Foreclosure Moratorium and Strategic Default[*]

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Abstract

We identify customers who strategically default on their mortgage by exploiting the provisions of a residential foreclosure moratorium imposed in 2010 by the Greek government. Using proprietary data from a large Greek bank, we conservatively estimate that 29% of defaults in primary residence mortgages are strategic, which corresponds to 12.3-14.3 billion euros of non-performing loans. Strategic defaulters are more likely to be self-employed, have lower CLTVs, higher credit scores, and college education than non-strategic defaulters. Pensioners, military personnel, and single-parent families exhibit the lowest levels of strategic default. We find evidence that strategic defaults spread through homeowners' social networks, and evaluate the impact of regulation securing homeowners' collateral on the financial health of the Greek banking system.

The ability to enforce contracts lies in the core of any economic activity. Particularly for credit markets, the capacity of lenders to ensure repayments at a reasonable level is a prerequisite of their very existence. Typically, failure to meet debt obligations entails a penalty in the form of collateral impound or preclusion from future credit. This paper tells a story of a setting, where legislation invalidates penalties for mortgage defaults, and disrupts the ability of lenders to enforce repayment of debt obligations.

In June 2010, Greek legislators introduced a set of measures that aimed to provide relief to households suffering from the ongoing financial crisis. These provisions, among others, included an almost universal foreclosure moratorium for primary residences, and a personal debt discharge (bankruptcy) process, which excluded primary dwellings from liquidation.[1] This overlap of protection for primary residences, allowed borrowers to protect their primary homes by using either provision; thus, individuals could default on their primary residence mortgages, with or without declaring bankruptcy, and still prevent lenders from foreclosing the collateral. In this study, we exploit the observed preference towards the debt discharge process to assess borrowers' "ability to pay", and determine whether a default is strategic or not.

In order to separate strategic from liquidity defaulters, we focus on a sample of primary residence mortgage holders that is eligible for the foreclosure moratorium and a significant "debt haircut" should they choose to participate in the debt discharge process. Since the bankruptcy procedure also protects primary residences from liquidation, these individuals are expected to receive only benefits from their participation, in the absence of additional (to the primary home) financial and real assets. We define *strategic defaulters*, as borrowers who default on mortgages, and choose not to apply for debt discharge. For these individuals, we interpret the choice not to participate as proof that additional financial or real assets (formal or hidden) exist, which they wish to protect from liquidation. Accordingly, *liquidity defaulters* are defined as borrowers that default on their mortgages and apply for the debt

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[1] The legislation also implemented a general moratorium that deferred foreclosures for debt obligations below 200,000 euros. This provision applied to residences, in general, however provided more limited protection for primary dwellings compared to the primary mortgage foreclosure moratorium examined here.

discharge process, accepting the liquidation of their additional assets, if any.

We emphasize that this criterion separates strategic from liquidity defaulters by observing the behavior of the entity with superior information in our setting; *the borrower*. In other words, we let strategic defaulters self-identify themselves by revealing their preferences toward the debt discharge procedure. Thus, our approach is free of self-reporting biases that may hinder survey methods, or limitations related to the ability of financial or banking data to proxy for the true "ability to pay".

Our criterion allows us to estimate the incidence of strategic default for a wide, population-representative sample of borrowers. We conservatively estimate that, by the end of 2013, 28% of defaults are strategic default, which aggregates to 12 -14 billion euros in non-performing loans across the Greek banking system. Consistently with previous studies, we find that delinquency is more probable in loans of higher amounts and CLTVs, and borrowers with lower credit scores. However, we show that strategic defaulters have higher credit scores and reported income, and hold loans with lower CLTVs than liquidity defaulters. All of these results are consistent with delinquency, despite (relative) ability to pay.

We extend our analysis to examine the distribution of strategic default behavior across borrowers' characteristics. We find the highest concentrations of strategic defaulters in the industries of law and finance (47% and 41% of defaults, respectively), even though these professionals very low overall default rates. This result is consistent with the ability of these groups to understand legislative provisions and actively use them to their benefit. Similarly, highly educated individuals are less likely to default, but when they do it is more probable they do it strategically. Additionally, strategic default rates of self-employed are significantly higher than wage workers'. Artavanis, Morse, and Tsoutsoura (2016) show that self-employed are consistently exhibiting high tax evasion rates, which might discourages the disclosure of of information for their true financial state through the debt discharge process.

On the other hand, military and security personnel is less likely to default, strategically or not, which we relate to high sense of duty of these professionals, that might lead to increased self-perceived social stigma. Interestingly, we find relatively low percentages of

strategic default in financially weak groups, that exhibit high overall default rates. Apart from individuals with lower income and education, pensioners, and single-parent families are significantly more probable to default, but significantly less probable to strategically default. We attribute this finding to increased risk aversion, which prevents borrowers to exploit the legislation loopholes, when uncertainty regarding the succeeding phase is present. Furthermore, we find that even though the existence of a consignor or a guarantor does not affect the probability of a delinquency, it makes strategic default less probable, suggesting that the later case requires coordination.

Finally, we document the strongly contagious nature of strategic default behavior, consistent with the findings of Guiso et al. (2013) and Bradley et al. (2015). We follow a methodology similar to Iyer and Puri (2012), who examine the effects of social networks in bank runs, and show that local strategic defaults at the zip code level are strongly related to strategic default behavior. A one standard deviation increase in the zip code rate of strategic default increases the likelihood of defaulting strategically by 5.3-7.5%.. This result is consistent with the existense of a leaning mechanism (Goodstein et al. (2011)), or the reduction of the social stigma associated with strategic default (Guiso et al. (2013)), that accelerates the phenomenon. In contrast, the overall default rate carries a negative coefficient, implying that strategic default is concentrated in areas where the rate of liquidity defaults is relatively rate.

Our analysis combines several propriety datasets related to the universe of primary residence mortgages contracted by a large Greek bank. For this sample, which includes tenths of thousands of mortgages, we obtain detailed information from applications, regarding customer and loan characteristics. Additionally, we observe the performance of the loans at a monthly frequency, which allows us to follow repayment patterns and determine the exact time of default for each borrower. Finally, we compliment these data with information regarding the objective value of each dwelling, which determines eligibility for the law provisions, and hand-collected data indicating whether the borrower has applied for the debt discharge process.

Given the magnitude and the incidence of strategic default, our results have important policy implications. First, we find that the foreclosure moratorium had a substantial impact on strategic default rates and contributed to the deterioration of the Greek banking system. Since the cost of strategic default is born by other groups, namely shareholders and taxpayers, through recapitalizations and bailouts, apparent moral hazard situations arise. The interruption of the foreclosure process had a sizable impact on the supply side, as well. citemorse2013 show that the foreclosure moratorium resulted in an increase in interest rates and a large reduction in new home loans.

Second, we show that the foreclosure moratorium as a stand-alone provision was ineffective from a social perspective. Most of our distributional results are consistent with an adverse selection story, where the moratorium (without the debt discharged process) is mainly used by individuals with higher income, education and credit scores. In contrast, the weaker groups tend to use the bankruptcy process. Finally, due to the contagious nature of strategic default behavior it is advisable that policymakers use broad intervention programs, as a universal foreclosure moratorium, only as a last resort and only temporarily, in order to avoid spreading strategic default behavior through borrowers' social networks.

Our work contributes directly to the strategic default literature. Also examined in the context of corporate debt, strategic default in mortgages focuses on individuals, who become delinquent despite "ability to pay" on negative equity loans. Guiso et al. (2013), using survey data find that the decision to default strategically depends on both pecuniary and non-pecuniary factors. Gerardi et al. (2015) report a surprisingly low percentage of strategic defaulters, while the majority of liquidity-constrained households continue to serve their mortgages, and Tiruppatur et al. (2010) find that the incidence of strategic default is higher among borrower of higher quality and prime jumbo collateral. Probably closer to our setting, Mayer et al. (2014), show that the announcement of a nationwide settlement for delinquent borrowers results in increased strategic default behavior.

Our results are also relevant to the more general mortgage foreclosure literature. Traditional foreclosure models predict delinquency as a result of the existence of negative equity

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in the mortgage. The introduction of additional costs and frictions suggests that defaults occur when loans are deeply underwater. Here, the implementation of the foreclosure moratorium allows borrowers to defer debt payments without foregoing the collateral. In our setting, we observe defaults and strategic defaults even in mortgages with positive equity. This finding is consistent with pessimistic expectations regarding future house prices (see Foote et al. (2008)) in a collapsing real-estate market and higher marginal utility of income during a recession that results to a preference for liquidity.

The remainder of the study is organized as follows. The next section provides details for the legal framework and the definitions of strategic and liquidity defaulters. Section II. describes our data. Section III. presents our empirical results regarding the incidence and the distribution of strategic default. Finally, Section V. concludes the study.

I. Legal Framework

A. Legal Framework for Personal Bankruptcy and Foreclosure Moratoria

Up to 2010, Greece did not have any personal default framework for non-commercials.[2] In June 2010, the Greek Parliament voted for legislation that aimed to provide relief to households that had become financially-constrained, due to the ongoing financial crisis. Law N.3869/2010, also known as the law for "over-indebted households" or the "Katseli law", introduced a *primary residence mortgage moratorium* and a *debt discharge process.* The law originally deferred foreclosures for six months, but was subsequently extended without any change until the end of 2013.[3] More importantly, the aforementioned provisions had the unanimous support of all political parties in Greece, thus the continuation of the status quo was anticipated by borrowers.

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[2]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.

[3]The protection of the primary residence, prescribed in N.3869/2010 was extended with N.3886/2011, N.4047/2012, and N.4128/2013. Starting from 1/1/2014, N.4224/2013 added additional criteria for inclusion based on the objective value of the primary residence and income, while in 2015 the aforementioned criteria became stricter (but still covering about two thirds of the existing borrowers with primary residence mortgages).

The law provided *dual protection* for primary residences, a feature that we exploit to identify strategic default. First, it imposed a foreclosure moratorium for dwellings serving as primary homes with objective value[4] below 300,000 euros[5]. Based on these thresholds, the vast majority of primary residences was eligible for foreclosure protection, making the effect of the provision almost universal. Figure 1 plots the objective values of primary dwellings in our sample; the median objective value is 71,000 euros, while 98.7% of dwellings in our sample falls below the 300,000 euro threshold.

Second, the law for over-indebted households (N.3869/2010) introduced a personal debt discharge procedure, which *excluded primary residences from liquidation.*[6] The process can be summarized in three stages:

- *Stage 1 (Application)*: The borrower applies for inclusion, which results to an automatic stay of any actions from creditors. From the time of the application, debt obligations seize accruing interest, with the exception of collateralized debt (i.e. mortgages) that continues to accrue at the non-delinquency rate, regardless of the status of the borrower.

- *Stage 2 (Out-of-Court Settlement)*: The borrower provides to creditors a list of eligible debt obligations to be settled, a comprehensive report that discloses the current financial state (financial/real assets and income), along with a proposed repayment plan. If borrower and lenders agree on the repayment plan within three months, then the settlement is deemed as successful.

- *Stage 3 (In-Court Settlement)*: If the out-of-court settlement is unsuccessful, then the case is deferred to the court. The court orders for the liquidation of the borrower's assets, excluding the (eligible) primary residence, and then sets a monthly payment

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[4]Objective values correspond to presumed values used by tax authorities to estimate tax liabilities. At the time of the implementation, objective values were significant lower than market values.

[5]This threshold applied to for single individuals, was increased to 350,000 euros for married borrowers, and by 50,000 euros for each child, up to 450,000 euros

[6]For the exclusion of the primary residence from liquidation, the same thresholds on objective value, as in the case of the foreclosure moratorium, apply.

for the any outstanding debt. These monthly payments continue for the next four years, and are set at an amount that allow the borrower to maintain "decent living standards", given her financial state and reasonable living costs. The residual debt is eliminated ("*debt haircut*"). If the primary residence is excluded from liquidation, then the court *may* rule for additional payments. that do not exceed *in total* the 85% of the current commercial value of the house, in a period of up to 35 years with low interest rate.

In practice, this framework was proved to be incomplete, dysfunctional and prone to abuse (Paulus et al. (2015)). The provisions applied only to bank and private debt, thus failing to to provide full discharge for a wide range of liabilities, mainly towards the state (i.e. taxes, social security). Due to the overload in Greek courts, cases may take more than 10 years to settle, a period during which the applicant continues to enjoy the protection of the law.[7] Additionally, the vagueness of the law allows for subjective interpretation, that usually favors the borrower. For example, there are cases where the requirement to "maintain decent living standards" has resulted to the exception of additional assets from liquidation, as secondary residences and automobiles. Furthermore, judicial practice suggests that ruling for additional payments, when the primary residence is excluded from liquidation, is the exception rather than the rule, while debt haircuts of 80-90% are not uncommon.

In summary, law N.3869/2010 deferred foreclosures for eligible primary residences, and provided the opportunity for significant debt discharges, while protecting these dwellings from liquidation. This overlap of protection for primary homes is critical for the identification of strategic defaulters, as we show in the next section.

B. Indentification of Strategic Default

Undoubtedly, the greatest challenge in examining strategic default behavior is its identification. The reason is, because strategic default is defined as the deliberate decision of

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[7]For an overview of the weaknesses of the Greek judicial system, see "European Commission for the Efficiency of Justice" [Bajari et al. (2014)].

a borrower to become delinquent, despite her ability to pay (see Mian and Sufi (2008), Guiso et al. (2013)). Thus, detecting such behavior presupposes that the researcher has a comprehensive view of the borrower's financial state, in order to access whether she can afford making debt payments. However, in reality this information is not attainable, as individuals may hold hidden assets or have access to informal sources of financing. The past literature has used different methods to evaluate a borrower's "ability to pay", ranging from survey data (Guiso et al. (2013), Gerardi et al. (2015)) to exploiting banking information (Tiruppatur et al. (2010)); each method having its own merits and weaknesses.

In this paper, we exploit the introduction of the personal bankruptcy procedure and the foreclosure moratorium, in order to detect strategic default based on of borrowers' responses to these provisions. Thus, our criterion assesses strategic default by directly observing the behavior of the entity that has superior information regarding the "ability to pay"; the borrower. As such, our method is not tainted by personal biases that might contaminate survey data (see Hurst et al. (2014)), or subject to data limitations that might fail to capture the comprehensive financial state of borrowers.

Even though we also examine the effect of the new legislation on defaults, in general, our analysis focuses on mortgages of primary residences, because they are eligible for both "debt haircut" and foreclosure protection. In order to obtain a sample that is definitely eligible for both provision, we make the following adjustments:

1. Since law N.3869/2010 applies only to non-commercials, we exclude commercials.[8]

2. We exclude mortgages on primary residences with objective values above the threshold, depending on the marital status and the number of children of the borrower, at the time the mortgage was contracted.

3. We require that the total debt obligations towards our bank exceed the 50% of the

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[8]For the purpose of the law, commercials are defined as individuals, who profit from commercial activity. This definition excludes self-employed individuals, as doctors, engineers, lawyers, and low-scale commercials that are mainly compensated for their personal labor. We define commercials based on their detailed occupation description for professionals that report more than 50,000 euros in annual income.

current market value of the primary residence.[9] This requirement ensures that a significant debt haircut will result from applying to the debt discharge provision, even if the court rules for the maximum additional payment, while excluding the primary residence from liquidation.

The sample we obtain by applying the three aforementioned requirements constitutes our main sample. For these cases, mortgages are protected by the primary foreclosure moratorium <u>and</u> a significant debt haircut is expected by applying for the debt discharge procedure, in the absence of additional assets. Therefore, we separate strategic from liquidity defaulters, as follows:

- *Strategic Defaulters*: Primary residence mortgage holders, who become delinquent, but <u>do not</u> apply for inclusion to the debt discharge provisions of N.3869/2010.

- *Liquidity Defaulters*: Primary residence mortgage holders, who become delinquent, and <u>apply</u> for inclusion to the debt discharge provisions of N.3869/2010.

The intuition behind our criterion is that a liquidity defaulter should strictly prefer the permanent debt discharge to the temporal protection of the foreclosure moratorium. That is, an individual with "inability to pay" has to realize only gains from N.3869/2010; the liquidation process is not threatening in the absence of financial or real assets, monthly payments and outstanding debt can be significantly reduced, and the primary residence is protected.

On the other hand, a debtor that chooses to passively default on mortgage payments without applying for inclusion to the law N.3869/2010 indicates that the existence of costs related to the "ability to pay". These may include the information cost of disclosing her true financial state to creditors for in the second stage of the process, or the existence of additional financial and real assets that may be subject to liquidation in the third stage.

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[9]The covenant of the law that gives to the court the right to rule for additional payments up to 85% of the current market value of the house, in the event that the primary residence is excluded from liquidation, ignores the time value of money. Our imposed threshold of 50% corresponds to the case that the court rules for the maximum amount to be paid in a period of 20 years with a discount rate of 5%.

In both cases, the reluctance to apply for the provisions of the debt discharge process is consistent with "ability to pay", indicating that the debtor has defaulted strategically.

It is important to note that the above criterion is conservative, as there are reasons for an individual with "ability to pay" to apply for the provisions of the debt discharge law, and appear as a liquidity defaulter in our sample. Since the procedure is based on formal income and assets, the benefits from inclusion may be substantial for individuals that systematically underreport their income or hold hidden assets. Artavanis, Morse, and Tsoutsoura (2016) show that Greece is an economy where this phenomenon is quite pervasive. Also, strategic defaulters may choose to apply to benefit from the favorable provisions (i.e. low monthly payments and new interest rate schedule) for the long period until the case is settled in court. This is possible, if the value from postponing debt payments is greater than the potential cost, taking into account the increased marginal utility of income in recession periods.

II. Data & Samples

Our dataset includes the universe of primary residence mortgages from a large Greek bank. We restrict our sample to mortgages contracted from 2007, for which both the application and the performance files are available. We exclude any loans that were made after 2010 (post-legislation). These restrictions yield a sample that is representative of our entire mortgage pool, since the household credit boom occured mainly post-2004, as a result of the financial liberalization of the Greek banking system and the introduction of euro (see Haliassos et al. (2016)). Our sample includes tens of thousands of mortgages.[10] We group primary and additional liens at the property level, and we classify the type of the loan (ordinary, subsidized) based on the characteristics of the first lien. Subsidized loans include mortgages with subsidized interest rate.

From the application files, we obtain important information for loan terms (amount approved, monthly installment, interest rate, interest rate type, maturity, existence of consignors) and customer characteristics (credit score, reported personal and total income, age,

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[10]We do not report numbers of observations in tables for confidentiality reasons.

occupation, marital status, number of children, and education level). For each borrower, we are provided with the total debt outstanding towards our bank, and other banks (through the credit bureau office), which allows us to calculate the total bank debt for each individual at application time. We estimate the initial loan-to-value (LTV) and combined loan-to-value (CLTV) ratios, the initial market value of the property, and the payment-to-income (PTI) ratio.

From performance files, we observe monthly repayment patterns, which we collapse at a quarterly frequency. From these data, we can specify the exact time a borrower becomes delinquent. Additionally, the performance files track changes in credit scores and (current) LTV, which is calculated based on a detailed real-estate index at the zip code level, which is updated annually. We compliment these data with hand-collected objective values for each dwelling. Finally ,if the borrower applies for the debt discharge procedure, we use a separate dataset that depicts the exact timing of entrance in each of the 3 stages of the debt discharge process.

Our sample period is from 2007 to 2013. We define defaulters as borrowers that are delinquent for 180 days in delay (t+6 rule) or defaulters that become delinquent on a re-structuring.[11] Following the specification of the previous section, liquidity defaulters are identified as the ones that have defaulted before the implantation of law N.3869/2010, or have become delinquent after, but applied for inclusion to its provisions, up to six months past our sample period. In order to ensure that defaulters are eligible for the foreclosure moratorium, and are expected to receive a significant "debt haircut", should they choose to participate in the debt discharge process, we apply the following filters:

1. We exclude commercials, since law N.3869/2010 applies only to non-commercials.[12]

2. We exclude mortgages on primary residences with objective values above the threshold

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[11] The latter criterion labels as defaulters borrowers that are involved in subsequent restructurings that are not serviced.

[12] For the purpose of the law, commercials are defined as individuals, who profit from commercial activity. This definition excludes self-employed individuals, as doctors, engineers, lawyers, and low-scale commercials that are mainly compensated for their personal labor. We define commercials based on their detailed occupation description for professionals that report more than 30,000 euros in annual income.

(300,000-450,000 euros, depending on marital status and number of children).

3. We require that the total bank debt obligations exceed the 50% of the market value of the dwelling.[13] This requirement ensures that a significant debt discharge is expected, even if the court rules for the maximum of additional payments allowed when the primary residence is excluded from liquidation.

It is important to note that the first two conditions do not have a significant impact on our sample, however, the third filter excludes about a quarter of our observations. We retain this criterion, to be conservative, even though, there are two reasons that suggest that the set threshold might be too strict. First, as mentioned previously, judicial practice suggests that the ruling for additional payments, in the event of exclusion of the primary residence from liquidation. Second, our proxy for the debt exposure of the borrower is imperfect; our measure uses the total bank debt at the time of the application. Hence, if the borrower has personal (non-bank) debt or has accumulated additional debt since the application date, then our proxy is an underestimation. In unreported robustness, we relax the total debt threshold to 25% of the current value of the primary residence, and our results remain practically unchanged.

Table 1 presents summary statistics for our main sample, after applying the aforementioned conditions. On the law implementation date (July 2010), our average mortgage exceeds 100,000 euros with average interest rate 4% and maturity 25 years. Commercial values are significantly higher than objective values, and the average CLTV in our sample is 0.70. Our typical borrower is 51 years old, reports personal income just below 15,000 Euros and has a cosigner or a guarantor.

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[13]The covenant of the law that gives to the court the right to rule for additional payments up to 85% of the current market value of the house, in the event that the primary residence is excluded from liquidation, ignores the time value of money. Our imposed threshold of 50% corresponds to the case that the court rules for the maximum amount to be paid in a period of 20 years with a discount rate of 5%.

III. Empirical Results

A. Foreclosure Moratoria and Defaults

The Greek banking system has experienced an unprecedented period of high delinquency rates across all credit products, following the recent financial crisis. For mortgages, in particular, it is of interest to examine whether increasing default rates can be attributed, at least partially, to the introduction of primary residence and general foreclosure moratoria in July 2010.

Figure 2 plots default rates for the entire portfolio of primary and secondary residence mortgages contracted after 2007 by our bank. Default rates increase dramatically in the post-crisis period, reaching 41% for the primary and 23% for the secondary mortgage portfolio by the end of 2013. The slope of both curves becomes steeper following the introduction of the moratoria,[14] consistent with the findings of Morse and Tsoutsoura (2013), and the invalidation of the enforcement role of foreclosure.

However, the increase in default rates cannot be attributed totally to the introduced legislative provisions, as the Greek economy was in the midst of the worst recession of its modern history. But the fact that the difference between delinquency rates of the two portfolios consistently widens with time, is suggestive of the role of the more generous provisions for the protection of primary dwellings.[15] We do not draw any conclusions from this comparisons, due to considerations for possible wealth effects, and instead we focus on primary residences, where we detect strategic default by directly observing the behavior of borrowers with respect to the law provisions.

B. Incidence and Distribution of Strategic Default

One of the advantages of our ad-hoc criterion for the identification of strategic default is that we do not impose any restrictions on borrower or loan characteristics. Instead we

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[14]Notice that the curves steepen with a lag from the voting of the law, since for defaults a delinquency of 6 months is required.

[15]Note that secondary mortgages were receiving more limited protection by a general foreclosure moratorium based on the total delinquent debt (N.3858/2010).

observe the behavior of borrowers and let them self-select their status by revealing their preference towards the debt discharge process. We find that by the end of 2013, the default rate on the primary residence mortgage portfolio was 41.5%. According to our criterion 28.4% of the defaulters (11.8% of the borrowers) defaulted strategically, as they became delinquent without applying for personal bankruptcy under the provisions of law N.3869/2010.

Given the high strategic and overall defaults rates observed, it is of interest to examine the characteristics of each group of borrowers. Table 2 reports univariate differences on loan and borrower characteristics between (i) defaulters and non-defaulters, and (ii) strategic and liquidity defaulters, as of July 2010. As expected, defaulters are shown to have significantly higher loan amounts, CLTVs and income, lower initial reported income and lower education. Among defaulters, strategic defaulters have higher initial credit scores, CLTVs and total income, which suggest that they were significantly less constrained than liquidity defaulters.

Examining the strategic default rate, defined as the incidence of strategic default as a percentage of defaulters, reveals some noteworthy patterns. Figure 3 shows the distribution of strategic default across industries. The industries of law and finance emerge as the groups with the highest strategic default rate (47.5% and 41.1% respectively), probably reflecting the ability of these professionals to comprehend legislation provision and actively use them to their benefit. On the other end, military officials exhibit the lowest incidence of strategic default (21%), reflecting perhaps a distinct moral stance on the phenomenon. In general, the industry distribution of strategic default indicates that it is pronounced in occupational groups that overall default rates are low. This further demonstrates the inefficiency of the legislative provisions, as they were exploited by the less vulnerable groups.

This pattern of exploitation exists in other groupings of our sample. We find that the strategic default is more pronounced among self-employed (35.7%) professionals, as compared to wage workers (27%). Since tax evasion among self-employed is pervasive in Greece (Artavanis, Morse, and Tsoutsoura (2016)), it is reasonable that these individuals would be less likely to voluntarily disclose their financial state and (hidden) assets through the debt discharge process. In contrast, "weak" and more risk averse classes of borrowers exhibit

lower levels of strategic default, while suffering from high overall default rates; pensioners (22.7%), people without college education (28.5%), and single-parent families (21.3%).

Tables 3 and 4 report OLS regressions that estimate the probability of default and strategic default controlling for multiple loan and borrower characteristics. The main variables related to ability to pay and the characteristics of the loans in specification (1) are extremely robust; borrowers with lower income and credit score, and loans with higher outstanding amounts and CLTV are more likely to default. These dynamics reverse when distinguishing between strategic and liquidity defaulters; in the event of default, individuals with higher income, higher credit score and lower loan CLTVs are more likely to default strategically.

The second specification includes selected demographics. The adverse effect of these characteristics on default and strategic default is evident. Higher education reduces the probability of default, but increases the probability of becoming delinquent deliberately. Similarly, older borrowers and single parents are more probable to default, but less probable to strategically default. The third specification adds industry groupings that verify the univariate patterns discussed earlier. Professionals in the law and finance industry are less likely to default, but when they do, it is more probable that they do it deliberately. In contrast, military officials are less likely to default, either strategically or not. Finally, the last specification includes additional loan characteristics. It is shown that the interest rate is not related to the probability of strategic default, while the existence of a consignor or a guarantor reduces the probability of a deliberate delinquency, suggesting that strategic default requires ordination.

C. Strategic Default and Social Networks

A number of studies have documented the contagious nature of foreclosures, which has been attributed to local economic conditions and negative spillover effects on housing prices and employment. However, the literature around whether strategic defaults are contagious is far more limited, reflecting the challenges of this question. For example, Guiso et al. (2013) show, using a survey method, that knowing someone that has defaulted strategically,

increases the probability of mimicking such behavior. Also, Bradley et al. (2015) find that both the local foreclosure and strategic default rate are significant in predicting strategic default behavior.

The main challenge of a regression analysis approach, is that liquidity from strategic defaulters are usually differentiated based on customer characteristics (i.e. credit score, liquidity). As a result, these tests, under certain conditions, can reduce to just cross-section test of these features and induce spurious correlation between foreclosure and strategic default rates. In contrast, our self-revealing preference criterion not only is free of these characteristics, allowing liquidity and strategic default rates to evolve independently (if this is the case), but also allows us to condition on them.

The cross sectional analysis in the previous section suggests that financially educated borrowers, or those who understand the institutional details in banks' legal capacity to foreclosure houses, are more likely to engage in moral hazard and default strategically. In this section, we investigate whether living in close proximity to borrowers who strategically default, affects peoples' decision to engage in this type of moral hazard.

We hypothesize that strategic defaults tend to spread through borrowers' social network. To test this hypothesis, we calculate the overall default and strategic default rate at the residence zip code level. Then, we regress whether a customer defaulted strategically, on the rate of defaults and the rate of strategic defaults in the customer's zip code. Table V shows the results from these regressions, and we control for the customer's income, mortgage amount, credit score, and CLTV. The regression results in column (1) suggest that a one standard deviation increase in the rate of defaults in a mortgagor's zip code, decreases the likelihood that the customer will default strategically by 1.7%. This is consistent with the idea that strategic defaulters are on average wealthier individuals and live in neighborhoods where fewer people default overall.

In contrast, the effect of local strategic default rates is strongly positive, as suggested by columns (2) and (3). A one standard deviation increase in the rate of strategic defaults around a borrower's neighborhood increases the likelihood that they will also default strate-

gically by 5.3-7.5%. The results are economically larger when we control for the default rate in the zip code in column (3). Taken together, these findings suggest that social networks play a significant role in the spread of strategic defaults, and therefore, moral hazard becomes more intense by prolonging the regulation. We discuss potential policy implications in more detail in the next section.

IV. Policy Implications

Our empirical results have policy implications for both the effectiveness of the imposed measures and the nature of strategic default. Here, we offer our insights stemming from our findings related to the incidence, the distribution and the role of social networks on the phenomenon.

First, it is of interest to see how the high rate (28%) of strategic default aggregates at the economy level. Unfortunately, the Bank of Greece only provides aggregate amounts of mortgages across the banking system, which amounted to 70.6 billion Euros in December 2013, which no classification based on the collateral. In lack of official date, we surveyed top bank managers of the systemic Greek banks to obtain an estimate of mortgages that refer to primary homes. Based on their responses, this percentage ranges from 60 to 70% of the total mortgage portfolio. Given these figures, we conservatively estimate that non-performing loans attributable to strategic default just for primary residence mortgages amount to 11.97-13.9 billion Euros across the Greek banking system.

Clearly, the imposed legislation had a significant, adverse effect on the financial health of Greek banks. Furthermore, the situation constitutes a moral hazard situation with tangible effects. Due to the deterioration of their financials, Greek banks completed three rounds of recapitalizations (2012-2015), amounting over 50 billion Euros (Gehrig et al. (2016)). The recapitalization cost was borne by the Greek state, by either increasing government debt or depleting the value of the state holdings on Greek banks. In both cases, the cost from strategic default behavior was predominately moved to the public.

Second, the distributional results of our analysis are consistent with an adverse selection story. From loan to borrower characteristics, our findings indicated that weaker groups are more prone to apply for the debt discharge process. In contrast, the solely use of the foreclosure moratorium characterizes more privileged individuals (higher income, higher education etc.). Thus, from a social perspective, the imposed foreclosure moratorium *as a stand-alone provision* appears to be ineffective, as it fails to offer any additional protections to the individuals that need it more (due to the protection overlap). In contrast, it's only use appears to be facilitating strategic default behavior.

Third, an important implication of our results relates to the contagious nature of strategic default. Mayer et al. (2014) offer an excellent discussion for the trade-off between a broad ("umbrella") mortgage adjustment program and one with strict eligibility criteria. The former might foster strategic default, while the latter may not be implemented timely to prevent liquidity defaults. Our new insight is that if strategic default is spreading through social networks, a broad program can only be temporal in nature, in order to prevent contagious effects among borrowers.[16]

V. Conclusion

Our study shows that the introduction of the almost unconditional foreclosure moratorium on primary residences had a significant impact on strategic default and the deterioration of the financial state of the Greek banking system. We conservatively estimate a range from 12 to 14 billion euros in delinquent mortgages, due to strategic default. Since most of this cost has been borne by shareholders and taxpayers, through the several recapitalization attempts of Greek banks, apparent moral hazard situations arise.

Apart from being costly, the foreclosure moratorium is shown to be ineffective, in the sense that it failed to protect borrowers that were most exposed to the recent financial crisis.

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[16]Consistent with this, in cases foreclosure moratoria have been imposed, they were either temporary or based on strict eligibility criteria. For example, the temporal halt of foreclosures by large financial institutions in the U.S. (2010) or the two-year foreclosure moratorium for primary residences under strict eligibility criteria in Spain

Due to its unconditional nature, it fostered strategic default behavior that is concentrated among borrowers with high education, higher income, lower debt, and the ability to actively exploit law provisions. Additionally, its high cost deprived funds from alternative, targeted interventions that could provide relief to truly over-indebted households. Individuals without college degrees, single parent families, and senior citizens exhibit lower incidence of strategic default, but are exposed to significantly higher overall default rates.

Moving forward, as banks attempt to clean their balance sheets from non-performing loans, the realization that a significant portion of their delinquent portfolios is due to strategic default, is of critical importance. Since the causes of these delinquencies can be traced to the law provisions, once the foreclosure moratorium is lifted and the debt relief provisions are subject to stricter eligibility criteria it is highly probable that the majority of these loans will become performing again.

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Figures

Figure 1: 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 is below 300,000 Euros (vertical line). The threshold for primary residencies that are protected increases to 350,000 Euros if the borrower is married, and increases by 50,000 Euros more for each child in the household.

Distribution of Objective Values
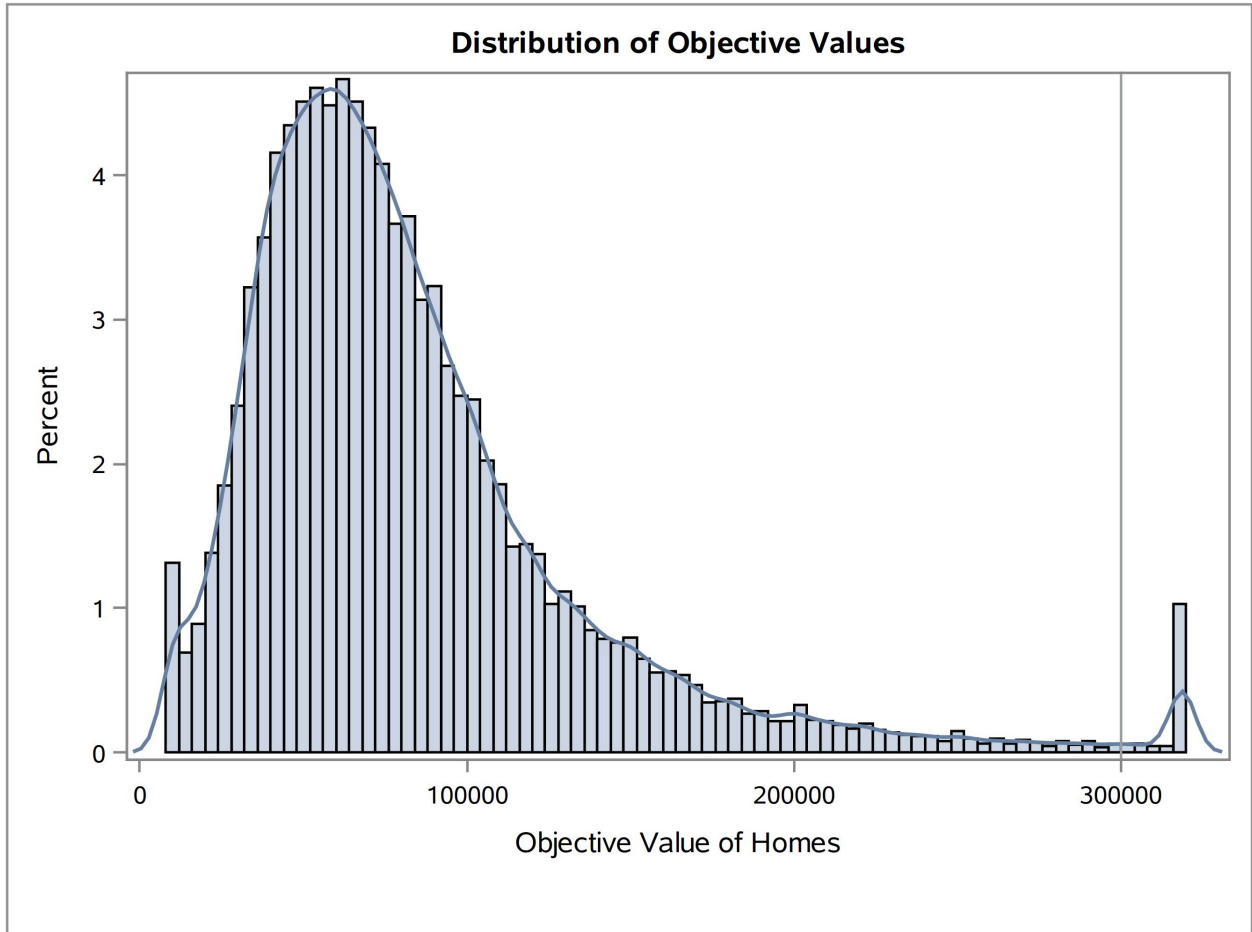
Figure 2: The graph presents cumulative default rates on a monthly frequency for the entire sample of primary residence (straight line) and secondary residence (dashed line) mortgages. The sample includes mortgages contracted after January of 2007. Mortgages guaranteed by the state and with subsidized interest rates are excluded. The dash-dot line depicts the difference in default rates between primary and secondary residence. Delinquency is defined as the delay of payment for an amount equal to 6 monthly payments (t+6 rule). The horizontal line depicts the implementation time of laws N.3869/2010 and N.3858/2010.

Figure 3: The graph presents strategic default rates as percentage of total defaults, and overall default rates by occupation type.

Tables

Table I: Summary Statistics of Mortgages on Primary Residences

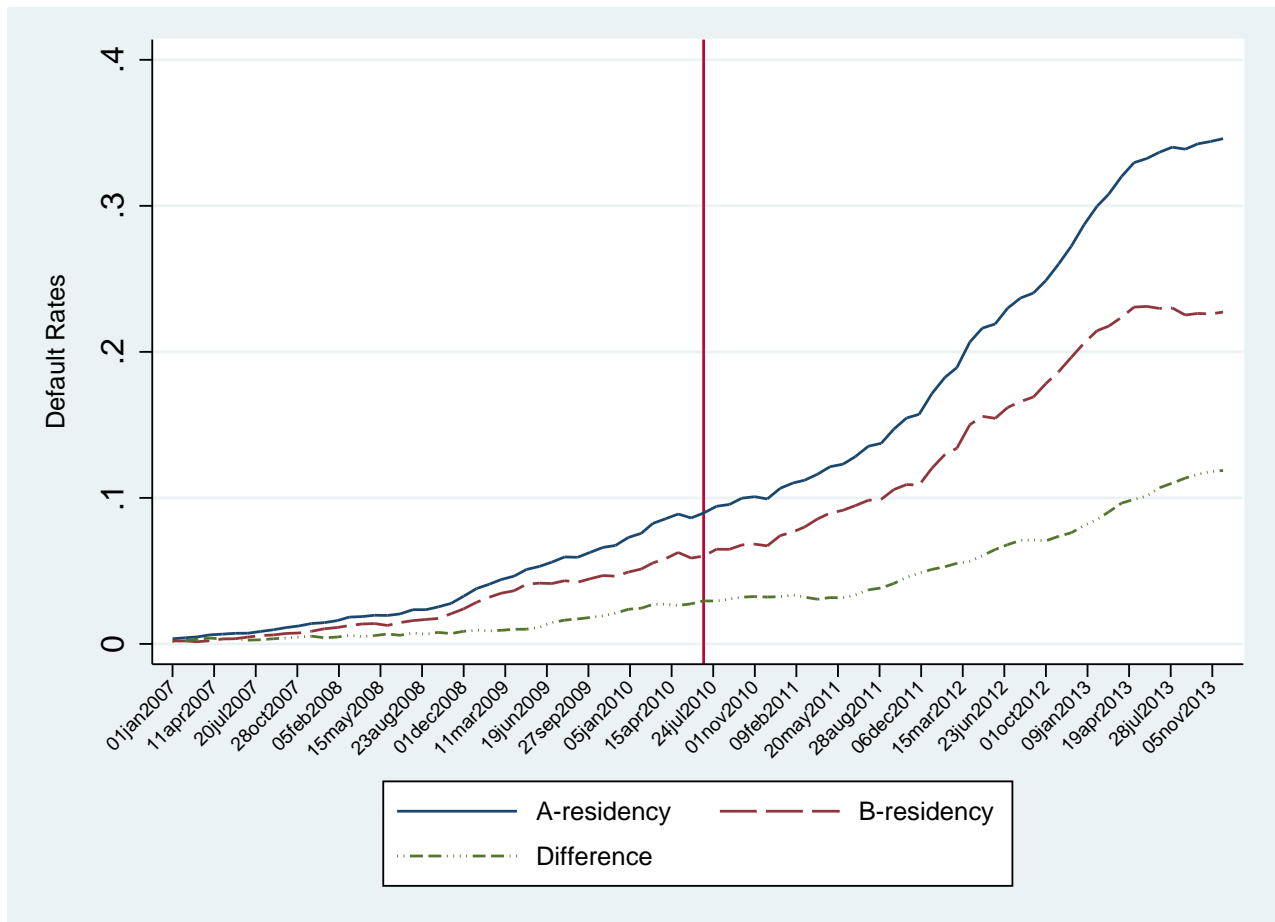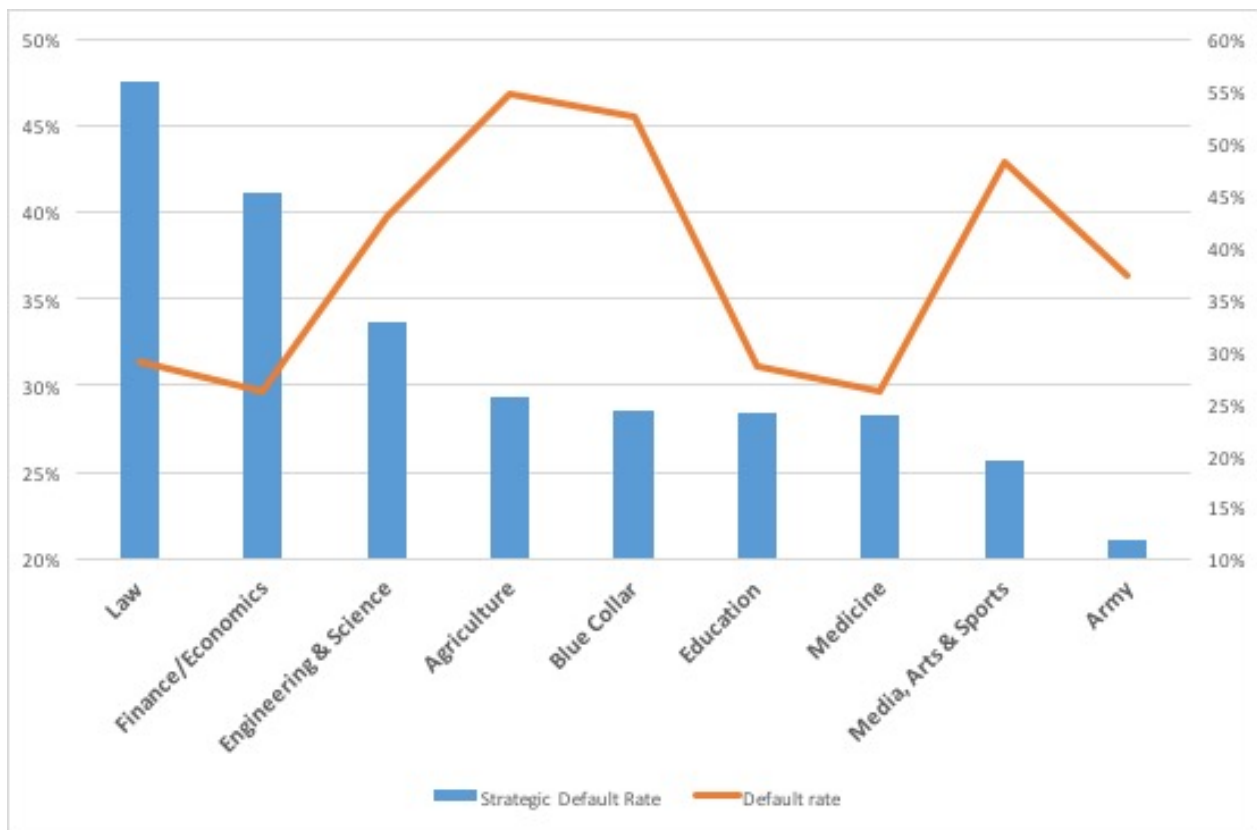The table presents summary statistics of primary residential mortgages from 2007 until 2013. We use mortgage, dwelling, and customer characteristics from mortgage applications and performance information at the date of the foreclosure moratorium regulation (July 2010).

	Mean	sd	p10	p50	p90
Loan Characteristics					
Loan Amount Total	103.86	73.59	35.00	88.26	199.81
Monthly Installment	519.41	364.12	150.83	450.56	965.68
Interest Rate	4.08	1.08	2.62	4.07	5.42
Maturity (years)	24.59	9.27	12.00	25.00	40.00
Num. people involved	1.85	0.71	1.00	2.00	3.00
CLTV	0.70	0.22	0.43	0.71	0.92
Dwelling Characteristics					
Commercial Value	156.76	97.11	65.00	135.58	270.03
Objective Value	78.64	49.65	30.34	67.31	140.50
Customer Characteristics					
Credit Score	650.08	100.88	549.00	648.00	753.00
Reported Income	14.56	13.83	0.00	12.22	30.00
Total Income	31.23	21.24	12.17	25.76	55.35
College Education	0.29	0.45	0.00	0.00	1.00
Age	51.07	11.83	36.00	50.00	68.00

Table II: Univariate differences

This table presents average mortgage and customer characteristics for delinquent (column 1) and non-delinquent borrowers (column 2). We define a customers as "defaulter" if he has been delinquent for at least six months, and "non-defaulter" otherwise. We define as "strategic defaulter" a customer that defaults before December of 2013 and does not apply for the debt discharge provision of the "Katseli-Law". Borrowers who default and apply for the regulation provision for debt discharge are classified as "liquidity defaulters". The third column shows the univariate difference in average characteristics between defaulting and non-defaulting customers, and the last column shows the difference in the characteristics between strategic and liquidity defaulters.

	(1) Non-Defaulters	(2) Defaulters	(1)-(2)	(4) Liquidity defaults	(5) Strategic defaults	(4)-(5)
Loan Amount Total	99.58	109.89	-10.30***	109.85	109.97	-0.12
Monthly Installment	523.95	513.01	10.93***	501.35	542.43	-41.08***
Interest Rate	4.06	4.10	-0.04***	4.09	4.13	-0.04*
Maturity (years)	23.26	26.45	-3.19***	26.81	25.56	1.26***
Num. people involved	1.85	1.83	0.02**	1.84	1.81	0.03**
CLTV	0.68	0.74	-0.05***	0.75	0.71	0.04***
Commercial Value	155.41	158.66	-3.26***	156.06	165.21	-9.16***
Objective Value	80.12	76.73	3.40***	75.36	80.36	-4.99***
Credit Score	672.39	618.64	53.75***	613.38	631.49	-18.11***
Reported Income	15.78	12.87	2.91***	12.83	12.96	-0.13
Total Income	33.26	28.42	4.84***	27.56	30.54	-2.99***
College Education	0.35	0.20	0.15***	0.19	0.22	-0.03***
Age	51.10	51.03	0.07	51.25	50.51	0.73**

Table III: The determinants of defaults in primary residence mortgages

This table presents OLS regressions of defaulting customers on borrower and mortgage characteristics. The dependent variable is an indicator variable that takes the value of one when the customer is delinquent for six consecutive months. Standard errors are reported below each regression coefficient. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively.

	(1) Defaulter	(2) Defaulter	(3) Defaulter	(4) Defaulter
LTV	0.0804***	0.0800***	0.0778***	0.0669***
	(0.0111)	(0.0117)	(0.0116)	(0.0114)
Credit Score	-0.2283***	-0.2124***	-0.2110***	-0.1968***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Total Income	-0.0685***	-0.0492***	-0.0434***	-0.0324***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Loan Amount	0.1003***	0.1073***	0.1097***	0.0746***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
College Education		-0.1064***	-0.0892***	-0.0877***
		(0.0056)	(0.0058)	(0.0058)
Single-Parent		0.0199***	0.0211***	0.0224***
		(0.0174)	(0.0174)	(0.0173)
age>65		0.0147*	0.0156**	0.0393***
		(0.0111)	(0.0111)	(0.0112)
35<age<=65		0.0498***	0.0545***	0.0614***
		(0.0090)	(0.0090)	(0.0091)
Finance			-0.0632***	-0.0654***
			(0.0094)	(0.0095)
Law			-0.0075	-0.0070
			(0.0213)	(0.0212)
Medicine			-0.0310***	-0.0316***
			(0.0118)	(0.0118)
Blue Collar			0.0244***	0.0218***
			(0.0084)	(0.0083)
Military			-0.0114**	-0.0172***
			(0.0128)	(0.0128)
Interest Rate				0.0098**
				(0.0023)
Maturity (years)				0.0983***
				(0.0003)
Num. people involved				-0.0062
				(0.0037)
Zip Code FEs	Yes	Yes	Yes	Yes
Adjusted R^2	0.104	0.117	0.123	0.129

Table IV: The determinants of strategic defaults in primary residence mortgages
This table presents OLS regressions of customers who strategically default. The dependent variable is an indicator variable that takes the value of one when the customer is delinquent for six consecutive months, and did not apply for debt discharge (defaults strategically). Standard errors are reported below each regression coefficient. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively.

	(1) Str.Defaulter	(2) Str.Defaulter	(3) Str.Defaulter	(4) Str.Defaulter
LTV	-0.0719***	-0.0748***	-0.0725***	-0.0690***
	(0.0150)	(0.0160)	(0.0159)	(0.0160)
Credit Score	0.0640***	0.0569***	0.0604***	0.0588***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Total Income	0.0697***	0.0694***	0.0658***	0.0739***
	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Loan Amount	-0.0129	-0.0135	-0.0139	0.0004
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
College Education		0.0273***	0.0219**	0.0163*
		(0.0101)	(0.0103)	(0.0104)
Single-Parent		-0.0333***	-0.0334***	-0.0340***
		(0.0218)	(0.0218)	(0.0217)
age>65		-0.0478***	-0.0526***	-0.0722***
		(0.0185)	(0.0185)	(0.0190)
35<age<=65		-0.0139	-0.0198	-0.0386***
		(0.0154)	(0.0154)	(0.0157)
Finance			0.0487***	0.0463***
			(0.0208)	(0.0209)
Law			0.0358***	0.0346***
			(0.0447)	(0.0446)
Medicine			-0.0090	-0.0102
			(0.0236)	(0.0235)
Blue Collar			0.0063	0.0061
			(0.0113)	(0.0113)
Military			-0.0388***	-0.0388***
			(0.0191)	(0.0192)
Interest Rate				-0.0018
				(0.0035)
Maturity (years)				-0.0389***
				(0.0005)
Num. people involved				-0.0457***
				(0.0056)
Zip Code FEs	Yes	Yes	Yes	Yes
Adjusted R^2	0.036	0.038	0.043	0.046

Table V: Strategic defaults through social networks

This table presents OLS regressions of customers who strategically default. The dependent variable is an indicator variable that takes the value of one when the customer is delinquent for six consecutive months, and did not apply for debt discharge (defaults strategically). *Zip Code Rate of Defaults* is the total number of customers that defaulted in the zip code divided by the total number of customers in the zip code. *Zip Code Rate of Strategic Defaults* is the total number of customers that defaulted strategically divided by the total number of customers in the zip code. Standard errors are reported below each regression coefficient. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively.

	(1) Str.Defaulter	(2) Str.Defaulter	(3) Str.Defaulter
Zip Code Rate of Defaults	-0.0172*		-0.0501***
	(0.0448)		(0.0425)
Zip Code Rate of Strategic Defaults		0.0530***	0.0750***
		(0.0877)	(0.0961)
Control Variables			
CLTV	-0.0764***	-0.0747***	-0.0743***
	(0.0138)	(0.0138)	(0.0138)
Credit Score	0.0622***	0.0638***	0.0630***
	(0.0000)	(0.0000)	(0.0000)
Total Income	0.0666***	0.0698***	0.0671***
	(0.0002)	(0.0002)	(0.0002)
Loan Amount	-0.0168**	-0.0153**	-0.0158**
	(0.0000)	(0.0000)	(0.0000)
Adjusted R^2	0.016	0.018	0.020