

# NONLOCAL MORTGAGE LENDING AND THE SECONDARY MARKET INVOLVEMENT

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## **Abstract**

This paper documents that out-of-state nonlocal mortgages, originated by state-chartered banks, are more likely to be subprime (high-priced) loans and are sold more to the secondary market than other types of mortgages, based on the data collected under the Home Mortgage Disclosure Act from 2005 to 2008. We find that the demand for nonlocal mortgages is larger in the neighborhood where the denial rate of mortgage applications to local banks is higher, suggesting that the borrowers of nonlocal mortgages are less creditworthy. Furthermore, a bank makes more nonlocal mortgages to out-of-state borrowers if it is involved more in the secondary market.

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Remote lending has become an important channel in the application and origination of home mortgages. Out-of-state banks benefit more from remote lending than their in-state counterparts because branching outside the charter state is costly due to restrictions on interstate banking. This paper aims to investigate the impact of remote lending and interstate banking on the mortgage market, using mortgage data from the periods before and after the subprime crisis.

We classify mortgages by whether the lending bank is chartered in the state of the borrower and whether the bank has branch offices in the Metropolitan Statistical Area (MSA) of the borrower. This generates four types of mortgages: in-state local, in-state nonlocal, out-of-state local, and out-of-state nonlocal mortgages. Using a sample of mortgages from state-chartered banks, collected under the Home Mortgage Disclosure Act from 2005 to 2008, we find two salient features of out-of-state nonlocal mortgages. First, they are more likely to be subprime loans. We define subprime or high-priced loans as those with annual percentage rate equal or greater than 3 percentage points for the first lien loans comparing to the applicable Treasury yield. In 2005, 67% of out-of-state nonlocal mortgages are high-priced; however, for other mortgages, only 12% to 19% are high-priced. Second, out-of-state nonlocal mortgages are more likely to be sold to the secondary market; 80% of those loans are sold to the secondary market, but only 43% to 48% for others.

Understanding the substantially high subprime rate and sales rate of out-of-state nonlocal mortgages is very important. As Coulton, Chan, and Schramm (2008) show, loans made by nonlocal banks get foreclosed earlier than those made by the local banks in Cuyahoga County in Ohio. Also, subprime mortgages end up with foreclosure almost more than six times as often as prime mortgages (Gerardi, Shapiro, and Willen, 2007). As the secondary market grows, it may take up too many loans

of low quality (Gabriel and Rosenthal, 2007), presumably because banks can sell those loans, especially subprime loans, to other investors through the secondary market.

We first investigate borrowers' characteristics of different mortgages and find that borrowers with lower credit worthiness, such as without co-applicants and higher loan-to-income ratio, are more likely to apply for and obtain out-of-state nonlocal mortgages. Using a logit model, we show that out-of-state nonlocal mortgages are more likely to be subprime and to be sold on the secondary market than others, even after controlling for the observed characteristics of borrowers and mortgages.

Then, we construct panel data sets of home mortgages at the community and bank level and provide empirical evidence from both the demand side and the supply side to explain the high subprime and sales rates of out-of-state nonlocal mortgages.

On the demand side, we show that the demand for nonlocal mortgages, measured by the share of nonlocal applications, is greater in the neighborhoods where local banks have higher lending standards, measured by the denial rate in the previous year.<sup>1</sup> Our explanation is that local banks select better qualified borrowers by taking advantage of their information about local communities and their easier access to borrowers' banking accounts (Mester, Nakamura, and Renault, 2007) and financial background, so less creditworthy borrowers tend to end up with nonlocal mortgages.

On the supply side, there is evidence that the secondary market provides the incentive for banks to originate the risky out-of-state nonlocal mortgages. Using panel data at the bank level, we show that banks that are more active on the secondary market originate a higher proportion of out-of-state nonlocal mortgages. We also find that banks with smaller assets and a larger amount of total applications, given that everything else is equal, have higher shares of out-of-state nonlocal mortgages. This suggests that, for smaller banks, the secondary market might play an even larger role in their origination of out-of-state nonlocal mortgages.

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## LITERATURE REVIEW

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Our paper shows that home mortgages made by lenders without branch offices in the local market are of lower credit quality. This finding adds to the studies of lending channels that have been well studied in the context of small business lending. It is unclear in this stream of literature whether distant lending results in bad credit. DeYoung et al. Nigro (2008) show that an increase in the distance between small business borrowers and their lenders during the 1990s was disproportionately large for borrowers located in low-income and minority neighborhoods. However, Peterson and Rajan (2002) argue that the distant borrowers are not necessarily the ones with high quality credits, due to the improvement in lenders' productivity and the increasing competition in the credit market. Our paper provides evidence that borrowers in the nonlocal loan market are those who cannot get loans in the local market and they have relatively worse observable characteristics than those who borrow from the local market.

Our paper enriches the studies on home mortgage lending from the perspective of lending channels. Although the bank-borrower relationship may not play a key role

in home mortgage lending, the presence of branch offices in local markets facilitates the collection of information about the local housing market and socioeconomic conditions. Ergungor (2010) shows that lenders are more willing to lend to someone in a low- to moderate-income neighborhood if they have a bank branch in the neighborhood. Loutskina and Strahan (2011) show that banks with more geographically concentrated mortgage lending performed better during the subprime crisis because of greater use of private information.

Our paper extends the lending channel studies to the home mortgage market by accounting for the impact of interstate banking. Distinguishing in-state banks from out-of-state banks can differentiate the costs to comply with host-state laws and banks' commitment to local prosperity. Moreover, we also consider the impact of interstate banking and the incentive effect of the secondary market on nonlocal mortgage lending. This paper thus contributes to the growing literature on securitization and the secondary market, especially the incentives of banks to expand lending to risky borrowers. Loutskina and Strahan (2009) show that securitization in the secondary market reduces the importance of the financial conditions of lenders for credit supply. Our paper also confirms this conclusion by showing that the smaller banks are more involved in the secondary market. Using the HMDA data between 1992 and 2004, Gabriel and Rosenthal (2007) show that the secondary market purchase helps to expand the credit supply in terms of higher origination rates, and the effect is even greater for subprime lenders. Mian and Sufi (2009) argue that the sharp increase in the fraction of loans sold on the secondary market expands the home mortgage credit supply to the neighborhoods of low credit quality in terms of low denial rates. Our study on the out-of-state nonlocal mortgages compliments these previous findings related to the secondary market.

Our paper provides evidence from a panel of banks that operates between 2005 and 2008 to show that banks that have closer connections to the secondary market in the previous year will make more risky loans in areas outside their charter states where they do not have local branch offices. The result is consistent with the findings in the literature. Dell'Ariccia, Igan, and Laeven (2009) and Keys, Mukherjee, Seru, and Vig (2010) point out that securitization adversely affects the banks' incentives to screen the loans, and therefore banks lower their lending standard when making home mortgage loans. Purnanandam (2011) shows that banks that are more active in secondary market in the pre-crisis period have more defaulted loans in the post-crisis period, especially for capital-constrained banks. Rosen (2011) finds that the securitization market facilitates the wholesale lending channel and increases the share of nonlocal loans, which tend to be riskier on average than loans made by local banks.

## DATA

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The major data resource is the Home Mortgage Disclosure Act (HMDA) data from 2005 to 2008, which accounts for approximately 80% of all home mortgages nationwide (Berkovec and Zorn, 1996; Avery, Brevoort, and Canner, 2007). Since our focus is the impact of interstate banking and lending channels on the home mortgage market, we use a sample of home mortgage applications and loans made by state-

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chartered commercial banks. We then use the Institution Record and the MSA Office Information to identify the charter states of banks and the locations of their branches.

Our sample includes conventional home purchase loans for one-family to four-family housing units secured by first lien. Each observation is a loan application that may lead to origination if borrowers and banks reach agreements. The interest rate spreads are reported if the difference between the annual percentage rate and the applicable Treasury yield is equal to or greater than 3 percentage points. Only complete applications initiated by a person are included; loans initiated by a corporation or other entity that is not a person are excluded. The applications withdrawn by the applicants and the loans purchased by banks are also excluded.

### **TOTAL APPLICATION AND ORIGINATION RATE**

Exhibit 1 shows the distribution of loan applications and originations among different banks through different lending channels. The total number of applications with in-state banks is around twice that of out-of-state banks. This indicates that there are more in-state banks in the market or the applicants prefer in-state banks to out-of-state banks when they apply for home mortgages. Among the applications with in-state banks, more than two-thirds are local applications, while for the applications with out-of-state banks, only one-third are local applications. These contrasting facts reflect the lower availability of branches owned by out-of-state banks than those owned by in-state banks because of the regulation barriers faced by out-of-state banks.

The majority of local applications go to in-state banks, but most of nonlocal applications go to out-of-state banks. Such distribution might be attributed to the fact that the applicants who apply with local branches prefer in-state banks to out-of-state banks, while the applicants who choose nonlocal banks are indifferent between in-state banks and out-of-state banks. Moreover, the out-of-state banks might be more specialized in conducting nonlocal loans because they are restricted in establishing branches in other states.

The origination rate, that is, the share of applications that become loans, is the highest for in-state local applications and the lowest for out-of-state nonlocal applications. This may imply that the applicants of out-of-state nonlocal loans have poorer qualities or are less creditworthy.

Out-of-state nonlocal applications are more responsive to time-varying shocks. The share of out-of-state nonlocal applications in total applications gets smaller over time, from around 30% in 2005 and 2006 to 16% in 2008; the share of out-of-state local applications is stable and the share of in-state applications increases. The origination rate of out-of-state nonlocal applications decreased from more than 70% in earlier years to 64% in 2008, while the origination rates of other types of applications remain almost the same over time.

### **FEATURES OF LOANS AND BORROWERS**

Exhibit 2 shows the most salient features of different types of mortgages. Compared to others, the out-of-state nonlocal mortgages have a much larger proportion of

**Exhibit 1**  
**Application and Origination by Bank Type**

	In-State Banks		Out-of-State Banks			All Banks	
	Local	Nonlocal	Sub-total	Local	Nonlocal	Sub-total	Total
Panel A: 2005-2008							
Number of applications	890,282	360,444	1,250,726	223,642	486,035	709,677	1,960,403
Share of total application	0.45	0.18	0.64	0.11	0.25	0.36	1.00
Share of applications become loans	0.86	0.82	0.85	0.78	0.71	0.73	0.81
Panel B: 2005							
Number of applications	266,145	105,018	371,163	63,609	169,261	232,870	604,033
Share of total application	0.44	0.17	0.61	0.11	0.28	0.39	1.00
Share of applications become loans	0.87	0.83	0.86	0.79	0.75	0.76	0.82
Panel C: 2006							
Number of applications	240,414	96,689	337,103	58,399	168,705	227,104	564,207
Share of total application	0.43	0.17	0.60	0.10	0.30	0.40	1.00
Share of applications become loans	0.85	0.82	0.84	0.78	0.69	0.71	0.79
Panel D: 2007							
Number of applications	210,167	87,183	297,350	60,795	93,614	154,409	451,759
Share of total application	0.47	0.19	0.66	0.13	0.21	0.34	1.00
Share of applications become loans	0.86	0.82	0.85	0.77	0.70	0.73	0.81
Panel E: 2008							
Number of applications	173,556	71,554	245,110	40,839	54,455	95,294	340,404
Share of total application	0.51	0.21	0.72	0.12	0.16	0.28	1.00
Share of applications become loans	0.85	0.81	0.84	0.80	0.64	0.71	0.80

**Exhibit 2**  
**Characteristics of Originated Loans by Bank Type**

	In-State Banks		Out-of-State Banks	
	Local	Nonlocal	Local	Nonlocal
<b>Panel A: 2005</b>				
Share of sold loans	0.48	0.47	0.43	0.80
Share of subprime loans	0.12	0.19	0.12	0.67
Interest rate spread	4.71	4.53	4.48	5.69
Share with a co-applicant	0.55	0.59	0.51	0.36
Loan-to-income ratio	2.07	1.88	2.14	1.87
Loan amount (thousands)	168.98	143.24	199.36	152.78
<b>Panel B: 2006</b>				
Share of sold loans	0.48	0.47	0.40	0.76
Share of subprime loans	0.14	0.22	0.17	0.58
Interest rate spread	4.77	4.56	4.59	6.11
Share with a co-applicant	0.54	0.57	0.47	0.38
Loan-to-income ratio	2.01	1.84	2.02	1.88
Loan amount (thousands)	168.02	143.6	191.68	165.7
<b>Panel C: 2007</b>				
Share of sold loans	0.48	0.47	0.46	0.68
Share of subprime loans	0.10	0.18	0.12	0.24
Interest rate spread	4.28	4.22	4.51	4.69
Share with a co-applicant	0.54	0.58	0.49	0.49
Loan-to-income ratio	2.08	1.89	2.13	2.14
Loan amount (thousands)	171.96	141.96	192.84	180.04
<b>Panel D: 2008</b>				
Share of sold loans	0.39	0.36	0.51	0.63
Share of subprime loans	0.13	0.21	0.10	0.14
Interest rate spread	4.54	4.54	4.19	4.11
Share with a co-applicant	0.54	0.59	0.50	0.55
Loan-to-income ratio	2.06	1.82	2.17	2.21
Loan amount (thousands)	184.40	146.45	207.95	217.31

subprime loans and more of these mortgages are sold to the secondary market. For instance, 67% of the out-of-state nonlocal mortgages are subprime and 80% of their mortgages are sold on the secondary market in 2005. These shares are around 50% and 30% higher, respectively, than those of other types of mortgages.

The subprime rate of out-of-state nonlocal mortgages drops substantially over the years, while this rate remains relatively stable for the other mortgages, which narrows the gaps among different mortgages. The sales rate drops for all types of loans other than the out-of-state local loans, indicating that secondary market activities are

**Exhibit 3**  
**Borrower and Neighborhood Characteristics of Originated Loans by Bank Type**

	In-State Banks		Out-of-State Banks	
	Local	Nonlocal	Local	Nonlocal
<b>Panel A: 2005</b>				
Share of white borrowers	0.91	0.94	0.91	0.71
Share of male borrowers	0.76	0.79	0.76	0.67
Share of minority tract	0.31	0.3	0.34	0.54
Share of low-income tract	0.15	0.1	0.15	0.23
<b>Panel B: 2006</b>				
Share of white borrowers	0.91	0.94	0.90	0.75
Share of male borrowers	0.76	0.79	0.74	0.68
Share of minority tract	0.31	0.29	0.35	0.51
Share of low-income tract	0.16	0.10	0.16	0.22
<b>Panel C: 2007</b>				
Share of white borrowers	0.92	0.95	0.90	0.89
Share of male borrowers	0.76	0.79	0.74	0.74
Share of minority tract	0.28	0.26	0.33	0.35
Share of low-income tract	0.15	0.09	0.15	0.14
<b>Panel D: 2008</b>				
Share of white borrowers	0.92	0.95	0.91	0.92
Share of male borrowers	0.77	0.80	0.75	0.77
Share of minority tract	0.27	0.26	0.32	0.29
Share of low-income tract	0.15	0.09	0.14	0.11

affected dramatically by the subprime crisis. However, the sales rate of the out-of-state nonlocal mortgages is still much higher than that of other types in 2008.

The borrowers of out-of-state non-local mortgages have lower loan-to-income ratios and are less likely to have a co-applicant (Exhibit 2); they are more likely from minority groups, such as non-whites and females, as well as applicants from minority tracts and low-income tracts (Exhibit 3). Given banks' charter (in-state or out-of-state), the average income of the borrowers who file a non-local application is lower than that of borrowers who apply through local branches (Exhibit 4).

### **BANK CHARACTERISTICS**

Given the salient features of out-of-state nonlocal mortgages relative to others, it is interesting to investigate the characteristics of out-of-state nonlocal mortgage lenders. First, we find a particular bank, Fremont Investment & Loan,<sup>2</sup> originated a large

**Exhibit 4**  
**Income Information of Originated Loans by Bank Type**

	In-State Banks		Out-of-State Banks	
	Local	Nonlocal	Local	Nonlocal
<b>Panel A: 2005</b>				
Annual income (thousands)	106.75	98.49	122.96	100.20
Income to MSA median income ratio	1.79	1.96	2.14	1.70
Share of low-income borrowers	0.22	0.22	0.22	0.23
Tract to MSA median income ratio	110.00	107.15	114.39	102.29
<b>Panel B: 2006</b>				
Annual income (thousands)	110.83	102.50	121.91	111.02
Income to MSA median income ratio	1.83	2.03	2.07	1.87
Share of low-income borrowers	0.22	0.22	0.21	0.20
Tract to MSA median income ratio	110.31	106.80	113.02	103.94
<b>Panel C: 2007</b>				
Annual income (thousands)	113.6	103.63	123.18	115.26
Income to MSA median income ratio	1.90	2.11	2.11	2.09
Share of low-income borrowers	0.24	0.22	0.23	0.21
Tract to MSA median income ratio	110.73	106.89	113.60	110.42
<b>Panel D: 2008</b>				
Annual income (thousands)	129.48	111.43	137.69	141.88
Income to MSA median income ratio	2.07	2.19	2.27	2.51
Share of low-income borrowers	0.27	0.22	0.24	0.20
Tract to MSA median income ratio	111.90	107.28	117.09	115.24

amount of out-of-state nonlocal mortgages in 2005 and 2006; about 90% of their mortgages are subprime and are sold to the secondary market. We recheck the features documented below without this major lender and find that the sales rate and the subprime rate of out-of-state nonlocal loans become smaller, but are still significantly higher than other types. The higher sales rate and subprime rate of out-of-state nonlocal mortgages are not driven entirely by this particular bank. In the empirical analysis, we control for the impact of this particular lender.

The degree of market concentration is higher for the out-of-state nonlocal mortgages. In 2005 and 2006, less than 10 banks account for 80% of the total out-of-state nonlocal mortgages. The market concentration decreases after the subprime crisis. In 2008, the top 70 banks originate 80% of the out-of-state nonlocal mortgages.

The biggest out-of-state nonlocal lenders are not necessarily big banks; those banks with small assets are more specialized in nonlocal lending and sell extremely high proportions of their subprime mortgages to the secondary market. After the subprime crisis, a smaller proportion of the mortgages they sell are subprime loans.



## SUBPRIME LOANS AND SALES ON THE SECONDARY MARKET

In this section, we estimate the impact of different factors, especially loan types, on the propensity of a mortgage being subprime and being sold on the secondary market. To study the determinants of subprime loans, we estimate the following transformed logit model:

$$Pf(H_i = 1) = \alpha_1 ON_i + \alpha_2 IN_i + \alpha_3 OL_i + \beta_1 Fremont_i + \beta_2 Border_i + X_i \gamma, \quad (1)$$

where  $Pf(H_i = 1)$  is the transformed probability function and  $H$  is a discrete variable that equals one if loan  $i$  is subprime and zero otherwise.  $ON$ ,  $IN$ , and  $OL$  are the dummies for the out-of-state nonlocal, in-state nonlocal, and out-of-state local loans, respectively. To compare the impact of the loan dummies on the subprime status, we use the in-state local loans as the base case. *Fremont* is the dummy for loans made by the biggest lender of out-of-state nonlocal mortgages; *Border* is the dummy for loans made to borrowers in MSAs that cross the state borders.  $X$  is a vector of controls that include property occupancy, presence of co-applicant, loan amount, gender and race of borrowers, year and state dummies; it also includes the median income, minority share, and population of the neighborhood.  $\alpha_1$ ,  $\alpha_2$ ,  $\alpha_3$ ,  $\beta_1$ ,  $\beta_2$ , and  $\gamma$  are the parameters.

The main finding is that nonlocal loans are more likely to be subprime relative to in-state local loans, as shown in the columns 1 and 2 of Exhibit 5, where we report the marginal effects, that is, the expected marginal impact of each independent variable on the probability of becoming subprime loan. The marginal effects of nonlocal loans from both out-of-state and in-state banks are positive and significant, and such effects are robust with the inclusion of control variables.

We then investigate the determinants of the incidence of sales on the secondary market by estimating the following transformed logit model:

$$Pf(S_i = 1) = \alpha_1 ON_i + \alpha_2 IN_i + \alpha_3 OL_i + \alpha_4 ON_i H_i + \alpha_5 IN_i H_i + \alpha_6 OL_i H_i + \beta_1 Fremont_i + \beta_2 Border_i + X_i \gamma. \quad (2)$$

$Pf(S_i = 1)$  is the transformed probability function and  $S$  is a discrete variable that is equal to one if the loan is sold on the secondary market and zero otherwise. Again, the impact of loan dummies is estimated relative to in-state local loans. Other explanatory variables are the same as those in the logit model studying subprime loans. We also include the interaction items between loan types and subprime status, because the subprime loans of different types might have different propensities to be sold on the secondary market.

In all the specifications, the marginal effects of the out-of-state nonlocal loans are positive and significant, indicating that those loans are more likely to be sold on the secondary market. These marginal effects of different factors on the sales status from different logit specifications are shown in columns 3–5 in Exhibit 5.

**Exhibit 5**  
**The Determinates of Subprime Status and the Sales Status**

	Subprime Status		Sales Status		
	Logit (1)	Logit (2)	Logit (3)	Logit (4)	Logit (5)
Out-of-state nonlocal	0.120** (0.0430)	0.118** (0.0413)	0.2260*** (0.0654)	0.2300*** (0.0650)	0.2010** (0.0689)
In-state nonlocal	0.100*** (0.0074)	0.105*** (0.0081)	0.0022 (0.0114)	0.0127 (0.0110)	0.0229* (0.0109)
Out-of-state local	0.0099 (0.0463)	0.0088 (0.0435)	0.0071 (0.0402)	-0.0135 (-0.0412)	-0.0314 (-0.0406)
Fremont	0.7990*** (0.0241)	0.7880*** (0.0271)	0.4730*** (-0.0402)	0.4780*** (-0.0419)	0.3890*** (0.0427)
Border MSA	0.0194 (0.0122)	0.0086 (0.011)	0.0537** (-0.0179)	0.0589*** (-0.017)	0.0585*** (0.0169)
Subprime			-0.3200*** (-0.0321)	-0.3580*** (-0.0342)	-0.3970*** (0.0246)
Fremont*subprime					0.1630** (0.0554)
Out-of-state nonlocal*subprime					0.1530* (0.0632)
In-state nonlocal*subprime					-0.0699** (0.0250)
Out-of-state local*subprime					0.1560 (0.0822)
State dummies	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes
Controls		Yes		Yes	Yes

Notes: Marginal effects reported. Standard errors are in parentheses. In columns 1 and 3,  $N = 1,567,367$ ; in columns 2, 4, and 5,  $N = 1,507,404$ .

\*  $p < 0.05$

\*\*  $p < 0.01$

\*\*\*  $p < 0.001$

The subprime loans are less likely to be sold to the secondary market than the prime loans; however, the subprime loans from out-of-state nonlocal banks are more likely to be sold on the secondary market, compared to those originated by other groups, as seen from the positive marginal effects of the interaction item.

## HIGH SUBPRIME AND SALES RATES OF OUT-OF-STATE NONLOCAL MORTGAGES

In this section, we attempt to explain why out-of-state nonlocal mortgages have relatively high subprime and sales rates. First, we use a multinomial logit model to

study how different characteristics of borrowers can explain the choice of different types of mortgages. We find that applicants who are female, nonwhite, from a minority neighborhood, or without co-applicants are more likely to apply for and get out-of-state nonlocal mortgages. This suggests that borrowers of out-of-state nonlocal mortgages might be less creditworthy. The multinomial logit model might suffer from the unobserved factors affecting the origination of individual mortgages. Hence, we use fixed effects models to provide further evidence using community panel data.

### HIGHER LOCAL LENDING STANDARD, HIGHER NONLOCAL CREDIT DEMAND

Given that local banks are able to screen the relatively better qualified borrowers by taking advantage of their knowledge of local communities and by the easier access to the financial information of local borrowers, less credit-worthy borrowers might end up with nonlocal mortgages more likely. To test this conjecture, we investigate the relation between the lending standard of local banks and the demand for nonlocal mortgages using neighborhood level data. We expect that neighborhoods with high local lending standards have a higher share of nonlocal applications.

A bank's branching decision is likely to be endogenous to the characteristics of local communities, so is the scale and share of nonlocal lending in a local mortgage market. To deal with this potential endogeneity problem, we construct a panel data set at the Census tract level by collapsing the HMDA mortgage applications during 2005–2008. We test our hypothesis by estimating the following fixed effects model:

$$Share_{nt} = T_n + \beta Denial_{nt-1} + \beta_t Y_t + \varepsilon_{nt}. \quad (3)$$

$Share_{nt}$  is the share of nonlocal applications in total applications in tract  $n$  in year  $t$ . We use shares to represent the demand for nonlocal mortgages because they are less sensitive to the sizes of census tracts than other measures, such as the total amounts of nonlocal mortgages.  $Denial_{nt-1}$  is the denial rate of the applications with local banks and is used as a proxy for the lending standard implemented by local banks. We use denial rate in the previous year because the lagged variable is less likely to be correlated with factors that affect nonlocal mortgage shares at this period. Also, borrowers typically make their decisions of loan application based on the conditions that local and nonlocal banks propose; borrowers need time to learn about those conditions.

The tract fixed effects,  $T_n$ , control for the unobservable tract characteristics that are potentially correlated with the share of nonlocal lending, especially the average credit quality of borrowers in a tract. The aggregation at the tract level aims to overcome the problem that the HMDA data lacks the credit information for individuals. At the tract level, unless there is migration of large scale, the credit pool will remain similar over the short period covered by our sample. The year fixed effects,  $Y_t$ , control for changes in the macro economy and the housing policies that affect all tracts in a given year.

The estimated impact of the lending standard on nonlocal demands for mortgages is positive and significant in all specifications, as shown in Exhibit 6. This supports the

**Exhibit 6**  
**The Local Lending Standard and the Nonlocal Credit Demand**

Variables	Nonlocal Share		Out-of-State Nonlocal Share	
	OLS (1)	FE (2)	OLS (3)	FE (4)
Lagged local denial rate	0.092*** (0.005)	0.015*** (0.006)	0.089*** (0.004)	0.017*** (0.005)
2007	-0.063*** (0.002)	-0.035*** (0.002)	-0.059*** (0.002)	-0.038*** (0.002)
2008	-0.117*** (0.002)	-0.075*** (0.002)	-0.113*** (0.002)	-0.080*** (0.002)
Constant	0.311*** (0.002)	0.303*** (0.001)	0.259*** (0.002)	0.255*** (0.001)
R <sup>2</sup>	0.028	0.024	0.030	0.029
Tract FE	No	Yes	No	Yes

Notes: Each observation is a tract. Clustered standard errors are in parentheses. In columns 1–4  $N = 106,239$ . In columns 2 and 4, the number of tracts is 42,904.

\*  $p < 0.05$

\*\*  $p < 0.01$

\*\*\*  $p < 0.001$

hypothesis that nonlocal banks get lower creditworthy loan applicants. The OLS estimates overvalue the impact of the lending standard on nonlocal demand, comparing to the fixed effects estimates. The reason is that OLS does not control for the unobserved quality that negatively correlates to dependent and independent variables.

The estimated impact of the local lending standard on the demand for out-of-state nonlocal mortgages is slight higher than that on the demand for nonlocal mortgages. This is consistent with the data analysis. Among the nonlocal mortgages, we observe that out-of-state nonlocal loans are more likely to be high-priced and sold to the secondary market than their in-state counterparts. This might reflect the impact of even longer distance between borrowers and lenders of the out-of-state mortgages; it may also be due to the obligation of out-of-state banks to promote lending to low-income neighborhoods and low-income groups (Schwartz, 1998).<sup>3</sup>

#### **HIGHER SALES IN SECONDARY MARKET, HIGHER OUT-OF-STATE NONLOCAL LENDING**

As demonstrated in previous sections, nonlocal borrowers are less creditworthy than other borrowers (see also Rosen, 2011). Besides the compensation from higher interest rates, the lenders of nonlocal mortgages, especially those out-of-state lenders, might take advantage of the secondary market to sell mortgages of low quality but still get revenues from origination and other transaction fees.

If the secondary market does provide incentives for banks to make nonlocal mortgages, we expect that banks that are more active on the secondary market will originate more out-of-state nonlocal mortgages, given everything else as equal. To investigate this, we estimate different versions of the following fixed effects model:

$$Share_{jt} = B_j + Sales_{jt-1}\beta + X_{jt}\gamma + \beta_t Y_t + \varepsilon_{jt}. \quad (4)$$

$Share_{jt}$  is the share of out-of-state nonlocal loans for a given bank  $j$  in year  $t$ . The explanatory variable in interest is  $Sales_{jt-1}$ , the sales rate of the bank in the previous year. This measure is a proxy for the bank's operation skills on the secondary market such as loan packing and marketing, as well as its close connection with the purchasers on the secondary market. The bank fixed effects,  $B_j$ , control for the unobservable bank characteristics that are correlated with the out-of-state nonlocal lending and the participation in the secondary market. The year fixed effect,  $Y_t$ , control for shocks in a given year that affect all banks.  $X_{jt}$  is a vector of control variables, such as total assets, total application counts (including applications for government backed loans and refinance loans), shares of loans sold to different types of purchasers on the secondary market, and the share of subprime loans.

The HMDA loan origination data are aggregated to the bank level to construct a panel data set in order to control for the fixed effects of banks. We restrict the sample to banks that originate more than 10 loans, have a proportion of out-of-state nonlocal loans greater than 10%, and sell at least one loan to the secondary market. In total, there are 258 state banks in the sample. The biggest out-of-state nonlocal lender, Fremont Investment & Loan, is no longer a concern in this analysis because it only accounts for one observation among these banks.

We find that banks that successfully sell a larger proportion of their mortgages in the previous year—more active or capable on the secondary market—originate a higher proportion of out-of-state nonlocal mortgages. In Exhibit 7, columns 1 and 2 show the results from the model without any control variables; columns 3 and 4 show the results with controls. The OLS and FE estimators in all specifications are positive and significant. According to the FE estimates in column 4, the share of out-of-state nonlocal mortgages of a bank increases 0.19% if its sales rate in the previous year increases by 1%.

Interestingly, the size of a bank's total assets has a negative impact on its share of out-of-state nonlocal mortgages, while the total number of applications has a positive impact on the out-of-state nonlocal share. These patterns are robust across different specifications. This implies that banks with smaller assets or those receiving more applications originate more out-of-state nonlocal mortgages. A bank without large assets is less likely to have branches and holds large amounts of mortgages, so it has to make more nonlocal mortgages and sell them to the secondary market. Banks receiving more applications are more likely to get that expansion from areas without branches, that is, involve more in the out-of-state nonlocal mortgage market. Such findings are similar to those in Purnanandam (2010), who also uses the HMDA data.

The share of out-of-state nonlocal loans might be determined simultaneously with the share of sold loans since the characteristics of the mortgages originated by a lender

**Exhibit 7**  
**The Sale Ability and the Out-of-State Nonlocal Lending Share**

	Share of Out-of-State Nonlocal					
	OLS (1)	FE (2)	2SLS (3)	OLS (4)	FE (5)	2SLS (6)
Lagged sales rate	0.096** (0.039)	0.186*** (0.063)	0.737* (0.383)	0.104*** (0.038)	0.188*** (0.065)	0.395** (0.193)
Assets (\$billion)				-0.001** (0.001)	-0.001*** (0.000)	
Application count (1000)				0.002*** (0.001)	0.001*** (0.000)	
Lagged GSE purchase				0.013 (0.025)	0.058 (0.053)	0.086* (0.052)
Lagged private securitization				0.034 (0.063)	-0.023 (0.026)	0.113 (0.095)
Lagged affiliation purchase				0.187** (0.092)	0.034 (0.027)	0.292** (0.119)
Lagged subprime ratio				0.191*** (0.059)	-0.027 (0.078)	0.306*** (0.085)
2007	-0.005 (0.015)	-0.006 (0.010)	-0.002 (0.025)	-0.008 (0.015)	0.004 (0.011)	-0.006 (0.018)
2008	-0.018 (0.017)	0.008 (0.012)	-0.002 (0.028)	-0.009 (0.016)	0.017 (0.013)	0.006 (0.021)
Constant	0.188*** (0.022)	0.127*** (0.037)	-0.187 (0.226)	0.144*** (0.025)	0.111** (0.048)	-0.062 (0.138)
R <sup>2</sup>	0.034	0.072		0.197	0.117	
Bank FE	No	Yes	Yes	No	Yes	Yes
Control	No	No	No	Yes	Yes	Yes
F-stat (1 <sup>st</sup> stage)			6.08			9.76

Notes: Each observation is a state-chartered commercial bank, mortgage banking subsidiaries excluded. The sample includes the banks that have out-of-state shares greater than 10%, originate more than 10 loans and sell at least one loan in a given year. In columns 1–6,  $N = 407$ .

Clustered standard errors in parentheses.

\*  $p < 0.05$

\*\*  $p < 0.01$

\*\*\*  $p < 0.001$

also affect its decision of secondary market participation. To deal with this problem, we use a two-stage least square model (2SLS) and report the results in Exhibit 7. In the 2SLS regression, the lagged share of sold loans is instrumented by a dummy for subsidiaries of Banking Holding Companies, the lagged asset and origination count, and the lagged share of conforming loans originated by the lender. These instrumental variables affect the secondary market involvement of banks, but are less likely correlated with the share of out-of-state nonlocal mortgages of banks.

Comparing the estimates from OLS and fixed effects (FE) models, the 2SLS estimates show a larger impact on the nonlocal share from the secondary market involvement, which strengthens our previous findings. However, the significance level of the 2SLS estimates is lower than those from the OLS and FE models, and the estimates from OLS and FE and 2SLS have overlapped confidence intervals. Such findings suggest that the simultaneity problem biases downward the effect of the secondary market involvement on the share of out-of-state nonlocal mortgages.

## CONCLUSIONS

This paper documents and investigates the high subprime rate and the high sales rate of out-of-state nonlocal mortgages. We show that nonlocal mortgage demand is greater in the neighborhoods where the borrowers get rejected by local banks more often. This indicates that less-creditworthy and riskier applicants tend to end up with nonlocal loans. Additionally, we explore the incentives to make nonlocal loans to low-quality applicants in other states by investigating banks' involvement in the secondary market. We find that banks that sell more loans to the secondary market in the past will originate a higher proportion of out-of-state nonlocal loans. The risky lending made by out-of-state nonlocal banks might be one contributing factor of the subprime crisis. Our findings suggest that government regulatory agents should be careful about the rules on interstate banking and brokers.

## ENDNOTES

1. Using the same measure, Dell'Ariccia, Igan, and Laeven (2009) investigate the relation between lending standards and credit boom of mortgages.
2. Fremont Investment & Loan originated 67.77% (48.83%) of the out-of-state nonlocal loans in 2005 (2006) and was closed in August 2008. According to the Federal Deposit Insurance Corporation (FDIC) press release, "On March 8, 2007, the FDIC issued a cease and desist order against Fremont Investment & Loan, Brea, California (Bank), and its parent corporations, Fremont General Corporation and Fremont General Credit Corporation."
3. Distinguishing the different explanations is left for future research.

## REFERENCES

- Avery, R.B., K.P. Brevoort, and G.B. Canner. Opportunities and Issues in Using HMDA Data. *Journal of Real Estate Research*, 2007, 29:4, 351–80.
- Berkovec, J. and P. Zorn. How Complete Is HMDA? HMDA Coverage of Freddie Mac Purchases. *Journal of Real Estate Research*, 1996, 11:1, 39–56.
- Coulton, C., T. Chan, M. Schramm, and K. Mikelbank. Pathways to Foreclosure: A Longitudinal Study of Mortgage Loans, Cleveland and Cuyahoga County, 2005–2008. Case Western Reserve University, Mandel School of Applied Social Sciences, Center on Urban Poverty and Community Development, 2008.
- Dell'Ariccia, G., D. Igan, and L. Laeven. Credit Booms and Lending Standards: Evidence from the Subprime Mortgage Market. International Monetary Fund working paper, 2009.

- DeYoung, R., W.S. Frame, D. Glennon, D.P. McMillen, and P. Nigro. Commercial Lending Distance and Historically Underserved Areas. *Journal of Economics and Business*, 2008, 60:1–2, 149–64.
- Ergungor, O.E. Bank Branch Presence and Access to Credit in Low to Moderate Income Neighborhoods. *Journal of Money, Credit and Banking*, 2010, 42:7, 1321–49.
- Gabriel, S. and S.S. Rosenthal. Secondary Markets, Risk, and Access to Credit: Evidence from the Mortgage Market. Unpublished working paper, 2007.
- Gerardi, K., A.H. Shapiro, and P.S. Willen. Subprime Outcomes: Risky Mortgages, Homeownership Experiences, and Foreclosures. Federal Reserve Bank of Boston working paper 07-15, 2007.
- Keys, B.J., T. Mukherjee, A. Seru, and V. Vig. Did Securitization Lead to Lax Screening? Evidence from Subprime Loans. *Quarterly Journal of Economics*, 2010, 125:1, 307–62.
- Loutskina, E. and P.E. Strahan. Securitization and the Declining Impact of Bank Finance on Loan Supply: Evidence from Mortgage Originations. *Journal of Finance*, 2009, 64:2, 861–89.
- . Informed and Uninformed Investment in Housing: The Downside of Diversification. *Review of Financial Studies*, 2011, 24:5, 1447–80.
- Mester, L.J., L.I. Nakamura, and M. Renault. Transactions Accounts and Loan Monitoring. *Review of Financial Studies*, 2007, 20:3, 529.
- Mian, A. and A. Sufi. The Consequences of Mortgage Credit Expansion: Evidence from the U.S. Mortgage Default Crisis. *The Quarterly Journal of Economics*, 2009, 124:4, 1449–96.
- Petersen, M.A. and R.G. Rajan. Does Distance Still Matter? The Information Revolution in Small Business Lending. *Journal of Finance*, 2002, 57:6, 2533–70.
- Purnanandam, A. Originate-to-Distribute Model and the Subprime Mortgage Crisis. *Review of Financial Studies*, 2011, 24:6, 1881–915.
- Rosen, R.J. Competition in Mortgage Markets: The Effect of Lender Type on Loan Characteristics. *Economic Perspectives*, 2011, 35:1, 2–21.
- Schwartz, A. Bank Lending to Minority and Low-Income Households and Neighborhoods: Do Community Reinvestment Agreements Make a Difference? *Journal of Urban Affairs*, 1998, 20: 3, 269–301.

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