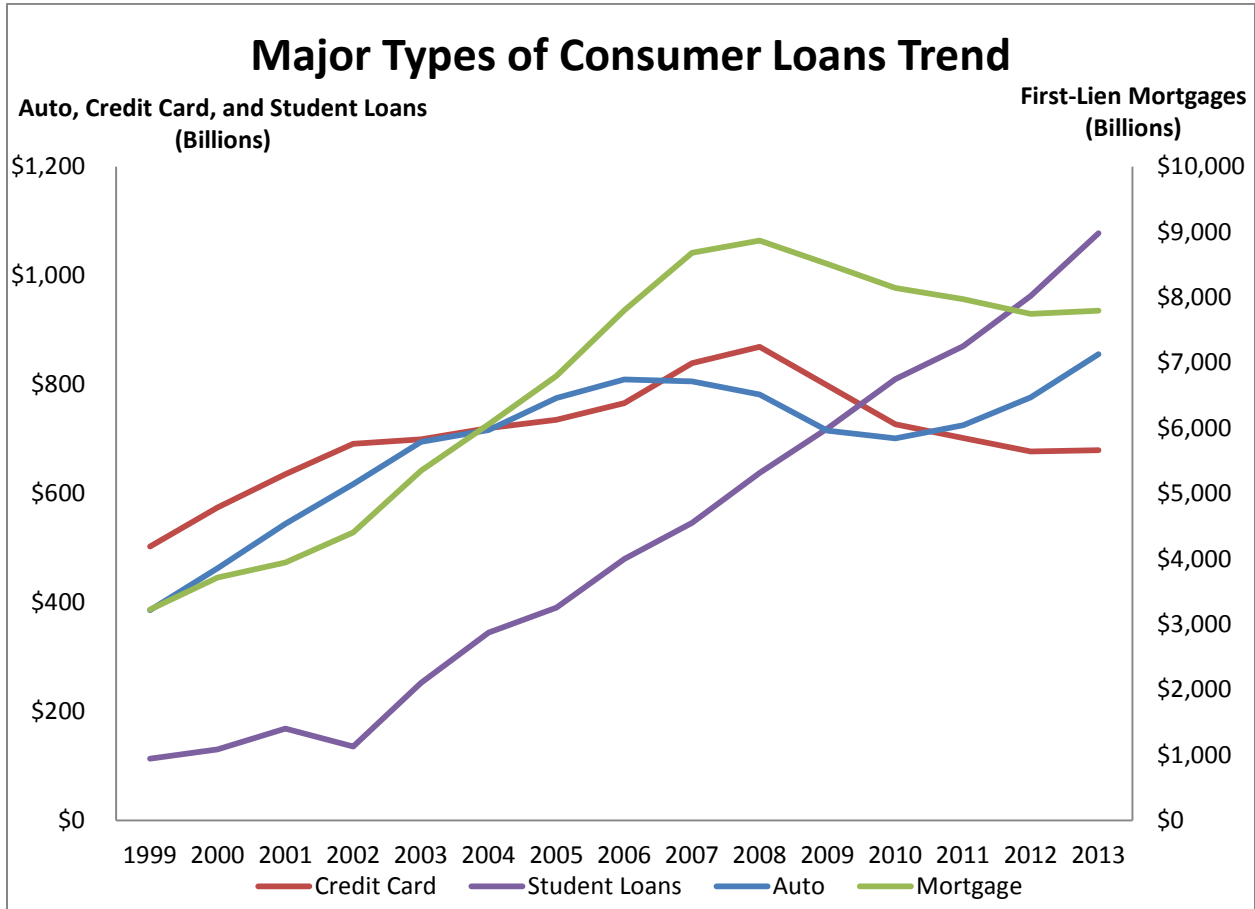


Note: The chart shows total dollar amounts of auto, credit cards, and student loans on the left axis and total dollar amount of first-lien mortgages on the right axis.
Source: Federal Reserve Bank of New York Consumer Credit Panel/Equifax

**Figure 2: Distribution of Counties Based on Relative Changes in Student Debt Usage**
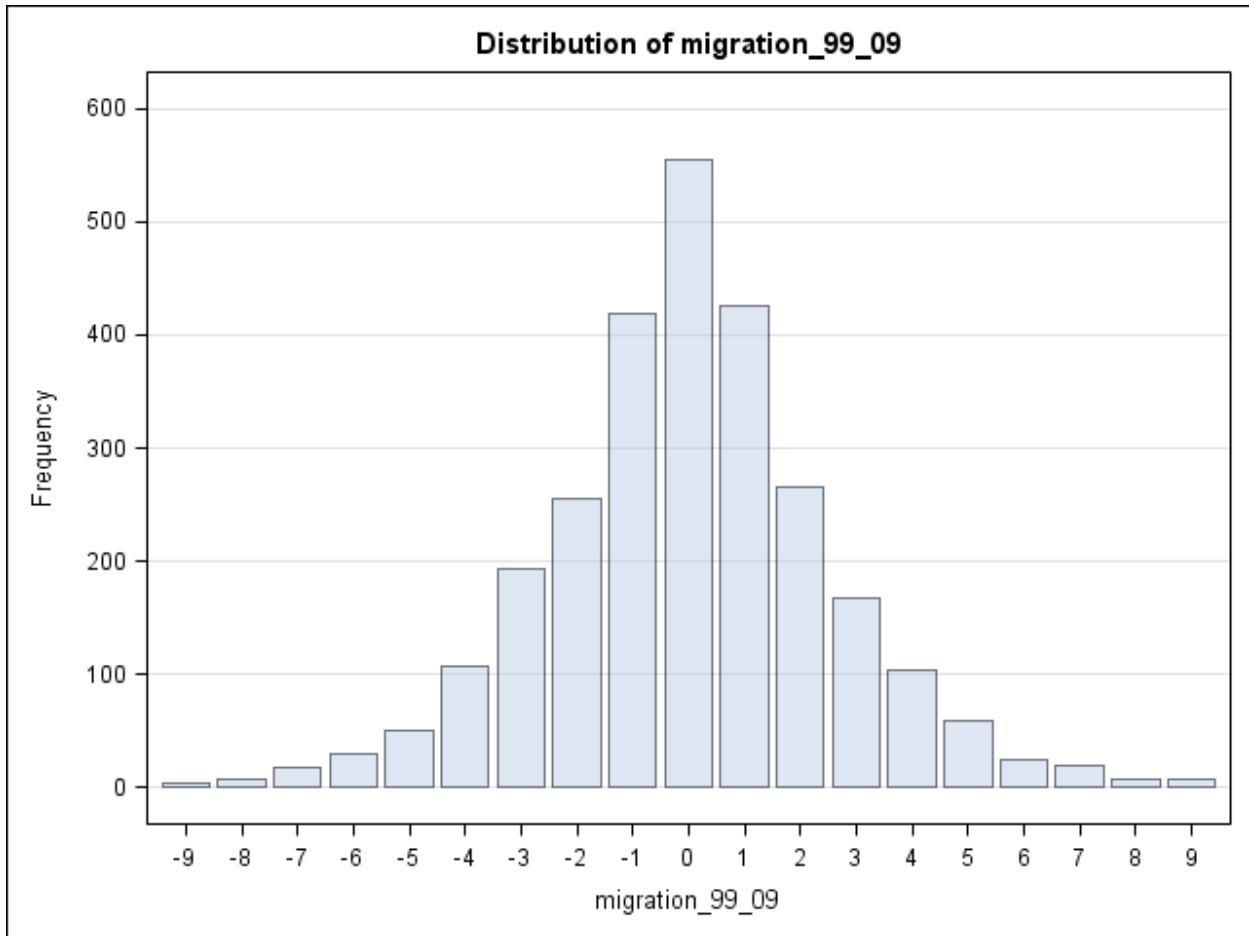


Note: This figure reports the relative change in student debt between 1999 and 2009. Each county is ranked based on total student loans outstanding as a percentage of total consumer debt outstanding in 1999 and 2009. Migration_99_09 reflects the difference in the 1999 rank and the 2009 rank. Counties with no difference in the 1999 and 2009 ranks indicate that their student debt outstanding relative to other counties did not change. A positive difference indicates that the county's student debt usage position increased relative to other counties, while a negative difference indicates that the county student debt percentage declined relative to other counties. Sources: Federal Reserve Bank of New York Consumer Credit Panel/Equifax and U.S. Census Bureau County Business Patterns database

**Figure 3: County Map of Student Debt Usage and Net Firms with 1–4 Employees**

## Student Debt Usage



**Counties**
- Decreased
- Increased
- No Change
- no data

## Net New Firms with 1-4 Employees



**Counties**
- < -25
- 0 to 25
- no data
- -25 to 0
- > 25
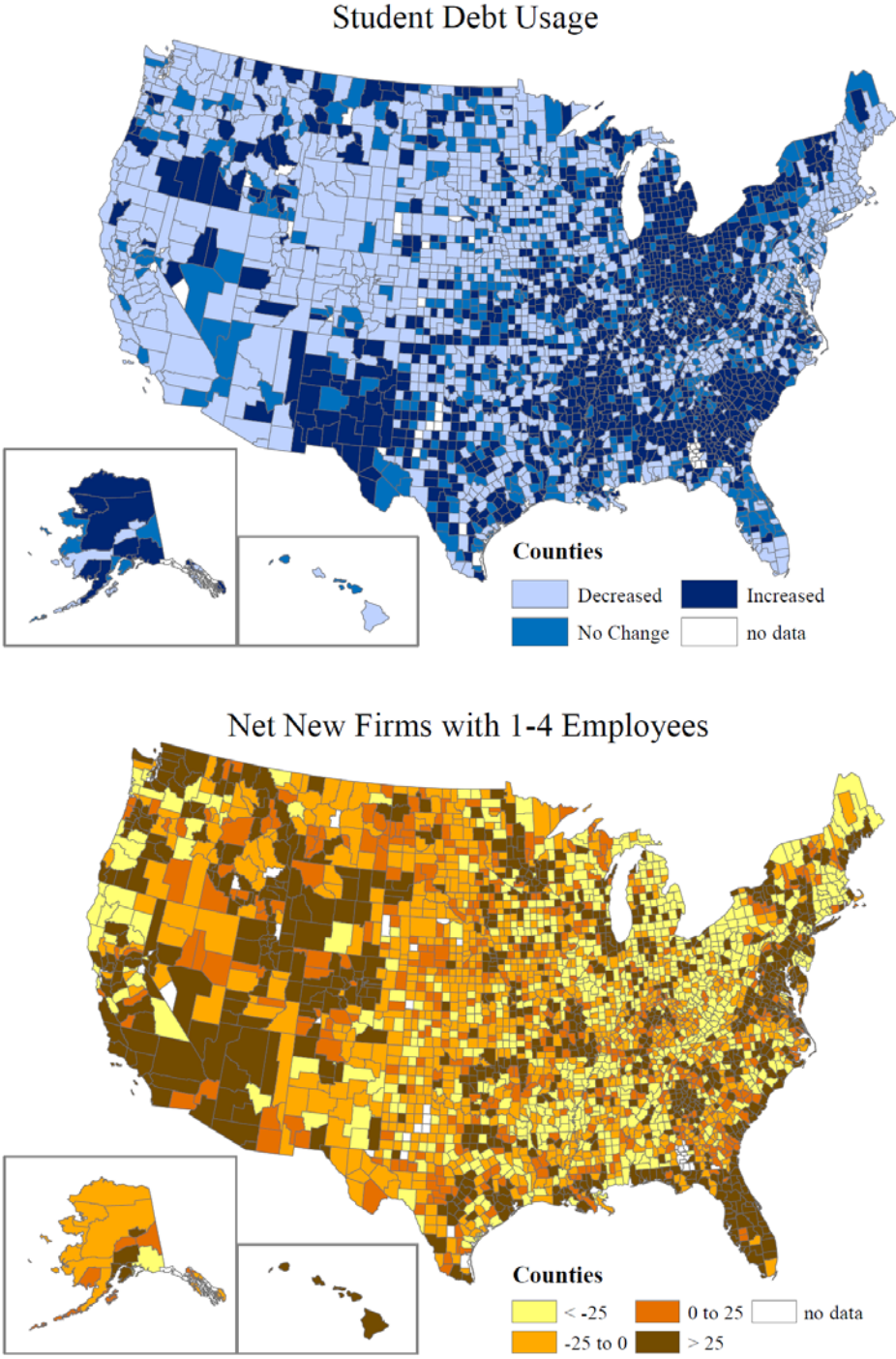
Sources: CoreLogic Home Price Index and U.S. Census Bureau County Business Patterns database

**Table 1: Summary Statistics — Segmented Based on Change in Relative Student Debt Usage**

| | | Relative Student Debt as Percentage of Total Debt | | | |
|---|---|---|---|---|---|
| | All Counties | Decreased | No Change | Increased | F-test |
| **Panel A: Net Growth in Firms by Firm Size (2000 to 2010)** | | | | | |
| 1–4 (mean) | 388 | 582 | 373 | 201 | 21.4*** |
| (std. dev.) | (1366) | (1988) | (876) | (518) | |
| (% growth over year 2000 base) | 37% | 40% | 40% | 28% | |
| 5–9 (mean) | 90 | 122 | 93 | 56 | 15.7*** |
| (std. dev.) | (276) | (131) | (116) | (79) | |
| (% growth over year 2000 base) | 22% | 23% | 26% | 18% | |
| 10–19 (mean) | 79 | 104 | 83 | 52 | 15.5*** |
| (std. dev.) | (223) | (99) | (118) | (61) | |
| (% growth over year 2000 base) | 30% | 30% | 35% | 26% | |
| 20+ (mean) | 55 | 72 | 63 | 32 | 15.8*** |
| (std. dev.) | (171) | (78) | (55) | (52) | |
| (% growth over year 2000 base) | 18% | 18% | 23% | 14% | |
| | | | | | |
| **Panel B: Debt (1999 to 2009)** | | | | | |
| Student Debt/Total Debt (1999) | 0.028 | 0.034 | 0.033 | 0.020 | 451.29*** |
| | (.025) | (.03) | (.03) | (.01) | |
| Student Debt/Total Debt (2009) | 0.075 | 0.059 | 0.081 | 0.087 | 802.55*** |
| | (.035) | (.023) | (.047) | (.033) | |
| Change in Relative Student Debt (1999 to 2009) | 0.047 | 0.025 | 0.048 | 0.067 | 2617.64*** |
| | (.033) | (.027) | (.028) | (.027) | |
| Total Debt Growth Rate (1999 to 2009) | 1.405 | 1.639 | 1.453 | 1.145 | 674.23*** |
| | (.668) | (.701) | (.689) | (.512) | |
| Total Debt Amount (millions, 1999 nominal) | $1,739 | $2,529 | $1,477 | $1,081 | 54.46*** |
| | ($6,620) | ($9,676) | ($3,574) | ($2,956) | |
| Total Debt Amount (millions, 2009 nominal) | $4,342 | $6,701 | $3,725 | $2,292 | 74.7*** |
| | ($17,097) | ($25,398) | ($9,065) | ($6,036) | |
| | | | | | |
| Number of Counties | 2,716 | 1,083 | 554 | 1,080 | |

Note: The table reports student debt as a percent of total debt for all U.S. counties, then subdivides them into three groups: those that decreased their relative share of student debt between 1999 and 2009, those in which the relative share stayed the same, and those in which the relative share increased.
*** indicates significance at the 1% level, ** significance at the 5% level, and * significance at the 10% level
Sources: Federal Reserve Bank of New York Consumer Credit Panel/Equifax, U.S. Census Bureau County Business Patterns database, and U.S. Census Bureau Decennial Census.

**Table 2: Demographic and Credit Risk Characteristics for Counties Segmented Based on Change in Relative Student Debt Usage Between 2000 and 2010**

| | | Relative Student Debt as Percentage of Total Debt | | | |
| | All Counties | Decreased | No Change | Increased | F-Statistic |
|---|---|---|---|---|---|
| **Panel A: Demographic Characteristics** | | | | | |
| Total Population Growth | 0.064 | 0.075 | 0.08 | 0.044 | 19.59*** |
| | (0.132) | (0.128) | (0.152) | (0.122) | |
| Growth in Percent Young (18 to 21) | -0.015 | -0.014 | -0.015 | -0.015 | 2.92 |
| | (0.008) | (0.007) | (0.009) | (0.009) | |
| Percentage Change in Median Age (2000 to 2010) | 0.077 | 0.077 | 0.073 | 0.08 | 3.80** |
| | (0.044) | (0.044) | (0.044) | (0.044) | |
| | | | | | |
| **Panel B: County Risk Measures (2000 to 2010)** | | | | | |
| Geometric Mean Unemployment Rate | 5.735 | 5.378 | 5.495 | 6.217 | 75.56*** |
| | (1.704) | (1.653) | (1.614) | (1.687) | |
| House Price Growth (2000 to Peak) | 0.591 | 0.687 | 0.612 | 0.485 | 94.56*** |
| | (0.355) | (0.394) | (0.366) | (0.267) | |
| House Price Growth (Peak to Trough) | -0.148 | -0.156 | -0.148 | -0.14 | 6.70*** |
| | (0.103) | (0.113) | (0.111) | (0.086) | |
| Percent Growth in Vacant Housing (2000 to 2010) | 0.021 | 0.022 | 0.02 | 0.02 | 2.90 |
| | (0.024) | (0.024) | (0.026) | (0.022) | |
| Average Credit Score (2000) | 681.202 | 688.79 | 682.408 | 672.947 | 109.29*** |
| | (25.850) | (22.551) | (24.377) | (27.227) | |
| Change in Credit Score (2000 to 2010) | 11.494 | 11.779 | 11.611 | 11.146 | 1.91 |
| | (7.666) | (7.722) | (7.971) | (7.439) | |

*** indicates significance at the 1% level, ** significance at the 5% level, and * significance at the 10% level

Sources: Federal Reserve Bank of New York Consumer Credit Panel/Equifax, U.S. Census Bureau County Business Patterns database, and U.S. Census Bureau Decennial Census.

**Table 3: Individual Debt Regressions**

| | Student Loans | | Auto Loans | | Unsecured Debt | | Mortgage Loans | | Home Equity/ HELOC | |
|---|---|---|---|---|---|---|---|---|---|---|
| Intercept | -0.00013 | | 0.003629 | | -8E-05 | | 0.006588 | | 0.001999 | |
| | (0.001557) | | (0.002699) | | (0.001882) | | (0.005696) | | (0.001264) | |
| Firm Size: 1-4 $(1_1)$ | 0.001806 | *** | 0.001237 | *** | 0.000776 | *** | 0.000845 | *** | 0.001084 | *** |
| | (9.37E-05) | | (0.000107) | | (0.000107) | | (0.000111) | | (9.41E-05) | |
| Firm Size: 5-9 $(1_2)$ | 0.000609 | *** | 0.00042 | *** | 0.000395 | *** | 0.000428 | *** | 0.000412 | *** |
| | (5.05E-05) | | (5.59E-05) | | (5.76E-05) | | (5.8E-05) | | (4.79E-05) | |
| Firm Size: 10-19 $(1_3)$ | 0.000378 | *** | 0.000344 | *** | 0.000264 | *** | 0.000299 | *** | 0.000307 | *** |
| | (5.17E-05) | | (5.7E-05) | | (5.42E-05) | | (5.73E-05) | | (4.76E-05) | |
| $\Delta Debt_i$ | 4.78E-05 | | -4.4E-05 | | 2.83E-05 | | 2.09E-05 | | 1.18E-05 | |
| | (4.41E-05) | | (5.25E-05) | | (3.09E-05) | | (2.02E-05) | | (1.28E-05) | |
| $\Delta Debt_i * 1_1$ | -1.4E-05 | *** | -4.6E-06 | ** | 1.29E-05 | *** | 2.47E-06 | *** | 1.13E-05 | *** |
| | (1.38E-06) | | (2.18E-06) | | (2.83E-06) | | (2.13E-07) | | (1.99E-06) | |
| $\Delta Debt_i * 1_2$ | -3.8E-06 | *** | -1.4E-07 | | 9.75E-07 | | 2.12E-07 | ** | 3.9E-07 | |
| | (7.23E-07) | | (1.13E-06) | | (1.62E-06) | | (1.04E-07) | | (9.83E-07) | |
| $\Delta Debt_i * 1_3$ | -1.5E-06 | ** | -1.1E-06 | | 2.05E-06 | | 4.84E-08 | | 6.28E-07 | |
| | (7.14E-07) | | (1.11E-06) | | (1.69E-06) | | (1.19E-07) | | (9.91E-07) | |
| $\Delta OtherDebt_i$ | 3.2E-06 | * | 9.48E-07 | | -3.8E-07 | | -5.7E-05 | | -2.6E-07 | |
| | (1.76E-06) | | (2.02E-06) | | (3.28E-06) | | (6.41E-05) | | (3.56E-06) | |
| $\Delta OtherDebt_i * 1_1$ | 3.38E-06 | *** | 2.97E-06 | *** | 2.31E-06 | *** | 4.02E-06 | *** | 1.86E-06 | *** |
| | (1.66E-07) | | (1.63E-07) | | (1.96E-07) | | (6.26E-07) | | (2.17E-07) | |
| $\Delta OtherDebt_i * 1_2$ | 2.90E-07 | *** | 1.61E-07 | ** | 1.17E-07 | | -6.3E-08 | | 1.29E-07 | |
| | (8.03E-08) | | (7.83E-08) | | (9.88E-08) | | (3.31E-07) | | (1.07E-07) | |
| $\Delta OtherDebt_i * 1_3$ | 9.81E-08 | | 7.15E-08 | | -5.1E-08 | | 2.61E-08 | | -2.0E-08 | |
| | (7.89E-08) | | (7.76E-08) | | (1.1E-07) | | (3.7E-07) | | (1.1E-07) | |
| Population Growth (%) | -0.06454 | | 0.005312 | | 0.001531 | | -0.11861 | | -0.00763 | |
| | (0.040638) | | (0.051218) | | (0.045509) | | (0.093751) | | (0.043026) | |
| Adjusted $R^2$ | 0.6429 | | 0.6292 | | 0.63 | | 0.6276 | | 0.6327 | |
| F-stat | 8.17 | | 7.78 | | 7.75 | | 7.71 | | 7.86 | |
| Observations | 10,864 | | 10,864 | | 10,864 | | 10,864 | | 10,864 | |

Note: This table reports the regression results for equation (4) where the dependent variable is the per capita net business formation in four different firm sizes. $\Delta Debt_i$ represents the growth in the per capita debt category denoted in the column heading in county $i$ between 1999 and 2009. $\Delta OtherDebt_i$ represents the growth in per capita debt in all categories other than the debt denoted in the column heading in county $i$ between 1999 and 2009. The dummy variables $(1_j)$ denote the business size categories (1–4 employees, 5–9 employees, 10–19 employees). We exclude the 20+ employees' category and make that our baseline. Population growth is the percentage growth rate for county $i$ between 2000 and 2010.

*** indicates significance at the 1% level, ** significance at the 5% level, and * significance at the 10% level

Sources: Federal Reserve Bank of New York Consumer Credit Panel/Equifax, U.S. Census Bureau County Business Patterns database, and U.S. Census Bureau Decennial Census.

**Table 4: Regression Results (All Debt)**

| | Parameter Estimate | Standard Error | t-Stat. | P-val |
|---|---|---|---|---|
| Intercept | 8.67E-04 | 4.28E-03 | 0.203 | 0.839 |
| Firm Size: 1-4 ($1_1$) | 1.82E-03 | 1.08E-04 | 16.873 | 0.000 |
| Firm Size: 5-9 ($1_2$) | 6.04E-04 | 5.90E-05 | 10.233 | 0.000 |
| Firm Size: 10-19 ($1_3$) | 3.90E-04 | 6.06E-05 | 6.435 | 0.000 |
| $\Delta StudentDebt_i$ | -2.38E-06 | 3.59E-05 | -0.066 | 0.947 |
| $\Delta StudentDebt_i*1_1$ | -1.47E-05 | 1.35E-06 | -10.845 | 0.000 |
| $\Delta StudentDebt_i*1_2$ | -3.94E-06 | 7.07E-07 | -5.573 | 0.000 |
| $\Delta StudentDebt_i*1_3$ | -1.65E-06 | 7.11E-07 | -2.317 | 0.021 |
| $\Delta AutoDebt_i$ | -9.01E-06 | 2.73E-05 | -0.330 | 0.742 |
| $\Delta AutoDebt_i*1_1$ | -3.24E-06 | 2.13E-06 | -1.526 | 0.127 |
| $\Delta AutoDebt_i*1_2$ | -2.51E-07 | 1.16E-06 | -0.216 | 0.829 |
| $\Delta AutoDebt_i*1_3$ | -1.63E-06 | 1.15E-06 | -1.410 | 0.159 |
| $\Delta UnsecuredDebt_i$ | 1.79E-05 | 4.00E-05 | 0.447 | 0.655 |
| $\Delta UnsecuredDebt_i*1_1$ | 1.70E-05 | 2.85E-06 | 5.947 | 0.000 |
| $\Delta UnsecuredDebt_i*1_2$ | 1.99E-06 | 1.72E-06 | 1.159 | 0.246 |
| $\Delta UnsecuredDebt_i*1_3$ | 3.23E-06 | 1.85E-06 | 1.745 | 0.081 |
| $\Delta MortgageDebt_i$ | -7.81E-07 | 1.26E-06 | -0.620 | 0.536 |
| $\Delta MortgageDebt_i*1_1$ | 1.86E-06 | 3.27E-07 | 5.682 | 0.000 |
| $\Delta MortgageDebt_i*1_2$ | 2.07E-07 | 1.66E-07 | 1.252 | 0.211 |
| $\Delta MortgageDebt_i*1_3$ | -5.42E-08 | 1.73E-07 | -0.313 | 0.754 |
| $\Delta SecondDebt_i$ | 7.61E-07 | 1.47E-05 | 0.052 | 0.959 |
| $\Delta SecondDebt_i*1_1$ | 1.08E-05 | 1.93E-06 | 5.598 | 0.000 |
| $\Delta SecondDebt_i*1_2$ | 2.83E-07 | 9.63E-07 | 0.294 | 0.769 |
| $\Delta SecondDebt_i*1_3$ | 3.17E-07 | 9.92E-07 | 0.319 | 0.749 |
| Population Growth (%) | 1.32E-02 | 1.36E-02 | 0.968 | 0.333 |
| Fixed Effects | Yes | | | |
| Adjusted $R^2$ | 0.6488 | | | |
| F-Stat | 8.33 | | | |
| Observations | 10,864 | | | |

Note: This table reports the regression results for equation (4) where the dependent variable is the per capita net business formation in four different firm sizes. $\Delta StudentDebt_i$ represents the growth in student loans per capita in county $i$ between 1999 and 2009. $\Delta AutoDebt_i$ represents the growth in auto loans per capita in county $i$ between 1999 and 2009. $\Delta UnsecuredDebt_i$ represents the growth in unsecured loans per capita in county $i$ between 1999 and 2009. $\Delta MortgageDebt_i$ represents the growth in first-lien mortgage loans per capita in county $i$ between 1999 and 2009. $\Delta SecondDebt_i$ represents the percentage of growth in second-lien mortgage debt in county $i$ between 1999 and 2009. The dummy variables ($1_j$) denote the business size categories (one to four employees, five to nine employees, 10 to 19 employees). We exclude the 20 or more employees' category and make that our baseline. Population growth is the percentage growth rate for county $i$ between 2000 and 2010.
Sources: Federal Reserve Bank of New York Consumer Credit Panel/Equifax, U.S. Census Bureau County Business Patterns database, and U.S. Census Bureau Decennial Census.

**Table 5: Predicted Net Firms at Sample Means and for a One Standard Deviation Increase in the Student Loan Debt (Based on Fixed Effects Regression Coefficients in Table 4)**

| | | | One Standard Deviation Increase in Student Debt | |
| --- | --- | --- | --- | --- |
| | Base Level | New Level | Net Change | Percentage Change |
| **Panel A: All counties** | | | | |
| Firm Size: 1 to 4 | 484 | 415 | -70 | -14.4% |
| Firm Size: 5 to 9 | 212 | 186 | -26 | -12.2% |
| Firm Size: 10 to 19 | 192 | 175 | -17 | -8.6% |
| Firm Size: 20+ | 158 | 148 | -10 | -6.2% |
| | | | | |
| **Panel B: Counties that saw a decrease in relative student debt use** | | | | |
| Firm Size: 1 to 4 | 737 | 649 | -88 | -12.0% |
| Firm Size: 5 to 9 | 305 | 272 | -33 | -10.7% |
| Firm Size: 10 to 19 | 273 | 252 | -21 | -7.6% |
| Firm Size: 20+ | 225 | 213 | -12 | -5.5% |
| | | | | |
| **Panel C: Counties that saw no change in relative student debt use** | | | | |
| Firm Size: 1 to 4 | 482 | 411 | -71 | -14.7% |
| Firm Size: 5 to 9 | 219 | 193 | -26 | -12.0% |
| Firm Size: 10 to 19 | 200 | 184 | -17 | -8.4% |
| Firm Size: 20+ | 169 | 159 | -10 | -5.9% |
| | | | | |
| **Panel D: Counties that saw an increase in relative student debt use** | | | | |
| Firm Size: 1 to 4 | 284 | 235 | -49 | -17.4% |
| Firm Size: 5 to 9 | 132 | 114 | -18 | -13.9% |
| Firm Size: 10 to 19 | 120 | 108 | -12 | -9.7% |
| Firm Size: 20+ | 97 | 90 | -7 | -7.1% |

Note: This table reports the sensitivity of new business formation to a one standard deviation shock to the aggregate student debt use while holding all other values constant (at their sample means).
Sources: Federal Reserve Bank of New York Consumer Credit Panel/Equifax, U.S. Census Bureau County Business Patterns database, and U.S. Census Bureau Decennial Census.

**Table 6: Change in Student Debt Percentage (2000 to 2010)**

| Variable | Model (1) | | | Model (2) | | |
|---|---|---|---|---|---|---|
| | Parameter Estimate | t Value | Pr > \|t\| | Parameter Estimate | t Value | Pr > \|t\| |
| Intercept | 0.159 | 16.48 | <.0001 | 0.124 | 6.33 | <.0001 |
| HPI Growth (2000 to Peak) | -0.020 | -3.35 | 0.0008 | -0.024 | -4.21 | <.0001 |
| HPI Decline (Peak to Trough) | -0.086 | -4.1 | <.0001 | -0.037 | -1.93 | 0.0533 |
| $\Delta TotalDebt_i$ | | | | 0.308 | 4.08 | <.0001 |
| $\Delta TotalPop_i$ | | | | 0.061 | 5.11 | <.0001 |
| Log(Total Population) | | | | -0.002 | -1.5 | 0.1325 |
| Pct Change in Age | | | | 0.109 | 2.91 | 0.0037 |
| Avg Unemploy Rate | | | | 0.005 | 5.41 | <.0001 |
| State Fixed Effects | Yes | | | Yes | | |
| Adjusted $R^2$ | 0.207 | | | 0.247 | | |

Note: This table reports the estimated coefficients for equation (5). The dependent variable is the county level growth in student debt between 2000 and 2010. HPI Growth is the county level Federal Housing Finance Agency (FHFA) house price index measured from 2000 to the peak of the index. HPI Decline is the change in the county level FHAF HPI house price index from the market peak to the trough or end of 2010. Control variables are defined in Table 2.

Sources: Federal Reserve Bank of New York Consumer Credit Panel/Equifax, U.S. Census Bureau County Business Patterns database, and U.S. Census Bureau Decennial Census.

**Table 7: Change in Student Debt Percentage (2000 to Peak)**

| Variable | Model (1) | | |
| --- | --- | --- | --- |
| | Parameter Estimate | t Value | Pr > \|t\| |
| Intercept | 0.156 | 7.9 | <.0001 |
| HPI Growth (2000-to-Peak) | -0.001 | -0.11 | 0.9107 |
| Log(Total Population) | -0.001 | -0.73 | 0.4645 |
| State Fixed Effects | Yes | | |
| $R^2$ | 0.246 | | |

Note: This table reports the estimated coefficients for equation (6). The dependent variable is the county-level growth in student debt between 2000 and the peak of the local housing market. HPI Growth is the county-level FHFA house price index measured from 2000 to the peak of the index. Control variables are defined in Table 2.
Sources: Federal Reserve Bank of New York Consumer Credit Panel/Equifax, U.S. Census Bureau County Business Patterns database, and U.S. Census Bureau Decennial Census.


**Table 8: Change in Student Debt Percentage (Peak to 2010)**

| Variable | Model (1) | | |
| --- | --- | --- | --- |
| | Parameter Estimate | t Value | Pr > \|t\| |
| Intercept | 0.154 | 5.98 | <.0001 |
| HPI Decline (Peak-to-Trough) | -0.077 | -3.35 | 0.0008 |
| Log(Total Population) | -0.004 | -2.19 | 0.028 |
| State Fixed Effects | Yes | | |
| $R^2$ | 0.057 | | |

Note: This table reports the estimated coefficients for equation (7). The dependent variable is the county-level growth in student debt between the years when the local housing market peaked to 2010. HPI Decline is the change in the county-level FHFA HPI house price index from the market peak to the trough or end of 2010. Control variables are defined in Table 2.
Sources: Federal Reserve Bank of New York Consumer Credit Panel/Equifax, U.S. Census Bureau County Business Patterns database, and U.S. Census Bureau Decennial Census.