Are Mortgage Regulations Affecting Entrepreneurship?*

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Abstract

I show that rules designed to prevent unaffordable mortgage lending restrict self-employed households' access to credit and reduce entrepreneurship. I use eligibility criteria for exemptions from the Ability-to-Repay rule – a key part of the U.S. policy response to the subprime mortgage crisis – to take a difference-in-differences approach. Comparing exempt and non-exempt bank lending behavior I find that the rule reduced access to mortgage credit in high self-employment census tracts. I then use geographic variation in access to banks receiving an exemption to identify broader economic effects. Growth in self-employment was lower in areas where exempt banks had a smaller market share. Locations farther from exempt branches experienced a relative reduction in new small business employment as a percentage of total employment.

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1. Introduction

Since the subprime crisis risky mortgage lending practices have become the subject of considerable public scrutiny. High rates of mortgage default prompted a regulatory response predicated on the view that lenders originated unaffordable mortgages. Furthermore, low documentation products had allowed borrowers to overstate their income, making their true repayment burden larger than reported. Policymakers have attempted to address this issue by incentivizing lenders to limit the size of mortgage repayments as a share of verified income. While the motivation behind the response is clear, the costs are still not well understood.[1]

One cause for concern is the implication for entrepreneurship given that small business owners were the traditional users of low documentation loans (Ambrose et al., 2016). The unstable and opaque nature of business income means that self-employed households often face a choice between a standard mortgage discounting their business income or a low documentation mortgage. With full documentation the self-employed household would have an inflated debt-to-income ratio relative to households with more transparent income sources. By both eliminating low documentation products and penalizing applicants with high debt-to-income ratios, mortgage regulation could therefore be particularly restrictive for self-employed households.[2] Given that small business owners frequently rely on personal credit as a source of funding, this could have important implications for self-employment and small business formation (Berger and Udell (1998); Black et al. (1996); Adelino et al. (2015); Herkenhoff et al. (2016)).

To estimate the effect of verified debt-to-income restrictions on credit and employment outcomes I take a difference-in-differences approach using variation in bank exposure to a recent U.S. policy. The Ability-to-Repay rule is a key part of the regulatory response to the subprime crisis which allows borrowers to bring legal proceedings against lenders who originate unaffordable mortgages. Lenders can limit their legal risk by originating mortgages which satisfy 'qualified mortgage' criteria set out by the Consumer Financial Protection Bureau (CFPB). For some lenders a mortgage will fail to satisfy the criteria if

[1] Policies restricting debt-to-income ratios may attenuate housing price cycles (Greenwald, 2016) and make households more resilient, reducing the severity of recessions (Mian and Sufi (2014); Mian et al. (2013)). Restricting debt-to-income ratios may also directly reduce the rate of mortgage default; however, Foote et al. (2010) show that debt-to-income ratios measured at origination are not a strong predictor of default compared with housing prices and job loss.

[2] It is the interaction of the verification requirement with the debt-to-income restriction that is important. While the verification requirement alone is likely to raise debt-to-income ratios for small business owners, this need not affect credit access in the absence of debt-to-income restrictions.

the borrower's total payment exceeds 43 per cent of verified income after accounting for other financial obligations such as alimony, child support and property-related expenses. My identification strategy relies on the fact that this requirement is applied differently based on bank size and holding company status. Though still required to verify income, banks eligible for an exemption have more flexibility to continue serving households with high debt-to-income ratios.

This flexibility is likely to be valuable given the way business income is treated under the Ability-to-Repay rule. To count business income the applicant needs to provide the lender with two years of accounts verified by third party sources. Even then the lender is only able to extrapolate income based on the lower bound of recent history so recent declines in business income reduce the household's ability to borrow while recent increases are ignored. If a business-owning household deducts certain expenditures for tax purposes or has unreported cash receipts this also reduces their verifiable income and therefore their borrowing capacity given the debt-to-income requirement.[3] There are other exemptions that allow banks to originate qualified mortgages potentially violating the debt-to-income requirement and still receive legal protections. If a loan meets requirements set out by Fannie Mae, Freddie Mac, the Federal Housing Administration or the Department of Veterans Affairs compliance with the CFPB's qualified mortgage definition does not depend on the debt-to-income ratio. While the exemptions apply to a large share of borrowers, these institutions apply their own debt-to-income restrictions and also have rules dictating when lenders can take business income into account. These alternative exemptions are therefore unlikely to circumvent the considerations for self-employed households described above.[4]

To analyze the effects of the Ability-to-Repay rule on mortgage credit access and entrepreneurship I combine loan origination data reported under the Home Mortgage Disclosure Act (HMDA) with local measures of self-employment and small business employment from the American Community Survey, the U.S. Census Bureau and the U.S. Bureau of Economic Analysis. I measure exempt lender proximity using FDIC branch location and deposit data. In the first part of the paper I show that the rule has a disproportionate ef-

[3] Chetty (2012) and Kleven and Waseem (2013) provide evidence that self-employed households manipulate income to reduce tax payments. This could lead to self-employed households' verifiable income being lower than that of salaried households. Over the longer term verified debt-to-income restrictions could lead to more accurate income reporting by self-employed households. However, if the self-employed are also affected by business history and income stability considerations such behavioral adjustments are unlikely to offset the effects I document.

[4] In August 2015 Fannie Mae relaxed its rules for counting business income, requiring only a 12 month business history to be documented.

fect on mortgage credit access for the self-employed. Following the policy areas with more self-employed households experienced weaker lending growth. An additional percentage point of self-employment is associated with a lending reduction of around 0.3 – 0.4 per cent that also persists in the second year of the policy. This suggests a large effect on the self-employed but is based on a simple before and after comparison. To directly relate the effect to the policy I show that an additional percentage point of self-employment is associated with around an 0.4 – 0.7 percentage point decline in the census tract market share of non-exempt banks by number of loans.[5] These estimates reflect the amount by which the effect of the policy on the self-employed exceeds the effect on other borrowers. While a disproportionate effect on the self-employed is not strictly necessary for there to be some effect on entrepreneurship (the overall credit reduction documented by DeFusco et al. (2017) would be enough), showing that the self-employed are particularly affected by verified debt-to-income requirements is important. This insight is helpful for understanding why the Ability-to-Repay rule has a sizable effect on self-employment and entrepreneurship, despite exemptions for conforming and non-conventional loans which apply to a large share of the market. It is likely that the results I present here also help explain why the self-employed seem to be underrepresented in the conforming and non-conventional market – where similar debt-to-income ratio requirements have been imposed by Fannie Mae, Freddie Mac and the FHA for some time. By further extending costs on loans with high debt-to-income ratios to the remainder of the market, the Ability-to-Repay rule has a disproportionate effect on mortgage credit access for the self-employed.

In the second part of the paper I discuss how verified debt-to-income restrictions affect entrepreneurship. Comparing counties with varying access to exempt bank branches suggests that the debt-to-income requirement reduces self-employment by around $2\frac{1}{2}$ per cent. Employer firms are also affected. Census tracts where the closest bank branch is not exempt experience a reduction in the new small business employment share of around 4 per cent relative to locations in the same county where the closest branch is exempt. Variation in proximity to exempt banks is important for employment outcomes even in locations where exempt banks are in principle accessible to everyone. One interpretation is that the regulation and its exemptions are not well understood by applicants, and measures

[5]When comparing exempt and non-exempt banks I focus on a subsample of loans where the exemption from the debt-to-income requirement is dependent on the lender. That is, I exclude non-conventional loans and loans which are sold by the originating bank because the application of the debt-to-income requirement is independent of the originator's eligibility for an exemption. I also focus on a restricted sample of banks which are likely to have similar business models regardless of their eligibility for exemptions.

of proximity are important because they are closely related to the probability that an uninformed applicant applies to a bank with an exemption. Another possibility is that households benefit from existing relationships with lenders, and existing relationships with exempt lenders are more common in locations close to exempt branches. In the case of refinance loans the borrower may also be likely to return to the original lender. Indeed for self-employed borrowers who do not qualify for conforming or government-insured loans the relationship with the original lender could be particularly important. Consequently significant differences in outcomes are possible even where distance to the nearest exempt branch differs by only a few kilometers.

In addition to these direct effects I show that banks marginally exceeding a lending cutoff used to determine eligibility for the exemption display a skewed lending growth distribution, suggesting that they reduced lending in order to qualify. The change in behavior indicates that the debt-to-income requirement is costly for lenders to implement. It also informs my identification strategy by making a regression discontinuity approach based on the lending cutoff less attractive.

My paper relates both to work documenting the effect of credit access on entrepreneurship and to research evaluating household leverage policies. Using the Ability-to-Repay rule as a source of variation in credit access I confirm previous findings that mortgage credit is important for self-employment and small business formation (Adelino et al. (2015), Herkenhoff et al. (2016), Jensen et al. (2014)). My approach is of interest for two reasons. Firstly, differential application of the Ability-to-Repay rule by bank allows me to identify the effect of mortgage credit access independently of changes in collateral values, helping to address some concerns raised with respect to previous work (Kerr et al., 2015). Secondly, understanding the implications of verified debt-to-income restrictions for business owners is directly relevant for conducting a comprehensive cost-benefit analysis of the Ability-to-Repay rule and other similar policies. Given evidence that income verification standards are more beneficial in the case of salaried borrowers, there may be a case for treating the self-employed differently (Ambrose et al., 2016). In the specific context of the Ability-to-Repay rule, I show that exemptions for small banks play a important role in mitigating negative effects of the regulation on the self-employed. This provides empirical support for the CFPB's recent relaxation of the criteria determining exemption eligibility.[6] Overall, my results predict that the CFPB's recent relaxation of the

[6]The revision, which was finalized in late 2015 in response to feedback received from lenders and implemented in 2016, substantially expanded the set of lenders eligible for an exemption from the debt-to-income component of the qualified mortgage definition. As my sample ends in 2015 I use the original definition which applied during 2014 and 2015.

criteria determining exemption eligibility should improve credit access for self-employed households.

Existing work looking at the impact of the Ability-to-Repay rule on the mortgage market tends to either focus on predicted effects or quantifies aspects of the policy which are not specific to the self-employed. Peirce et al. (2014) provide survey evidence that, in comparison to other recent regulatory developments, small banks viewed the Ability-to-Repay rule and other CFPB rules as particularly costly. This is consistent with my finding that banks were willing to restrict lending in order to obtain an exemption. Hoskins (2014), however, notes that the rules should not have a significant effect on credit access. This is based on the fact that conforming loans and government-insured loans are, at at least temporarily, unaffected by the Ability-to-Repay debt-to-income requirement combined with the view that lenders should be willing to continue making loans which do not receive an exemption, albeit at a premium to cover the risk of litigation. Despite these considerations, my results suggest that there are still important implications for self-employed households.

Bhutta and Ringo (2015) provide a preliminary evaluation of the policy and conclude that the lender exemptions have little effect on credit availability. In contrast I find that the lender exemptions are beneficial. This could be because they focus on other outcomes and do not explicitly consider self-employed borrowers. Also, as they note, it is difficult in available datasets to identify with certainty loans affected by the Ability-to-Repay rule, and loans whose treatment differs by lender. This is particularly hard in datasets where it is also possible to link loans to small lenders. Combined with the fact that much of the mortgage market is theoretically unaffected, it is perhaps unsurprising that existing work has found little effect around small lender eligibility cutoffs. A further consideration is that comparing banks close to the eligibility cutoff may be problematic given the evidence of selection I document in Section 4.1.

DeFusco et al. (2017) estimate the effect of the Ability-to-Repay rule on the price, quantity and quality of residential mortgage credit in the jumbo market.[7] They find that the policy led to a large reduction in originations of jumbo loans failing to satisfy qualified mortgage criteria. However, lenders charge only a modest premium for the non-qualified mortgages they do originate, suggesting that they may be rationing credit or dropping out of the market entirely. The sizable credit and employment effects I document are

[7]Jumbo mortgages are ineligible for purchase by Fannie Mae and Freddie Mac because the loan size exceeds the conforming limit. Consequently jumbo mortgages are subject to the 43 per cent debt-to-income cutoff for qualified mortgages imposed by the Ability-to-Repay rule.

consistent with the large quantity response documented by DeFusco et al. (2017). It is possible that the quantity response may be even larger in the non-conforming non-jumbo market given that these borrowers tend to have higher risk characteristics than jumbo borrowers, though unfortunately it is not possible for me to test this directly.[8]

2. Data

I analyze changes in self-employed credit access using data on mortgage lending provided under the Home Mortgage Disclosure Act (HMDA) and a local measure of self-employment from the American Community Survey (ACS). Linking these lending changes directly to the regulation also involves identifying whether a loan is made by an exempt lender, which can be imputed given the lender's assets and the number of first lien loans originated in the previous year. The HMDA dataset provides very good coverage of the U.S. residential mortgage market and also contains some applicant characteristics such as income and race. Importantly I can match an application to the census tract in which the property is located, allowing me to use self-employment variation within counties. Because I focus on loans to owner-occupiers the local self-employment share should provide a measure of the probability that the applicant is self-employed. For most of the analysis the lender sample is restricted to commercial banks and savings institutions. I use FDIC information on bank branch locations to calculate proximity measures. I construct the sample of small banks that fail to receive an exemption by grouping institutions which are part of the same bank holding company and selecting holding companies where combined HMDA originations exceed 500 first lien loans.[9] I construct a census tract measure of the share of households with self-employment income using the ACS five-year tables from 2009 to 2013, which are constructed based on information collected between 2005 and 2013.[10]

[8] See Sections 3 and 4.1 for a discussion of the difficulties associated with identifying non-qualified mortgages in the HMDA dataset. This is a significant challenge for researchers attempting to evaluate the effects of the small creditor exemption. Other datasets, such as the CoreLogic Loan-Level Market Analytics database used by DeFusco et al. (2017), allow for more precise classification of affected loans; however, these loans cannot be linked to lenders and in any case it is unclear whether the dataset contains many loans originated by lenders small enough to qualify for an exemption.

[9] Total holding company originations will be understated if the holding company contains lenders that are not HMDA reporters. This may result in the misclassification of a non-exempt lender as exempt if only one lender in the holding company appears in HMDA. However, if anything misclassification should weaken the results.

[10] Because most census tract samples are relatively small, I restrict attention to higher population tracts. Specifically, I consider census tracts where the average five-year sample is at least 200 people. This covers about 90% of the U.S. population. I also use an average of the five-year estimates given the small census tract samples and my interest in cross-sectional rather than time-series variation. This

Figure 5 shows that there is considerable local variation in census tract self-employment in Cook County IL, with self-employment shares ranging from near zero to above 20 per cent. I also collect a number of other ACS census tract statistics to include as controls. I condition on the share of poor english speakers, the share of single parent households, the home-ownership rate, the share of households aged over 65, median income, racial composition and the share with a bachelor's degree or higher. Column 1 of Table 6 contains summary statistics for the sample of census tracts considered in Section 4.

To look at how the regulation affects employment outcomes I use statistics from the U.S. Bureau of Economic Analysis on county non-farm proprietors' employment and LEHD Origin-Destination Employment Statistics (LODES) data on employment at businesses with fewer than 20 employees that are 0–1 years old. Figure 14 shows the non-farm proprietors' employment share is currently around 21.5 per cent. Figure 14 also shows the aggregate trend in the new small firm employment share, which has been declining since the 1980s and is currently just over 2 per cent. Without the restricted use microdata I am unable to directly identify new small business employment at a local level. However, given the fine-grained nature of the data it is possible to impute this measure for a sizeable share of census blocks. To ensure consistency over time I restrict the sample to census blocks where new small business employment can be identified over 2011–2015. Although this is an incomplete measure I am able to obtain some coverage of 99 per cent of census tracts with an average census block coverage of around 45 per cent. I then aggregate to the census tract level.

To construct a measure of local variation in exempt bank proximity I use FDIC data on bank deposits and branch locations. To the extent that people bank locally, places close to exempt branches should be less exposed to the regulation. I measure county exempt bank access using the exempt bank deposit share and census tract access using the exemption eligibility of the nearest bank branch. This is a binary measure equal to one if the closest branch to the tract midpoint has an exemption and zero otherwise. I remove very large census tracts from the sample given that proximity measures are imprecise for these locations. Figure 6 shows variation in this measure within Cook County, IL and the effect of restricting the sample to census tracts with an area less than two square miles. I also show results using the pre-policy mortgage application share of exempt banks as a measure of exposure to the regulation. In most of the analysis I use variation in exempt

approach results in more weight being placed on data collected in the middle of the period. In any case it is not possible to construct the measure on an annual basis at the census tract level since only five-year estimates are available.

bank presence within Core Based Statistical Areas (CBSAs) or counties.

I focus on commercial banks and savings institution locations and exclude credit union branch locations. This is partly motivated by the relatively weak relationship between credit union proximity and application probability (Figure 9), possibly reflecting special eligibility requirements such as belonging to a particular profession or working for a particular employer. Although in practice many credit unions offer options for people outside of the group they traditionally serve, it is possible that perceptions of ineligibility still affect borrowers' application behavior. Perhaps more importantly, evidence from the Survey of Consumer Finances (2010– 2013) suggests that credit unions are not an important source of the types of loans that facilitate small business formation and are affected by the Ability-to-Repay rule. Table 2 shows that while 15.8 per cent of business-owning households used a personal loan to start their business, only 0.1 per cent obtained the loan from a credit union. This is in sharp contrast to the overall market share of credit unions in HMDA: credit unions and their subsidiaries accounted for around 9 per cent of HMDA applications in 2014. Data on first mortgages in the Survey of Consumer Finances (2004–2013) also indicate that credit unions are less active in serving households with self-employment income. While 5.3 per cent of households without a self-employed member obtained their first mortgage from a credit union this share falls to 2.1 per cent for households with a member who became self-employed in the previous two years (Table 17).

3. Identification

Given that the Ability-to-Repay rule contains exemptions along multiple dimensions it is important to understand which types of mortgages are affected by the verified debt-to-income requirement. Perhaps most importantly, any borrower who was previously able to qualify for a conforming or non-conventional (government-insured) loan should not be affected. It would therefore be ideal to limit attention to conventional non-conforming loans; however, using HMDA it is not possible to identify these loans with certainty. I construct an approximate measure by excluding non-conventional loans and loans which are sold in the year they are originated. This is an approximation because banks may retain conforming loans in portfolio or sell non-conforming loans. In principle the affected share may be either overstated or understated. However, in practice overstatement is more likely given that it has become difficult to sell non-conforming loans since the financial crisis – especially those with a short repayment history (Calem et al., 2013). A further

reason for focusing only on retained loans is that loans sold in the year of origination are not eligible for exemptions regardless of whether the lender has exempt status. So while these loans may be affected by the rule, we do not expect them to be affected differently based on whether the originator has an exemption. A summary of the application of the debt-to-income requirement to different types of loans and lenders is provided in Table 1.

Table 1 – Application of ATR Debt-to-Income Requirement by Loan Type

Loan Type	Exempt Lender	Non-Exempt Lender
Non-Conventional	Does not apply	Does not apply
Conforming	Does not apply	Does not apply
Conventional Non-Conforming (Retained)	Does not apply	**Does apply**
Conventional Non-Conforming (Sold)	**Does apply**	**Does apply**

While all lenders are required to assess the borrower's ability to repay, eligibility for an exemption gives the lender flexibility to continue originating 'qualified mortgage' loans with a verified debt-to-income above 43 per cent as long as these are retained in portfolio. Although non-conventional and conforming loans are also subject to debt-to-income and other requirements, these do not vary with either the Ability-to-Repay implementation timeline or lender exemptions.

To identify the effect of verified debt-to-income ratio restrictions on credit access I compare the behavior of exempt and non-exempt banks before and after the policy was introduced. A bank is eligible for an exemption if, at the end of the previous year, its assets did not exceed $2 billion and it originated fewer than 500 first-lien mortgages during the previous year.[11] Simply comparing exempt and non-exempt bank lending behavior may be problematic because small and large banks have different business models. In particular, large banks sell a higher proportion of their loans to Fannie Mae and Freddie Mac, meaning that much of their lending is unlikely to be affected by the policy. The strong relationship between bank size and (approximate) exposure to the regulation as measured by the share of conventional retained HMDA originations is illustrated in Figure 12. For banks originating more than 2000 loans each year it is likely that the 43 per cent debt-to-income cutoff for qualified mortgage status will apply to less than 10 per cent of their total lending volume.

Given the threshold nature of the eligibility criteria, restricting attention to banks

[11] Only mortgages subject to the Truth in Lending Act count towards the 500 loan limit. For this reason I include only loans made to owner-occupiers.

close to the cutoffs may help to improve comparability. This approach has been used by other authors (Bhutta and Ringo (2015); Alexandrov (2015)); however, it may present problems for two reasons. Firstly, Figure 12 suggests that the potentially affected share of a bank's originations declines rapidly with size – meaning that banks close to the origination and asset cutoffs could be less affected by the policy than banks well below the cutoff. Secondly, I provide some evidence that more exposed banks close to the cutoff reduced lending to qualify for an exemption. If banks with a large share of affected loans reduce lending to become eligible, banks remaining just above the threshold after implementation are less likely to benefit from the exemption – for example because they make mainly conforming loans which are exempt from the debt-to-income requirement regardless of the lender or because they originate loans violating other parts of the qualified mortgage definition, such as loans with high interest rates or complex features. I provide some evidence supporting this claim in Section 4.1.

In light of these concerns I take an alternative approach and focus on a subset of small lenders who failed to receive an exemption because they are part of a holding company originating more than 500 first lien mortgages. Although these banks individually originate fewer than 500 first lien mortgages, they are not eligible for the exemption because eligibility criteria are applied at the holding company level. These banks should be similar to exempt banks but find it more difficult to obtain an exemption by adjusting lending because their eligibility is based on combined holding company originations. In defining the group of non-exempt small banks I also restrict attention to banks that are part of smaller holding companies with total assets less than $20 billion. These holding companies generally own a small number of community banks which have separate charters.[12] Making this restriction leaves 91 banks in the non-exempt category, with operations across the U.S. (Figure 7). Given my approach the credit effect I measure is most relevant for small banks; however, it is plausible that the conclusions could be applied to larger banks active in the conventional non-conforming market.

Using the small bank sample I construct the census tract market share of non-exempt banks by originations. That is:

$$\mathrm{M}_{\text{Non-Exempt},c,t} = \frac{\sum_{b \in \text{Non-Exempt}} \#\text{Retained conventional loans}_{b,c,t}}{\sum_{b \in \text{Non-Exempt} \cup \text{ Exempt}} \#\text{Retained conventional loans}_{b,c,t}}$$

[12] Even if behavior within small bank holding companies is coordinated this should push the estimated effect closer to zero because of selection around the eligibility cutoff. The advantage of selecting small holding companies is that even if the holding company acts as a single entity, behavior should still be broadly comparable to other small banks in the sample.

where $b \in$ Non-Exempt if bank b is part of a multibank holding company with total assets less than \$20 billion and which (individually) had assets less than \$2 billion at the end of 2013 and fewer than 500 first lien originations in 2013. I focus on retained conventional loans as this is the set of loans for which the debt-to-income requirement may be applied differentially for exempt and non-exempt banks. I also restrict attention to census tracts where these banks are active – that is, census tracts where non-exempt banks in the small bank sample originated loans at some point during 2006 – 2015.

I then estimate the relationship between the census tract self-employment share and the exempt bank market share relative to 2013 – the year before the policy was implemented:

$$\text{M}_{\text{Non-Exempt},c,t} = \gamma_c + \alpha_t + \beta_{1,t}\text{Self Employment}_c + \beta_{2,t}X_c + \epsilon_{c,t}$$

The implicit assumption is that in the absence of the regulation the relationship between census tract self-employment and the market share of non-exempt banks would have remained unchanged. A negative coefficient on self-employment after the policy then supports the claim that the verified debt-to-income requirement affects the self-employed more than it affects other borrowers.

In the second part of the paper I use geographic variation in access to banks receiving an exemption to identify the effects of the policy on the non-farm proprietors' employment share and new small business employment share. I measure exempt bank proximity at the county level by the exempt bank deposit share and at the census tract level using an indicator equal to one if the closest branch has an exemption. In general I take a difference-in-differences approach and compare outcomes across locations which vary in their proximity to exempt banks before and after the policy. When looking at county outcomes I use within CBSA or within state variation in proximity measures and when looking at census tract outcomes I use within county variation. I allow the coefficients to vary by year. For example, for county n in state s:

$$Y_{n,t} = \gamma_n + \alpha_{s,t} + \beta_{1,t}\text{Exempt Proximity}_n + \beta_{2,t}X_n + \epsilon_{n,t}$$

Here the general assumption is that variation in exempt bank proximity is not associated with changes in the outcome for reasons unrelated to the policy. I estimate both self-employment and new small firm employment effects taking into account the locations of all exempt and non-exempt commercial bank branches; however, when looking at county

outcomes I also condition on the historical average share of banks originating fewer than 500 mortgages and the share of banks that change status between 2012 and 2013 (and therefore may be actively avoiding the regulation). After including appropriate controls, there is little indication of a relationship between local variation in proximity measures and changes in employment outcomes before the policy was introduced.

4. Credit Effects

In this section I provide evidence that the Ability-to-Repay rule disproportionately reduced mortgage credit access for self-employed households. This complements evidence of a negative effect on the jumbo market reported by DeFusco et al. (2017), and is important for understanding the sizable employment effects I document in Section 5. Before reporting the main results I document lenders' pre-policy responses following the finalization of exemption criteria. This represents both an indirect cost of the policy and provides some insight into the value lenders place on exempt status. Lenders' willingness to change their behavior in order to obtain exemptions from some parts of the policy indicates that these aspects of the policy are likely to be costly for them. The pre-policy response also informs my choice of identification strategy as it suggests that lenders marginally above the 500 loan cutoff for exempt status are less likely to make loans affected by the rule. A regression discontinuity approach is therefore likely to understate the effect of the regulation.

4.1 Do Banks Adjust Behavior to Qualify for Exemptions?

Figure 8 shows the share of banks meeting small creditor eligibility criteria by year. The orange line shows the share of banks actually exempt when the Ability-to-Repay rule was implemented in January 2014. The blue line shows the share of banks that would have been exempt if the rule had been applied in 2013. For banks with assets less than $1.5 billion there is a clear increase in the exempt share in the implementation year, suggesting that banks close to the origination threshold could be reducing lending in order to obtain an exemption. The effect is not obvious for larger banks – possibly because it is too costly for them to try to become exempt given their size.

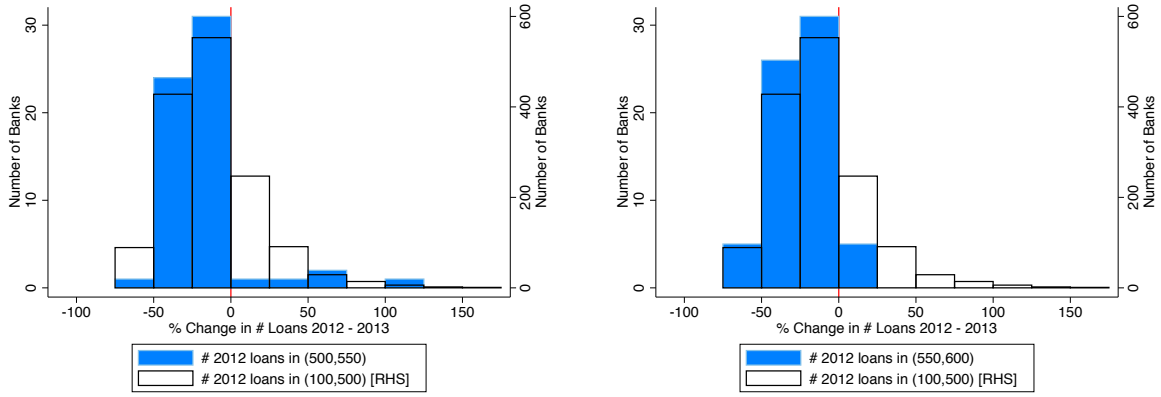
Of course, the increase in the share of banks below the cutoff could simply be the result of negative aggregate lending growth between 2012 and 2013. To rule this out I compare the distribution of lending growth for banks slightly above the cutoff in 2012 to those below. Figure 1 shows the distribution of lending growth for banks somewhat above and

below the 500 loan threshold between 2012 and 2013. Very few banks originating between 500 and 550 loans in 2012 grew their originations between 2012 and 2013. Although small bank lending growth was negative on average over the same period, there are clear differences in behavior relative to banks already below the eligibility cutoff suggesting that banks were actively trying to gain exemptions from the policy. Even looking at banks with 2012 loans between 550 and 600 there is still evidence of some behavioral adjustment. Figure 11 in the Appendix shows that lending distributions above and below the threshold were broadly similar in previous years suggesting that the two groups of banks would likely have behaved similarly in the absence of the rule.

Figure 1 – Behavior around the cutoff

Lending Growth

2012–2013



Lender eligibility status and loan growth are constructed using HMDA originations and asset information provided by reporters. Lenders that are part of a multibank holding company are excluded. Observations above the 97.5th percentile or below the 2.5th percentile of the lending growth distribution are removed.

The lending adjustment has implications for the identification strategy as lenders remaining slightly above the origination threshold at the time of implementation likely place a lower value on the exemption. This could be because only a small share of their lending volume would benefit from the exemption. We would not expect the behavior of these lenders to change relative to lenders below the cutoff following the implementation of the policy, and estimates obtained using a regression discontinuity approach will likely understate the true effect. Documenting this effect in more detail is relevant not only for this paper, but also for other papers that use a regression discontinuity approach to

evaluate the effects of the Ability-to-Repay rule (Bhutta and Ringo (2015); Alexandrov (2015)). Ideally I would test this claim by calculating the share of a bank's 2012 loans which would be affected by the rule. This is not possible for two reasons. Firstly, I observe only whether a loan is sold to the GSEs (or sold more generally). It is not possible to know whether loans held in portfolio or sold to other institutions are conforming or not. Secondly, I observe the loan-to-income ratio (loan size divided by income) not the debt-to-income ratio (payment divided by income) which appears in the qualified mortgage definition. The debt-to-income ratio associated with a given loan size can vary a lot depending on the interest rate the borrower pays. Consequently loan-to-income is a very noisy measure of debt-to-income. Without knowing which loans are conforming it is also quite hard to use loan-to-income as a measure of exposure given that the debt-to-income cutoff for conforming loans is fairly high (45-50%). That is, a bank could easily originate a large share of loans with high loan-to-income ratios – or similarly a large share of loans in lower income areas – without being exposed to the rule.

To help address this issue as much as possible, I construct a measure of how much a bank's loan-to-income distribution for retained conventional loans differs from its loan-to-income distribution for non-conventional and sold loans. Given that non-conventional loans generally have debt-to-income ratios below 55% and conforming loans below 50%, the more the loan-to-income distribution for conventional retained loans sits substantially to the right of the loan-to-income distribution for non-conventional and sold loans the more likely the lender is to be affected by the regulation. Table 7 shows that the relative position of the two loan-to-income distributions is strongly related to the probability that a bank finds itself above or below the eligibility cutoff at the time of implementation. When the 75th percentile loan-to-income for retained conventional loans exceeds the 75th percentile loan-to-income on other loans by one point, this is associated with a 20 per cent increase in a bank's probability of being eligible for an exemption. This is true for banks very close to the cutoff (Column 1), and restricting the sample to lenders who do not have an unusually large share of higher-priced loans it is also true for those slightly further away (Column 2). The reasoning behind this restriction is that banks with a very large share of higher-priced loans may be likely to violate other aspects of the qualified mortgage criteria (such as limits on points and fees, interest only and negative amortization), making the small creditor exemption from the debt-to-income requirement less valuable.[13]

[13]The expected effect of the higher priced share is not obvious as small lenders also receive some favorable treatment on higher priced loans conditional on the absence of other risky characteristics. However, the share of loans with rates in the affected range (1.5 – 3.5 per cent above the Average Prime Offer Rate) is fairly small – around 2 per cent for banks close to the 500 loan cutoff. Furthermore, these

Columns 3 and 4 show analogous results for a placebo test performed using data from the year prior to the policy announcement. In this case whether a bank ends up above or below the cutoff is related to the initial distance from the cutoff and but does not depend on the measure of regulatory exposure. This is consistent with sorting above or below the cutoff being due to natural fluctuations in lending in 2012, but being due to strategic factors in 2013. Overall, there is some evidence that more exposed banks are adjusting behavior to qualify for an exemption; however, it is unfortunately not possible to precisely identify whether the banks who adjust are more exposed given the available data.

Banks' willingness to reduce lending in order to gain an exemption represents an indirect effect of the regulation. The size of this indirect cost depends on the extent to which the lending adjustment is offset by other banks. To examine substitution I look at how county loan growth responds to the loan growth of avoiders – that is, lenders who would have been ineligible based on 2012 originations but are eligible based on 2013 originations. For county n in state s:

$$\Delta \log(\#\text{Loans})_{\text{total},n,2012-2013} = \gamma_s + \alpha \Delta \log(\#\text{Loans})_{\text{Avoider},n,2012-2013} \times \text{LoanShare}_{\text{Avoider},n,2012} + \beta X_n + \epsilon_n$$

where $\Delta \log(\#\text{Loans})_{\text{total},n,2012-2013}$ is the log change in the total number of loans made in county n between 2012 and 2013; $\Delta \log(\#\text{Loans})_{\text{Avoider},n,2012-2013}$ is the log change in the number of loans made by banks who are eligible for an exemption in 2014 because they reduced originations between 2012 and 2013; $\text{LoanShare}_{\text{Avoider},n,2012}$ is the 2012 market share of avoider banks in county n by number of loans; and X_n is a set of county socioeconomic controls. If the coefficient α is not significantly different from zero this indicates that full substitution occurs and county loan growth is not affected by the actions of avoider banks. If α is close to one this indicates that other banks in the area do not adjust their behavior and the contraction by the avoiders leads to an overall decline in originations.

Table 8 shows the effect of changes by avoiders on county loan growth. For both purchase and refinance loans, the coefficients are significantly different from zero. For purchase loans around 40 per cent of the effect is offset by other lenders – a one percentage point decrease in loans made by banks avoiding the regulations is associated with an 0.6 percentage point decrease in county loan growth, adjusting for the market share of

loans would still receive qualified mortgage status (albeit with a rebuttable presumption) even if the lender did not have an exemption.

avoiders. In the case of refinance loans around half of the loss is offset by other banks. Regulatory avoidance therefore leads to a decline in lending. Aggregate effects are likely to be small given the 2 per cent market share of avoiders by number of loans; however, avoidance may still be important for areas served by these lenders.

4.2 Mortgage Credit

The value banks place on the exemption suggests that borrowers with high debt-to-income ratios are important for their profitability. As discussed above, the self-employed are likely to be overrepresented in the affected group as business income may be discounted in the debt-to-income ratio calculation. Households borrowing to start a business may also be taking a temporary income cut, and debt-to-income restrictions limit their ability to compensate for this in other parts of the application. To get a sense for the size of the overall effect on the self-employed relative to other borrowers, I first examine the relationship between census tract lending and the share of households with self-employment income. To address the concern that self-employment may be correlated with other economic factors affecting lending I use self-employment variation within a county. I estimate:

$$\log(\text{Loans})_{c,t} = \gamma_c + \alpha_{n,t} + \beta_{1,t}\text{SelfEmployment}_c + \beta_{2,t}X_c + \epsilon_{c,t}$$

where $\log(\text{Loans})_{c,t}$ is the log number of loans originated in tract c in county n in year t and X_c is a set of census tract socioeconomic controls. Both census tract self-employment, SelfEmployment_c, and the other socioeconomic variables are sourced from the ACS 5-year tables for years immediately prior to the policy. These variables are time invariant but separate coefficients are estimated for each year.

Estimates in the second column of Table 3 indicate that after conditioning on other tract characteristics within-county variation in self-employment is not strongly associated with lending growth immediately prior to the implementation year (though there is an association prior to 2009). This broadly supports the interpretation of the 2014 and 2015 coefficients as the effect of the policy; however, it is important to remember that changes in the coefficients could reflect any events affecting the relative flow of credit to self-employed households. Following implementation a one percentage point increase in the share of households with self-employment income is associated with a 0.3 – 0.4 per cent decline in lending. Columns 1 and 2 of Table 9 indicate that, if anything, refinance loans are more negatively affected than purchase loans.

The strong overall relationship between self-employment and total lending growth suggests that whatever the benefits of the small bank exemption for the self-employed, it has probably not been sufficient to offset the effect of the regulation. The large effect may in part reflect the fact that self-employed households are overrepresented in the market which is affected by the policy. The results presented in column 2 of Table 15 indicate that there is a strong positive relationship between the census tract self-employment share and the predicted share of loans subject to the Ability-to-Repay debt-to-income requirement. A one percentage point increase in tract self-employment (within county) is associated with an increase in the share of potentially affected loans of around 0.4 percentage points. Furthermore, column 1 of of Table 15 shows that, conditional on a loan being potentially subject to the debt-to-income requirement, the loan-to-income ratio increases strongly with census tract self-employment. The reason for this relationship could be that self-employed applicants have trouble meeting eligibility criteria for conforming and non-conventional loans because of verified debt-to-income cutoffs and business history requirements – the same considerations that are expected to make the Ability-to-Repay rule problematic for them.

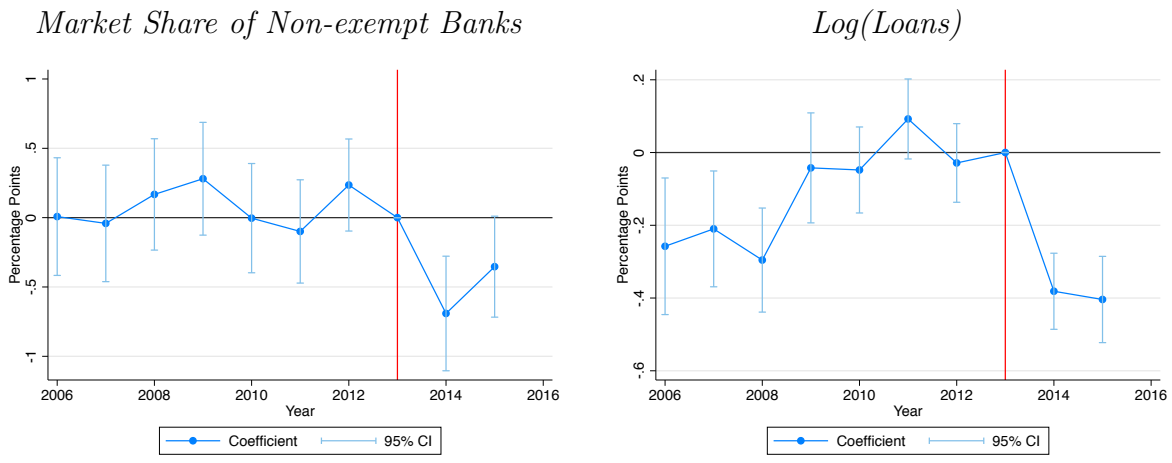
To establish a stronger causal connection to the policy I compare the behavior of exempt and non-exempt small banks before and after implementation. The non-exempt group I consider fails to qualify because it is part of a multibank holding company with originations exceeding the 500 loan threshold. Because these banks are also small the assumption that lending behavior would have been similar in the absence of the policy is more likely to hold. When comparing exempt and non-exempt lenders I exclude non-conventional loans as well as loans which are sold by the originator because the debt-to-income requirements for these loans are not lender dependent (and so we would not expect treated banks to behave differently with respect to these loans). I then calculate the tract market shares $\mathrm{M}_{\mathrm{NonExempt},c,t}$ of non-exempt banks within the small bank sample and estimate:

$$\mathrm{M}_{\text{Non-Exempt},c,t} = \gamma_c + \alpha_t + \beta_{1,t}\text{SelfEmployment}_c + \beta_{2,t}X_c + \epsilon_{c,t}$$

The estimates in the third and fourth columns of Table 3 support a direct policy effect because the non-exempt bank market share falls by more in tracts with higher self-employment. An additional percentage point of self-employment is associated with around a 0.4 – 0.7 percentage point decline in the market share of non-exempt small banks (Figure 2). To interpret this, consider a census tract where the market share of

non-exempt banks within the small bank sample is 20 per cent (which is the mean for the sample of census tracts in the fourth column of Table 3). Assume that the share of loans made to self-employed households pre-policy is in line with the population share and identical across small banks. If the self-employment share were 1 per cent, a decision by the non-exempt banks to stop originating conventional non-conforming mortgages to self-employed households would generate a decline in market share of 0.16–0.20 percentage points depending on the extent of substitution towards exempt banks. The estimated effect therefore seems to be of a plausible order of magnitude – the fact that it is somewhat larger could be because self-employed households are more likely to have a mortgage, or are overrepresented in the sample. Indeed, overrepresentation is highly likely given that conventional non-conforming lending is positively associated with census tract self-employment (Table 15). Coefficient estimates for both the total lending and market share specifications are illustrated graphically in Figure 2. The top left panel of Figure 17 shows that the policy also reduces the overall market share of non-exempt banks in the small bank sample by around 2%. Appendix B contains a discussion of estimates obtained using alternative approaches, including RDD. Overall, these results suggest that the policy disproportionately affects self-employed borrowers both because they find it more difficult to qualify for conforming or non-conventional loans treated favorably under the rules, and because they have more trouble meeting the Ability-to-Repay debt-to-income requirement when applying for a non-conforming loan.

Figure 2 – Census Tract Self-employment and Mortgage Outcomes



This figure shows estimates of the relationship between the census tract self-employment share and mortgage outcomes with 95% confidence intervals.

Given the effect of the policy on credit access in areas with high self-employment, we might also expect to see a reduction in self-employed households' debt-to-income ratios relative to other households. Using the Consumer Expenditure Survey I calculate debt-to-income ratios for households with and without self-employment income and compare the two groups before and after policy implementation. The numerator is the sum of the household's mortgage repayment, property tax, credit card, student loan and other financial charges. The denominator is total household income. Results in Table 11 show that the debt-to-income ratio of households with at least one self-employed member falls by about 1-2 percentage points relative to other households after the policy is implemented. The effect increases to 4-5 percentage points for self-employed households who do not report any wage or salary income. This is in line with the effect being driven by reliance on business income. These estimates are not conditional on a recent purchase or refinance and so may understate the effect.

5. Effects on Self-employment and Entrepreneurship

By reducing access to mortgage credit the Ability-to-Repay rule could also have implications for business formation. The size of this effect depends on how important residential mortgage credit is for starting a business relative to other funding sources. Previous work has suggested that housing equity is an important source of funding for small business owners and can facilitate entrepreneurship (Adelino et al. (2015); Herkenhoff et al. (2016)). This is also supported by a positive correlation between self-employment and the share of refinance loans with cash out observed in the CoreLogic Loan Level Market Analytics Database.[14] Table 12 shows that a one percentage point increase in the ZIP Code share of households with self-employment income is associated with an 0.2 percentage point increase in the share of refinance loans with cash out. Furthermore, this correlation exists both within and across three digit zip codes and is robust to the inclusion of housing price growth and socioeconomic control variables. The average cash out share in the sample is around 30 per cent of all refinance originations.

[14]The CoreLogic Loan Level Market Analytics dataset is based on information provided to CoreLogic by anonymous contributors and covers around 60 per cent of first mortgages originated in the U.S. The dataset contains a number of borrower and loan characteristics which are not available in HMDA, including the borrower's debt-to-income ratio, FICO score and whether equity is withdrawn at the time of refinancing. However, it is not possible to identify the contributing financial institutions.

Table 2 – Business Funding Sources in the Survey of Consumer Finances

	Startup	Continuation
Personal Loan from Bank/Savings Institution	0.081	0.036
Personal Loan from Credit Union	0.001	0.002
Personal Loan from Other	0.076	0.030
N	1,766	1,766

Statistics are calculated using information from the SCF (2010; 2013). The sample includes households who currently own a business.

The Survey of Consumer Finances also contains information about sources of business funding. Based on the 2010 and 2013 samples nearly 16% of business owners stated that they used a personal loan to start their business (Table 2). It is also possible that this figure understates the importance of mortgage credit. If mortgage credit is used to fund other household expenditures this leaves more cash available for business purposes. Furthermore, for households purchasing a property the Ability-to-Repay rule may imply a larger downpayment, reducing liquid assets left for other purposes. The Ability-to-Repay rule is likely to affect mainly new small businesses because their limited business history makes it more difficult for them both to satisfy the debt-to-income requirement and to switch to a business loan. Older businesses may be less affected because the owners are more likely to be able to include business income in the debt-to-income ratio and are less reliant on personal loans (Table 2). It is also possible to calculate debt-to-income ratios by household, incorporating the inability to count business income for businesses less than two years old. Figure 13 shows that around 6 per cent of self-employed households in the 2013 Survey of Consumer Finances have a debt-to-income ratio exceeding 43 per cent. This rises to $14\frac{1}{2}$ per cent for households with a business less than two years old.

I measure the effects of the rule on both non-farm proprietors' employment and new small business employment. The first measure includes owners of unincorporated businesses while the second focuses specifically on businesses with employees. I use a difference-in-differences approach based on cross-sectional variation in proximity to exempt banks to identify the effects of rule. I start by looking at the effect on non-farm proprietors' employment:

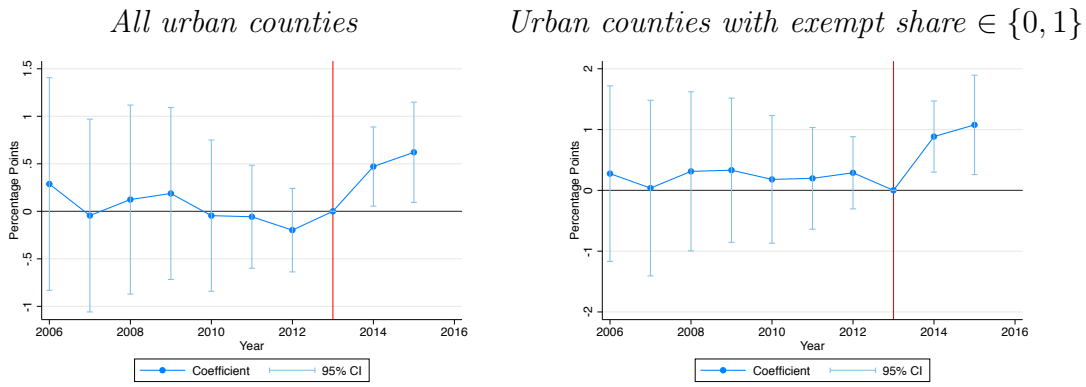
$$\text{SelfEmployed}_{n,t} = \gamma_n + \alpha_{cbsa,t} + \beta_{1,t}\text{ExemptDepositShare}_n + \beta_{2,t}X_n + \epsilon_{n,t}$$

where $\text{SelfEmployed}_{n,t}$ is the non-farm proprietors' employment share in county n in year t and $\text{ExemptDepositShare}_n$ is the average share of 2013 deposits in County n held by banks with end 2013 assets less than $2 billion and fewer than 500 holding company originations in 2013. X_n contains a number of county characteristics, including race, education, age, english language ability, single parent and home ownership shares. I condition on the deposit share of small banks to address the concern that the size of local banks may be related to other economic characteristics that affect self-employment trends. I also condition on the 2013 share of 'avoider banks' – that is banks that switched from non-exempt to exempt in the year before the policy was introduced. The results are based on within CBSA variation in exempt bank shares across counties. If the 43 per cent debt-to-income requirement affects self-employment I expect the self-employment share to evolve differently after the policy was implemented in areas with a strong exempt bank presence compared to areas with few exempt banks. This is captured by the coefficients $\beta_{1,2014}$ and $\beta_{1,2015}$.

Column 2 of Table 4 shows that following the introduction of the policy a one percentage point increase in the deposit share of exempt banks is associated with an 0.005 – 0.006 percentage point increase in non-farm proprietors' employment share. Extrapolating this estimate to a comparison of locations with only exempt or only non-exempt banks implies a total effect on non-farm proprietors' employment of around $0.5 - 0.6$ percentage points, or 2.2 – 2.7 per cent. To check the validity of this extrapolation I also directly compare outcomes for counties having only non-exempt bank branches with counties having only exempt branches. The estimates in Table 10 indicate that in this restricted sample exempt bank access is associated with around a one percentage point, or $4\frac{1}{2}$ per cent increase in the non-farm proprietors' employment share. The reported coefficients are interpreted relative to 2013, so the smaller and insignificant estimates of $\beta_{1,2011}$ and $\beta_{1,2012}$ in Table 4 indicate that the exempt bank share was not driving self-employment outcomes before the Ability-to-Repay rule was implemented. This supports my claim that the effects observed in 2014 and 2015 are a direct consequence of the policy. Figure 3 provides a graphical representation of the estimated coefficients.

There are multiple interpretations of the effect of exempt bank access on self-employment. It is possible that mortgage applicants understand that applying to an exempt bank is

Figure 3 – Effect of Exempt Deposit Share on Self-employment



This figure shows estimates of the relationship between county exempt bank deposit share and non-farm proprietors' employment share with 95% confidence intervals.

beneficial and target these banks provided there is one nearby. In this case, we might expect to see the relationship between the exempt share and self-employment being driven by counties where no banks are exempt, with outcomes for counties with a positive exempt bank share being broadly similar to each other. However, Figure 15 shows the relationship looks similar even when I restrict the sample to counties with an exempt bank deposit share exceeding 20 per cent. This seems consistent with the idea that households in counties with more exempt banks are less affected because they are likely to select an exempt bank regardless of their understanding of the rule or knowledge of the bank's status.

In addition to affecting individual self-employment choice, the Ability-to-Repay rule may also have restricted new small business employment. I test this by constructing a measure of new small business employment at the census tract level. This allows me to use within county variation in the accessibility of exempt bank branches. For each census tract I calculate the distance to the nearest exempt and non-exempt bank branches within the same CBSA. Given that most census tracts in the sample have an exempt bank branch within 10km (Figure 10), the relevance of this variation for outcomes depends on how much applicants know about the regulation and the exempt status of banks. As discussed above, the results for self-employment are consistent with applicants being relatively uninformed or with existing banking relationships being important. I interpret distance from an exempt branch as a measure of the probability that a potential business owner in the area applies at an exempt bank. Figure 9 illustrates that application behavior, at least for commercial banks and savings institutions, is indeed largely driven by whichever branch is closest. Consistent with this, my preferred choice of proximity measure is an indicator

equal to one when the closest bank is exempt and zero otherwise. However, the results are broadly robust to using other relative distance measures or pre-policy application shares. I express new small firm employment as a share of total employment in the same census tract to abstract from general employment trends. The main specification is:

$$\log\left(\frac{\text{New Small Firm Emp.}_{c,t}+1}{\text{Total Emp.}_{c,t}}\right)=\alpha_c+\gamma_{n,t}+\beta_{1,t}1(\text{ExemptClosest})_c+\beta_{2,t}X_c+\epsilon_{c,t}$$

where $\frac{\text{New Small Firm Emp.}_{c,t}}{\text{Total Emp.}_{c,t}}$ is the ratio of new small firm employment to total employment in census tract c in county n in year $t \in \{2011, 2012, 2013, 2014, 2015\}$. I add one to the numerator to avoid dropping tract years where new small firm employment was zero. I restrict the sample to census tracts with areas less than two square miles as the proximity measure becomes less precise for large tracts. This restriction effectively means that I use only areas with a relatively high population density. Figure 6 shows the effect of the tract area restriction in Cook County, IL.

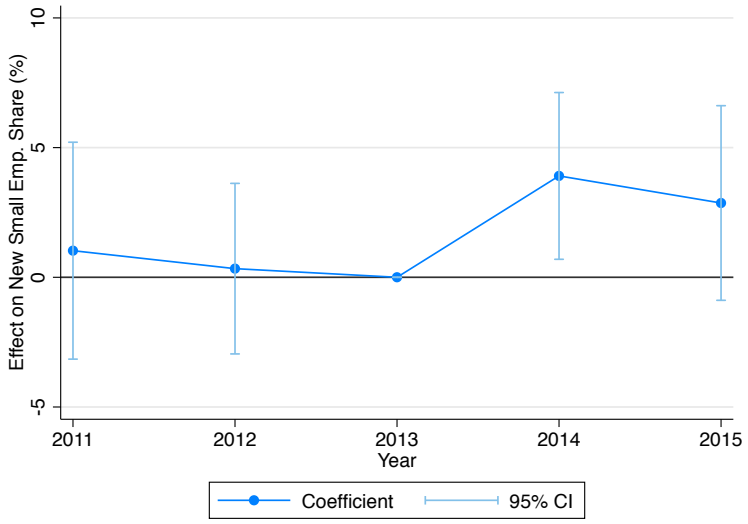
The results shown in Table 5 support a significant effect of the accessibility of exempt bank branches on new small business employment as a share of total employment. Being closer to an exempt branch is associated with a 4 per cent increase in the new small firm employment share following the policy. The coefficients prior to 2013 are insignificant suggesting that the effect of exempt branch proximity was stable prior to the implementation of the policy. Replacing the dependent variable with $\log\left(\frac{\text{New Small Firm Emp.}_{c,t}}{\text{Total Emp.}_{c,t}}\right)$ increases the estimated policy effect to 6 per cent, though the sample size is considerably smaller as tract years with zero new small firm employment are dropped and coefficients are less precisely estimated (Table 16). In line with the mortgage credit estimates, there is evidence of some attenuation in the second year the policy was in effect. This could suggest learning on the part of households; however, the learning story seems inconsistent with the fact that non-exempt banks also reclaim market share in 2015 (Figure 2). Given this, a change in bank behavior seems more likely to be driving the attenuation. One possibility is that non-exempt banks became less conservative after learning about changes to CFPB criteria which would make them eligible for an exemption in 2016. Alternatively, 2015 changes to Fannie Mae underwriting requirements with respect to business income could be responsible. Finally, interpreting the estimates in terms of an overall policy effect requires an assumption regarding the share of applicants for whom the exemption status of the closest bank matters. If all applicants apply to the closest bank, the estimates would be directly interpretable as the policy effect. However, to the extent that some

households do not behave this way the true policy effect may be larger.

As the proposed channel depends on the applicant's ability to verify a sufficiently large and stable income stream over several years, we expect young small firms to be most affected. Older firms may be more likely to have established business lending relationships with banks, reducing their exposure to the regulation. In line with this, the results in Column 2 of Table 5 suggest the policy had little effect on small businesses established more than 10 years ago.

Figure 4 – Proximity to Exempt Branch and New Small Firm Employment

Effect of being closer to an exempt than non-exempt branch



This figure shows estimates of the effect of the closest bank branch having an exemption on new small firm employment as a percentage of total employment and 95% confidence intervals.

6. Conclusion

I find that the Ability-to-Repay rule significantly restricts self-employed households' access to mortgage credit. This is likely attributable to two factors. Firstly, households reliant on business income may find it more difficult to verify a debt-to-income ratio of less than 43 per cent required for qualified mortgage status under the Ability-to-Repay rule. Secondly, applicants with business income are less likely to qualify for government-insured and conforming loans which are not directly affected by Ability-to-Repay debt-to-income rules – probably because eligibility for these loans is already based on a debt-to-income criterion. By extending debt-to-income requirements to the rest of the mortgage market the Ability-to-Repay rule imposes particularly large costs on the self-employed.

In addition to restricting credit access, verified debt-to-income requirements also lead to a reduction in self-employment and small business employment. The effects on small business employment are limited to young businesses, suggesting that the most important factors restricting credit access are likely to be the length of business history required to count income and the fact that households may need to forgo salary income when starting a new business. While it is difficult to measure the costs associated with these adjustments, in theory they would include both the pecuniary and non-pecuniary benefits associated with self-employment and a lower rate of small business formation. An important question is whether the individuals affected by the policy would have founded productive firms. Given the mechanism, we expect people with limited access to alternative funding sources to be most affected. Whether these people found poorly performing businesses is an open question. Evidence that low documentation loans tend to be less problematic when used by the self-employed is also a relevant consideration (Ambrose et al., 2016).

Variation in proximity to exempt lenders is important even where there is an exempt lender within easy driving distance, suggesting that households may be uninformed about the regulation or the exempt status of branches. Another possibility is that households affected by the rule benefit from having an existing relationship with the lender and existing relationships with exempt lenders are likely to be more common in locations close to exempt branches. Overall, the results suggest that the CFPB's recent relaxation of eligibility requirements for lender exemptions could lead to improved credit access for self-employed borrowers and higher rates of self-employment and local small business formation.

Table 3 – Credit Effects are Larger in Areas with High Self-employment

	(1)		(2)		(3)		(4)	
Explanatory Variables	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE
2006 × Self-emp.	-4.425***	(0.207)	-0.258***	(0.096)	0.170	(0.191)	0.008	(0.216)
2007 × Self-emp.	-4.061***	(0.183)	-0.210**	(0.081)	-0.002	(0.197)	-0.041	(0.214)
2008 × Self-emp.	-2.805***	(0.130)	-0.296***	(0.073)	0.102	(0.187)	0.167	(0.205)
2009 × Self-emp.	0.027	(0.138)	-0.042	(0.077)	0.118	(0.190)	0.281	(0.207)
2010 × Self-emp.	0.388***	(0.127)	-0.048	(0.060)	0.023	(0.187)	-0.004	(0.201)
2011 × Self-emp.	0.678***	(0.136)	0.092	(0.056)	-0.129	(0.170)	-0.100	(0.190)
2012 × Self-emp.	0.858***	(0.106)	-0.029	(0.055)	0.263*	(0.141)	0.235	(0.169)
2013 × Self-emp.								
2014 × Self-emp.	-1.137***	(0.114)	-0.381***	(0.053)	-0.464**	(0.183)	-0.691***	(0.211)
2015 × Self-emp.	-0.847***	(0.135)	-0.404***	(0.060)	-0.297*	(0.154)	-0.354*	(0.186)
Number of Tracts	67,806		67,806		4,008		4,008	
Number of Counties	2,776		2,776		616		616	
Number of States	51		51		39		39	
Number of Observations	539,483		539,483		15,932		15,932	
County × Year FE	X		X					
Year FE					X		X	
Tract FE	X		X		X		X	
Tract controls × Year			X				X	

Notes: The dependent variable in columns (1) and (2) is $\log(\#\text{ loans})_{c,t}$ where c is the census tract and t is the year. The dependent variable in columns (3) and (4) is the market share of non-exempt banks in census tract c at time t, $M_{\text{NonExempt},c,t}$. Self-employment is the share of households with income from self-employment, calculated by averaging ACS 5-year estimates from 2009 – 2013 for census tracts with a total sample exceeding 200. In columns (3) and (4) sample includes only retained conventional mortgages and tracts where non-exempt small banks originated at least one retained conventional mortgage over the sample period. Excludes tracts in the top and bottom 1 per cent of the self-employment distribution. Standard errors are clustered by county.

Table 4 – Self-employment is Higher in Areas with more Exempt Banks Post Policy

	(1)		(2)	
Explanatory Variables	Coef.	SE	Coef.	SE
2006 × Exempt Bank Share	0.313	(0.548)	0.288	(0.571)
2007 × Exempt Bank Share	0.026	(0.501)	-0.045	(0.518)
2008 × Exempt Bank Share	0.106	(0.486)	0.124	(0.507)
2009 × Exempt Bank Share	0.063	(0.444)	0.188	(0.462)
2010 × Exempt Bank Share	-0.226	(0.404)	-0.046	(0.406)
2011 × Exempt Bank Share	-0.080	(0.269)	-0.057	(0.277)
2012 × Exempt Bank Share	-0.237	(0.213)	-0.198	(0.224)
2014 × Exempt Bank Share	0.466**	(0.207)	0.471**	(0.212)
2015 × Exempt Bank Share	0.826***	(0.269)	0.621**	(0.269)
Number of Observations	11,010		11,010	
CBSA × Year, County FE	X		X	
County × Year controls			X	

Notes: Dependent variable is the county non-farm proprietors' employment share. Exempt bank share is the 2013 deposit share of banks eligible for an exemption in 2014. Standard errors are clustered by county. Counties not in a CBSA are excluded.

Table 5 – Effect of Proximity to Exempt Branch on log(Small Bus. Emp. + 1/Total Emp.)

	(1)		(2)	
	New Business		**Old Business**	
	Coef./SE	p-value	Coef./SE	p-value
2011 × Closer	0.0103	0.631	-0.0190	0.111
	(0.0213)		(0.0119)	
2012 × Closer	0.0033	0.842	-0.0082	0.396
	(0.0168)		(0.0096)	
2014 × Closer	0.0391**	0.017	-0.0114	0.207
	(0.0164)		(0.0090)	
2015 × Closer	0.0286	0.135	-0.0111	0.255
	(0.0191)		(0.0097)	
Number of Observations	175,600		170,385	
	Coef./SE	p-value	Coef./SE	p-value
2011 × Exempt bank application share	-0.4713	0.270	-0.0999	0.504
	(0.4264)		(0.1495)	
2012 × Exempt bank application share	-0.2904	0.308	0.0417	0.642
	(0.2846)		(0.0895)	
2014 × Exempt bank application share	0.7120***	0.000	-0.1557*	0.094
	(0.1617)		(0.0928)	
2015 × Exempt bank application share	0.4959*	0.083	-0.1021	0.396
	(0.2855)		(0.1202)	
Number of Observations	172,980		168,015	
County × Year FE	X		X	
Census Tract FE	X		X	

Notes: Dependent variable is log(Small Bus. Emp. + 1/Total Emp.) in column (1) and log(Old Bus. Emp. + 1/Total Emp.) in column (2). A new small business is defined as a business 0 – 1 years old with fewer than 20 employees. An old small business is defined as a business at least 11 years old with fewer than 20 employees. The sample includes census tracts with an area less than two square miles located in a CBSA. Standard errors are clustered by CBSA.

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A. Appendix

A. Substitution to Business Credit

As the Ability-to-Repay rule only applies to closed-end residential mortgage loans, a possible way around the policy is to instead apply for a business loan. To test this, I use small business lending data provided under the Community Reinvestment Act (CRA). The advantage of CRA data is that it is available at a local level. However, only banks with total assets exceeding $1 billion are required to report. Columns 1 and 2 of Table 13 show estimation results for the following specification:

$$\Delta \log(\text{SBLoans})_{n,b,t} = \alpha_b + \gamma_{n,t} + \beta_{1,t}\text{NonExempt}_b + \beta_{2,t}X_b + \epsilon_{n,b,t}$$

where $\text{SBLoans}_{n,b,t}$ is the value of business loans less than $1 million originated by bank b in county n in year y. Column 1 contains estimates for the full sample of CRA lenders, whereas Column 2 contains results for the small bank sample used in the HMDA analysis above. Both show no significant difference in behavior for exempt and non-exempt banks after the policy was implemented. In Columns 3 and 4 of Table 13 the dependent variable is the share of small business loans in a county made by exempt banks. There is still no significant effect.

This could be because the factors which make it difficult for the self-employed to meet Ability-to-Repay requirements, such as limited business history, also make it difficult to get a business loan. This is consistent with the results I find for small business employment, which suggest that the policy had no effect on employment at small businesses more than ten years old. I also consider an alternative specification using CRA census tract

data. Although loans cannot be linked to the lender in this case, it is possible to use the exempt branch access measure from Section 5. I use the following specification:

$$\log(SBLoans)_{c,t} = \alpha_c + \gamma_{n,t} + \beta_{1,t}\text{d(Nearest Exempt)}_c + \beta_{2,t}X_c + \epsilon_{c,t}$$

Results in Table 14 show no significant effect on the number of loans. While there is a significant effect for the total value of business loans less than $250 000, there are also significant coefficients for some years prior to the policy change, making the effect difficult to interpret.

B. Alternative Estimation Samples

To better motivate my identification strategy in Section 4 I also present results obtained using alternative approaches. Specifically, I consider an RDD approach similar to that used in previous work , a sample excluding banks very close to the cutoff, and a sample including all banks with fewer than 1000 first lien originations. In each case I consider only retained conventional loans as the small creditor exemption has little or no effect on qualified mortgage status in the case of non-conventional loans and loans sold within the year of origination. I also use $\log(\text{M}_{\text{NonExempt},c,t})$ because the average non-exempt market share differs across samples.

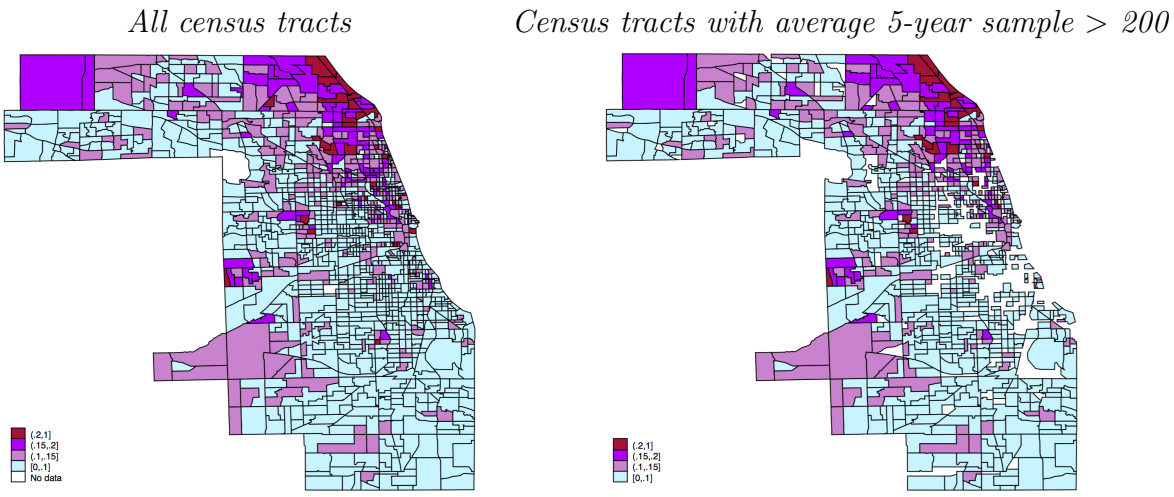
Figure 16 shows self-employment coefficient estimates from alternative samples of exempt and non-exempt banks. The bottom left panel shows the results for a sample including all banks with less than 1000 first lien originations and assets less the $2 billion. Estimates of the policy effect are insignificant. The top right panel uses only banks very close to the 500 loan cutoff. If anything this suggests a positive effect. In the bottom right panel the sample is selected to exclude loans close to cutoff, with the goal of addressing selection issues arising from regulatory avoidance. This gives a negative effect, though the estimates are still smaller than those obtained using the holding company criterion.

Figure 17 plots the trajectory of the non-exempt bank market share over time for each of the four bank samples. If the Ability-to-Repay rule affects mortgage originations overall there should be a negative effect after the policy is introduced. The top left panel shows that banks which fail to receive an exemption because of their holding company status experience a decrease in market share of around 2 per cent within the small bank

sample. Looking at all banks with 2013 originations less than 1000 yields significant but smaller estimates. Restricting attention to banks very close to the cutoff still gives a small negative effect; however, the pre-trend looks unconvincing. Focusing on banks a little further away from the cutoff gives a similar result.

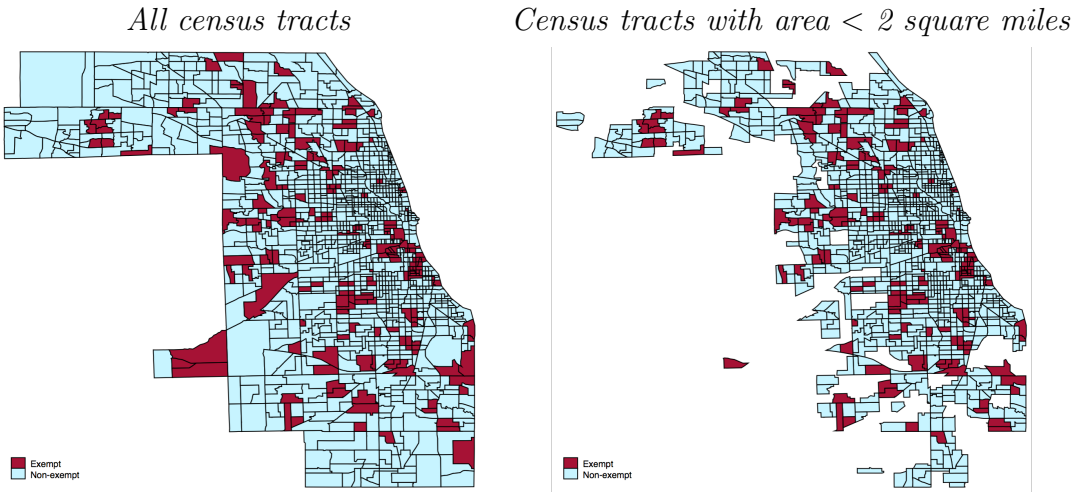
The results using alternative samples suggest that while an RDD approach yields different estimates with respect to the effect on the self-employed, looking at small banks somewhat further from the cutoff can deliver estimates at least the same sign as those obtained using the holding company criterion. However, in general estimates are smaller in magnitude using other approaches. The fact that estimated effects remain weaker even after removing lenders close to the cutoff could mean that selection due to regulatory avoidance is not the only issue. One possibility is that the regulation has a larger effect on very small banks, and this is particularly evident in the holding company sample which focuses on non-exempt banks with individual originations less than 500 loans. In contrast the non-exempt group in other samples is dominated by larger banks. Overall, the holding company approach is preferred both because of selection concerns and because it facilitates comparison of exempt and non-exempt banks of a similar size.

Figure 5 – Share of Households with Self-employment Income – Cook County, IL



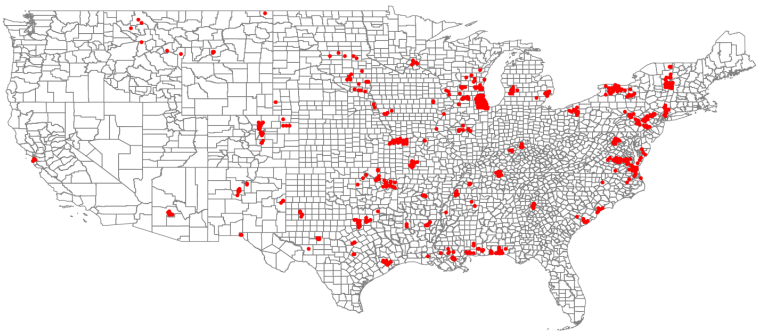
This figure shows variation in the share of households with self-employment income in Cook County, IL. The self-employment measure is constructed by averaging estimates from the 2009 – 2013 ACS 5-year tables.

Figure 6 – Exemption eligibility of closest bank branch – Cook County, IL



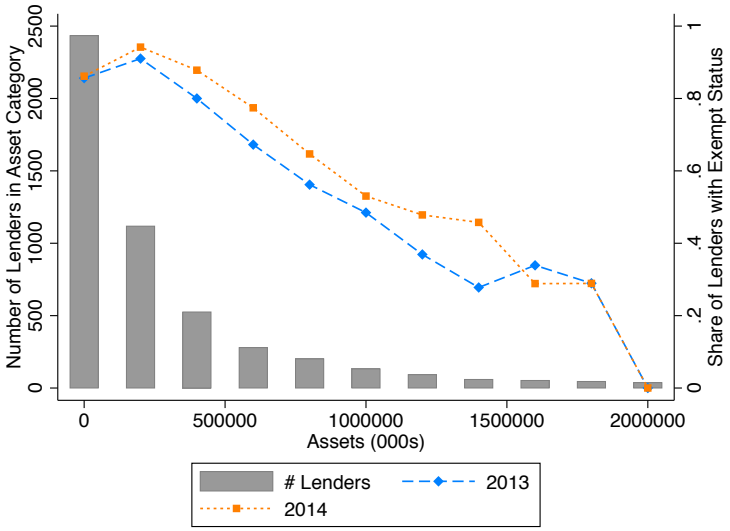
Tracts where the closest branch has an exemption are shaded blue. Tracts where the closest branch does not have an exemption are shaded gold. Distances are constructed using 2014 FDIC branch locations.

Figure 7 – Location of banks in treatment group



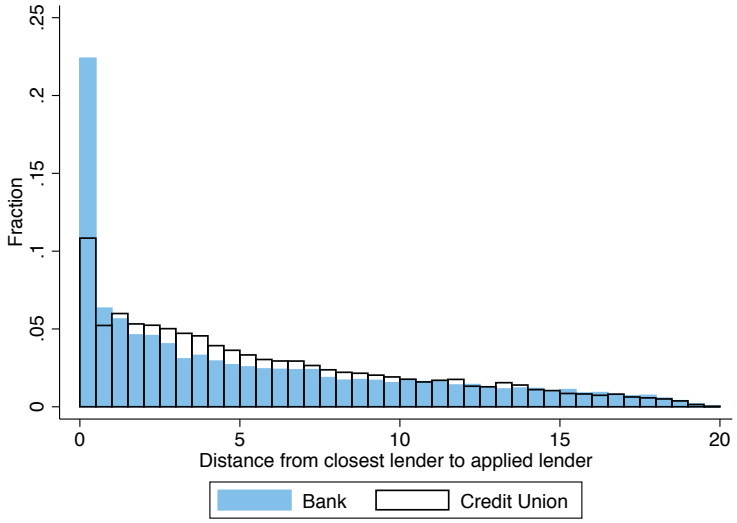
This figure shows locations of banks which would have been exempt if not for holding company originations exceeding the 500 loan limit.

Figure 8 – Small Creditor Exemption Eligibility



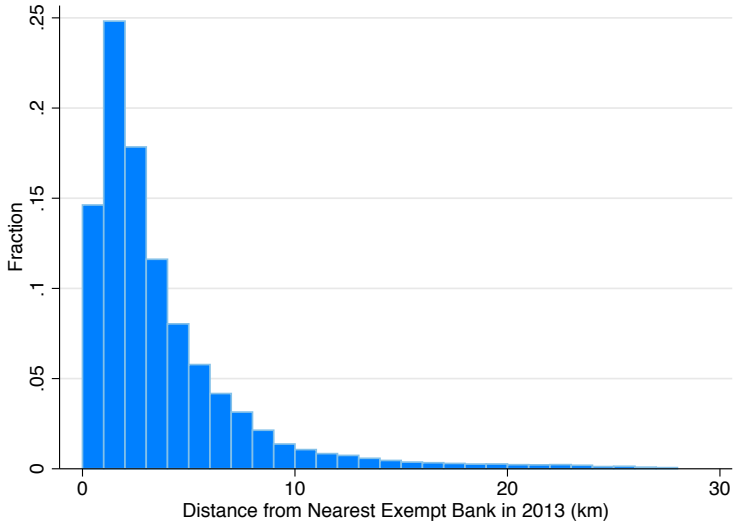
This figure shows the size distribution of HMDA reporters and the share of lenders in each size class meeting the eligibility criteria for a small creditor exemption in 2013 and 2014. Lenders that are part of a multibank holding company are excluded.

Figure 9 – Applicant Behavior by Lender Type - Lenders with ≤ 5 Branches



This figure shows the distribution of the distance between the branch closest to the census tract where the property is located and the nearest branch of the lender applied to in HMDA.

Figure 10 – Distribution of Distance from Closest Exempt Bank Branch

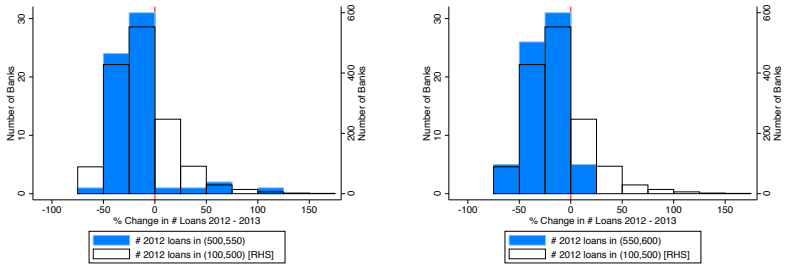


This figure shows the distribution of distance from census tract midpoints to the nearest exempt bank branch using 2014 branch locations.

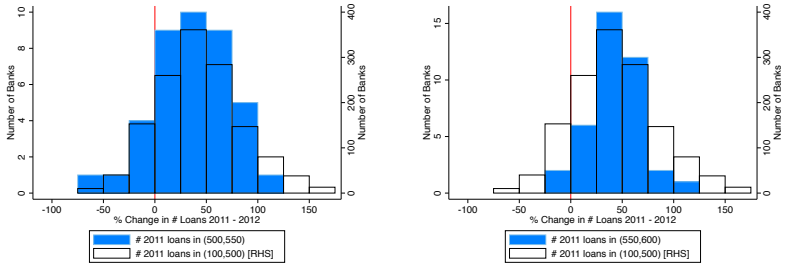
Figure 11 – Behavior around the cutoff

Lending Growth

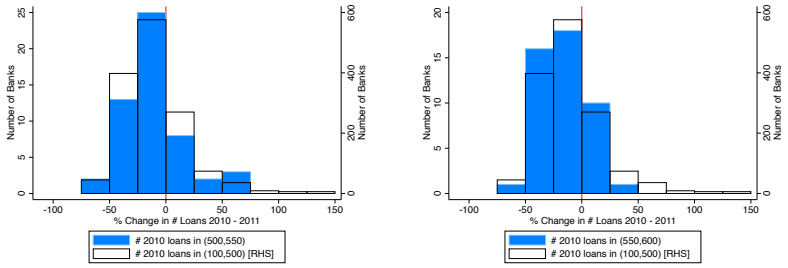
2012–2013



2011–2012

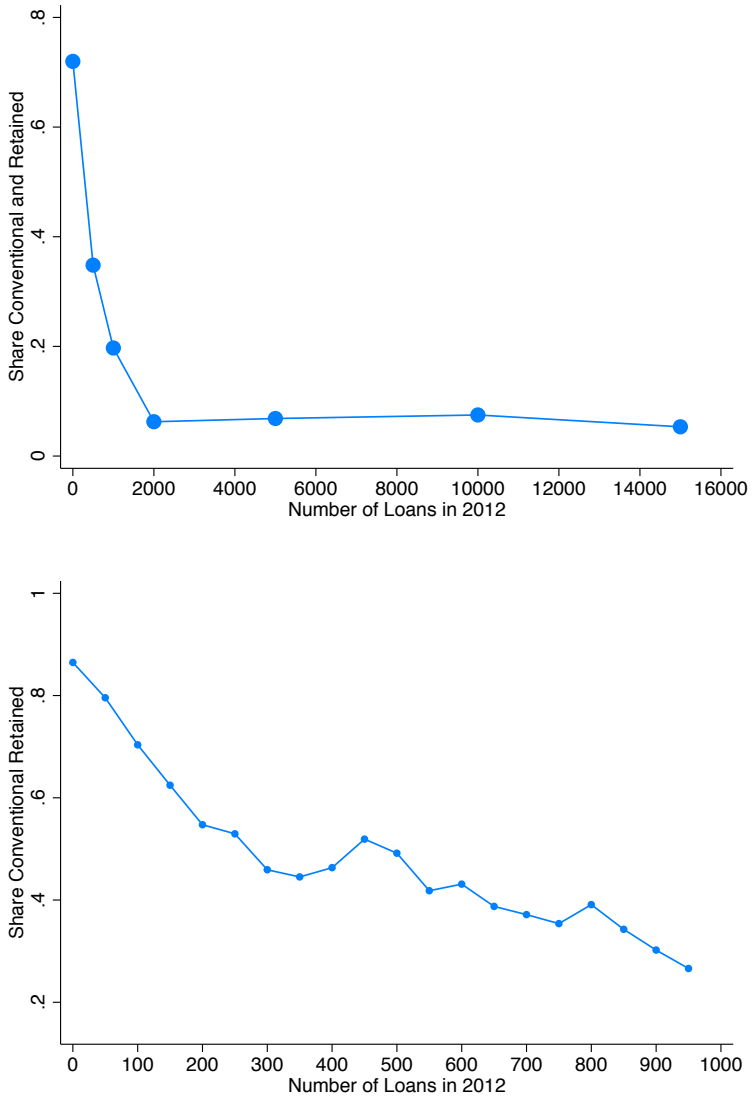


2010–2011



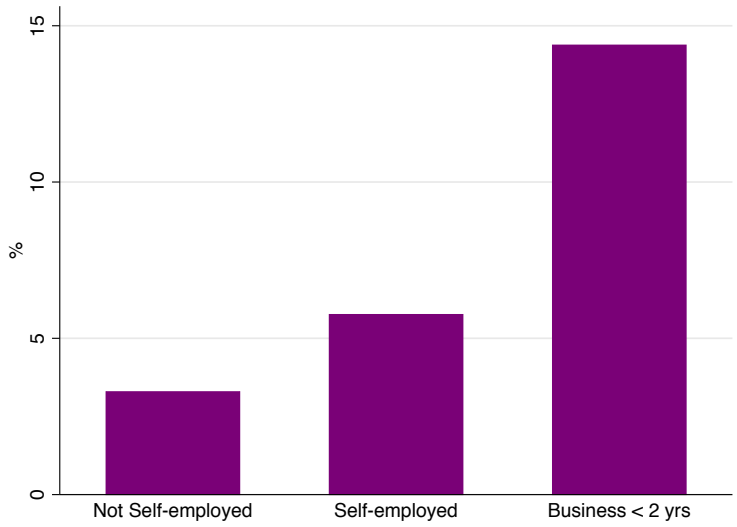
Lender eligibility status and loan growth are constructed using HMDA originations and asset information provided by reporters. Lenders that are part of a multibank holding company are excluded. Observations above the 97.5th percentile or below the 2.5th percentile of the lending growth distribution are removed.

Figure 12 – Affected Loan Share Measures by Bank Size



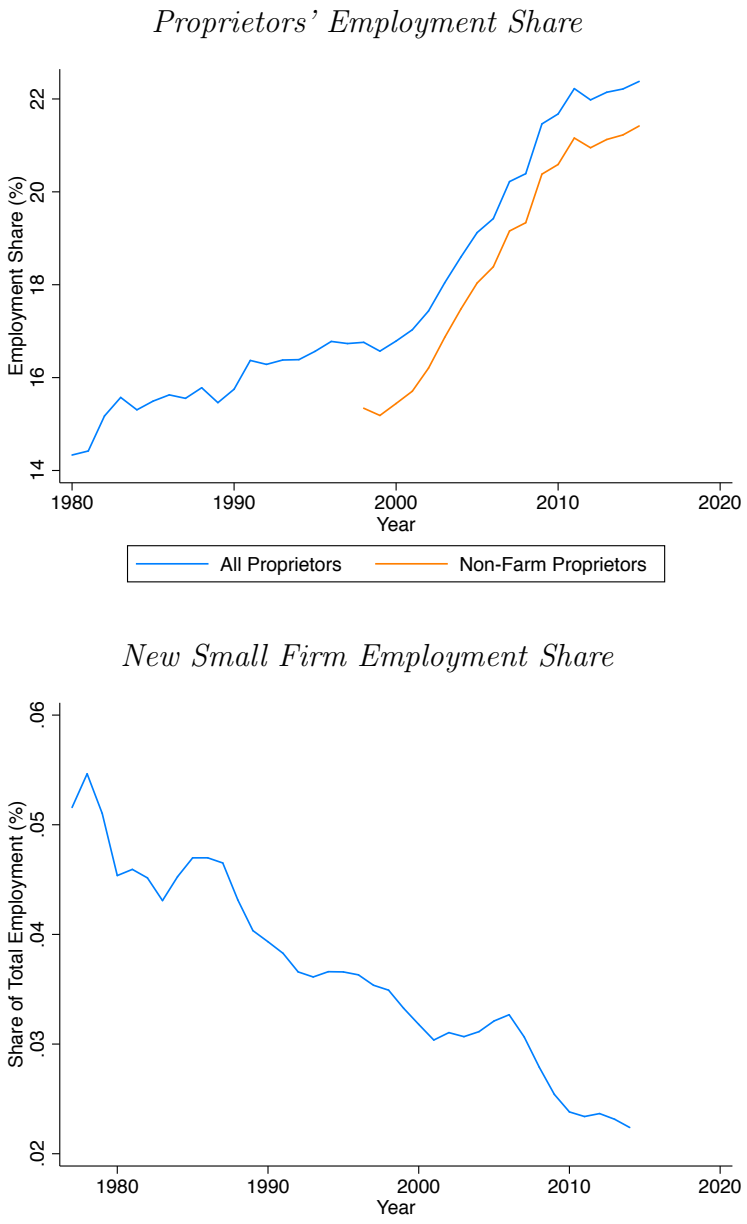
This figure is constructed by grouping lenders according to the number of first lien mortgages they originated in 2012 and, within each group, calculating the share of HMDA mortgage originations that are both conventional and not sold in the calendar year of origination.

Figure 13 – Percentage of Households with DTI > 43%



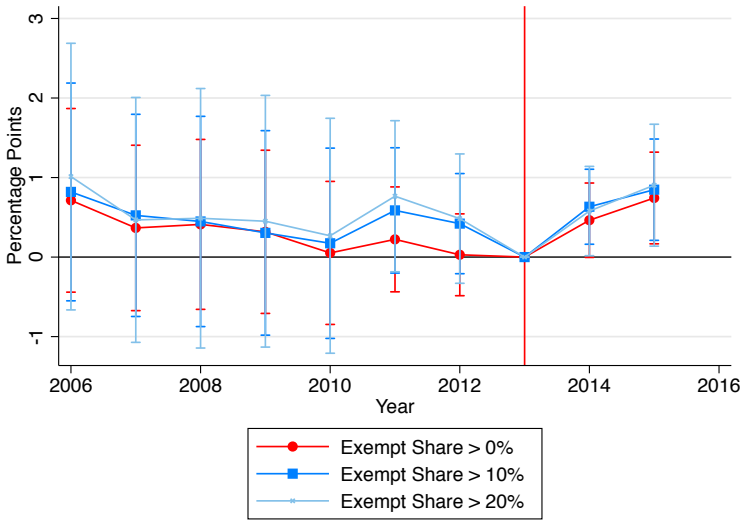
This figure shows the share of households in the 2013 Survey of Consumer Finances with a debt-to-income ratio exceeding 43 per cent. A household is classified as self-employed if the main respondent or their spouse is self-employed. Business income is not counted towards the debt-to-income ratio if the household's business was established in the past two years. Otherwise, business income is fully incorporated.

Figure 14 – Proprietors' and New Small Firm Employment Share



The top panel shows BEA proprietors' and non-farm proprietors' employment shares. The bottom panel shows new small firm employment as a share of total employment calculated using the Business Dynamic Statistics database. A new small firm is 0-1 years old and has fewer than 20 employees.

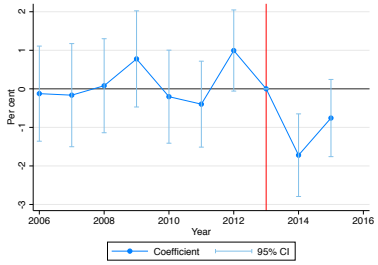
Figure 15 – Non-Zero Exempt Deposit Share



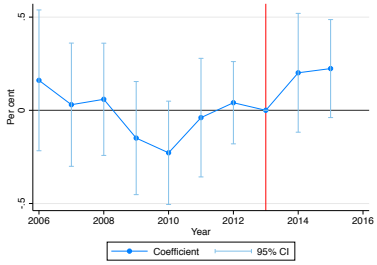
This figure shows estimates of the relationship between county exempt bank deposit share and non-farm proprietors' employment share using subsamples of counties where the exempt bank deposit share exceeds 0, 10 and 20 per cent.

Figure 16 – Non-exempt Bank Market Share and Self-employment

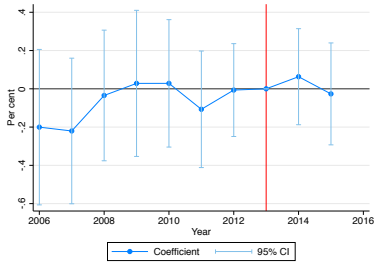
Holding Company Criterion



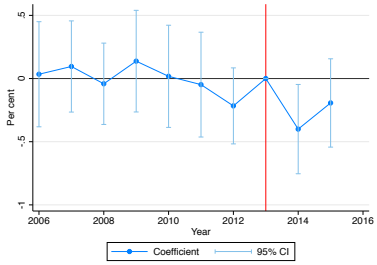
2013 Loans $\in [450, 550]$



2013 Loans $\in [0, 1000]$



2013 Loans $\in [300, 425] \cup [575, 700]$

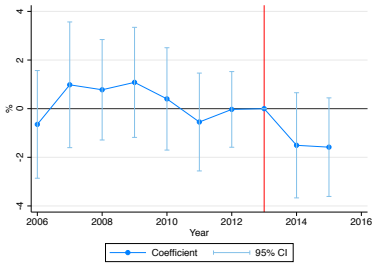


This figure plots estimates of $\beta_{1,t}$ using different bank samples to calculate $\mathrm{M}_{\mathrm{NonExempt},c,t}$, the market share by retained conventional mortgage originations of non-exempt banks in census tract c at time t.

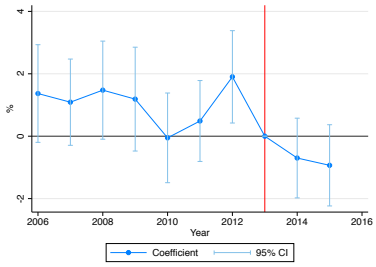
$$\log(\mathrm{M}_{\mathrm{NonExempt},c,t}) = \gamma_c + \alpha_t + \beta_{1,t}\mathrm{SelfEmployment}_c + \beta_{2,t}X_c + \epsilon_{c,t}$$

Figure 17 – County Market Share of Non-Exempt Banks Relative to 2013

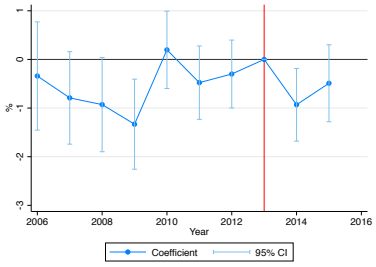
Holding Company Criterion



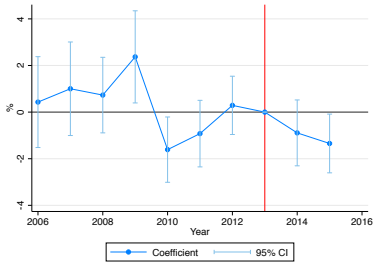
2013 Loans $\in [450, 550]$



2013 Loans $\in [0, 1000]$



2013 Loans $\in [300, 425] \cup [575, 700]$



This figure plots estimates of α_t using different bank samples to calculate $\mathrm{M}_{\mathrm{NonExempt},n,t}$, the market share by retained conventional mortgage originations of non-exempt banks in county n at time t.

$$\log(\mathrm{M}_{\mathrm{NonExempt},n,t}) = \gamma_n + \alpha_t + \beta_{2,t} X_n + \epsilon_{n,t}$$

Table 6 – Descriptive Statistics

	Tracts		Counties	
	mean	sd	mean	sd
Self-employment (%)	11.8	(5.7)	12.0	(3.8)
Poor english (%)	7.9	(11.1)	4.0	(5.2)
Single parent family (%)	17.1	(9.0)	23.6	(6.6)
Home ownership (%)	68.1	(21.0)	71.6	(8.2)
Median income (000s)	28.5	(11.3)	24.6	(5.2)
College degree (%)	25.1	(16.7)	19.6	(8.4)
Householder 65 plus (%)	21.6	(9.5)	23.3	(4.7)
Black (%)	10.8	(18.4)	9.8	(13.8)
Hispanic (%)	14.4	(20.5)	8.9	(13.3)
Population (000s)	5.1	(2.6)	165.3	(414.3)
Small bank deposits (%)			32.3	(25.0)
Exempt bank deposits (%)			32.5	(29.8)
Avoider bank deposits (%)			2.8	(9.7)
Non-farm proprietors employment (%)			22.1	(6.2)

Notes: Columns 1 and 2 contain summary statistics for the sample of census tracts used in Section 4. Columns 3 and 4 contain statistics for all counties in metropolitan or micropolitan areas. The variables available at the census tract level are constructed by averaging ACS 5-year estimates from 2009–2013. Exempt and small banks are identified using HMDA. The exempt bank share is calculated as the 2013 deposit share of lenders with assets at end 2013 less then $2 billion with fewer than 500 first lien (holding company) originations during 2013. The small bank share is calculated as the average deposit share of lenders with fewer than 500 annual first lien originations from 2006–2013. The avoider bank share is calculated as the 2013 deposit share of lenders who would have failed to receive an exemption based on 2012 assets and originations, but did receive an exemption based on 2013 assets and originations. Local deposit statistics come from the FDIC. Non-farm proprietors' employment statistics are obtained from the BEA.

Table 7 – Selection Around the Origination Cutoff

	P(below 500 loans in 2013)		P(below 500 loans in 2012)	
	(1)	(2)	(3)	(4)
Explanatory Variables				
p(75) LTI Diff.	0.201**	0.093	0.089	0.066
	(0.081)	(0.079)	(0.109)	(0.101)
(# Loans (t-1) - 500)/100	-0.004	-0.068***	-0.020	-0.078**
	(0.023)	(0.023)	(0.042)	(0.037)
High price share of conv. retained	0.138	-0.067	0.153	0.411*
	(0.337)	(0.242)	(0.253)	(0.247)
Number of Obs.	125	129	125	117
High price share of conventional retained loans < 10%				
p(75) LTI Diff.	0.223**	0.267***	0.082	0.090
	(0.086)	(0.086)	(0.130)	(0.135)
(# Loans (t-1) - 500)/100	0.001	-0.073***	-0.010	-0.074*
	(0.026)	(0.026)	(0.047)	(0.040)
High price share of conv. retained	0.949	-1.155	-1.037	-2.205
	(1.687)	(1.658)	(1.963)	(2.277)
Number of Obs.	91	88	89	80

Notes: The dependent variable in Column (1) is an indicator equal to one if # $\text{Loans}_{2013} \in (500, 550]$ and zero if # $\text{Loans}_{2013} \in (450, 500]$. The dependent variable in Column (2) is an indicator equal to one if # $\text{Loans}_{2013} \in (525, 575]$ and zero if # $\text{Loans}_{2013} \in (425, 475]$. The dependent variable in Column (3) is an indicator equal to one if # $\text{Loans}_{2012} \in (500, 550]$ and zero if # $\text{Loans}_{2012} \in (450, 500]$. The dependent variable in Column (4) is an indicator equal to one if # $\text{Loans}_{2012} \in (525, 575]$ and zero if # $\text{Loans}_{2012} \in (425, 475]$. Explanatory variables are measured at 2012 for Columns (1) and (2) and 2011 for Columns (3) and (4).

Table 8 – Do other Lenders Substitute for Avoiders?

	Purchase	Refinance
	Coef./SE	Coef./SE
$\Delta \log(Loans)_{Avoider,2013} \times LoanShare_{Avoider,2012}$	0.5710***	0.4659**
	(0.1862)	(0.1739)
N	857	884

Notes: State fixed effects. Standard errors clustered by state. Dependent variable is loan growth in county n between 2012 and 2013. $LoanShare_{Avoider,2012}$ is the share of all HMDA loans made in a county by banks which were non-exempt based on 2012 characteristics but exempt based on 2013 characteristics. Sample includes counties where more than one loan was made by an avoider bank in both 2012 and 2013.

Table 9 – Relative Refi/Purchase Effect

	(1)		(2)		(3)		(4)	
Explanatory Variables	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE
2006 × Self-emp.	-0.040***	(0.014)	-0.013***	(0.003)	-0.004	(0.010)	-0.004	(0.011)
2007 × Self-emp.	-0.035**	(0.014)	-0.009***	(0.002)	-0.014	(0.011)	-0.015	(0.012)
2008 × Self-emp.	-0.002	(0.005)	0.009***	(0.003)	0.007	(0.008)	0.012	(0.010)
2009 × Self-emp.	0.100***	(0.009)	0.043***	(0.004)	-0.004	(0.008)	0.003	(0.009)
2010 × Self-emp.	0.072***	(0.008)	0.016***	(0.003)	0.008	(0.008)	0.012	(0.009)
2011 × Self-emp.	0.050***	(0.007)	0.009***	(0.003)	0.001	(0.008)	0.004	(0.009)
2012 × Self-emp.	0.050***	(0.009)	0.012***	(0.004)	0.001	(0.006)	0.003	(0.009)
2013 × Self-emp.								
2014 × Self-emp.	-0.022***	(0.005)	-0.014***	(0.003)	-0.011	(0.008)	-0.003	(0.009)
2015 × Self-emp.	-0.009**	(0.005)	-0.013***	(0.003)	-0.006	(0.007)	-0.003	(0.009)
Number of Tracts	67,693		67,693		2,165		2,165	
Number of Counties	2,775		2,775		397		397	
Number of States	51		51		33		33	
Number of Observations	536,539		536,539		7,889		7,889	
County × Year FE	X		X					
Year FE					X		X	
Tract FE	X		X		X		X	
Tract controls × Year			X				X	

Notes: The dependent variable in columns (1) and (2) is the ratio of refinance to purchase loan counts in census tract c in year t. The dependent variable in columns (3) and (4) is the ratio of refinance to purchase market share of non-exempt banks in census tract c at time t. Census tract self-employment is measured as the average of ACS 5-year estimates from 2009 – 2013 for census tracts with a total sample exceeding 200.

Table 10 – Comparison of Counties where Exempt Bank Share $\in \{0, 1\}$

	(1)		(2)	
Explanatory Variables	Coef.	SE	Coef.	SE
2006 × Exempt Bank Share	0.275	(0.737)	0.366	(0.784)
2007 × Exempt Bank Share	0.037	(0.737)	0.088	(0.778)
2008 × Exempt Bank Share	0.312	(0.668)	0.349	(0.718)
2009 × Exempt Bank Share	0.331	(0.605)	0.328	(0.655)
2010 × Exempt Bank Share	0.181	(0.535)	0.219	(0.557)
2011 × Exempt Bank Share	0.197	(0.427)	0.208	(0.418)
2012 × Exempt Bank Share	0.289	(0.303)	0.254	(0.295)
2014 × Exempt Bank Share	0.885***	(0.299)	0.940***	(0.306)
2015 × Exempt Bank Share	1.077**	(0.417)	1.096***	(0.412)
Number of Observations	2,790		2,790	
State × Year, County FE	X		X	
County × Year controls			X	

Notes: Sample is restricted to urban counties where the exempt bank share is either zero or one. Dependent variable is the county non-farm proprietors' employment share. Standard errors are clustered by county. Counties not in a CBSA are excluded.

Table 11 – Self-employed Households Have Lower Debt-to-Income Ratios

	(1)		(2)	
Explanatory Variables	Coef.	SE	Coef.	SE
Excludes DTI = 0				
2006 × Self-employed	-2.635***	(0.992)	-3.695*	(2.144)
2007 × Self-employed	-0.883	(1.030)	-3.484*	(2.047)
2008 × Self-employed	-1.696*	(1.002)	-3.277	(2.031)
2009 × Self-employed	0.001	(1.085)	-1.324	(2.088)
2010 × Self-employed	-0.842	(1.089)	-2.521	(2.165)
2011 × Self-employed	1.230	(1.243)	1.760	(2.585)
2012 × Self-employed	0.676	(1.020)	-0.445	(2.202)
2014 × Self-employed	-2.016**	(0.976)	-4.876**	(1.895)
2015 × Self-employed	-1.294	(1.068)	-3.672*	(2.065)
Number of Observations	128,776		118,050	
Includes DTI = 0				
2006 × Self-employed	-1.386*	(0.837)	-2.914*	(1.698)
2007 × Self-employed	-0.286	(0.872)	-2.790*	(1.623)
2008 × Self-employed	-0.873	(0.837)	-2.171	(1.635)
2009 × Self-employed	0.226	(0.896)	-1.961	(1.665)
2010 × Self-employed	-0.564	(0.903)	-2.459	(1.743)
2011 × Self-employed	-0.415	(1.006)	-0.953	(1.995)
2012 × Self-employed	-0.058	(0.826)	-1.394	(1.681)
2014 × Self-employed	-1.441*	(0.795)	-3.727**	(1.477)
2015 × Self-employed	-1.299	(0.855)	-3.498**	(1.579)
Number of Observations	230,824		216,084	
State × Year, Self-employed FE	X		X	
Controls × Year	X		X	

Notes: Column 1 contains results for the full sample of households. Column 2 compares self-employed households with no wage or salary income to households without a self-employed member. Coefficients are interpretable as the difference relative to 2013. The sample includes only households with a positive debt-to-income ratio. Excludes the top 1% of the debt-to-income distribution. Standard errors are clustered by consumer unit. Controls include race, age quartile, education and occupation of reference person.

Table 12 – Share of Refinance Loans with Cash Out

	(1)		(2)		(3)	
Explanatory Variables	Coef.	SE	Coef.	SE	Coef.	SE
Self-Employment Share	0.187***	(0.022)	0.175***	(0.022)	0.230***	(0.032)
Housing Price Growth			0.001***	(0.000)	0.002***	(0.000)
Number of Observations	98,214		98,214		98,214	
ZIP3 FE	X		X			
ZIP5 Controls			X		X	

Notes: Sample includes conventional mortgage loans to owner-occupiers originated by CoreLogic reporters between 2008 and 2015. Standard errors clustered by ZIP3. Self-employment is measured at ZIP5.

Table 13 – Business Credit Substitution

	(1)		(2)		(3)		(4)	
Explanatory Variables	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE
2011					0.160	(0.291)	-0.023	(0.062)
2012					-0.279	(0.284)	-0.008	(0.061)
2014					-0.317	(0.272)	0.002	(0.060)
2015					-0.459	(0.283)	-0.079	(0.064)
2011 × Non-Exempt	4.375	(5.364)	2.609	(12.595)				
2012 × Non-Exempt	-7.950*	(4.796)	-10.460	(11.148)				
2014 × Non-Exempt	-0.301	(3.609)	7.470	(13.421)				
2015 × Non-Exempt	6.811	(4.495)	12.088	(12.021)				
Number of Counties	2,524		1,207		731		3,033	
Number of Observations	54,390		12,784		2,095		15,500	
County × Year, Bank FE	X		X					
Controls × Year	X		X		X		X	

Notes: In Columns (1) and (2) the dependent variable is CRA small business credit growth at the bank × county level. In Columns (3) and (4) the dependent variable is the share of small business loans in a county made by exempt banks and the unit of observation is bank-type $\in \{exempt, nonexempt\}\times$ county. Columns (1) and (3) are for the full sample of lenders. Columns (2) and (4) show results for the restricted sample of small lenders where the non-exempt banks fail to receive exempt status because of holding company originations only. Standard errors clustered by lender.

Table 14 – Business Credit Substitution

	(1)		(2)	
	Log($ Loans)		**Log(# Loans)**	
	Coef./SE	p-value	Coef./SE	p-value
2006 × Closer	0.0252	0.209	0.0105	0.330
	(0.0200)		(0.0107)	
2007 × Closer	0.0164	0.332	-0.0038	0.666
	(0.0168)		(0.0088)	
2008 × Closer	0.0379*	0.076	0.0032	0.733
	(0.0213)		(0.0092)	
2009 × Closer	0.0404*	0.071	0.0073	0.559
	(0.0223)		(0.0124)	
2010 × Closer	0.0289	0.268	-0.0058	0.628
	(0.0261)		(0.0120)	
2011 × Closer	0.0293*	0.088	0.0030	0.770
	(0.0171)		(0.0104)	
2012 × Closer	0.0407***	0.006	0.0096	0.276
	(0.0147)		(0.0088)	
2014 × Closer	0.0108	0.473	-0.0024	0.740
	(0.0151)		(0.0071)	
2015 × Closer	0.0278*	0.076	0.0038	0.555
	(0.0156)		(0.0064)	
Number of Observations	102,274		102,303	
County × Year FE	X		X	
Census Tract FE	X		X	

Standard errors clustered by CBSA. Tract lending aggregates are the sum of business loans less than $250 000 made by CRA reporters. Distance from the nearest exempt bank is constructed using the midpoint of each census tract and FDIC branch location data. Sample is restricted to census tracts smaller than two square miles located in a CBSA. Standard errors are clustered by CBSA.

Table 15 – Self-employment is Positively Correlated with Measures of the Affected Market

	(1)		(2)	
Explanatory Variables	Coef.	SE	Coef.	SE
Self-employment	1.211***	(0.127)	0.384***	(0.017)
Householder 65 plus	0.073	(0.075)	0.225***	(0.014)
Black	0.105***	(0.020)	-0.027***	(0.002)
Hispanic	0.113***	(0.021)	-0.006**	(0.002)
Poor English	0.721***	(0.117)	-0.020	(0.013)
Single Parent	-0.250*	(0.130)	0.032**	(0.014)
Home ownership (%)	-0.098**	(0.044)	-0.086***	(0.008)
Tract Median Income	0.000	(0.000)	0.000***	(0.000)
Bachelor or Higher	0.374***	(0.087)	-0.050***	(0.009)
Number of Observations	1,190,536		6,669,214	
County FE	X		X	

Notes: The dependent variable in Column (1) is the loan-to-income ratio on conventional loans retained in portfolio. The mean of the dependent variable in Column (1) is 2. The dependent variable in Column (2) is an indicator equal to 1 if the loan is conventional and retained in portfolio. The mean of the dependent variable in Column (2) is 0.18 (18 per cent). The sample is mortgages to occupiers in 2012 in census tracts where the ACS 5-year sample is at least 200. Self-employment is the share of households in the property census tract with self-employment income. Standard errors are clustered by county.

Table 16 – Effect of Proximity to Exempt Branch on log(Small Bus. Emp. /Total Emp.)

	(1)		(2)	
	New Business		**Old Business**	
	Coef./SE	p-value	Coef./SE	p-value
2011 × Closer	0.0169	0.629	-0.0177*	0.090
	(0.0349)		(0.0104)	
2012 × Closer	0.0084	0.747	0.0008	0.924
	(0.0262)		(0.0086)	
2014 × Closer	0.0626**	0.021	-0.0121	0.190
	(0.0271)		(0.0092)	
2015 × Closer	0.0470	0.182	-0.0106	0.333
	(0.0352)		(0.0109)	
Number of Observations	82,040		147,764	
	Coef./SE	p-value	Coef./SE	p-value
2011 × Exempt bank application share	-0.4928	0.326	-0.1807	0.116
	(0.5015)		(0.1148)	
2012 × Exempt bank application share	-1.0335***	0.004	-0.1166	0.266
	(0.3597)		(0.1047)	
2014 × Exempt bank application share	1.1284***	0.000	-0.1923**	0.043
	(0.2402)		(0.0946)	
2015 × Exempt bank application share	0.4151	0.322	-0.2014*	0.071
	(0.4189)		(0.1114)	
Number of Observations	81,405		145,893	
County × Year FE	X		X	
Census Tract FE	X		X	

Notes: Standard errors are clustered by CBSA. A new small business is defined as a business 0 – 1 years old with fewer than 20 employees. An old small business is defined as a business at least 11 years old with fewer than 20 employees. The sample includes census tracts with an area less than two square miles.

Table 17 – First Mortgage Sources in the Survey of Consumer Finances

	Not Self-employed	Old Self-employed	New Self-employed
Mortgage from Credit Union	0.053	0.043	0.021
Mortgage from Bank/Savings Institution	0.486	0.516	0.494
N	4,863	2,708	462

Source: Survey of Consumer Finances 2004; 2007; 2010; 2013.