Collateral Value and Strategic Default: Evidence from Auto Loans

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Abstract

This paper identifies the link between collateral value and strategic default incentives. Using novel auto loan performance data, I exploit how unanticipated changes in vehicle import taxes and changes to loan-to-value restrictions impact borrowers strategic behavior incentives. These shocks affect the value of the underlying asset but are not related to underlying borrower characteristics or their ability to repay. Using a difference-in-difference strategy, I estimate that a 10% drop in the collateral value corresponds to a 44% increase in default rate. Consistent with the strategic default hypothesis, I also find a stronger effect for borrowers with higher outstanding loan balances and no significant impact on the prepayment rate.

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Introduction

Is there a causal link between collateral value and strategic default? A strategic default is a decision by borrowers to stop making payments, despite the ability to do so, to maximize their wealth. The answer to this question is of critical importance to policymakers when designing both ex-ante and ex-post interventions such as loan-to-value restrictions, stricter underwriting standards and loan modifications. Option-theoretic models of default suggest that, borrowers strategically default if the value of their collateral pledged to the lenders decreases below a crucial threshold (Foster and Van Order (1984), Kau et al. (1987) and Titman and Torous (1989)). However, due to countervailing non-financial factors, borrowers may choose to stay put even though their financial incentives suggest that the default is optimal[1]. Therefore whether collateral value affects the borrowers' default decision is a challenging empirical question and there has been no compelling empirical evidence on the causal effect of collateral value on strategic default due to confounding factors. Using policy induced variation in collateral value and rich auto loan microdata, this paper estimates the causal effect of collateral value on strategic default.

The greatest challenge of empirically identifying the effect of collateral value on default is finding a source of variation in collateral value that is otherwise uncorrelated with unobserved borrower characteristics (Guiso et al., 2013). To the extent these unobserved factors are correlated with the value of the collateral, failing to control for these factors can introduce omitted variable biases and preclude causal inference. In particular, failing to control for borrowers ability to pay will confound the identification of strategic defaults. While a decrease in collateral value may lead to more defaults, it is unclear whether this occurs because decreasing collateral values or because aggregate shocks to

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[1]Non-financial factors may include moral aversion to default (Bursztyn et al. (2015) and Guiso et al. (2013)), emotional attachment (Guiso et al. (2013),Bhutta et al. (2017)), fear over the perceived consequences of default (White (2010),Seiler et al. (2012)), people's subjective expectations (Kuhnen and Melzer, 2017), inattention (Andersen et al. (2015) and Agarwal et al. (2015)) and financial illiteracy(Burke and Mihaly (2012))

joint determinants–such as local demand shocks–of both collateral value and borrowers' ability to pay. Other unobservable factors such as credit quality and cost of default of the borrower–which are likely to be correlated with factors such as the type of collateral, level of maintenance and time of purchase–may inhibit the isolation of strategic defaults driven solely by changes in collateral value.

In this paper, I overcome the identification challenge by exploiting policy changes that varied import tax rates and maximum loan-to-value ratios in Sri Lanka[2]. These policy changes were unanticipated and affected the secondary market values of the vehicles pledged as collateral in the past. My identification strategy hinges on the notion that while these changes to the value impact borrowers' incentives to strategically default, those are not correlated with unobserved borrower characteristics or their ability to pay. Further, these changes only impacted the values of certain classes of vehicles and this allows me to use other similar types of vehicles as control samples in a difference-in-differences setting.

I divide my empirical analysis into two sections. First, I estimate the impact of change in collateral value on strategic default based on three unanticipated import tax rate changes during my sample period: reduction in import tax rate for cars with an engine capacity less than 1L (henceforth, smaller-engine cars) in November 2014, increase import tax rate for new 3-wheelers[3] in November 2015 and in April 2016. I find that, as expected, the decrease (increase) in import tax rates on smaller-engine cars (3-wheelers) led to a decrease (increase) in the secondary market price of used vehicles in affected category by increasing (decreasing) the relative demand for new vehicles. Using these tax rate changes as *treatments*, I apply the standard difference-in-difference methodology, using loan-month observations, to estimate the effect of the change in collateral value on default. I define as *treated* the loans to finance vehicle types affected by the tax rate changes, originated prior

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[2]Vehicle imports are taxed heavily in Sri Lanka and taxes are one-off and should be paid by the importer before the vehicle is cleared from the Sri Lanka Customs Department.

[3]These are also known as auto-rickshaws, tuk-tuks or trishaws. These are motorized vehicles with three wheels that are mainly used as taxis in Sri Lanka.

to the respective tax rate change. In the case of tax rate decrease on smaller-engine cars, I use small cars with engine capacity greater than 1L(henceforth, larger-engine cars) as the control sample. When analyzing the impact of the tax rate increases for 3-wheelers, to ensure that my control group is comparable, I construct matched samples using loans to finance other types of vehicles based on borrower characteristics and purpose. I expect, following the tax rate decrease, the default rate for smaller-engine car loans, originated prior to tax rate reduction, to increase relative to the default rate of larger-engine car loans. Similarly, default rate of 3-wheeler loans is expected to decrease following tax rate increases, relative to the control sample. Throughout, I include loan fixed effects to account for unobserved borrower characteristics and district-month fixed effects absorb any time-varying differences across borrowers at the district level.

The second setting is based on changes to loan-to-value ratio (LTV) restrictions. In Sri Lanka, all auto loans originated prior to 2017 were subject to a maximum LTV of 70%. In January 2017, the Central Bank of Sri Lanka revised the maximum LTVs applicable to auto loans that finance purchase of *new vehicles*. Maximum LTV applicable to all *used vehicle* loans remained unchanged at 70%. The changes to the maximum LTV were not uniform across vehicle types. The directive increased the maximum LTV for some types of vehicles and decreased it for certain other types of vehicles. For example the maximum LTV applicable to a loan to finance the purchase of a new truck was revised upwards to 90% and maximum LTV for a new car loan was revised downwards to 50%. As I show later in the paper, changes to maximum LTV for new vehicles affect the secondary market values of used vehicles. Consider cars, whose maximum LTV was reduced. This decrease in maximum LTV increases the down-payment required to purchase a new car and would force some of the borrowers who would have purchased a new car to the used vehicle market. The down-payment requirement for a used car would be much lower due to higher maximum LTV of 70% (as opposed to 50%) and lower valuations. As a result of the higher demand, the value of cars pledged as collateral before the reform will increase,

reducing the borrowers incentives to strategically default. Similarly, for the types of vehicles whose maximum LTV was increased, borrowers' incentives to strategically default would increase. In this setting, I use a generalized difference-in-differences approach with dummy variables indicating each vehicle type after new LTV rules came in to effect. Sample consists of loan-month observations surrounding the rule change and all the loans were originated prior to the rule change.

Using a large proprietary database of auto loan performance from a major non-bank financial institution in Sri Lanka, first I present evidence which supports the baseline hypothesis that policy changes outlined above have a significant impact on the secondary market values of assets already pledged as collateral. Next, I estimate the impact of these changes on default rate. I find strong evidence for the significant effect of collateral value changes on borrowers' default decisions. Default rate of borrowers who experienced a 10% drop (increase) in the collateral value following the tax changes increases (decreases) by 0.4% (0.4%). The unconditional probability of default prior to the tax change is 0.9% (1.7%) and the estimated effect corresponds to a 44% (24%) higher(lower) probability of default. Evidence from changes to LTVs presents similar effects of the collateral value on default. Default rates of vehicle types whose maximum LTV was reduced decreased, and vice versa.

Main threat to my identification is the violation of the parallel trends assumption. Parallel trends assumption for above tests is that default rates of different vehicle types would have trended similarly if there were no regulatory changes. Graphical evidence presented suggests that even though treatment and control groups differ in the absence of treatment, they move in parallel–providing support for the parallel trend assumption. Placebo tests that simulate the reforms at earlier dates confirm that the results are not driven by preexisting trends in different types of vehicles.

The second identification concern regards liquidity-constrained borrowers. In the case of smaller-engine cars, liquidity-constrained borrowers with positive equity would have

prepaid their loan in absence of a tax rate reduction. However, post-tax rate reduction, these borrowers may decide to default as their equity is no longer positive. In this case my results would be capturing the defaults driven by liquidity constraints. Similarly, in the case of 3-wheelers, some of the borrowers who would have defaulted otherwise, may prepay the loan because of the increased value of their collateral. Though this is a valid concern, it is likely to be mitigated by the fact that in Sri Lanka auto loan borrowers face a severe prepayment penalty, sometimes as high as 25% of the outstanding loan amount. In fact, during my sample period only 0.16% of the loans were prepaid. Nonetheless, I use difference-in-difference estimates to confirm that tax changes did not have a significant impact on the prepayments. Further, I find that effect of collateral value is stronger for borrowers with higher outstanding loan balance, which is also consistent with the strategic default hypothesis.

One final concern I address is equity extraction. If liquidity-constrained borrowers are able to extract their equity in the form of a secondary loan following the increases in collateral value, then my results would be picking up the impact of relaxed liquidity constraints. Detailed monthly level data allows me to track the total loan balance from month to month and I do not observe any increase in loan balance after value increases and regulations do not allow borrowers to use the same asset as the collateral for a secondary loan with another lender. In private conversations, management of the lender also confirmed that there were no equity extractions following the collateral value increases.

I contribute to the household finance literature by empirically identifying the effect of collateral value on strategic default. I present evidence that borrowers respond strategically to changes in collateral value via their default decision and this has policy implications not just in the auto loan market, but also in mortgage, student loan and credit card loan markets. Even though many papers demonstrate that default more likely ceteris paribus, for borrowers who experience a larger drop in collateral value, (e.g., Deng et al. (2000), Bajari et al. (2008), Foote et al. (2008), Scharlemann and Shore (2016))

a causal interpretation is not possible due to omitted variable bias. One notable exception is Palmer (2015). Using long-run regional variation in house-price cyclicality as an instrument for house price declines, he shows that the price declines causally explain disproportionate share of subprime defaults came from mortgages originated in 2006-2007. My paper also complements the literature of strategic default in general. A recent set of studies shows that borrowers strategically default in response to loan modifications (Mayer et al., 2014), foreclosure moratoriums (Artavanis and Spyridopoulos, 2018), bankruptcy exemptions and wage garnishments (Yannelis, 2017).

This paper also adds to the thin literature on determinants of auto loan default. Agarwal et al. (2008) and Agarwal et al. (2007) study the relationship between borrower consumption choices and future auto loan performance. Heitfield and Sabarwal (2004), Ghulam and Hill (2017) and Wu and Zhao (2016) look at the determinants of auto loan default.