Do House Prices Impact Business Starts?

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Abstract

At the national level, business starts and housing prices both fell dramatically over the 2007-2009 period. Using a proprietary database of business starts this paper quantitatively models the interaction between house price and business starts from 2005 to 2009. We identify the impact by exploiting the cross-sectional variation in house price changes during the period. Controlling for observable and unobservable city characteristics, we find the significance of a causal link between house prices and business starts depends on the size of the business starts; causal link exists between house prices and very small business, whereas, no significant causal link is seen for large business starts.

JEL classification: R1, R51, G01, G32

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1. Introduction

Business starts declined dramatically over the 2007-9 period. Such a drop is not atypical in recessions—Tuna (2009) notes that starts declined by about 9% in the recession of 2001—but the sheer scale of the decline in 2007-09 is unprecedented. The proprietary Dunn and Bradstreet Metropolitan Statistical Area (MSA) business starts data suggest that over the two years in question, business starts declined by over 60% (Figure 1). The coincident decline of the housing market over the same period suggests a link between housing prices and business starts. It is certainly the case that the housing market decline makes it difficult for investors to utilize housing equity to finance investment, especially business starts. If the use of housing equity as collateral plays an important role in obtaining credit to start a business, there may indeed be a causal link between the two.

Also, substantial anecdotal evidence for this phenomenon exists. In an online commentary, Shane (2010) points out that "falling real estate prices impinge on the ability of small employers to borrow the money they need to fund their operations because small businesses use real estate to obtain credit in a variety of ways." Dennis (2010) notes that 95% of small business owners own real estate (either residential or commercial or investment properties) which can serve as collateral, and 20% hold mortgages that finance non-real estate business capital. The fall in real estate prices, and particularly the steep drop in residential prices can therefore have binding effects on business capital formation.

The link between housing prices, collateral and business starts has been confirmed. Much of this literature follows from Bernanke and Gertler's theoretical model (1989) showing that collateralizable net worth influences a firm's borrowing capacity and any resulting fluctuations in a firm's net worth can amplify macroeconomic shocks. Analyzing United Kingdom data, Black, de Mez and Jeffreys (1996) find that an increase in housing equity yields an increase in business starts. Robson (1996) casts doubt on this finding, but demonstrates an empirical link between increasing house prices and declining business failures. As the value of collateralizable property declines, Goodhart and Hoffman (2008) find that firms have difficulty in borrowing to finance business investments. In Japan, Gan (2007(a), 2007(b)) finds that

the land market collapse provided a shock to collateral value, and had a significant statistical and economic impact on corporate investment via the collateral channel. In the US, Hurst and Lusardi (2004) find little relationship between housing wealth changes and business starts using micro data from the Panel Study of Income Dynamics.[3]

Like several of the empirical papers discussed above, we exploit the rather dramatic regional variation in housing price changes to identify its impact on business starts. The current housing market crash provides a unique laboratory setting for this study. However, one of the key challenges in analyzing the impact of house price on business starts via the collateral channel is to acknowledge that both supply and demand for credit can both be affected at the same time[4]. We account for this by employing a proxy for MSA level credit conditions and collateral related denials of credit. Using fixed effects, Tobit and Poisson regressions of starts on various macroeconomic and credit market variables, the results of our study show that house price does indeed impact business starts. Though the effect is small, in particular, very small business starts, those that have between zero and twenty employees, show statistically significant response to changes in house price. We find approximately five percent of the unweighted average number of starts are lost due to a change in log housing prices.

2. Data

The MSA-level business starts data are proprietary data from Dunn and Bradstreet (D&B). The sample is composed of counts of business starts from 2005 to 2009 from of 376 MSAs. A business is considered a "start" from the point in time it is registered by the appropriate state agency and receives a

[3] Aoki *et al.* (2002), Lustig and Nieuwerberg (2004), and Ortalo and Rady (2004) provide links between house price appreciation and increased consumption through the collateral channel. These studies argue that house price increases can fuel consumption by reducing borrowing constraints. However, it is unclear if the same condition can also fuel business formation.

[4] Triest *et al.* (2010) shows that that lending standards tightened moderately at community banks since late 2008. New customers were more likely to be affected by credit tightening than those that had an existing relationship with the respondent bank. The survey paper also indicates that expanding SBA guarantee programs have mitigated the credit constraint on small businesses.

business tax identification number[5]. The D&B counts are further categorized based on the number of employees. Business starts comprised of zero to twenty employees are considered very small business starts. Businesses that have a number of employees between twenty and two hundred employees are considered medium businesses, while business starts that have over two hundred to five hundred employees are considered large businesses. The large majority of these starts are in the "very small" category. Figure 2 displays the smoothed density of the log of the number of very small starts over all years and locations, and it can be seen that this variable is bell-shaped and well approximated by the normal density. The remaining categories are more problematic in that there are substantial numbers of zeroes. Figures 3, 4, and 5 are histograms displaying this phenomenon. In Figure 3 the distribution of small business starts can range up to 800, but the histogram shows a large spike at 0—12% of the city-year observations have zero small business starts. In Figures 4 and 5 it can be seen that the problem is exacerbated. 81% of the observations had zero medium business starts and 89% had zero large starts. We discuss our response to this feature of the data in the estimation section which follows.

Our house price variable is the all-transactions house price index (HPI), available from the Federal Housing Finance Administration, for each metropolitan area. Given that we basically have every US metropolitan area in our data set, the all-transactions data is the only one that will serve our purpose—the sales-only index will not provide suitable indexes for all times and locations. This data is available on a quarterly basis; since we are constructing an annual panel, we use the quarter three index (Q3) for each of the years 2005 to 2009. Since the data here is an index, with all city values set to 100 in the first quarter of 1995, cross-sectional comparisons are difficult, so for that reason alone (not to mention the issue of unobserved heterogeneity) the use of fixed city effects will be prominent.

[5] This definition of a business start is slightly different from that of the Census Bureau. Doms (2011), for example , uses entry into the Longitudinal Business Database as the definition of a start, which requires the establishment to have at least one employee (Bureau of the Census, Center for Economic Studies, undated). Dun and Bradstreet aggregate counts are therefore higher than in Doms (2011). Also note that the publicly available (aggregated) version of the LBD (Business Dynamics Statistics) aggregates to the state level, which is does not correspond to the notion of housing markets which we investigate here.

Since we wish to estimate the causal impact of house prices on business starts, we must control for other possible channels through which the correlation between these two variables might take place. One obvious channel is obviously through local business cycles. Whether or not housing market changes were the source of the downturn, both business starts and housing prices will contemporaneously react to local economic conditions. We therefore gather data on local unemployment rate from the Bureau of Labor Statistics (BLS). To be consistent with the FHFA data that we extract, we use Q3 unemployment rates.[6] We also MSA level gross domestic product in millions of US dollars, obtained from the Regional Economic Accounts of the Bureau of Economic Analysis. We also add population data from 2005 to 2009, obtained from the U.S. Census Bureau, to the model.[7] This is used to put both business starts (where applicable) and metropolitan GDP in per capita terms.

Importantly, we need to control for other sources of variation in credit market conditions across time and across MSAs. We use year fixed effects to model macroeconomic conditions. However the latter is particularly difficult. We use the FFIEC's Home Mortgage Disclosure Act (HMDA) Data[8]. HMDA requires lending institutions to make annual disclosures of their home mortgage and home improvement lending activity, and summaries of this data by MSA and year are available[9]. For each year/MSA observation we find the total number of loans for conventional home purchase applied for and denied. Second, we identify the number of conventional home purchase loan denials that have resulted due to insufficient collateral. The ratio of loans denied for lack of collateral to total loans is constructed. We then subtract this ratio from the ratio of total number of denials to total loans to get a ratio of "non-

[6]The unemployment rate data is obtained from http://www.bls.gov/data/#unemployment

[7] Population data is obtained from http://www.census.gov/popest/metro/CBSA-est2009-annual.html

[8] HMDA data is obtained from http://www.ffiec.gov/hmdaadwebreport/

[9] To date, only *Triest et al. (2010)* has confidential survey data of First District Community Banks.

collateral denials". [10] We include both these ratios in the model; the first (Collateral Denials) is presumably correlated with housing prices, so not much explanatory power is expected from it. The second, more importantly, is our measure of changing credit conditions that are unrelated to housing collateral. This is an imperfect measure, because it is not a direct measure of the credit-worthiness of commercial borrowers in a particular year and MSA, nor can we identify whether changes in this measure reflect movements from the supply or the demand side of local credit markets.

Table 1 presents the MSA means, by years for the above variables. Several things are of note. The first is (as suggested by Figure 1) the tremendous decline of starts in 2009. This is accompanied by the decline in the house price index and the increase in unemployment. Note the basically opposite trends in the earlier part of the sample frame. There is a huge variation between the mean number of very small businesses with that of medium and large businesses. The sample is skewed towards very small and small businesses.

3. Estimation and Results

In Table 2, we present results for models for total business starts. As noted, total (log) business starts is well-approximated by a normal distribution, and so ordinary least squares is, at least on that account, an appropriate estimation procedure. In column 1, we simply present the bivariate regression results. As can be seen, log starts are highly correlated with the log of the house price index—the t-ratio is 14.9. However there are of course several reasons to doubt any causal interpretation of this coefficient, some of which were alluded to above.

In column 2, we therefore add two economic condition variables: the logarithm of metropolitan GDP and unemployment rate. The coefficient of the house price index drops slightly but is still highly significant; house prices still have a role to play in explaining starts, even after taking into account

[10] Refer to Table 8-2 and 10 of the Aggregate Report at the MSA Level
http://www.ffiec.gov/hmdaadwebreport/AggTableList.aspx

business cycle effects of population changes is rather reduced. The roles of GDP and the unemployment rate are entirely expected. Higher unemployment rates and lower (per capita) GDP cause the rate of business starts to fall.[11]

We next take the important step of adding both metropolitan and year fixed effects into the model. Year fixed effects will account for macroeconomic conditions that exist across the various metropolitan areas in the sample, while metropolitan fixed effects will control for city-specific (albeit time-invariant) factors, including the indexation of the FHFA housing price index. Column 3 displays this result. The log house price index is now insignificant, indicating no statistical link between house prices and business starts. Why the non-result? Figure 6 displays a peculiar anomaly in the data. This figure shows, for the year 2008, the scatter plot of the change in business starts per capita against the change in housing prices. Since fixed effect regressions use only within-city variation to identify the parameters, looking at changes is appropriate. Using 2008 data only is for visual clarity, the results would be similar for the downturn years 2007 and 2009. The point is that there are a number of outlier observations from California, particularly the Central Valley area. These metropolitan areas (prominently, Merced, Stockton, Bakersfield and Modesto, but others as well) were characterized by an anomalous combination of huge drops in housing prices, but also changes in business start rates that were among the highest (which is to say, least negative) in the US. These areas (again, particularly those in the Central Valley) also had some of the highest unemployment rates in the country, so the relatively small declines in business starts are something of a puzzle for future research; nevertheless it behooves us to take this into account. We do so by removing all California cities from the database. (The results that follow do not depend on this exact choice. Just removing Central Valley observations would yield qualitatively the same choice.) Column 4 of Table 2 shows that this has the effect of making the coefficient of house prices positive and significant. This coefficient is somewhat less than that displayed

[11] In point of fact, there is some speculation in the literature that self-employment (which is one form of business startup) is countercyclical (e.g. Becker, (1994), Evans and Leighton (1989)). But we do not find that in these results.

in columns 1 and 2 but much greater than that in column 3. Clearly the omission of California from the sample has a substantial effect. [12] Our final model modification is to include our two measures of the local credit markets, the percent of total loans denied and the percent of denials that were for non-collateral reasons. Both of these variables had positive coefficients, which are somewhat surprising, but neither was estimated with particularly high precision. There is little evidence that these variables have an impact on starts.

With this basic model in place we stratify the business starts into size categories. Table 3 presents these results. In the first column, we present a fixed effects regression of very small business starts. Since very small starts comprise 99% of total starts we expect this regression to look very much like similar ones in the previous table, and in fact it does. There are no real differences between this set of coefficients and those in column 5 of Table 2.

As noted above, when examining the number of small business starts, we need to deal with the fact that 12% of the observations are zero. We use a Tobit estimator to deal with this issue, and the results are presented in the column 3 of Table 3. Housing prices continue to be a positive and significant predictor of business starts. The two business cycle variables are insignificant, although the percent of loans denied does have the expected negative impact.

The last two columns present the results for medium and large business starts respectively. Given the distributions of these two variables displayed in Figures 4 and 5, we use Poisson regressions, which are appropriate for the case when the dependent variable is and integer count of occurrences. Note, though, that in doing so we do not (as in previous models) transform the variable into per capita terms. Instead we use (log) population as an explanatory variable. Note further, that we continue to employ both

[12]The Chow test of the difference between the slope coefficients for the California and non-California samples has a prob-value of less than 0.0001. Also, estimates of the model for California alone indicate no statistical link between per capita starts and housing prices. The business cycle variables per capita gdp and the metropolitan unemployment rate are significant predictors in the expected directions.

time and city fixed effects. A number of cities had no medium and/or large starts during our sample period; these cities do not, on that account, contribute to the likelihood function and are therefore omitted from their respective regressions.[13] In the "medium model" house prices are insignificant. Curiously, the only statistically significant slope coefficient is population, and it's influence is negative. In the "large model" house prices (surprisingly) carry a significantly negative coefficient. Nothing else is as precisely estimated.

The story from these regressions is straightforward. Cross-sectional variation in house prices have a statistically significant correlation with metropolitan business starts. This is the case even after controlling for local business cycles; the residual role for housing prices over and above its role as a signal of local economic conditions is as potential collateral for business startups. Our results suggest, naturally enough that housing prices are causal for very small and small business starts. While we have no data on the people behind these starts, intuition suggests that these are first-time entrepreneurs whose only source of capital is the home which they occupy, which thereby becomes their source of collateral. Declines in the value of this collateral, according to this story, and the models discussed in the introduction, cause credit to dry up, and the number of starts to decline. The lack of statistical signficance of our other credit market measures suggests that this is the major source of cross-city variation in the health of credit markets. Larger business starts, on the other hand, seem unaffected by housing price variation. This is presumably due to the fact that for larger enterprises, housing is not the source of collateral; sole proprietors using housing as collateral could scarcely be able to finance a startup larger than a few dozen employees, at best.

How much did the fall in housing prices matter? Let us use the large decline in starts from 2008 to 2009 as an example. The unweighted mean decline in log housing prices from 2008 to 2009 was

[13] This is because the likelihood calculation is conditional on the total number of occurrences, and the likelihood is based on the proportion of occurrences which occur in each year. When that total is zero, these proportions are known (see Wooldridge, 2010). As a specification check, we estimated the mode in per capita terms as a linear regression (with fixed effects) using the full sample and the non-result reported shortly is repeated there.

-0.0322. Using the "very small" coefficient from the first column of Table 3 indicates that the fall in per capita starts due to the change in log housing prices would be roughly (-0.0322)*(0.0013)=-0.000042. In a city of 1 million people this would be approximately 42 starts which is about five percent of the unweighted average number of starts, suggesting that the effect is small. Further suggesting that the effect of housing prices is small, the unweighted mean change in very small starts per capita was -0.0019. Since (-0.000042/-0.0019=0.022), the suggestion is that cross-city variation in house price declines was responsible for only about 2.2% of business start declines across cities. While we do not present the coefficient of the time dummies in our table, our inspection of them indicates that they are large contributors to the fit of the model. The coefficient of the 2009 binary is -0.0032 which is larger than the mean decline in starts. While house prices at the local level are certainly important, the size of the decline here indicates that general macroeconomic conditions played an even greater role.

4. Conclusion

Housing prices fell dramatically over the 2007-2009 period and concurrently business starts declined dramatically indicating a link between housing prices and business starts. By controlling for cross sectional variation, time fixed effects and local macroeconomic conditions; we find that housing prices are causal for very small and small business starts. Our study lends support to the idea that *de novo* entrepreneurs of very small and small businesses rely on their homes as a source of collateral to access credit. Larger businesses show no response to decline in house prices. However, this is not surprising as large business starts are unlikely to rely on personal housing wealth as a source of collateral to acquire credit to fund the business and hence unaffected by variation in housing prices. Though the quantitative impact of house price on business starts is small, our study is key to providing evidence of the collateral channel for small business starts. Shocks to this collateral channel can be a potential feedback mechanism that can affect credit channels and business lending.

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Figure 1

Plot of house price index(HPI) and total business starts from 2005-2009 at the national level. The HPI and total business starts have been aggregated and averaged across the metropolitan statistical areas for 2005-2009.

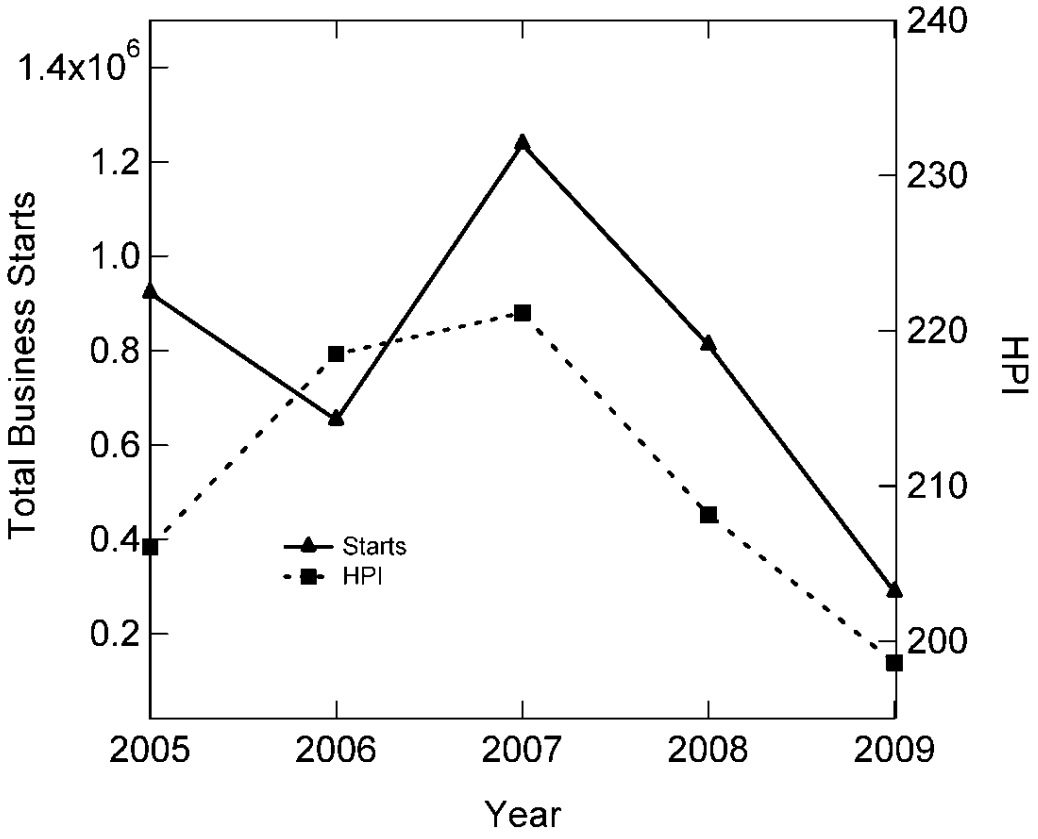

Figure 2: Density of (log) very small business starts

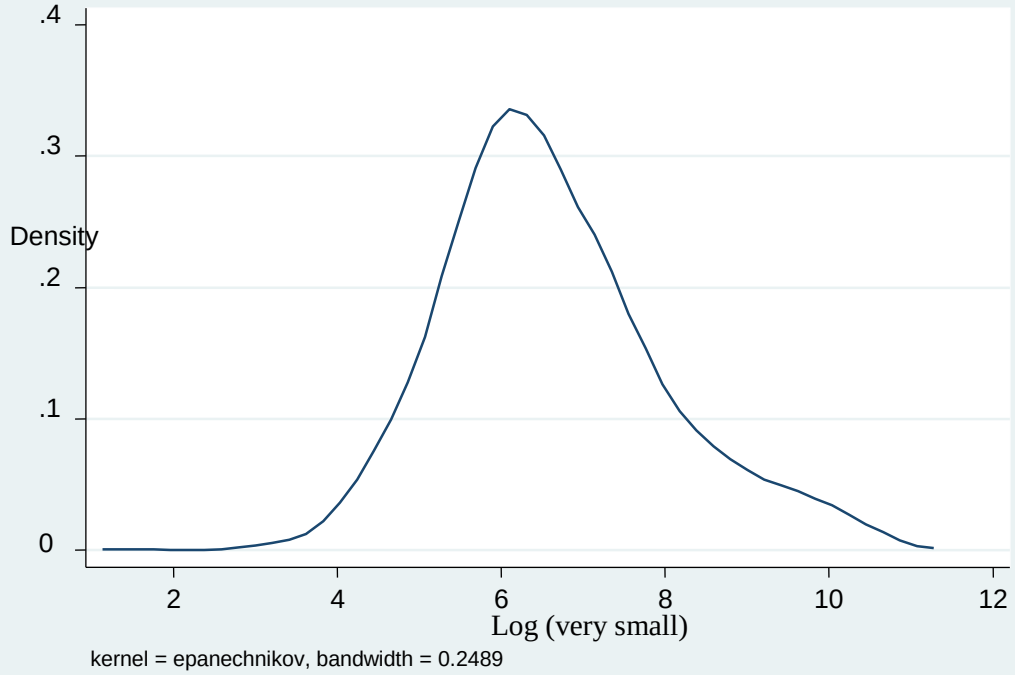

Figure 3: Distribution of small business starts

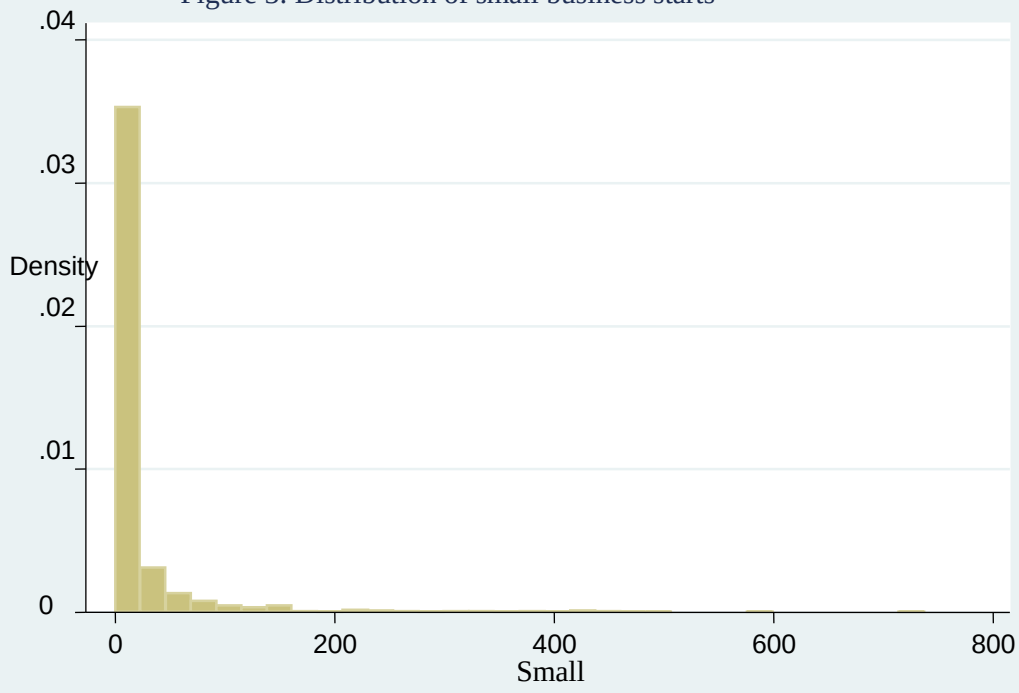

Figure 4: Distribution of medium business starts

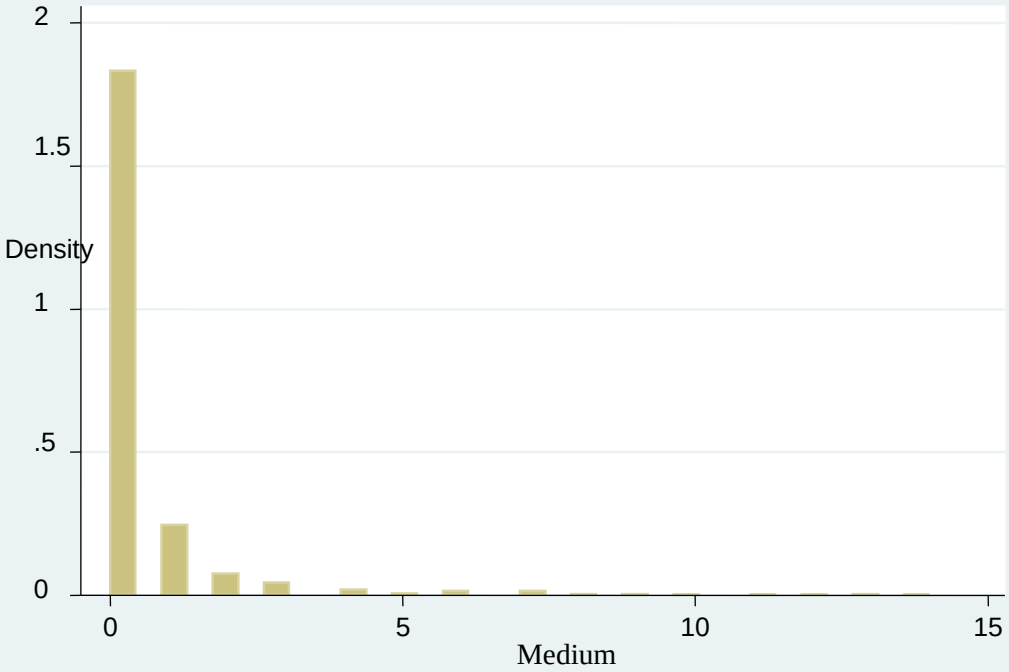

Figure 5: Distribution of large business starts

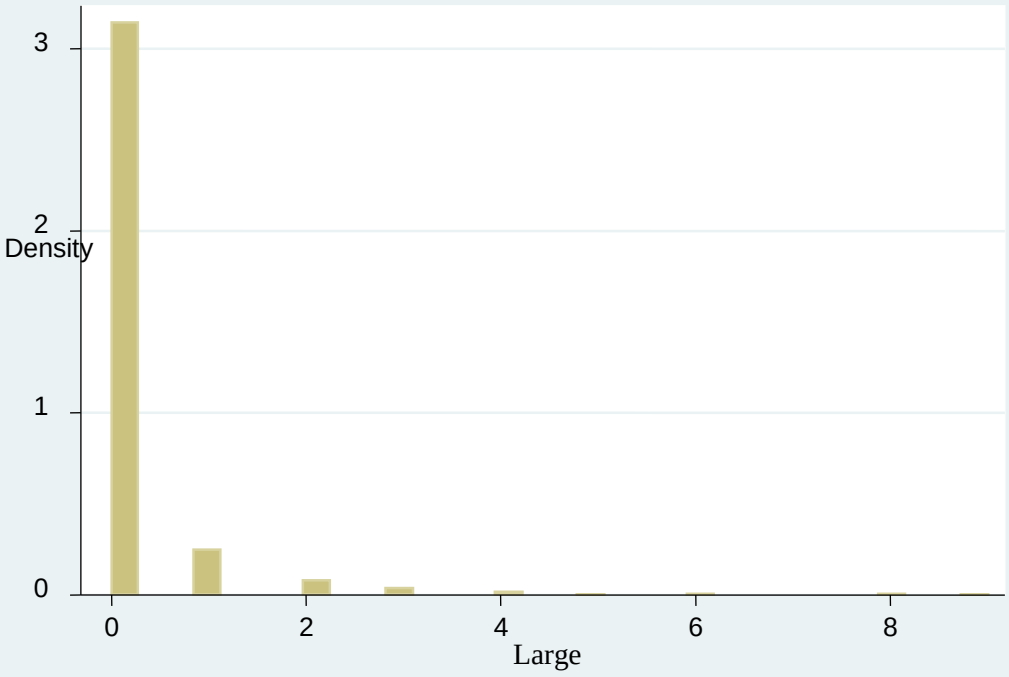

Figure 6: Change in per capita business starts versus percentage change in house prices.

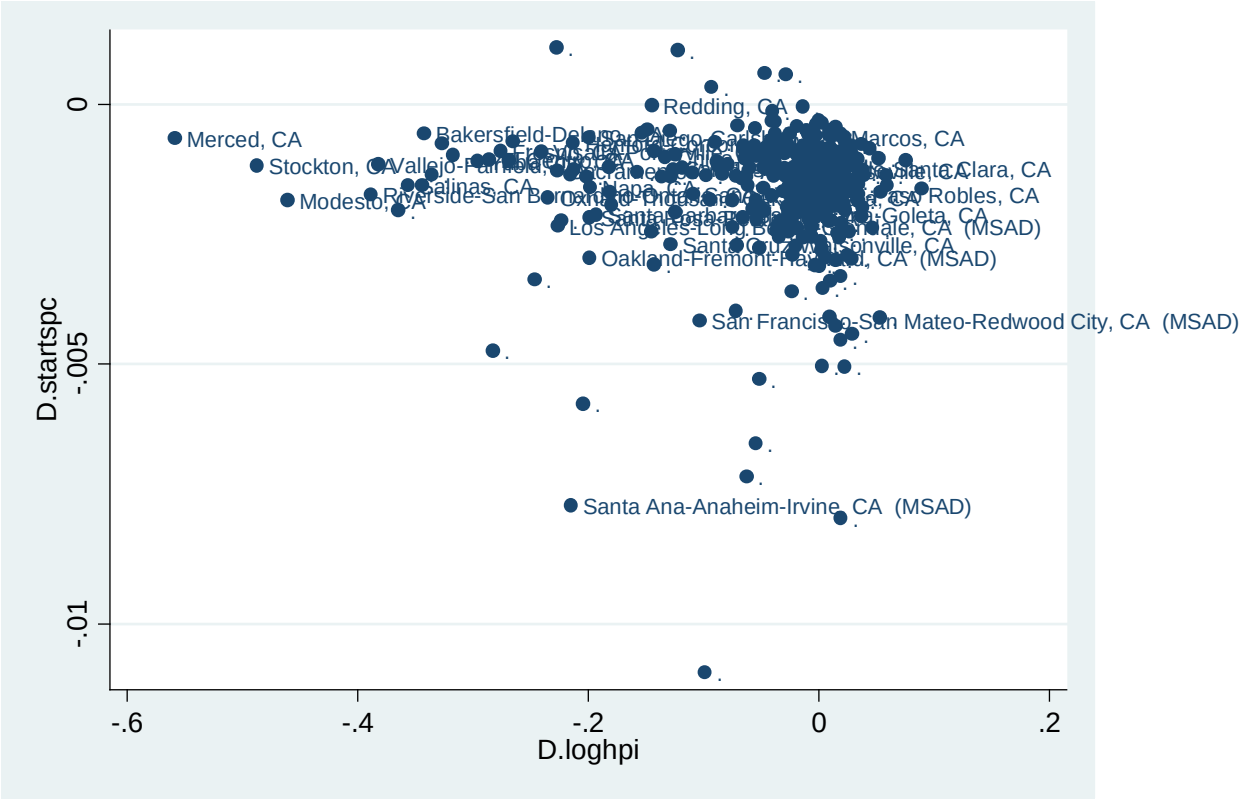

Table 1

This table provides the descriptive statistics at the MSA level for house price index, total business starts, gross domestic product, population, unemployment rate, ratio of total number of conventional home mortgage denials due to lack of collateral to the total number of conventional home mortgage denials . The table presents unweighted means and standard deviations, by year, of the variables used in the analysis.

Variable		Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
		2005		2006		2007		2008		2009	
totbustarts	Total number of business starts	2686.501	5155.066	1922.85	4166.598	3678.142	8189.268	2459.239	5435.554	860.555	1986.743
vsmall	Total number of "very small" business starts	2636.169	5050.827	1892.694	4100.401	3648.228	8124.895	2443.595	5401.441	857.0268	1978.011
small	Total number of "small" business starts	49.09383	102.5932	29.30831	65.14528	29.15013	63.5902	15.16086	33.96837	3.308311	8.581605
med	Total number of "medium" business starts	0.836461	2.24867	0.608579	1.533543	0.544236	1.540249	0.351206	1.066337	0.144772	0.486877
large	Total number of "large" business starts	0.402145	1.241832	0.238606	0.782476	0.219839	0.651659	0.131367	0.435529	0.075067	0.394513
gdp	Gross domestic product of metropolitan area	43596.93	122752.8	46353.88	131372.4	48689.72	138243.5	49736.88	141409.7	48925.81	138064
ur	Unemployment rate	5.157909	1.559905	4.693029	1.487223	4.641287	1.504853	5.756568	1.90411	9.134316	2.782839
hpi	FHFA house price index	183.8836	45.12288	195.9343	50.66988	197.2623	43.7818	187.0575	31.10245	180.6148	26.38002
popl	Population	651085.9	1188400	658264.9	1199405	665997.6	1210876	665997.6	1210876	680303.5	1236935
pcden	Percent of mortgage loans denied	0.714048	0.896816	0.749444	0.090258	0.749627	0.106663	0.752049	0.112012	0.785836	0.090158
pcdennoncoll	Percent of denials due to non-collateral reasons	0.890351	0.054102	0.890158	0.037701	0.876959	0.053444	0.845692	0.074467	0.824088	0.10226

Table 2

OLS and Fixed Effect and 2SLS regressions of Total Business Starts on indicated variables. T-statistics in brackets.

	(1)	(2)	(3)	(4)	(5)
Estimation	OLS	OLS	FE	FE	FE
Size category	Total	Total	Total	Total	Total
Sample	Full	Full	Full	Non-CA MSAs	Non-CA MSAs
loghpi	0.003144	0.002369	0.00015	0.001409	0.001325
	(0.000237)	(0.000226)	(0.000341)	(0.000424)	(0.000445)
ur		-0.00026	6.5E-05	6.96E-05	6.26E-05
		(1.79E-05)	(3.39E-05)	(3.44E-05)	(3.47E-05)
percapgdp		2.51E-08	2.52E-08	1.00E-08	7.87E-09
		(4.18E-09)	(1.64E-08)	(1.66E-08)	(1.66E-08)
pcden					3.96E-05
					(5.96E-05)
pcdennoncoll					0.000721
					(0.0005)
N	1865	1865	1865	1730	1725
r2	0.086377	0.21987	0.679704	0.694901	0.696623

Table 3

Fixed effects, Tobit and Poisson regressions of starts indicated size categories on indicated variables.
Fixed time and city effects are included in every specification. All of these samples are for non-California cities

	(1)	(2)	(3)	(4)	(5)
	FE	FE	Tobit	Poisson	Poisson
Size	Very small	Small	Small	Medium	Large
loghpi	.00129735	2.68E-05	2.26E-05	-0.21538	-2.48406
	.0004435	7.73E-06	7.62E-06	0.798504	1.22812
ur	.00006224	3.54E-07	4.34E-08	-0.04927	-0.23315
	.0000345	6.01E-07	6.13E-07	0.091978	0.132752
percapgdp	8.219e-09	-3.64E-10	-6.15E-10	-2.2E-05	8.11E-05
	1.652e-08	2.88E-10	2.89E-10	4.34E-05	5.24E-05
pcden	.00004315	-3.30E-06	-3.21E-06	-0.02173	-0.04279
	.0000593	1.03E-06	9.71E-07	0.028631	0.032046
pcdennoncoll	.00070907	1.22E-05	3.67E-06	-0.79855	-0.41188
	.00049758	8.67E-06	8.35E-06	0.513987	0.670698
logpop				-10.3576	4.567501
				3.049731	4.168977
N	1725	1725	1725	770	525
r2	.69311348	0.662067			