Collateral Enforcement and Strategic Behavior:
Evidence From a Foreclosure Moratorium in Greece[*]

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Abstract

We exploit the introduction of a foreclosure moratorium and a new debt-discharge process in Greece that mitigate repossession risk of primary residence mortgages to identify strategic behavior. Under this legislative framework, the dominant strategy for non-strategic defaulters is to apply for debt-relief, while strategic mortgagors prefer to protect their homes through the foreclosure moratorium. We find that 37% of delinquencies in our sample are strategic, and document considerable heterogeneity in strategic behavior across mortgagors; Just 22% of borrowers who can afford their mortgages become delinquent intentionally. Our findings suggest that factors beyond collateral enforcement and pecuniary costs—the level of borrower sophistication, prior engagement in moral hazard (tax evasion), banking relationships, and liquidity preference—play an important role in strategic behavior.

Moral hazard and adverse selection problems permeate financial markets and create significant distortions (Akerlof (1970), Stiglitz and Weiss (1981)). These issues take a prominent form in the case of strategic default, whereby borrowers become delinquent despite their ability to service their debt.[1] Strategic default has received increased attention following the recent financial crisis, particularly in mortgage markets (Foote and Willen (2018)), where it can create significant welfare and economic spillover effects (Mian and Sufi (2014), Bradley et al. (2015)), and compromises the effectiveness of intervention policies (Mayer et al. (2014), Giné and Kanz (2017)).[2] Recent literature suggests not all households that can act strategically choose to do so (Foote et al. (2008), Guiso et al. (2013), Bhutta et al. (2017)), but due to challenges in identifying strategic behavior, we know very little about what motivates or prevents these decisions.

In this paper, we exploit a unique set of regulatory changes in Greece that allows us to identify borrowers who become delinquent despite their ability to service their mortgages. In the face of one of the deepest economic contractions in Greece, the government legislated in 2010 a set of measures to provide relief to over-indebted households. These measures included the introduction of a new debt-discharge process that excluded primary residences from liquidation. The provision required borrowers to undergo a multi-stage application and auditing process to prove inability to service their debt in exchange for a generous, permanent debt haircut (up to 80%-90% of outstanding debt). Additionally, in the same legislative bill, the government independently implemented an almost universal moratorium on the foreclosure of primary homes.[3]

In our setting, we can identify strategic behavior by exploiting the fact that the concurrent introduction of the debt-discharge process and the foreclosure moratorium creates

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[1]Henceforth, the terms "strategic default" and "strategic delinquency" are used interchangeably, even if in our case deliberate delinquencies do not go through a formal bankruptcy process.

[2]Even though the focus of this paper is on mortgages, strategic default has been documented in almost every credit market, including corporate debt (Giroud et al. (2012)), unsecured debt (Gross and Souleles (2002)), student loans (Yannelis (2016)), and sovereign debt (Yeyati and Panizza (2011)).

[3]Debt moratoria have been implemented in the U.S. in the past during periods of high financial distress (Alston (1984), Rucker and Alston (1987)). More recently, O'Malley (2018) shows that a legal ruling in Ireland that prevented foreclosures for certain mortgages increased delinquency rates by 40%. The uniqueness of our setting lies on the fact that the foreclosure moratorium is implemented *concurrently* with a debt-discharge process, which allows us to separate strategic from non-strategic delinquencies.

distinct optimal strategies for strategic and non-strategic defaulters. Delinquent mortgagors who truly cannot pay their mortgage have a dominant strategy: to apply for debt-relief. For these borrowers, the debt-discharge process not only excludes the primary home from liquidation, but also provides a generous, permanent debt haircut. By contrast, the debt-discharge process entails significant liquidation and disclosure costs without providing debt-relief for mortgagors with sufficient wealth or income. As a result, borrowers with the ability to pay, should they choose to become delinquent, would prefer to protect their primary homes through the foreclosure moratorium. We complement our criterion using court decisions to identify strategic mortgagors who file a false claim for debt-relief, and assign strategic status to applications withdrawn or rejected by the court. Therefore, our identification method separates non-strategic defaulters, who apply for debt-discharge and are approved, from strategic defaulters, who do not apply for debt-relief or have their applications either withdrawn or rejected by the court.

The debt-discharge process received extensive media attention and involved minimal costs, which mitigates concerns that mortgagors without the ability to pay remained inert due to lack of information or funds. In addition, the legislative changes were largely unanticipated, particularly for strategic mortgagors. The legislative bill passed just a few days before the implementation date. Furthermore, strategic opportunities emerged due to poor drafting of the law that could not have been anticipated; because the two provisions were legislated in different articles, the foreclosure moratorium applied to all mortgages below a certain threshold, instead to only those going through the debt-discharge process.[4]

We apply our identification criterion to a large representative sample of households in Greece to estimate the incidence of strategic default in the mortgage market. We conservatively estimate that, until the end of 2013, 37% of delinquencies were strategic (16% of mortgagors in our sample). This rate aggregates to over 7 billion euros (4% of Greek GDP) in non-performing loans (NPLs) across the Greek banking system. The respective cost was

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[4]Due to strong electoral support in favor of the moratorium the provision was not revised until 2015, and became thenceforth available only to mortgagors that had applied for debt discharge.

largely moved to the public through recapitalizations that increased government debt and depleted state holdings in Greek banks.

Consistent with prior work on mortgage default, we find that borrowers with lower credit scores, higher loan amounts, and higher combined CLTV ratios are more likely to become delinquent. Furthermore, we show that delinquencies by mortgagors with higher credit scores, higher income, and lower CLTVs are more likely to be strategic. Taken together, these results are consistent with the idea that strategic defaulters have greater ability to pay than their non-strategic peers.

Our results indicate considerable heterogeneity in strategic decisions across homeowners. We focus on a sample of mortgagors with the choice to act strategically or not, and thus exclude borrowers who cannot afford their mortgages (non-strategic defaulters). Among mortgagors with the ability to pay, just 22% exploit the moratorium and become delinquent intentionally. On the other hand, almost 4 out of 5 borrowers with enough liquidity continue to service their mortgages, despite the fact that the foreclosure moratorium mitigates repossession risk and associated financial penalties for the duration of the provision. Guiso et al. (2013) and Bhutta et al. (2017) emphasize on the role of non-pecuniary factors—as stigma, morality and personal biases—on strategic behavior. Here, we extend this line of work by focusing on factors beyond collateral enforcement and financial costs that motivate or prevent strategic behavior.

We find that household sophistication, assessed from professional specialization in conjunction with education, plays an important role on strategic behavior. Among high-profile professions that typically require a college degree, borrowers working in law and finance are 23% and 14% more likely to act strategically, respectively. These professionals have a better understanding of the legal and financial ramifications of the moratorium, which facilitates the identification of strategic opportunities. Furthermore, the aversion of law professionals towards filing a false court claim, and the stronger reaction of finance professionals to the presence of negative equity suggest that the two groups process different types of information: legal and financial, respectively. On the other hand, the military exhibits remarkably

low strategic delinquency rates, consistent with the view that military service inculcates a stronger sense of ethics and social consciousness (Akerlof and Kranton (2005), Benmelech and Frydman (2015)).

Second, we show that previous engagement in moral hazard is related to strategic behavior in the future. We relate the significantly higher propensity of self-employed professionals to act strategically compared to wage-workers (given the ability to pay) to another prominent characteristic of self-employment status; tax evasion (Kleven et al. (2011), Artavanis et al. (2016)). We provide evidence on the intensive margin of this relationship by estimating tax-evaded income following the methodology of Artavanis et al. (2016). We find that the magnitude of past tax-evading activity is strongly related to the propensity to exhibit strategic behavior; specifically, an increase in tax-evaded income by 8,000 euros annually increases the probability of strategic delinquency for self-employed professionals by 4.3%.

Our analysis also indicates that banking relationships can affect the decision to act strategically. We show that the length of the relationship between the mortgagor and the bank, its scope across both credit and deposit products, and proximity to bank branches have a significant effect in preventing strategic behavior. Given the sharp credit crunch in the Greek banking system during the crisis (Haliassos et al. (2017)), these results are more likely to reflect lower incentives to act strategically due to personal interactions between borrowers and lenders (Schoar (2012)) rather than to secure access to future credit (Puri et al. (2017)).

Lastly, we provide evidence that preference for liquidity can motivate strategic behavior (Cohen-Cole and Morse (2010)). Specifically, we examine whether borrowers who suffer a substantial adverse liquidity shock are more likely to act strategically in order to restore their prior levels of liquidity. To this end, we exploit the disproportionate effect of Greek austerity measures on retirees during our sample period; high-income pensioners experienced a 30% reduction in their pensions, whereas low-income pensioners were almost unaffected (Tinios (2016)). Our results indicate that high-earning (€5,200 per month) retirees are 34% more likely to become delinquent strategically than their low-income (€1,250 per month) peers,

which is consistent with individuals substituting the loss of liquidity by foregoing mortgage payments.

Our paper contributes to the literature on the determinants of strategic default in mortgage markets, focusing on factors beyond collateral enforcement and financial costs. Guiso et al. (2013) and Bhutta et al. (2017) highlight the importance of non-pecuniary factors on strategic behavior that can explain the reluctance of deep-underwater borrowers to walk-away from their mortgages. Mayer et al. (2014) and O'Malley (2018) show that credit interventions in mortgage markets result in increasing delinquency rates, as previously solvent borrowers attempt to benefit from the provisions. Gerardi et al. (2017) find a high percentage of borrowers with no apparent liquidity continue to service their mortgages. Giné and Kanz (2017) show that a bailout program in India had a significant effect on strategic behavior, which was sensitive to the state electoral cycle.

Additionally, our study offers new evidence about the importance of collateral enforcement as a way of mitigating moral hazard behavior (Barro (1976)). Collateral pledge reduces the cost of intermediation and eases financing constraints, but exacerbates business cycles (Kiyotaki and Moore (1997)). In our setting, the foreclosure moratorium mitigates repossession risk on a credit product for which collateral is internal.[5] However, we show that just 1 in 5 mortgagors with the ability to pay their mortgage become delinquent exploiting the bank's inability to seize the collateral. Therefore, our findings regarding the efficacy of collateral enforcement are particularly important in light of several recent studies suggesting (over)collateralization is an important channel through which macroeconomic shocks propagate to the real economy (Chaney et al. (2012), Mian et al. (2015), Schmalz et al. (2017)).

Finally, our study uses a novel method to identify strategic behavior based on the revealed preference of the agent with superior information regarding ability to pay in the setting; *the borrower*. This approach is free of self-reporting biases that may hinder survey methods

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[5]Assessing the role of collateral in enforcing repayments on these type of credit products is difficult to establish under normal circumstances, due the lack of a testable counter-factual. Our work, here, on repayment patterns complements the existing literature on debt moratoria that is mainly focused on supply-side effects (Alston (1984), Pence (2006), Morse and Tsoutsoura (2013)).

(Hurst et al. (2014)), or limitations of financial and banking data in estimating borrowers' true ability to pay (Guiso et al. (2013)). To our best knowledge, this is the first method that identifies strategic defaulters without conditioning on borrower or loan characteristics (i.e., credit scores, CLTV). As a result, we can include and study these variables in our analysis without concerns for possible correlations with any conditioning criteria.

The remainder of the study is as follows. The next section provides details for the legal framework and our identification criterion. Section II. describes our data and our empirical methodology. Section III. presents our empirical results regarding the incidence and the distribution of strategic default. In section IV., we examine the factors that motivate strategic default. Section V. concludes the study.

I. Legal Framework and Identification

A. Legal Framework

Greece is a full recourse country with personal bankruptcy proceedings for individuals before 2010.[6] This regulatory framework, which is common in many European countries and other developed economies reduces mortgagors' incentive to walk-away from negative equity mortgages (Ghent and Kudlyak (2011)).

With the onset of the debt crisis, Greek policymakers introduced legislation to provide relief to over-indebted households. Specifically, in June 2010, the Greek Parliament enacted law N.3869/2010, also known as the "Katseli law", which imposed a *primary residence moratorium* and introduced a *debt-discharge process*. Both provisions mitigate repossession risk for primary residences, which is a key feature we exploit to identify strategic behavior.

The foreclosure moratorium prevented repossession of primary homes with objective values below 300,000 euros.[7] In practice, the imposed thresholds protected the vast majority of primary residences and made the effect of the provision almost universal. The objective

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[6]The ability to default was only available to commercials with N.3855/2007. See Vallender et al. (2013) for more details on personal debt charge provisions in Greece and other European countries.

[7]Objective values correspond to presumed values used by tax authorities to estimate tax liabilities, and at the time of the implementation they were significantly lower than market values. The 300,000-euros

value of the median home in our sample is 71,000 euros, while 98.7% of dwellings fall below the minimum inclusion threshold (Figure 1). The law originally deferred foreclosures for six months but was subsequently extended without any change until the end of 2013.[8] These subsequent extensions were largely anticipated, due to strong electorate support for politicians to protect mortgagors.[9]

The same legislative bill (N.3869/2010) introduced a debt-relief procedure for over-indebted households that *excluded primary residences from liquidation*, using inclusion thresholds identical to the foreclosure moratorium. The debt-discharge process included the following three stages. In the first stage (application), the borrower applies for debt-relief, invoking inability to service her debt obligations. From the time of the application, mortgages accrue interest at the non-delinquency rate. In the second stage (out-of-court settlement), the borrower provides to creditors a list of eligible debt obligations to be settled, a comprehensive report of her current financial state, and a proposed repayment plan. The case is settled if the two parties agree on the repayment plan within three months. Finally, the third stage (in-court settlement) occurs if the out-of-court settlement is unsuccessful. Then the case is deferred to the court, which orders the liquidation of the borrower's assets excluding the primary residence, sets a monthly payment for the next four years, and eliminates the residual debt (debt haircut).

It is important to note that the debt-discharge process received extensive media attention for a prolonged period of time. Additionally, the application for debt-relief, which pauses any recovery measures of the creditors against the debtor and keeps the interest rate to the non-delinquency rate, involved minimal costs (50 euros). These facts mitigate concerns that eligible mortgagors without the ability to pay did not apply for debt-relief due to lack of information or funds.

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threshold applied to single individuals. A threshold of up to 450,000 euros applied for married couples with three or more children.

[8]The government extended protection of the primary residence prescribed in N.3869/2010 with N.3886/2011, N.4047/2012, and N.4128/2013. Starting from 1/1/2014, N.4224/2013 imposed additional criteria on objective value and income. This is the main reason our sample period ends in December 2013.

[9]Bolton and Rosenthal (2002) describe a similar setting where an unanticipated foreclosure moratorium receives political support by improving efficiency and preventing negative spillover effects from a large number of foreclosures.

Moreover, both measures were largely unanticipated, as the legislative bill was voted just a few days before the implementation date of the provisions. Particularly for borrowers with the ability to service their mortgages, the opportunity to act strategically emerged unexpectedly, due to poor drafting of the law. The debt-discharge process and the foreclosure moratorium were legislated in different articles of law N.3869/2010 (articles 2 & 19) resulting to the independent implementation of the two provisions. Consequently the foreclosure moratorium applied to all mortgages below a certain threshold, and not only to those of over-indebted mortgagors, who had applied the debt-discharge process. Due to strong electoral and political support in favor of the moratorium, this legislative "failure" was not revised until 2015, thenceforth protecting only to mortgagors who had applied for debt-relief.

B. Identification of Strategic Behavior

Borrowers act strategically if they become delinquent despite having the financial means to service their debt obligations. Identifying strategic defaulters is a particularly challenging task because these individuals have a strong incentive to camouflage as borrowers with inability to pay (Guiso et al. (2013)). Detecting strategic behavior requires a comprehensive view of the borrower's financial state, however in reality this information is not attainable because individuals may hold hidden assets or have informal income.

Previous studies have used different approaches to determine borrowers' ability to pay, each having its own merits and limitations. One approach relies on survey data, whereby strategic behavior is assessed through a set of survey questions. By altering a set of hypothetical questions, surveys are helpful in examining counterfactual scenarios (Guiso et al. (2013)), but they can be subject to self-reporting biases (Hurst et al. (2014)), especially if they do not reflect agents' actions. Another method is to estimate the agent's ability to pay using formal financial data, such as measures of liquidity (Gerardi et al. (2017)), credit scores (Goodstein et al. (2017)), or repayment patterns (Cohen-Cole and Morse (2010)). Even though more direct, this approach may fail to determine mortgagors' ability to pay if they hide their assets or income. For instance, Gerardi et al. (2017) find that 80% of

households with low ability to pay continue to service their mortgages, which implies these borrowers have access to income streams that formal financial datasets do not reflect.

Finally, a third approach, which is closer to our setting, is to examine borrowers' response to exogenous policy shocks (Mayer et al. (2014), O'Malley (2018)). Even though this method provides strong causal evidence about the incidence of strategic delinquencies, it is difficult to assess which individuals act strategically, because the shocks (e.g., debt moratoria, restructuring programs) coincide with negative economic shocks that affect homeowners' ability to pay. For example, O'Malley (2018) shows that a legal ruling in Ireland that prevented foreclosures for certain mortgages increased delinquency rates by 40%, but also finds that a significant portion of this increase originates from financially constrained borrowers.

The new legislative framework in Greece provides an excellent setting for identifying strategic behavior. They key identification assumption is that non-strategic defaulters have a strict dominant strategy; to apply for debt-relief. By contrast, for delinquencies by mortgagors with ability to pay, the debt-discharge process entails significant liquidation and disclosure costs. Therefore, we identify (ex ante) strategic behavior based on the revealed preference of delinquent borrowers with respect to the debt-discharge process.

Borrowers who cannot afford to pay their mortgage become—by definition—delinquent. These mortgagors, given the provisions of the new law, should strictly prefer the debt-discharge process to the temporal protection of the foreclosure moratorium (Figure 2). The reason is that the former not only protects their primary residence, but also allows for a generous, permanent debt haircut that can reach up to 80-90% of their outstanding obligations. Furthermore, these borrowers face minimal liquidation and disclosure costs due to their weak financial state. The massive media coverage and the low cost of application alleviate concerns that eligible mortgagors did not apply because they were not aware of the provision or they could not afford it.

Borrowers with ability to pay may continue to service their mortgages or, as shown in Figure 2, may choose to become delinquent intentionally. If they decide to act strategically the high liquidation and disclosure costs this process entails for individuals that hold formal

and hidden assets, would discourage applying for debt-discharge. Instead, these mortgagors can simply refrain from paying their loans and protect their primary home from repossession through the foreclosure moratorium.

However, it is still possible that mortgagors with ability-to-pay apply for debt-discharge, even though they do not qualify. For instance, they may want to exploit possible inefficiencies of the process and the Greek judicial system (Paulus et al. (2015)) or they may feel confident that they have successfully hidden their assets. To exclude these possibilities we look into the outcomes of these cases and identify as strategic applications that were withdrawn or rejected in court.[10] Even though the judicial process is not perfect, the disclosure and audit of a long-history of financial and real estate transactions provides an additional layer of confidence that approved applications belong to borrowers with true inability to service their debts.

To summarize, our criterion identifies as *non-strategic* those delinquencies that go through the debt-discharge process *and* are approved by the court. On the other hand, we identify as *strategic* defaulters the mortgagors who become delinquent and do not apply for debt-relief (*strategic group 1*) or have their applications either withdrawn or rejected by the court (*strategic group 2*).

But what motivates some mortgagors to exhibit strategic behavior, while others continue servicing their loans? The direct benefit of strategic delinquency is the loan installment amount. In our setting, the strategic mortgagor realises the entirety of the mortgage payment as she continues to enjoy "free" housing services, due to the inability of the bank to repossess the house. Furthermore, the marginal utility of the foregone payment can be particular high because it is realised during a severely adverse state (Greek crisis).

Additionally, borrowers may decide to act strategically in response to high economic and policy uncertainty. Our sample period includes intervals when the bankruptcy of the Greek state and the exit of Greece from the European Monetary Union were possible scenarios. Thus, mortgagors may become delinquent deliberately in anticipation of a change to national

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[10]Approximately 2.5% of applications are withdrawn before adjudication because applicants refuse to provide access to their financial accounts and transaction history.

currency—and its subsequent devaluation—that would result to an implicit haircut of their debt obligations. Indeed, we find evidence that borrowers respond to policy risk. Figure 3 shows that the transition rate of current borrowers to strategic defaulters peaks up between October 2011 and June 2012, a period of elevated political uncertainly/currency risk (see Hardouvelis et al. (2018)), during which the Greek banking system experienced massive deposit withdrawals.[11]

On the other hand, strategic behavior entails both pecuniary and non-pecuniary costs (Guiso et al. (2013)). However, in our setting, the financial costs of strategic delinquency are largely muted for the duration of the foreclosure moratorium; repossession risk is mitigated, while any associated penalties are not payable until the moratorium is lifted. Furthermore, future access to credit as an incentive to remain in good-standing is negated to a great extent by the extensive credit crunch in the Greek banking system during the crisis period (Haliassos et al. (2017)). By contrast, non-economic costs remain largely unaffected; factors like social stigma and morality may still have a significant role in constraining strategic behavior.

In short, mortgagors with ability-to-pay who choose to act strategically, receive the tangible benefit of increased liquidity and the opportunity for an implicit debt haircut in the case of a currency change. At the same time, they remain (temporarily) immune to repossession risk and associated penalties due to the foreclosure moratorium. Consequently, our setting emphasizes the role of non-pecuniary costs, which become increasingly relevant when we examine factors that affect the decision of these borrowers to remain current or become delinquent, in section IV.

II. Data and Methodology

Our dataset includes the universe of primary residence mortgages from a large Greek bank from 2006 to 2013. Our bank is one of the four systemic banks, which account for

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[11]The episode starts in October 2011, which corresponds to the unexpected resignation of Prime Minister Papandreou and the declaration of national elections, and ends in June 2012 with the formation of a pro-European, coalition government.

over 80% of banking activity in Greece. The bank has branches in every municipality in Greece, and serves a population-representative clientele. We focus only on primary residence mortgages to exploit the overlap of protection from the foreclosure moratorium and the debt-discharge process. We also restrict our sample to mortgages originated after 2006, for which both application and performance files are available, and exclude any loans that were made post-legislation to mitigate potential selection issues.

Our study combines multiple proprietary datasets from the bank. From mortgage application files, we obtain information on loan terms (amount approved, monthly installment, interest rate, interest-rate type, maturity, and number of cosigners). We complement this information with mortgagor characteristics (credit score, reported personal and total income, age, occupation, marital status, number of children, and education). Our data also include borrowers' total outstanding debt with the bank and other financial institutions from the credit registry. For each mortgage, we observe initial loan-to-value (LTV) and combined loan-to-value (CLTV) ratios, and the initial market value of the property. We define as delinquent mortgages that are in delay for more than 180 days (t+6 rule), or if the mortgagor becomes delinquent on a previously restructured loan.[12] Finally, we use a separate dataset to track whether a borrower has applied for debt-discharge, the stage of the application, the exact time of entry in each stage and the outcome (approval/rejection/withdrawal) of the applications that are adjudicated in court.

To ensure all mortgagors in our sample are eligible for both regulatory provisions, we apply the following filters. First, we exclude mortgages held by commercials because the debt-discharge process applies only to non-commercial individuals.[13] Second, we exclude mortgages on primary residences with objective values above the 300,000 euros, which is the minimum inclusion criterion for both the foreclosure moratorium and the exclusion

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[12]We impose this condition to account for possible "ever-greening" effects (see Peek and Rosengren (2005)) in accordance to the European Central Bank definition of Non-Performing Exposures (EU 680/2014).

[13]According to Greek law, the definition of commercials includes individuals who profit from commercial activity. This definition excludes self-employed individuals, such as doctors, engineers, lawyers, and low-scale commercials who are mainly compensated for personal labor. We define commercials based on their detailed occupation description and require that they report more than 50,000 euros in annual income. We also use an alternative threshold of 30,000 euros, with no significant changes in our main results.

from liquidation of the debt-discharge process. Third, we exclude subsidized mortgages, or mortgages guaranteed by the state.

We present summary statistics for our main sample, which includes 57,854 mortgages, in Table I. The average mortgage has an outstanding amount of 103,000 euros, interest rate of 4.2%, and maturity of 25 years. The average market value of homes is approximately 160,000 euros—significantly higher than the average objective value—and the mean initial CLTV is 62%. The median mortgage has fixed rate and two cosigners. The median borrower is 51 years old, has personal (total) income of approximately 12,200 (25,700) euros, and holds one additional credit product with the bank (credit card, term loan, or revolving credit). Finally, the majority of mortgagors hold a deposit account with the bank.

We study repayment patterns across borrowers with different mortgage and demographic characteristics using multivariate regressions. Our baseline regression model is as follows:

$$\Pr(Y_i = 1) = \mathbb{B}_i + \mathbb{L}_i + \alpha_z + \varepsilon_i, \tag{1}$$

where indicator i refers to the borrower, z refers to the residence ZIP code, and $\mathbb{B}_i$ and $\mathbb{L}_i$ are vectors of variables for borrower and loan characteristics, respectively. We choose a linear probability model for our baseline regressions to partial out unobservable time-invariant local factors by including ZIP-code fixed effects (α_z). We also use Probit and multinomial Probit regressions and find qualitatively similar results (see Appendix Tables A.I and A.II).

We adjust our baseline specification (1) based on the research question we want to examine, which determines the sample used and the group of interest. For example, in section IV., we study factors that motivate strategic behavior by focusing on mortgagors with ability to pay. Thus, we use a sample including strategic delinquencies and current mortgages (exluding non-strategic defaulters) ans set strategic defaulters as the group of interest. Consequently, our specification is modified as follows:

$$\Pr(\text{Str.Default}_i{=}1 \mid \text{Able to pay}) = \mathbb{B}_i + \mathbb{L}_i + \alpha_z + \varepsilon_i$$

where indicator our dependent variable takes the value one in case of a strategic delinquency and zero if the mortgagor remains current on her loan.

III. Incidence and Distribution of Strategic Behavior

A. Incidence of Strategic Behavior

During the financial crisis, Greek banks experienced an unprecedented period of high delinquency rates across all credit products (Haliassos et al. (2017)). Residential mortgages, which account for over 30% of assets in the Greek banking system (Bank of Greece, 2013), were no exception. As a result, the effects of the foreclosure moratorium on borrower behavior and repayment patterns could have far-reaching implications on the overall stability of the banking sector.

In Table II we present the number of borrowers in our sample by delinquency status and ability to pay. By the end of 2013, the delinquency rate in primary residence mortgages reaches 43%. To put this number in perspective, the delinquency and foreclosure rates during the recent U.S. mortgage crisis were 11.5% and 4.6%, respectively (Frame (2010)).

Applying our identification criterion reveals that 16% of mortgagors in our sample engage in strategic behavior. Furthermore, we find that 37% of delinquencies are deliberate, a result that is comparable with findings in previous studies set in the United States. Guiso et al. (2013), using survey data, estimate a strategic delinquency rate of 35%, while Gerardi et al. (2017), employing liquidity measures to assess ability to pay, find that 38% of the delinquencies in their sample are intentional. Therefore, even though the two crisis episodes differ substantially, the fact that the share of deliberate to total delinquencies is so similar emphasizes the persistence of strategic behavior across empirical settings and identification methods.

Focusing only on borrowers with ability to pay, we find that 22% of these mortgagors become delinquent intentionally, either by using the foreclosure moratorium (18%) or by filling a false debt-discharge claim (4%) that is subsequently rejected by the court. This means that almost 4 in 5 borrowers who can afford their mortgages remain current despite the inability of banks to repossess the collateral due to the foreclosure moratorium.

Strategic delinquencies had a significant impact on the financial health of Greek banks, which held over 70 billion euros in outstanding mortgages. Our estimates aggregate between 7 and 8 billion euros in non-performing loans due to strategic behavior just in the primary residence mortgage portfolio.[14] The cost of these delinquencies was primarily moved to the public through bank recapitalizations that increased government debt and depleted state bank holdings (see Haliassos et al. (2017)).

B. The Role of Borrower and Loan Characteristics

Our identification criterion separates mortgagors in our sample to three groups; borrowers who continue to service their debts and those who become delinquent either deliberately (strategic defaulters) or due to inability to pay (non-strategic defaulters). Here, we contrast these groups in order to investigate the role of borrower and loan characteristics on their repayment patterns.

First, we examine whether borrower and loan characteristics predict delinquency in general. Thus, we use the the entire sample and modify our baseline specification (1) as follows:

$$\Pr(\text{Default}_i=1) = \mathbb{B}_i + \mathbb{L}_i + \alpha_z + \varepsilon_i \tag{2}$$

where the dependent variable Y_i equals one if the mortgagor defaults, and zero otherwise.

The first two columns of Table III present the results. Consistent with previous studies, we find that borrowers with lower income, lower credit score, and higher CLTV are more likely to become delinquent. Specifically, a 10% increase in CLTV increases the likelihood of delinquency by 2.6%. Similarly, doubling mortgagors' income and increasing the credit score by 100 points decreases the probability of becoming delinquent by 3-5% and 8-9%, respectively. College graduates are less likely to stop servicing their mortgages, suggesting that educated individuals weathered the economic crisis relatively more successfully (column 2). Self-employed professionals exhibit a higher propensity to become delinquent, similarly

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[14]Bank of Greece does not provide information on mortgages by residence type (primary vs secondary). Instead, we surveyed bank managers of the Greek systemic banks, and used their lower-bound estimates as benchmarks (60%-70% of the entire mortgage portfolio).

to mortgagors employed in the private sector, which is consistent with the existence of a public-sector wage premium that largely persisted during the crisis (Christopoulou and Monastiriotis (2015)).

Next, we investigate the role of borrower and loan characteristics on strategic behavior given the event of a delinquency (conditional probability). In this case, we confine our sample only to delinquent mortgagors and use the following specification:

$$\Pr(\text{Str.Default}_i=1 \mid \text{Default}) = \mathbb{B}_i + \mathbb{L}_i + \alpha_z + \varepsilon_i \tag{3}$$

where the dependent variable takes the value one and zero, if the delinquency is intentional or not, respectively.

This analysis is important for two reasons. First, in contrast to the event of a delinquency, the motives of borrowers are not directly observable. Therefore, the ability to identify strategic behavior within a pool of delinquencies can have important policy implications for the design and implementation of modification plans and the resolution of non-performing loans. Second, our criterion is based on revealed preference and court enforcement and is free of any conditioning on customer and loan characteristics. This allows us to evaluate the role of these characteristics with confidence that our results are not driven by correlations between conditioning criteria and independent variables.[15]

In columns (3) and (4) of Table III we show that delinquencies by mortgagors with higher credit scores, higher reported income, and lower CLTVs are more probable to be deliberate. A one-standard-deviation increase in a homeowner's credit score (100 points) increases the likelihood that a delinquency is strategic by 3%, and a one-standard-deviation increase in CLTV (20%) reduces the respective probability by 3.6-3.8%. These findings are consistent with strategic defaulters being less financially constrained than their non-strategic peers.

Additionally, interest rates are positively correlated with the probability of a delinquency being strategic consistent with the results of Karlan and Zinman (2009) on the role of

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[15]Previous studies have defined strategic defaulters as mortgagors who become delinquent with high credit score or negative equity (high LTV). The former criterion, for example, will yield mechanically a positive relationship between income and strategic behavior, if credit scores and income are highly correlated.

hidden action (moral hazard) in credit markets. Moreover, adding an additional cosigner in the mortgage reduces the likelihood that a delinquency is deliberate by 2.1%-2.6%. Self-employment status increases not only the probability of a delinquency (column 2), but also the likelihood that the delinquency is deliberate (column 4). Lastly, single parents are significantly less likely to fail meeting mortgage payments intentionally, despite the fact that they exhibit particularly high delinquency rates.

Our last set of tests focuses on individuals who can afford their mortgages. By excluding borrowers with inability to pay (non-strategic defaulters), we are able to examine the effect of borrower and loan characteristics on the choice to continue meeting debt obligations or not. Thus, our baseline specification as follows:

$$\Pr(\text{Str.Default}_i{=}1 \mid \text{Able to pay}) = \mathbb{B}_i + \mathbb{L}_i + \alpha_z + \varepsilon_i \tag{4}$$

where the dependent variable equals one if the mortgagor becomes delinquent deliberately and zero if she remains current.

Table IV presents our results for the full sample of strategic defaulters (column 1). Strategic defaulters tend to have higher reported income and lower credit scores. Since we are considering only borrowers with adequate liquidity during the crisis, this sample features higher credit scores than the general population. Additionally, borrowers are more prone to intentional delinquencies the higher the loan-to-value ratio is (not the loan amount per se), which is consistent with the strategic nature of the decision. Borrowers with adequate liquidity are also less likely to become delinquent deliberately in the presence of a co-signer. This result is consistent with the idea that strategic decisions require coordination, and coordination failure is more likely due to "strategic uncertainty"—the notion that some individuals involved in the transaction may perceive this strategy as too risky (Van Huyck et al. (1990)).

Our results suggest that mortgagors' personal characteristics have a significant effect on strategic behavior. Among borrowers who can afford their mortgage payments, pensioners and college graduates are 3.2% and 6.8% less likely to become delinquent, respectively. On

the other hand, self-employed professionals and individuals employed in the private sector, with the ability to remain current on their debts, are 7.3% and 1.7% more likely to act strategically.

Our criterion identifies as strategic defaulters those mortgagors who either become delinquent without filing for debt discharge (strategic group 1) or file but have their applications subsequently withdrawn or rejected by the court (strategic group 2). As shown in Table II, the vast majority of strategic defaulters (81%) choose to passively become delinquent rather than filing a false claim for debt-relief. In columns (2) and (3) of Table IV we examine these two groups separately to investigate the effect of borrower and loan characteristics on the way strategic behavior is realized.

In general, our estimates are consistent between the two groups with some notable exceptions. First, the negative effect of loan amount and cosigners stems exclusively from the first group. This result suggests that strategic behavior in lower balances and coordination failure are mainly features of the passive approach that does not include an application for debt-relief. Second, self-employed professionals and individuals employed in the private sector who act strategically exhibit a strong preference towards exploiting the foreclosure moratorium and away from the court process. This finding is consistent with the existence of high disclosure costs for borrowers with hidden assets or income that the debt-discharge process entails.

Taken together, we find extensive heterogeneity in strategic behavior across individuals, suggesting that mortgagor-specific traits play an important role in their decision to act strategically. In the next section, we focus on factors related to these characteristics that have explanatory power towards strategic behavior.

IV. Motives of Strategic Behavior

The motives of strategic behavior are not easily identifiable because, after all, the decision to act strategically is a personal one; it depends on the combination of a host of factors,

including financial characteristics, moral attributes, and behavioral traits. As a result, it is difficult to discern and interpret general patterns across borrowers. For example, the existence of negative equity provides a financial incentive for strategic behavior (Guiso et al. (2013), but there is evidence that the majority of negative equity mortgages do not become delinquent (Foote et al. (2008)). Additionally, Guiso et al. (2013) and Bhutta et al. (2017) emphasize the importance of non-pecuniary factors (such as stigma, sense of fairness, and aversion to moral hazard) on the decision to act strategically that can be unique to each borrower.

Our results so far reveal significant heterogeneity in strategic delinquency across borrower and loan characteristics. In this section, we go beyond these characteristics and identify factors that motivate strategic behavior. For this reason, we only focus on borrowers with ability to make mortgage payments (equation (4)), and thus exclude delinquencies due to mortgagor's financial constraints. Our goal is to investigate the decision to act strategically (or not) within a sample of borrowers for which this choice is available. In other words, we want to examine why once the opportunity for strategic behavior arises, some mortgagors who can afford their payments act on it, while others do not.

A. Borrower Sophistication and Strategic Behavior

Household sophistication affects financial behavior in aspects ranging from market participation to asset allocation and mortgage decisions (Campbell (2006)). One of the most important proxies for household sophistication is education. Well-educated agents are more likely to overcome misperceptions, avoid financial mistakes, and recognize financial opportunities (Haliassos and Bertaut (1995)).[16] However, Guiso et al. (2013) and Bhutta et al. (2017) find little evidence associating education with strategic behavior. Similarly, our results (Table IV) indicate, if any, a negative relationship between education and strategic delinquencies among those who can service their mortgages.

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[16]More closely related to our setting, Amromin et al. (2018) find that well-educated, higher-income households tend to hold complex mortgage products in order to increase the option value of default.

These somewhat controversial results can be reconciled, if we consider that education is not the sole determinant of household sophistication (Calvet et al. (2009)). Furthermore, the role of education in our setting can be multi-dimensional. For example, well-educated mortgagors may be indeed more sophisticated and thus more likely to recognize opportunities for strategic behavior. But they may also be less likely to act on these opportunities, if due to their educational (and social) status they are subject to higher reputation costs and social stigma (Akerlof (1980), Gordon (1989)).

To investigate the role of borrower sophistication on strategic behavior, we examine education in conjunction with professional specialization. We focus on high-profile occupations that typically require a college degree, and exhibit relatively low delinquency rates (30-33%) compared to blue-collars (60%). Therefore, we examine a more homogeneous group of well-educated professionals, who were less affected by the economic crisis.

In Table V we report results from a matched sample on income, credit score and CLTV using the retail sector as the reference group. We find a clear dichotomy in strategic behavior across industries. On the one hand, educators and doctors—occupations related to social service—are less prone to act strategically than other high-profile professionals. On the other hand, law and finance professionals are are 2.6-4.3% more likely to become delinquent deliberately, which represents a 13.5-22.8% increase from the sample mean (column (1)). These results support the view that borrowers' sophistication—the ability to understand the legal and financial ramifications of the foreclosure moratorium—rather than just educational status, motivates strategic behavior.

Further refinement of our results suggests that professionals in law and finance make strategic decisions by processing different types of information. In columns (2) and (3) (Table V), we examine how strategic behavior is realized. Law professionals exhibit a strong preference towards the use of the moratorium and away from the court process. Specifically, borrowers employed in law industry are 7.6% more likely to become delinquent deliberately without applying for debt-discharge (a 54% increase from the sample mean), and 3.3% less likely to submit a false claim for debt relief (a 65% decrease from the mean). These patterns

suggest that mortgagors with legal expertise fully understand and exploit the lack of legal ramifications of delinquency due to the moratorium, which makes the debt discharge process an inferior option.

On the other hand, finance professionals appear to weigh economic information more heavily on their decision to act strategically. In columns (4)-(6) of Table V, we test whether the sensitivity of strategic behavior to the existence of negative equity. When a mortgage is underwater, the borrower transacts in a net loss as mortgage payments exceed the current value of the house. Therefore, the existence of negative equity provides an economic motive for the mortgagor to act strategically. Consistent with this view, negative equity in our setting increases the probability of strategic delinquency by 11.7 percentage points. Furthermore, we find that borrowers employed in the finance industry act more aggressively when their mortgage is underwater; for finance professionals, negative equity increases the likelihood of acting strategically by an additional 8.2 percentage points (column (4)). By contrast, borrowers from the law industry appear to be largely insensitive to whether the mortgage is underwater or not. Taken together, these results suggest that finance and law professionals motivate their high propensity to act strategically by processing different types of information; financial and legal, respectively.

Finally, military exhibits a distinct aversion to strategic behavior. Military personnel are approximately 50% (0.095/0.19) less likely to act strategically than other professionals, suggesting that military service may instill a stronger sense of ethics that prevents moral-hazard (Akerlof and Kranton (2005)). This behavior is consistent with evidence in the literature that military CEOs are less likely to engage in corporate fraudulent activity (Benmelech and Frydman (2015)), and tax avoidance (Law and Mills (2017)).

B. Tax Evasion and Strategic Behavior

Borrowers' attitudes towards moral hazard can play an important role on the decision to act strategically or not, as shown previously in the case of military. However, strategic default is not the only way households engage in moral hazard behavior. Another, prominent

example is tax evasion. Here, we examine whether these two types of moral hazard are related. Specifically, we test whether individuals who evade taxes are also more prone to strategic default, reflecting a more systematic propensity towards moral hazard behavior.

To uncover the relationship between tax evasion and strategic default we focus on self-employed professionals, a group that exhibits high propensity towards both types of moral hazard. There is strong evidence in the literature that self-employment status is related to tax evasion, mainly due to the lack of third-party reporting (Kleven et al. (2016)). Kleven et al. (2011) show that under-reporting in Denmark is concentrated among taxpayers who self-report their income. Artavanis et al. (2016) find that self-employed professionals in Greece hide almost half of their income from tax authorities.

Additionally, our previous results show that self-employed professionals are more likely to become delinquent, deliberately or not. Even though unobservables, like higher variability of income or exposure to the crisis, may explain higher delinquency rates, it is harder to argue that they can account for our results on intentional delinquencies. The fact that self-employed professionals are 7.3% more likely to exhibit strategic behavior among mortgagors who can afford their payments (Table IV), reflects directly borrowers' choices that are not related to financial constraints.

To provide additional evidence on the relationship between self-employment status and strategic behavior at the extensive margin, we match self-employed professionals to wage workers across a detailed job description, credit score, and CLTV.[17] This procedure reduces our sample size because it excludes job types that belong exclusively to one of the two groups (e.g., military personnel and judges can only be wage-workers as state-employees). Table VI presents the results. Among borrowers with the ability to pay their mortgage, self-employment status increases the probability of acting strategically by an additional 5%; a 19% increase from the average strategic delinquency rate of wage-workers. Furthermore, self-employed professionals show a strong preference towards the use of the foreclosure moratorium to protect their houses (column (2)) compared to filing a false-claim for debt-relief

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[17]For instance, we match within the medicine industry, private-practice dentists with public-practice dentists, private-practice nurses with public-practice nurses and so on.

(column (3)). This result is consistent with the existence of significant disclosure costs in the debt-discharge process for individuals with hidden income and assets.

The results in Table VI indicate that self-employed mortgagors are more prone to strategic behavior than their wage-worker peers. We further refine these findings and quantify the role of reported income on strategic behavior employing a Blinder-Oaxaca decomposition. (Blinder, 1973; Oaxaca, 1973).[18] This method decomposes the difference in strategic delinquency rate between wage-workers and self-employeds into two parts; one part is explained by differences in the levels of reported income (differences in endowments), and the other part is explained by differences in sensitivities to income (differences in coefficients).

The Blinder-Oaxaca decomposition in Table VII (Panel A) suggests that group differences in reported income cannot explain the 9.3% gap in strategic delinquency rate between wage-workers and self-employed. By contrast, differences in reported income sensitivities to strategic delinquency account for most of this gap. In other words, if we were to apply wage-workers' sensitivity of reported income to self-employeds', the strategic delinquency rate of self-employed would be significantly lower. The take-away of this analysis is differences in coefficients of reported income—rather differences in covariates (endowment effects)—can explain better the observed differences in strategic behavior between wage-workers and self-employeds.

The fact that strategic delinquency has higher sensitivity to self-employed reported income is closely aligned with the findings of Artavanis, Morse, and Tsoutsoura (2016). They show that self-employed professionals have higher income sensitivities to credit capacity, because loan officers in Greece base their credit decisions on true rather than reported income, that adjusts for tax evasion. Furthermore, Artavanis et al. (2016) develop a methodology to estimate tax evasion multipliers from borrower's credit capacity. This method gauges tax-evaded income by comparing credit extended by commercial banks to self-employed individuals and wage workers (who cannot evade taxes) while controlling for a host of customer and loan characteristics. The multipliers provide an intensive-margin measure of tax eva-

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[18]Our approach is based on the variable decomposition for binary outcomes by Fairlie (2005).

sion for self-employed by mapping reported to true income, using wage-workers with similar characteristics as benchmark.

Following Artavanis et al. (2016), we estimate evading activity using the following structural model:

$$Y_i^T = \begin{cases} \lambda_j \cdot Y_i^R, & \text{if } i \text{ self-employed}, \\ Y_i^R, & \text{if } i \text{ wage-worker} \end{cases} \tag{5}$$

$$\text{Cc}_{ij} = \alpha_j + \beta_1 Y_i^T \cdot \mathbb{I}_{ww_i} + \beta_{2j} Y_i^R \cdot \mathbb{I}_{se_{ij}} + \gamma_1 \cdot \mathbb{B}_i + \gamma_3 \cdot \mathbb{L}_i + \varepsilon_{ij} \tag{6}$$

$$= \alpha_j + \beta_1 Y_i^T \cdot \mathbb{I}_{ww_i} + \beta_1 \cdot \lambda_j Y_i^T \cdot \mathbb{I}_{se_{ij}} + \gamma_1 \cdot \mathbb{B}_i + \gamma_3 \cdot \mathbb{L}_i + \varepsilon_{ij} \tag{7}$$

$$\lambda_j = \frac{\beta_{2j}}{\beta_1} \tag{8}$$

where Cc_{ij} refers to credit capacity extended to the borrower, Y_i^T and Y_i^R refer to true (for wage-workers) and reported (for self-employeds) income respectively, $\mathbb{B}_i$ and $\mathbb{L}_i$ are vectors of borrower and loan characteristics, and $\mathbb{I}_{ww_i}$ and $\mathbb{I}_{se_{ij}}$ are indicator variables for wage-worker and self-employment status.

As in Pissarides and Weber (1989), we assume that wage-workers do not evade taxes and that true income is a multiple of reported income for the self-employed (equation (5)). We estimate the sensitivity of credit capacity to true income for wage-workers (β_1), who cannot under-report their income. Next, we estimate the same relationship for self-employed professionals within a detailed job-description cell j. Coefficient β_{2j} tells us how an additional dollar of reported (not true) income for self-employeds maps to the amount of credit they receive. Assuming that the true income-credit capacity sensitivity is the same for both groups and to the extent our control variables capture soft information, we can replace reported with true income for self-employed using multiplier λ_j in equation (7). Intuitively, multiplier λ_j is the ratio of β_{2j} over β_1 (equation (8)), and maps reported-to-true income

for self-employed professionals using wage-workers—who cannot tax-evade—as benchmark. Thus, this variable provides an intensive margin estimate of tax-evading.[19]

We return to our Blinder-Oaxaca decomposition analysis, in Table VII, and replace reported income with income adjusted for tax evasion using the estimated multipliers λ_j (Panel C). The results indicate that evasion-adjusted income differences can account for almost one third (2.7%) of the difference is propensities towards strategic behavior between wage-workers and self-employed professionals (9.3%). Correspondingly, the unexplained portion is reduced to 6.6%. Collectively, our results suggest that tax-evading activity has significant explanatory power on the differential attitude of the two groups towards strategic delinquencies.

We provide evidence for the relationship between strategic behavior and tax evasion at the intensive margin in Table VIII. Specifically, we add in the regressions the tax-evasion multiplier λ_j (columns (1)-(3)) and the corresponding amount of hidden income (columns (4)-(6)). Our sample consists only of self-employed professionals with the ability to service their mortgages. We find a significant, positive relationship between the portion of income evaded and the propensity to exhibit strategic behavior (column (2)). Our results suggest that self-employed mortgagors who report half of their true income to tax authorities ($\lambda_j=2$) are 12% (0.039/0.32) more likely to default strategically, compared to self-employeds who do not evade taxes ($\lambda_j=1$). Furthermore, this increased propensity to strategic behavior is exclusively coming from borrowers who use the foreclosure moratorium to protect their homes (column (2)). By contrast, our coefficient in column (3) is insignificant, reflecting the high disclosure costs of filing a false debt-discharge claim for borrowers that have hidden income or assets.

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[19]This methodology requires that we focus on borrowers who exhaust their credit capacity. Because we do not have information on whether the mortgage is close to this limit, we only keep mortgages with CLTV over 70%. This control does not alleviate concerns that our borrower might choose a property below her full credit capacity. However, buying a house in Greece is usually a lifetime decision, in contrast to markets where entry houses, geographical migration, or frequent flipping of properties are more common. Therefore, our assumption that Greek mortgagors attempt to buy the "best house" they can afford and consequently exhaust their current credit capacity is plausible. See Artavanis et al. (2016) for a more detailed description of the methodology.

Our estimates for mortgagors' hidden income allow us to quantify the relationship between evaded income and strategic delinquency. To this end, we calculate a mortgagor's *Hidden income* by applying the income multiplier on borrower's reported income (equation (5)). Our results in column (4) and (5) provide an intuitive relationship between hidden income and strategic delinquency; increasing the amount of evaded income by 8,000 euros per year, increases the average probability of strategic delinquency among self-employed professionals by 4.3% (0.0136/0.32).

Taken together, our results suggest individuals who are less averse to moral hazard are also more likely to exhibit similar behavior in other settings as well (strategic default). Moreover, we find evidence that not only the incidence, but also the intensity of prior evading activity affect the propensity to default deliberately.

C. Banking Relationships and Strategic Behavior

Banking relationships are important in credit markets as they produce soft information that is incorporated in credit pricing and rationing decisions (Petersen and Rajan (1994)). However, only a few studies examine the effect of these ties in retail banking. Schoar (2012) finds that personal interactions between borrowers and lenders reduce the likelihood of moral hazard and default. Puri et al. (2017) offer compelling evidence that stronger banking relationships are associated with lower default rates. They attribute this finding to the bilateral effect of soft information created within these relationships, which banks use for better screening and monitoring, and borrowers value resulting to lower incentives to default.

Here, we examine the effect of close ties with the bank on the decision to act strategically. Our tests differ from Puri et al. (2017) in that we focus on the impact of banking relationships through borrowers' incentives because our setting isolates the screening and monitoring channels. The legislative measures applied almost horizontally on existing mortgages, therefore they do not affect the screening process of the loans in our sample. Additionally, our tests examine strategic behavior rather than delinquencies in general, excluding cases where

the delinquency is due to inability to continue servicing the loan, which limits the value of monitoring.

In Table IX we use a set of proxies to capture the length and scope of ties between the borrower and the bank. All proxies use variables at the time of loan origination, therefore they refer to the relationship prior to the mortgage under examination. Our results suggest that bank relationships have a significant effect in mitigating moral hazard. The length of the relationship with the bank is important; an increase by 10 years decreases the likelihood of strategic delinquency by an additional 4.7% (column (1)). The exclusivity and the relative importance of the relationship also matters. Borrowers with credit products from other banks (*External Debt*) are 11.4 percentage points more likely to act strategically, but this effect reverses if the borrower has higher debt balances in our bank compared other financial institutions (*Main Bank*).

Consistent with the findings of Puri et al. (2017), the scope of the relationship with the bank also mitigates strategic behavior. The median mortgagor in our sample has at least one other credit product with the bank before applying for the mortgage (Table I). An additional credit product (i.e., credit card, term loan, or consumer loan) reduces the probability of strategic default by an additional 4% (column (4)), an 18% decrease with respect to the mean. Furthermore, prior bank-depositor relationships also reduce the likelihood of acting strategically. The existence of a time-deposit or a savings account with the bank reduces the probability of a strategic delinquency by an additional 13.2% and 17.4%, respectively (columns (6)-(7)).[20] Finally, consistent with the view of Puri et al. (2017) that proximity facilitates relationships, we find that borrowers who live in areas with no branch in the same zip-code are 2.4% more likely to exhibit strategic behavior.

Overall, our findings suggest that banking relationships create strong motives for borrowers to refrain from acting strategically that can arise from two, non-mutually exclusive, channels. First, they may reflect personal interactions and relationships with the bank and its officers that create a feeling of personal responsibility between the two parties and

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[20]Sight accounts are also negatively related to the propensity of strategic behavior, however these accounts in Greece are not popular and they are mainly used for specific payroll services.

increase the self-perceived sense of shame/stigma for the borrower in the case of default (Schoar (2012)). Second, they may arise from the value of retaining a continuous relationship with the bank in good-standing to ensure access to future credit (Puri et al. (2017)). Our findings here, are more likely to be motivated by personal interactions rather than access to future credit, due to the sharp credit crunch in the Greek banking system during our sample period.

D. Liquidity Preference and Strategic Behavior

Past literature identifies two pecuniary factors motivating strategic behavior; the existence of negative equity and the preference for (precautionary) liquidity. The *negative-equity hypothesis* refers to deliberate delinquencies, due to the outstanding balance of the loan exceeding the market value of the collateral (Guiso et al. (2013)). The *liquidity-preference hypothesis*, on the other hand, attributes strategic behavior to mortgagors' choice of maintaining a certain level of liquidity (Cohen-Cole and Morse (2010)). These two channels are not mutually exclusive, and they can affect borrower behavior simultaneously.

The negative equity hypothesis has received increased attention in the study of strategic behavior because it provides a direct financial incentive for delinquency. However, there is evidence that only a small portion of negative equity mortgages becomes delinquent (Foote et al. (2008), when the loan is very deep underwater (Bhutta et al. (2017), suggesting the existence of additional factors that interact with the equity of the mortgage. It is important to note that theoretically, negative equity as a stand-alone condition can motivate strategic behavior only in non-recourse states.[21] In full-recourse states, including the majority of US states and most countries internationally (including Greece), the borrower remains responsible for the residual debt.[22] Furthermore, negative equity cannot be defined in the absence of collateral, and thus it cannot account for the documented strategic behavior in unsecured loans, like credit cards (Gross and Souleles (2002)) and student loans (Yannelis (2016)).

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[21] Bhutta et al. (2017) show that, even in non-recourse states, mortgage delinquencies on average are deep underwater, implying the existence of significant non-pecuniary costs related to the decision to walk-away from the house.

[22] Ghent and Kudlyak (2011) classify as non-recourse just 11 of the 50 U.S. states.

On the other hand, liquidity preference can explain strategic behavior in the presence of recourse or the absence of collateral. Specifically for mortgages, the liquidity-preference channel can provide an explanation for strategic delinquencies, even when the loan is not underwater. For example, Mayer et al. (2014) report higher increases in delinquency for positive compared to negative equity mortgages rates following a loan-modification plan. Similarly, in our setting the majority of strategic delinquencies refer to positive equity mortgages (Figure 4.d). On the other hand, consistent with the findings of Bhutta et al. (2017), a large portion of mortgages that remain current by the end of our sample period are deep underwater.

Our setting provides an excellent opportunity to examine the liquidity channel for several reasons. First, mortgage payments are large enough compared to other credit products (e.g., credit cards, personal loans, auto loans) to enable liquidity effects. Second, the inability to repossess the collateral transforms previously secured loans to de facto unsecured debt for the duration of the moratorium, which renders the negative-equity condition less important. Third, because the bank cannot foreclose the house, the delinquent mortgagor retains the value of housing services, and realizes the entirety of the foregone mortgage payment as a positive liquidity shock. Taking together, the new legislative framework mutes the effect of negative equity to a large degree, and concurrently underpins the importance of the liquidity channel.

Directly testing the liquidity preference hypothesis is challenging, because it requires knowledge of current and desired (optimal) levels of liquidity, both of which are difficult to assess. Instead, we examine the effect of this channel on strategic behavior by focusing on individuals who experience negative cash-flow shocks during the crisis. We hypothesize that, among borrowers who can afford their mortgages, those who realize a significant adverse liquidity shock exhibit a strong preference for liquidity to restore its prior levels. Therefore, these borrowers would be more prone to strategic behavior in order to restore their liquidity by foregoing their mortgage payments.

To test this hypothesis, we focus on pensioners for two reasons. First, Greek pensioners were exposed to differential liquidity shocks during the crisis. Austerity measures significantly reduced pensions, but not uniformly, because the government attempted to protect low-income retirees. Tinios (2016) identifies 13 distinct pension cuts between 2010 and 2013 that resulted in reductions of over 30% for high-income pensioners, while leaving low-income retirees largely unaffected. Second, pensions in Greece are typically reported by the state, which mitigates concerns for income under-reporting (Kleven et al. (2011)), which poses a serious challenge in identifying liquidity shocks in an environment characterized by pervasive tax evasion.

In Table X, we examine the propensity to act strategically among pensioners with ability to service their debt for different income quartiles. Income differences across quartiles are large; the average monthly income of retirees in the low (high) quartile is 1,250 (5,200) euros per month. We find that high-income pensioners, who experienced the largest cuts due to austerity measures, are more likely to exhibit strategic behavior; retirees at the top quartile are 4.6% more likely to act strategically than their low-income peers, a 34% increase from the unconditional mean (13.3%).[23] High-income pensioners show a strong preference towards the passive cease of mortgage payments and the use of the foreclosure moratorium to protect their homes (column (2)). Since their income is largely third-party reported, their aversion towards filing a false claim for debt-discharge implies the existence of high liquidation rather than high disclosure costs.

Overall, our results are consistent with the hypothesis that individuals who experience large liquidity shocks are more likely to substitute mortgage payments to restore their liquidity. Furthermore, this finding can shed light to the positive relationship between income and strategic behavior for the general pool of borrowers who can afford their mortgages, in Table IV. At first glance, such a relationship appears counter-intuitive if marginal utility of liquidity is decreasing; for instance, forgoing a mortgage payment of 100 euros on an income

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[23]In Appendix Table A.III, we document two additional monotonic relationships across pensioner quartiles; a negative relationship between default rates and income, and a positive relationship between the probability that a delinquency is deliberate and income.

of 500 euros should yield higher utility than foregoing 1000 euros for a borrower that earns 5000 euros. On the other hand, there is evidence that higher income households were more severely affected by the crisis during our sample period.[24] Based on our results here, the positive sensitivity of strategic behavior to income may reflect the effect of adverse liquidity shocks for high-income borrowers dominating the effect of higher marginal utility of liquidity for low-income households.

V. Conclusion

Interventions in credit markets during crises aim to prevent foreclosures and negative spillover effects, but also create strategic opportunities for ineligible debtors. These programs are subject to an inherit trade-off between the effectiveness and the cost of screening eligible borrowers in distress (Foote et al. (2008), Mayer et al. (2014)). In our setting, an almost universal foreclosure moratorium in primary residences creates opportunities for strategic behavior. We find that 37% of delinquencies in our sample were intentional, resulting to over 7 billion euros (4% of GDP) in non-performing loans across the banking system. The fact that the cost was largely moved to the public through recapitalizations and bailouts highlights the importance of preventing moral hazard in credit markets.

If the goal is to design more efficient intervention programs in distress times, then understanding strategic behavior and its determinants is essential. Early work in this field identified strategic delinquencies on the basis of whether the mortgage is underwater or not. Recent studies show that even though negative equity provides an economic motive to act strategically, it is just one of many determinants of this decision (Bhutta et al. (2017)). There is a host of non-pecuniary and behavioral factors (Guiso et al. (2013), Bhutta et al. (2017)) that interact with pecuniary costs and collateral enforcement to determine borrower's behavior. To this end, our work here highlights stylized factors which can motivate or prevent strategic behavior, offering useful insights to policy-makers who design interventions in

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[24]The Bank of Greece, using Household Finance and Consumption Survey data, reports a monotonic decrease of income across deciles, ranging from -15.3% for the lowest to -30.1% for the highest income decile for the period 2009-2014 (Monthly Bulletin, July 2017).

credit markets. For example, based on our findings, we expect strategic behavior to pose a greater challenge in settings with a culture of moral hazard (e.g., informality (La Porta and Shleifer (2008)).

An intriguing result in our study is that, despite the mitigation of repossession risk through the foreclosure moratorium, almost 4 out of 5 mortgagors with the ability to service their loans remain current on their debt obligations. Our findings underline the importance of mechanisms beyond collateral pledge that affect moral hazard in debt markets. Therefore, in light of several theoretical and empirical studies that document the amplifying effects of the collateral lending channel on real economic activity, the results in this paper also relate to problems associated with the (over)collateralization of lending (see Chaney et al. (2012), Mian et al. (2013), Adelino et al. (2015)).

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Figures

Figure 1: Distribution of primary residence objective values
The histogram presents the distribution of objective values for the full sample of primary residence mortgages, excluding loans guaranteed by the state and loans with subsidized interest rates. A primary residence is protected from foreclosure if the objective value of the collateral is below €300,000 (vertical line) for single borrowers, and reaches up to €450,000 for married mortgagors with three children or more.
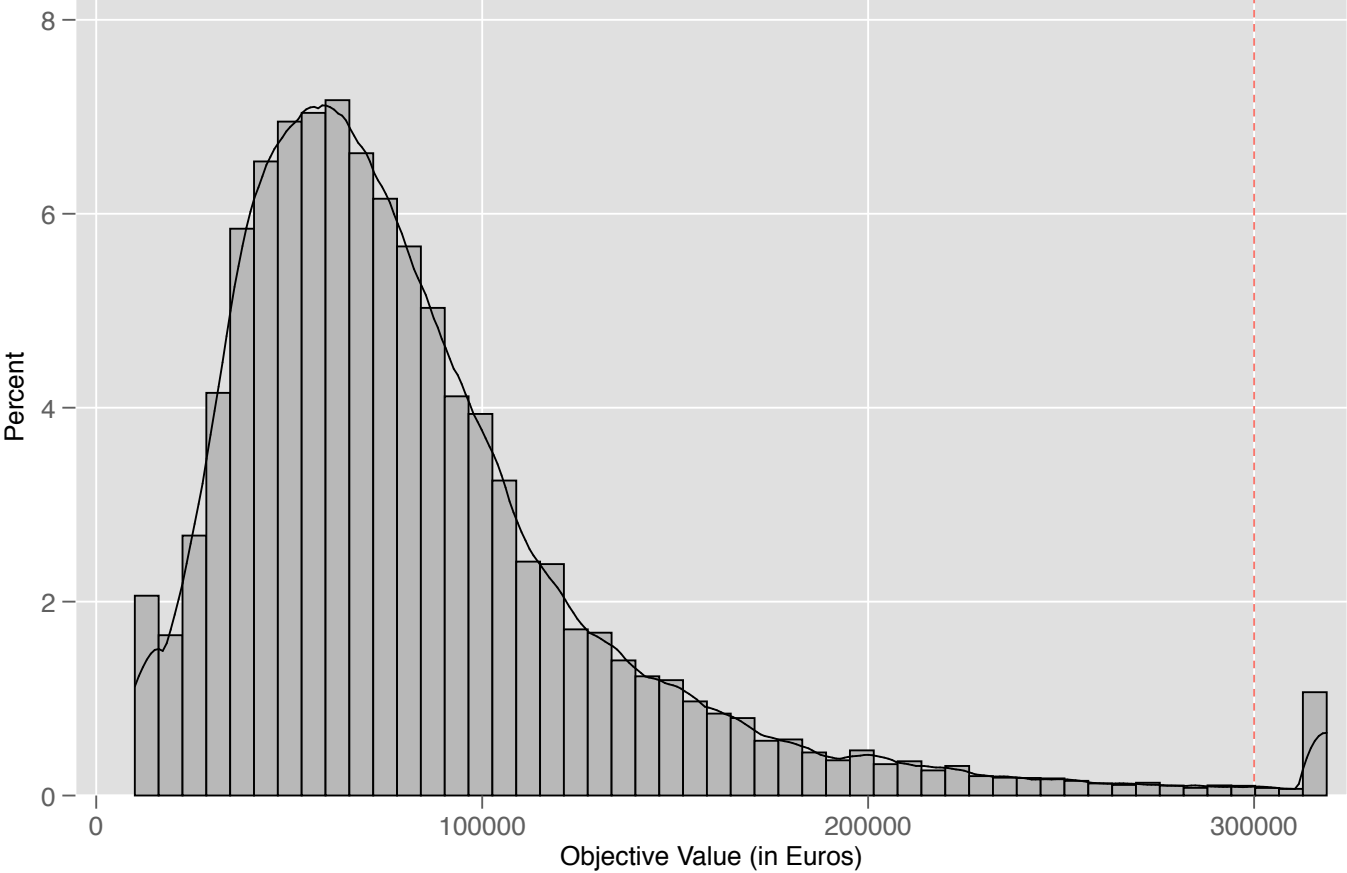
Figure 2: Identification of strategic delinquency The figure presents available strategies for mortgagors after the implementation of Law N.3869/2010.
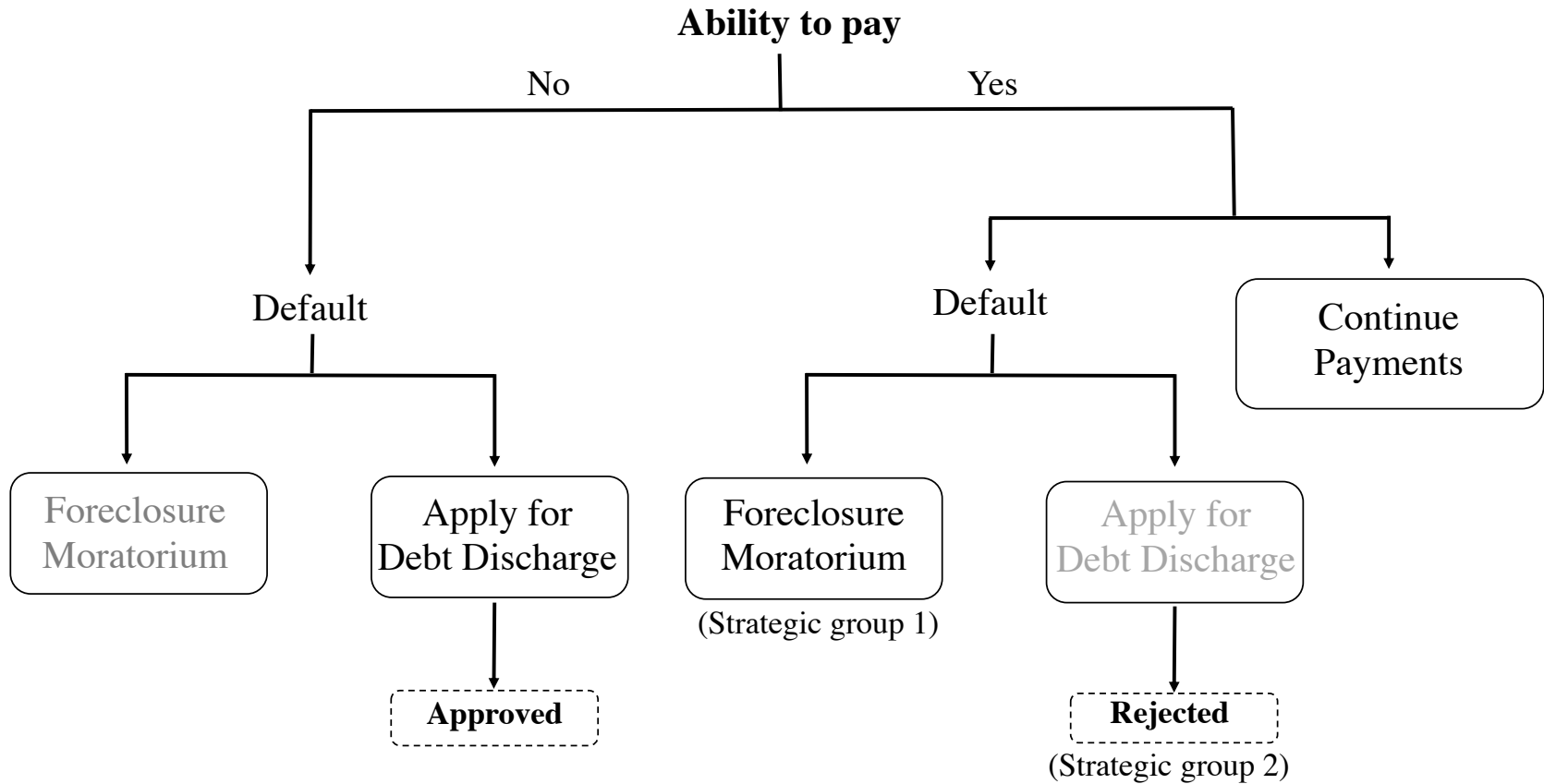
Figure 3: Strategic default around state elections The figure presents the share of (total) mortgagors who become strategically delinquent in a given month in our sample period. The first vertical line marks the announcement date of early parliamentary elections (October 2011), the second vertical line marks the date for the first round of the elections (May 2012), and the last vertical line marks the second round of the elections (June 2012). The dashed line represents the total amount of deposits (EUR mn) in the Greek banking system in a given month.
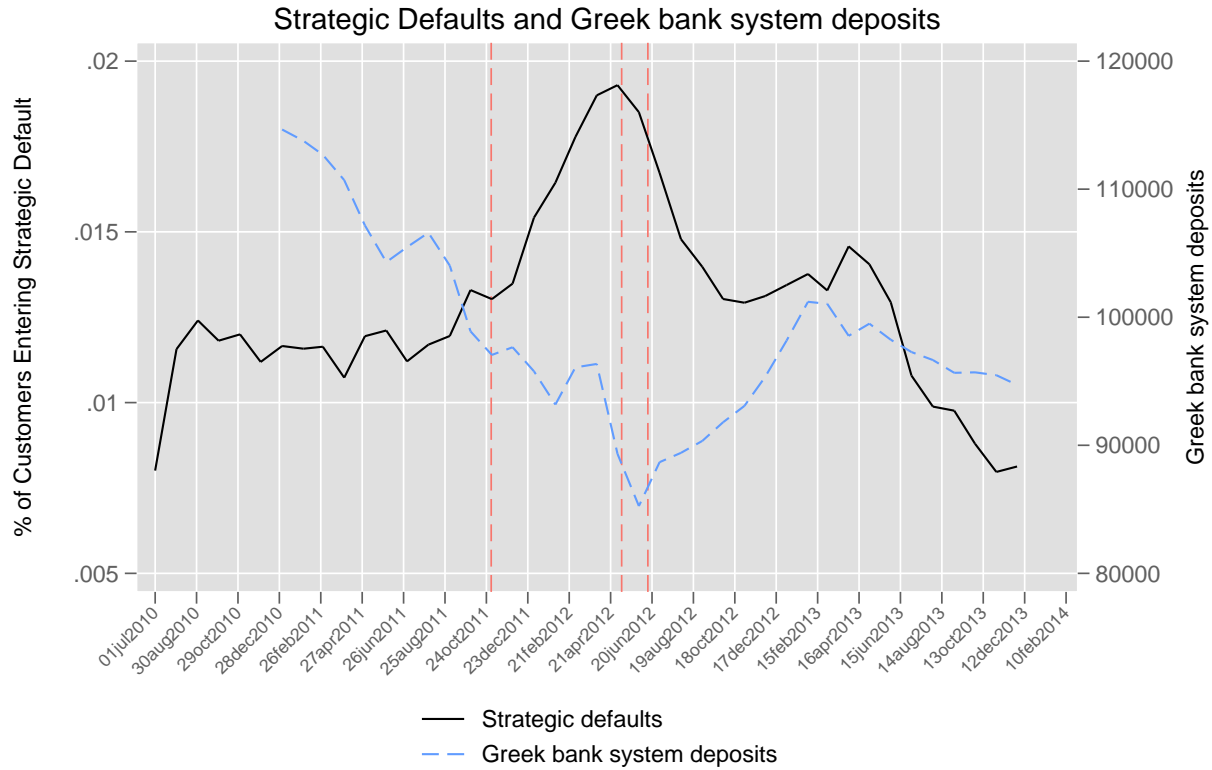
Figure 4: Distribution of CLTVs from 2010-2014

The histograms present the distribution of cumulative LTV (CLTV) values of primary residence mortgages for different groups and time periods. The first plot (a) shows the distribution of CLTVs on July 2010, which is the date of the implementation of the foreclosure moratorium and the introduction of the new debt-discharge regulation (Katseli Law). The second plot (b) shows the distribution of CLTVs at the end of our sample period—June 2014. The third plot (c) shows the distribution of CLTVs for non-delinquent individuals at the end of our sample period. The fourth plot (d) shows the distribution of CLTVs at the (event) time of strategic delinquency.
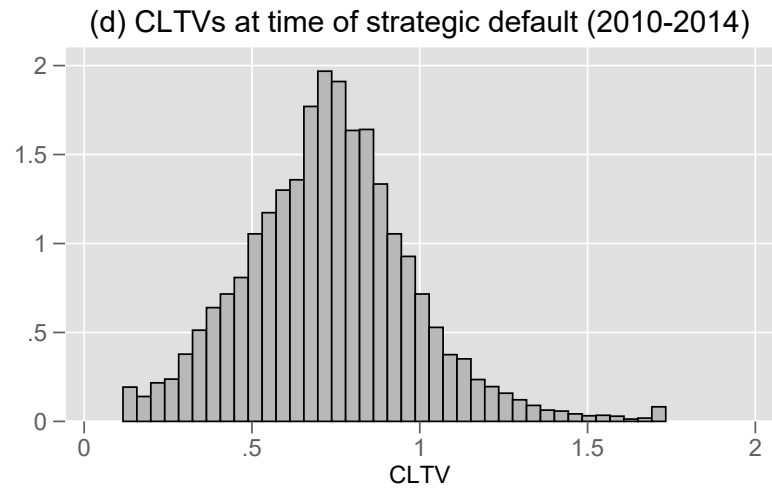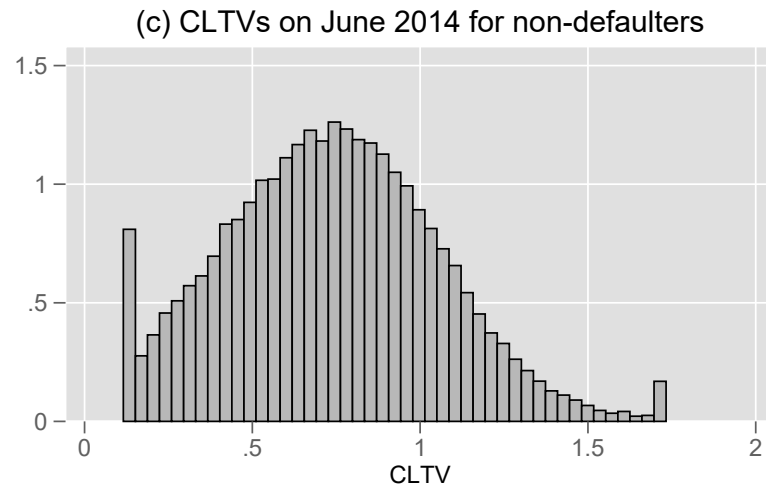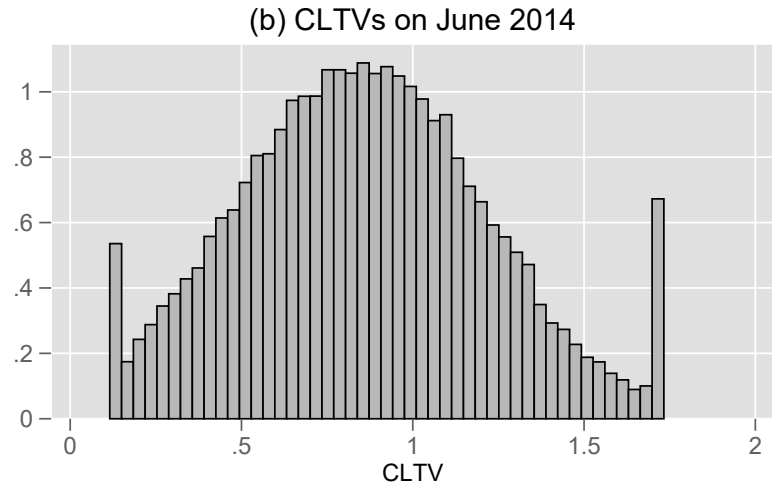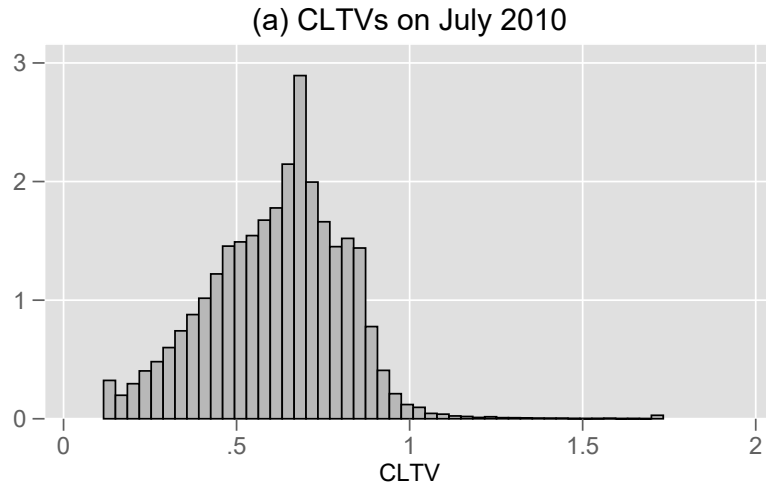
Tables

Table I: Summary Statistics of Mortgages on Primary Residences

The table presents summary statistics of primary residential mortgages from 2007 until 2013. We use mortgage, dwelling, and borrower characteristics from mortgage applications and performance information at the date of the foreclosure moratorium regulation (July 2010).

	N	Mean	sd	p10	p50	p90
Loan Amount (K)	57854	103.33	73.14	33.60	87.00	198.90
Monthly Installment	57854	518.95	362.80	153.55	449.86	964.07
Interest Rate	57854	4.08	1.09	2.62	4.07	5.42
Fixed Rate	57854	0.60	0.49	0.00	1.00	1.00
Maturity (years)	54620	24.78	9.40	12.00	25.00	40.00
Num. of cosigners	54620	1.86	0.72	1.00	2.00	3.00
CLTV	50530	61.62	19.52	35.06	63.92	84.57
Commercial Value (K)	55915	158.26	99.88	65.01	136.42	273.00
Credit Score	51326	651.74	99.99	552.00	648.00	753.00
Reported Income (K)	52346	14.54	13.70	0.00	12.23	30.00
Total Income (K)	52833	31.13	21.04	12.16	25.72	55.23
College Education	45850	0.29	0.45	0.00	0.00	1.00
Age	50850	51.09	11.85	36.00	50.00	68.00
Defaulter	57854	0.43	0.50	0.00	0.00	1.00
Relationship Years	56042	9.24	5.76	3.00	9.00	17.00
Num. Credit Products	57854	1.63	1.59	0.00	1.00	4.00
External Debts	57854	0.57	0.50	0.00	1.00	1.00
Credit Card Account	57854	0.32	0.47	0.00	0.00	1.00
Time Deposit Account	57854	0.02	0.15	0.00	0.00	0.00
Savings Account	57854	0.74	0.44	0.00	1.00	1.00
Checking Account	57854	0.21	0.41	0.00	0.00	1.00

Table II: Mortgagors by Delinquency Status and Ability to Pay
This table presents the number of mortgagors by delinquency status and ability to pay based on the identification criterion described in section I.B.; mortgagors with inability to pay are defined as borrowers who become delinquent and apply for debt-discharge (non-strategic delinquencies). Delinquencies are identified as strategic if mortgagors do not apply for debt-discharge (strategic group 1) or they apply and the application is rejected by the court (strategic group 2).

	Unable to Pay	Able to Pay	Total
Non-Strategic	15,576	–	15,576 (26.92%)
Str.Group 1:	–	7,567	
Str.Group 2:	–	1,721	
Strategic	–	9,288	9,288 (16.05%)
Delinquent	15,576	9,288	24,864 (42.97%)
Non-Delinquent	–	32,990	32,990 (57.03%)
Total	15,576 (26.92%)	42,278 (73.07%)	57,854 (100%)

Table III: Defaulters vs Strategic Defaulters

This table presents differences in characteristics between defaulters and strategic defaulters. In columns (1)-(2) the dependent variable equals one if the mortgagor defaulted (delinquent for six consecutive months) and zero if the mortgagor did not default. In columns (3)-(4) the dependent variable equals one if the mortgagor defaulted strategically (delinquent for six consecutive months and did not apply for debt discharge) and zero if the mortgagor did not default strategically (defaulted and applied for debt discharge). All regressions include ZIP code fixed effects. We cluster at the ZIP code level and report standard errors in parentheses. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively.

	(1)	(2)	(3)	(4)
	$Pr(Default = 1)$		$Pr(Strategic = 1 | Default = 1)$	
	(Full Sample)		(Only Delinquencies)	
Ln(Total Income)	-0.0490***	-0.0291***	0.0638***	0.0598***
	(0.0050)	(0.0052)	(0.0080)	(0.0089)
Credit Score	-0.0009***	-0.0008***	0.0003***	0.0003***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
CLTV	0.0026***	0.0025***	-0.0019***	-0.0018***
	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Ln(Loan Amount)	0.0226***	0.0292***	0.0373***	0.0305***
	(0.0041)	(0.0042)	(0.0071)	(0.0077)
Interest Rate	0.0083***	0.0077***	0.0073**	0.0077**
	(0.0024)	(0.0025)	(0.0035)	(0.0037)
Maturity (years)	0.0043***	0.0043***	-0.0004	-0.0005
	(0.0004)	(0.0004)	(0.0005)	(0.0005)
Num. of cosigners	0.0069*	-0.0062	-0.0263***	-0.0212***
	(0.0041)	(0.0042)	(0.0057)	(0.0063)
College Education		-0.1177***		0.0199*
		(0.0069)		(0.0113)
Private Sector		0.0450***		-0.0149
		(0.0064)		(0.0102)
Self-employed		0.0564***		0.0526***
		(0.0072)		(0.0119)
Pensioner		-0.0070		-0.0698***
		(0.0083)		(0.0142)
Single		-0.0317***		0.0053
		(0.0061)		(0.0105)
Parent		0.0187***		0.0140
		(0.0065)		(0.0097)
Single-Parent		0.0888***		-0.0854***
		(0.0176)		(0.0216)
Zip Code FEs	Yes	Yes	Yes	Yes
Observations	43893	39520	18611	16412
Adjusted R^2	0.103	0.117	0.032	0.037

Table IV: Determinants of strategic delinquency

This table presents OLS regressions of defaulting homeowners on mortgage and borrower characteristics. Strategic defaulters are mortgagors who become delinquent and either do not apply for debt discharge (*Group 1*), or they apply and their application is rejected in court (*Group 2*). The dependent variable in column (1) equals one if the mortgagor is strategically delinquent (Groups 1 and 2), and zero if the mortgagor is non-delinquent. In column (2), the dependent variable equals one if the mortgagor is delinquent and never applies for debt discharge (*Group 1*), and zero if the mortgagor is non-delinquent. In column (3), the dependent variable equals one for delinquent mortgagors who apply for debt discharge and the debt-discharge application is rejected in court (*Group 2*), and zero for non-delinquent mortgagors. All regressions include ZIP code fixed effects. We cluster at the ZIP code level and report standard errors in parentheses. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively.

	$Pr(Str.Default = 1 \| NonStr.Default = 0) = \mathbb{B}_i + \mathbb{L}_i + \alpha_z + \varepsilon_i$		
	All	Group 1	Group 2
Ln(Total Income)	0.0235***	0.0218***	0.0087***
	(0.0045)	(0.0044)	(0.0026)
Credit Score	-0.0005***	-0.0004***	-0.0002***
	(0.0000)	(0.0000)	(0.0000)
CLTV	0.0056***	0.0051***	0.0021***
	(0.0002)	(0.0002)	(0.0001)
Ln(Loan Amount)	-0.0172***	-0.0212***	-0.0032
	(0.0045)	(0.0042)	(0.0027)
Interest Rate	0.0015	0.0013	0.0000
	(0.0022)	(0.0021)	(0.0014)
Maturity (years)	0.0001	-0.0004	0.0005**
	(0.0003)	(0.0003)	(0.0002)
Num. of cosigners	-0.0097**	-0.0128***	0.0018
	(0.0038)	(0.0036)	(0.0025)
College Education	-0.0679***	-0.0573***	-0.0226***
	(0.0053)	(0.0053)	(0.0032)
Private Sector	0.0166***	0.0221***	-0.0060*
	(0.0052)	(0.0052)	(0.0034)
Self-employed	0.0725***	0.0763***	0.0063
	(0.0068)	(0.0067)	(0.0041)
Pensioner	-0.0320***	-0.0287***	-0.0080*
	(0.0073)	(0.0068)	(0.0042)
Zip Code FEs	Yes	Yes	Yes
Observations	29724	28484	24710
Adjusted R^2	0.127	0.113	0.060

Table V: Strategic delinquencies and borrower sophistication

This table presents OLS regressions of delinquent homeowners on mortgagors' occupational expertise. The dependent variable in columns (1) and (4) equals one if the mortgagor is strategically delinquent, and zero if the mortgagor is non-delinquent. In columns (2) and (5), the dependent variable equals one if the mortgagor is delinquent and never applies for debt discharge (*Group 1*), and zero if the mortgagor is non-delinquent. In columns (3) and (6), the dependent variable equals one for delinquent mortgagors who apply for debt discharge and the debt-discharge application is rejected in court (*Group 2*), and zero for non-delinquent mortgagors. *Finance, Law, Medicine, Engin./Science, Military, Education* are indicator variables that equal one if the mortgagor is employed in the respective industry, and zero otherwise. *Negative Equity* is an indicator variable that takes the value of one if the CLTV of the customer at the time of default is above one, and equals zero otherwise. We control for mortgagor income, credit score, CLTV, loan amount, interest rate, and number of cosigners. All regressions include ZIP code fixed effects. We cluster at the ZIP code level and report standard errors in parentheses. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Finance	0.0256***	0.0286***	-0.0039	0.0226**	0.0202**	-0.0017
	(0.0091)	(0.0085)	(0.0079)	(0.0091)	(0.0083)	(0.0100)
Law	0.0434**	0.0761***	-0.0326***	0.0526**	0.0832***	-0.0363***
	(0.0201)	(0.0184)	(0.0095)	(0.0227)	(0.0204)	(0.0116)
Medicine	-0.0668***	-0.0476***	-0.0250***			
	(0.0119)	(0.0110)	(0.0075)			
Engin./Science	0.0103	0.0254*	-0.0198**			
	(0.0141)	(0.0131)	(0.0097)			
Military	-0.0951***	-0.0649**	-0.0170			
	(0.0274)	(0.0262)	(0.0280)			
Education	-0.0391***	-0.0302***	-0.0155**			
	(0.0114)	(0.0106)	(0.0067)			
CLTV	0.0044***	0.0037***	0.0018***			
	(0.0002)	(0.0002)	(0.0002)			
Finance(x)Negative Equity				0.0821***	0.0849***	0.0122
				(0.0274)	(0.0255)	(0.0530)
Law(x)Negative Equity				0.0376	0.0720	0.0096
				(0.0686)	(0.0615)	(0.0504)
Negative equity				0.1173***	0.0979***	0.0584***
				(0.0098)	(0.0092)	(0.0220)
Zipcode FEs	Yes	Yes	Yes	Yes	Yes	Yes
Observations	15191	14433	13667	15191	14433	13667
Adjusted R^2	0.083	0.071	0.094	0.048	0.052	0.100

Table VI: Strategic delinquencies and moral hazard behavior

This table presents coefficients from cross-sectional OLS regressions of strategic defaulters on mortgagors' ability to tax evade. *Self-employed* is an indicator variable that equals one if the individual is self-employed (income is self-reported), and zero if the individual is a wage-worker (income is reported by a third-party). Strategic defaulters are mortgagors who become delinquent and either do not apply for debt discharge (*Group 1*), or apply for debt-discharge and their application is rejected in court (*Group 2*). The dependent variable in column (1) equals one if the mortgagor is strategically delinquent (Groups 1 and 2), and zero if the mortgagor is non-delinquent. In column (2), the dependent variable equals one if the mortgagor is delinquent and never applies for debt discharge (*Group 1*), and zero for non-delinquent mortgagors. In column (3), the dependent variable equals one for delinquent mortgagors who apply for debt discharge and the debt-discharge application is rejected in court (*Group 2*), and zero for non-delinquent mortgagors. In all regressions, we match self-employed professionals to wage-workers based on the same job description, credit score, and CLTV. All regressions include ZIP code fixed effects. We cluster at the ZIP code level and report standard errors in parentheses. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively.

	Strategic Delinquency		
	(1)	(2)	(3)
Self-employed	0.0506***	0.0541***	-0.0002
	(0.0093)	(0.0086)	(0.0055)
Controls			
Ln(Total Income)	-0.0035	-0.0035	0.0019
	(0.0083)	(0.0079)	(0.0044)
Credit Score	-0.0008***	-0.0008***	-0.0002***
	(0.0000)	(0.0000)	(0.0000)
CLTV	0.0022***	0.0019***	0.0010***
	(0.0003)	(0.0003)	(0.0002)
Ln(Loan Amount)	-0.0052	-0.0092	0.0055
	(0.0077)	(0.0073)	(0.0047)
Interest Rate	-0.0057	-0.0070*	-0.0004
	(0.0040)	(0.0039)	(0.0023)
Maturity (years)	0.0039***	0.0036***	0.0010***
	(0.0006)	(0.0006)	(0.0004)
Num. of cosigners	-0.0169**	-0.0212***	0.0055
	(0.0068)	(0.0065)	(0.0041)
Zipcode FEs	Yes	Yes	Yes
Observations	14880	14141	10780
Adjusted R^2	0.094	0.087	0.071

Table VII: Fairley-Oaxaca-Blinder decomposition of strategic delinquency

The decomposition measures what share of the difference in average strategic delinquency rate between wage-workers and self-employed individuals is explained by differences in control variables such as income, credit scores, CLTV, and loan amount. Panel A presents the share of the total difference in strategic delinquency rates between wage-workers and self-employed mortgagors. *Explained difference* measures the share of total difference in strategic delinquency rate between wage-workers and self-employed due to group differences in *reported* income. *Unexplained difference* measures the share of total difference in strategic delinquency rate between wage-workers and self-employed due to group differences in income sensitivity. Panel B shows the share of explained difference in strategic delinquency rate between self-employed and wage-workers after adjusting reported income of self-employeds by the tax evasion λ (i.e., the ratio of the sensitivity of credit capacity to income for self-employed professionals divided by the sensitivity of credit capacity to income for wage workers).

Decomposition estimates: Self-employed versus wage-workers		
	Decomposition estimate (%)	z-value
Wage-Workers	25.8	56.6
Self-Employed	35.1	61.6
Total Difference	-9.3	-14.1
A: Differences due to income		
Explained Difference	0.0	-0.2
Unexplained Difference	-9.3	-14.2
B: Differences due to adjusted income		
Explained Difference	-2.7	-8.4
Unexplained Difference	-6.6	-10.7

Table VIII: Strategic delinquencies and moral hazard behavior

This table presents coefficients from cross-sectional OLS regressions of strategic defaulters on mortgagors' extent of tax-evasion. *tax evasion proxy-λ* is the ratio of the sensitivity of credit capacity to income for self-employed professionals (who are able to tax evade) divided by the sensitivity of credit capacity to income for wage workers (who are not able to evade taxes). *Ln(Hidden Income)* is the natural logarithm of the borrower's unreported income at mortgage origination, calculated as (total income)*($\lambda - 1$). The dependent variable in columns (1) and (4) equals one if the mortgagor is strategically delinquent, and zero if the mortgagor is non-delinquent. In columns (2) and (5), the dependent variable equals one if the mortgagor is delinquent and never applies for debt discharge (*Group 1*), and zero if the mortgagor is non-delinquent. In columns (3) and (6), the dependent variable equals one for delinquent mortgagors who apply for debt discharge and the application is rejected in court (*Group 2*), and zero for non-delinquent mortgagors. All regressions include ZIP code fixed effects, regression (1) also includes fixed effects at the job-description level. We cluster at the ZIP code level and report standard errors in parentheses. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively.

	Strategic Delinquency					
	(1)	(2)	(3)	(4)	(5)	(6)
Tax evasion proxy - λ	0.0391**	0.0364**	0.0158			
	(0.0157)	(0.0156)	(0.0157)			
Ln(Hidden Income)				0.0136***	0.0126**	0.0045
				(0.0050)	(0.0050)	(0.0056)
Ln(Total Income)	0.0353***	0.0410***	-0.0080	0.0261**	0.0323***	-0.0112
	(0.0120)	(0.0120)	(0.0120)	(0.0124)	(0.0123)	(0.0125)
Credit Score	-0.0006***	-0.0006***	-0.0002***	-0.0006***	-0.0006***	-0.0002***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
CLTV	0.0109***	0.0105***	0.0061***	0.0109***	0.0105***	0.0061***
	(0.0004)	(0.0004)	(0.0009)	(0.0004)	(0.0004)	(0.0009)
Ln(Loan Amount)	-0.0080	-0.0128	0.0017	-0.0086	-0.0133	0.0016
	(0.0113)	(0.0114)	(0.0148)	(0.0113)	(0.0114)	(0.0148)
Interest Rate	-0.0045	-0.0053	-0.0006	-0.0045	-0.0053	-0.0006
	(0.0058)	(0.0058)	(0.0056)	(0.0058)	(0.0058)	(0.0056)
Maturity (years)	-0.0002	-0.0008	0.0000	-0.0002	-0.0008	0.0000
	(0.0008)	(0.0008)	(0.0009)	(0.0008)	(0.0008)	(0.0009)
Num. of cosigners	-0.0153*	-0.0147	-0.0027	-0.0153*	-0.0146	-0.0027
	(0.0089)	(0.0090)	(0.0099)	(0.0089)	(0.0090)	(0.0099)
Zipcode FEs	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5930	5537	4405	5930	5537	4405
Adjusted R^2	0.218	0.204	0.248	0.218	0.204	0.248

Table IX: Strategic delinquencies and bank-credit relationships

Strategic defaulters are mortgagors who become delinquent and either do not apply for debt discharge (*Group 1*), or apply for debt-discharge and their application is rejected in court (*Group 2*). The dependent variable in all regressions equals one if the mortgagor is strategically delinquent (Groups 1 and 2), and zero if the mortgagor is non-delinquent. In each of the columns (1)-(8), respectively, the independent variable is one of the following relationship variables: (1) *Relationship years* is the number of years the borrower has a credit relationship with the bank (excluding the current mortgage); (2) *External debt* indicates if the mortgagor has debt with other banks; (3) *Main bank* indicates if the mortgagor's debt with the bank exceeds the cumulative debt obligations with other lenders; (4) *Number of credit products* measures the total number of credit products (excluding the mortgage) with the bank; (5) *Sight account* indicates if the mortgagor's account is linked to payroll; (6) *Time deposit account* indicates if the mortgagor has a time deposit account with the bank; (7) *Savings account* indicates if the mortgagor has a savings account with the bank; (8) *No branch ZIP code* indicates if the bank does not have a branch in the ZIP code of the mortgagor's residence. All regressions include control variables for mortgagor income, credit score, CLTV, loan amount, interest rate, number of cosigners. We cluster at the ZIP code level and report standard errors in parentheses. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively.

	Dependent Variable: Strategic Delinquency			
	(1)	(2)	(3)	(4)
Relationship Variable:	Relationship Years	External Debt	Main Bank	Number of Credit Products
	-0.0047***	0.1140***	-0.1238***	-0.0395***
	(0.0004)	(0.0044)	(0.0083)	(0.0020)
Borrower Controls	Yes	Yes	Yes	Yes
Mortgage Controls	Yes	Yes	Yes	Yes
Zipcode FEs	Yes	Yes	Yes	Yes
Observations	31385	32473	32473	32473
Adjusted R^2	0.104	0.113	0.105	0.106

	Dependent Variable: Strategic Delinquency			
	(5)	(6)	(7)	(8)
Relationship Variable:	Sight Account	Time Deposit Account	Savings Account	No Branch in Zip-code
	-0.0114**	-0.1268***	-0.1630***	0.0239***
	(0.0053)	(0.0091)	(0.0066)	(0.0057)
Borrower Controls	Yes	Yes	Yes	Yes
Mortgage Controls	Yes	Yes	Yes	Yes
Zipcode FEs	Yes	Yes	Yes	-
Municipality FEs	-	-	-	Yes
Observations	32473	32473	32473	32314
Adjusted R^2	0.096	0.098	0.120	0.105

Table X: Cash-Flow Shocks and Strategic Default

This table presents coefficients from cross-sectional OLS regressions of defaulting mortgagors using only pensioners from our sample. We create income quartiles based on the distribution of pensioners' personal income and classify them as high income, medium income, and low income (lowest income-quartile is omitted). Strategic defaulters are mortgagors who become delinquent and either do not apply for debt discharge (*Group 1*), or they apply and their application is rejected in court (*Group 2*). The dependent variable in column (1) equals one if the mortgagor is strategically delinquent (Groups 1 and 2), and zero if the mortgagor is non-delinquent. In column (2), the dependent variable equals one if the mortgagor is delinquent and never applies for debt discharge (*Group 1*), and zero for non-delinquent mortgagors. In column (3), the dependent variable equals one for delinquent mortgagors who apply for debt discharge and the debt-discharge application is rejected in court (*Group 2*), and zero for non-delinquent mortgagors. All regressions include ZIP code fixed effects. We cluster at the ZIP code level and report standard errors in parentheses. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively.

	Strategic Delinquency		
	(1)	(2)	(3)
Pensioner income Q1 (Low)-omitted			
Pensioner income Q2	0.0163	0.0180	-0.0001
	(0.0182)	(0.0170)	(0.0104)
Pensioner income Q3	0.0196	0.0263	-0.0024
	(0.0192)	(0.0181)	(0.0110)
Pensioner income Q4 (high)	0.0462**	0.0516***	0.0024
	(0.0212)	(0.0199)	(0.0122)
Credit Score	-0.0001	-0.0002*	-0.0000
	(0.0001)	(0.0001)	(0.0001)
CLTV	0.0042***	0.0035***	0.0016***
	(0.0004)	(0.0004)	(0.0002)
Ln(Loan Amount)	-0.0231*	-0.0204	-0.0074
	(0.0137)	(0.0128)	(0.0079)
Interest Rate	0.0078	0.0075	0.0015
	(0.0065)	(0.0061)	(0.0037)
Maturity (years)	-0.0031***	-0.0036***	0.0002
	(0.0010)	(0.0009)	(0.0005)
Num. of cosigners	-0.0023	-0.0008	-0.0007
	(0.0099)	(0.0093)	(0.0057)
Zipcode FEs	Yes	Yes	Yes
Observations	3598	3298	3004
Adjusted R^2	0.074	0.078	0.035

Appendix Tables

Table A.I: Determinants of strategic delinquency (multinomial Logit regressions)
This table presents multivariate Logit regressions for three outcomes: non-delinquency, which serves as the base outcome, non-strategic delinquency, and strategic delinquency. Non-delinquent mortgagors are mortgagors that have not been delinquent for more than six consecutive months. Delinquent mortgagors are non-strategic if they apply for debt discharge and their application is approved in court. Strategically delinquent mortgagors are delinquent individuals who either do not apply for debt discharge (strategic group 1), or apply for debt discharge and their application is rejected in court (strategic group 2). Standard errors are robust to heteroskedasticity and are reported in parentheses. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively.

	(1)	(2)
	Non-Strategic Delinquency (Base outcome: No Delinquency)	Strategic Delinquency (Base outcome: No Delinquency)
Ln(Total Income)	-0.0316***	0.0161***
	(0.004)	(0.004)
Credit Score	-0.0007***	-0.0001***
	(0.000)	(0.000)
CLTV	0.0040***	0.0027***
	(0.000)	(0.000)
Ln(Loan Amount)	-0.0075*	-0.0057*
	(0.004)	(0.003)
Interest Rate	-0.0029	0.0029*
	(0.002)	(0.002)
Maturity (years)	0.0014***	-0.0003
	(0.000)	(0.000)
Num. of cosigners	0.0107***	-0.0063**
	(0.003)	(0.003)
College Education	-0.0849***	-0.0379***
	(0.005)	(0.004)
Private Sector	0.0272***	0.0041
	(0.005)	(0.004)
Self-employed	0.0063	0.0546***
	(0.006)	(0.005)
Pensioner	0.0239***	-0.0421***
	(0.008)	(0.007)
Observations	41013	41013
Pseudo R^2	0.100	0.100

Table A.II: Determinants of strategic delinquency - Probit regressions

This table presents Probit regressions of strategic delinquency on mortgage and borrower character-istics. Strategic defaulters are mortgagors who become delinquent and either do not apply for debt discharge (*Group 1*), or they apply and their application is rejected in court (*Group 2*). The dependent variable in column (1) equals one if the mortgagor is strategically delinquent (Groups 1 and 2), and zero if the mortgagor is non-delinquent. In column (2), the dependent variable equals one if the mortgagor is delinquent and never applies for debt discharge (*Group 1*), and zero if the mortgagor is non-delinquent. In column (3), the dependent variable equals one for delinquent mortgagors who apply for debt discharge and the debt-discharge application is rejected in court (*Group 2*), and zero if the mortgagor is non-delinquent. We cluster at the ZIP code level and report standard errors in parentheses. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively.

	Strategic Delinquency		
	(1)	(2)	(3)
Ln(Total Income)	0.0147***	0.0130***	0.0055**
	(0.0044)	(0.0043)	(0.0026)
Credit Score	-0.0005***	-0.0004***	-0.0002***
	(0.0000)	(0.0000)	(0.0000)
CLTV	0.0050***	0.0044***	0.0019***
	(0.0001)	(0.0001)	(0.0001)
Ln(Loan Amount)	-0.0069	-0.0112***	0.0051*
	(0.0044)	(0.0041)	(0.0028)
Interest Rate	0.0031	0.0027	0.0010
	(0.0021)	(0.0020)	(0.0013)
Maturity (years)	0.0000	-0.0003	0.0003*
	(0.0003)	(0.0003)	(0.0002)
Num. of cosigners	-0.0029	-0.0057	0.0035
	(0.0036)	(0.0035)	(0.0022)
College Education	-0.0788***	-0.0681***	-0.0264***
	(0.0055)	(0.0055)	(0.0035)
Private Sector	0.0153***	0.0199***	-0.0047
	(0.0051)	(0.0051)	(0.0033)
Self-employed	0.0721***	0.0750***	0.0051
	(0.0061)	(0.0059)	(0.0037)
Pensioner	-0.0423***	-0.0412***	-0.0073
	(0.0087)	(0.0084)	(0.0050)
Observations	29724	28484	24710
Pseudo R^2	0.117	0.108	0.129

Table A.III: Delinquency and strategic delinquency rates for pensioners

The dependent variable in column (1) is an indicator variable that equals one if the mortgagor is delinquent and zero if the mortgagor is non-delinquent. In column (2), the dependent variable equals one if the mortgagor is strategically delinquent (defaulted and did not apply for debt discharge or applied and the application was withdrawn or rejected in court) and zero if the mortgagor is delinquent but not strategically (unable to pay). We create income quartiles based on the distribution of pensioners' personal income and classify them as high income, medium income, and low income (lowest income-quartile is omitted). All regressions include ZIP code fixed effects. We cluster at the ZIP code level and report standard errors in parentheses. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively.

	Delinquency	Str. Delinquency
	(1)	(2)
Pensioner income Q1 (Low)-omitted		
Pensioner income Q2	-0.0074	0.0178
	(0.0179)	(0.0287)
Pensioner income Q3	-0.0616***	0.0625*
	(0.0193)	(0.0330)
Pensioner income Q4 (high)	-0.0832***	0.1494***
	(0.0213)	(0.0344)
Credit Score	-0.0008***	0.0001
	(0.0001)	(0.0001)
CLTV	0.0063***	0.0003
	(0.0003)	(0.0005)
Ln(Loan Amount)	0.0092	-0.0233
	(0.0134)	(0.0216)
Interest Rate	0.0100	-0.0025
	(0.0063)	(0.0117)
Maturity (years)	-0.0003	-0.0010
	(0.0010)	(0.0017)
Num. of cosigners	0.0226**	-0.0358**
	(0.0106)	(0.0165)
Zipcode FEs	Yes	Yes
Observations	4771	1632
Adjusted R^2	0.138	0.010