Second Liens and the Holdup Problem in First Mortgage Renegotiation

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ABSTRACT

Loss mitigation actions (e.g., liquidation, renegotiation) of delinquent mortgages might be hampered by conflicting goals of lenders at different seniority. In particular, a servicer has less incentive to take certain actions to reduce losses of investor-owned first lien mortgages if the servicer happens to own the second lien claim secured by the same property. Rather, the servicer has an incentive to hold up loss mitigation as it seeks to preserve the values of its own, junior, claim. We show that a sizable fraction of delinquent mortgages with multiple liens are indeed characterized by the servicer holding a direct financial interest in the junior liens, but not the first-lien mortgage. We further show that such cases are less likely to be liquidated or modified, and are instead more likely to not receive any loss mitigation actions from their servicers. Supporting the idea that second lien lenders pursue more profitable modifications, we find that modification terms are less concessionary and redefault rate is lower. These results highlight a specific incentive-driven channel by which separation of mortgage ownership and servicing may present an impediment to loss mitigation of delinquent mortgages.

Keywords: Loan Modifications, Subprime Crisis, Household Finance, Second Liens, Mortgages, Holdup Problem
JEL Classification: D14, D18, L85, R21

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1 Introduction

With the recent boom and bust of the housing market and the subsequent financial crisis, aggregate mortgage delinquency rates have reached unprecedented levels. In an attempt to mitigate these losses, lenders and servicers have pursued several resolution practices including liquidation (foreclosures, deeds-in-lieu, and short-sales), and modifications. Several studies identified securitization as being an important impediment for efficient renegotiation following delinquency (Piskorski et al., 2010; Agarwal, et al., 2011a; Zhang, 2011).[1] However, these papers do not focus on identifying a specific channel through which securitization frictions impede renegotiations.

One potentially important factor that could be at play is the existence of senior and junior liens secured by the same collateral and the common practice of major loan servicers owning the junior, but not the senior lien claims. Specifically, over half of the mortgages in trouble have a second lien attached to the first mortgage. The majority of the second liens are on the books of the bank servicing the first mortgage (Enger and McCoy, 2011). This dichotomy between ownership and control over loss mitigation actions on a delinquent loan can give rise incentive conflicts that stymie both liquidation and modification resolutions. In case of foreclosures, proceeds from auction sales satisfy the claims of senior lien holders before turning any residual to junior claimants. Since this residual is often times small or non-existent, servicers that own second liens have no particular incentive to pursue foreclosure aggressively and extinguish their claims for little in return. This incentive is considerably stronger in the minority of cases in

[1] Several commentators have argued that securitization does not fully explain the lack of modifications, especially since the government introduced the Home Affordable Modification Program (HAMP) that should have made modifications easier (Agarwal et al. 2011b).

which the first-lien mortgage is delinquent, but the second continues to perform.[2] In case of voluntary liquidations – deeds-in-lieu and short sales – the servicer does not automatically have to extinguish the second lien, but they need to resolve it in some fashion in order to be able to dispose of the liquidated property. This, too, leaves little incentive for the 2nd lien owner/servicer to trigger the liquidation process. In cases of loan modifications, second liens present a particularly thorny problem. First lien holders are reluctant to agree to a modification that leaves the junior claim intact, since lien priority dictates that junior claimants bear the loss first.[3] For their part, junior debt holders are not willing to simply extinguish their claims and allow modification to proceed, since there is always a chance that a delinquent loan may cure, or that collateral value may rise enough to yield a positive return in event of foreclosure. The resulting stalemate may be all the more pronounced when the second lien holder is also the party determining when, whether, and how to proceed with a specific set of loss mitigation actions. Indeed, in non-HAMP modifications, servicers are not obligated to modify second liens at all.[4]

All of these factors encourage the second lien owner to "hold up" any resolution (modification or liquidation) of the mortgage unless they can recover some price above the true value of the second lien, especially when the first lien is securitized. Specifically, when the first lien is securitized the ownership structure of the first claim holders is dispersed. This significantly hampers negotiations between the first and second lien holders and so they are more likely to holdup mortgage resolution. In a proposal for optimal loan modification strategy, Mayer

[2] Amherst Mortgage Insight (February 11, 2011) suggests that upwards of 20% of prime mortgages held in private-label securities (PLS) fit this profile.
[3] Many pooling and servicing agreements (PSA) that govern the relationship between loan servicers and investors, make it hard to modify the first mortgage unless the second lien holder relinquishes their claim on the mortgage.
[4] Under the HAMP Second Lien program, first and second liens are treated *pari passu* – the second lien is modified in exactly the same fashion as the first-lien loan,

et al. (2009a) discuss this possibility. In this paper, we empirically document the role of second lien owners causing the holdup on any loss mitigation resolution of securitized first mortgages.[5]

We overcome the empirical challenge of identifying the holdup problem by using a unique dataset from the OCC/OTS that matches the first and second liens on exact property address. The data allow us to separately identify whether the same or different servicer is servicing the first and second liens, and we can also identify whether the first lien is being held in the servicer's portfolio or is securitized. This is critical, because the prior literature has identified securitization as a barrier to loan modification. Here, we can identify the channel through which the second lien holder will impede modification of the securitized first lien.

To isolate the effect of holdup due to second liens, we focus on four particular sets of ownership and servicing structures. The first set includes properties that have first and second liens that are all held and serviced by the same bank. In this sample, there is no holdup problem. The second set also contains properties with first and second liens that are serviced by the same bank. However, here the first lien is securitized (by either private-label investors or the GSEs). Renegotiations in this sample are potentially subject to the holdup problem due to the fact that the second lien holder/servicer is also the servicer of the first lien mortgage that is owned by another investor. The holdup effect, however, may be only one of the channels through which securitization-driven frictions between servicer and investors are manifested. In order to separate the holdup effect from the broader securitization effect on specific loss resolution actions, we make use of properties with only the first-lien mortgage. Thus, the third set consists of first-lien only loans that are securitized. The loans in this set have no holdup problem since there is no

[5] Mayer et al. (2009a) proposes a solution to the holdup problem by providing a fee to the second lien holder to relinquish their control on the modification of the first lien. Beyond the mortgage market, there is a vast literature that has suggestions possible solutions to the holdup problem in more general settings (see, Mailath and Postlewaite, 1990 and Kominers and Weyl, 2011).

corresponding second lien, but they are supposedly exposed to other securitization frictions. Finally, we include a sample of first-lien only loans held in a servicer's portfolio, i.e., not securitized. The loans in this set have no securitization friction nor are they subject to holdup.

Our empirical strategy is to use a simple difference-in-differences analysis and compare these four samples, allowing us to identify the effect of holdup due to second liens. Our underlying assumption is that besides the introduction of second liens and securitization, and controlling for risk factors, these four samples are similar. Comparing these four samples allows us to identify the effect of holdup. As expected, our results show that holdup reduces the likelihood of any resolution: actual liquidation (voluntary or not), or modification. Specifically, we document that when there is potential for holdup, the likelihood of actual liquidation in six months (voluntary and involuntary liquidations) is lower by 3.5% points (60% in relative terms).

We also report materially low rates of renegotiation when the possibility of holdup exists. This is consistent with the idea that second lien holders are not interested in renegotiating outcome as their claim loses its value in most cases. When holdup is possible (i.e., first lien mortgage is securitized and is being serviced by a servicer that holds in its portfolio the attached second lien), the likelihood of a first mortgage modification is lower by 3.6% (70% in relative terms). As for liquidations, the renegotiation results are stronger for modifications outcomes within nine months.

Next, we explore the effects of the holdup on modification outcomes. Conditional on modification, the holdup problem is most prominent in principal write-downs. Finally, the redefault rates are higher for first lien mortgages that have a potential holdup problem. Our paper is related to several strands of the literature. First, our results contribute to the small literature on explaining the lack of loan modifications. Piskorski et al. (2010), Agarwal, et al. (2011a), and Zhang (2011) study the role of securitization and loan modifications. Our results reconfirm the

role of securitization frictions in loan modification. In addition, we identify a new friction in explaining the lack of loan modifications – i.e., the holdup problem due to second lien holders.

Second, our work is related to the growing literature on explaining the crisis and mortgage foreclosures. Keys et al. (2010), Mian and Sufi (2009), Campbell et al. (2010), Mayer et al. (2009b), Agarwal et al. (2011c), and Agarwal et al. (2011d) study the various factors in explaining mortgage foreclosures. Our paper contributes to the literature by documenting the important role of second liens in mortgage foreclosures and renegotiation.

Third, our work also contributes to long literature on the role of second liens on mortgage defaults. Agarwal et al. (2006) study the factors explaining the role of second liens in mortgage defaults. We contribute to this literature by looking at the redefault rate of mortgages.

Finally, there is a vast literature in law and economics on eminent domain and corporate takeovers that has been motivated by the holdup problem. Specifically, in public land assembly projects minority land holders can create a holdup problem. In order to cover this problem, the Fifth Amendment of the US Constitution allows the government to take over private property under the justification of eminent domain (Posner, 2005). Similarly in corporate takeover of public firms, the law requires the acquiring party to bid for all the shares of the firm. However, minority shareholders could create a holdup problem for the acquiring firm. Hence, to overcome this problem, some jurisdictions allow for the acquirer to bid for some super majority of the shareholders (Armour and Skeel, 2007).

The rest of the paper proceeds as follows. In Section 2, we develop a testable hypothesis, section 3 summarizes the data. Section 4 details the results. Section 5 discusses policy implications of our findings.

2 Hypotheses and Identification Strategy

2.1 Hypotheses

The effect of second lien holders on the loss resolution process is discussed in two main sources. Mayer et al. (2009a) argue that a holdup problem arises when property values decline and modification of the first lien acceptable to investors effectively extinguishes the second lien on the property. The authors also propose that by dragging their feet, second lien holders put pressure on first lien holders to buy them out.

In addition, Goodman (2011a, 2011b) analyzes the conflict of interests between first and second lien holders, when the second lien holder is the servicer of both liens, and proposes several hypotheses. Similarly to Mayer et al. (2009a), she concludes that second lien lenders oppose resolutions that deplete the value of their claims. Specifically, liquidations are less likely to be approved, since the second lien holders bear most of the brunt from this action. Also, second lien lenders are less likely to approve loan modifications.

Hence, the predictions based on Mayer et al. (2009a) and Goodman (2011a, 2011b) are threefold. First, the likelihood of liquidations is lower in the presence of second lien lenders. Second, second lien lenders reduce the likelihood of renegotiations. Finally, the likelihood of no action is higher. While not explicitly outlined in these proposals, the holdup problems due to second liens highlighted in these proposals explain part of the securitization friction.

2.2 Identification Strategy

Our purpose is to capture the effect of holdup in mortgage loss mitigation resolutions due to the presence of junior lien-holders who are also the servicers of the securitized senior liens. The holdup problem arises since servicers of the first lien are often also the servicers and owners

of the second lien. Although the servicer does not have an ownership stake in the securitized first lien, it can impede loss resolution by foot-dragging and imposing difficulties in the liquidation or modification process in order to reduce and/or delay the losses of his second lien portfolio.

To ease the discussion, we label our sample groups using four-letter acronyms according to their servicing and ownership structure. The first and second letters represent the first lien (servicer and holder, respectively), while the third and fourth letters represent the second lien (servicer and holder, respectively). For example, APAA stands for a first lien that is serviced by Bank A, is owned by private-label investor, and. Bank A owned and services the second lien.

Table 1, Panel C, shows the distribution of troubled loans by sample type. Our overall sample contains over 40,000 loans that have two liens (samples AAAA and APAA in Table 1, Panel B-I), and over 700,000 that have only one lien (samples AA00 and AP00 in Table 1, Panel B-I). It is possible that not all first liens that have a second lien are matched in our sample (i.e., samples AA00 and AP00 may actually have a second lien but that second lien is being held or serviced by a financial institution that is not in our database). While this would potentially bias our results, the bias goes against us. Specifically, in the current specification we are incorrectly identifying them simply as first liens mortgages without a second lien attached. If we could correctly identify their second liens, then the point estimate differences will be even larger. The holdup problem exists in the groups that have two liens, except for sample group AAAA, where both liens are held and serviced by the same party. Despite the fact that the holdup problem is expected to exist in many mortgages, we focus on a subset of loans where the identification of the effect is the cleanest. Specifically, we limit the sample to four groups, as motivated below, and listed in Table 1, Panel D.

To empirically capture the effect of holdup, consider two groups of loans:

a. First and second liens are both portfolio loans: they are owned and serviced by the same bank. We call this type of loans AAAA.

b. First and second liens are serviced by bank A. The second lien loan is owned by bank A and the first lien loan is owned by private-label investors (APAA).

In the data, the first lien mortgages in group APAA are securitized by the private-label investors, rather than owned by a bank servicer. Therefore, the difference in workout resolution rates between groups AAAA and APAA can potentially reflect a holdup effect and a securitization effect (as documented in Piskorski et al., 2010; Agarwal, et al., 2011a; Zhang, 2011).

To disentangle the holdup effect from the securitization effect, we introduce two additional groups that capture the securitization effect in loss resolution. These groups include only first lien:

a. First lien is a portfolio loan, owned and serviced by bank A. This sample is called AA00.

b. First lien is a securitized loan, owned by private-label investors and serviced by Bank A (AP00).

By combining the four subsamples in our analysis, we are able to control for effect of securitization and isolate the effect of holdup. In a regression format, the holdup will be captured in the interaction between a securitization dummy and a second lien dummy. Consider the following regression:

p(Modification) = a + b * Securitization indicator + c * Second lien indicator

+ d * Securitization indicator × Second lien indicator + controls + e

Based on the previous literature cited above, the likelihood of modification is lower when loans are securitized. Since the second lien holdup will not be able to explain the entire

securitization effect, we capture that with the securitization dummy. But, the interaction of the second lien with securitization will explain the effect of securitization due to holdup. Of course, a main effect for the second lien is necessary, because loans with second liens might have different characteristics than those of loans with a single lien (e.g., the former might be with higher leverage and different quality of borrowers).

Hence, the variable of interest in our study is the interaction between the securitization indicator and the second lien indication—it captures the holdup effect due to securitization.

3 Data

3.1 Source and Address Matching for First Mortgage and Home Equity Loan

We use three raw data sources to develop our analysis data. The first one is the OCC/OTS Mortgage Metrics (MM) data collected from 10 large banks that service about 64% of first lien mortgages in the U.S. The MM database records various loan attributes as well as precise loss mitigation and performance outcomes starting from January 2008. The second source data is the OCC/OTS Home Equity (HE) data that contain about 10 million second lien home equity credits (representing about 65% of all home equity credits outstanding). Similar to MM database, the HE database has a pre-defined list of attributes that covers a broad spectrum of loan/borrower attributes measured at the time of loans origination, current measures of loan/borrower attributes, delinquency behavior, and loss mitigation/workout resolution starting from May 2008.

Associated with the HE database is another database called the OCC/OTS Home Equity Crosswalk (HECW). For each home equity account that exist in the data from December 2009 to March 2011, the HECW database allows us to link a HE loan to a MM loan through an exact

address matching for each loan in a given month. Each record of the HECW data contains a pair of MM and HE loan numbers, the statement month and the corresponding ID for each property address (e.g., 1234 Main Street, City X, State Y, and Zip Code 56789). If there are multiple MM loans or HE loans found for one property, the HECW data record that a property address has multiple records and the variable "match type" shows the type of match that MM and HE loans have for this property (e.g., many-MM-to-one-HE, one-MM-to-many-HE, many-MM-to-many-HE in Table 1, Panel A). For example, if a borrower takes out one first mortgage (loan A), one home equity loan (loan B), and one home equity line of credit (HELOC, loan C) for his/her home, there will be two records shown: loan A matching with loan B, and then loan A matching with loan C under one property address ID, and the match type of both records is labeled as one-MM-to-many-HE. In Table 1 Panel A, we summarize five types of match and present the overall match rate associated with each match type. Matching the MM and HE data through the HECW address link, we are able to extract about 4.3 million loan pairs (56 million loan-pair-months from December 2009 through March 2011). The one-to-one match represents more than 80% of home equity properties in the HECW.

3.2 Our Sample

For this paper, we focus on the first two types: (1) properties that have one first mortgage but no home equity loan (one-MM-to-zero-HE); and (2) properties that have one first mortgage with one home equity credit attached (one-MM-to-one-HE). We want to focus on loans that are in serious delinquency status. To construct our sample of in-trouble loans, we first require that loans are either current or at most 30 days past due as of December 2009 when the HECW becomes available. We then define a loan as being in trouble/distress when either the MM loan

or the HE loan became serious delinquent (defined as 60 days past due)[6] from January 2010 or thereafter. Using this definition, we identified about 2.2 million distressed loans with 15.3 million loan-pair-months from January 2010-March 2011.

To conduct our empirical tests, we use information about whether a given servicer (say Bank A) is servicing and/or holding in its portfolio the first and/or second lien mortgage (see e.g., Table 1, Panel B-I) to develop different sample groups. Our first sample of loans is the first lien mortgages that do not have a second lien home equity. In this group of loans, we have two types of loans. In the first group (sample group AA00 in Panel B-I), servicer Bank A is holding and servicing the first lien mortgage; the first mortgage is held on the servicer's portfolio and no second lien attached to the first mortgage in this sample. This sample group AA00 represents about 26.8 percent of first mortgages that do not have a second lien attached, and is used as our control sample. The second type of loans in this group is first lien mortgages that are being serviced by Bank A on behalf of investors/securitizers. About 45.5 percent of first mortgages that do not have a second lien attached are owned by private-label investors (AP00 in Panel B-I) and about 27.7 percent of first mortgages that do not have a second lien attached are owned by agency investors (AG00 in Panel B-II).

We construct our second lien holdup test samples using the first lien mortgages that have a second lien home equity credit attached. To test for the existence of holdup due to second liens, we use information on whether or not the same servicer (Bank A) is holding the second mortgage in its portfolio, while servicing the first mortgage on behalf of private-label investor (in Panel B-I) or agency investors (in Panel B-II). In our test sample group, we have the first and second mortgages being serviced and held in the portfolio of the same servicer (Bank A); this is labeled

[6] Mortgage Banker Association delinquency definition.

as sample group AAAA and represents about 6.2 percent of first mortgages that have a second lien attached. In Panel B-I, we have the first test sample group (APAA), in which servicer Bank A is servicing the first mortgage on behalf of the private-label investors P, but Bank A is holding and servicing the second mortgage on its portfolio; this sample group represents about 7.2 percent of first mortgages that have a second lien attached. In Panel B-II, we have the second test sample group (AGAA), in which servicer Bank A is servicing the first mortgage on behalf of the agency investors G, but Bank A is holding and servicing the second mortgage on its portfolio; this sample group represents about 23.5 percent of first mortgages that have a second lien attached.

3.3 Summary Statistics

We present the summary statistics in Table 2. Panel A shows the statistics for groups AA00, AP00, AAAA, and APAA for six month horizon. Panel B presents similar statistics for nine months horizon. The summary statistics show that liquidation rates of first liens are highest for loans in the AP00 group. Besides the indicators for second lien, private label investor, and their interactions as discussed in Section 2.2.Identification Strategy, we also introduce a rich set of variables to control for borrower and loan characteristics, which generally can be grouped into two groups: first lien related and second lien related. Combined loan-to-value (CLTV) for the current month shows that all the four samples have similar percentage of property equity on average. But the average FICO scores are very low, and extraordinarily so for loans without a 2^{nd} lien. First lien mortgages without a second lien have a lower loan amount at origination, a longer loan term, fewer low documented loans, and a lower percentage of interest only (IO) and adjustable rate mortgages (ARM) than those with second lien attached. The similar pattern generally holds for these first lien controls between portfolio loans and their securitized

counterparties. For second lien only controls, such as second lien loan amount, loan term, documentation type, ARM, IO, the sample AAAA appears to be of higher mortgage quality than sample APAA. APAA also shows a higher rate of second lien being fully drawn, frozen or HELOC, and a higher rate of amount ratio of first lien vs. second lien loan. However, the sample APAA has a lower percentage of loans that are delinquent on both first and second lien loans, and that are piggyback, than AAAA. The non-recourse indicators for first and second lien are constructed according to Goodman et al. (2011). Compared to first lien only sample, few loans with second lien were originated in second lien non-recourse states.

Panel C of Table 2 presents summary statistics for loans that were modified. Panel D shows summary statistics for loans there were classified as GSE-like, i.e., have characteristics of loans that are securitized by GSEs. Panel E presents summary statistics for loans classified as non-GSE-like, i.e., have characteristics of privately securitized loans. To determine whether loans are have the characteristics of a private or GSE loans we follow the procedure outlined in Piskorski et al. (2010) and Agarwal, et al. (2011a). We use the subsamples of loans that were securitized by either GSEs or private securitizers and regress (logit regression) a GSE indicator on loan characteristics. We build individual logit regression models for first lien only loans (AP00 and AG00) and for loans with second lien attached (APAA and AGAA). The explanatory variables for first lien only loans include FICO and LTV when the loan get into trouble (including their corresponding missing or invalid indicators), the loan amount and loan term at origination, as well as indicators for whether a mortgage is a interest only product, for adjustable interest rates, for not fully documented loans (low or no documentation), for year of origination, and for bank servicers. For loans with second lien attached, we also control for second lien loan characteristics including loan amount and term at origination, documentation type, interest only or

not,[7] HELOC vs HELoan, whether the credit line has been fully drawn, whether the credit line has been frozen, the ratio of first lien loan amount over second lien loan amount, whether the second lien loan is originated as a piggyback loan. We also adjust the LTV to Combined LTV (CLTV) when a second lien loan is present. Then, we use the regression to predict the likelihood that portfolio loans resemble GSE-securitized loans or privately securitized loans. We use a likelihood of 0.5 as the cutoff. Portfolio loans that resemble GSE-securitized loans are considered GSE-like, while portfolio loans that resemble privately securitized loans are considered non-GSE-like.

4 Empirical Results

We test the effects of holdup on several aspects of loss resolution. First, we examine the different types of liquidation (involuntary liquidation and short-sale/deed-in-lieu). Then, we explore the effects on modification and on no-action. Finally, we examine the characteristics of modifications of loans that are subject to holdup and their outcomes.

4.1 Holdup and Liquidations

The OCC-OTS data allow us to identify the specific type of liquidation that takes place. We define liquidations as mortgages that have been liquidated through involuntary liquidations (e.g., foreclosure post sales or real-estate owned (REOs)) or short sales or deed-in-lieu. The prediction is that a bank servicer is less likely to liquidate securitized first lien mortgages if it holds on its portfolio the second lien attached to the securitized first mortgage. To test this prediction, we regress in Table 3 an indicator for whether a loan was already liquidated. The dependent variable indicates whether the first lien was liquidated within six months or within

[7] Almost all second lien loans have adjustable rates.

nine months. The independent variables include second-lien indicator[8], securitization dummy, an interaction between the two, and controls. The controls include logged mortgage amount, CLTV (combined Loan to Value ratio), default indicator for each of the liens, FICO credit score, non-recourse indicator for each of the liens, indicators to whether the loans have no or low documentation, ARM (adjustable rate mortgage) indicator, home equity line of credit indicator (HELOC), an indicator to whether the 2nd lien loan is fully drawn, loan term each of the liens, the ratio between the amounts of the first and second liens, an indicator to whether the 2nd lien credit line is frozen, an indicator to whether there the 1st and 2nd liens where originated together (piggyback loan), and indicators to whether the loan is interest only for each of the liens. In Tables 3, 4, and 5, the Columns (1) and (3) have no fixed effects, and Columns (2) and (4) have the following fixed effects: 2nd lien servicer identity, zip code, and origination year.

The interaction between the securitization dummy and the second-lien indicator captures the effect of holdup, after controlling for securitization friction effects (discussed in Section 2.2). The regressions indicate that in the presence of a potential for holdup, securitized first lien mortgages are less likely to be liquidated when a bank servicer of the securitized first lien also holds the second lien mortgage on its portfolio. These results are supportive of the idea that second lien holders hold up the first lien holders. In the presence of a holdup threat, first lien holders are less likely to liquidate their liens. In some cases, however, the holdup is resolved, and eventually the second lien is liquidated, at a rate that is higher than the rate that would a single holder (group AAAA) would liquidate.

[8] Since the sample includes mortgages that are composed of two loans (1st and 2nd liens) and ones that have only 1st lien only, we need to adjust some of the variables that describe the second lien loans: e.g., 2nd lien non-recourse indicator. For observations that have only a single lien, we set these variables to zero. The result of this definition is that the 2nd lien indicator absorbs the mean difference between the variable levels and zero, therefore its value cannot be easily interpreted.

Beyond the statistical significance of most results, the economic magnitude of the effect is impressive. The probability of liquidation in the presence of holdup is lower by 3.5% within six months, and lower by about 4.2% within nine month (Column (4)).

The regressions also shows that 1st lien securitized liens are more likely to be liquidated (consistent with the results of Piskorski et al. (2010) and Agarwal et al. (2011a)). The magnitude of the effect is 1.9% to 2.6% in the 6 months horizon and 2.4% to 3.1% in the 9 months horizon. However, the holdup effect is larger by about 60% to 70% than the main effect of securitization, and constitutes over 50% of the magnitude of the base probability of liquidation in group AAAA.

Moreover, the regressions contain some additional interesting results. First, the probability of liquidation is increasing with CLTV. Second, related to the holdup problem – the likelihood of liquidation is lower when only borrowers default only on one loan. In particular, liquidation rate is lower by 2.3% to 4.2% if the borrower defaults only on the 1st lien, and is lower by 4.7% to 7.8% if the borrower defaults only on the 2nd lien. Conditional on default, borrowers with lower FICO are more likely to be liquidated. Borrowers with no/low documentation, as well as borrowers with ARM mortgages and interest only mortgages are less likely to be liquidated. Finally, we also see that if the borrower has a home equity line of credit they are less likely to be liquidated and if the home equity is fully withdrawn, then they are less likely to be liquidated. This is consistent with our hypothesis, second lien holders holdup the first lien if they have more at stake.

In summary, our results indicate that liquidation is less likely when the securitized first mortgage has a second lien attached and is being serviced by holder of the second lien. This finding is consistent with the idea that second lien lenders hold up first lien lenders.

4.2 Holdup and Renegotiations

If the first lien is securitized, renegotiations are not favorable to second lien holder because the negotiating party is dispersed. Additionally, in the renegotiations process, the second lien claim is often extinguished as part of the agreement, since the value of the house is below the value of the first lien. To prevent this outcome, second lien lenders may use their power to object to modifying the original loan, in particular when they are the servicers of the first lien mortgage. To test this proposition, we regress a renegotiation indicator on a second lien indicator, in addition to a securitization indicator (of the first lien), and the interaction between the two. The effect of the holdup is captured by the interaction.

The regressions are presented in Table 4. It shows the effect of holdup on the probability of modification for the horizon of six months (Columns (1) and (2)) and nine months (Columns (3) and (4)). The results show that modifications of securitized first lien mortgages are less likely to take place when a bank servicer is also holding on its portfolio the second liens attached to the first mortgage. The effect is large: holdup reduces the likelihood of the first mortgage modification by about 3.0% within six months horizons and about 4.4% within nine months horizons. Given that the unconditional likelihood of modification within six months is 7.8%, this effect is very large. In addition, the results also confirm previous findings of Agarwal, et al. (2011a), and Zhang (2011), that modification rates are lower for loans that are securitized. Importantly, the effect of holdup is materially larger than the effect of securitization, which is smaller than -1% in our sample.[9]

[9] We further explore the effect of holdup on renegotiations, by examining the effect on refinancing and repayment plans. In results available upon request, we regress a refinancing and repayment indicator on the usual explanatory variables for the horizons of six and nine months, respectively. The results show that first lien mortgages are 4.1% to 4.6% more likely to be refinanced or get a repayment plan if they are securitized. However, securitized first lien mortgages are significantly less likely to be refinanced or receive a repayment plan if a bank servicer of the first

The regressions also indicate that modification is correlated with borrower and mortgage characteristics. They show that loans with high CLTV, default on one lien only, low FICO credit score, full documentation, fixed rate mortgages, and loans without frozen 2nd lien credit line are more likely to be modified.

Overall, consistent with the interpretation of a holdup, these regressions show that modification of the first lien mortgage is less likely to take place when a second lien is attached and the holder of the second lien does not own the first lien mortgage.

4.3 Holdup and No Action

The complementary category to liquidation and renegotiation is no action. In Table 5, we regress an indicator of no action on the first lien on the usual set of explanatory variables. The results show that the likelihood of no action on the first lien is materially higher, by about 8%, when the servicer of the first lien mortgage also holds on its portfolio the attached second lien. As the base rate of no action is about 60%, this effect amounts to about 13% of the base rate.

There is an interesting contrast between the effects of securitization and holdup. While securitization status is associated with lower likelihood of no action, the possibility of holdup is correlated with an increased likelihood of no action. Comparing Columns (1)-(2) to (3)-(4) shows that the probability of no action does not materially decline as time elapses.

The regressions show that no action is more likely to take place when borrowers default only on one loan out of the two. In addition, no action is more likely when borrowers' CLTV is lower, FICO is lower, loans are fully documented, loans are fixed rate and amortized, and when

mortgage also holds on its portfolio the attached second lien. The magnitude of the holdup effect on refinancing/repayment is also large; the possibility of holdup by the second lien holders is associated with lower probability of refinancing and repayment of about 6% to 7%. This material given that the base likelihood of refinancing and repayment is about 6%.

the 2nd lien is not an equity line of credit. Finally, we also see that if the borrower has a home equity line of credit they are less likely to have no action and if the home equity is fully withdrawn, then they are less likely to have no action.

In sum, we find that no action occurs more often when the first lien mortgage has a second lien attached and when the first mortgage is not held on the portfolio of a second lien holder.

4.4 The Characteristics of Modifications of Loans that are Subject to Holdup

To understand better the effects of holdup on renegotiations, we take a closer look at the types of modification given to the first mortgage, and test whether holdup is associated with their terms. To do so, we devise indicators for the different types of modification terms: principal deferral, principal write-down, capitalization of interest, interest rate reduction, interest rate freezing, and term extension.

Table 6 presents the results. Here the sample consists only of loans that were modified, and hence is substantially smaller. The regressions present evidence that securitized first lien mortgages receive more concessionary modification terms during modification in the presence of a holdup problem. Specifically, when securitized first lien mortgages are modified, they are generally less like to get a principal writedown, interest rate reduction and term extension, but more likely to receive a capitalization. However, if there is a second lien attached and the second lien is held on the portfolio of the servicer of the first lien, then when the securitized first lien mortgages are modified, they are significantly 11.8% more likely to get a principal write-down, 7.2% more likely to get an interest rate reduction, and 12.6% more likely to get a term extension.

These patterns can be explained through the negotiation process within the first and second lien holders. First, since second lien holders have the discretion to block renegotiations, they are likely to approve transactions that are profitable, i.e., that have greater likelihood of survival (this will show up in the redefault regressions in the following subsection). In these transactions, it is likely that there is greater room for maneuver, and thus to make greater concessions.

4.5 Redefault of Modifications of Loans that are Subject to Holdup

To further explore the role of second lien holders in the loss resolution process, we examine the probability of redefault following modification. In Table 7, we regress a redefault dummy within 3, 6, or 9 months on the usual covariates. The results in Table 7 show that the likelihood of redefault for loans which have been approved by second lien holders has lower redefault rate. For the horizon of three months and nine months, redefault rate is lower by about 9% (13.4% in relative terms). For six month horizon, the effect is smaller (a decline of 3.4%), and statistically insignificantly.

Overall, this evidence suggests that second lien holders use their power over the first lien holders to approve as modifications only modifications with higher quality.

4.6 Heterogeneity in the Holdup for Private and GSE securitized loans

In table 8 we present results of second lien holdup for securitized loans through GSE and private label separately. During our sample period the government implemented the HAMP program that encouraged loan modifications that were designed to modify second liens along with the first liens to address the holdup problem. Hence, it is possible that the holdup problem

in loan modification for GSE securitized loans is mitigated to some extent. We report results for forced liquidation, modification and no action. While, the results for the second lien interacted with securitization across GSE and private label securitized loans are directionally the same across these specification, but we do see some dampened effect of holdup due to second liens on loan modification securitized through the GSE.

5 Conclusion

In this paper we present novel evidence showing that the seniority structure in mortgage lending affects loss mitigation outcomes. In particular, our results show a lower likelihood of liquidation and modification, and a higher likelihood of no action of securitized first mortgages when the servicer of that securitized first mortgage holds on its portfolio the second lien attached to the first mortgage. This finding supports the existing literature that shows that securitization hampers loan modification and outlines one such mechanism through which second lien holders holdup the modification of first mortgages.

These effects are not only statistically significant, but they are economically quite large. Specifically, we find that liquidation and modifications of securitized first mortgages are 60% 70% less likely respectively and no action is 13% more likely when the servicer of that securitized first mortgage holds on its portfolio the second lien attached to the first mortgage.

Mayer et al. (2009a) propose a way to resolve the holdup friction by buying out the second lien holders. While, it is beyond the scope of this paper to evaluate the cost benefit of such a proposal, we do document that second lien holdup problem is a significant impediment to resolving the mortgage crisis.

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Table 1. Distribution of Loan Types

The table presents information about the organization of the data and summary statistics. Panel A shows the different matching types between 1st and 2nd lien databases. Panel B shows the different types of subsamples by investor type and lien status. Panel C presents summary statistics for the different subsamples. Panel D shows the structure of the sample used in the study.

Panel A: Match types

Match Type	Definition
One-MM-to-zero-HE	One first mortgage without a home equity credit
One-MM-to-one-HE	One first Mortgage with one home equity credit
One-MM-to-many-HE	One first Mortgage with two or more home equity credits
Many-MM-to-one-HE	Two or more first mortgages with one home equity credit
many-MM-to-many-HE	Two or more first mortgages with more than two home equity credits

Panel B: Control and Test Samples

Panel B-I: Private-Label Investor

				First Mortgage		Second Mortgage			
Mortage Holding	Sample Type	Sample Group	Same servicer for 1st & 2nd	Bank-Servicer	Owner	Bank-Servicer	Owner	Frequency by Sample	% by Sample
1st Lien Mortgage Only	Control: No friction due to 2nd Lien (Friction due securitization)	AA00	-	A	A	-	-	274,023	26.8%
		AP00	-	A	Private-Label	-	-	465,046	45.5%
1st & 2nd Lien Mortgage	Test 1: Friction due to 2nd lien holding & *Private-Label Investor*	AAAA	YES	A	A	A	A	19,932	6.2%
		APAA	YES	A	Private-Label	A	A	23,020	7.2%

Panel B-II: Agency Investor

				First Mortgage		Second Mortgage			
Mortage Holding	Sample Type	Sample Group	Same servicer for 1st & 2nd	Bank-Servicer	Owner	Bank-Servicer	Owner	Frequency by Sample	% by Sample
1st Lien Mortgage Only	Control: No friction due to 2nd Lien (Friction due securitization)	AA00	-	A	A	-	-	274,023	26.8%
		AG00	-	A	Agency	-	-	282,666	27.7%
1st & 2nd Lien Mortgage	Test 2: Friction due to 2nd lien holding & *Agency Investor*	AAAA	YES	A	A	A	A	19,932	6.2%
		AGAA	YES	A	Agency	A	A	75,711	23.5%

Table 1. Distribution of Loan Types (Cont.)

Panel C: Breakdown of troubled loans' population

	1st and 2nd liens								Only 1st lien		
	Service by same bank			Service by different banks							
Group	AGAA	APAA	AAAA	AGBS	AGBB	APBS	APBB	AABB	AA00	AP00	AG00
Servicer 1st	A	A	A	A	A	A	A	A	A	A	A
Owner 1st	G	P	A	G	G	P	P	A	A	P	G
Servicer 2nd	A	A	A	B	B	B	B	B	-	-	-
Owner 2nd	A	A	A	S	B	S	B	B	-	-	-
N =	75,711	23,020	19,932	27,556	100,314	14,524	39,507	13,421	273,925	465,046	282,666
1st lien											
In foreclosure process	28.1	25.2	22.4	27.4	26.7	12.3	19.6	15.9	15.3	13.8	37.6
Liquidated	3.2	3.8	6.3	3.3	3.5	1.9	3.2	2.8	4.2	14.0	10.4
Modified	6.1	4.4	7.8	6.9	7.5	9.8	10.1	14.1	15.7	12.7	10.8
Repayment+Refinanced	12.1	8.9	6.2	1.7	8.5	1.1	6.4	4.4	12.0	20.9	7.3
No action	54.0	59.8	59.6	63.9	57.8	75.9	63.9	66.9	53.7	39.8	34.7
2nd lien											
In foreclosure process	2.2	3.6	11.8	0.1	1.4	0.1	1.0	1.3	-	-	-
Liquidated	9.2	12.7	10.3	13.3	12.0	18.5	14.1	12.8	-	-	-
Modified	1.8	3.6	5.2	2.9	1.6	3.8	2.3	2.7	-	-	-
Repayment	0.3	0.4	1.5	0.3	0.4	0.2	0.4	0.4	-	-	-
No action	86.6	80.4	72.4	83.5	84.8	77.7	82.4	83.2	-	-	-

Panel D: Structure of sample

				First Mortgage		Second Mortgage	
Group	Purpose	Friction	Mortgage Holding	Servicer	Owner	Servicer	Owner
AA00	Control	No Friction	1st lien mortgage only	A	A	-	-
AAAA	Control	No Friction	1st & 2nd lien mortgage	A	A	A	A
AP00	Control	Friction due to securitization	1st lien mortgage only	A	Private-Label Securitized	-	-
APAA	Test	Friction due to securitization and due to holdup by 2nd lien	1st & 2nd lien mortgage	A	Private-Label Securitized	A	A

Table 2. Summary Statistics

The table presents summary statistics for the samples used in the study. Panels A and B shows summary statistics for the main sample (composed of four subsamples: AA00, AAAA, AP00, and APAA) for six and nine months, respectively. Panel C presents summary statistics for loans that have been modified in the four subsamples. Panel D presents summary statistics for GSE-like loans. Panel E presents summary statistics for non-GSE-like loans.

Panel A: Summary statistics for main sample – 6 months horizon

Sample:	AA00		AAAA		AP00		APAA	
N =	244,243		19,932		438,846		23,020	
Variable	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
Liquidated of 1st lien (%)	3.61	18.64	6.34	24.37	11.67	32.11	3.77	19.06
Modification of 1st lien (%)	16.70	37.30	7.78	26.78	12.96	33.59	4.40	20.52
No action of 1st lien (%)	51.83	49.97	59.57	49.08	40.18	49.03	59.82	49.03
2nd lien exists	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00
Private label securitization	0.00	0.00	0.00	0.00	1.00	0.00	1.00	0.00
2nd lien × Private label securitization	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
log(1st lien amount + 1)	11.94	0.89	12.15	0.99	12.05	0.78	12.55	0.86
log(2nd lien amount + 1)	0.00	0.00	11.05	0.84	0.00	0.00	11.18	0.77
CLTV current	0.82	0.32	0.80	0.46	0.82	0.28	0.82	0.46
CLTV indicator	0.43	0.49	0.15	0.35	0.61	0.49	0.10	0.30
Default of 1st lien only indicator	0.00	0.00	0.37	0.48	0.00	0.00	0.52	0.50
Default of 2nd lien only indicator	0.00	0.00	0.19	0.39	0.00	0.00	0.19	0.39
FICO (/100)	5.55	1.38	6.01	0.98	5.09	1.63	6.39	1.00
FICO missing indicator	0.15	0.35	0.01	0.11	0.32	0.46	0.00	0.06
1st lien non-recourse indicator	0.07	0.26	0.02	0.14	0.08	0.26	0.02	0.14
2nd lien non-recourse indicator	0.35	0.48	0.40	0.49	0.32	0.47	0.54	0.50
1st lien is no/low documentation loan	0.50	0.50	0.55	0.50	0.57	0.49	0.56	0.50
2nd lien is no/low documentation loan	0.00	0.00	0.93	0.26	0.00	0.00	0.98	0.15
1st lien is ARM	0.34	0.47	0.44	0.50	0.53	0.50	0.54	0.50
Home equity line of credit (HELOC) indicator	0.00	0.00	0.51	0.50	0.00	0.00	0.74	0.44
2nd lien is fully withdrawn	0.00	0.00	0.11	0.32	0.00	0.00	0.14	0.34
1st lien term	29.34	6.59	28.75	6.32	29.74	3.94	28.79	5.03
2nd lien term	0.00	0.00	23.57	8.38	0.00	0.00	19.71	9.64
1st lien loan amount / 2nd lien loan amount	0.00	0.00	4.27	3.44	0.00	0.00	4.97	3.21
2nd lien credit line is frozen	0.00	0.00	0.42	0.49	0.00	0.00	0.57	0.50
Piggyback indicator	0.00	0.00	0.67	0.47	0.00	0.00	0.55	0.50
1st lien is interest only (IO)	0.10	0.30	0.23	0.42	0.18	0.39	0.34	0.47
2nd lien is interest only (IO)	0.00	0.00	0.46	0.50	0.00	0.00	0.68	0.47

Table 2. Summary Statistics (Cont.)

Panel B: Summary statistics for main sample – 9 months horizon

Sample:	AA00		AAAA		AP00		APAA	
N =	171,785		10,506		357,069		14,050	
Variable	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
Liquidated of 1st lien (%)	4.02	19.65	5.93	23.62	14.25	34.96	4.66	21.08
Modification of 1st lien (%)	18.94	39.18	10.54	30.70	14.37	35.08	6.81	25.20
No action of 1st lien (%)	44.67	49.72	59.13	49.16	31.55	46.47	10.66	30.86
2nd lien exists	0.00	0.00	1.00	0.00	0.00	0.00	53.99	49.84
Private label securitization	0.00	0.00	0.00	0.00	1.00	0.00	1.89	13.60
2nd lien × Private label securitization	0.00	0.00	0.00	0.00	0.00	0.00	20.09	40.07
log(1st lien amount + 1)	11.95	0.89	12.35	0.91	12.05	0.77	2.90	16.79
log(2nd lien amount + 1)	0.00	0.00	10.99	0.84	0.00	0.00	0.43	6.52
CLTV current	0.80	0.31	0.87	0.47	0.82	0.28	74.82	43.41
CLTV indicator	0.48	0.50	0.16	0.37	0.63	0.48	1.00	0.00
Default of 1st lien only indicator	0.00	0.00	0.44	0.50	0.00	0.00	1.00	0.00
Default of 2nd lien only indicator	0.00	0.00	0.23	0.42	0.00	0.00	1.00	0.00
FICO (/100)	5.50	1.38	6.12	1.02	4.87	1.65	12.66	0.74
FICO missing indicator	0.15	0.36	0.01	0.10	0.38	0.49	11.21	0.77
1st lien non-recourse indicator	0.07	0.26	0.02	0.15	0.07	0.26	0.86	0.46
2nd lien non-recourse indicator	0.35	0.48	0.44	0.50	0.32	0.46	0.02	0.14
1st lien is no/low documentation loan	0.50	0.50	0.40	0.49	0.57	0.49	0.55	0.50
2nd lien is no/low documentation loan	0.00	0.00	0.91	0.28	0.00	0.00	0.21	0.41
1st lien is ARM	0.34	0.47	0.51	0.50	0.56	0.50	6.48	0.99
Home equity line of credit (HELOC) indicator	0.00	0.00	0.58	0.49	0.00	0.00	0.00	0.07
2nd lien is fully withdrawn	0.00	0.00	0.12	0.33	0.00	0.00	0.02	0.13
1st lien term	29.33	6.60	28.98	6.45	29.75	3.88	0.56	0.50
2nd lien term	0.00	0.00	22.35	8.84	0.00	0.00	0.52	0.50
1st lien loan amount / 2nd lien loan amount	0.00	0.00	5.02	3.34	0.00	0.00	0.97	0.16
2nd lien credit line is frozen	0.00	0.00	0.47	0.50	0.00	0.00	0.53	0.50
Piggyback indicator	0.00	0.00	0.58	0.49	0.00	0.00	0.76	0.43
1st lien is interest only (IO)	0.11	0.31	0.29	0.45	0.18	0.39	0.14	0.35
2nd lien is interest only (IO)	0.00	0.00	0.49	0.50	0.00	0.00	28.93	4.77

Table 2. Summary Statistics (Cont.)

Panel C: Summary statistics for modified loans

Sample:	AA00	AP00	AAAA	APAA
N =	43,002	58,911	1,550	1,014
Variable	Mean	Mean	Mean	Mean
Principal Defer of 1st (0/1)	0.014	0.002	0.017	0.011
Principal Writedown of 1st (0/1)	0.287	0.008	0.010	0.000
Capitalization of 1st (0/1)	0.505	0.504	0.356	0.341
Interest Rate Reduction of 1st (0/1)	0.527	0.344	0.337	0.208
Interest Rate Frozen of 1st (0/1)	0.073	0.129	0.098	0.045
Term Extension of 1st (0/1)	0.420	0.062	0.215	0.066
Redefault within 3 months	0.506	0.397	0.641	0.276
Redefault within 6 months	0.564	0.476	0.676	0.364
Redefault within 9 months	0.682	0.791	0.726	0.580

Panel D: Summary statistics for GSE-like sample – 6 months horizon

	AA00		AAAA		AG00		AGAA	
N =	103101		14679		282664		75711	
Variable	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
Liquidated of 1st lien (%)	3.10	17.33	5.70	23.18	10.44	30.57	3.24	17.71
Modification of 1st lien (%)	15.24	35.94	7.02	25.54	10.82	31.06	6.06	23.85
No action of 1st lien (%)	56.14	49.62	61.55	48.65	34.73	47.61	53.97	49.84
log(1st lien amount + 1)	11.65	0.88	11.86	0.92	11.85	0.53	12.06	0.57
log(2nd lien amount + 1)	0.00	0.00	10.84	0.78	0.00	0.00	10.77	0.75
CLTV current	0.84	0.31	0.84	0.45	0.91	0.20	0.84	0.45
CLTV indicator	0.36	0.48	0.14	0.35	0.41	0.49	0.07	0.26
Default of 1st lien only indicator	0.00	0.00	0.34	0.47	0.00	0.00	0.53	0.50
Default of 2nd lien only indicator	0.00	0.00	0.20	0.40	0.00	0.00	0.25	0.44
FICO (/100)	5.35	1.15	5.96	0.99	5.41	0.90	6.30	1.04
FICO missing indicator	0.11	0.31	0.01	0.12	0.05	0.21	0.01	0.10
1st lien non-recourse indicator	0.10	0.30	0.03	0.16	0.10	0.30	0.03	0.16
2nd lien non-recourse indicator	0.25	0.44	0.34	0.47	0.22	0.42	0.38	0.48
1st lien is no/low documentation loan	0.39	0.49	0.47	0.50	0.40	0.49	0.35	0.48
2nd lien is no/low documentation loan	0.00	0.00	0.91	0.28	0.00	0.00	0.93	0.25
1st lien is ARM	0.06	0.24	0.30	0.46	0.05	0.22	0.17	0.38
Home equity line of credit (HELOC) indicator	0.00	0.00	0.44	0.50	0.00	0.00	0.68	0.47
2nd lien is fully withdrawn	0.00	0.00	0.09	0.29	0.00	0.00	0.09	0.28
1st lien term	27.88	7.03	28.16	6.77	29.46	2.95	27.76	5.88
2nd lien term	0.00	0.00	22.93	8.35	0.00	0.00	20.21	9.44
1st lien loan amount / 2nd lien loan amount	0.00	0.00	3.94	3.28	0.00	0.00	4.60	3.10
2nd lien credit line is frozen	0.00	0.00	0.36	0.48	0.00	0.00	0.50	0.50
Piggyback indicator	0.00	0.00	0.64	0.48	0.00	0.00	0.40	0.49
1st lien is interest only (IO)	0.04	0.19	0.16	0.37	0.03	0.17	0.12	0.32
2nd lien is interest only (IO)	0.00	0.00	0.38	0.49	0.00	0.00	0.57	0.50

Table 2. Summary Statistics (Cont.)

Panel E: Summary statistics for non-GSE-like sample – 6 months horizon

	AA00		AAAA		AP00		APAA	
N =	141142		5253		438846		23020	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
Liquidated of 1st lien (%)	3.97	19.54	8.15	27.36	11.67	32.11	3.77	19.06
Modification of 1st lien (%)	17.76	38.22	9.90	29.87	12.96	33.59	4.40	20.52
No action of 1st lien (%)	48.68	49.98	54.03	49.84	40.18	49.03	59.82	49.03
log(1st lien amount + 1)	12.15	0.83	12.96	0.65	12.05	0.78	12.55	0.86
log(2nd lien amount + 1)	0.00	0.00	11.65	0.71	0.00	0.00	11.18	0.77
CLTV current	0.81	0.33	0.71	0.46	0.82	0.28	0.82	0.46
CLTV indicator	0.47	0.50	0.16	0.36	0.61	0.49	0.10	0.30
Default of 1st lien only indicator	0.00	0.00	0.45	0.50	0.00	0.00	0.52	0.50
Default of 2nd lien only indicator	0.00	0.00	0.16	0.36	0.00	0.00	0.19	0.39
FICO (/100)	5.71	1.52	6.15	0.92	5.09	1.63	6.39	1.00
FICO missing indicator	0.17	0.38	0.00	0.06	0.32	0.46	0.00	0.06
1st lien non-recourse indicator	0.06	0.23	0.01	0.08	0.08	0.26	0.02	0.14
2nd lien non-recourse indicator	0.41	0.49	0.56	0.50	0.32	0.47	0.54	0.50
1st lien is no/low documentation loan	0.59	0.49	0.79	0.41	0.57	0.49	0.56	0.50
2nd lien is no/low documentation loan	0.00	0.00	0.96	0.20	0.00	0.00	0.98	0.15
1st lien is ARM	0.54	0.50	0.83	0.37	0.53	0.50	0.54	0.50
Home equity line of credit (HELOC) indicator	0.00	0.00	0.70	0.46	0.00	0.00	0.74	0.44
2nd lien is fully withdrawn	0.00	0.00	0.17	0.37	0.00	0.00	0.14	0.34
1st lien term	30.41	6.04	30.40	4.48	29.74	3.94	28.79	5.03
2nd lien term	0.00	0.00	25.39	8.20	0.00	0.00	19.71	9.64
1st lien loan amount / 2nd lien loan amount	0.00	0.00	5.21	3.71	0.00	0.00	4.97	3.21
2nd lien credit line is frozen	0.00	0.00	0.59	0.49	0.00	0.00	0.57	0.50
Piggyback indicator	0.00	0.00	0.72	0.45	0.00	0.00	0.55	0.50
1st lien is interest only (IO)	0.15	0.36	0.43	0.50	0.18	0.39	0.34	0.47
2nd lien is interest only (IO)	0.00	0.00	0.66	0.47	0.00	0.00	0.68	0.47

Table 3. Holdup and Liquidation

The table shows results of regressions of indicator of whether the 1st lien was liquidated on determinants. All regressions are OLS regressions. The sample includes 1st lien only portfolio loans (AA00), 1st lien only securitized loans (AP00), 1st and 2nd lien loans in which both are portfolio loans (AAAA), and 1st and 2nd lien loans in which 1st lien is securitized (APAA). Columns (1) and (2) measure the dependent variable over a period of six months since the loan has been identified as distressed. Columns (3) and (4) measure the dependent variable over a period of nine months since the loan has been identified as distressed. The sample covers loans that became distressed between December 2009 through March 2011. The variable of interest is the interaction between the 2nd lien interaction and the 1st lien securitization. *2nd lien exists* is an indicator to whether the mortgage has a second lien. *log(X lien amount + 1)* is the logged mortgage amount at the time of distress. *CLTV current* is the combined LTV as reported by the servicer. *CLTV missing indicator* is an indicator to whether CLTV data is missing. *Default of X lien only indicator* is an indicator to whether only the 1st or 2nd lien defaulted. *FICO* is the credit score as reported by the servicer. *FICO missing indicator* is an indicator to whether the FICO score is missing. *X lien non-recourse indicator* is an indicator to whether the lien is considered non-recourse. *X lien is no/low documentation loan* is an indicator to whether loans have no or low level of documentation. *1st lien is ARM* is an indicator to whether the 1st lien is an adjustable rate mortgage (ARM). *Home equity line of credit (HELOC) indicator* is an indicator to whether the 2nd lien is a line a credit. *2nd lien is fully withdrawn* is an indicator to whether the line of credit of the 2nd lien is fully withdrawn. *X lien term* is the loan term measured in months. *1st lien loan amount / 2nd lien loan amount* is the ratio between the amounts of 1st and 2nd liens. *2nd lien credit line is frozen* is an indicator to whether the 2nd lien credit line has been frozen by the servicer. *Piggyback indicator* is an indicator to whether the 1st and 2nd liens where originated by the same originator (piggyback loans). *X lien is interest only (IO)* is an indicator to whether the loan is an interest only loan (IO). Standard errors are clustered at the zip code level. *t*-statistics are presented in brackets. *, **, *** denote two-tailed significance at the 10%, 5%, and 1% levels, respectively.

	Dependent Variable: Liquidation of 1st (0/1) × 100			
Sample:	Portfolio, private securitizations (1st and 2nd liens)			
Hortizon:	6 Months		9 Months	
	(1)	(2)	(3)	(4)
2nd lien exists	13.855***	10.766***	26.198***	22.983***
	[7.171]	[4.901]	[10.53]	[7.627]
1st lien securitized	2.606***	1.887***	3.092***	2.391***
	[35.76]	[25.26]	[34.74]	[26.03]
2nd lien × 1st lien securitized	-3.410***	-3.562***	-2.649***	-4.175***
	[-14.70]	[-14.33]	[-8.928]	[-12.19]
log(1st lien amount + 1)	-0.259***	1.325***	-0.314***	1.534***
	[-3.017]	[13.61]	[-2.935]	[12.20]
log(2nd lien amount + 1)	-0.028	-0.323**	-1.016***	-1.444***
	[-0.172]	[-1.965]	[-4.825]	[-6.341]
CLTV current	1.382***	0.487***	1.450***	0.733***
	[12.78]	[3.993]	[10.51]	[4.562]
CLTV missing indicator	4.247***	4.649***	5.804***	6.215***
	[51.64]	[53.23]	[56.23]	[56.34]

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Table 3. Holdup and Liquidation (Cont.)

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Default of 1st lien only indicator	-4.188***	-2.293***	-4.805***	-2.919***
	[-14.03]	[-7.467]	[-11.89]	[-7.069]
Default of 2nd lien only indicator	-6.592***	-4.764***	-7.842***	-6.166***
	[-22.76]	[-16.16]	[-19.97]	[-14.94]
FICO (/100)	-0.066*	-0.024	-0.020	-0.026
	[-1.845]	[-0.696]	[-0.432]	[-0.577]
FICO missing indicator	21.727***	20.960***	21.132***	20.011***
	[105.1]	[105.7]	[97.77]	[94.18]
1st lien non-recourse indicator	-0.136	-2.403***	-0.012	-5.183***
	[-0.836]	[-25.92]	[-0.0625]	[-38.31]
2nd lien non-recourse indicator	0.938***	11.803***	1.332***	12.169***
	[6.293]	[88.08]	[7.243]	[74.87]
1st lien is no/low documentation loan	1.366***	1.274***	1.950***	1.862***
	[19.48]	[17.55]	[21.85]	[20.12]
2nd lien is no/low documentation loan	-1.856***	-3.268***	-0.158	-1.705*
	[-3.008]	[-3.868]	[-0.229]	[-1.838]
1st lien is ARM	4.916***	4.319***	6.077***	5.298***
	[55.48]	[51.90]	[53.18]	[49.94]
Home equity line of credit (HELOC) indicator	-4.724***	-2.085***	-4.176***	-0.577
	[-11.46]	[-4.516]	[-7.694]	[-0.932]
2nd lien is fully withdrawn	-0.663**	-1.445***	-0.587	-1.658***
	[-2.285]	[-4.762]	[-1.470]	[-3.865]
1st lien term	-0.023***	-0.125***	-0.013	-0.136***
	[-3.071]	[-15.92]	[-1.465]	[-14.12]
2nd lien term	-0.013	0.222***	-0.074***	0.311***
	[-0.984]	[10.75]	[-4.344]	[9.679]
1st lien loan amount / 2nd lien loan amount	-0.350***	-0.287***	-0.455***	-0.525***
	[-9.613]	[-7.877]	[-8.345]	[-9.049]
2nd lien credit line is frozen	0.478*	2.034***	-0.324	1.291***
	[1.816]	[6.454]	[-0.803]	[2.658]
Piggyback indicator	1.288***	-0.320	1.932***	0.371
	[6.434]	[-1.516]	[6.768]	[1.243]
1st lien is interest only (IO)	-0.013	-0.716***	0.088	-0.745***
	[-0.115]	[-6.440]	[0.632]	[-5.371]
2nd lien is interest only (IO)	1.086***	-0.058	0.697*	-1.048**
	[3.377]	[-0.165]	[1.812]	[-2.489]
Fixed effects: 2nd lien servicers, zip code, origination year	No	Yes	No	Yes
Observations	726041	726041	553410	553410
Adj. R^2	0.168	0.217	0.167	0.225

Table 4. Holdup and Modification

The table shows results of regressions of indicator of whether the 1st lien was modified on determinants. All regressions are OLS regressions. The sample includes 1st lien only portfolio loans (AA00), 1st lien only securitized loans (AP00), 1st and 2nd lien loans in which both are portfolio loans (AAAA), and 1st and 2nd lien loans in which 1st lien is securitized (APAA). Columns (1) and (2) measure the dependent variable over a period of six months since the loan has been identified as distressed. Columns (3) and (4) measure the dependent variable over a period of nine months since the loan has been identified as distressed. The sample covers loans that became distressed between December 2009 through March 2011. The variable of interest is the interaction between the 2nd lien interaction and the 1st lien securitization. *2nd lien exists* is an indicator to whether the mortgage has a second lien. *log(X lien amount + 1)* is the logged mortgage amount at the time of distress. *CLTV current* is the combined LTV as reported by the servicer. *CLTV missing indicator* is an indicator to whether CLTV data is missing. *Default of X lien only indicator* is an indicator to whether only the 1st or 2nd lien defaulted. *FICO* is the credit score as reported by the servicer. *FICO missing indicator* is an indicator to whether the FICO score is missing. *X lien non-recourse indicator* is an indicator to whether the lien is considered non-recourse. *X lien is no/low documentation loan* is an indicator to whether loans have no or low level of documentation. *1st lien is ARM* is an indicator to whether the 1st lien is an adjustable rate mortgage (ARM). *Home equity line of credit (HELOC) indicator* is an indicator to whether the 2nd lien is a line a credit. *2nd lien is fully withdrawn* is an indicator to whether the line of credit of the 2nd lien is fully withdrawn. *X lien term* is the loan term measured in months. *1st lien loan amount / 2nd lien loan amount* is the ratio between the amounts of 1st and 2nd liens. *2nd lien credit line is frozen* is an indicator to whether the 2nd lien credit line has been frozen by the servicer. *Piggyback indicator* is an indicator to whether the 1st and 2nd liens where originated by the same originator (piggyback loans). *X lien is interest only (IO)* is an indicator to whether the loan is an interest only loan (IO). Standard errors are clustered at the zip code level. *t*-statistics are presented in brackets. *, **, *** denote two-tailed significance at the 10%, 5%, and 1% levels, respectively.

	Dependent Variable: Modification of 1st (0/1) × 100			
Sample:	Portfolio, private securitizations(1st and 2nd liens)			
Hortizon:	6 Months		9 Months	
	(1)	(2)	(3)	(4)
2nd lien exists	13.550***	12.344***	2.978	0.578
	[6.750]	[5.693]	[1.047]	[0.182]
1st lien securitized	-0.614***	-1.892***	-0.290	-1.474***
	[-3.978]	[-11.29]	[-1.608]	[-7.603]
2nd lien × 1st lien securitized	-3.008***	-3.012***	-4.198***	-4.413***
	[-10.26]	[-9.786]	[-9.687]	[-9.633]
log(1st lien amount + 1)	2.921***	2.223***	3.287***	2.721***
	[40.53]	[25.33]	[40.03]	[25.10]
log(2nd lien amount + 1)	-2.800***	-1.826***	-2.366***	-1.206***
	[-16.51]	[-10.36]	[-9.709]	[-4.640]
CLTV current	8.447***	7.759***	9.490***	8.735***
	[40.05]	[36.77]	[37.33]	[34.48]
CLTV missing indicator	-6.111***	-5.865***	-7.016***	-6.944***
	[-59.42]	[-56.82]	[-56.34]	[-55.19]

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Table 4. Holdup and Modification (Cont.)

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Default of 1st lien only indicator	3.913***	2.810***	7.879***	6.085***
	[11.94]	[8.339]	[16.90]	[12.61]
Default of 2nd lien only indicator	2.692***	2.093***	4.283***	2.734***
	[7.321]	[5.563]	[8.644]	[5.332]
FICO (/100)	-6.669***	-6.284***	-7.126***	-6.686***
	[-113.5]	[-104.7]	[-103.1]	[-93.03]
FICO missing indicator	-30.745***	-30.919***	-33.801***	-34.071***
	[-135.2]	[-129.4]	[-127.0]	[-120.4]
1st lien non-recourse indicator	-0.770***	1.223***	-0.699***	0.703***
	[-4.280]	[6.024]	[-3.188]	[3.134]
2nd lien non-recourse indicator	3.062***	6.099***	3.073***	8.585***
	[20.91]	[51.64]	[19.13]	[62.26]
1st lien is no/low documentation loan	-1.462***	-1.618***	-1.519***	-1.475***
	[-13.61]	[-15.61]	[-12.36]	[-12.30]
2nd lien is no/low documentation loan	3.025***	2.040***	3.050***	2.478**
	[5.937]	[2.950]	[4.113]	[2.301]
1st lien is ARM	-3.050***	-4.250***	-3.577***	-4.718***
	[-19.92]	[-26.16]	[-22.89]	[-28.57]
Home equity line of credit (HELOC) indicator	8.923***	3.624***	10.347***	4.844***
	[13.08]	[4.768]	[11.49]	[4.743]
2nd lien is fully withdrawn	-1.981***	-1.642***	-0.479	-0.842
	[-5.032]	[-4.034]	[-0.854]	[-1.436]
1st lien term	0.898***	0.812***	0.807***	0.693***
	[47.03]	[43.03]	[43.71]	[37.46]
2nd lien term	0.020	-0.316***	0.008	-0.294***
	[1.320]	[-15.14]	[0.337]	[-9.148]
1st lien loan amount / 2nd lien loan amount	-0.268***	-0.401***	0.018	-0.065
	[-5.639]	[-7.920]	[0.250]	[-0.871]
2nd lien credit line is frozen	-5.291***	-6.833***	-6.384***	-7.466***
	[-12.99]	[-14.53]	[-11.34]	[-11.50]
Piggyback indicator	1.134***	-0.499*	1.904***	-0.555
	[4.172]	[-1.712]	[4.906]	[-1.372]
1st lien is interest only (IO)	1.754***	1.421***	1.245***	0.883***
	[13.95]	[10.82]	[8.833]	[5.964]
2nd lien is interest only (IO)	-2.845***	-0.387	-2.825***	0.436
	[-5.478]	[-0.697]	[-4.188]	[0.590]
Fixed effects: 2nd lien servicers, zip code, origination year	No	Yes	No	Yes
Observations	726041	726041	553410	553410
Adj. R^2	0.108	0.151	0.111	0.162

Table 5. Holdup and No Action

The table shows results of regressions of indicator of whether the 1st lien had no action on determinants. All regressions are OLS regressions. The sample includes 1st lien only portfolio loans (AA00), 1st lien only securitized loans (AP00), 1st and 2nd lien loans in which both are portfolio loans (AAAA), and 1st and 2nd lien loans in which 1st lien is securitized (APAA). Columns (1) and (2) measure the dependent variable over a period of six months since the loan has been identified as distressed. Columns (3) and (4) measure the dependent variable over a period of nine months since the loan has been identified as distressed. The sample covers loans that became distressed between December 2009 through March 2011. The variable of interest is the interaction between the 2nd lien interaction and the 1st lien securitization. *2nd lien exists* is an indicator to whether the mortgage has a second lien. *log(X lien amount + 1)* is the logged mortgage amount at the time of distress. *CLTV current* is the combined LTV as reported by the servicer. *CLTV missing indicator* is an indicator to whether CLTV data is missing. *Default of X lien only indicator* is an indicator to whether only the 1st or 2nd lien defaulted. *FICO* is the credit score as reported by the servicer. *FICO missing indicator* is an indicator to whether the FICO score is missing. *X lien non-recourse indicator* is an indicator to whether the lien is considered non-recourse. *X lien is no/low documentation loan* is an indicator to whether loans have no or low level of documentation. *1st lien is ARM* is an indicator to whether the 1st lien is an adjustable rate mortgage (ARM). *Home equity line of credit (HELOC) indicator* is an indicator to whether the 2nd lien is a line a credit. *2nd lien is fully withdrawn* is an indicator to whether the line of credit of the 2nd lien is fully withdrawn. *X lien term* is the loan term measured in months. *1st lien loan amount / 2nd lien loan amount* is the ratio between the amounts of 1st and 2nd liens. *2nd lien credit line is frozen* is an indicator to whether the 2nd lien credit line has been frozen by the servicer. *Piggyback indicator* is an indicator to whether the 1st and 2nd liens where originated by the same originator (piggyback loans). *X lien is interest only (IO)* is an indicator to whether the loan is an interest only loan (IO). Standard errors are clustered at the zip code level. *t*-statistics are presented in brackets. *, **, *** denote two-tailed significance at the 10%, 5%, and 1% levels, respectively.

	Dependent Variable: No Action of 1st lien (0/1) × 100			
Sample:	Portfolio, private securitizations (1st and 2nd liens)			
Hortizon:	6 Months		9 Months	
	(1)	(2)	(3)	(4)
2nd lien exists	-35.832***	-36.329***	-43.625***	-41.572***
	[-9.182]	[-8.352]	[-8.513]	[-7.117]
1st lien securitized	-5.314***	-4.226***	-5.979***	-4.953***
	[-31.73]	[-24.06]	[-31.49]	[-25.01]
2nd lien × 1st lien securitized	7.187***	8.396***	5.071***	8.426***
	[14.09]	[15.67]	[7.586]	[11.92]
log(1st lien amount + 1)	-5.115***	-5.341***	-4.916***	-5.157***
	[-45.15]	[-33.84]	[-41.27]	[-29.95]
log(2nd lien amount + 1)	3.276***	4.518***	4.196***	5.514***
	[9.858]	[12.77]	[9.584]	[11.77]
CLTV current	-4.799***	-5.228***	-4.285***	-4.324***
	[-21.42]	[-22.90]	[-17.61]	[-17.64]
CLTV missing indicator	1.495***	1.905***	4.652***	5.074***
	[8.272]	[10.61]	[24.28]	[26.80]

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Table 5. Holdup and No Action (Cont.)

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Default of 1st lien only indicator	10.432***	6.672***	10.376***	7.560***
	[16.66]	[10.12]	[12.25]	[8.616]
Default of 2nd lien only indicator	28.703***	26.204***	29.891***	29.381***
	[42.77]	[37.07]	[33.59]	[31.63]
FICO (/100)	-4.999***	-4.535***	-4.928***	-4.514***
	[-43.90]	[-39.32]	[-43.45]	[-38.48]
FICO missing indicator	-44.024***	-42.197***	-40.260***	-38.211***
	[-124.9]	[-116.5]	[-104.1]	[-95.60]
1st lien non-recourse indicator	1.813***	-6.351***	2.105***	-11.202***
	[6.565]	[-26.24]	[6.947]	[-38.86]
2nd lien non-recourse indicator	1.618***	-12.063***	1.056***	-13.177***
	[8.333]	[-85.58]	[5.107]	[-80.77]
1st lien is no/low documentation loan	-2.800***	-2.944***	-3.063***	-3.325***
	[-20.07]	[-21.47]	[-20.39]	[-22.65]
2nd lien is no/low documentation loan	-2.943***	2.292*	-5.622***	1.702
	[-2.806]	[1.722]	[-4.168]	[0.982]
1st lien is ARM	-1.921***	-0.486***	-3.337***	-1.742***
	[-11.26]	[-2.809]	[-19.06]	[-9.962]
Home equity line of credit (HELOC) indicator	-6.214***	-2.803**	-7.749***	-5.836***
	[-5.003]	[-2.055]	[-5.293]	[-3.617]
2nd lien is fully withdrawn	-4.797***	-2.211***	-3.559***	0.101
	[-6.220]	[-2.891]	[-3.911]	[0.111]
1st lien term	-0.290***	-0.251***	-0.204***	-0.113***
	[-17.02]	[-14.51]	[-12.15]	[-6.712]
2nd lien term	-0.061**	-0.438***	0.191***	-0.628***
	[-2.099]	[-10.66]	[5.067]	[-10.97]
1st lien loan amount / 2nd lien loan amount	1.005***	0.676***	0.861***	0.935***
	[12.03]	[7.786]	[7.611]	[8.019]
2nd lien credit line is frozen	13.157***	5.335***	17.648***	8.728***
	[16.74]	[6.117]	[18.79]	[8.372]
Piggyback indicator	-4.370***	-1.394**	-4.605***	-2.145***
	[-8.315]	[-2.540]	[-7.126]	[-3.190]
1st lien is interest only (IO)	-2.069***	-1.489***	-1.338***	-0.431**
	[-11.77]	[-8.282]	[-7.323]	[-2.279]
2nd lien is interest only (IO)	-6.226***	-5.688***	-4.582***	-3.121***
	[-6.552]	[-5.600]	[-4.095]	[-2.593]
Fixed effects: 2nd lien servicers, zip code, origination year	No	Yes	No	Yes
Observations	726041	726041	553410	553410
Adj. R^2	0.106	0.152	0.111	0.166

Table 6. Modification Terms

The table shows results of regressions of indicator of modification outcomes on determinants. All regressions are OLS regressions. The sample includes 1st lien only portfolio loans (AA00), 1st lien only securitized loans (AP00), 1st and 2nd lien loans in which both are portfolio loans (AAAA), and 1st and 2nd lien loans in which 1st lien is securitized (APAA). All regressions measure the dependent variables over a period of six months since the loan has been identified as distressed. The sample covers loans that became distressed between December 2009 through March 2011. The variable of interest is the interaction between the 2nd lien interaction and the 1st lien securitization. *2nd lien exists* is an indicator to whether the mortgage has a second lien. *log(X lien amount + 1)* is the logged mortgage amount at the time of distress. *CLTV current* is the combined LTV as reported by the servicer. *CLTV missing indicator* is an indicator to whether CLTV data is missing. *Default of X lien only indicator* is an indicator to whether only the 1st or 2nd lien defaulted. *FICO* is the credit score as reported by the servicer. *FICO missing indicator* is an indicator to whether the FICO score is missing. *X lien non-recourse indicator* is an indicator to whether the lien is considered non-recourse. *X lien is no/low documentation loan* is an indicator to whether loans have no or low level of documentation. *1st lien is ARM* is an indicator to whether the 1st lien is an adjustable rate mortgage (ARM). *Home equity line of credit (HELOC) indicator* is an indicator to whether the 2nd lien is a line a credit. *2nd lien is fully withdrawn* is an indicator to whether the line of credit of the 2nd lien is fully withdrawn. *X lien term* is the loan term measured in months. *1st lien loan amount / 2nd lien loan amount* is the ratio between the amounts of 1st and 2nd liens. *2nd lien credit line is frozen* is an indicator to whether the 2nd lien credit line has been frozen by the servicer. *Piggyback indicator* is an indicator to whether the 1st and 2nd liens where originated by the same originator (piggyback loans). *X lien is interest only (IO)* is an indicator to whether the loan is an interest only loan (IO). Standard errors are clustered at the zip code level. *t*-statistics are presented in brackets. *, **, *** denote two-tailed significance at the 10%, 5%, and 1% levels, respectively.

	Dependent Variable: Modification of 1st lien					
	Principal Deferral	Principal Writedown	Capitalization	Interest Rate Reduction	Interest Rate Frozen	Term Extension
	(1)	(2)	(3)	(4)	(5)	(6)
2nd lien exists	0.066	0.313***	0.091	-0.022	0.129	0.088
	[1.224]	[3.349]	[0.411]	[-0.111]	[1.029]	[0.531]
1st lien securitized	-0.002***	-0.169***	0.077***	-0.103***	0.028***	-0.233***
	[-3.912]	[-51.85]	[17.32]	[-24.43]	[11.72]	[-63.39]
2nd lien × 1st lien securitized	0.002	0.118***	0.016	0.072***	-0.032***	0.126***
	[0.385]	[12.86]	[0.695]	[3.385]	[-2.577]	[7.725]
log(1st lien amount + 1)	0.004***	-0.003*	0.032***	0.026***	-0.010***	-0.005
	[6.089]	[-1.672]	[8.020]	[6.764]	[-4.042]	[-1.542]
log(2nd lien amount + 1)	-0.006	-0.032***	-0.026	-0.026	-0.002	-0.022
	[-1.393]	[-4.340]	[-1.418]	[-1.597]	[-0.171]	[-1.611]
CLTV current	-0.002**	0.038***	0.016***	-0.030***	-0.022***	0.006
	[-2.125]	[11.88]	[3.293]	[-6.374]	[-8.192]	[1.412]
CLTV missing indicator	-0.008***	0.006***	-0.039***	0.063***	0.054***	-0.047***
	[-14.96]	[3.041]	[-10.41]	[16.93]	[20.25]	[-20.28]

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Table 6. Modification Terms (Cont.)

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Default of 1st lien only indicator	-0.008	0.007	0.016	-0.012	-0.041**	-0.018
	[-0.973]	[0.558]	[0.491]	[-0.425]	[-2.096]	[-0.707]
Default of 2nd lien only indicator	0.038***	0.006	0.144***	0.099***	-0.014	0.052
	[2.598]	[0.349]	[3.764]	[2.685]	[-0.589]	[1.631]
FICO (/100)	-0.001***	-0.037***	-0.107***	-0.055***	0.001	-0.036***
	[-5.132]	[-26.62]	[-46.69]	[-23.17]	[1.107]	[-22.05]
FICO missing indicator	0.050***	-0.093***	-0.272***	-0.142***	-0.009	-0.099***
	[15.50]	[-15.07]	[-29.07]	[-16.00]	[-1.613]	[-13.00]
2nd lien non-recourse indicator	0.002***	-0.035***	0.108***	0.129***	-0.023***	-0.042***
	[7.295]	[-40.39]	[66.73]	[81.38]	[-24.81]	[-31.79]
1st lien is no/low documentation loan	0.003***	0.074***	0.053***	0.036***	-0.019***	0.073***
	[5.701]	[40.97]	[13.82]	[9.574]	[-8.029]	[29.88]
2nd lien is no/low documentation loan	0.008*	-0.009	-0.037	0.005	0.046**	0.039
	[1.809]	[-0.442]	[-0.794]	[0.129]	[2.279]	[1.255]
1st lien is ARM	-0.004***	-0.104***	-0.189***	-0.026***	0.109***	-0.127***
	[-4.686]	[-37.28]	[-42.18]	[-5.894]	[36.94]	[-35.02]
Home equity line of credit (HELOC) indicator	-0.001	-0.016	-0.085	-0.060	0.212***	-0.060
	[-0.0478]	[-0.841]	[-1.430]	[-1.132]	[4.389]	[-1.381]
2nd lien is fully withdrawn	0.009	-0.026**	0.054*	-0.020	0.018	-0.015
	[0.885]	[-2.165]	[1.891]	[-0.749]	[1.073]	[-0.611]
1st lien term	0.000***	0.019***	0.005***	0.015***	0.001***	0.021***
	[7.239]	[67.46]	[15.33]	[43.37]	[2.783]	[58.56]
2nd lien term	-0.000	-0.003***	-0.007***	-0.003	-0.003**	-0.005***
	[-0.282]	[-3.872]	[-3.737]	[-1.567]	[-2.292]	[-3.674]
1st lien loan amount / 2nd lien loan amount	-0.000	-0.004***	0.002	-0.003	-0.001	0.000
	[-0.287]	[-2.750]	[0.718]	[-0.978]	[-0.551]	[0.0815]
2nd lien credit line is frozen	0.000	-0.021*	0.051	0.009	-0.008	-0.039*
	[0.0568]	[-1.787]	[1.562]	[0.341]	[-0.485]	[-1.915]
Piggyback indicator	0.005	0.001	-0.058***	0.008	-0.034***	0.047***
	[0.807]	[0.151]	[-2.579]	[0.426]	[-2.818]	[2.752]
1st lien is interest only (IO)	-0.004***	-0.041***	-0.040***	-0.016***	-0.080***	-0.091***
	[-5.421]	[-17.10]	[-7.123]	[-2.746]	[-22.19]	[-27.79]
2nd lien is interest only (IO)	-0.001	0.019	0.010	0.006	-0.249***	0.060
	[-0.0390]	[1.149]	[0.197]	[0.134]	[-5.568]	[1.556]
2nd lien servicer fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	109,810	109,810	109,810	109,810	109,810	109,810
Adj. R^2	0.105	0.510	0.222	0.259	0.201	0.491

Table 7. Redefault Rate Following Modification

The table shows results of regressions of indicator of redefault (i.e., post modification default) on determinants. All regressions are OLS regressions. The sample includes 1st lien only portfolio loans (AA00), 1st lien only securitized loans (AP00), 1st and 2nd lien loans in which both are portfolio loans (AAAA), and 1st and 2nd lien loans in which 1st lien is securitized (APAA). Columns (1), (2), and (3) measure the dependent variables over a period of three, six, and nine months since the loan has been modified. The sample covers loans that became distressed between December 2009 through March 2011 that have been modified. The variable of interest is the interaction between the 2nd lien interaction and the 1st lien securitization. *2nd lien exists* is an indicator to whether the mortgage has a second lien. *Principal Deferral* is a modification method in which some of the principal due in payments is deferred. *Principal Writedown* is a modification method in which some of the principal is forgiven. *Capitalization* is a modification method in which unpaid interest is added to the principal of the loan. *Interest Rate Reduction* is a modification method in which the interest rate on the loan is reduced. *Interest Rate Frozen* is a modification method in which the interest rate on the loan is frozen and not increased according to the original schedule. *Term Extension* is a modification method in which the term of the loan is extended. *log(X lien amount + 1)* is the logged mortgage amount at the time of distress. *CLTV current* is the combined LTV as reported by the servicer. *CLTV missing indicator* is an indicator to whether CLTV data is missing. *Default of X lien only indicator* is an indicator to whether only the 1st or 2nd lien defaulted. *FICO* is the credit score as reported by the servicer. *FICO missing indicator* is an indicator to whether the FICO score is missing. *X lien non-recourse indicator* is an indicator to whether the lien is considered non-recourse. *X lien is no/low documentation loan* is an indicator to whether loans have no or low level of documentation. *1st lien is ARM* is an indicator to whether the 1st lien is an adjustable rate mortgage (ARM). *Home equity line of credit (HELOC) indicator* is an indicator to whether the 2nd lien is a line a credit. *2nd lien is fully withdrawn* is an indicator to whether the line of credit of the 2nd lien is fully withdrawn. *X lien term* is the loan term measured in months. *1st lien loan amount / 2nd lien loan amount* is the ratio between the amounts of 1st and 2nd liens. *2nd lien credit line is frozen* is an indicator to whether the 2nd lien credit line has been frozen by the servicer. *Piggyback indicator* is an indicator to whether the 1st and 2nd liens where originated by the same originator (piggyback loans). *X lien is interest only (IO)* is an indicator to whether the loan is an interest only loan (IO). Standard errors are clustered at the zip code level. *t*-statistics are presented in brackets. *, **, *** denote two-tailed significance at the 10%, 5%, and 1% levels, respectively.

	Dependent Variable: Redefault within…		
	3 months	6 months	9 months
	(1)	(2)	(3)
2nd lien exists	0.358	0.185	-1.080*
	[1.434]	[0.561]	[-1.820]
1st lien securitized	0.105***	0.093***	0.071***
	[26.07]	[20.61]	[12.48]
2nd lien × 1st lien securitized	-0.090***	-0.034	0.043
	[-3.473]	[-1.080]	[0.639]
Principal Deferral	0.014	-0.012	0.075***
	[0.715]	[-0.575]	[3.008]
Principal Writedown	-0.038***	-0.058***	-0.009
	[-4.929]	[-6.991]	[-0.877]
Capitalization	0.222***	0.200***	0.148***
	[54.99]	[47.95]	[28.22]
Interest Rate Reduction	0.145***	0.104***	0.070***
	[31.64]	[21.47]	[11.85]
Interest Rate Frozen	0.215***	0.169***	0.121***
	[38.46]	[29.26]	[17.41]
Term Extension	0.058***	0.047***	0.049***
	[9.359]	[7.051]	[6.028]

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Table 7. Redefault Rate Following Modification (Cont.)

(Continued from previous page)

log(1st lien amount + 1)	0.060***	0.049***	0.036***
	[15.89]	[11.62]	[6.973]
log(2nd lien amount + 1)	-0.043**	-0.030	0.056
	[-2.119]	[-1.101]	[1.146]
CLTV current	0.014***	0.026***	0.050***
	[3.031]	[5.455]	[7.914]
CLTV missing indicator	0.039***	0.021***	0.004
	[10.17]	[5.208]	[0.730]
Default of 1st lien only indicator	-0.065	-0.168***	-0.014
	[-1.613]	[-3.430]	[-0.135]
Default of 2nd lien only indicator	-0.270***	-0.275***	-0.023
	[-5.573]	[-4.709]	[-0.189]
FICO (/100)	-0.070***	-0.080***	-0.081***
	[-31.89]	[-32.95]	[-25.61]
FICO missing indicator	-0.249***	-0.290***	-0.303***
	[-28.15]	[-29.96]	[-25.29]
2nd lien non-recourse indicator	-0.010***	-0.087***	-0.137***
	[-5.720]	[-35.99]	[-38.35]
1st lien is no/low documentation loan	-0.040***	-0.043***	-0.041***
	[-11.07]	[-10.92]	[-8.541]
2nd lien is no/low documentation loan	0.113**	0.020	-0.010
	[2.566]	[0.331]	[-0.101]
1st lien is ARM	0.101***	0.078***	0.068***
	[24.81]	[18.07]	[12.55]
Home equity line of credit (HELOC) indicator	-0.041	-0.046	-0.089
	[-0.639]	[-0.594]	[-0.784]
2nd lien is fully withdrawn	0.011	-0.014	0.079
	[0.354]	[-0.336]	[1.086]
1st lien term	0.002***	0.002***	0.002***
	[5.084]	[4.592]	[3.662]
2nd lien term	-0.002	-0.002	-0.001
	[-0.743]	[-0.931]	[-0.101]
1st lien loan amount / 2nd lien loan amount	-0.010***	-0.002	0.001
	[-2.648]	[-0.455]	[0.123]
2nd lien credit line is frozen	0.073**	0.082*	0.092
	[2.058]	[1.758]	[1.117]
Piggyback indicator	-0.051**	-0.017	-0.057
	[-2.037]	[-0.554]	[-1.069]
1st lien is interest only (IO)	0.037***	0.038***	0.026***
	[7.193]	[6.796]	[3.737]
2nd lien is interest only (IO)	-0.032	0.030	0.020
	[-0.548]	[0.437]	[0.203]
2nd lien servicer fixed effects	Yes	Yes	Yes
Observations	106,592	94,267	68,657
Adj. R^2	0.296	0.266	0.257

Table 8. GSE-Like vs. Non-GSE-Like Loans

The table shows results of regressions of indicator of whether the 1st lien had an action on determinants. All regressions are OLS regressions. The sample used in Columns (1), (3), and (5) includes loans that are, or resemble, loans originated by GSEs. The sample used in Columns (2), (4), and (6) includes loans that are, or resemble, loans originated by private securitizers. All regressions measure the dependent variable over a period of six months since the loan has been identified as distressed. The sample covers loans that became distressed between December 2009 through March 2011. The variable of interest is the interaction between the 2nd lien interaction and the 1st lien securitization. *2nd lien exists* is an indicator to whether the mortgage has a second lien. *log(X lien amount + 1)* is the logged mortgage amount at the time of distress. *CLTV current* is the combined LTV as reported by the servicer. *CLTV missing indicator* is an indicator to whether CLTV data is missing. *Default of X lien only indicator* is an indicator to whether only the 1st or 2nd lien defaulted. *FICO* is the credit score as reported by the servicer. *FICO missing indicator* is an indicator to whether the FICO score is missing. *X lien non-recourse indicator* is an indicator to whether the lien is considered non-recourse. *X lien is no/low documentation loan* is an indicator to whether loans have no or low level of documentation. *1st lien is ARM* is an indicator to whether the 1st lien is an adjustable rate mortgage (ARM). *Home equity line of credit (HELOC) indicator* is an indicator to whether the 2nd lien is a line a credit. *2nd lien is fully withdrawn* is an indicator to whether the line of credit of the 2nd lien is fully withdrawn. *X lien term* is the loan term measured in months. *1st lien loan amount / 2nd lien loan amount* is the ratio between the amounts of 1st and 2nd liens. *2nd lien credit line is frozen* is an indicator to whether the 2nd lien credit line has been frozen by the servicer. *Piggyback indicator* is an indicator to whether the 1st and 2nd liens where originated by the same originator (piggyback loans). *X lien is interest only (IO)* is an indicator to whether the loan is an interest only loan (IO). Standard errors are clustered at the zip code level. *t*-statistics are presented in brackets. *, **, *** denote two-tailed significance at the 10%, 5%, and 1% levels, respectively.

Dependent Variable (0/1) × 100:	Liquidation of 1st		Modification of 1st		No Action of 1st lien	
Sample:	GSE-like	Non-GSE-like	GSE-like	Non-GSE-like	GSE-like	Non-GSE-like
	(1)	(2)	(3)	(4)	(5)	(6)
2nd lien exists	45.023***	19.727***	12.344***	0.578	-37.520***	-46.153***
	[23.10]	[6.372]	[5.693]	[0.182]	[-10.52]	[-7.540]
1st lien securitized	10.553***	3.586***	-1.892***	-1.474***	-23.732***	-4.867***
	[68.42]	[39.77]	[-11.29]	[-7.603]	[-107.7]	[-23.54]
2nd lien × 1st lien securitized	-9.556***	-5.655***	-3.012***	-4.413***	12.020***	10.596***
	[-34.19]	[-12.98]	[-9.786]	[-9.633]	[23.04]	[12.68]
log(1st lien amount + 1)	1.301***	1.419***	2.223***	2.721***	-4.544***	-4.825***
	[10.53]	[12.78]	[25.33]	[25.10]	[-22.95]	[-28.41]
log(2nd lien amount + 1)	-4.372***	-0.920***	-1.826***	-1.206***	4.721***	4.344***
	[-26.30]	[-4.433]	[-10.36]	[-4.640]	[15.58]	[9.587]
CLTV current	-4.242***	0.472***	7.759***	8.735***	-3.617***	-3.959***
	[-20.56]	[3.297]	[36.77]	[34.48]	[-12.19]	[-15.68]
CLTV missing indicator	-7.159***	5.584***	-5.865***	-6.944***	13.067***	2.530***
	[-64.67]	[55.57]	[-56.82]	[-55.19]	[66.92]	[13.46]

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Table 8. GSE-Like vs. Non-GSE-Like Loans (Cont.)

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Default of 1st lien only indicator	-3.812***	-1.767***	2.810***	6.085***	13.070***	6.159***
	[-15.99]	[-4.947]	[8.339]	[12.61]	[28.34]	[7.598]
Default of 2nd lien only indicator	-4.909***	-4.288***	2.093***	2.734***	42.024***	29.659***
	[-20.79]	[-12.28]	[5.563]	[5.332]	[87.00]	[33.72]
FICO (/100)	2.716***	0.163***	-6.284***	-6.686***	-5.679***	-5.016***
	[47.50]	[4.322]	[-104.7]	[-93.03]	[-56.99]	[-39.37]
FICO missing indicator	18.266***	21.938***	-30.919***	-34.071***	-33.327***	-44.750***
	[62.15]	[104.7]	[-129.4]	[-120.4]	[-72.83]	[-113.1]
1st lien non-recourse indicator	6.648***	-3.366***	1.223***	0.703***	4.807***	-16.470***
	[48.69]	[-30.05]	[6.024]	[3.134]	[19.53]	[-68.75]
2nd lien non-recourse indicator	14.440***	15.309***	6.099***	8.585***	-25.370***	-10.636***
	[114.9]	[106.4]	[51.64]	[62.26]	[-121.2]	[-69.70]
1st lien is no/low documentation loan	3.071***	1.431***	-1.618***	-1.475***	-2.513***	-2.617***
	[32.09]	[17.61]	[-15.61]	[-12.30]	[-14.49]	[-18.32]
2nd lien is no/low documentation loan	-2.292***	-3.819***	2.040***	2.478**	1.279	4.521**
	[-5.757]	[-3.119]	[2.950]	[2.301]	[1.612]	[2.310]
1st lien is ARM	9.505***	5.018***	-4.250***	-4.718***	-6.191***	-0.785***
	[37.08]	[55.99]	[-26.16]	[-28.57]	[-17.57]	[-4.251]
Home equity line of credit (HELOC) indicator	-4.317***	-2.065***	3.624***	4.844***	-3.908***	-1.949
	[-14.33]	[-3.461]	[4.768]	[4.743]	[-4.866]	[-1.153]
2nd lien is fully withdrawn	-0.605**	-1.157***	-1.642***	-0.842	-1.474**	0.824
	[-2.383]	[-3.329]	[-4.034]	[-1.436]	[-2.424]	[0.944]
1st lien term	-0.109***	-0.070***	0.812***	0.693***	-0.029	-0.233***
	[-10.49]	[-8.407]	[43.03]	[37.46]	[-1.610]	[-11.53]
2nd lien term	0.189***	0.284***	-0.316***	-0.294***	-0.356***	-0.295***
	[14.77]	[8.830]	[-15.14]	[-9.148]	[-13.13]	[-4.938]
1st lien loan amount / 2nd lien loan amount	-0.962***	-0.420***	-0.401***	-0.065	1.061***	0.577***
	[-25.39]	[-8.598]	[-7.920]	[-0.871]	[14.53]	[5.327]
2nd lien credit line is frozen	3.115***	2.196***	-6.833***	-7.466***	9.071***	6.846***
	[14.23]	[5.741]	[-14.53]	[-11.50]	[16.07]	[6.862]
Piggyback indicator	-1.361***	-0.431*	-0.499*	-0.555	-1.205***	-0.884
	[-7.944]	[-1.723]	[-1.712]	[-1.372]	[-3.359]	[-1.322]
1st lien is interest only (IO)	10.271***	-0.894***	1.421***	0.883***	-0.171	-2.066***
	[29.01]	[-7.694]	[10.82]	[5.964]	[-0.395]	[-11.21]
2nd lien is interest only (IO)	-0.687***	-0.351	-0.387	0.436	-6.327***	-6.876***
	[-2.965]	[-0.842]	[-0.697]	[0.590]	[-10.68]	[-5.592]
Fixed effects: 2nd lien servicers, zip code, origination year	Yes	Yes	Yes	Yes	Yes	Yes
Observations	476155	608261	726041	553410	476155	608261
Adj. R^2	0.194	0.228	0.151	0.162	0.175	0.155