Liquidity Constraints and Consumption: Evidence from Macro-Prudential Policy in Turkey[1]

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Abstract

Using account-level credit card data from a large Turkish bank, we study the impact of a unique restrictive credit card policy that increases minimum payment on consumption and debt repayment behavior. We show that the policy reduces credit card spending and debt, boosts existing debt repayment, and reduces credit card delinquency. The credit card debt of affected consumers falls on average by TL416 ($232) or 46% two years into the policy implementation. Overall, our results demonstrate that the policy that mandates a higher minimum payment ratio has a significant impact on household debt by changing both consumers' spending and debt payment behavior. We also show that an increase in minimum payment has a much stronger effect than a decrease of similar magnitude. Our findings imply that macro-prudential policies are likely to be effective when they are tightening, but not otherwise.

Keywords: Liquidity Constraints, Credit Constraints, Consumption, Spending, Debt, Credit Cards, Household Finance, Fiscal Policy.

JEL Classification: D12, D14, D91, E21, E51, E62, G21

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1. Introduction

The relationship between liquidity constraints and consumption is an important question in the literature. While there is a vast literature on how consumption responds to income shocks (Jappelli and Pistaferri 2010; Agarwal and Qian 2014), fewer studies focus on the effect of changes in liquidity constraints on consumption, mainly due to the difficulty of identifying shocks to liquidity constraints.

Household debt has the potential to crumble the economic health of a country, especially that of a developing one. Mian, Sufi, and Verner (2017) show that, for a sample of thirty developed economies, an increase in household debt leads to a decline in economic growth. In many emerging economies consumer credit plays a prominent role (Müler, 2018). In Turkey, consumer credit grew from TL4.4 billion in 2002 to more than TL45 billion by December 2010[1]. Such rapid and unsustainable growth in consumer debt raised serious concerns about the systemic risks in the Turkish banking sector and the overall economy. Regulators and policymakers have multiple macroprudential tools at their disposal to fight the unsustainable growth in consumer credit, such as enforcing higher debt repayment, reducing credit card spending, or restructuring debt (d'Astous and Shore 2017; Medina and Negrin 2019).

In this paper, we study a novel macroprudential policy intended to restrict rampant growth in credit card debt in Turkey. We specifically explore two credit card payment policies that enforce higher minimum payment targets and assess their impact on credit card spending, debt repayment, and delinquency. The first policy (Minimum Payment treatment, henceforth, MP treatment) entails sequential increases in the required minimum payment ratio over consecutive six-month intervals. The new minimum payment ratio depends on the individual's credit card limit and increases from 20% in December 2010 to somewhere between 25% and 40% at the end of the 36-month-long policy implementation. The second policy (Cash Advance treatment, henceforth, CA treatment) mandates that every credit card holder pay at least half of his monthly balance three or more times in a calendar year; otherwise, he loses the privileges of cash advances and credit card limit increases until the outstanding credit card balance is settled in full. These policies might reduce household debt by two channels: directly, by increasing debt payments, or

[1] 1 USD=3.9 TRY (Turkish Lira) in November 2017, 1.47 TL in January 2010, 1.59 TRY in June 2011, and 1.81 TRY in March 2013. Average TRY/USD exchange rate in our sample is 1.66. Average TRY/USD exchange rate after the policy is 1.79. All dollar values for the regression results are reported using the latter exchange rate.

indirectly, by reducing credit card spending. Thus, they provide a unique setting to analyze the impact of a tightening credit card regulation on consumption and debt. The results stand to provide valuable insights into the effectiveness and design of macroprudential policies.

We utilize a rich dataset from a major Turkish bank to conduct our empirical tests. It contains monthly account-level credit card information for more than 1.1 million individuals from January 2010 to February 2013.

Using difference-in-differences methodology, we estimate the impact of the two policy changes on credit card spending and debt. We compare changes in outcomes over time for consumers who pay a low fraction of credit card debt to consumers who pay a high chunk of their credit card debt before the policy announcement. The former are likely to be affected by the two policies, but not the latter. Thus, low-paying consumers form the treatment, while high-payers form the control group.

The precise definition of the treatment and the control groups is based on consumers' payment behavior *before* the policy announcement. The treatment group is based on the likelihood to be treated rather than the actual treatment which occurs after the policy. This identification relies on the assumption of persistence in payment behavior. We validate this assumption by showing that debt payment behavior is persistent over time in the absence of the policy. Also, by establishing the treatment and the control groups before the policy announcement, we avoid the selection into the actual treatment. Lastly, the treatment and the control groups do not change over time, i.e. they do not depend on real-time treatment. Hence, the treatment group consists of consumers with low payments before the announcement, precisely those that are likely to be treated by the policy.

The difference-in-differences strategy requires that the outcomes of the treatment and control groups maintain parallel trends in the absence of the policy. To validate this identifying assumption, we show that outcomes for the treatment and control groups move together before the policy announcement, with parallel trends in credit card spending, debt and delinquency.

Using this difference-in-differences strategy, we find that the policy reduces credit card spending and debt substantially. Overall, consumers affected by both the MP treatment and the CA treatment reduce their credit card debt by 46.15% (TL415.69 or $232.40) by the end of the second year of the policy. If we extrapolate this result to the entire economy, we get approximately 2.75% (TL0.99 billion or $0.55 billion) drop in total debt. The proportion of debt paid increases by 24.45% on average, and the percentage of consumers that pay less than the minimum, or less than

50% of the balance, declines by 28.03 and 29.73 percentage points, respectively. For consumers affected by the CA treatment only, credit card spending and total debt decrease by about TL107.46 ($60.03) and TL282.91 ($158.05), respectively. The latter amounts to a 17.63% reduction of credit card debt which implies a 6.98% (TL2.51 billion or $1.40 billion) reduction in the total credit card debt in the economy. These results suggest that BRSA's credit card policy helps reduce consumer debt through two channels: reducing consumer spending and increasing debt payment.

We use the baseline results to make inferences about the elasticity of credit card spending and debt to changes in the payment policy. We find that one percentage point increase in target payment ratio reduces the credit card spending by 0.53%, reduces the credit card debt by 0.59%, and increases the proportion of debt paid by 0.37% on average. Overall, an increase in the target payment ratio forces consumers to reduce their credit card spending and repay more debt.

We also use new credit cards as an alternative control group to conduct the difference-in-differences strategy. The policy mandates a fixed 40% minimum payment ratio for new credit cards during the first twelve months. In other words, new cards are only impacted by the CA rule, but not the MP rule for at least one year. We use the sample of new cards as the control group and run our baseline regressions to estimate the MP treatment effect. We find that treated consumers reduce their spending and debt versus new credit card holders by TL410 ($229) and TL630.74 ($352.37), respectively. Moreover, the proportion of debt paid increased on average by 22.28%.

We further exploit the rules for new credit cards to study the impact of reducing minimum payment on credit card spending and debt payment behavior. As mentioned above, the policy required that all new credit card accounts have a minimum payment ratio of 40% for the first twelve months. This rule also stipulated that banks could decrease the minimum payment at the end of that period. Relying on this rule, we exploit the variation in timing of the minimum payment decrease for new cards opened in different months. We use a panel data regression to estimate the change in the average spending and debt using six months before and six months after the minimum payment decrease. We find that credit card spending does not change, but debt increases by TL12.75, and the proportion of debt paid falls by 2.58%. This finding implies that a decrease in the required payment ratio exerts less force on spending and debt than an equivalent increase. There seems to be a significant asymmetry in how credit card spending and debt respond to higher versus lower minimum payments.

Lastly, we study the policy's impact on credit card delinquencies. We find that delinquencies fall on average by 2.33% for the CA treatment and 7.41% for the combined MP and CA treatment. This stands contrary to the findings in the recent literature. For example, d'Astous and Shore (2017) find that higher minimum payment results in 4.33% more delinquencies and defaults. Why do we find delinquencies fall in a more restrictive credit environment?

One plausible explanation for a decline in delinquencies is that most consumers did not find it extremely difficult to reduce their consumption. The impact on delinquency rate depends on consumers' flexibility to quickly reduce current levels of spending to meet the higher minimum payments. If a consumer is extremely constrained and lives hand-to-mouth, it would be very challenging to reduce consumption quickly. As such, delinquencies are likely to rise for highly indebted consumers. On the other hand, less constrained consumers will likely find it less challenging to reduce consumption to avoid delinquency. Our empirical results confirm this story. We find that the decrease in consumption is primarily driven by the reduction in non-discretionary consumption. Moreover, we show that consumers with lower debt balances are the ones that drive the reduction in delinquencies. Therefore, the drop in delinquencies can be explained by the relative flexibility many consumers had in reducing their consumption.

This paper contributes primarily to the broad literature that focuses on consumption and saving in the face of liquidity constraints, as well as the role of credit cards in consumer finances. We contribute to the literature by studying the impact of multiple, consecutive liquidity constraints on consumers' spending and debt payment behavior. Numerous papers show that households face liquidity constraints or act as if they face liquidity constraints (Souleles 2002; Shapiro and Slemrod 2003; Mankiw 2000). Gross and Souleles (2002) test consumers' response to changes in credit limit and find that credit card debt jumps by as much as $350 for accounts that experienced an increase in credit card limit. Their results are consistent with models of liquidity constraints and buffer stocks.[2] d'Astous and Shore (2017) show that liquidity-constrained borrowers decrease their credit card spending to meet the increased minimum payment. Aydin (2016) conducts a field experiment where treated credit card customers experience a credit card limit increase, while the control group observes no changes. Results show an increase in credit card debt and spending, especially in durables and services, both in the short term and the long term. The paper concludes that relaxing credit constraints leads to higher consumption even

[2] Other related studies include Wilcox (1989, 1990), Parker (1999), Souleles (2000, 2002), Browning and Collado (2001), Hsieh (2003), and Stephens (2003), among others.

without any changes in permanent income. We study a unique policy which introduces multiple liquidity constraints and find results consistent with Aydin (2016).

Our paper also contributes to the literature on the impact of consumer credit regulations. Existing literature studies the impact of credit card policies on borrowing costs, debt repayment behavior, and delinquencies (e.g. Agarwal et al. 2015; Jones, Loibl, and Tennyson 2015; Seira, Elizondo, and Laguna-Muggenburg 2016; d'Astous and Shore 2017; Castellanos et al. 2018; Keys and Wang 2019; Medina and Negrin 2019). For example, Agarwal et al. (2015) study the effectiveness of the CARD Act and find that it saved US consumers almost $12 billion a year through reduced borrowing costs. Jones, Loibl, and Tennyson (2015) show that the CARD Act disclosures were effective in inducing households to increase the amounts of credit card debt paid off each month. Medina and Negrin (2019) study a regulatory change in the Mexican credit card market and find that a change in minimum payments affects debt repayment of both constrained and unconstrained consumers. Their main finding is that around 30% of unconstrained consumers tend to pay whole-number multiples of the minimum payment, a behavioral response similar to anchoring.d'Astous and Shore (2017) also show that an increase in minimum payment results in higher debt payment. However, they also find that higher minimum payments result in more delinquencies and default, while we find a decline in delinquencies, as mentioned above. Our findings suggest that delinquencies can potentially decline following a credit tightening policy if there is a strong behavioral response of spending to such a policy.

We build on previous literature by providing additional evidence on the effect of credit card regulation on consumption. We show that regulating the credit card minimum payment can help reduce consumer debt through two channels: reducing consumer spending and increasing debt payment. These results imply that consumer financial product regulation is not only a tool to reduce consumer debt but also another tool of macroprudential policy to affect consumption.

Third, our paper directly contributes to the vast literature that studies the consumption response to various fiscal, monetary, and macroprudential policies.[3] Our work is closely related to the work by Agarwal, Liu, and Souleles (2007), Aaronson, Agarwal, and French (2012), and Agarwal and

[3]For literature on consumption response to fiscal policies see Shapiro and Slemrod (1995), Souleles (1999, 2000, 2002), Parker (1999), Browning and Collado (2001), Hsieh (2003), Stephens (2003, 2006, and 2008), Johnson, Parker and Souleles (2006), Parker, et al. (2013) and Gine and Kanz (2015).
For recent papers on the effectiveness of macro-prudential policies see Keys et al. (2009), Brunnermeier et al. (2009), Galati and Moessner (2014), Freixas, Laeven and Peydró (2015), Claessens (2015), and Cerutti, Claessens, and Leaven (2016).
For papers that study the interaction of monetary and macro-prudential policies see Cecchetti (2009), Borio and Drehmann (2009a), Fernández and García Herrero (2009) among others.

Qian (2014) who examine consumption changes resulting from tax rebates, minimum wage changes, and fiscal policy changes in Singapore. This paper is also a part of recent efforts to understand the effectiveness of macro-prudential policy (Agarwal, Bubna, and Lipscomb, 2013; Fu, Qian, and Yeung, 2012; Akinci and Olmstead-Rumsey, 2015; Cerrutti, Claessens and Laeven, 2015; McDonald, 2015; Tressel and Zhang, 2016). We contribute to the literature and show that the consumption and debt response of constrained consumers to a minimum payment increase is many magnitudes larger than a response to an equivalent decrease. In other words, tighter credit conditions seem to be a much more effective policy tool than a relaxation of credit constraints. The results are consistent with the recent survey evidence about strong asymmetries between the marginal propensity to consume in response to positive and negative unanticipated income shocks (Christelis et al. 2017). The asymmetric response to minimum payment changes has broader implications for the design and timing of macroprudential policies, as well as their interaction with conventional and unconventional monetary policy tools.

The remainder of the paper is organized as follows. Section 2 provides background information about the credit card market in Turkey and discusses important details about BRSA's policy. Section 3 provides details about the data and empirical methodology. Section 4 presents the results of our analyses. We discuss additional empirical results in Section 5 and conclude in Section 6.

2. Background and Data

2.1 BRSA's policy background and implications

As of December 2016, there were more than 58 million credit cards held by Turkey's 74 million citizens, making it the second largest credit card user in Europe. The explosive growth in the Turkish credit card market can be attributed to several factors. First, GDP per capita almost tripled between 2002 and 2010, and consumer spending accounts for 70% of Turkey's GDP[4]. Most of this increase in consumer spending was financed by debt, including personal loans, household loans, and credit cards. Household debt as a proportion of disposable income increased from 4.7% in 2002 to 50.4% in 2012[5].

[4] Central Bank of the Republic of Turkey; Turkish Statistical Institute
[5] Financial Stability Report, CBRT

Rapid growth in consumer loans in Turkey was a cause for alarm among bank regulators, government, and the central bank. The Turkish Banking Regulation and Supervision Agency (BRSA) announced the credit card tightening policy in December 2010. This policy constitutes an important precedent in the Turkish banking regulation. For the first time, the government decided to enact a restrictive credit policy. At the time, low-income individuals who rolled over their debt, often with multiple credit cards were maintaining their living standard by making minimum or near-minimum monthly payments. The policy would impact them the most. On the other hand, the policy change would not affect the individuals who paid their balance in full or significantly more than the minimum every month. A survey done by the Interbank Card Center's survey in Turkey shows that the ratio between the former and the latter was approximately 20-to-80 as of 2010, indicating that the policy would likely impact about one in five of all credit card holders. Section A.1 in the Appendix further discusses important results in the survey and outlines the main institutional differences between the US and Turkish credit card market.

The policy contains some unique features that we exploit in our empirical analysis. First, the policy introduced a step-wise payment rule that progressively increased the required minimum payment over time depending on one's credit card limit (minimum payment rule). The schedule for the implementation of this rule is shown in Table A.1. In effect, the minimum payment ratio would increase to somewhere between 22% and 40% by January 2014, as depicted in Figure 1. This rule applied to existing credit cards; new credit cards were treated by a different rule, which we explain below. The second rule of the policy mandated that if a borrower failed to pay half or more of his outstanding balance at least three times in a calendar year, he would lose the privileges of cash withdrawals at ATMs and credit card limit hikes until the balance was paid in full (cash advance rule). The BRSA's policy increased the target payment by between 5% and 30% over time, depending on one's credit card limit. This provides a unique setting to study the impact of a substantial increase in the target payment on credit card spending and debt.

The official implementation date for both rules was June 17, 2011, exactly six months after the announcement on December 17, 2010. The 'post-policy' period in our empirical analysis is based on the announcement date and starts in January 2011. At each subsequent six-month interval, the policy mandates additional minimum payment increases. In other words, in each July and January between 2011 and 2013 there was an increase in the new minimum payment ratio.

Credit card accounts opened after December 2010 had a different rule. The required minimum payment ratio was set at 40% for at least a year following the activation of a new card. The legal minimum was 40%, but the banks reserved the right to specify a higher minimum ratio as well. After the first year, the minimum payment ratio for new cards was also allowed to change to comply with the running minimum payment schedule at that time (Table A.1). In other words, new credit card users could have experienced a reduction in the minimum payment ratio after the first year of credit card use. We use this crucial aspect of the policy to examine how consumption and debt change when the target payment is reduced.

2.2 Data

We use a proprietary panel data set provided by a major Turkish bank (the Bank) headquartered in Istanbul. During the sample period we study, it was among the top 10 largest banks by total assets and number of employees in Turkey[5]. Similarly, the Bank was among the top 10 banks in terms of credit card market share in Turkey[6]. The Bank's capital ratio, banking, and other fees are analogous to the rest of the Turkish banking sector. It had close to 300 branches all over Turkey and more than a million customers with diverse demographic backgrounds.

We have complete information on monthly credit card spending and payment for the Bank's customers as well as their demographic information. The original data set contains monthly spending behavior for 1,143,278 customers from January 2010 to February 2013 for a total of 50,304,232 observations. It contains information on monthly credit card spending across 25 categories as defined by the Bank. The data is also rich in other consumer characteristics. For each account, in addition to monthly credit card statement information (Figure 7), we observe the card limit, number of different credit cards owned, number of transactions, and demographic information including age, gender, education, occupation, marital status, address, and the initial credit card approval date.

We filter the original data in multiple ways for our empirical tests. First, we remove all inactive credit card holders, i.e., the consumers with no credit card activity for the duration of our sample. Second, we exclude card holders that always pay full balance since the policy does not influence them. Finally, we exclude all the new accounts that were opened during our sample period. This sample of new cards cannot be directly used in the baseline regressions because of missing values, and more importantly because the policy has different rulings for the new accounts. We do, however, use this sample of new credit cards in an alternative regression specification that tests

[6] Banking Regulation and Supervision Agency

for the separate effect of the MP treatment on credit card debt and spending. The final sample that also excludes the new cards includes around 13.45 million observations.

Table 1, Panel A shows basic descriptive statistics using the full data set, but excluding full payers. Several interesting observations stand out. The average age in our sample is around 41 with the youngest consumer at 22 and the oldest at 88. Males and married individuals dominate in our sample, and the average consumer is educated at the high school level. On average 17.7% of consumers pay below the required minimum payment level, while around 30% pay less than half of the monthly balance. These consumers are the primary candidates to be treated by the policy. Finally, in terms of debt repayment, credit card holders pay 73% of their monthly balance on average, which hovers around TL901 ($503). Overall, these figures suggest that the policy likely had some impact on about a quarter of consumers in our sample.

Panel B reports the comparison between our full sample and the sample from the survey conducted by Interbank Card Center (ICC) across Turkey or the average figure for the entire population of credit card holders, where available. In terms of credit card spending and limits, we see that our data closely resembles the ICC's aggregate population data. Moreover, the Bank's presence closely mirrors the overall banking business distribution in Turkey. The above evidence suggests that our sample is representative of a broader Turkish population and the banking system.[10].

3. Empirical Methodology

The unique policy we study in this paper introduces several challenges with the empirical estimation. First, the policy is implemented nationwide and applies to all credit card holders. It is difficult to find a comparison group to identify the policy effect. Second, the decision to pay below the minimum payment is endogenous. It is challenging to distinguish between endogenous selection into treatment and the causal effect of the policy. Third, the policy introduces two separate rules that overlap in time. Moreover, the CA-rule superimposes the MP-rule, so it is not straightforward to estimate the effects of the latter.

To overcome the first empirical challenge, we consider those who pay below 50% of the credit card balance as our treatment group and define those who always pay above 50% of their credit card balance as the control group. The control group is not affected by the policy change. Thus, we employ a difference-in-differences methodology to estimate the differential impact of BRSA's policy on the spending and debt over time between the treatment group and the control group.

To solve the second challenge, we use the payment behavior before the policy announcement to further refine the definition of the treatment and control groups. Namely, the treatment group is based on the likelihood to be treated based on the consumers' behavior before the policy rather than the actual treatment which occurs after the policy. If the credit card holders' payments are generally low before the policy announcement, they are more likely to stay low after the policy as well. In other words, low-paying consumers are more likely to be treated by the policy. Note that the treatment and the control groups do not change over time, and they do not depend on the actual treatment. We establish the treatment and the control groups before the policy announcement to avoid the selection into the actual treatment.

Our identification relies on the following two assumptions. First, the treatment and the control groups should have parallel trends in credit card spending and debt before the announcement of the policy. This is the identification assumption in a standard difference-in-differences estimation. Second, the payment behavior is persistent over time before the policy announcement: those who make low payments this month are more likely to make lower payments in the future. The second assumption is specific to our setting since we define the treatment group based on their likelihood to be treated. We test these assumptions in Section 4.1.

We address the third empirical challenge by defining separate treatment variables for the first rule of the policy - the minimum payment treatment (MP), and the second rule of the policy - cash advance treatment (CA). We use the information on credit card limits in Table A.1 to define the MP treatment. It includes consumers whose average minimum payment twelve months before the policy announcement is less than the applicable minimum payment ratio for their credit card limit bracket. For example, the required minimum payment for a consumer with TL17,000 credit card limit goes from 20% to 30% by the end of the policy's second year. This consumer would be included in the treatment group if they paid on average less than 30% in the twelve months before the announcement. Figure 2 illustrates MP treatment and control groups for consumers with credit card limit less than TL15,000, and between TL15,000 and TL20,000, respectively. Note that a consumer who pays 23% of his credit card balance in December 2011 and must start paying at least 25% in January 2012 is not necessarily in the MP treatment group. We emphasize that the treatment only depends on payment behavior and credit card limits *before* the policy announcement in December 2010, but not after.

Based on the second rule of the BRSA's policy, we define the second treatment variable, referred to as the 'cash advance treatment', or CA treatment for short. Namely, the second rule of the policy applies when a consumer fails to pay at least 50% of his credit card debt three or more times (months) in a single calendar year. Therefore, his credit card limit gets frozen, and cash advances suspended until the credit card debt has been settled in full. Specifically, the CA-treatment is equal to 1 if a borrower pays less than 50% of his monthly credit card balance three or more times during the twelve months before the policy announcement (December 2010).

Since some consumers receive both the MP treatment and the CA treatment, we start by defining three mutually exclusive groups: the MP-only treatment, the CA-only treatment, and the combined MP and CA treatment. 39.6% of consumers in our sample belong to the CA-only treatment. 5.95% are affected by both MP and CA treatments, and there are none that are affected by MP-only treatment. The MP-only treatment is an empty set by construction. For example, consider consumers with a credit card limit of TL16,000. Those who pay less than 30% before the policy constitute the combined MP and CA treatment. On the other hand, those who pay between 30% and 50% on average comprise the CA-only treatment. Therefore, we cannot separate the effect of MP treatment. We use the following baseline specification to estimate the average response to BRSA's policy:

$$S_{i,t} = \alpha + \beta_1 \times 1_{CA} \times 1_{post\ Dec\ 2010} + \beta_2 \times 1_{MP+\ CA} \times 1_{post\ Dec\ 2010} + u_i + v_t + \varepsilon_{i,t} \quad (1)$$

$S_{i,t}$ is the outcome variable, such as credit card spending, debt, interest charge, dummy for below-minimum payments, below-50% payments, and penalty fees. 1_{CA} is an indicator variable with a value of 1 if the consumer is in the CA-only treatment group, and $1_{MP+\ CA}$ is an indicator variable with a value of 1 if the consumer is affected by both the MP and the CA treatments. 1_{post} is a post-policy indicator variable with a value of 1 for months following the policy announcement in December 2010. The twelve-month pre-policy period we use for treatment definitions starts in January 2010 and ends in December 2010. We emphasize that both the MP and CA treatment are defined before the policy announcement, and stay fixed throughout our sample period. This approach helps us eliminate endogenous selection into treatment from the causal effect we purport to estimate. It allows us to add individual fixed effects to control for unobserved time-invariant individual heterogeneity.

We construct standard errors to account for (i) serial correlation in outcomes within accounts over time and (ii) correlation in outcomes across accounts that have the same type of credit card within a city. We specify cluster-robust standard errors at the city × product type level. The number of product types varies across cities producing 612 clusters.

The second regression specification aims to estimate the dynamic effect of the policy on credit card spending and debt. We interact $1_{MP+\,CA}$ with five time indicators: 0, 6, 12, 18, and 24 months after the policy announcement, respectively.

$$S_{i,t} = \alpha + \beta_1 \times 1_{CA} \times 1_{post\ Dec\ 2010} + \beta_2 \times 1_{MP+CA} \times 1_{post\ Dec\ 2010}$$

$$+\beta_3 \times 1_{MP+CA} \times 1_{post\ Jun\ 2011} + \beta_4 \times 1_{MP+CA} \times 1_{post\ Dec\ 2011}$$

$$+\beta_5 \times 1_{MP+CA} \times 1_{post\ Jun\ 2012} + \beta_6 \times 1_{MP+CA} \times 1_{post\ Dec\ 2012} + u_i + v_t + \varepsilon_{i,t} \qquad (2)$$

The third specification aims to overcome the third empirical challenge, i.e. estimating the MP treatment separate from the CA treatment. We capture the MP treatment effect using a sample of new credit cards opened after the policy announcement as the control group. The policy mandated that all new credit cards have a minimum payment ratio of 40% for at least twelve months following the account activation. We use this policy change to estimate the effect of the MP treatment during this twelve-month period when all new cards have a fixed minimum payment ratio of 40%. The dependent variables are the same as in the baseline specification.

$$S_{i,t} = \alpha + \beta_1 \times 1_{MP} \times 1_{post\ Dec\ 2011} + \beta_2 \times 1_{MP} \times 1_{post\ Jun\ 2012}$$

$$+\beta_3 \times 1_{MP} \times 1_{post\ Dec\ 2012} + u_i + v_t + \varepsilon_{i,t} \qquad (3)$$

Our final regression specification also relies on the sample of new cards but estimates the effect of a decrease in the minimum payment ratio on the credit card spending and debt. The sample here does not include all new credit card holders but only those for whom we observe a fall in the minimum payment ratio from 40% to 25%. This change in the minimum payment occurs one year after the new card activation. We exploit the variation in timing of the minimum payment decrease due to different account opening months. The dependent variables are credit card spending, debt, the proportion of debt paid.

$$S_{i,t} = \alpha + \beta_1 \times 1_{MPdecrease_{i,t}} + u_i + v_t + \varepsilon_{i,t} \qquad (4)$$

$1_{MPdecrease_{i,t}}$ is an indicator that equals 1 if the minimum payment is below 40% for individual i at time t, and 0 otherwise. β's are the focal point of our analysis as they measure the differential response of spending and debt of the treated consumers to each additional increase in the minimum payment ratio.

4. Empirical Results

The consumers might respond to the policy in different ways. First, they could decide to meet only the required minimum payment and avoid delinquency, but consequently, lose the privilege of cash withdrawals and credit card limit changes because of the policy's second rule. This option might or might not affect their spending patterns. Second, they could abide by both policy rules and keep their cash withdrawal and credit card limit options intact. This choice would most likely result in the reduction of credit card spending and faster repayment of existing credit card debt. Finally, for the borrowers with the most severe liquidity constraints, delinquency and default might be the only option. Consumers can default even with higher credit card payments and a reduction in consumption, as shown in d'Astous and Shore (2017).

In this section, we present our main findings. We first provide validations for assumptions about our empirical strategy. Next, we use the sample of existing credit cards to estimate the spending and debt response following the announcement of the BRSA's policy. Moreover, we exploit the sample of new credit cards and estimate the impact of reducing minimum payment. Finally, we discuss the possible explanations and the consequences of the policy.

4.1 Validation of Assumptions

Our identification relies on two assumptions. First, the treatment and the control groups should have parallel trends in the credit card spending and debt before the policy announcement. Second, the payment behavior should be persistent over time before the announcement of the policy. In other words, if the payment behavior is persistent, the consumers we identify as the treatment group before the policy announcement are highly likely to be treated by the policy.

The central assumption of the difference-in-differences strategy is that the control group and the treatment group should have parallel trends. Figure 3 shows the difference-in-difference coefficients from an event-study point of view for credit card spending, debt, and 30-day delinquency. Observations on the left side of the '2010m12' line should be interpreted as the average difference in the credit card spending (top left), debt (top right), and delinquencies (bottom) between the treatment and the control groups before the policy. Similarly, everything to the right of the line shows the policy effects, i.e. after-policy differences in spending, debt, and delinquency between the treatment and the control groups. If the parallel-trends assumption is true, the difference-in-difference coefficients before the policy announcement should not be statistically different from zero. Figure 3 shows strong support for the common trend assumption. The graphs show the difference-in-difference regression coefficients as well as the 95% confidence intervals. Before the policy, most coefficients bundle around zero for all three variables. Immediately after the policy, however, we see a substantial change in the coefficient magnitudes, consistent with the natural experiment and difference-in-difference regressions as the proper empirical set-up for the study of BRSA's policy. We discuss the after-policy changes in spending, debt, and delinquencies in detail in Sections 4.2 - 4.4.

The main concern in our empirical analysis is to have a treatment variable that robustly identifies consumers that are likely to be impacted by the policy. If our treatment group indeed consists of constrained consumers, their low-payment behavior is likely to persist over time. We test this assumption by analyzing the persistence in payment behavior of treated and non-treated consumers before the policy. Figure 4 shows the results. The data used here only includes the twelve months before the policy announcement, to avoid any policy effects. Panel A shows a scatter plot for the current and previous month payment ratio for two clusters of consumers. The cluster on the left (green) consists of low payers, i.e. the consumers that pay below the minimum. Similarly, the cluster on the right (blue) includes the high payers; the individuals that consistently pay higher than the minimum. We see that both low payers and high payers lie closely to the 45-degree line. The treated consumers remain treated in the subsequent month; their previous payment history robustly predicts future payment behavior. Panel B shows the average payment behavior over consecutive eight months for low payers and high payers. Similar to Panel A, we observe persistent behavior for both groups. Low payers, i.e. the treated consumers remain treated in the subsequent months; they consistently pay less the 50% of their credit card balance over the eight months. High-payers consistently pay significantly more than the minimum. Therefore, these results support the persistence in payment behavior over time.

4.2 Baseline Difference-in-Difference Regressions

Table 2 shows the estimates of credit card spending and debt response following the policy announcement. Panel A shows the average policy effect from the CA treatment or the combined CA and MP treatment using Equation (1). We find that the credit card spending and debt decrease for the treated consumers. Consumers in the CA treatment reduce their credit card spending by TL 109.14 ($61), or 15.93%, and credit debt by TL158.79 ($88.37) or 17.63%. The proportion of debt paid falls by 11.06%, thus reducing the interest and penalty charges.

The consumers in the combined treatment reduce their credit card spending by TL107.46 ($60.03) on average. Additionally, their debt balance, penalty, and interest payments fall by TL282.91 ($158.05), TL36.85 ($20.59), and TL8.84 ($4.94), respectively. The change in spending represents about 15.69% drop relative to the average spending level. The decline in debt is much stronger surpassing 31%. On average, the treated consumers pay an additional 24.45% of their debt.

Panel B presents the dynamic effect of the policy at each consecutive six-month interval using Equation (2). Both debt and spending decrease at monotonically higher magnitudes at subsequent six-month intervals. Two years into the policy implementation monthly credit card spending, and debt decline by TL174.45 ($97.46; 25.47%), and TL415.69 ($232.23; 46.15%), respectively. The proportion of debt paid grows monotonically over time as well, increasing by an impressive 29.4% after two years. This behavior naturally drives down the penalty and interest charges; they fall by TL45.68 ($25.52) and TL10.02 ($5.60), respectively. Therefore, the policy seems effective in substantially reducing the credit card spending and debt of the treated consumers.

As mentioned in Section 3 we cannot directly estimate a separate MP treatment effect using Equations 1 and 2; all consumers in the MP treatment are also in the CA treatment. The specification in Equation 3 makes it possible to isolate the MP treatment. It exploits the rule that all credit cards opened after the policy announcement are required to have a fixed minimum payment ratio of 40% for the first twelve months. After one year, their minimum payment ratio can be changed to comply with the minimum payment schedule applicable at that time or stay at 40%. Therefore, we have a sample of new credit cards that are only affected by the CA rule, but not the MP rule for an entire year.

We utilize this sample of new credit cards as the new control group because it is not subject to any changes in the minimum payment during this time; however, both the treatment and the control are still affected by the CA rule. Running difference-in-difference regressions on these two groups neutralizes the effect of the CA rule and singles out the MP treatment effect.

The results are shown in Table 3. We find that the treated consumers significantly reduce their spending and debt relative to the new credit card holders. Consequently, the proportion of debt paid surges, and consumers pay less for interest and penalty charges. The results are qualitatively and quantitatively comparable to our baseline findings in Table 2. In other words, the MP rule had a substantial impact on consumption and payment behavior. By the end of the twelve months with fixed minimum payment ratio, the treated consumers reduced their spending and debt versus the new credit card holders by TL409.89 ($228.99) and TL630.74 ($352.37), respectively. Moreover, the proportion of debt paid increased on average by 22.28%, reducing the average interest and penalty payments by TL4.5 ($2.5), and TL18 ($10), respectively.

Figure 5 shows the MP treatment effect on credit card spending and debt from an event study point of view. The coefficients on the right of the '2011m12' line represent the MP treatment effects, while the coefficient on the left shows the difference in the credit card spending and debt before the increase of the minimum payment ratio to 22%. We see a significant decrease in both spending and debt following the change in Figure 5. The pre-change coefficients show that the parallel trend assumption is satisfied. However, we want to note a potential drawback in the event-study done in Figure 5. Namely, the treated consumers are already treated before December 2011. Therefore, even though we have common trends before January 2012, the previous treatment could potentially overstate the coefficients plotted in Figure 5. Overall, we believe that both Table 3 and Figure 5 show that the policy's minimum payment rule had a sizeable effect on credit card spending and debt.

Our results allow us to make inferences about the elasticity of credit card spending and debt to changes in the target payment ratio. This elasticity is analogous to the idea of 'marginal propensity to borrow' in Aydin (2016). We use the results in Table 2 and Table 3 to impute these elasticities. In the CA treatment, increasing the target payment ratio from 20% to 50% reduces the credit card spending by 15.93%, and the credit debt by 17.63%. This implies that one percentage point increase in the target payment ratio reduces the credit card spending by 0.53%, and the credit card debt by 0.59%. Moreover, it increases the proportion of debt paid by 0.37% on average. Finally, a similar elasticity analysis with coefficients in Table 3 implies that a percentage point increase in the minimum payment ratio reduces the credit card spending and debt by 5.98% and 7% and increases the proportion of debt paid by 2.22%.

Overall, over the two years of the policy's implementation, the credit card debt is reduced by 46.15% and the credit card spending by 25.47% for consumers affected by both rules of the policy. For consumers affected by the CA rule only, the credit card spending, and debt fall on average by 15.93%, and 17.63%, respectively. To better understand macroeconomic applications of BRSA's policy, we extrapolate from our sample to the entire economy assuming our sample is representative of the entire country. The consumers that are affected by both rules of the policy constitute about 5.95% of our sample. This implies that the corresponding reduction in the total debt in the economy would be 2.75% (=46.15%*5.95%), which is about TL0.99 billion[7]. The cash advance rule, independent of the minimum payment rule, affects about 39.6% of consumers in our sample. This implies a reduction in total debt in the economy by 6.98% (=39.6%*17.63%), which is about TL2.51 billion.

We further explore the policy on new credit cards and study the impact of lower minimum payment on credit card spending and debt. A small sample of around 10,000 new credit card accounts experienced a reduction in the minimum payment ratio from 40% to 25% after the first twelve months. We use this sample and Equation (4) to test the response of credit card spending and debt to a decrease in the required minimum payment. The results are shown in Table 4. The change in spending is negative but not statistically significant. Debt increases by TL12.75 ($7.12), while the proportion of debt paid falls by 2.58%. These estimates indicate that the decrease in the minimum payment affects the debt payment behavior but has no significant impact on the spending. Medina and Negrin (2019) also find that consumers their debt payment when the minimum payment ratio is lowered, albeit their focus are unconstrained consumers. Compared to the results in Table 2, there seems to be a substantial asymmetry in how consumers respond to a minimum payment decrease relative to an increase of a similar magnitude. As shown in Table 4, debt payment falls, and consumers pay higher penalty and interest charges; however, the coefficients we obtain are economically much smaller than those following a minimum payment increase.

We discuss several possible explanations behind the asymmetric effect of minimum payment changes on spending and debt repayment of constrained consumers. First, reducing the minimum payment ratio is not as binding a constraint on consumers as a tightening credit card policy. Higher required minimum is both restrictive and binding on liquidity constrained consumers. An alternative to not paying is becoming delinquent. On the other hand, a lower required payment relaxes the borrowing constraints and produces no additional restrictions. Second, paying the penalty after missing a minimum payment is a painful experience that consumers try to avoid. Agarwal et al. (2013) find that consumers learn through negative feedback; paying the penalty this month has a substantial effect on avoiding extra fees and penalties in the next month. A

[7] Total credit card debt in 2010 was around TL36 billion based on the data of the Central Bank of Turkey.

minimum payment decrease is not likely to have the same magnitude of response as a minimum payment increase; there is no penalty or another source of negative feedback mechanism that pushes consumers to learn and change their behavior quickly.

The asymmetric response to minimum payment changes has important implications for macro-prudential policies. Existing literature shows that monetary policy has asymmetric effects on output[8]. Specifically, a contractionary monetary policy has a stronger effect on output than expansionary policy. Theoretical explanation behinds this finding include the credit constraint channel of contractionary monetary policy, consumer pessimism to tightening economic conditions, price and wage stickiness, and loss aversion. These explanations proposed for asymmetric response to monetary policy shocks might be valid for macroprudential policies as well. A recent paper by Christelis et al. (2017) finds substantial asymmetries between the MPC in response to positive and negative unanticipated income shocks. The findings in our paper are consistent with this broad literature and find a similar effect on consumption in case of macroprudential policies related to credit cards.

4.3 Alternative explanations

We have documented that the BRSA' policy reduces credit card spending and increase debt repayment over time. In this subsection, we first discuss the explanations for the reduction of credit card spending. Then, we discuss why consumers increase debt repayment.

The post-policy reduction in consumption can be explained by the model of liquidity constraints and precautionary savings (Carroll and Kimball, 1996, 2005; Carroll, 2001). According to the model, consumers will decrease consumption and increase precautionary savings in the presence of liquidity constraints. The model produces the same outcomes regardless of whether the constraint is currently binding or will become binding in the future. The model posits that the introduction of liquidity constraint increases the precautionary saving motive around the levels of wealth where the constraint becomes binding. In other words, consumers' motive for precautionary savings is strengthened by the desire to make constraints less likely to bind. The drop in the consumption we observe in our results can be interpreted as an attempt by the treated consumers to avoid being treated or minimize the chances of being treated by the policy. Moreover, additional constraints imposed by the policy's progressive nature are likely to push

[8] For the theoretical papers on asymmetry see Cover (1992), Morgan (1993), and Santoro et al. (2014). For empirical papers see Christelis et al. (2017), Tenreyro and Thwaites (2016), Lo and Piger (2005), Weise (1999), and Barnichon and Matthes (2016).

consumers to reduce consumption and increase savings before each policy change. Overall, our results show a significant reduction in consumption and credit card debt after the policy which agrees with the prediction of the model of consumption/precautionary savings under liquidity constraints.

In addition to the reduced spending, we find that the treated consumers significantly increase their debt repayment and that many more pay exactly at or more than the required minimum payment (Table 2, columns 3,4). Moreover, we also find that a reduction in the minimum payment results in higher credit card debt (Table 4). Why do the treated consumers make higher payments towards their credit card balance after the minimum payment increase and vice versa?

There are two possible explanations: liquidity constraints, and anchoring bias (Medina and Negrin 2019). Liquidity constraints explanation predicts that the treated consumers would be paying exactly at the new minimum, but not more. Anchoring bias predicts that some of the treated consumers would be paying above the new minimum due to anchoring to the payment information shown on the monthly statement. This behavior is not the result of optimizing their consumption function, but instead anchoring to the minimum payment information saliently displayed on the credit card statement.

To test the anchoring bias, we estimate the impact of the policy on the variable P, which measures the proportion of consumers that pay at or below the new minimum. Table A.10 shows the result of difference-in-difference regression where P is the dependent variable. Column 1 shows that the proportion of consumers that pay at or below the minimum falls by about 6.98% for CA treatment and more than 30% for the MP+CA treatment. These estimates point to a substantial increase in the number of consumers that pay some amount higher than the minimum. A severely constrained consumer would be inclined to pay precisely the new minimum, but not more, as argued above. However, consumers that pay more than the minimum are not necessarily constrained. The liquidity constraints story can only marginally explain the significant increase in debt repayment we uncover in Table 2. Anchoring seems to play a much stronger role in explaining the substantial increase in debt payment after the policy. Furthermore, a reduction in the proportion of debt paid after a reduction in the minimum payment is also consistent with the anchoring story. Therefore, we find consistent evidence with anchoring bias and show that it portends a sizeable impact on credit card payment behavior.

Another possible explanation is that the effect on debt payment is driven by mean reversion in debt payment behavior. Specifically, it might be the case that the low-paying households would pay more and the high-paying households would pay less in the future. Figure 4 shows a clear pattern of persistence rather than mean reversion in payment behavior. Therefore, mean reversion is unlikely to be a possible explanation for debt payment behavior we obtain in Table 2.[9]

4.4 Consequences of the policy

In this section, we analyze the consequences of the BRSA's policy for credit card delinquencies. Since the policy introduces significant borrowing constraints for low-cash consumers, one could expect an increase in delinquency due to difficulties to pay a higher minimum payment. However, consumers can reduce credit card spending and debt to avoid the high payment, and the delinquency might remain the same or even decrease. The impact on delinquency rate depends on consumers' flexibility to quickly reduce current levels of spending to meet the higher minimum payments.

We use a difference-in-differences strategy to test for the post-policy changes in delinquencies. Figure 3 shows that there are parallel trends before the policy announcement. We run difference-in-differences regressions using Equation (1) and (2), and present the results in Table 5. The dependent variables are 30-day and 60-day delinquency. Columns 1 and 2 report the average coefficients for CA and MP+CA treatments. Columns 3 and 4 also consider the dynamic changes in delinquencies for the MP+CA treatment. Surprisingly, all the coefficients are negative, and statistically and economically significant. 30-day delinquencies fall by 2.33% on average for consumers in the CA treatment, and by 7.41% for the MP+CA treatment group. For the 60-day delinquency, these declines are 0.43% and 5.58% respectively. The delinquencies decline more in the later stages of the policy, dropping by about 7.90% and 6.93% two years into the policy implementation, for the 30-day and 60-day delinquency, respectively. These results suggest that the treated consumers remain relatively resilient in reducing their consumption and paying down debt as the policy imposes additional increases in the required minimum payment. They are not only able to avoid delinquencies, but also reduce them.

[9] In untabulated results we also run regressions to test for mean reversions. We regress proportion of debt paid, proportion of consumers making minimum payments, interest, and penalty charges on their lagged versions controlling for total debt and lagged total debt. The regression uses data before the policy to analyze the possibility of mean-reverting behavior without any confounding policy effects. All coefficients are positive and statistically significant, rejecting the hypothesis that consumers exhibit mean-reverting behavior. Regressions results are available from the authors upon request.

Why do delinquencies fall in a more restrictive credit environment? One plausible explanation is that the majority of consumers did not find it difficult to reduce their consumption. Whether a credit tightening policy increases delinquency depends on how difficult it is for the treated consumers to reduce their credit card spending. If a consumer is extremely constrained and lives hand-to-mouth, it is challenging to reduce consumption that primarily consists of life necessities. For these highly indebted consumers, delinquencies are likely to rise. On the other hand, less constrained consumers will find it easier to reduce consumption and avoid delinquency. To test this explanation, we measure the difficulty in reducing consumption using two proxies: the level of non-discretionary consumption, and the level of outstanding credit card debt.

Table 6 reports the changes in average discretionary and non-discretionary consumption for the CA treatment and the combined MP+CA treatment. Discretionary consumption includes non-essential goods and services such as alcohol, tobacco, jewelry, travel, restaurants, sports, and entertainment. Consumers cut down much more on discretionary than on non-discretionary consumption. Namely, the discretionary consumption falls on average by TL91.12 ($50.90), and TL 87.39 ($48.82) for the CA, and the MP+CA treatments, respectively. The non-discretionary consumption falls by TL16.49 ($9.21) for the CA treatment and TL16.11 ($9) for the MP+CA treatment. It shows that consumers with relatively higher discretionary spending cut down on their purchases to meet the new minimum payment and avoid delinquency. Non-discretionary consumption declined on average, but the magnitude is much smaller compared to the former. This result is likely due to the higher difficulty in reducing the consumption of basic life necessities such as food, groceries, hygiene, and healthcare products and services.

Second, we study the heterogeneous effect on delinquency based on the intensity of liquidity constraints the consumers are facing. We assume that the spending of heavily constrained consumers is mostly non-discretionary. The decline in the delinquency rates should be lowest for them. In fact, the delinquency rates could rise for severely constrained individuals. We empirically test for the change in the delinquency rates across various levels of indebtedness, a proxy for liquidity constraints. We separate the sample into quintiles based on their debt burden, i.e. unpaid credit card balance. The results are shown in Figure 6. Horizontal axis plots the debt burden quintiles, while the vertical axis shows the average change in the delinquency rates after the policy. The delinquencies fall by around 10-11% for the lowest two quintiles, around 2.5% for the middle quintile, and less than 1% for the top two quintiles. It is interesting that even the most indebted individuals are still managing to avoid a higher delinquency rate after the policy. However, these results still imply that the heavily constrained individuals struggle the most with the new policy. On the other hand, less constrained individuals find it much easier to reduce their consumption and delinquencies after the policy.

In sum, we find that the reduction in consumption is driven by a decline in mostly discretionary consumption and the reduction of delinquency is driven by consumers with less outstanding debt. Therefore, the drop in the delinquency rate is likely a result of the relative ease with which some treated consumers can reduce their (discretionary) consumption.

5. Discussion

Our results indicate that the policy had a sizeable impact on credit card spending and debt payment behavior. However, whether the policy changed total consumption is not evident. There are two concerns we need to address. First, it is possible that consumers in the treatment group switch to credit cards from other banks or switch to other types of consumer loans such that the total consumption remains unaffected. Second, consumers might fully substitute credit cards with debit cards and cash, with no real impact of BRSA's policy on total consumption. We discuss these two possibilities next.

We only have data from a single bank, so we cannot provide direct evidence on total consumption. However, switching to other credit cards is unlikely to be the case due to several reasons. First, the policy is implemented across all banks in Turkey at the same time. Interest and penalty charges for all banks are calculated using the same rates imposed by the Central Bank of Turkey (CBRT). Interest and penalty rates do not vary across banks. Thus, there is no incentive to switch banks; substitution to credit cards at other banks would not result in any meaningful change.

Individuals with existing credit cards at different Turkish banks are likely to have had very similar terms and conditions. Even if that was not the case, it is questionable if consumers would optimally allocate spending and debt payment across multiple cards following the BRSA's policy. A recent study by Gathergood, Mahoney, Stewart, and Weber (2018) finds that individuals do not optimally allocate payments across credit cards to minimize the cost of borrowing. Instead, they allocate repayments according to a balance-matching heuristic under which the share of repayments on each card is matched to the share of balances on each card. Ponce, Seira, and Zamarripa (2017) similarly find that consumers with multiple credit cards do not minimize their borrowing cost by using their cheaper cards. To the contrary, debt revolvers usually borrow on a higher-interest card, thus increasing their borrowing cost by 31% relative to the minimum. The two studies show evidence that consumers do not necessarily behave in a cost-minimizing way even when it is feasible to do so.

We conduct our analysis using the difference-in-differences methodology. There are no differential incentives for those in the MP treatment group to switch to credit cards from other banks; the policy would still affect them in the same manner. In fact, there is a disadvantage of switching to another bank or opening a new credit card account at the same bank. In both cases, the consumer would be operating under 40% minimum payment requirement for at least a year, a strict mandate of BRSA's policy for all new accounts. Therefore, a consumer has no incentive to open a new credit card account at any bank, as his borrowing costs would only increase.

It is possible that the consumers are turning from credit cards to other types of consumer loans to avoid stricter requirements of the policy. Although plausible, we argue this is not the case for several reasons. First, we do not observe any significant post-policy changes in the proportion of various consumer loans types. Figure 8 shows the time series for the proportion of vehicle, housing, and personal and other loans to total consumer loans and credit cards combined. We see no significant changes after the policy implementation. Although this is aggregate data for all Turkish banks, and not just for our sample, it suggests that no real movement from credit cards to other types of consumer loans occurred post policy. Second, credit cards offer convenience and ease of transaction which would be very difficult with other types of consumer loans that require a formal application, necessary paperwork, a credit score, and a physical visit to a bank branch. Finally, switching from a credit card to other forms of credit would be difficult for consumers that are already heavily indebted with their existing credit card(s). Such consumers are likely to decrease their spending to avoid higher borrowing costs and adding more debt.

We now turn to the second concern, i.e., a possibility that consumers switched from credit to debit cards. We could not obtain debit card spending data from the bank and are thus unable to test for this explanation directly. However, this explanation is unlikely for two reasons. First, it is challenging for consumers with low cash to substitute credit with debit cards or cash easily. Second, there is little to no incentive for consumers with a lot of cash to engage in this substitution. Substitution with debit cards or cash can only happen for consumers with enough cash holdings. Consumers with low cash cannot simply substitute credit card debt with cash or debit card balances because they lack those resources in the first place. Therefore, observing a policy-driven reduction in consumption for low-cash consumers implies a consumption decrease and not just a substitution from credit card to cash/debit card spending.

We focus on low-cash consumers and test the substitution effect by separating our sample into 'revolvers' and 'non-revolvers'. Consumers with low cash are often 'revolvers,' i.e., they roll over their debt every month because they lack resources to pay it off entirely, and this practice allows them to maintain a consistent level of consumption by pushing the payment to future dates. Non-revolvers are defined as consumers that make full payments every month from the beginning of the sample but before policy implementation, i.e. between January 2010 and June 2011 (18 months). Revolvers, on the other hand, make at least one payment smaller than 100% of the balance during those 18 months. We also create an alternative definition where we consider payments only during the last six months before the policy implementation, and not from the beginning of the sample (6 months). We run difference-in-difference regressions separately for revolvers and non-revolvers, reporting only the coefficients for the credit card spending. The results are shown in Table 7.

The coefficients from Table 7 tell a consistent story: severely constrained consumers were forced to reduce their consumption more and sooner than the less constrained consumers. Panel A shows that on average, revolvers reduce their spending more than the non-revolvers, regardless of the type of treatment or the definition of revolvers. The coefficients in Panel B uncover an interesting dynamic. The revolvers reduce their spending much faster than the non-revolvers; however, by the end of the policy the gap is reduced, or completely reversed, depending on the revolver definition. Both groups reduce their spending; however, unlike non-revolvers who have relatively higher cash holdings, revolvers have no financial capacity to quickly move their spending from credit cards to debit cards or cash. Hence, the reduction in consumption for revolvers is likely to be a real drop in consumption.

We observe that non-revolvers also reduce their credit card spending. Since we have no debit card or cash spending data, it is not easy to attribute their reduction in credit card spending to a drop in real consumption or substitution from credit to debit cards. However, we argue that non-revolvers have no real incentive to substitute their credit card spending. When a consumer substitutes credit card with a debit card, he has to pay the full amount for all purchases immediately, instead of postponing the payment to a future date. Even if a consumer has the means to pay the full amount upfront, it is still beneficial to pay with a credit card now and pay the balance at the end of the billing cycle without incurring interest charges. A consumer would do so to keep cash in case of an emergency, collect points, miles or cash-back rewards which were and still are a significant competition focus among Turkish credit cards[10]. Overall, low-cash consumers have no means, and high-cash consumers have no incentive to switch from credit cards to debit cards or cash.

Anecdotal evidence also suggests it is challenging for many consumers to substitute credit cards with cash, debit cards, or other types of consumer loans. The popular Turkish press indicated that many consumers were anxious and in a state of panic when they learned that the policy would affect them. In fact, Consumers' Rights Association warned BRSA that they would be responsible for suicides, divorces, and family dramas if they go ahead with the policy implementation. Such extreme responses to BRSA's policy would not be possible if most consumers could switch from credit cards to debit cards or other cheaper forms of credit. Indeed, many consumers relied heavily on multiple credit cards to roll over their debt every month. That practice was done out of necessity by many low-income and liquidity constrained consumers so much so that it became a common practice. BRSA's policy was making this practice extremely difficult or impossible, hence the consumers' outrage was more than vocal. This evidence suggests that it was challenging for many consumers to substitute credit cards with cash, debit cards, or other types of consumer loans.

In sum, there is no incentive that consumers in the treatment group switch to credit cards from other banks or switch to other types of consumer loans. Moreover, consumers are unlikely to substitute credit cards with debit cards or cash, at least not entirely. Our results suggest that the BRSA's policy not only affects credit card spending but real consumption too.

6. Conclusion

Using a unique policy implemented by Turkey's Banking Regulation and Supervision Agency, we find that constrained consumers significantly decrease their spending and ramp up their debt repayment after the policy implementation. The policy consists of two components: a progressively higher minimum payment ratio, and the requirement to pay 50% of the credit card balance at least three times a year. Both rules were effective in reducing credit card spending and debt. We also find that a decrease in the minimum payment ratio results in higher debt for the treated consumers but does not affect spending.

[10] Aysan and Muslim (2007)

These results improve our understanding of consumption and debt response to consumer credit regulation (Agarwal et al. 2015). Our findings are consistent with the theoretical work of Carroll and Kimball (1996, 2005) and Fernandez-Corugedo (2002) on consumption under liquidity constraints. The two policy rules we study in this paper impose a specific type of liquidity constraint under which a consumer maintains his borrowing capacity, but at a higher cost, implied by a higher minimum payment ratio. By reducing consumption, the consumer is effectively avoiding being treated by the policy and hence minimizing or eliminating a future loss of borrowing capacity as a result of a possible default.

We find strong evidence of higher debt payment after the policy. We find the opposite results in the case of a minimum payment decrease. These results imply that certain consumers are anchoring to the new minimum payment ratio. These results are consistent with Medina and Negrin (2019). Liquidity constrained consumers reduce their consumption to meet the new minimum. Anchoring consumers, on the other hand, make payments that are slightly higher but anchored to the new minimum in some way. Medina and Negrin (2019) show that between 35% and 47% of unconstrained partial payers make a payment that is a whole-number multiple of the minimum payment, with 2 as the most common multiple. Delinquency rate also declines after the policy. Although surprising, we show that this result is plausible because consumers reduce their discretionary consumption significantly, and non-discretionary consumption only marginally. The relative ease in reducing the non-essential consumption explains the simultaneous decline of consumption and delinquencies.

Our results have important implications for the design of macroprudential policies especially in the context of credit cards. In Turkey, credit card debt is much more prominent than the mortgage debt; hence, this policy is an example of an effective solution to slow down the unsustainable growth of consumer debt. We also showed that credit card debt increases after a minimum payment decrease, albeit at a much smaller rate than after a similar minimum payment hike. This implies that tightening macro-prudential policies are much more effective than expansionary policies, a result also found for monetary policy. Moreover, the question of how effective these policies are in the long-run is still to be answered. From a policy perspective, it is important to underline that both the minimum payment rule and the cash advance rule are effective in reducing the credit card spending and debt. Increasing the required minimum payment pushes consumers to cut down on their credit card debt and meet the new requirement to avoid delinquency. Possibly owing to this fact, even after the sample period we analyze here, Turkey has made the minimum payment requirements even stricter. However, credit card spending has continued its overall growth trend. The number of credit cards in Turkey has been trending up rapidly, making it the European leader in the total number of credit cards. Further research should aim to test the long-term effects of such policies empirically, and potentially provide a recommendation for their ideal design.

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Table 1: Sample summary and comparison

Panel A reports the basic summary statistics for different credit card spending and debt related variables as well as basic demographic information. The sample in Panel A excludes full payers, to provide a set of descriptive statistics that apply to the sample used in regressions. Panel B reports the comparison between our full sample and either the aggregate figures from the entire population of credit card holders or the sample used in the survey conducted by Interbank Card Center in terms of average spending and credit card limit distribution. Panel B also reports the geographical distribution of bank branches for the entire Turkish banking system, and the bank whose data we use in our sample.

Panel A: Descriptive Statistics	Excluding Full Payers			
Variable	Mean	StDev	Min	Max
Spending Total	684.90	1581.82	0	310765.40
No. of Transactions	7.51	12.19	0	2335
Debt	900.67	1725.36	0	311523.70
Amount Paid	639.27	1472.12	0	293391.9
Interest	6.37	18.90	0	6117.24
Penalty	18.50	59.21	0	9698.78
Percentage Paid	.73	.37	0	1
Paid Below Minimum	.177	.38	0	1
Paid Below 50%	.30	.46	0	1
Age	40.99	9.57	22	88
Male	.89	.32	0	1
Married	.81	.39	0	1
Education Level	3.08	1.28	1	8

Panel B: A representative sample		
	Average Cash Withdrawals/Spending	
Aggregate	361	
Our sample	383	
Distribution of CC limit	ICC Survey	Our Sample
Less than TL 2000	55%	50%
TL 2,000-5,000	24%	25%
TL 5,000 -10,000	10%	15%
TL 10,000 and more	11%	10%
	All Banks' branches (%)	Our Sample Bank Branches (%)
İstanbul	28.46	37.28
Ankara	9.87	8.24
İzmir	7.16	5.02
Antalya	4.08	3.58
Bursa	3.55	3.23
Konya	2.21	2.87
Kocaeli (İzmit)	2.16	2.15
Gaziantep	1.56	2.15
Kayseri	1.43	1.43
Manisa	1.40	1.79
Samsun	1.25	1.08
Trabzon	1.01	1.08
Diyarbakır	0.83	0.30

Table 2: Spending and debt response to the policy announcement

This table reports the difference-in-difference regression estimates for the policy effect on credit card spending and debt. We report the estimates for spending, total debt, the proportion of debt paid, interest charges, and penalty, respectively. Panel A reports the average impact of the two policy rules, the CA treatment, and the combined MP+CA treatment. Panel B shows the impact over time at each policy date for the combined MP+CA treatment. All treatment variables are defined in the period between January 2010 and December 2010 based on the credit card limits. The independent variables are the interactions between a treatment variable and a corresponding post-policy variable. All regressions control for consumer fixed effects and monthly time effects. The standard errors are clustered at the city×product level. The sample used in the regressions runs from January 2010 to February 2013.

Panel A

Dep.Var.	Spending	Debt	% Paid	Interest	Penalty
	(1)	(2)	(3)	(4)	(5)
CA * post	-109.1361***	-158.7894***	0.1106***	-3.3505***	-5.8946***
	(7.3982)	(7.4175)	(0.0027)	(0.0891)	(0.1480)
(MP + CA) * post	-107.4648***	-282.9110***	0.2445***	-8.8440***	-36.8476***
	(12.1831)	(17.2600)	(0.0051)	(0.3790)	(1.6082)
Individual FE	Yes	Yes	Yes	Yes	Yes
Year-month FE	Yes	Yes	Yes	Yes	Yes
Observations	13440334	13440334	13440334	13440334	13440334
Adjusted R-squared	0.569	0.637	0.431	0.486	0.571

Panel B

Dep.Var.	Spending	Debt	% Paid	Interest	Penalty
	(1)	(2)	(3)	(4)	(5)
CA * post	-109.1361***	-158.7894***	0.1106***	-3.3505***	-5.8946***
	(7.3982)	(7.4175)	(0.0027)	(0.0891)	(0.1480)
(MP + CA) * post-0m	-67.6908***	-150.6539***	0.1736***	-7.0460***	-21.3177***
	(6.0249)	(7.9873)	(0.0057)	(0.2815)	(0.7965)
(MP + CA) * post-6m	-77.5242***	-232.4805***	0.2322***	-8.8905***	-35.9680***
	(9.1168)	(13.0662)	(0.0057)	(0.3946)	(1.6092)
(MP + CA) * post-12m	-111.2760***	-321.0888***	0.2687***	-9.2240***	-42.3467***
	(13.5291)	(20.3467)	(0.0051)	(0.4111)	(1.8791)
(MP + CA) * post-18m	-151.0403***	-383.1599***	0.2870***	-9.8233***	-44.8134***
	(18.6039)	(26.8760)	(0.0047)	(0.4379)	(2.1066)
(MP + CA) * post-24m	-174.4484***	-415.6929***	0.2940***	-10.0214***	-45.6816***
	(20.8499)	(26.8181)	(0.0049)	(0.4074)	(2.0028)
Individual FE	Yes	Yes	Yes	Yes	Yes
Year-month FE	Yes	Yes	Yes	Yes	Yes
Observations	13440334	13440334	13440334	13440334	13440334
Adjusted R-squared	0.569	0.638	0.431	0.486	0.572

Table 3: Using new credit cards as the control group

This table reports the difference-in-difference regressions estimates for the policy effect using an alternative control group definition. The control group only includes consumers that opened a credit card account after the policy announcement in December 2010. The sample used in this table starts in July 2011 and includes new credit cards with minimum payment ratio fixed at 40%. The independent variables are the interactions between a treatment variable and a corresponding post-policy variable. All regressions control for consumer fixed effects and monthly time effects. The standard errors are clustered at the city×product level.

Dep.Var.	Spending	Debt	% Paid	Interest	Penalty
	(1)	(2)	(3)	(4)	(5)
MP * post-12m	-157.3524***	-245.3844***	0.0928***	-1.0566***	-8.2174***
	(9.9180)	(10.2348)	(0.0035)	(0.0959)	(0.3902)
MP * post-18m	-309.3681***	-458.2700***	0.1708***	-2.9787***	-13.7440***
	(16.2669)	(17.0619)	(0.0061)	(0.1057)	(0.4738)
MP * post-24m	-409.8906***	-630.7352***	0.2228***	-4.4892***	-18.0323***
	(19.9827)	(17.9523)	(0.0082)	(0.1906)	(0.5124)
Individual FE	Yes	Yes	Yes	Yes	Yes
Year-month FE	Yes	Yes	Yes	Yes	Yes
Observations	2409806	2409806	2409806	2409806	2409806
Adjusted R-squared	0.556	0.633	0.562	0.588	0.712

Table 4: New credit cards – a reduction in the minimum payment

This table reports the panel data regressions estimates of the effect of a reduction in the minimum payment ratio on credit card spending and debt. The sample includes only the new credit card holders, opened after the policy announcement. The sample in this table consists of new cards that experienced a reduction in the minimum payment ratio from 40% to 25%. It covers a twelve-month period including the six months before the change in the minimum payment ratio from 40% to 25%, and the six months after. The independent variable is a dummy that takes a value of 1 in a month when the minimum payment ratio for a new credit card falls from 40% to 25%. Independent variable is the interaction between a treatment variable and a corresponding post-policy variable. All regressions control for consumer fixed effects and monthly time effects. The standard errors are clustered at the city×product level.

Dep.Var.	Spending	Debt	% Paid	Interest	Penalty
	(1)	(2)	(3)	(4)	(5)
MP decrease*post	-0.5688	12.7535***	-0.0258***	0.5335***	1.3789***
	(5.5790)	(4.9145)	(0.0036)	(0.0638)	(0.1679)
Individual FE	Yes	Yes	Yes	Yes	Yes
Year-month FE	Yes	Yes	Yes	Yes	Yes
Observations	118786	118786	118786	118786	118786
Adjusted R-squared	0.650	0.721	0.485	0.528	0.564

Table 5: Changes in the delinquency rate

This table reports the difference-in-difference regressions estimates for the policy effect on 30-day delinquency. Column 1 reports the average impact of the two policy rules, the CA treatment, and the combined MP+CA treatment. Column 2 shows the impact over time at each policy date for the combined MP+CA treatment. All treatment variables are defined in the period between January 2010 and December 2010 based on the credit card limits. The independent variables are the interactions between a treatment variable and a corresponding post-policy variable. All regressions control for consumer fixed effects and monthly time effects. The standard errors are clustered at the city×product level. The sample used in the regressions runs from January 2010 to February 2013.

Dep.Var.	30-day delinquency (1)	60-day delinquency (2)	30-day delinquency (3)	60-day delinquency (4)
CA * post	-0.0233***	-0.0043***	-0.0233***	-0.0043***
	(0.0017)	(0.0010)	(0.0017)	(0.0010)
(MP + CA) * post	-0.0741***	-0.0558***		
	(0.0048)	(0.0033)		
(MP + CA) * post-0m			-0.0669***	-0.0410***
			(0.0041)	(0.0030)
(MP + CA) * post-6m			-0.0737***	-0.0533***
			(0.0042)	(0.0031)
(MP + CA) * post-12m			-0.0768***	-0.0606***
			(0.0054)	(0.0035)
(MP + CA) * post-18m			-0.0774***	-0.0637***
			(0.0057)	(0.0037)
(MP + CA) * post-24m			-0.0790***	-0.0693***
			(0.0060)	(0.0038)
Individual FE	Yes	Yes	Yes	Yes
Year-month FE	Yes	Yes	Yes	Yes
Observations	13440334	13395291	13440334	13395291
Adjusted R-squared	0.239	0.313	0.239	0.313

Table 6: Discretionary vs. non-discretionary consumption

This table reports the difference-in-difference regressions estimates for the policy effect on credit card spending separated into discretionary and non-discretionary consumption. Non-discretionary consumption includes spending on food, hygiene and cosmetic products, healthcare products, and general groceries and spending in supermarkets. Discretionary spending includes categories such as travel, jewelry, entertainment, car rentals, hotel lodging, direct marketing sales, and miscellaneous expenses. This table reports the average impact of the two policy rules, the CA treatment, and the combined MP+CA treatment. All treatment variables are defined in the period between January 2010 and December 2010 based on the credit card limits. The independent variables are the interactions between a treatment variable and a corresponding post-policy variable. All regressions control for consumer fixed effects and monthly time effects. The standard errors are clustered at the city×product level. The sample used in the regressions runs from January 2010 to February 2013.

Dep.Var.	Discretionary	Non-Discretionary	Discretionary	Non-Discretionary
	(1)	(2)	(3)	(4)
CA * post	-91.1159***	-16.4859***	-91.1159***	-16.4859***
	(6.1245)	(1.6940)	(6.1245)	(1.6940)
(MP + CA) * post	-87.3909***	-16.1149***		
	(10.1245)	(2.1797)		
(MP + CA) * post-0m			-44.6833***	-10.1284***
			(5.1009)	(1.4845)
(MP + CA) * post-6m			-38.3399***	-6.5253***
			(5.6419)	(1.6639)
(MP + CA) * post-12m			-116.6352***	-19.4420***
			(13.9664)	(3.0267)
(MP + CA) * post-18m			-134.0831***	-24.3757***
			(15.4515)	(3.4661)
(MP + CA) * post-24m			-134.8571***	-28.0796***
			(17.7647)	(3.4523)
Individual FE	Yes	Yes	Yes	Yes
Year-month FE	Yes	Yes	Yes	Yes
Observations	13440334	13440334	13440334	13440334
Adjusted R-squared	0.392	0.277	0.392	0.277

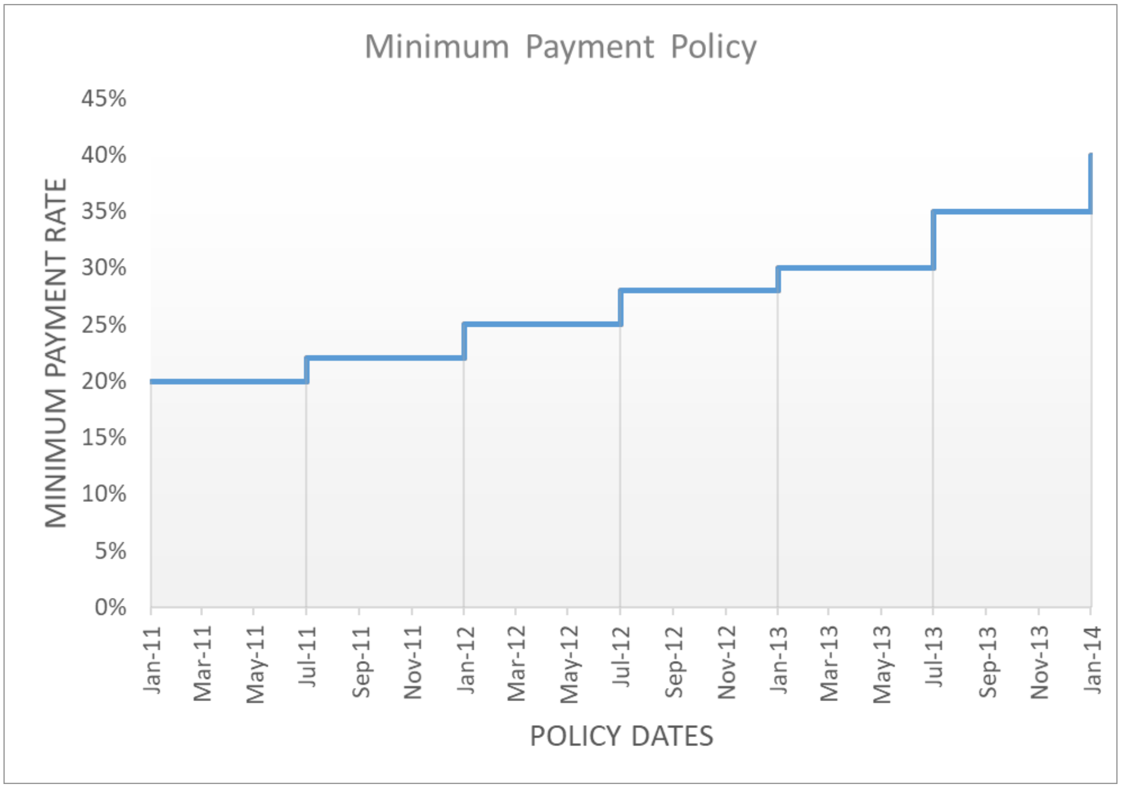
Table 7: Consumption response: revolvers vs non-revolvers

This table reports the difference-in-difference regressions estimates for the policy effect on credit card spending for revolvers and non-revolvers. Revolvers are defined as consumers that roll over their debt at least once between January 2010 and December 2010 (12 months), or between January 2011 and June 2011 (6 months). Non-revolvers pay in full in the same periods, respectively. We report the average policy impact of the CA treatment, and dynamic impact for the combined MP+CA treatment. All treatment variables are defined between January 2010 and December 2010 based on credit card limits. The independent variables are the interactions between a treatment variable and a corresponding post-policy variable. All regressions control for consumer fixed effects and monthly time effects. The standard errors are clustered at the city×product level. The sample used in the regressions runs from January 2010 to February 2013.

	12 months before policy		6 months before policy	
Panel A	Non-revolver	Revolver	Non-revolver	Revolver
Dep.Var.	Spending	Spending	Spending	Spending
	(1)	(2)	(3)	(4)
CA * post	-103.4959***	-168.4234***	-86.7494***	-113.8167***
	(6.9666)	(14.8635)	(5.8132)	(10.4560)
(MP + CA) * post	-62.9339***	-149.0823***	-51.0765***	-81.2861***
	(14.0745)	(14.9994)	(18.5219)	(11.8580)
Individual FE	Yes	Yes	Yes	Yes
Year-month FE	Yes	Yes	Yes	Yes
Observations	11568340	1871994	8648534	3135304
Adjusted R-squared	0.569	0.543	0.568	0.549

	12 months before policy		6 months before policy	
Panel B	Non-revolver	Revolver	Non-revolver	Revolver
Dep.Var.	Spending	Spending	Spending	Spending
	(1)	(2)	(3)	(4)
CA * post	-103.4959***	-168.4234***	-86.7494***	-113.8167***
	(6.9666)	(14.8635)	(5.8132)	(10.4560)
(MP + CA) * post-0m	-38.0504***	-141.7859***	-19.1625**	-72.9439***
	(8.7068)	(14.4195)	(9.4986)	(10.4105)
(MP + CA) * post-6m	-32.6003***	-146.3931***	-22.6670	-76.2905***
	(12.2185)	(15.1218)	(15.8153)	(11.7346)
(MP + CA) * post-12m	-61.8210***	-156.5158***	-46.0708**	-86.0679***
	(17.0283)	(15.6823)	(21.2122)	(12.6570)
(MP + CA) * post-18m	-101.0685***	-151.4467***	-94.2379***	-86.8555***
	(22.7634)	(15.8696)	(29.3959)	(13.2433)
(MP + CA) * post-24m	-117.5196***	-149.6456***	-117.5801***	-90.2461***
	(28.7192)	(15.8182)	(39.0952)	(13.6020)
Individual FE	Yes	Yes	Yes	Yes
Year-month FE	Yes	Yes	Yes	Yes
Observations	11568340	1871994	8648534	3135304
Adjusted R-squared	0.569	0.543	0.568	0.549

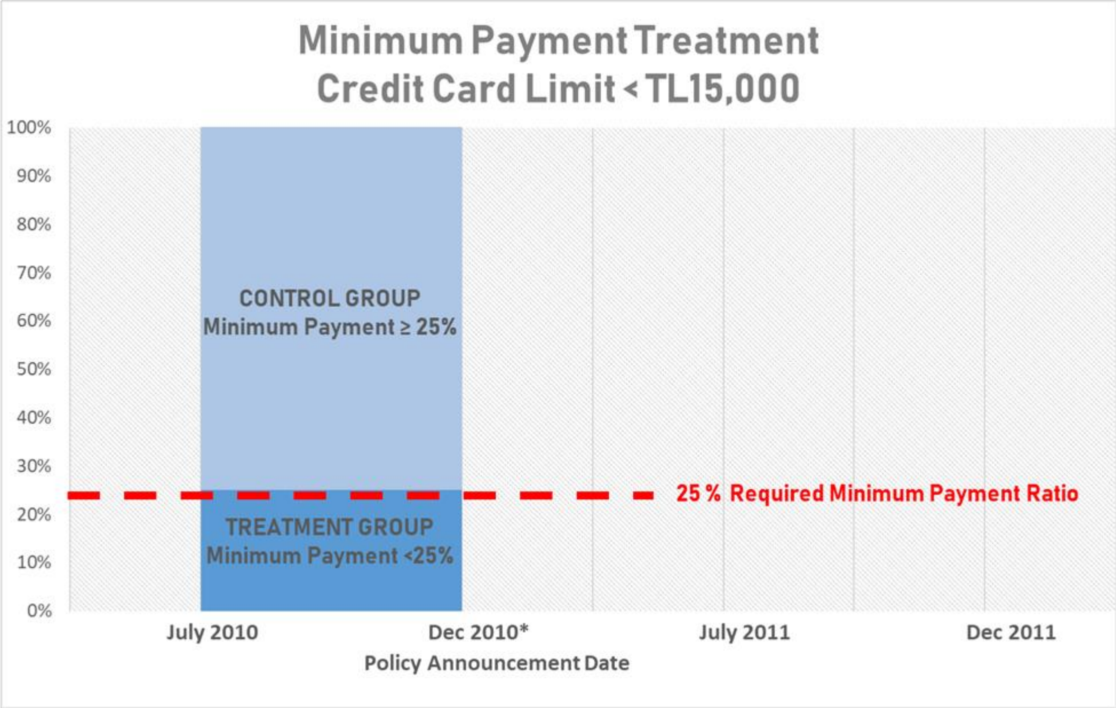
Figure 1: Minimum payment policy: changes in minimum payment over time



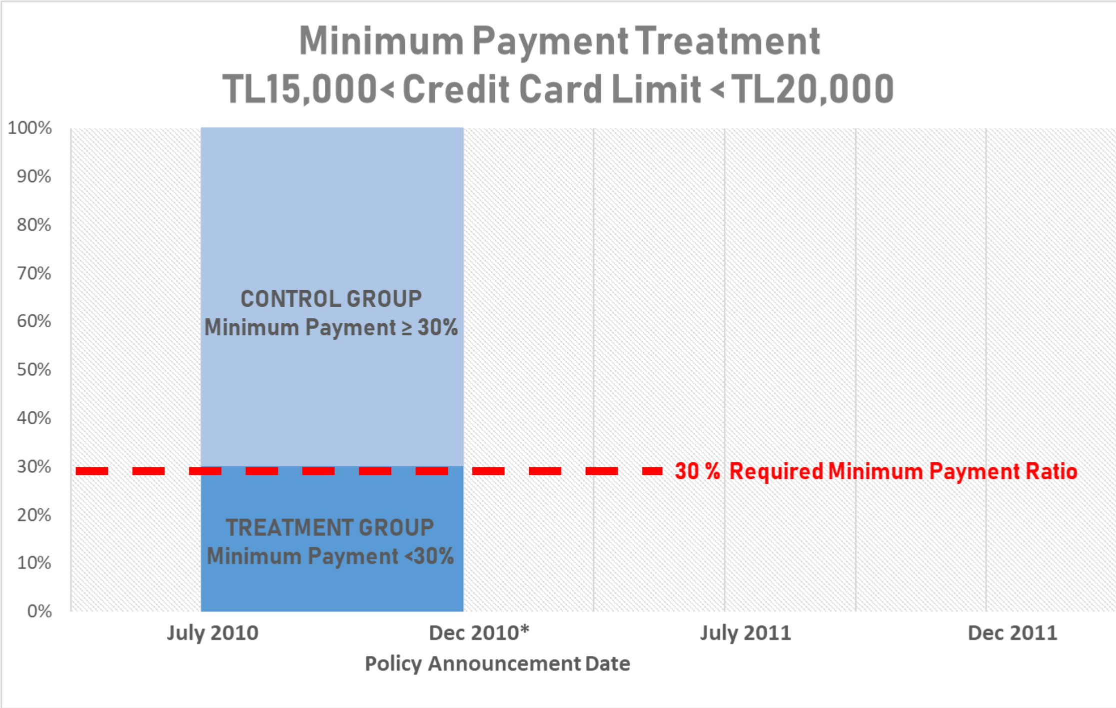
Notes: This figure presents the progression of required minimum payment ratio after the implementation of BRSA's policy. The minimum payment ratio was increased every six months starting in July 2011 until it reached 40% in January 2014 for credit card holders with limits of TL20,000 or more. The resulting minimum payment ratio for accounts with credit card limits less than $20,000 was capped at a level lower than 40%, depending on the credit card limit bracket they are in. Details are provided in Table A.1.

Figure 2: Treatment vs control

Panel A

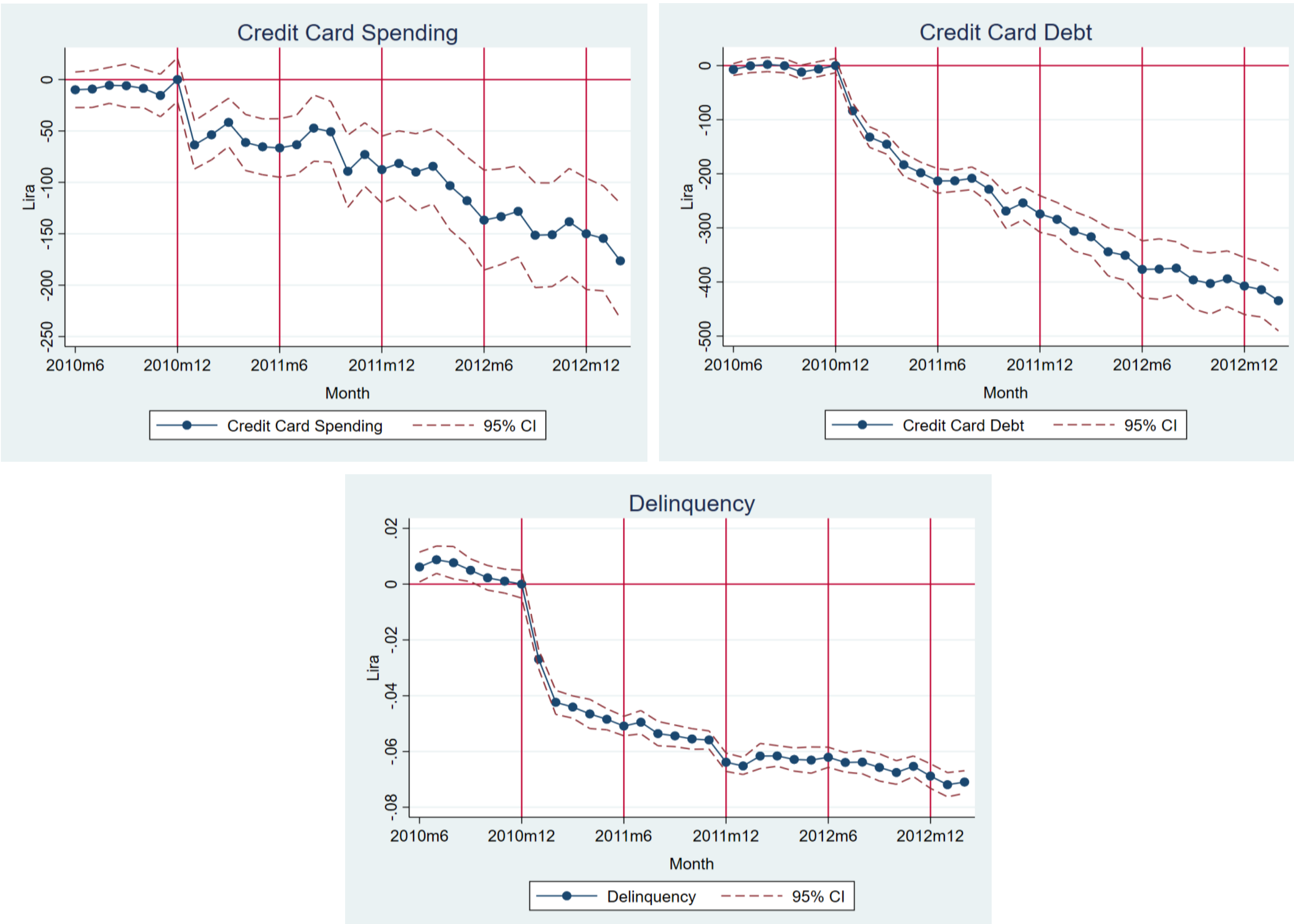


Panel B



Notes: This figure illustrates the definition of treatment and control groups. Panel A depicts the treatment and control for consumers with credit card limit less than TL15,000. Panel B depicts the treatment and control for consumers with credit card limit between TL15,000 and TL20,000. The two groups are defined based on the likelihood to be treated in the twelve months before the policy announcement rather than actual treatment which occurs after the policy. The two groups remain fixed and are independent of the actual treatment after the policy announcement.

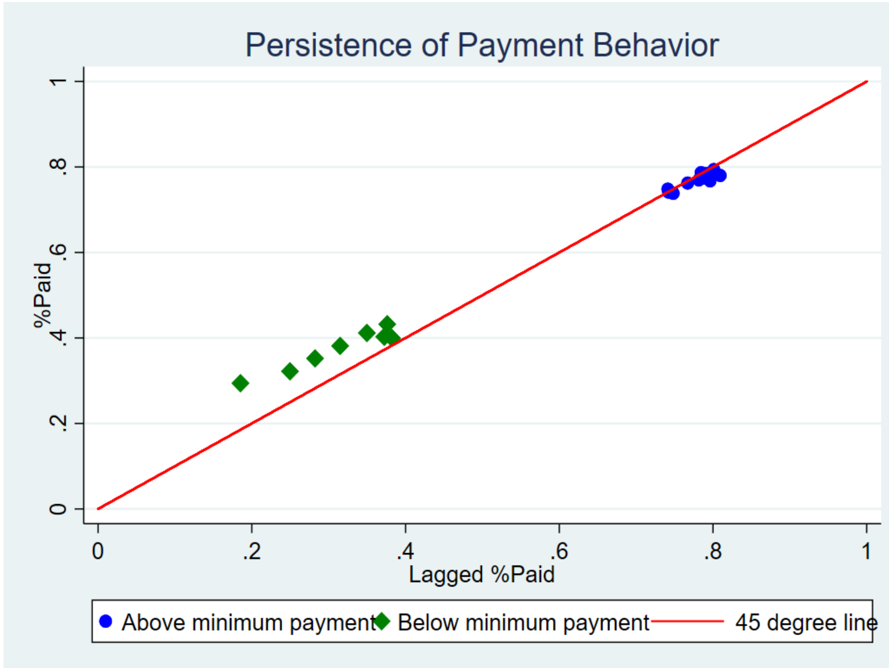
Figure 3: Policy effect on credit card spending, debt, and 30-day delinquencies: Event study estimates



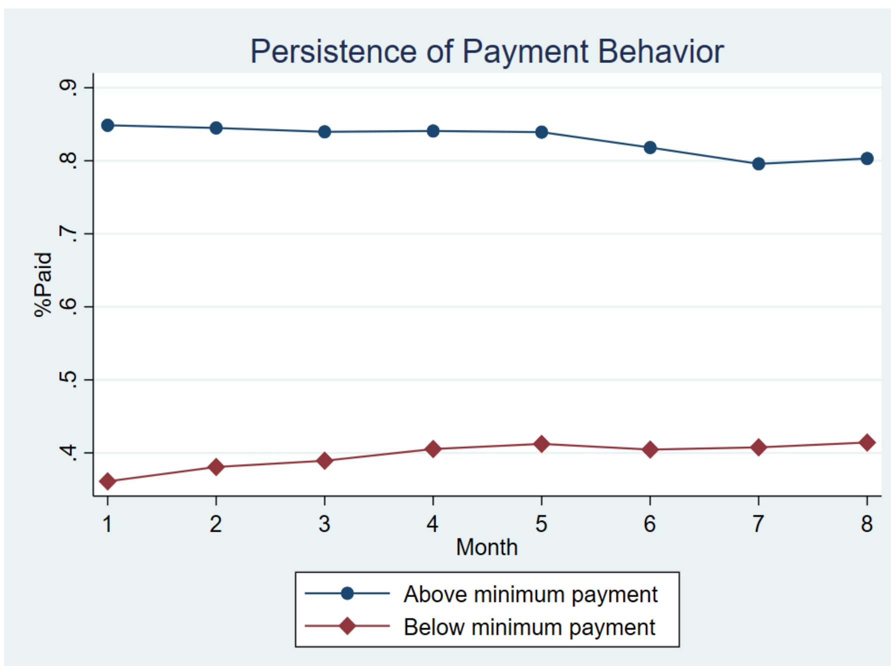
Notes: Top left figure presents the event-study type analysis depicting the difference in credit card spending between the treatment and the control groups before and after the policy announcement in December 2010. All months after '2010m12' depict the change in credit card spending between the treatment and the control group that can be attributable to the policy announcement. Top right figure similarly shows the event study estimates for the difference in credit card debt between the treatment and the control group. The bottom figure shows the event-study estimates for the difference in the proportion of 30-day delinquencies between the treatment and the control group before and after the policy announcement. The dots show the estimated coefficients and the bars striking through them show the 95% confidence intervals.

Figure 4: Persistence in payment behavior

Panel A



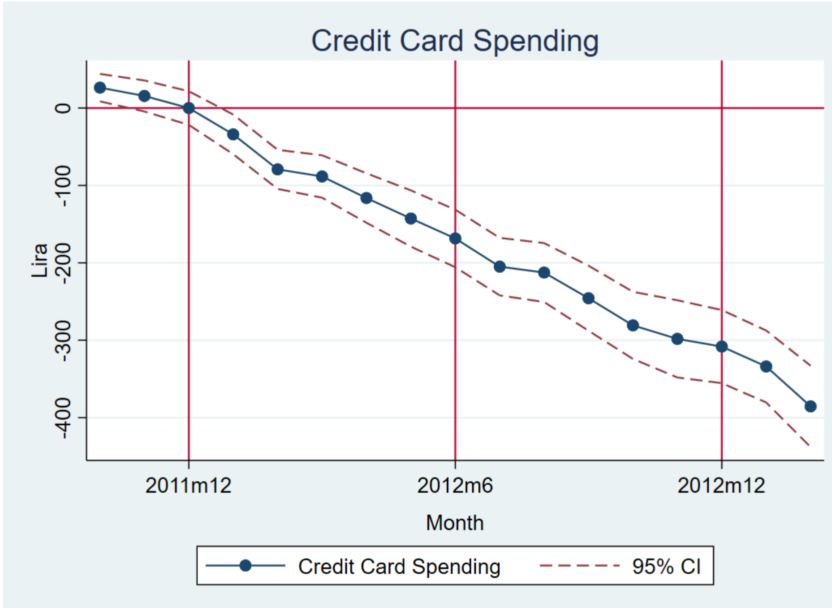
Panel B



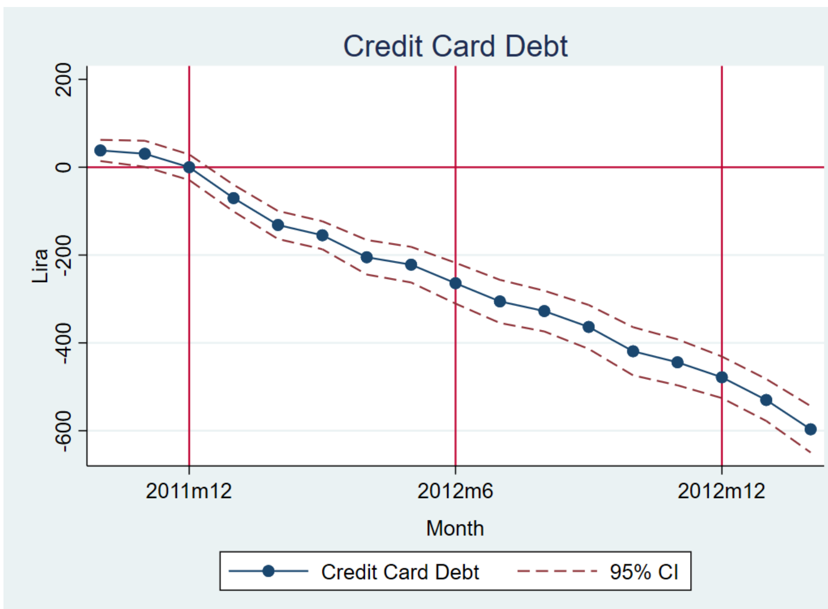
Notes: This figure shows the persistence in payment behavior for low payers and high payers before the policy announcement in December 2010. Panel A compares the relationship between payment behavior in the current and the previous month. The green cluster on the left shows the low-payers (treatment group), and the blue cluster on the right shows the high-payers (control group). Panel B shows persistence in payment for eight subsequent months for the low and the high payers. The red line on the bottom depicts payment over time for the low payers (treatment group), and the top blue line shows the payment behavior for the high payers (control group). Low payments on average follow low payments, and high payments follow high payments; payment behavior is persistent.

Figure 5: MP treatment effect on credit card spending and debt

Panel A

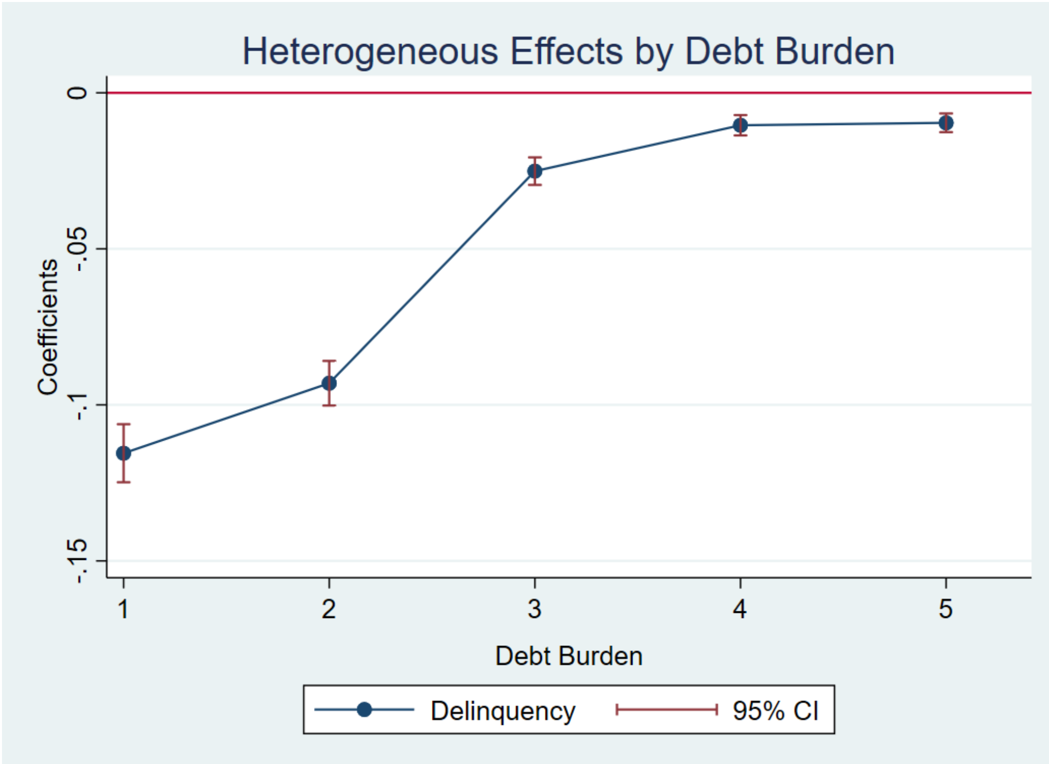


Panel B



Notes: The figure in Panel A presents the event-study type analysis depicting the difference in credit card spending between the treatment and the control groups before and after December 2011. The control group consists of only the new credit cards opened after the policy announcement that do not experience a change in the required minimum payment for an entire calendar year. As a result, the plotted difference-in-difference coefficients represent only the MP treatment effect. All months after '2011m12' depict the change in credit card spending between the treatment and the control group that can be attributable to the treatment. The figure in Panel B similarly shows the event study estimates for the difference in credit card debt between the treatment and the control group. The dots show the estimated coefficients and the bars striking through them show the 95% confidence interval.

Figure 6: Delinquency across debt burden quintiles



Notes: This figure shows the average change in the rate of delinquencies after the policy. The sample is divided into quintiles based on the individual's debt burden, measured as an unpaid credit card balance every month. The horizontal axis shows the debt burden quintiles, and the vertical axis shows the average change in the delinquency rates after the policy. The dots show the estimated delinquency rates and the bars striking through them show the 95% confidence intervals.

Figure 7: Sample credit card statement (personal and other information excluded)

HESAP BİLGİLERİ

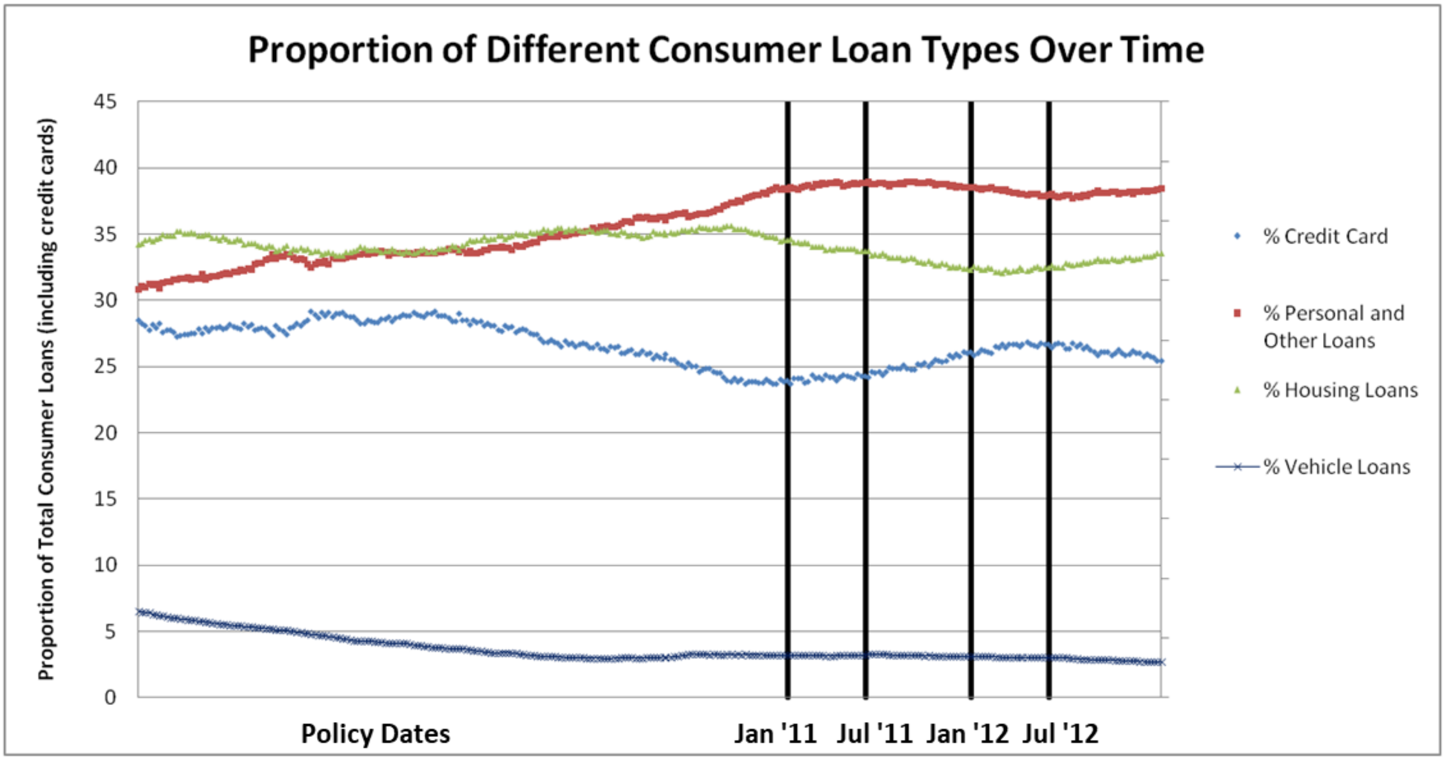
Hesap Kesim Tarihi	:27 Kasım 2013
Son Ödeme Tarihi	**:9 Aralık 2013**
Dönem Borcu	**:1.322,45 TL**
Ödenmesi Gereken Asgari Tutar/Oran	:330,61TL / 25%
Önceki Dönem Hesap Özeti Borcu	:1.357,15 TL
Dönem İçi Harcamalar	:1.322,45 TL
Dönem İçi Ödemeler	:+1.357,15 TL
Kalan Toplam Taksit Tutarı	:0,00 TL
Bir Sonraki Ay Hesap Kesim Tarihi	:27 Aralık 2013
Bir Sonraki Ay Son Ödeme Tarihi	:6 Ocak 2014
Müşteri Limiti	:13.000,00 TL
Kart Limiti	:3.000,00 TL
Nakit Çekim Limiti	:3.000,00 TL
Alışveriş Faiz Oranı	:2,02%
Nakit Çekim Faiz Oranı	:2,02%
Gecikme Faiz Oranı	:2,52%

ACCOUNT INFORMATION

Statement Date	:27 November 2013
Payment Due Date	**:9 December 2013**
Total Debt	**:1,322.45 TL**
Minimum Payment	:330.61 TL /25%
Total Debt on the Previous Statement	:1,357.15 TL
Total Spending	:1,322.45 TL
Total Payments	:+1,357.15 TL
Remaining Installments	:0.00 TL
Next Statement Date	:27 December 2013
Next Payment Due Date	:6 January 2014
Customer's Total Credit Card Limit	:13,000.00 TL
Credit Card Limit (Card on the Statement)	:3,000.00 TL
Cash Advance Limit	:3,000.00 TL
Interest charged on purchases	:2.02%
Interest charged for cash advances	:2.02%
Penalty rate	:2.52%

Notes: This figure presents an excerpt from a credit card statement from a major Turkish bank in Turkish and a translation in the accompanying table. It shows the current and the next statement dates, minimum payment amount and due date, as well as total spending, total debt, credit card limit and applicable interest rates and penalty rate. Minimum payment amount and date are shown in bold in the original statement with the intention to direct the account holder's attention to those two important pieces of information.

Figure 8: Proportion of main consumer loan types relative to total consumer loans and credit cards



Notes: This figure shows the proportions of four major consumer loan types for Turkey. Included are credit card loans, housing loans, vehicle loans, and personal and other loans. Black vertical lines represent the dates when the BRSA's policy mandates a hike in the required minimum payment ratios depending on consumers' credit card limit.

Appendix

A.1 Institutional background

As of December 2016, there were more than 58 million credit cards held by Turkey's 74 million citizens, making it the second largest credit card user in Europe. The explosive growth in the Turkish credit card market can be attributed to several factors. First, GDP per capita almost tripled between 2002 and 2010, and consumer spending accounts for 70% of Turkey's GDP[11]. Most of this increase in consumer spending was financed by debt, including personal loans, household loans, and credit cards. Household debt as a proportion of disposable income increased from 4.7% in 2002 to 50.4% in 2012[12]. Second, credit was and still is readily attainable in Turkey. Banks use aggressive marketing techniques including booths in crowded urban areas offering on-the-spot credit card approval. Further, credit card or personal loan applications were even made available on smartphones and at ATMs with instant approval response. The Turkish population financed their newfound prosperity with debt, thereby reducing their savings to historically low levels.

To further understand the Turkish credit card market, we compare some crucial elements between the Turkish and US markets. The structure of the minimum payment rules and penalty fees for late payment is quite different for Turkish and US credit cards. First, there is no floor in the Turkish case. That is, the minimum payment is defined as a percentage of outstanding credit card balance. Before December 2010, it was 20% across all credit card users but increased progressively to 40% after the new policy was implemented. The average minimum payment is much smaller in the US than in Turkey. Minimum payment in the US is typically between 1% and 4% of the balance. Second, penalty fees are also structured differently between the two markets. In the US, late payment penalties are usually fixed at $25 to $35, arguably quite high given that the minimum payment is on average less than $100. In Turkey, the late penalty fee depends on the rate set every quarter by the Central Bank of Turkey.

Panel A of Figure A.1 presents a chart of penalty rates over our sample period. Monthly penalty rates varied from 2.62% to 3.55%. Panel B shows the late payment penalty for different levels of monthly payment. Panel B was created assuming a minimum payment requirement of 20%. There are no late fees charged for payments of 20% or higher. However, for payments below 20%, the penalty is assessed as the difference between the minimum payment and the actual payment, multiplied by the penalty rate and adjusted for the number of days between the payment due date and next statement date. For example, consider the following scenario: credit card debt of TL3000, minimum payment rate of 20%, penalty rate of 3%, January 15 as the statement date, January 25 as the payment due date, February 15 as the next statement date, and the actual payment of TL300 made before the payment due date. The

[11] Central Bank of the Republic of Turkey; Turkish Statistical Institute
[12] Financial Stability Report, CBRT

late fee on the February 15 statement would be TL6 ([(600-300)*3%*20/30]). Similarly, with no payment, the penalty would be TL12. Of course, this is only the late payment fee, excluding the interest rate regularly charged for outstanding credit card balances. Table A.1 shows the calculation of all interest and penalty charges using the example above. In general, the late payment penalty is much lower in Turkey; however, regular interest charges are comparable to those in the United States.

Finally, the distribution of payment behavior is strikingly different in the two markets. Not more than 30% of credit card holders in the US can be classified as full payers, based on Agarwal et al. (2015). This is much lower than 80% of full payers in Turkey, based on the survey results of the Interbank Card Center (ICC), a centralized entity for clearing and settlement of all credit and debit card transactions in Turkey.

A.2 Robustness checks

We conduct several tests to check the robustness of our main results. First, we run the baseline regressions using the policy implementation instead of policy announcement as the alternative policy date. We find qualitatively identical, and quantitatively very similar results, shown in Table A.3. Second, we use an alternative definition of treatment to see if the results in Table 2 still hold (Table A.4). Here, the treatment group consists of consumers that pay below the minimum for at least three out of twelve months before the policy. Third, we use propensity score matching (PSM) to define the treatment and control variables (Table A.5). Fourth, we conduct a falsification test where we randomly assign individuals into treatment and control groups (Table A.6). Fifth, we separate the MP treatment into three categories to see if the results are driven by any specific group of within the treated consumers (Table A.7). The categories are based on the minimum payment ratio before the policy and include the following brackets: less than 20%, 20%-25%, and 25%-30% respectively. This test also provides additional insights into the difference in the spending and debt payment behavior of constrained and unconstrained consumers. Finally, we test if the primary results hold after we include full payers in our sample (Table A.8). All five tests provide strong support for our main findings and conclusions.

First, we repeat the analysis from Table 2, but use the policy implementation instead of policy announcement as the official start of the policy. In other words, the post-policy variable in our regressions is equal to 1 for months after June 2011 (instead of December 2010). The goal is to estimate consumption response following the implementation, ignoring the period before the policy announcement. The definition of this treatment variable is identical as in the baseline case except that it is measured using consumers' behavior in the six months before the policy implementation, i.e. between January 2011 and June 2011. Therefore, the pre-policy sample includes the period between January and June 2011 while the post-policy period starts in July 2011 and goes for the following twenty-four months. The results are reported in Table A.3. The regression coefficients confirm all the results in Table 2.

Both the spending and debt fall on average following the policy implementation and they decline more at each subsequent six-month interval. The coefficients are very similar in magnitude in most case, but there are some slight differences. Spending seems to decline more on average following the policy implementation than the policy announcement. Debt, on the other hand, declines more if post-announcement months are included. This effectively reveals that consumers started paying more debt right after the announcement, but only started reducing consumption after the policy was put into effect. This makes sense since changing consumption habits, especially if it involves a reduction, is always a difficult and undesirable task.

Second, we check our main results by using an alternative treatment definition. In this version, the treatment group consists of individuals that fail to make the minimum payment four or more times between January 2010 and December 2010. By extension, the control group includes consumers that pay the minimum at least three times in the same period. The results are shown in Table A.4. All the coefficients are very similar to the baseline results in Table 2. It shows that the main results in our paper are very robust to alternative definitions of the treatment variable, indicating that the decline in credit card spending and debt is a valid and firm empirical fact we establish in this paper.

Third, we use propensity score matching (PSM) to define the treatment and control variables in an alternative way. Using a multitude of demographic and credit-card related variables for PSM, we make sure that the treatment and controls groups are closely comparable. As a result, we reduce potential bias due to confounding variables in the original definition of our treatment and control. We use PSM to predict the likelihood of being treated by the policy overall, not by separate policy rules. For that reason, we only have one PSM-treatment definition, in contrast to having both CA and MP+CA treatments as in the original case. The results are shown in Table A.6. Panel A reports the average effect of the policy using the PSM-treatment, and Panel B looks at the dynamics of the policy impact. The results are qualitatively and quantitatively very similar to those in Table 2 and confirm our intuition about the policy effects. Most importantly, Table A.6 provides additional support regarding our definitions of the treatment and control groups; they robustly capture the policy effects even after controlling for differences in demographics and other credit card related variables.

Fourth, we conduct a falsification test where we randomly assign individuals into treatment and control groups. The cash advance rule treats around 27% of our sample (when full payers are excluded), and 13% are treated by both cash advance and minimum payment rules. Using these proportions, we randomly allocate consumers into the CA treatment, and the combined MP+CA treatment, respectively. We then run our baseline difference-in-difference regression using these random treatment assignments. A negative and significant relationship would raise the concern that simple spurious variation drives the documented impact of the policies. The results are shown in Table A.5.

None of the coefficients is statistically or economically significant. Thus, the results indicate that the identification of our main findings is not due to random variation.

Fifth, we separate MP treatment into three categories based on minimum payment ratios, namely less than 20%, 20-25%, and 25%-30%. We run the same difference-in-difference regressions as in Panel A of Table 2 for each of the three levels. The results are presented in Table A.7 show that any specific category does not drive the reduction in credit card spending and debt, but consumers reduce their spending and debt regardless of the specific minimum payment category they are in. All the coefficients are the order of magnitude we see in Table 2. However, it is interesting that the spending falls the most for the last category, but debt repayment is the highest for the second category, i.e. consumers with minimum payment ratio between 20%-25%. In other words, consumers with the highest minimum payment requirements reduce their consumption the most, but not necessarily their debt. This is consistent with the theory of consumption under liquidity constraints. The most constrained consumers reduce their consumption the most in order to break away from those constraints. Other treated consumers, although less constrained, also reduce their consumption proportional to the constraints they are facing.

Finally, we replicate those results including full payers and report the findings in Table A.8. The results are quantitatively and qualitatively very similar to the results using the baseline sample. In fact, the results are somewhat stronger when the full payers are included, indicating that our baseline sample is more conservative, but yields virtually identical results.

A.3 Heterogeneity in consumption response

In addition to the aggregate results, we study how BRSA's policy affects different consumer groups based on characteristics such as gender, age, marital status and occupation. We discuss the results here but report the tables in the appendix (Table A.9) for the sake of saving space.

We find that males, married individuals, as well as private-sector employees, have a consistently larger decline in spending and debt relative to females, singles, and public-sector employees respectively. On the other hand, delinquencies drop somewhat more for females, singles, and public-sector employees. Older consumers reduce their debt more, and their spending less than younger consumers. Delinquencies also drop somewhat more for younger individuals. The detailed results are shown in Panel A and B of Table A.9. The most drastic differences in credit card debt and spending are observed between the genders. The reduction of spending and debt for males is even more dramatic if we analyze these coefficients within the context of Turkish society. Male credit card holders constitute about 85% and married consumers about 83% of our sample. The fact that males and married consumers see a more substantial drop in consumption is not surprising as Turkey is still, by and large, a male-dominated society; men are the sole or primary breadwinners in the family.

Furthermore, in most cases, individuals with private sector jobs have higher employment uncertainty and more volatile income. The private sector has on average higher salaries than those in the public sector, but less job security, resulting in higher income sensitivity. The results we observe for the two employment categories are consistent with Agarwal et al. (2017), who study consumption response to a large unexpected interest rate hike in Turkey in 2014. They also find that consumers with less stable income and employment show a stronger effect on consumption and cash demand in response to this unexpected monetary policy shock. The differences in debt across all these characteristics seem to be more pronounced for the MP+CA treatment compared to the CA treatment. Overall, the policy seems to affect all consumers, regardless of their demographics, but the impact is marginally stronger for males, married individuals, and private-sector employees.

Table A.1: BRSA's schedule and minimum payment ratios for the first rule

This table reports the increases in the required minimum payment ratio based on consumers' credit card limits, as mandated by the policy. The first column shows the brackets for the credit card limit, while the second column shows the corresponding consecutive changes in the minimum payment ratio. The last column shows the range of months during which those consecutive changes are implemented and enforced.

Credit Card Limit	Minimum Payment	Date effective
Less than 5,000	20%	0-12 months after policy
	22%	12-24 months after policy
	25%	After 24 months
5,000 – 15,000	20%	0-6 months after policy
	22%	6-12 months after policy
	25%	After 12 months
15,000 – 20,000	20%	0-6 months after policy
	22%	6-12 months after policy
	25%	12-18 months after policy
	28%	18-24 months after policy
	30%	After 24 months
Greater than 20,000	20%	0-6 months after policy
	22%	6-12 months after policy
	25%	12-18 months after policy
	28%	18-24 months after policy
	30%	24-30 months after policy
	35%	30-36 months after policy
	40%	After 36 months

Table A.2: Examples of interest and late payment charges before and after the BRSA's policy implementation

Assumptions:

- Monthly interest rate =5%
- Monthly late payment rate = 5%
- Minimum payment rate = 20% (before policy); 40% (after policy)
- Purchase made on 10th day in the cycle (20 days remaining to the next cycle)
- Credit card balance = TL 5000

Before Policy	After Policy
Example 1: Minimum payment = TL5000*20% = TL1000 Actual payment made = TL300 Difference between actual and minimum = TL 700	Minimum payment = TL5000*40% = TL2000 Actual payment made = TL300 Difference between actual and minimum = TL 1700
Late payment fee = 700TL * 5%*20/30= TL 23.33 Interest charges (1) = (TL5000-TL300)*5%*10/30 = TL 78.33 Interest charges (2) = (TL5000-TL1000)*5%*20/30 = TL 133.33	**Late payment fee = 1700TL * 5%*20/30= TL 56.67** Interest charges (1) = (TL5000-TL300)*5%*10/30 = TL 78.33 Interest charges (2) = (TL5000-TL2000)*5%*20/30 = TL 100
Total Interest and Penalty = TL23.33+TL78.33 + TL133.33= TL235	***Total Interest and Penalty = TL56.67+TL78.33 + TL100= TL235***
Example 2: Minimum payment = TL5000*20% = TL1000 Actual payment made = TL1000 Difference between actual and minimum = TL 0	Minimum payment = TL5000*40% = TL2000 Actual payment made = TL2000 Difference between actual and minimum = TL 0
Late payment fee = 0TL * 5%*20/30 = TL 0 Interest charges (1) = (TL5000-TL1000)*5%*10/30 = TL66.67 Interest charges (2) = (TL5000-TL1000)*5%*20/30 = TL133.33	***Late payment fee = 0TL * 5%*20/30 = TL 0*** Interest charges (1) = (TL5000-TL2000)*5%*10/30 = TL50 Interest charges (2) = (TL5000-TL2000)*5%*20/30 = TL100
Total Interest and Penalty = TL0+TL66.67+TL133.33= TL200	***Total Interest and Penalty = TL0+TL50+TL100= TL150***
Example 3: Minimum payment = TL5000*20% = TL1000 Actual payment made = TL0 Difference between actual and minimum = TL1000	Minimum payment = TL5000*40% = TL2000 Actual payment made = TL0 Difference between actual and minimum = TL2000
Late payment fee = 1000TL * 5%*20/30 = TL33.33 Interest charges (1)= (TL5000-TL0)*5%*10/30 = TL83.33 Interest charges (2) = (TL5000-TL1000)*5%*20/30 = TL133.33	***Late payment fee = 2000TL * 5%*20/30 = TL66.67*** Interest charges (1) = (TL5000-TL0)*5%*10/30 = TL83.33 Interest charges (2) = (TL5000-TL2000)*5%*20/30 = TL100
Total Interest and Penalty = TL33.33+TL83.33+TL133.33= TL250	***Total Interest and Penalty = TL66.67+TL83.33+TL100= TL250***

Table A.3: Spending and debt response to policy implementation

This table reports the difference-in-difference regressions estimates for the policy effect on credit card spending and debt. We report the estimates for spending, total debt, the proportion of debt paid, interest charges, and penalty, respectively. Panel A reports the average impact of the two policy rules, the CA treatment, and the combined CA+MP treatment. Panel B shows the impact over time at each policy date for the combined MP+CA treatment. All treatment variables are defined in the period between January 2011 and June 2011 based on the credit card limits. The independent variables are the interactions between a treatment variable and a corresponding post-policy variable. All regressions control for consumer fixed effects and monthly time effects. The standard errors are clustered at the city×product level. The sample used in the regressions runs from January 2010 to February 2013.

Panel A

Dep.Var.	Spending	Debt	% Paid	Interest	Penalty
	(1)	(2)	(3)	(4)	(5)
CA * post	-106.3103***	-110.7679***	0.0401***	-0.9838***	-0.4199**
	(9.5115)	(10.6269)	(0.0012)	(0.0448)	(0.1663)
(MP + CA) * post	-124.3417***	-174.9723***	0.0624***	-2.7465***	-7.5367***
	(13.9998)	(17.9677)	(0.0021)	(0.1508)	(0.4923)
Individual FE	Yes	Yes	Yes	Yes	Yes
Year-month FE	Yes	Yes	Yes	Yes	Yes
Observations	13440334	13440334	13440334	13440334	13440334
Adjusted R-squared	0.500	0.637	0.424	0.483	0.567

Panel B

Dep.Var.	Spending	Debt	% Paid	Interest	Penalty
	(1)	(2)	(3)	(4)	(5)
CA * post	-106.3103***	-110.7679***	0.0401***	-0.9838***	-0.4199**
	(9.5115)	(10.6269)	(0.0012)	(0.0448)	(0.1663)
(MP + CA) * post-6m	-106.3754***	-49.2398***	-0.0071***	-1.5051***	2.3841***
	(10.5688)	(7.8383)	(0.0025)	(0.0899)	(0.2616)
(MP + CA) * post-12m	-111.2697***	-181.0990***	0.0697***	-2.6874***	-9.2083***
	(13.6377)	(18.5330)	(0.0023)	(0.1507)	(0.5802)
(MP + CA) * post-18m	-145.7578***	-252.4972***	0.1053***	-3.6061***	-13.2643***
	(16.5431)	(24.7365)	(0.0022)	(0.2103)	(0.7923)
(MP + CA) * post-24m	-153.2081***	-301.2152***	0.1202***	-4.0686***	-15.1015***
	(18.8485)	(28.9156)	(0.0026)	(0.2148)	(0.8064)
Individual FE	Yes	Yes	Yes	Yes	Yes
Year-month FE	Yes	Yes	Yes	Yes	Yes
Observations	13440334	13440334	13440334	13440334	13440334
Adjusted R-squared	0.500	0.637	0.425	0.483	0.567

Table A.4: Alternative MP-treatment definition

This table reports the difference-in-difference regressions estimates for the policy effect on credit card spending and debt, using an alternative definition of the MP treatment. We report the estimates for spending, total debt, the proportion of debt paid, interest charges, and penalty, respectively. The table reports the average impact of the two policy rules, the CA treatment, and the combined MP+CA treatment. MP treatment variable is equal to 1 if a consumer pays below the minimum more than three times between January 2010 and December 2010. The required minimum payment is defined in the policy text based on the credit card limits. The independent variables are the interactions between a treatment variable and a corresponding post-policy variable. All regressions control for consumer fixed effects and monthly time effects. The standard errors are clustered at the city×product level. The sample used in the regressions runs from January 2010 to February 2013.

Dep.Var.	Spending	Debt	% Paid	Interest	Penalty
	(1)	(2)	(3)	(4)	(5)
CA * post	-99.7927***	-104.3608***	0.0778***	-2.2088***	-0.5172***
	(5.7098)	(5.3134)	(0.0022)	(0.0592)	(0.1880)
(MP + CA) * post	-117.9596***	-244.9960***	0.1779***	-5.9102***	-19.2715***
	(10.8811)	(14.7120)	(0.0024)	(0.2508)	(0.8951)
Individual FE	Yes	Yes	Yes	Yes	Yes
Year-month FE	Yes	Yes	Yes	Yes	Yes
Observations	13440334	13440334	13440334	13440334	13440334
Adjusted R-squared	0.569	0.638	0.431	0.486	0.571

Table A.5: Treatment assignment using propensity score matching

This table reports the difference-in-difference regressions estimates for the policy effect on credit card spending and debt when treatment is assigned using propensity score matching (PSM-treatment). We report the estimates for spending, total debt, the proportion of debt paid, interest charges, and penalty, respectively. Panel A reports the average impact of the PSM-treatment. Panel B shows the impact over time at each policy date for the PSM-treatment. We use cardholders' gender, age, education, marital status, city, job type, credit limit, card type, and card issuance month to predict participation in the treatment or control group. The independent variables are the interactions between a PSM-treatment variable and a corresponding post-policy variable. All regressions control for consumer fixed effects and monthly time effects. The standard errors are clustered at the city×product level. The sample used in the regressions runs from January 2010 to February 2013.

Panel A

Dep.Var.	Spending	Debt	% Paid	Interest	Penalty
	(1)	(2)	(3)	(4)	(5)
Treatment * post	-111.4649***	-195.2607***	0.1173***	-3.5957***	-10.1178***
	(7.1541)	(6.5519)	(0.0021)	(0.0865)	(0.2664)
Individual FE	Yes	Yes	Yes	Yes	Yes
Year-month FE	Yes	Yes	Yes	Yes	Yes
Observations	7801514	7801514	7801514	7801514	7801514
Adjusted R-squared	0.572	0.642	0.426	0.488	0.566

Panel B

Dep.Var.	Spending	Debt	% Paid	Interest	Penalty
	(1)	(2)	(3)	(4)	(5)
Treatment * post-6m	-59.8292***	-117.5081***	0.0932***	-3.5497***	-8.9784***
	(4.5333)	(3.9293)	(0.0020)	(0.1133)	(0.2827)
Treatment * post-12m	-97.1094***	-184.9470***	0.1181***	-3.3427***	-10.2315***
	(6.1815)	(6.1678)	(0.0024)	(0.0834)	(0.2926)
Treatment * post-18m	-152.9072***	-250.3628***	0.1331***	-3.7760***	-10.7506***
	(10.8292)	(9.5499)	(0.0020)	(0.1027)	(0.3118)
Treatment * post-24m	-185.1120***	-294.1531***	0.1394***	-3.9522***	-11.2963***
	(12.2629)	(12.4853)	(0.0023)	(0.1036)	(0.3094)
Individual FE	Yes	Yes	Yes	Yes	Yes
Year-month FE	Yes	Yes	Yes	Yes	Yes
Observations	7801514	7801514	7801514	7801514	7801514
Adjusted R-squared	0.572	0.642	0.426	0.488	0.566

Table A.6: Falsification test: random treatment assignment

This table reports the difference-in-difference regressions estimates for the policy effect on credit card spending and debt when CA and combined MP + CA treatments are randomly assigned. We report the estimates for spending, total debt, the proportion of debt paid, interest charges, and penalty, respectively. Panel A reports the average impact of the two random treatment assignments, respectively. Panel B shows the impact over time at each policy date for the randomly assigned combined MP + CA treatment. All random treatment variables are defined in the period between January 2010 and December 2010 based on credit card limits and maintaining the sample proportions of the CA and combined MP + CA treatments, respectively. The independent variables are the interactions between a random treatment variable and a corresponding post-policy variable. All regressions control for consumer fixed effects and monthly time effects. The standard errors are clustered at the city×product level. The sample used in the regressions runs from January 2010 to February 2013.

Dep.Var.	Spending	Debt	% Paid	Interest	Penalty
	(1)	(2)	(3)	(4)	(5)
CA * post	0.3374	-0.1150	-0.0000	0.0116	0.1337
	(2.3724)	(2.7230)	(0.0007)	(0.0413)	(0.1256)
(MP + CA) * post	-4.9528	-1.2590	0.0006	0.0537	0.1820
	(5.1644)	(6.2773)	(0.0013)	(0.0727)	(0.2558)
Individual FE	Yes	Yes	Yes	Yes	Yes
Year-month FE	Yes	Yes	Yes	Yes	Yes
Observations	13440334	13440334	13440334	13440334	13440334
Adjusted R-squared	0.569	0.637	0.423	0.482	0.566

Table A.7: MP Treatment categories – different minimum payment ratios

This table reports the difference-in-difference regressions estimates for the policy effect on credit card spending separating the MP-treatment into three categories. The categories are based on the minimum payment ratios, namely less than 20%, 20-25% and 25-30%. We report the estimates for spending, total debt, the proportion of debt paid, interest charges, and penalty, respectively. All treatment variables are defined in the period between January 2010 and December 2010 based on the credit card limits. The independent variables are the interactions between a treatment variable and a corresponding post-policy variable. All regressions control for consumer fixed effects and monthly time effects. The standard errors are clustered at the city×product level. The sample used in the regressions runs from January 2010 to February 2013.

Dep.Var.	Spending	Debt	% Paid	Interest	Penalty
	(1)	(2)	(3)	(4)	(5)
MP_20%*post	-45.3517***	-148.5143***	0.2792***	-5.4769***	-28.6736***
	(14.5748)	(20.0951)	(0.0053)	(0.3605)	(1.7973)
MP_25%*post	-77.8543***	-247.3106***	0.1800***	-8.0928***	-36.3096***
	(12.1141)	(18.0506)	(0.0023)	(0.3993)	(1.6277)
MP_30%*post	-83.4142***	-221.4570***	0.1768***	-6.5108***	-22.3313***
	(10.8427)	(15.9823)	(0.0017)	(0.3311)	(1.1567)
Individual FE	Yes	Yes	Yes	Yes	Yes
Year-month FE	Yes	Yes	Yes	Yes	Yes
Observations	13440334	13440334	13440334	13440334	13440334
Adjusted R-squared	0.569	0.637	0.428	0.485	0.572

Table A.8: Consumption response including full payers

This table reports the difference-in-difference regressions estimates for the policy effect on credit card spending and debt including full payers. We report the estimates for spending, total debt, the proportion of debt paid, interest charges, and penalty, respectively. Panel A reports the average impact of the two policy rules, the CA treatment, and the combined MP+CA treatment. Panel B shows the impact over time at each policy date for the combined MP+CA treatment. All treatment variables are defined in the period between January 2010 and December 2010 based on the credit card limits. The independent variables are the interactions between a treatment variable and a corresponding post-policy variable. All regressions control for consumer fixed effects and monthly time effects. The standard errors are clustered at the city×product level. The sample used in the regressions runs from January 2010 to February 2013.

Panel A

Dep.Var.	Spending	Debt	% Paid	Interest	Penalty
	(1)	(2)	(3)	(6)	(7)
CA * post	-142.4069***	-185.2083***	0.1150***	-3.0761***	-5.1968***
	(7.0478)	(6.3696)	(0.0032)	(0.0743)	(0.1310)
(MP + CA) * post	-140.7356***	-309.3298***	0.2489***	-8.5697***	-36.1498***
	(11.8776)	(16.1640)	(0.0057)	(0.3644)	(1.5646)
Individual FE	Yes	Yes	Yes	Yes	Yes
Year-month FE	Yes	Yes	Yes	Yes	Yes
Observations	22057514	22057514	22057514	22057514	22057514
Adjusted R-squared	0.538	0.596	0.449	0.431	0.555

Panel B

Dep.Var.	Spending	Debt	% Paid	Interest	Penalty
	(1)	(2)	(3)	(6)	(7)
CA * post	-142.4069***	-185.2083***	0.1150***	-3.0761***	-5.1968***
	(7.0478)	(6.3696)	(0.0032)	(0.0743)	(0.1310)
(MP + CA) * post-0m	-87.7532***	-161.2694***	0.1656***	-6.8388***	-20.7596***
	(5.0987)	(6.9647)	(0.0053)	(0.2855)	(0.8038)
(MP + CA) * post-6m	-108.0766***	-257.5593***	0.2345***	-8.7443***	-35.5222***
	(8.8453)	(12.3503)	(0.0061)	(0.3908)	(1.5889)
(MP + CA) * post-12m	-144.3441***	-348.5359***	0.2763***	-8.8614***	-41.5911***
	(13.1900)	(18.9228)	(0.0061)	(0.3860)	(1.8176)
(MP + CA) * post-18m	-196.0187***	-420.9149***	0.2993***	-9.4744***	-43.8716***
	(18.6846)	(25.5363)	(0.0058)	(0.4092)	(2.0182)
(MP + CA) * post-24m	-220.9842***	-456.4489***	0.3090***	-9.6492***	-44.7139***
	(20.3608)	(25.1986)	(0.0059)	(0.3741)	(1.9112)
Individual FE	Yes	Yes	Yes	Yes	Yes
Year-month FE	Yes	Yes	Yes	Yes	Yes
Observations	22057514	22057514	22057514	22057514	22057514
Adjusted R-squared	0.538	0.596	0.449	0.431	0.556

Table A.9: Heterogeneity in consumption response

This table reports the difference-in-difference regressions estimates for the policy effects. Panel A-B reports the estimates for credit card spending and total debt across different consumer groups separated based on gender, age, marital status, and occupation, respectively. All panels report the average impact of the two policy rules, the CA treatment, and the combined MP+CA treatment. All treatment variables are defined in the period between January 2010 and December 2010 based on credit card limits. The independent variables are the interactions between a treatment variable and a corresponding post-policy variable. All regressions control for consumer fixed effects and monthly time effects. The standard errors are clustered at the city×product level. The sample used in the regressions runs from January 2010 to February 2013.

Panel A: Gender and Age	Female			Male		
Dep.Var.	Spending	Debt	30-day delinquency	Spending	Debt	30-day delinquency
	(1)	(2)	(3)	(4)	(5)	(6)
CA * post	-48.7542***	-86.1924***	-0.0323***	-116.0569***	-167.5213***	-0.0221***
	(5.7471)	(5.9143)	(0.0028)	(7.3651)	(7.3608)	(0.0016)
(MP + CA) * post	-32.1405***	-149.3193***	-0.0879***	-116.8276***	-301.5619***	-0.0723***
	(8.6803)	(10.2752)	(0.0062)	(12.2630)	(17.7923)	(0.0047)
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes
Year-month FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1684996	1684996	1684996	11724596	11724596	11724596
Adjusted R-squared	0.577	0.657	0.232	0.567	0.635	0.240

	Age <40			Age ≥40		
	Spending	Debt	30-day delinquency	Spending	Debt	30-day delinquency
	(1)	(2)	(3)	(4)	(5)	(6)
CA * post	-114.7316***	-157.6259***	-0.0273***	-103.6569***	-160.4517***	-0.0188***
	(8.6498)	(8.1190)	(0.0018)	(7.3065)	(8.0698)	(0.0019)
(MP + CA) * post	-115.9834***	-246.1361***	-0.0914***	-99.8750***	-310.5477***	-0.0609***
	(14.4120)	(18.3256)	(0.0058)	(11.3096)	(16.8082)	(0.0042)
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes
Year-month FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6785546	6785546	6785546	6654788	6654788	6654788
Adjusted R-squared	0.558	0.621	0.224	0.573	0.642	0.257

Panel B: Marital Status and Occupation	Single			Married		
Dep.Var.	Spending	Debt	30-day delinquency	Spending	Debt	30-day delinquency
	(1)	(2)	(3)	(4)	(5)	(6)
CA * post	-93.3657***	-141.6361***	-0.0328***	-112.0803***	-162.0149***	-0.0214***
	(10.0654)	(10.2886)	(0.0020)	(7.2427)	(7.2742)	(0.0017)
(MP + CA) * post	-90.0168***	-217.3468***	-0.0994***	-110.7338***	-297.6125***	-0.0693***
	(15.4700)	(18.9894)	(0.0043)	(11.9558)	(16.8147)	(0.0051)
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes
Year-month FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2336468	2336468	2336468	10937540	10937540	10937540
Adjusted R-squared	0.555	0.639	0.218	0.570	0.637	0.244

	Public Sector			Private Sector		
	Spending	Debt	30-day delinquency	Spending	Debt	30-day delinquency
	(1)	(2)	(3)	(4)	(5)	(6)
CA * post	-61.4373***	-118.9354***	-0.0321***	-147.8459***	-202.1096***	-0.0258***
	(9.8102)	(12.2186)	(0.0041)	(10.9688)	(9.4321)	(0.0020)
(MP + CA) * post	-51.2070***	-208.5524***	-0.1400***	-150.8048***	-350.8622***	-0.0749***
	(16.0995)	(30.9372)	(0.0168)	(16.4802)	(23.3699)	(0.0063)
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes
Year-month FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	314222	314222	314222	3731410	3731410	3731410
Adjusted R-squared	0.513	0.583	0.262	0.574	0.632	0.229

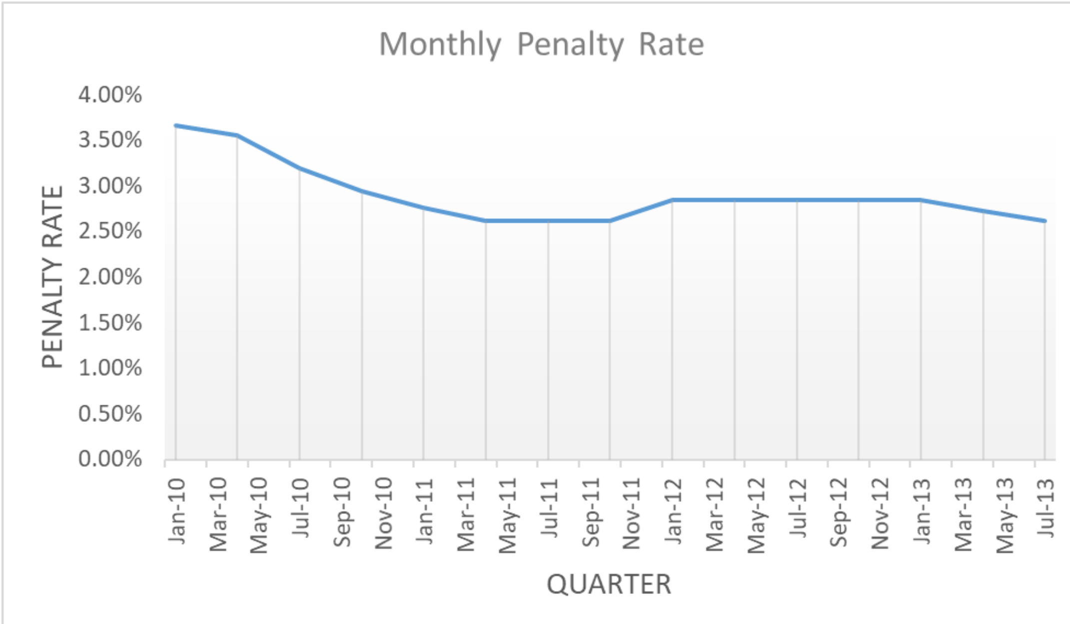
Table A.10 – Policy impact on payments at or below the minimum

This table reports the regressions estimates for the policy effect on credit card payment behavior. Specifically, we show the estimates for changes in the proportion of consumer that pay at or below minimum payment amount (P), respectively. Column 1 is based on a difference-in-difference regression and reports the average impact of the two policy rules, the CA treatment, and the combined MP+CA treatment. Column 2 also uses difference-in-difference regressions to show the impact over time at each policy date for combined MP+CA treatment. Column 3 employs a panel data regression to estimate the average change in the *P* measure for all new credit cards that experience a decrease in the minimum payment from 40% to 25%. All treatment variables are defined in the period between January 2010 and December 2010 based on the credit card limits. The independent variables in the first two columns are the interactions between a treatment variable and a corresponding post-policy variable. The independent variable in Column 3 is a dummy that takes a value of 1 in a month when the minimum payment ratio for a new credit card falls from 40% to 25%. All regressions control for consumer fixed effects and monthly time effects. The standard errors are clustered at the city×product level. The sample used in the regressions in Columns 1 and 2 runs from January 2010 to February 2013. The sample in Column 3 uses the six months before, and the six months after each new card's minimum payment decrease.

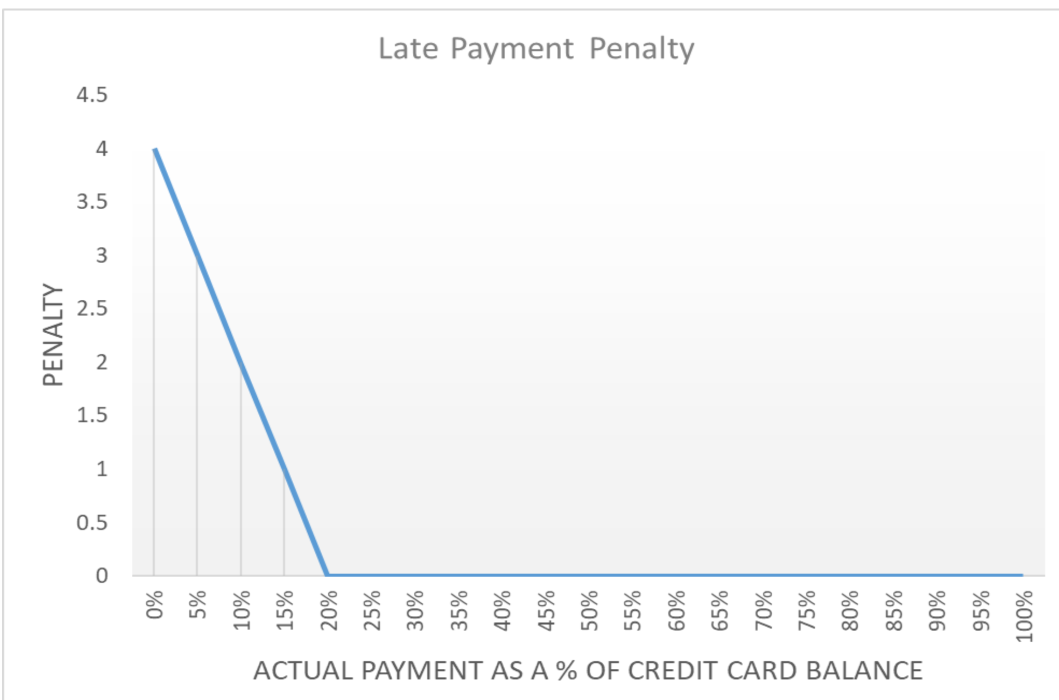
Dep.Var.	*P*	*P*	*P*
	(1)	(2)	(3)
CA * post	-0.0698***	-0.0698***	
	(0.0031)	(0.0031)	
(MP + CA) * post	-0.3074***		
	(0.0046)		
(MP + CA) * post-0m		-0.2115***	
		(0.0067)	
(MP + CA) * post-6m		-0.2740***	
		(0.0056)	
(MP + CA) * post-12m		-0.3269***	
		(0.0049)	
(MP + CA) * post-18m		-0.3594***	
		(0.0038)	
(MP + CA) * post-24m		-0.4804***	
		(0.0048)	
New Card - MP decrease			0.1060***
(panel regression)			(0.0078)
Individual FE	Yes	Yes	Yes
Year-month FE	Yes	Yes	Yes
Observations	13440334	13440334	118786
Adjusted R-squared	0.324	0.325	0.347

Figure A.1: Institutional setting: Penalty fees and monthly penalty rates

Panel A: Late payment penalty: changes in penalty rates over time



Panel B: Late payment penalty structure in Turkish credit cards



Notes: Panel A shows the time series of the monthly penalty rate for late credit card payments. The penalty rate is set by the Central Bank of Turkey every quarter. Panel B shows the amount the penalty charged before BRSA's policy for a given level of payment expressed as a proportion of outstanding credit card balance. The required minimum payment ratio before the policy was 20%. The penalty is charged only on the unpaid amount below the required minimum payment level. In this example the following assumptions were used: penalty rate = 3%; CC debt = 1000; actual payment = a range between 0TL and 200TL.