Misreporting of Second Liens in Portfolio Mortgages and Privately Securitized Mortgages

Preliminary Draft

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Abstract

Using a unique nationwide mortgage servicing dataset, this paper investigates the underreporting of second liens in both portfolio mortgages and privately securitized mortgages. We document that over 27% of portfolio loans and over 33% of privately securitized loans have second liens, and more than 40% of those second liens are underreported. Loans with misreported second liens have about 90% higher chance of default and incur about 90% higher loan losses in relative terms. Lenders seem to know the existence of the second liens in portfolio loans and intentionally misreport second liens with higher second lien LTV ratios and associated with risky first mortgages. Sold loans ex post have lower misreporting rate than observably similar portfolio loans. The effect is especially strong for loans that are subject to tighter screening such as low documentation loans and loans ex ante perceived harder to sell. In addition, we offer evidence that the lender-MBS servicer affiliation also plays a role in misreporting.

1 Introduction

The truthful reporting of financial assets is essential for a healthy capital market. Without accurate asset reporting, the financial market may misestimate the systemic risk and be at risk of a catastrophic event. Asset misreporting has come into question ever since the recent financial crisis. For example, Begley, Purnanandam and Zheng (2017) document that banks underreport the risk in their trading books when they have lower equity capital.[1] There have also been numerous instances of fraud related to asset misreporting in the mortgage industry. As a result, many of the largest mortgage originators and mortgage-backed securities issuers and underwriters have been implicated in regulatory settlements, and were forced to pay billions of dollars in penalties.

Having a second mortgage on top of the first mortgage increases the combined loan-to-value ratio (CLTV) and the credit risk of the first mortgage. Reporting a first mortgage that has a second lien as having no second lien leads investors, mortgage servicers, and regulators to underestimate the credit risk of the first mortgage. Moreover, second liens play a crucial role in the US residential mortgage market. Outstanding amount of home equity lines of credit and home equity loans secured by junior liens in 2018 exceeded 540 billion dollars.[2]

Despite being a widespread concern, the reporting quality of financial assets is typically difficult to investigate, especially on a large scale. This paper utilizes a unique dataset to

[1] Furthermore, Begley, Purnanandam and Zheng (2017) show that underreporting becomes significantly more frequent during the periods of high systemic risk.

[2] For example, Goodman, et. al. (2010) estimate that more than 50 percent of non-agency mortgages were accompanied by a second lien. They also report that the presence of a second lien raises the combined loan-to-value ratio (CLTV) by over 20 points and has a significant adverse impact on first-lien performance. Prior to financial crisis, however, investors and servicers were seriously disadvantaged by the lack of data on who owns and who services first and second liens on the same property.

investigate the presence and impact of second lien misreporting in both portfolio loans and privately securitized loans during the pre-crisis period. We use a nationwide mortgage servicing dataset and a matched nationwide county-level deed dataset to identify the underreporting of second liens. The mortgage servicing data contains the second lien information *reported/transferred* to the mortgage servicers by the lenders. The matched deed dataset provides the *true* second lien status recorded at the county Recorder's Office. The *true* second liens are restricted to loans originated at the same date as the first mortgages (concurrent second lien). [3]

Moreover, the dataset allows us to study the second lien misreporting not only in privately securitized loans but also in portfolio loans, and to compare the misreporting difference between the two groups of loans. Previous literature have studied the second lien misreporting in privately securitized loans. Misreporting of second lien in portfolio loans has not been investigated. Portfolio loans are originated by the lender and kept on the lender's book. Thus, the portfolio loan setting allows us to study the presence of second lien misreporting in the absence of complicated securitization structures. Since the lender is the only financial institution involved in portfolio loan second lien reporting, this portfolio loan setting allows us to investigate the lender's role in misreporting. Comparing the misreporting rates between sold loans and portfolio loans also makes it possible to draw inferences on the role of securitization in second lien misreporting.

We find significant amounts of second lien misreporting in both portfolio loans and

[3] This is an important restriction due to the fact that second liens can be issued months or years after the origination or securitization of the senior mortgage. In case of this, lenders would not know the existence of the second lien at the first lien origination.

sold loans originated in year 2005 and 2006. More than 27% portfolio loans and more than 33% of sold loans have concurrent second liens, and more than 40% of those second liens are underreported. The second lien misreporting is consistent over the pre-crisis time and exists in a variety of sub samples. Loans with misreported lien status have about 90% higher chance of default and incur about 90% higher loan losses (in relative terms) than other loans with similar reported loan characteristics.

Misreporting in portfolio loans does not seem to be purely random or just due to a lender's poor record keeping practice. Lenders seem to intentionally underreport certain second liens. The results show that higher second lien LTV ratio (ratio of the second lien amount to property value) is the most important factor leading to underreporting for portfolio loans. Economically, a 10% increase (absolute term) in second lien LTV ratio leads to an over 20% increase in misreporting probability in relative terms. Furthermore, lenders are more likely to misreport second liens associated with lower quality first mortgages such as those with higher first lien LTV, lower borrower credit scores, low documentation status, adjustable interest rate, and longer loan terms. First mortgage portfolio loans with misreported second liens carry slightly higher mortgage rate than the otherwise similar mortgages. This indicates that lenders know the existence of at least some of the underreported second liens and have priced some of the additional risk in the contract rate of the corresponding first mortgage. In addition, the validation sample shows that about eighty-two percent of the mortgages with misreported second liens have the same first lien lender and the second lien lender. With the same lender originating the first and second mortgages at the same date, it seems reasonable to assume that the lender knows the existence

of the second lien. All of the above evidence indicates that lenders are likely to intentionally misreport riskier second liens. The results are not driven by the potential differences in lender reporting practices for the mortgage servicing file.

Underreporting a second lien increases the valuation of the mortgage servicing right associated with the first mortgage. Underreporting a second lien also increases the possibility of selling the first mortgage to the secondary market at a potentially more favorable price. To explore loan sale as a potential motivation of second lien underreporting, we utilize the approach of Keys et al (2010) and show a discontinuity of misreporting rate around the FICO score of 620 for low documentation loans and 580 for full documentation loans, and around the debt-to-income ratio (DTI) of 0.5. This provides evidence that loan sale consideration plays a role in portfolio loan second lien underreporting. The market mechanisms such as lender reputation concerns do not seem to properly address the misreporting issue. [4]

When comparing the ex post misreporting rates between sold loans and portfolio loans, we focus on jumbo loans as GSE does not play a role in the jumbo loan market. The analysis shows some interesting results. For full documentation loans, sold loans do not have significantly different misreporting probability than observably similar portfolio loans. For low documentation loans, however, sold loans are about 46% less likely to be misreported in relative terms. Similarly, sold loans with borrowers' credit scores great than 620 do not show significant difference in misreporting from portfolio loans. Sold loans with borrowers' credit scores less than 620 have significantly lower misreporting than portfolio loans. When

[4] It is important to add that our data is servicing data, hence we only observe the reporting status in the servicing contracts. This reporting is not subject to banking regulations. The only force to induce lenders to report second liens truthfully is the market forces, such as reputational concerns.

sorting the loans according to the expected probability of securitization, the results consistently show that sold loans in the top quartile of perceived probability of sale (easier to sell) have similar misreporting as portfolio loans, while loans in the bottom quartile of the perceived probability of sale (harder to sell) have significantly lower misreporting. The results show that among loans subject to lax screening during the securitization process, there is no significant different in misreporting between sold loans and portfolio loans. However, among loans subject to scrutiny of quality from MBS issuers/investors, sold loans have significantly lower misreporting than similar portfolio loans. This distinction is important as it indicates that securitization is not to be blamed for misreporting of all loans and MBS issuers and investors could have additional screening in the securitization process to help lower the misreporting rate especially for low documentation loans and loans that perceived harder to sell ex ante. One possible explanation is that buyers of senior tranches of MBS are generally purchased by institutional buyers (e.g. pension funds) who are considered less sophisticated and rely on rating agencies for pricing and risk assessment. In contrast, junior tranches are generally purchased by hedge funds who are considered more sophisticated and have their own risk and pricing models and might apply additional loan screenings.[5]

We also infer the affiliation between MBS loan servicer and the loan originator, and find that the affiliation plays a role in the securitization effect on misreporting. We use the investor status when a sold loan enters the dataset to infer if the servicer of a sold loan solely services the sold loan. If the sold loan has a servicer solely servicing the sold loan, then the

[5] This result is in line with Yavas and Zhu (2019) who report that lenders sell lower quality prime loans and keep higher quality loans on their books while selling better quality subprime loans and keeping lower quality subprime loans on their books.

lender and the MBS servicer is less likely to be affiliated. Otherwise, if the servicer services both the portfolio loan and the sold loan, the lender and the servicer is more likely to be affiliated. The results show that unaffiliated MBS servicer reduces misreporting in sold loans, which is consistent with the previous findings that additional screening reduces misreporting in sold loans. If the sold loan has a lender-affiliated MBS servicer, this increases misreporting for both full and low documentation loans, which could be driven by the lender's motivation to seek more favorable loan sale and/or mortgage servicing right sale terms.

The two studies most directly related to our work are Piskorski et al. (2015) and Griffin and Maturana (2016). Both of these studies document second lien misreporting (reporting loans with a second lien as having no second lien) in the securitized residential mortgage market. Piskorski et al. (2015) document that underreporting of second liens led to understatement of the true CLTV (cumulative loan to value ratio) by about 20 percentage points and the rate of misrepresented loan default was 70% higher than for similar loans. Investors holding securities with misrepresented collateral suffered severe losses because pools with a large share of misrepresentations were not issued at a discount relative to pools with few misrepresentations. Griffin and Maturana (2016) report that two-thirds of loans with unreported second liens had the same originator issuing both the first and second lien. As in Piskorski et al. (2015), they also find that MBS investors were unaware of misreporting as misreporting is not reflected in MBS pricing or subordination. They also show that both loan originators and underwriters might play a role in underreporting of second liens.

Both Piskorski et al. (2015) and Griffin and Maturana (2016) focus misreporting of

second liens for securitized loans where both lender and MBS underwriter/servicer may play a role in the second lien reporting quality. In the current paper, we are able to study misreporting of second liens for portfolio loans as well as securitized loans. Portfolio loans are originated by a lender and retained in the same lender's book. Thus, the mortgage lender is the only financial institution that could have an impact on the second lien reporting quality of portfolio loans. This distinction is critical because this makes it possible to investigate the role of the lender versus underwriter in asset reporting quality. It also enables us to investigate if securitization leads to more or less misreporting activity.

Levitin and Wachter (2015) highlight a problem that lenders face with second liens. They argue that the federal Garn-St. Germain Depository Institutions Act of 1982 enabled homeowners to obtain second mortgages without the permission of first mortgage lenders. This makes it practically impossible for first mortgage lenders to accurately determine the leverage and price the risk, on their mortgages. This problem arises when the second lien is obtained subsequent to the first lien. We highlight a different problem with second liens. What we show is that even when second mortgages were issued by the same lender on the same day as the first mortgage, they were often not reported by the lender. On a related note, Goodman, et. al. (2010) show that the performance of simultaneous seconds is worse than subsequent seconds. Agarwal, et. al. (2014) point to another (agency) problem created by second liens where servicers are less likely to act on the first lien mortgage owned by investors when they themselves own the second lien claim secured by the same property.

Our paper is also related to literature on misrepresentation by borrowers. Examples include Ben-David (2011) who report that financially constrained home buyers artificially

inflated transaction prices in order to obtain larger mortgages, Jiang, Nelson, and Vytlacil (2014) who show that low-documentation loans, also known as "liar's loans," contains borrower information falsification, Garmaise (2015) who documents misreporting of personal assets by borrowers, Mian and Sufi (2015) who highlights fraudulent income overstatement on mortgage applications, and Carrillo (2013) who proposes methods to detect mortgage fraud. Our paper is also related to studies that documented failure of credit rating agencies in their responsibility to adequately assess the risk of underlying collateral in the securities they rated prior to the financial crisis (Griffin and Tang, (2012); Griffin, Nickerson, and Tang (2013); and Rajan, Seru, and Vig (2015)).[6]

In addition to being crucial for an accurate assessment and pricing of default risk by mortgage lenders, servicers and investors, having a good understanding of misreporting of second liens is also critical for policy makers. Loan to value ratios are closely monitored by policy makers and regulators for early signs of problems for the financial system. In the absence of an accurate measure of second liens, cumulative loan to value ratios, hence the risk of instability in the financial system, will be underestimated. In fact, it has been argued that one of the reasons the Fed failed to foresee the financial crisis coming was its inability at the time to match first and second liens on the same property.

This paper is organized as follows. Section 2 discusses data, sample and summary

[6] Our paper is also related to a large literature on financial crisis, including moral hazard and adverse selection problems created by securitization. See, among others, Mian and Sufi (2009, 2011), Mayer, Pence, and Sherlund (2009), Keys et al. (2010), Piskorski, Seru, and Vig (2010), Agarwal et al. (2011), Ben-David (2011), Purnanandam (2011), Demyanyk and Van Hemert (2011), Demiroglu and James (2012), Agarwal, Chang, and Yavas (2012), Keys, Seru, and Vig (2012), Keys et al. (2013), Nadauld and Sherlund (2013) , Acharya, Schnabl, and Suarez (2013), He, Qian, and Strahan (2013), Ambrose, Sanders and Yavas (2016) and Ambrose, Conklin, and Yoshida (2016).

statistics. Section 3 presents the results of loan performances and misreported second lien. Section 4 investigates whether misreporting is done intentionally and whether it is priced in the mortgage rate. Section 5 explores why we observe misreporting in portfolio loans. Section 6 studies the impact of securitization on misreporting, and Section 7 concludes.

2 Data, Sample and Summary Statistics

This section discusses the data sources, sample construction, and the summary statistics. Section 2.1 introduces the data sources, sample, and variable definitions. Section 2.2 provides the summary statistics and the initial evidence of the presence of second lien misreporting.

2.1 Data, Sample and Variable Definitions

The main data source of this study, McDash Core Data, is provided by Black Knight Financial Service (BKFS). The McDash Core Data was previously called LPS data and provided by the LPS Applied Analytics. BKFS acquired the McDash Data through the acquisition of the LPS Applied Analytics. McDash Core Data includes the residential mortgages serviced by the nine out of the ten largest US residential mortgage servicers. This data set has detailed loan origination information such as borrowers' credit scores, loan-to-value ratios, and documentation status, etc. Subsequent loan performances such as payments and defaults were tracked and reported monthly. This data set has been used by academic research such as Piskorski et al. (2015), etc.

BKFS used their proprietary methodology to match the McDash Core Data with the nationwide county-level Recorder Data (public record data) and create the McDash Property Module. The Property Module provides the real estate property transaction history such as the property transaction dates and the property transaction prices, etc. The Property Module also reports the mortgage activities associated with the real estate transactions, such as the first lien amount, and the second lien status. We link the McDash Core Data and the Property Module using a common identifier to form the main sample. We also obtain the Recorder's Data from two counties (Orange County, CA and Miami County, FL) and match with the McDash Core Data to form a validation sample. This validation sample is used for the validation of concurrent second lien status identified in the main sample, and for the robustness checks of the analyses by including the lender fixed effects.

The main sample includes both privately securitized loans and portfolio loans. The analyses focus on the pre-crisis time period and include mortgages with origination time ranging from January 2005 to December 2006. The sample starts from year 2005 since the McDash Data does not have comprehensive coverage of some critical variables for mortgages originated before year 2005. For example, the variables such as documentation status and debt-to-income ratio were not included in the data until January 2005. Starting from year 2007, there was a structural change of the private securitization market, which makes it difficult to identify a lender's original intention whether to keep the mortgage in her own book or sell the mortgage to the mortgage backed security pool.

Mortgages are heterogeneous products. To reduce heterogeneity, we restrict the mortgages in the sample to conventional, single family, first lien loans with a mortgage term

of thirty or forty years. Mortgages financing a new purchase and refinancing an existing loan are both included in the analyses. To avoid potential data errors, loans are limited to have the underlying property value between $5K and $1.5M, loan-to-value ratio at origination between 0.3 and 1.1, and the combined loan-to-value ratio lower than 1.1 at origination. To control for survival bias, loans are required to enter the dataset within three months of origination.

The main interest of this paper is to investigate second lien underreporting - whether the reported second lien status is the same as the true second lien status. We obtain the reported second lien status from the McDash Core Data that is provided by mortgage servicers. Each mortgage record in the McDash Core Data origination file reports separately the first lien LTV ratio and the CLTV ratio. The CLTV ratio represents the aggregate LTV ratios from both the first lien and the second lien. We infer the reported second lien status of a mortgage by comparing the reported CLTV ratio to the reported first lien LTV ratio. If the CLTV ratio is more than two percent higher than the LTV ratio, the mortgage is identified as having a *reported* second lien. Otherwise, the mortgage is identified as having no *reported* second lien. We add in the two percent gap to avoid potential data error.

The true second lien status is inferred using information provided in the Property Module. The Property Module information is obtained from the county-level Recorder's Data (public record). All mortgage transactions including the first lien, the simultaneous second lien, and the subsequent liens are recorded in the county-level Recorder's Data. If a second lien is originated at the same date as a first lien mortgage (concurrent second lien), the public record reports the concurrent second lien together with the first mortgage in a

single record. If a subsequent second lien mortgage (after the first mortgage) is issued, it will be reported as a separate item in the public record. Black Knight checks into the Recorder's Data every month to update the Property Module and creates a new property-level record every month. If a second lien is originated after the first mortgage, then lenders would not know the second lien at the first lien origination. Thus, not including a subsequent second lien in the first mortgage reporting would not represent misreporting. Since Black Knight captures both the concurrent second liens and the subsequent liens, we need to ensure that only the simultaneous second mortgages are counted in when inferring the true second lien status. In order to ensure that only the simultaneous liens are counted, we use only the earliest observation of the first mortgage transactions captured by the Black Knight Property Module, and require that the second mortgage shows up in the exact same date and in same record in the Property Module as the first mortgage. We also require that the time difference between the recording date of the first observation of the mortgage in the Property Module and the loan origination date is less than three months. The three-month limit is chosen since there is a time lag between the county recording date and the loan origination date, and there could be an additional time lag between the Property Module update time and the county recording time (at least one month).[7]

To further validate that the second liens identified in the main sample are truly concurrent second liens, we obtain the Recorder's data from Orange County, CA and Miami, FL, and merge the McDash Core Data with the public records. To ensure high quality matching, we match the new purchase loans from public records and the mortgage data from

[7] These restrictions might lead to underestimation of the second lien misreporting.

BKFS, as new purchase loans have the actual transaction price information. About 95% of the public records have the actual transaction dates and about 5% of the public records only have the recording dates, which are different from the transaction dates. If the public records have the actual transaction dates, we require the mortgage data and the public record transaction data have the same zip codes, the same transaction dates, the same loan amounts (in $1000), and the same sale prices (in $1000). In case of absence of transaction dates in the public records, we require the mortgage data and the transaction data have the same zip codes, the same loan amounts (in $1000), the same sale prices (in $1000), the same loan types, and the difference between the recording date and the transaction date less than sixty days. We choose the time lag of sixty days since the average lag from the transaction date to recording date is about 30 days from the public record data. However, it is possible to be 60 days or longer from the actual transaction date to the recording time. The matching standards ensure high quality matching. This forms the validation sample. We are able to confirm that all the identified misreported second liens in the validation sample were originated as the concurrent second liens and have the same transaction dates as the first mortgages.[8]

The Property Module provides the first lien LTV ratio and the CLTV ratio based on County Recorder Data. We compare the first lien LTV ratio and the CLTV ratio in the Property Module. If the difference between the CLTV ratio and the first lien LTV ratio is greater than two percent, the mortgage is deemed as truly having a second lien. The difference between the CLTV ratio and the first mortgage LTV ratio in the Recorder Data is

[8] About 94% of the second liens are recorded in the same property transaction record with the first lien. The remaining 6% second liens are recorded as a separate record but the transact date is the same as the corresponding first lien of the same property.

calculated as the true second lien LTV ratio (LTV2Lien).

If a mortgage truly has a second lien (from public record), but is reported as having no second lien in the McDash Data, the misreported second lien variable (Mis2Lien) equals to one. Otherwise, the misreported second lien variable equals to zero. This misreported second lien variable is the main variable of interest in this paper. If a mortgage truly has a second lien and is also reported as having a second lien, the truly reported second lien variable (TrueR2Lien) equals to one. Otherwise, the truly reported second lien variable equals to zero. If a mortgage truly has no second lien and is reported as having no second lien, the truly reported no second lien variable (TrueRNo2Lien) equals to one. Otherwise, the truly reported no second lien variable equals to zero.

Next, we classify a mortgage into a portfolio loan or a securitized loan. The investor status (whether the loan is hold on a bank's book or sold to the MBS pool) could change over time. The purpose is to identify a lender's initial intention whether to keep or sell the mortgage. Previous study documents that over seventy-five percent of securitized mortgages were sold within six months of loan origination (Zhu, Yavas, and Higgins (2018)). The longer it takes to get the loan sold, the less likely the mortgage is originated with a lender's initial intention to get it securitized. Thus, we first take the investor status six months after origination and then make additional adjustments.[9] The first adjustment is to take out loans defaulted within six months after origination. Those early default loans may default too early to be securitized and thus might end up on a lender's balance sheet without a lender's initial intention to keep it. The second adjustment is to take out repurchased loans. Those are loans

[9] As robustness check, we also take the investor status at twelfth month after origination as the starting point.

securitized first then repurchased back by the lender due to default or violation of warranty clauses. We also require that the portfolio loan remains in a bank's balance sheet till the end of the sample time period.

Other mortgage characteristics variables at origination include a borrower's credit score (FICO, scaled by 100 for regression analysis), full documentation status (FullDoc) which equals one if a borrower provides full documentations on income and assets, low documentation status (LowDoc) which equals to one if a borrower provides low or no documentation on income or assets, fixed interest rate dummy (FRM) which equals to one if the mortgage carries fixed interest rate, first lien loan-to-value ratio (LTV), true second lien loan-to-value ratio (LTV2Lien), reported combined loan-to-value ratio (CLTV), reported second lien status (SecondLien), debt-to-income ratio (DTI), purchase dummy (Purchase) which equals to one if a mortgage is used to finance a new purchase, jumbo loan dummy (Jumbo) which equals to one if a mortgage has loan amount greater than the limit set by the Federal Housing Finance Agency (FHFA), exotic loan dummy (Exotic) which equals to one if a loan has interest only, initial teaser rate, or balloon payment features, owner occupied dummy (OwnerOccupy) which equals to one if the property is reported as owner occupied, and loan term (Term30) dummy which equals to one for loans with a thirty-year loan term. Next section discusses the summary statistics.

2.2 Summary Statistics

This section presents the summary statistics and provides the initial evidence of second lien

misreporting in both portfolio loans and securitized loans. Table 1 reports the loan characteristics at origination, the subsequent loan performances, and the overall second lien misreporting information. Table 2 reports the misreporting rates over time and across various sub samples.

We present the summary statistics separately for portfolio loans and privately securitized loans in Table 1. Loans are further divided into three categories according to the second lien reporting status: misreported second lien where a mortgage with a second lien is reported as having no second lien (Mis2Lien), truly reported second lien status where a mortgage with a second lien is truly reported as having a second lien (TrueR2Lien), and loans with truly reported no second lien status (TrueRNo2Lien). Panel A reports the mean values of loan characteristics at origination. Panel B summarizes the subsequent loan performances using a variety of measures. Panel C shows the number and the percentage of observations according to second lien reporting status, and the true value of the second lien LTV ratios (LTV2Lien).

Table 1 Panel C shows that 11.48% of portfolio loans that truly carry a second lien were reported as having no second lien, and 14.20% securitized loans have misreported second lien status. Put it in another way, given true second lien status, a portfolio loan would have 42.13% chance misreporting the mortgage as having no second lien (11.48/(11.48+15.77)=42.13%). Similarly, given true second lien status, about 43% of sold loans were misreported the second lien status (14.20/(14.20+18.87)=42.94%). The second lien LTV ratio (ratio of the second lien amount to property value) that were correctly reported on average is lower than that of the wrongly reported ones, for both portfolio loans (12.64%

versus 14.47%) and securitized loans (14.57% versus 17.29%). As for loan characteristics from Panel A, portfolio loans with misreported second lien have slightly lower borrower credit scores, lower proportion of loans with full documentations, more adjustable rate mortgages (ARMs), more exotic loans, and lower proportion of loans with a thirty-year loan term. Securitized loans with misreported second lien status have lower proportion of fixed rate mortgages, higher percentage of exotic loans, and fewer loans with a thirty-year loan term. Loans with misreported second liens seem to carry more risky features than the corresponding loans with truly reported second liens.

Panel B reports the different measures of loan performances including the default rate within twenty-four or thirty-six months after loan origination (Default24m or Default36m), and the average loan losses within thirty-six or forty-eight months after origination (Loss36m or Loss48m). Default is defined as missing at least three consecutive payments or in foreclosure or bankruptcy process. Loan loss rate, also known as loan severity rate, is calculated as (Loan Balance at Default – Liquidation Value) / Loan Balance at Default. If a mortgage remains current or is not yet liquidated within the specific tracking time, the loan loss is treated as zero. Across different measures of loan performances, mortgages with misreported second lien status perform dramatically worse than the corresponding mortgages with correctly reported second lien status. For example, about 13% portfolio loans with misreported second lien status default within twenty-four months of origination. While the portfolio loans with correctly reported second liens show only less than 6% default rate. In another words, portfolio mortgages with misreported second liens are more than twice as likely to default as the corresponding loans with correctly reported second liens. The loan

losses are also more than doubled for mortgages with misreported second liens than those with correctly reported second liens. The securitized loans display similar patterns of loan performances. However, the relative difference of performances between loans with correctly reported second lien and misreported second lien seems to be smaller in magnitude than that of portfolio loans. Comparing sold loans and portfolio loans, securitized loans show worse loan performance than the corresponding portfolio loans in each corresponding category. Overall, Table 1 provides evidence that there exists significant second lien misreporting in both portfolio loans and securitized loans, and loans with misreported second lien status perform significantly worse than the corresponding loans with truly reported second liens.

Table 2 exhibits misreporting rates for each quarter from year 2005 to year 2006 in Panel A, and across different sub samples in Panel B. We report three measures of misreporting rates: loans with misreported second liens as a percentage of loans reported as having no second liens (%ReportedNo2Lien), loans with misreported second liens as a percentage of the whole sample (%Whole), and loans with misreported second liens as a percentage of loans truly having second liens (%True2Lien). The first two measures intend to capture the overall misreporting level of the given mortgage pool. The third measure helps reveal the misreporting information from a lender's decision perspective as a lender may misreport second liens only on those loans having true second liens. We notice that there exists significant misreporting each quarter during the years 2005 and 2006 for both portfolio loans and securitized loans. When measured as a percentage of the whole sample (%Whole) or as a percentage of the reported no second lien sample (%ReportedNo2Lien), securitized

loans seem to carry higher misreporting rates than portfolio loans, regardless of the different measurements of misreporting, time period investigated, or the various sub samples. However, when measured as a percentage of loans truly having second liens (%True2Lien), sold loans do not always carry higher misreporting rates than portfolio loans. For example, while 63.84% low documentation portfolio loans with true second liens were misreported as having no second lien, only 42.84% low documentation sold loans were misreported as having no second liens. Both full documentation loans and low documentation loans carry significant second lien misreporting, though low documentation loans seem to have higher misreporting occurrence than full documentation loans, except for sold loans when measured as a percentage of loans with true second liens (%True2Lien). New purchase loans have higher misreporting rate than refinance loans when measured as a percentage of the whole sample (%Whole) or as a percentage of the reported no second lien sample (%ReportedNo2Lien). This is consistent with previous findings from sold loans (e.g., Piskorski et al., 2015). While it is not uncommon to have simultaneous liens to fund a new purchase, it is relatively rare to refinance into two liens simultaneously. Adjustable rate mortgages have higher misreporting rate than fixed rate mortgages. Loans with both high and low borrower credit scores exhibit similar levels of misreporting rate. Loans with LTV ratios less than or equal to 80 percent have high misreporting rate while there is almost no misreporting for loans with LTV ratios greater than 80 percent. Next section investigates whether the misreported second lien has any material impact on loan performances.

3 Misreported Second Lien and Loan Performances

After documenting that there is a significant amount of second lien misreporting in both portfolio loans and securitized loans, the next question is whether misreported second liens have any material impact on loan performances. If the misreported second liens do not have any material impact on loan performances, then this may not be a serious concern for the financial markets. However, if misreported second liens do affect loan performances in a material way, then the second lien misreporting would lower the perceived risk associated with the first mortgage and change the corresponding valuation and risk assessment of the first mortgage for the mortgage backed security (MBS) investors, the mortgage servicing right purchasers, and the regulatory agencies. In other words, loans with misreported liens would convey false information to financial markets regarding the risk level of the first mortgage, which would lead to inaccurate valuation and loss expectation of the first mortgage. Section 2 documents that mortgages with misreported second liens have higher default rates and incur larger loan losses than those with correctly reported second lien status. The difference in loan performances, however, may partly be due to the different loan characteristics between the two loan groups. This section investigates, after controlling for observable loan characteristics, whether misreported second liens have any impact on loan performances. We conduct the analysis of the impact of misreported second liens on both default probability and loan losses.

We use the Logit model to run the default regression. The dependent variable, default, equals to one if a borrower missed at least three consecutive mortgage payments or was in foreclosure or bankruptcy status within twenty-four months after origination (Default24m).

Otherwise, the default variable is set equal to zero. The explanatory variable of interest is the misreported second lien status. Loan characteristics at origination are included as control variables, including the reported CLTV ratio. We also include the state fixed effects and loan origination month fixed effects in the regressions to capture the potential market variations across time and space. State fixed effects also help control for the differences in foreclosure laws across states, and their potential impact on default decisions.[10] Table 3 reports the regression coefficient estimates and the standard errors of the Logit Model. The reported standard errors are clustered by state. We report the regression results separately for portfolio loans and securitized loans. We also investigate the whole sample, the new purchase sub sample, and the refinance sub sample. For both portfolio loans and securitized loans, across difference samples, misreported second liens are consistently associated with higher default probabilities. The effect is significant at one percent significance level. Economically, the marginal effects of the misreported second liens range from around 5% for whole sample portfolio loans to almost 10% for whole sample securitized loans. The marginal effects are calculated as the change of the predicted probability of default when the misreporting variable changes from 0 to 1, using the corresponding coefficient estimates from the default regressions and holding other independent variables at their means. Given the average default rate of 5.57% for portfolio loans with truly reported second lien status, misreported second liens increase the default probability by almost 90% in relative terms (5%/5.57%=89.77%). The results show that misreporting of second liens has an economically large and statistically significant impact on loan performance. Thus, reporting a mortgage with a second lien as having no second lien lowers the market's

[10] See, for instance, Pence (2006) and Demiroglu et al (2014) for the impact of state foreclosure laws on mortgage default.

perceived credit risk of the associated first mortgage, and could lead to distorted valuation and risk assessment of the first mortgage.

Table 4 reports the loan loss regression coefficient estimates and the standard errors of the OLS Model. The dependent variable is loan loss rate within thirty-six months after origination (Loss36m = (Loan Balance at Default – Liquidation Value) / Loan Balance at Default). The independent variables, including state and origination month fixed effects, are the same as in Table 3. The reported standard errors are clustered by state. The results show that, for observably similar loans, misreported second liens are associated with significantly higher loan loss for both portfolio loans and securitized loans. For example, misreported second lien increases loan loss by 1.49% for portfolio loans and by 1.92% for sold loans. Compared with the average loan loss rate of 0.45% for portfolio loans with truly reported second liens, misreported second liens increase the loan loss rate by more than three folds (1.49%/0.45%=3.22). Compared with the average loan loss rate of 2.08% for sold loans with truly reported second liens, misreported second liens increase the loan loss rate by more than 90% (1.92%/2.08%=0.92). The results again show that misreported second liens have a large magnitude of negative impact on mortgage performances. The following section investigates whether lenders intentionally misreport certain second liens.

4 Do Lenders Misreport the Second Liens Intentionally?

Given the significant amount of second lien misreporting and the material impact of the misreported second lien on loan performances, the next question arises: is the misreporting purely due to a lender's poor bookkeeping practices or does the lender intentionally misreport certain second liens? We conduct three experiments to investigate whether a lender is likely to know the existence of the second lien and whether a lender intentionally misreports certain second liens.

We first use the validation sample to check whether the first lien lender and the second lien lender are the same financial institutions. The results show that about 81% of the loans with misreported second lien have the same first mortgage lender and the second lien lender. If the same lender originates the first lien and the second lien on the same day, the chances that the lender does not know the existence of the second lien should be slim.

The following sections provide additional evidence. Section 4.1 investigates the determinants of second lien misreporting. If loans with certain characteristics are more likely to have second lien misreported, this indicates that misreporting may not be a purely random event. Section 4.2 studies whether lenders price loans with misreported second liens higher than otherwise observably similar loans. If loans with misreported second liens are priced higher than the otherwise observably similar loans, this provides evidence that lenders seem to know the existence of the second liens and price some or all of the risk associated with the misreported second lien in the corresponding first mortgage.

4.1 Determinants of Second Lien Misreporting

This section studies whether certain mortgages are more likely to have the second lien misreported. We investigate the determinants of second lien misreporting for portfolio loans and sold loans separately. The portfolio loans are especially useful in investigating the role of lenders in misreporting. Previous research investigates misreporting in sold loans. Since multiple financial institutions such as lenders and underwriters may get involved in the securitized loan reporting process, it is challenging to separate out the role of lenders in misreporting. However, for portfolio loans, the mortgage lender is the only financial institution who plays a role in the loan reporting. Thus, the portfolio loan setting allows us to more directly study the role of mortgage lenders in the second lien misreporting.

Are loan characteristics of mortgages with misreported second liens different from those with truly reported second liens? If some loan characteristics are systematically different between misreported loans and truly reported loans, this indicates that lenders may intentionally choose loans with certain characteristics to misreport the second lien information. Following the literature (Piskorski et al. (2015) and Griffin and Maturana (2016)), we adopt the OLS regression to study the determinants of second lien misreporting. Loans included in this analysis are loans with second liens. The dependent variable is the second lien misreporting, which equals to one if the second liens were not reported and equals to zero otherwise. Explanatory variables include the second lien LTV ratio, other borrower/loan characteristics at origination, state fixed effects and loan closing month fixed effects.[11]

[11] Given the nonlinearity of FICO score and misreporting rate, as shown in the next section, we also use dummy variables to do robustness checks. We create three dummy variables for FICO scores. If the FICO score is greater than 575 and lower than 620, the variable FICO1 is set to one, and zero otherwise. If FICO score is

Table 5 reports the OLS regression results for the whole sample, the new purchase sub sample and the refinance sub sample for the corresponding portfolio loans and sold loans separately. The standard errors are clustered by state. We observe that the value of second lien LTV ratio has a significant impact on second lien misreporting for both portfolio loans and sold loans. The higher the second lien LTV ratio, the more likely the second lien is misreported. The effect is significant at one percent statistical level. Economically, a ten percent increase in the value of second lien LTV ratio on average leads to about ten percent increase in the probability of misreporting for the portfolio loan whole sample and about sixteen percent increase in the probability of misreporting for the sold loan whole sample. Given the average portfolio misreporting rate among loans with a second lien is 42.13% (11.48%/(11.48%+15.77%) = 42.13%), a 10% increase in misreporting probability in absolute terms is equivalent to a 23.7% increase in misreporting probability in relative terms (10%/42.13%=23.74%), which represents a large economic impact. Similarly, given the average sold loan misreporting rate for loans with a second lien is (14.20%/(14.20%+18.87%)=42.94%), a sixteen percent increase in misreporting probability in absolute terms is equivalent to a 37.26% increase in misreporting probability in relative terms for sold loans (16%/42.94%=37.26%). The value of second lien LTV ratio seems to have a larger impact of misreporting on sold loans than for portfolio loans. The results show that misreporting is not purely random, but rather relates to the value of second lien LTV

greater than 620 and lower than 680, then the dummy variable FICO2 equals to one, and zero otherwise. If FICO score is greater than 680, the dummy variable FICO3 equals to one, and zero otherwise. The baseline case is borrowers with FICO scores lower than 575. Similarly, given the discontinuity of DTI ratio on misreporting, as shown in next section, we divide the DTI variable into two variables: DTI1 and DTI2. DTI1 equals to 1 if DTI ratio is greater than 0.5, and zero otherwise. DTI2 equals to 1 if DTI ratio is less than or equal to 0.5, and zero otherwise. The results remain similar.

ratio.

As for other loan characteristics, loans with misreported second liens tend to have higher credit risk components, including lower borrower credit scores, higher first lien LTV ratio, adjustable interest rates, and longer loan terms. Low documentation status increases portfolio loan second lien misreporting in a large magnitude but decreases sold loan second lien misreporting in a smaller magnitude. A second lien might not increase the perceived credit risk of a high quality loan as dramatically as that of a low quality loan, given the nonlinearity of loan quality versus credit risk. In other words, the marginal benefit of lowering the perceived credit risk to the lender by misreporting the second lien might be larger for low credit quality loans than high quality loans. The lower credit risk created by misreporting the second lien could increase the possibility of loan sale with a more favorable valuation, and/or increase the potential sale price of the mortgage servicing rights. The evidence presented above indicates that lenders seem to intentionally choose to misreport higher LTV ratio second liens for lower credit quality first mortgages.

4.2 Mortgage Rate and Second Lien Misreporting

Given one mortgage with no second lien and one mortgage with a misreported second lien, if the lender does not know the existence of the misreported second lien, the interest rates of the two otherwise similar mortgages should be the same. If the mortgage with a misreported second lien has an interest rate higher than the otherwise observably similar mortgage with no second lien, this indicates that the lender might be aware of the existence

of the misreported second lien and have incorporated some/all of the additional risk of the misreported second liens into the pricing of the corresponding first mortgage.

Table 6 presents the OLS regression estimates for mortgage rates. The dependent variable is the first mortgage contract rate. Explanatory variables include misreported second lien dummy (Mis2Lien), and other loan characteristics. We also include the quadratic term of the credit score to allow for potential nonlinearity. Closing month fixed effects is included to capture the market time-varying interest rate. State fixed effects is also included in all regressions. Reported standard errors are clustered by state. We present the results of the whole sample, the purchase loan sub sample and the refinance loan sub sample for the corresponding portfolio loans and sold loans separately. The results show that loans with misreported second lien carry a statistically higher mortgage rate than the otherwise observably similar loans for all portfolio loan samples and sold loan samples, except the portfolio loan refinance sample. This evidence indicates that lenders are likely to know the existence of the second liens when originating the first mortgages. However, the additional interest rate associated with the misreported second liens does not seem to be high enough to compensate the dramatically increased credit risk associated with the misreported second liens.

Putting together the evidence from mortgage rates and determinants of misreporting, this section suggests that lenders seem to intentionally choose to misreport second liens, particularly for lower quality mortgages with higher second lien LTV ratios. The next section discusses some potential reasons of underreporting of second liens in portfolio loans.

5 Why Second Lien Misreporting in Portfolio Loans?

The previous section shows that underreporting does not seem to be purely due to poor recording practice, and lenders seem to know the existence of the misreported second liens. What is seemingly puzzling is that misreporting is widespread not only for securitized loans but also for portfolio loans. This section discusses some potential reasons of portfolio loan second lien misreporting.

Portfolio loans are kept on a bank's book. Thus, the bank should not have incentives to misreport any second liens attached to her portfolio loans. However, a lender might sell the mortgage servicing right (MSR) of a portfolio loan to another financial institution. Mortgage servicers are typically paid by a certain percentage of the outstanding loan balance they service. There are also costs associated with loan servicing. The valuation of the mortgage servicing right captures the net present value of expected servicing fees and servicing costs. If a mortgage goes into default and later liquidated, this could reduce the outstanding servicing loan balance and thus the servicing compensation that a servicer may receive. The cost of servicing a defaulted mortgage is also higher than servicing a current mortgage.[12] Put it together, a higher perceived default probability leads to a lower valuation of mortgage servicing rights. Misreporting second lien could lower the perceived default risk of the first mortgage by almost 90 percent, which could in turn increase the valuation of

[12] Once the loan goes into default, the general servicer may transfer the loan to the special servicer, who may or may not be affiliated with the general servicer (Ambrose et al 2016). This practice is more common for commercial mortgages.

mortgage servicing rights significantly. In other words, a lender might benefit from second lien misreporting through the potential higher selling price of mortgage servicing rights.[13]

Another possible motivation of underreporting a portfolio loans is that there is always a chance that the loan might get sold in the future or has been tried to get sold in the past, even though it is currently kept on the bank's book. To maximize the option value of a loan sale, a lender might choose to underreport certain second liens. We next investigate whether the probability of loan sale or the ease of loan sale have any impact on portfolio loan second lien misreporting.

Since debt-to-income (DTI) ratio is an important factor in a loan sale, we first display the average misreporting rate against the debt-to-income ratio in Figure 1. Literature also shows that credit score is an important factor in determining the possibility of a loan sale. Figure 2 draws the average misreporting rate against a borrower's credit score. We present the graphs for both the full documentation sub sample and the low documentation sub sample. We also show the graphs with different measures of misreporting rates: misreporting as a percentage of the reported no second lien sample (ReportedNo2Lien Sample), and as a percentage of the whole sample (Whole Sample).

Figure 1 shows that the misreporting rate of portfolio loan second liens is not randomly distributed across DTI ratios. The misreporting rate increases with the DTI ratio in the 40% to 50% range, followed by a sudden and sharp drop at the DTI ratio of 50%. The pattern is similar for both full and low documentation sub samples, as well as for the different measures of misreporting rate. To qualify for GSE loans, generally, the maximum DTI ratio is 43%.

[13] Unfortunately, since we do not observe the mortgage servicing right transactions, we are not able to test this directly.

However, with strong compensating factors such as a high credit score and sufficient assets such as cash, the acceptable DTI ratio could go as high as 50%. Thus, loans with a DTI ratio lower than 50% could possibly be qualified as GSE loans, while loans with a DTI ratio greater than 50% could not be qualified as GSE loans. In order to increase the chance of selling loans to GSE, lenders might misreport the second liens in order to increase the perceived loan quality of those with DTI ratios close to the GSE upper limit. There is also a possibility that, for some reason, a lender might not be able to sell some of those loans close to the DTI ratio limit, so that these loans end up in the bank's own books as portfolio loans. Since loans with DTI ratio of 0.5+ could not be sold to GSEs, lenders might not have as strong motivation to manipulate the DTI ratio by misreporting the second lien status.

Figure 2 shows that there is a sudden jump of misreporting rate at the credit score of 620 for low documentation loans, and at the credit score of 580 for full documentation loans. A credit score of 620 for low documentation loans and a credit score of 580 for full documentation loans are the cutoff lines for the securitization rule of thumb. Loans with a credit score right above the cutoff line are easier to securitize than loans with a credit score right below the credit cutoff line. Even though loans were initially kept as portfolio loans, there is a possibility that some of those loans might be sold into a privately securitized pool in the future. For example, over 20 percent of securitized loans were securitized six months or later after loan origination. Keeping the option of future loan securitization in mind, lenders might misreport the second lien status of portfolio loans to increase the expected selling price in case of a sale in the future. This incentive is stronger for loans that are easier to securitize. There is also a possibility that lenders unintentionally underreport more second

liens for 620+ loans since lenders do not put as much screening effort on the 620+ credit score loans as they do on 620- credit score loans. Figure 2 offers preliminary evidence that loan sale considerations might play a role in portfolio loan second lien misreporting.

Next, we adopt a regression discontinuity design of Keys et al (2010) to quantify the magnitude of the sudden change at the DTI and FICO cutoff lines. We first calculate the average misreporting rates at each DTI ratio and FICO score, and then estimate the following regression equations.

$$y_i = \alpha + \beta_1 T_i + \beta_2 f(FICO) + \beta_3 T_i f(FICO) + \varepsilon_i$$

$$y_i = \alpha + \beta_1 T_i + \beta_2 f(DTI) + \beta_3 T_i f(DTI) + \varepsilon_i$$

The dependent variable y_i is the average misreporting rate at each FICO score or DTI ratio. Variable T_i is a binary variable that equals to one if FICO score or DTI ratio is equal to or above the corresponding cutoff lines (0.5 for DTI, 620 for low documentation FICO, and 580 for full documentation FICO), and equals zero otherwise. f (FICO) and f (DTI) are seventh-order flexible polynomials. FICO scores and DTI ratios are re-centered to the corresponding cutoff lines.

The regression coefficients of the variable of interest T_i represent the magnitude of the sudden change at the cutoff lines. Table 7 reports the DTI ratio analysis results and Table 8 reports the FICO score analysis results. We report the regression results using different measures of misreporting rates, and for both full and low documentation sub samples. Panel A presents the results without covariates (average loan characteristics) in the regressions and Panel B reports the results with covariates included in the regressions. The results in Table

7 show that, across different specifications, the coefficient estimates of T_i are consistently and statistically significant at one percent significance level. The magnitude of the sudden change around DTI ratio cutoff line goes as high as over 30% for the low documentation sub sample and as high as over 20% for the full documentation sub sample, for the discontinuity regressions without covariates. Even after controlling for covariates in the regressions, the magnitude of the sudden change is still dramatic. Table 8 reports similar statistically and economically significant results for the sudden jump around FICO score cutoff lines. These empirical results show that the second lien misreporting is affected by the probability of loan sale and thus might in part be driven by a lender's loan sale considerations.

There are two other possibilities that might lead to the observed portfolio loan second lien misreporting. The first possibility is that some lenders might not report any second liens and other lenders might report all the second liens. If that is the case, we need to be careful interpreting the results. We investigate this issue by using the validation sample and include the lender fixed effects in the analysis. The second one is that a lender might misreport the second lien to lower the corresponding capital requirement of corresponding mortgage in her book. The second lien misreporting we observe is from the servicing file. We do not have access to the mortgage file that is actually used by a bank to calculate the capital requirement. However, since only depository institutions have capital requirements, we use the validation sample to test whether banks or depository institutions have different misreporting rate than non-banks or non-depository institutions.

Table 9 uses the validation sample to investigate the determinants of second lien misreporting. The sample includes loans with a second lien. Other than using a different

sample, regression one has the same model specifications and control variables as Table 5. Regression two includes the lender type fixed effects such as bank, finance company, and mortgage company, etc. The classifications are provided in the public record data. Regression three adds in the lender fixed effects. If a lender originated more than 50 mortgages during our sample period in the original county's recorder data, the lender's fixed effect is included in Regression three. The omitted baseline case of lender fixed effect represents small lenders with less than 50 mortgages originated during the sample period. Regression four includes the bank dummy variable, which equals one if the lender is a depository institution, and equals zero otherwise. After controlling for lender effects, the results consistently show that higher misreporting probability is associated with higher second lien LTV ratio and some risky features of the associated first mortgage such as higher first mortgage LTV ratio, low documentation and adjustable interest rate. This provides evidence that misreporting is not driven by the differences in reporting practices among financial institutions. Regression four shows that depository institutions carry a lower, not a higher, misreporting rate than non-banks. This does not support the hypothesis that banks misreport second lien to lower the capital requirements of the associated first mortgages. On the contrary, tighter regulation on depository institutions seem to alleviate the misreporting issue.

Overall, the results indicate that the sale of mortgage servicing rights and the potential sale of the first mortgage play a role in a lender's motivation leading to portfolio loan misreporting. We did not find evidence that capital requirements is a consideration leading to portfolio loan misreporting. Nor is the observed misreporting driven by the

potential reporting practice differences among financial institutions. The next section investigates and compares misreporting between portfolio loans and securitized loans.

6 Securitization and Second Lien Misreporting

This section investigates the difference in the ex post misreporting rates between portfolio loans and securitized loans. Securitization could have two opposing effects on misreporting. On the one hand, securitized loans might have higher misreporting rates due to lenders' motivation to increase loan sale possibility as well as obtaining a favorable loan sale price. On the other hand, the MBS underwriters and MBS loan servicers might conduct additional screening to help detect, deter and lower the misreporting occurrences. Lenders also might have reputational concerns that help lower the misreport rate of the second liens for sold loans.

Previous literature documents significant amounts of second lien misreporting in residential privately securitized loans (Piskorski, Seru, and Witkin (2015); Griffin and Maturana (2016)). However, as discussed in the previous sections, portfolio loans also have significant amounts of loans with misreported second liens. So whether the misreporting rate of sold loans is different from that of securitized loans remains unknown. Section 6.1 compares the misreporting between portfolio loans and securitized loans. We also separately investigate misreporting in full documentation loans and low documentation loans as loans with different documentation status are likely subject to different screening effort from the MBS underwriters/issuers. Section 6.2 investigates the relation between ex ante perceived

probability of loan sale and the ex post misreporting rate difference between sold loans and portfolio loans. Section 6.3 briefly explores the impact of the potential affiliation between the mortgage lender and the MBS servicer on sold loan misreporting.

This section includes jumbo loans in the analyses. One potential concern for the analysis using all mortgages to infer securitization effect is that nonjumbo mortgages may be sold into privately securitized market or GSE, or kept on banks' books. Thus the role of GSE might affect any inference drawn for the privately securitization effect. However, jumbo loans can only be sold into the privately securitized market or kept on banks' books. This provides a cleaner setting to investigate the private securitization effect on misreporting.

6.1 Difference in Misreporting between Portfolio Loans and Securitized Loans

This section conducts the baseline analysis to investigate whether sold loans have different misreporting rates than observably similar portfolio loans. The reduced form OLS regression results are presented in Table 10 Panel A. The dependent variable is the misreporting status, which equals to one if a mortgage with a second lien is misreported as having no second lien, and zero otherwise. We use two sets of samples to conduct the analysis. The first set includes the whole sample of jumbo loans. The second set excludes jumbo loans originated in California and Florida as these two states have experienced more dramatic housing appreciation during the pre crisis time. We also separately investigate the effect of securitization for the full and low documentation sub samples. Since loans with low documentation status provide no or limited documentations for borrowers' income and/or

assets, low documentation loans are deemed riskier than full documentation loans and typically need closer scrutiny to help identify loan quality. Control variables include securitization status, first lien LTV ratio, second lien LTV ratio, and other loan and borrower characteristics. State fixed effects and loan origination month fixed effects are included in the regressions as well. Standard errors are clustered by state.

Table 10 reveals some interesting results. After controlling for loan characteristics, securitized loans show a significantly lower misreporting rate than portfolio loans for the whole sample and the CA/FL excluded sample. Securitized loans with full documentation status show no significant difference in misreporting rates than portfolio loans. However, securitized loans with low documentation status carry significantly lower misreporting than portfolio loans. We obtain similar results for the CA/FL excluded sample. Securitized loans show no significantly different rate in second lien misreporting than portfolio loans. Securitized loans have significantly lower misreporting for low documentation loans. The difference is statistically and economically significant. Given the misreporting rate of 14.59% for low documentation portfolio loans, securitized loans have a 6.82% lower misreporting rate in absolute term and an over 46% (6.82%/14.59%=46.74%) lower misreporting rate in relative term. These results indicate that securitization could play a positive role in reducing misreporting for low documentation loans, which may be due to MBS underwriter's and/or MBS servicer's additional screening efforts for such loans. Contrary to the common belief that securitization is associated with more misreporting, possibly due to potential documentation errors incurred in the securitization process and/or lender's potential motivation to manipulate the loan quality, the baseline results show that

securitized loans have similar misreporting for full documentation loans and lower misreporting for low documentation loans.

Table 10 Panel B conducts robustness checks of the securitization effect. Model 3 uses the one-to-one propensity matched (PSM) sample to repeat the analysis. To form the PSM sample, we estimate the Logistic regression of securitization and calculate the predicted probability of securitization for each observation according the Logistic regression. Portfolio loans and sold loans are then matched one-to-one using nearest neighbor matching according to the predicted probability of securitization. The PSM sample helps reduce the potential selection issue by including portfolio loan and sold loan pairs with comparable characteristics. All other specifications are the same as in Table 10 Panel A Model 1. To further control for lender fixed effect, Model 4 uses the validation sample to conduct the analysis. Other than including lender fixed effect, other specifications are the same in Table 10 Panel A Model 1. The results using PSM sample and validation sample again are consistent with the baseline regression results. Low documentation sold loans have lower misreporting than portfolio loans. Full documentation sold loans show no significant difference in misreporting than portfolio loans. Next section conducts additional robustness checks by investigating the ex ante perceived probability of loan sale and the ex post difference in second lien misreporting between portfolio loans and sold loans.

6.2 Ex Ante Perceived Probability of Loan Sale and Ex Post Misreporting

The previous section documents that low documentation sold loans have lower misreporting probability than the corresponding observably similar portfolio loans. One potential explanation is that low documentation loans are subject to closer screening that might lead to lower second lien misreporting. This section investigates whether additional screening leads to lower misreporting from another perspective: the ex ante perceived probability of loan sale and the difference in the ex post misreporting between sold loans and portfolio loans.

Loans perceived easier to get sold tend to have lax screening and loans perceived harder to get sold are more likely subject to tighter screening in the securitization process (e.g., Keys, et. Al. (2010)). Wei, Nelson, and Vytlacil (2014) study the ex ante probability of loan sale and the ex post loan performance by sorting mortgages according to the probability of loan sale and comparing the performance difference between sold loans and retained loans between sub sample of mortgages with different probability of loan sale ex ante. We use similar empirical design as in Wei, Nelson, and Vytlacil (2014) and conduct two analyses by sorting the mortgages according to the ex ante perceived probability of loan sale. The first sorting is according to the predicted probability of loan sale. We first take a random 60% mortgages out from the whole jumbo loan sample to form an estimation sample. The remaining 40% mortgages are used to form the holdout sample. We use the estimation sample to conduct the Logistics regression of loan sale and apply the coefficient estimates of the loan sale equation to the holdout sample to calculate the out-of-sample predicted probability of securitization. We then sort the mortgages in the holdout sample according to the predicted probability of securitization and use the top quartile and bottom quartile to

conduct the analysis. Loans in the top quartile are most likely or easily to sell and loans in the bottom quartile are most unlikely of difficult to sell. Loans that are difficult or unlikely to sell are subject to closer screening to ensure loan quality then loans that are easier to sell. Table 11 Model 1 reports the results for the samples in top and bottom quartiles of the predicted probability of loan sale.

As discussed in Wei, Nelson, and Vytlacil (2014), one potential concern of using the predicted probability of loan sale is that the probability of sale is calculated using the ex post securitization status. Keys et. al. (2010) document that credit score of 620 works as the rule of thumb for securitization of subprime loans. Subprime loans with a credit score higher than 620 are easier to securitize than similar loans with a credit score of lower than 620. To have the true ex ante expected probability of securitization, as in Wei, Nelson, and Vytlacil (2014), we divide the sample according to borrowers' credit score with 620 as the cutoff line. We also limit the sample to subprime loans as the 620 rule applies to subprime but not prime mortgages. Table 11 Model 2 report the subsample results with credit score of 620 as the cutoff line. The results show that sold loans with ex ante higher probability of sale (top quartile sample and 620+ sample) show no difference in misreporting than portfolio loans. In the sub sample with lower ex ante perceived probability of sale (bottom quartile sample and 620- sample), sold loans have significantly lower misreporting than portfolio loans.

Across different specifications, the results in Table 10 and 11 consistently show that securitized loans have lower misreporting in the sub samples of loans that are subject to closer screening. This indicates that securitization could lower misreporting through additional screening. In the next section, we provide additional evidence on the role of

additional screening on sold loan misreporting from institutional perspective.

6.3 Lender-MBS Servicer Affiliation and Misreporting

This section briefly explores the role of additional screening on sold loan misreporting from the perspective of financial institutions. In exchange for having access to the loan-level data, financial institution information has been excluded. Thus, we are not able to fully investigate the role of lenders, underwriters and/or servicers in the securitized loan misreporting. However, we can observe whether a mortgage enters into the dataset as a portfolio loan or a securitized loan. If a mortgage enters into the dataset as a portfolio loan and later changes to a sold loan, the servicer who serviced the loan when the loan was on the lender's books is also serving the sold loan. In this case, sold loan and the previous portfolio loan have the same servicer, and the same servicer is more likely to be affiliated with the lender. If a mortgage enters into the dataset as a sold loan, it is more likely that the sold loan is serviced by a servicer solely servicing the sold loan. In this case, the sold loan only servicer is less likely to be affiliated with the lender. We thus classify the sold loans into two groups, same servicer and sold loan only servicer. Compared to a sold loan servicer who is affiliated with the lender, a lender-unaffiliated servicer should have stronger motivation to conduct additional screening to assure the quality of the mortgages entering into the securitized pool.

Table 12 reports the OLS regression results of misreporting for the whole sample and the CA/FL excluded sample. Other than having the same and sold loan only servicer dummies replacing the single securitization dummy, the other control variables are the same

as in Table 10 Panel A. The dependent variable is the misreporting status. The results show that having a likely lender-unaffiliated sold loan servicer reduces misreporting for the whole sample, the full documentation sample and the low documentation sample. Having a lender-unaffiliated MBS servicer reduces misreporting rate for low documentation sample by 13.39%, which is about six time larger than the effect on full documentation loans (2.27%). Having the same and likely lender-affiliated MBS servicer increases misreporting for both full and low documentation loans. The effect seems to be stronger for full documentation loans. The results indicate that the additional screening from lender-unaffiliated servicers contributes to the lower misreporting in sold loans especially for the sub sample of mortgages subject to more scrutiny of quality ex ante.

In sum, this section shows that sold loans carry lower misreporting rate than observably similar portfolio loans, especially for the sub samples of mortgages subject to closer scrutiny of quality ex ante, such as low documentation loans and loans perceived harder to sell. One potential channel of additional screening is through the lender-unaffiliated MBS servicers whose motivation in safeguarding the sold loan quality for MBS issuers and investors is not distorted by the affiliation with the lender.

7 Conclusion

Using a unique nationwide dataset, this paper extends our understanding of second lien

misreporting in residential mortgages. We investigate the second lien misreporting in both portfolio loans and securitized loans. The portfolio loan setting makes it possible to infer a lender's role in misreporting as the lender is the only financial institution affecting the reporting quality. Comparing the misreporting difference between portfolio loans and securitized loans allows us to draw inference on the effect of securitization on misreporting.

We first document a significant amount of second lien underreporting in both portfolio loans and securitized loans. We then show that misreported second liens have a material impact on loan performances. For example, mortgages with misreported second liens have more than 90% higher chance of loan default within twenty-four months of origination (in relative terms) than the otherwise similar loans. Moreover, lenders seem to know the existence of the second liens and intentionally misreport higher LTV ratio second liens associated with lower quality first mortgages. We document that securitized loans have lower misreporting than observably similar portfolio loans for mortgages subject to closer scrutiny of quality such as low documentation loans and loans perceived harder to sell ex ante. We also offer evidence that an MBS servicer unaffiliated with the lender reduces misreporting in sold loans with especially large magnitude of impact for low documentations, while a lender-affiliated MBS servicer increases misreporting for both full and low documentation sold loans. The evidence indicates that additional screening during the securitization process helps lower the misreporting rate in sold loans.

In the absence of an accurate measure of second liens, cumulative loan to value ratios, hence the risk of instability in the financial system, will be underestimated. Misreporting in the servicing file could distort the valuation of the mortgage servicing rights and lead

servicers to implement improper loss mitigation measure. Misreporting in portfolio loans lowers the perceived asset risk, which could in turn increase the systemic risk for financial markets. Misreporting in sold loans could distort the pricing of MBS and mislead investors in the MBS market. The finding of severe misreporting in portfolio loans indicates that inaccurate asset reporting seems to be prevalent in financial institutions even without complicated securitization structure. In addition, the affiliation between lender and MBS servicer could make misreporting a more severe problem especially for full documentation loans. Note that misreporting is not the typical asymmetric information problem where one party knows more than the other party, but rather an example of misleading of investors and regulators regarding the credit risk of the underlying assets. It is critical to have the regulations and market mechanisms to address this fundamental problem for the sustainability of capital markets.

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Table 1: Summary Statistics

	Portfolio			Securitized		
Variable	Mis2Lien	TrueR2Lien	TrueRNo2Lien	Mis2Lien	TrueR2Lien	TrueRNo2Lien
Panel A : Mean of Loan Chars						
FICO	693.02	711.50	695.81	676.71	697.16	663.44
FullDoc (in %)	49.34	78.98	61.34	56.42	56.26	67.09
FRM (in %)	19.31	55.05	34.17	23.46	31.05	34.84
LTV (in %)	77.20	77.25	76.58	77.79	76.83	75.84
DTI (in %)	36.10	36.34	34.59	38.67	38.46	36.95
Purchase (in %)	68.24	74.58	41.19	75.39	68.62	28.73
Jumbo (in %)	37.07	23.53	29.68	27.90	29.97	27.33
Exotic (in %)	3.93	1.75	3.81	4.81	1.71	2.46
OwnerOccupy (in %)	85.87	86.66	79.95	87.75	86.49	84.75
Term30 (in %)	78.75	92.59	89.09	79.11	96.53	92.29
Panel B : Loan Performances						
Default24m (in %)	12.90	5.37	5.61	22.16	13.29	12.00
Default36m (in %)	22.85	11.38	12.13	35.12	25.68	20.50
Loss36m (in %)	2.01	0.45	0.60	4.36	2.08	1.82
Loss48m (in %)	4.34	1.12	1.80	7.44	4.22	3.38
Panel C : Misreporting						
LTV2Lien (in %)	14.47	12.64	0.00	17.29	14.57	0.00
N of Obs (in %)	11.48	15.77	72.75	14.20	18.87	66.92
N of Obs	20967.00	28787.00	132828.0	70001.00	93015.00	329786.0

Notes: This table reports the summary statistics for portfolio loans and securitized loans separately. Loans are further divided into three categories according to the second lien reporting status: misreported second lien status where a mortgage with a second lien is misreported as having no second lien (Mis2Lien), truly reported second lien status where a mortgage with a second lien is truly reported as having a second lien (TrueR2Lien), and truly reported no second lien status where a mortgage truly has no second lien(TrueRNo2Lien). Panel A reports the mean values of loan characteristics at origination. Panel B summarizes the different measures of subsequent loan performances, default rates within 24 and 36 months of origination (Default24m and Default36m), and loan loss rates within 36 and 48 months of origination (Loss36m and Loss48m). Panel C shows the number and the percentage of observations according to second lien reporting status. The true value of the second lien LTV ratio (LTV2Lien) is also reported in Panel C.

Table 2: Misreporting Rates

	%ReportedNo2Lien		%Whole		%True2Lien	
Misreporting Rate	Portfolio	Securitized	Portfolio	Securitized	Portfolio	Securitized
Panel A : Misreporting Rate over Time						
2005Q1	15.53	16.22	13.82	13.69	55.64	46.72
2005Q2	15.61	18.18	13.70	15.25	52.86	48.68
2005Q3	14.44	17.14	12.55	14.36	48.91	46.95
2005Q4	14.79	17.57	12.66	14.39	46.75	44.27
2006Q1	11.58	18.84	9.77	14.46	38.47	38.36
2006Q2	10.37	18.44	8.33	14.16	29.74	37.90
2006Q3	10.24	16.53	8.09	12.72	27.81	35.56
2006Q4	14.09	17.34	11.10	13.99	34.34	41.93
Panel B : Misreporting Rate Sub Samples						
Low Doc	17.25	21.94	15.72	16.97	63.84	42.84
Full Doc	11.19	15.15	8.97	12.62	31.12	43.02
Purchase	20.73	35.89	15.82	25.07	40.02	45.40
Refinance	7.85	6.74	7.23	6.04	47.57	36.73
FRM	7.98	12.45	6.04	10.20	19.93	36.11
ARM	16.30	19.98	14.51	16.13	56.80	45.57
FICO>680	13.49	18.84	11.10	14.17	38.45	36.40
FICO$\leq$680	13.81	16.45	12.09	14.21	49.24	51.05
LTV>0.8	2.35	1.74	2.01	1.64	12.35	21.62
LTV$\leq$0.8	12.68	15.94	10.67	12.87	40.32	40.09

Notes: Notes: This table reports misreporting rates for each loan origination quarter from year 2005 to year 2006 in Panel A, and across different sub samples in Panel B. A mortgage is defined to be misreported if it it has a second lien but is reported as not having a second lien. We report three measures of misreporting rate: misreported second liens as a percentage of all the loans reported as having no second liens (%ReportedNo2Lien), misreported second liens as a percentage of the whole sample (%Whole), and misreported second liens as a percentage of all the loans with a second lien (%True2Lien).

Table 3: Default and Second Lien Misreporting - Logit Regression

	Portfolio			Securitized		
Variable	Whole	Purchase	Refinance	Whole	Purchase	Refinance
Intercept	2.9018**	4.7758**	−0.0590	3.9557**	5.0524**	2.7040**
	(1.0844)	(1.0145)	(0.8822)	(0.6924)	(0.9547)	(0.5129)
Mis2Lien	1.1108**	0.9239**	1.0448**	0.9912**	0.9014**	0.9993**
	(0.0950)	(0.0981)	(0.0778)	(0.1696)	(0.1957)	(0.0885)
CLTV	0.0405**	0.0321**	0.0491**	0.0479**	0.0389**	0.0550**
	(0.0071)	(0.0050)	(0.0083)	(0.0088)	(0.0093)	(0.0083)
FICO	−1.1840**	−1.4065**	−0.9876**	−1.3967**	−1.4268**	−1.3657**
	(0.0706)	(0.0789)	(0.0476)	(0.0439)	(0.0469)	(0.0516)
FullDoc	−0.6260**	−0.5531**	−0.6187**	−0.4819**	−0.4862**	−0.4886**
	(0.1086)	(0.1455)	(0.0758)	(0.0679)	(0.0825)	(0.0571)
FRM	−0.3528*	−0.3475*	−0.2981*	−0.6143**	−0.9019**	−0.4084**
	(0.1692)	(0.1683)	(0.1492)	(0.0331)	(0.0530)	(0.0555)
Exotic	0.0907	0.2772**	−0.1150	0.0427	0.0006	0.1242**
	(0.0768)	(0.0724)	(0.1325)	(0.0492)	(0.0829)	(0.0263)
Jumbo	−0.1682*	−0.2543**	−0.1062	−0.0563	−0.1542**	0.0180
	(0.0737)	(0.0534)	(0.1011)	(0.0360)	(0.0235)	(0.0730)
DTI	0.6889**	1.0902**	0.3738**	0.5013**	0.6743**	0.3073**
	(0.0970)	(0.1688)	(0.0764)	(0.0825)	(0.1513)	(0.0665)
OwnerOccupy	−0.9044**	−0.6970**	−1.0254**	−0.8514**	−0.7898**	−0.9008**
	(0.0838)	(0.1487)	(0.0606)	(0.0672)	(0.0938)	(0.0424)
Term30	−0.4087**	−0.4696**	−0.2898**	−0.4744**	−0.5486**	−0.3586**
	(0.0503)	(0.0374)	(0.0649)	(0.0314)	(0.0438)	(0.0296)
Purchase	−0.1621*			0.3208**		
	(0.0674)			(0.0938)		
State FE	Y	Y	Y	Y	Y	Y
Orig Month FE	Y	Y	Y	Y	Y	Y
R-Square	0.2109	0.2224	0.2219	0.3190	0.3515	0.2755
N	182582	90514	92068	492802	211478	281324

Notes: This table reports the coefficient estimates and standard errors of the Logit regressions of default. We report the results for portfolio loans and securitized loans separately. The dependent variable, default, equals one if a borrower missed at least three mortgage payments or was in foreclosure or bankruptcy status within twenty-four months after origination (Default24m), and equals zero otherwise. Mis2Lien equals one if a mortgage with a second lien was reported as having no second lien, and equals zero otherwise. The state fixed effects and loan origination month fixed effects are included in all regressions. Standard errors are clustered by state. * $p<0.05$, ** $p<0.01$.

Table 4: Loan Loss and Second Lien Misreporting - OLS Regression

	Portfolio			Securitized		
Variable	Whole	Purchase	Refinance	Whole	Purchase	Refinance
Intercept	0.0096	0.0379**	−0.0159	0.0941**	0.1378**	0.0601**
	(0.0132)	(0.0077)	(0.0211)	(0.0127)	(0.0232)	(0.0066)
Mis2Lien	0.0149**	0.0082*	0.0218**	0.0192**	0.0190**	0.0150**
	(0.0049)	(0.0041)	(0.0046)	(0.0071)	(0.0067)	(0.0035)
FICO	−0.0030**	−0.0051**	−0.0013	−0.0123**	−0.0170**	−0.0084**
	(0.0008)	(0.0010)	(0.0008)	(0.0015)	(0.0028)	(0.0009)
CLTV	0.0004**	0.0002*	0.0005**	0.0008**	0.0008**	0.0008**
	(0.0001)	(0.0001)	(0.0001)	(0.0002)	(0.0002)	(0.0001)
DTI	−0.0004	0.0012	−0.0011	0.0079*	0.0077	0.0056**
	(0.0010)	(0.0021)	(0.0014)	(0.0040)	(0.0072)	(0.0014)
LowDoc	0.0032**	0.0027**	0.0032**	0.0093**	0.0111**	0.0062**
	(0.0008)	(0.0007)	(0.0008)	(0.0012)	(0.0018)	(0.0012)
FRM	−0.0052**	−0.0048**	−0.0050**	−0.0106**	−0.0128**	−0.0077**
	(0.0010)	(0.0018)	(0.0011)	(0.0016)	(0.0032)	(0.0008)
Exotic	0.0018	0.0024	0.0004	−0.0046	−0.0077	−0.0011
	(0.0016)	(0.0018)	(0.0017)	(0.0033)	(0.0055)	(0.0011)
Jumbo	−0.0070	−0.0054	−0.0092*	−0.0081	−0.0121	−0.0045
	(0.0036)	(0.0028)	(0.0041)	(0.0047)	(0.0076)	(0.0030)
OwnerOccupy	−0.0106**	−0.0075**	−0.0122**	−0.0268**	−0.0294**	−0.0230**
	(0.0014)	(0.0015)	(0.0020)	(0.0030)	(0.0045)	(0.0016)
Term30	−0.0032**	−0.0065**	−0.0000	−0.0295**	−0.0376**	−0.0204**
	(0.0007)	(0.0025)	(0.0023)	(0.0079)	(0.0112)	(0.0049)
Purchase	−0.0030**			0.0091**		0.0000**
	(0.0009)			(0.0028)		
State FE	Y	Y	Y	Y	Y	Y
Orig Month FE	Y	Y	Y	Y	Y	Y
R-Square	0.0038	0.0264	0.0029	0.0843	0.1044	0.0596
Adj R-Sq	0.0034	0.0255	0.0020	0.0842	0.1040	0.0593
N	182582	90514	92068	492802	211478	281324

Notes: This table reports the coefficient estimates and standard errors of the OLS regressions of loan loss for portfolio loans and securitized loans. The dependent variable, loan loss, is calculated as (outstanding loan balance - liquidation sale price)/ outstanding loan balance if the mortgage was liquidated within thirty-six months after origination (Loss36m). The outstanding loan balance is calculated at time of liquidation. If a mortgage is not liquidated three years after origination, loan loss is treated as zero. The state fixed effects and loan origination month fixed effects are included in all the regressions. Standard errors are clustered by state. * $p<0.05$, ** $p<0.01$.

Table 5: Determinants of Second Lien Misreporting

	Portfolio			Securitized		
Variable	Whole	Purchase	Refinance	Whole	Purchase	Refinance
Intercept	0.7583**	0.5927**	1.1067**	0.9016**	0.8440**	0.5362**
	(0.0325)	(0.0488)	(0.1175)	(0.0780)	(0.0960)	(0.1289)
LTV2Lien	0.9970**	1.0600**	0.6905**	1.6169**	1.6697**	1.5542**
	(0.1260)	(0.1061)	(0.0984)	(0.0978)	(0.0982)	(0.1141)
FICO	−0.0662**	−0.0558**	−0.0798**	−0.0894**	−0.1064**	−0.0214
	(0.0062)	(0.0042)	(0.0190)	(0.0156)	(0.0129)	(0.0208)
LTV	0.3998**	0.3865**	0.3767**	0.4482**	0.6885**	0.3447**
	(0.0416)	(0.0672)	(0.1314)	(0.0921)	(0.0512)	(0.1128)
DTI	−0.2198**	−0.2173**	−0.2672**	−0.2784**	−0.2813**	−0.3044**
	(0.0458)	(0.0705)	(0.0689)	(0.0326)	(0.0623)	(0.0699)
LowDoc	0.1692**	0.1577**	0.1726**	−0.0278**	−0.0301**	−0.0301
	(0.0259)	(0.0177)	(0.0439)	(0.0099)	(0.0111)	(0.0390)
FRM	−0.1915**	−0.1974**	−0.1774**	−0.0192	−0.0124	−0.0224
	(0.0247)	(0.0239)	(0.0356)	(0.0125)	(0.0135)	(0.0128)
Exotic	−0.0090	−0.0396	0.0375*	−0.0656**	−0.0839**	−0.0153
	(0.0201)	(0.0252)	(0.0160)	(0.0090)	(0.0135)	(0.0216)
Jumbo	0.0446**	0.0406**	0.0492*	0.0451**	0.0250**	0.0829**
	(0.0069)	(0.0103)	(0.0228)	(0.0060)	(0.0063)	(0.0124)
OwnerOccupy	0.0481**	0.0936**	−0.0733**	0.0238	0.0338	−0.0297*
	(0.0106)	(0.0157)	(0.0208)	(0.0190)	(0.0188)	(0.0138)
Term30	−0.1626**	−0.1661**	−0.1356**	−0.3558**	−0.3893**	−0.2211**
	(0.0148)	(0.0206)	(0.0167)	(0.0215)	(0.0232)	(0.0118)
Purchase	−0.0315**			0.0430**		
	(0.0094)			(0.0106)		
State FE	Y	Y	Y	Y	Y	Y
Orig Month FE	Y	Y	Y	Y	Y	Y
R-Square	0.2842	0.3301	0.2001	0.1836	0.2271	0.0880
Adj R-Sq	0.2831	0.3286	0.1959	0.1832	0.2266	0.0865
N	49754	35771	13983	163016	116786	46230

Notes: This table reports the coefficient estimates and standard errors of the OLS regressions, in which the dependent variable Mis2Lien equals one if a mortgage with a second lien is misreported as having no second lien, and equals zero otherwise. The sample includes all loans with a second lien. The state fixed effects and loan origination month fixed effects are included in all the regressions. Standard errors are clustered by state. * $p<0.05$, ** $p<0.01$.

Table 6: Mortgage Rate and Second Lien Misreporting

	Portfolio			Securitized		
Variable	Whole	Purchase	Refinance	Whole	Purchase	Refinance
Intercept	0.3970**	0.2537**	0.5084**	0.3446**	0.3421**	0.3775**
	(0.0213)	(0.0264)	(0.0172)	(0.0099)	(0.0098)	(0.0128)
Mis2Lien	0.0043**	0.0047**	0.0005	0.0026**	0.0027**	0.0012**
	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0004)	(0.0003)
FICO	−0.0992**	−0.0567**	−0.1352**	−0.0781**	−0.0759**	−0.0899**
	(0.0071)	(0.0086)	(0.0046)	(0.0039)	(0.0037)	(0.0045)
FICO-Square	0.0068**	0.0038**	0.0095**	0.0049**	0.0047**	0.0059**
	(0.0005)	(0.0006)	(0.0003)	(0.0003)	(0.0003)	(0.0004)
CLTV	0.0002**	0.0001**	0.0003**	0.0003**	0.0003**	0.0003**
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
LowDoc	−0.0049**	−0.0013	−0.0071**	−0.0030**	−0.0004	−0.0054**
	(0.0012)	(0.0010)	(0.0011)	(0.0009)	(0.0009)	(0.0006)
DTI	0.0153**	0.0229**	0.0082**	0.0128**	0.0177**	0.0085**
	(0.0015)	(0.0023)	(0.0020)	(0.0018)	(0.0039)	(0.0009)
FRM	0.0056*	0.0014	0.0105**	0.0071**	0.0044*	0.0088**
	(0.0022)	(0.0016)	(0.0018)	(0.0019)	(0.0020)	(0.0017)
Exotic	0.0075**	0.0057**	0.0086**	0.0053**	0.0032	0.0071**
	(0.0019)	(0.0020)	(0.0018)	(0.0020)	(0.0021)	(0.0017)
Jumbo	−0.0048**	−0.0050**	−0.0044**	−0.0012**	−0.0026**	0.0002
	(0.0002)	(0.0003)	(0.0003)	(0.0002)	(0.0004)	(0.0002)
OwnerOccupy	0.0028**	0.0021	0.0042**	−0.0057**	−0.0059**	−0.0052**
	(0.0010)	(0.0012)	(0.0006)	(0.0008)	(0.0007)	(0.0009)
Term30	0.0013**	−0.0016	0.0037**	−0.0029**	−0.0050**	0.0002
	(0.0004)	(0.0009)	(0.0008)	(0.0008)	(0.0013)	(0.0003)
Purchase	0.0002			0.0034**		
	(0.0005)			(0.0005)		
State FE	Y	Y	Y	Y	Y	Y
Orig Month FE	Y	Y	Y	Y	Y	Y
R-Square	0.2628	0.2522	0.3165	0.4128	0.4212	0.4252
Adj R-Sq	0.2624	0.2516	0.3160	0.4127	0.4210	0.4250
N	181753	90146	91607	490203	210590	279613

Notes: This table reports the coefficient estimates and standard errors of the OLS regressions in which the dependent variable is the first mortgage contract rate. LTV2Lien is the true second lien loan-to-value ratio. The squared term of FICO is added to capture potential non-linearity. The state fixed effects and loan origination month fixed effects are included in all the regressions. Standard errors are clustered by state. * p<0.05, ** p<0.01.

Table 7: Regression Discontinuity across DTI in Portfolio Loans

Sample	Variable	Estimate	P-Value	R-Square
Panel A : Without Covariates				
FullDoc(%ReportedNo2Lien)	T	−0.2126**	0.0005	0.9346
FullDoc(%Whole)	T	−0.1676**	0.0010	0.9257
LowDoc(%ReportedNo2Lien)	T	−0.3404**	0.0004	0.9552
LowDoc(%Whole)	T	−0.3034**	0.0011	0.9413
Panel B : With Covariates				
FullDoc(%ReportedNo2Lien)	T	−0.1814**	0.0004	0.9718
FullDoc(%Whole)	T	−0.1480**	0.0006	0.9683
LowDoc(%ReportedNo2Lien)	T	−0.3057**	0.0028	0.9653
LowDoc(%Whole)	T	−0.2989**	0.0034	0.9581

Notes: This table reports the results of regression discontinuity analysis for portfolio loans. The dependent variable is the misreporting rate. T equals one if DTI ratio is greater than or equal to 0.5, and equals zero otherwise. We use the 7th order polynomial in the regressions. Panel A reports the regression results without covariates and Panel B includes covariates as controls. The regressions %Whole include the whole sample while the regressions %ReportedNo2Lien include loans with no reported second liens. * p<0.05, ** p<0.01.

Table 8: Regression Discontinuity across FICO in Portfolio Loans

Sample	Variable	Estimate	P-Value	R-Square
Panel A : Without Covariates				
FullDoc(%ReportedNo2Lien)	T	0.2107**	0.0000	0.8413
FullDoc(%Whole)	T	0.1952**	0.0000	0.8406
LowDoc(%ReportedNo2Lien)	T	0.1702**	0.0000	0.7236
LowDoc(%Whole)	T	0.1540**	0.0000	0.6829
Panel B : With Covariates				
FullDoc(%ReportedNo2Lien)	T	0.1839**	0.0000	0.8605
FullDoc(%Whole)	T	0.1682**	0.0000	0.8628
LowDoc(%ReportedNo2Lien)	T	0.1450**	0.0000	0.7472
LowDoc(%Whole)	T	0.1275**	0.0002	0.7090

Notes: This table reports the results of regression discontinuity analysis for portfolio loans. The dependent variable is the misreporting rate. T equals one if a borrower's credit score is greater than or equal to 620for low documentation loans or 580 for full documentation loans. Otherwise, T equals zero. We use the 7th order polynomial in the regressions. Panel A reports the regression results without covariates and Panel B includes covariates as controls. The regressions %Whole include the whole sample while the regressions %ReportedNo2Lien include loans with no reported second liens. p<0.05, ** p<0.01.

Table 9: Robustness Checks of Determinants of Second Lien Misreporting with Lender Effect for Portfolio Loans

Variable	(1)	(2)	(3)	(4)
Intercept	−1.2591**	−1.0967**	−0.7582**	−1.2674**
	(0.2186)	(0.1737)	(0.0972)	(0.1828)
LTV2Lien	1.2313**	1.2091**	1.0194**	1.2398**
	(0.2284)	(0.3263)	(0.3531)	(0.2250)
FICO	0.0761	0.0653	0.0224**	0.0826
	(0.0589)	(0.0485)	(0.0000)	(0.0556)
LTV	1.6811**	1.5627**	1.3689**	1.5959**
	(0.2195)	(0.2189)	(0.2132)	(0.2407)
DTI	−0.1568**	−0.0742	0.1115	−0.0642**
	(0.0142)	(0.0395)	(0.1070)	(0.0069)
LowDoc	0.2470**	0.2238**	0.1723**	0.2065**
	(0.0699)	(0.0353)	(0.0459)	(0.0687)
FRM	−0.3433**	−0.2721**	−0.1579**	−0.2939**
	(0.0940)	(0.0843)	(0.0429)	(0.0879)
Exotic	−0.1628	−0.1321	0.0131	−0.1416
	(0.1316)	(0.1657)	(0.1129)	(0.1419)
Jumbo	−0.2182**	−0.1736**	−0.1621**	−0.1929**
	(0.0126)	(0.0078)	(0.0078)	(0.0032)
OwnerOccupy	0.1229*	0.1157**	0.0194	0.1493**
	(0.0515)	(0.0153)	(0.0888)	(0.0556)
Term30	−0.1776**	−0.2071**	−0.1034	−0.1591**
	(0.0116)	(0.0037)	(0.0619)	(0.0093)
Bank				−0.1564**
				(0.0147)
State FE	Y	Y	Y	Y
Orig Month FE	Y	Y	Y	Y
Lender Type FE	N	Y	N	N
Lender FE	N	N	Y	N
R-Square	0.4576	0.4857	0.6638	0.4689
Adj R-Sq	0.3347	0.3383	0.5418	0.3441
N	185	185	185	185

Notes: This table reports the coefficient estimates and standard errors of the OLS regressions, in which the dependent variable Mis2Lien takes a value of one if the second lien is misreported and zero otherwise. Loans included are new purchase loans from the validation sample (the Black Knight data and Orange County/Miami County public record data matched sample). In regression two, the classification of lender types is from the Orange County/Miami County public record data. In regression three, if a lender originated more than 50 mortgages during our sample period in the original Orange County/Miami County recorder data, the lender fixed effect is included. The omitted baseline case represents lenders with less than 50 mortgages originated during the sample time period in the original Orange County/Miami County recorder data. In regression four, the bank dummy variable equals one if the lender is a depository institution, and equals zero otherwise. The sample includes all loans with a second lien. The state fixed effects and loan origination month fixed effects are included in all the regressions. Standard errors are clustered by state. * $p<0.05$, ** $p<0.01$.

Table 10: Misreporting in Portfolio Loans versus in Securitized Loans

Panel A	(1) Whole Sample			(2) CA/FL Excluded		
Variable	Whole	FullDoc	LowDoc	Whole	FullDoc	LowDoc
Securitization	−0.0289**	−0.0031	−0.0682**	−0.0155**	0.0026	−0.0542**
	(0.0061)	(0.0040)	(0.0050)	(0.0035)	(0.0033)	(0.0058)
Other Controls	Y	Y	Y	Y	Y	Y
State FE	Y	Y	Y	Y	Y	Y
Orig Month FE	Y	Y	Y	Y	Y	Y
Lender FE	N	N	N	N	N	N
R-Square	0.3845	0.3116	0.4495	0.2947	0.2551	0.3637
Adj R-Sq	0.3843	0.3111	0.4490	0.2938	0.2534	0.3615
N	191504	99470	92034	55627	33716	21911
Panel B	(3) PSM Sample			(4) Validation Sample		
Variable	Whole	FullDoc	LowDoc	Whole	FullDoc	LowDoc
Securitization	−0.0157*	0.0086	−0.0603**	−0.0322**	−0.0015	−0.0668**
	(0.0079)	(0.0051)	(0.0066)	(0.0102)	(0.0070)	(0.0051)
Other Controls	Y	Y	Y	Y	Y	Y
State FE	Y	Y	Y	Y	Y	Y
Orig Month FE	Y	Y	Y	Y	Y	Y
Lender FE	N	N	N	Y	Y	Y
R-Square	0.4020	0.3087	0.4882	0.5503	0.5606	0.5850
Adj R-Sq	0.4011	0.3068	0.4868	0.5287	0.5192	0.5480
N	54994	27581	27413	1400	652	748

Notes: This table compares the misreporting rates between portfolio loans and securitized loans. Loans included in the analyses are jumbo loans. We report the coefficient estimates and the standard errors of the OLS regressions in which the dependent variable Mis2Lien takes a value of one if the second lien is misreported and zero otherwise. Other control variables include FICO, first lien LTV ratio, second lien LTV ratio, DTI, low documentation dummy, FRM dummy, exotic loan dummy, owner occupied status, new purchase dummy, and a dummy for loans with 30-year term. The state fixed effects and loan origination month fixed effects are included in all the regressions. We report the results of the overall sample, full documentation sub sample, and low documentation sub sample. Model 1 reports the results of whole sample, and Model 2 reports the sample excluding mortgages originated in California and Florida. Model 3 uses the one-to-one propensity score matched sample. Model 4 uses the validation sample and control for lender fixed effect. Standard errors are clustered by state. * $p<0.05$, ** $p<0.01$.

Table 11: Ex Ante Probability of Securitization and Ex Post Misreporting

	Model 1 sorted by Prob(Sec)		Model 2 sorted by FICO	
Variable	Top Quartile	Bottom Quartile	620+	620-
Securitization	0.0086	−0.0429**	−0.0002	−0.0146*
	(0.0056)	(0.0039)	(0.0074)	(0.0059)
Other Controls	Y	Y	Y	Y
State FE	Y	Y	Y	Y
Orig Month FE	Y	Y	Y	Y
R-Square	0.1710	0.5757	0.6093	0.6837
Adj R-Sq	0.1681	0.5743	0.6078	0.6812
N	19097	19096	18304	9262

Notes: This table reports the coefficient estimates and the standard errors of the OLS regressions. Only jumbo loans are included in the analyses. The dependent variable Mis2Lien takes a value of one if the second lien is misreported and zero otherwise. Other loan-level control variables include FICO, first lien LTV ratio, second lien LTV ratio, DTI, low documentation dummy, FRM dummy, exotic loan dummy, owner occupied status, new purchase dummy, and a dummy for loans with 30-year term. The state fixed effects and loan origination month fixed effects are included in all the regressions. Model 1 sorts the observations by the expected probability of securitization. We first use an estimation sample containing a random 60% mortgages to estimate the Probit model of securitization with the dependent variable as the securitization status. We then apply the coefficient estimates from the securitization equation to the remaining 40% holdout sample to obtain the out-of-sample predicted probability of securitization. The holdout sample is sorted according the expected probability of securitization. Model 1 reports the results of the top and bottom quartiles of the expected probability of securitization of the holdout sample. Model 2 divides the sample according to borrowers' credit scores. Subprime loans are included in Model 2. Standard errors are clustered by state. * $p<0.05$, ** $p<0.01$.

Table 12: Securitization Effect with Sold Loan Only Servicer and Same Servicer Dummies

	Whole Sample			Sample Excluding CA and FL		
Variable	Whole	FullDoc	LowDoc	Whole	FullDoc	LowDoc
Sold Only Servicer	−0.0667**	−0.0227**	−0.1339**	−0.0426**	−0.0131**	−0.1069**
	(0.0096)	(0.0056)	(0.0080)	(0.0046)	(0.0040)	(0.0075)
Same Servicer	0.0488**	0.0505**	0.0340**	0.0441**	0.0463**	0.0294**
	(0.0015)	(0.0016)	(0.0018)	(0.0047)	(0.0056)	(0.0043)
State FE	Y	Y	Y	Y	Y	Y
Orig Month FE	Y	Y	Y	Y	Y	Y
R-Square	0.3994	0.3189	0.4758	0.3055	0.2606	0.3864
Adj R-Sq	0.3992	0.3184	0.4753	0.3045	0.2589	0.3842
N	191504	99470	92034	55627	33716	21911

Notes: This table reports the coefficient estimates and standard errors of the OLS regressions in which the dependent variable Mis2Lien takes a value of one if the second lien is misreported and zero otherwise. Only jumbo loans are included in the analyses. The sold only servicer dummy equals to one if a securitized mortgage is likely serviced by a new servicer at the time of securitization. The same servicer dummy equals to one if a sold mortgage is likely serviced by the same portfolio loan servicer at the time of securitization. We infer whether a sold loan is serviced by a new servicer or the same servicer who services the portfolio loan by comparing the time of securitization and the time the mortgage first entered into the dataset. If a loan enters into the dataset as a portfolio loan and later is securitized, the sold loan is likely to be serviced by the same servicer who serviced the portfolio loan. Otherwise, if a mortgage enters into the dataset as a sold loan, it is likely that the sold loan servicer is new and just services the securitized loan. The omitted baseline case represents portfolio loans. Other loan-level control variables include FICO, first lien LTV ratio, second lien LTV ratio, DTI, low documentation dummy, FRM dummy, exotic loan dummy, owner occupied status, new purchase dummy, and a dummy for loans with 30-year term. The state fixed effects and loan origination month fixed effects are included in all the regressions. Standard errors are clustered by state. * $p<0.05$, ** $p<0.01$.

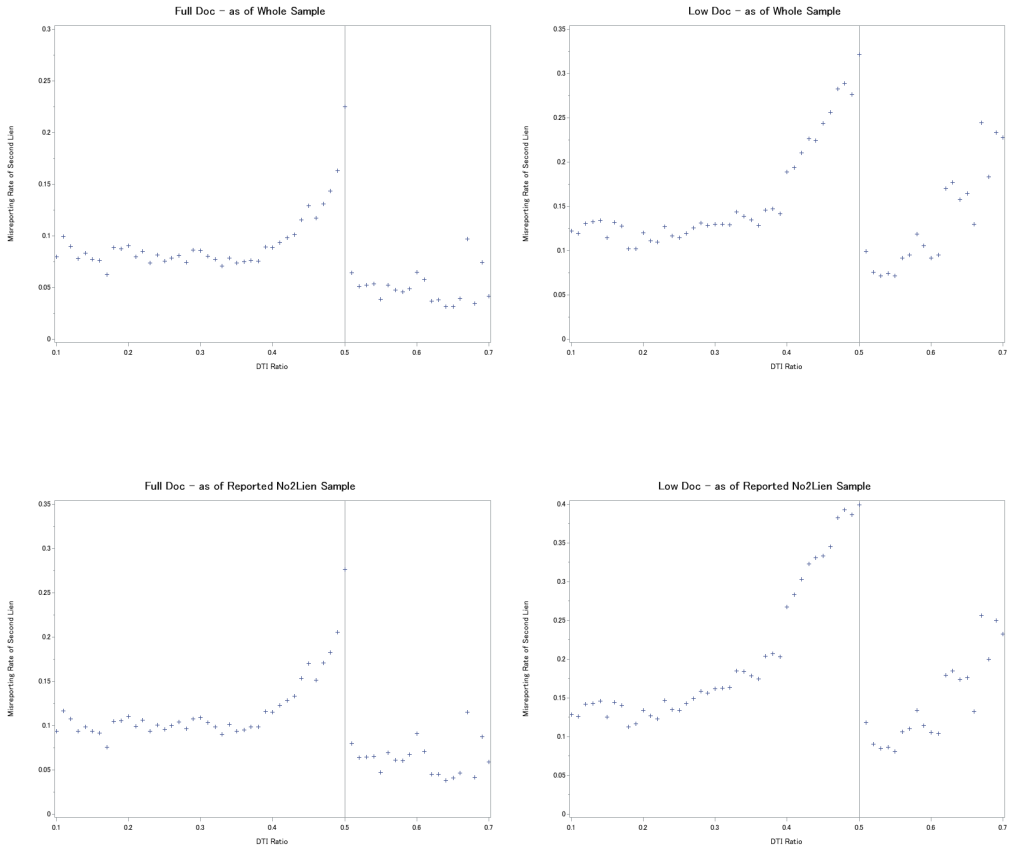

Figure 1: Misreporting Rate of Portfolio Loans by DTI

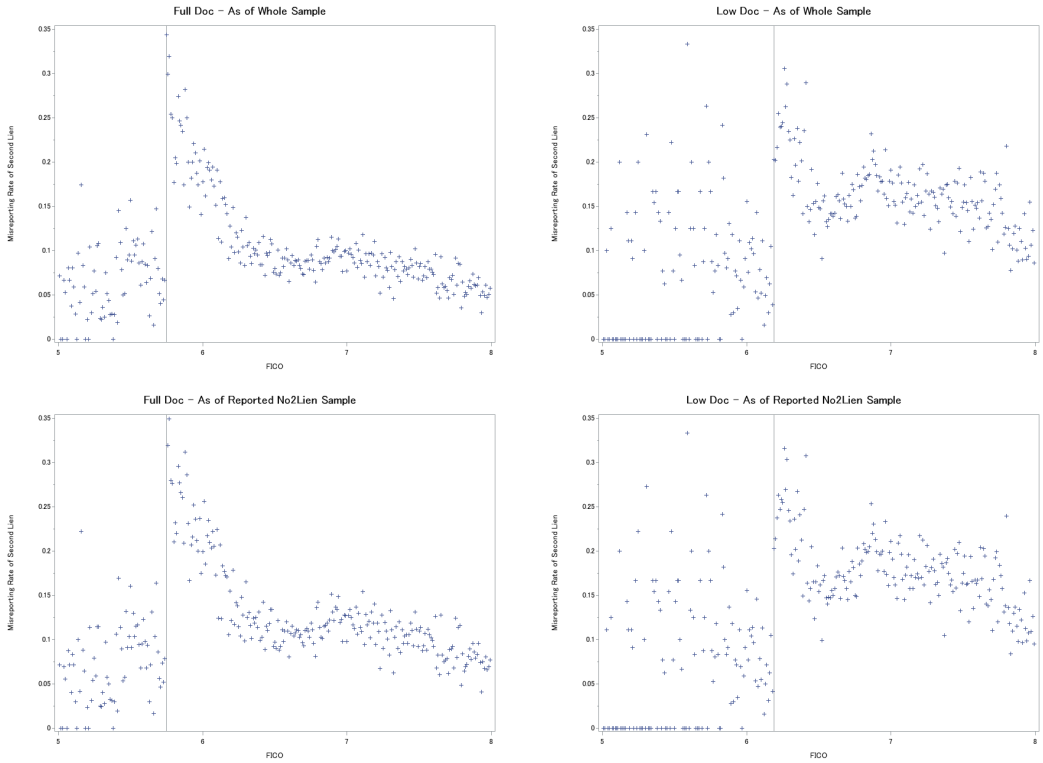

Figure 2: Misreporting Rate of Portfolio Loans by FICO