

# Collateral Value and Strategic Default: Evidence from Auto Loans

Dimuthu Ratnadiwakara\*

July 9, 2018

## Abstract

Using novel auto loan performance data, I examine how unanticipated changes in vehicle import taxes and changes to loan-to-value restrictions impact borrowers' default behavior. These shocks affect the value of the underlying asset but are not correlated with unobserved factors that influence borrowers' default risk. 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 find that the collateral value has a stronger effect for borrowers with higher outstanding loan balances.

**JEL Classification:** D12, D14, G23

**Keywords:** Strategic Default, Collateral Value, Auto Loans

---

\*C. T. Bauer College of Business, University of Houston; email: dnratnadiwakara@uh.edu. I am extremely grateful to my advisor Vijay Yerramilli and committee members Praveen Kumar, Vikram Maheshri, and Kevin Roshak for valuable suggestions and support. For helpful comments and suggestions, I thank Don Carmichael, Serdar Dinc, Zack Liu, Paul Povel, Raul Susmel, Buvaneshwaran Venugopal, and seminar participants at the University of Houston's Department of Finance. Special thanks to the institution that provided the data for this project. In addition, I am grateful to Prasanna de Silva, Maduranga Jayasundara, Hemantha Kumara, March Perera, Niroshan Udage, Palitha Walkadagamage, and Ravi Yatawara for providing useful details on auto finance market in Sri Lanka. All errors are my own.

# Introduction

A strategic default is the decision by a borrower to stop making payments on a debt despite having the ability to make the payments. Economic theory predicts strategic default when the value of the collateral drops sufficiently (Hart and Moore, 1998; Hart, 2009; Titman and Torous, 1989; Campbell and Cocco, 2015). However, due to countervailing non-financial factors, borrowers may opt to continue repaying even when default is optimal (Bursztyn et al., 2015; Guiso et al., 2013; Bhutta et al., 2017).<sup>1</sup> Therefore, the extent to which the collateral value affects the borrowers’ default decision is an empirical question with implications in macroprudential policy and contract design.

Although many papers demonstrate that default is more likely, *ceteris paribus*, for a borrower who experiences a larger drop in collateral value (Deng et al., 2000; Bajari et al., 2008; Foote et al., 2008), a causal interpretation is not possible due to confounding factors. A number of omitted variables—such as local economic conditions, borrowers’ discount rate, and borrowers’ cost of default—can be correlated with both the collateral value and borrowers’ default risk. As such, failure to control for these factors can introduce omitted variable biases that preclude causal inference.

In this paper, I isolate the collateral value channel in borrowers’ default decision by exploiting several policy changes that generated plausibly exogenous variation in the secondary market value of vehicles already pledged as collateral for auto loans in Sri Lanka. My identification strategy hinges on the notion that while these variations in the collateral value impact borrowers’ incentives to strategically default, those are not correlated with unobserved factors that influence borrowers’ default risk. Another feature of these policy changes is that they impacted certain classes of vehicles only, allowing me to use comparable unaffected vehicle types as control samples in a difference-in-difference

---

<sup>1</sup>Non-financial factors may include moral aversion to default (Bursztyn et al., 2015; 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; Agarwal et al., 2015) and financial illiteracy (Burke and Mihaly, 2012).

setting. Moreover, unlike in more developed countries, auto loan default decision is an important financial decision for borrowers in Sri Lanka. Due to severe import tax rates (approximately 200%), vehicles constitute a large fraction of a vehicle owner’s wealth—sometimes more than their home.

Policy changes I exploit are of two types: (1) changes to import tax rates and (2) revisions to loan-to-value ratio caps. In the first set of tests, I use three unanticipated vehicle import tax rate changes during the sample period: a November 2014 import tax rate cut for cars with an engine capacity less than 1L (henceforth, smaller-engine cars) and two import tax rate hikes for new 3-wheelers in November 2015 and April 2016.<sup>2</sup> In the case of the tax rate cut on smaller-engine cars, cars with engine capacity greater than 1L (henceforth, larger-engine cars) serve as the control sample.<sup>3</sup> When analyzing the impact of tax rate hikes on 3-wheeler loans, to ensure that my control group is comparable, I construct matched samples using loans offered for other unaffected vehicle types based on similar borrower profiles and type of vehicle use.<sup>4</sup>

I use a large proprietary database of auto loan transactions from a major auto loan lender in Sri Lanka. This data set includes a wide span of loan-level data at origination and month-by-month stream of payments made by the borrower, while also indicating whether (and, if so, when) the loan is in default.

I start by presenting evidence that supports the baseline hypothesis—the import tax rate changes had significant impact on the secondary market values of affected vehicles. Even though import tax rate changes do not directly impact used vehicles, we expect secondary market value of smaller-engine cars to drop due to increased relative demand for new vehicles following the tax cut. Similarly, secondary market value of 3-wheelers is

---

<sup>2</sup>3-wheelers are also known as auto-rickshaws, tuk-tuks or trishaws. These are motorized vehicles with three wheels mainly used as taxis in Sri Lanka.

<sup>3</sup>larger-engine cars were not affected by the November 2014 tax rate change

<sup>4</sup>3-wheelers are mainly used as a productive asset (as opposed to a consumption asset) and one of the control samples is restricted to loans used to finance the purchase of vehicles that are used for productive purposes

expected to increase following the tax rate increases. In the absence of monthly valuations of all the vehicles pledged as collateral to the lender, I compare valuations of used vehicles pledged as collateral for new loans surrounding each tax rate change, while controlling for vehicle model-year and district specific effects. As expected, I find that the decrease in import tax rates on smaller-engine cars led to a 10.2% decrease in the secondary market value of smaller-engine cars relative to that of larger-engine cars. The secondary market value of 3-wheelers increased on average by 8.7% following the import tax rate hikes, relative to the control sample.

Having established that import tax rate changes impacted the secondary market value of vehicles, I turn to estimating the effect of import tax rate changes on default. Using these tax rate changes as treatments, I apply the standard difference-in-difference methodology to loan-month observations. *Treated* loans are those financing vehicle types affected by a tax rate change and originated prior to that respective tax rate change. The detailed data allows for a rich set of controls, including fixed effects for loans and district-months. I expect, after the tax cut, the default rate to increase for smaller-engine car loans originated prior to the tax rate cut, in comparison to the default rate for the unaffected larger-engine car loans. Likewise, the default rate of 3-wheeler loans is expected to drop relative to the control sample, following tax rate hikes.

I find strong evidence for the significant effect of import tax rate changes on borrower default decisions. Default rate of smaller-engine car loans rose by 0.4% following tax rate cut. The unconditional probability of default prior to the tax change was 0.9% and the estimated effect corresponds to a 44% higher probability of default. Default rate of 3-wheeler loans fell by 0.3% which corresponds to a 24% lower probability of default.

The second set of tests examines the impact of loan-to-value ratio (LTV) cap changes on default rates. In Sri Lanka, auto loans originated prior to 2017 were subject to an LTV cap of 70%. In January 2017, the Central Bank of Sri Lanka revised the LTV caps applicable for auto loans financing *new* vehicles based on vehicle type— rising for some

and decreasing for others. Specifically, according to new rules, a person buying a new car, SUV, or van can only obtain financing up to 50% of the value of the vehicle, while the LTV cap was reduced to 25% for new 3-wheelers. For new trucks and buses, lenders are allowed to finance up to 90% of the value. LTV cap for *used vehicle* loans remained unchanged at 70%.

As I show below, these changes affected the secondary market values of used vehicles as well. Consider cars, whose LTV cap was reduced. This tighter LTV cap raises down-payment requirements to buy a new car, forcing some borrowers into used-vehicle market. The down-payment requirement for a used car is then much lower since a higher LTV cap of 70% (as opposed to 50%) applied to lower valuations. With the emerging higher demand for used cars, the value of those pledged before the reform will thus rise, curbing borrower incentives to strategically default. Similarly, for vehicle types where LTV cap is increased, borrower incentives to strategically default would rise.

In this setting, I use a generalized difference-in-difference approach with dummy variables indicating loan-months of each vehicle type after new LTV rules. The sample comprised loan-month observations before and after the rule change on all loans originated prior to the rule change. Evidence from LTV cap changes presents similar effects from collateral value: vehicle types with newly increased LTV caps, which curbed used-vehicle demand, lead to increased default rates; vehicle types with newly lowered LTV caps saw a drop in default rate.

The main assumption underlying my approach is that absent the tax-LTV policy changes, the average default rate in the treated and control groups would have moved in parallel. Graphical and regression evidence suggest that default rates moved in parallel before the treatments—providing support for this assumption. Furthermore, placebo tests simulating the reforms at earlier dates confirm that the results are not driven by preexisting trends inherent to specific vehicle types.

Another concern I address is equity extraction. If liquidity-constrained borrowers

could extract increased equity in the form of a secondary loan following gains in collateral value, then my results may be picking up the impact of relaxed liquidity constraints. However, I do not observe any increase in loan balances in my data which allows me to track loan balances from month to month. Also, regulations do not allow borrowers to pledge the same asset as the collateral for a secondary loan with another lender. In private conversations, management of the lender further confirmed no equity extractions following any collateral value gains.

My findings contribute to two strands of literature. First, I contribute to household finance literature by using policy-induced exogenous variation in collateral value to study the causal effect of collateral value changes on strategic default. The work of [Palmer \(2015\)](#), that uses long-run regional variation in house-price cyclicalities as an instrument for house price declines, comes closest to my paper. One potential concern with his methodology is that the exclusion restriction is likely to be violated if the instrument is associated with credit risk of borrowers. No other previous study to my knowledge has used actual data to identify the causal link between collateral value and strategic default. [Guiso et al. \(2013\)](#) and [Bajari et al. \(2008\)](#) use survey data and structural estimation respectively to understand how borrowers' willingness to default changes with the home-equity shortfall. The existing work on strategic default does not provide evidence on the collateral value channel ([Mayer et al., 2014](#); [Yannelis, 2017](#); [Blouin and Macchiavello, 2017](#); [Artavanis and Spyridopoulos, 2018](#)). Studies, such as [Deng et al. \(2000\)](#); [Bajari et al. \(2008\)](#); [Foote et al. \(2008\)](#); [Scharlemann and Shore \(2016\)](#), that show a negative association between collateral value and default, do not permit causal inference. Identification of the collateral value channel is particularly relevant for ex-ante policy interventions, such as loan-to-value restrictions and mortgage insurance, which have been implemented under the assumption that collateral value is an important determinant of strategic default, despite limited empirical evidence.

Second, my study contributes to the empirical literature on contractual imperfections

and defaults by examining how contractual defaults respond to unanticipated changes in market conditions. Theoretical models suggest that parties to a self-enforcing agreement have incentive to engage in ‘hold-up’ when market conditions change sufficiently to place the business relationship outside its self-enforcing range (Klein, 1996; Hart, 2009). A recent study by Blouin and Macchiavello (2017) provide evidence to support this prediction by showing that unanticipated rises in coffee market prices increase defaults on coffee pre-financing agreements. I complement their study by showing unanticipated drops in collateral value lead to more defaults.

In addition, this paper also adds to the sparse 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.

Finally, this paper presents direct evidence on the effect of unanticipated policy reforms in the Sri Lankan auto finance market. I show that an unintended consequence of selective import tax cuts and LTV cap increases was to increase the number of strategic defaults for certain types of loans. I also quantify the impact on the secondary market values of vehicles due to these policy reforms.

## 1. Theoretical and Institutional Background

### 1.1 Role of Collateral Value in Strategic Default

Economic theory predicts strategic default when the collateral value drops. Household finance literature has traditionally modeled individual loan default using option pricing theory, where borrowers default when the expected utility of continued loan repayment falls below that of default (Foster and Van Order, 1984; Kau et al., 1987; Titman and Torous, 1989). In these models, default arises from borrowers’ unwillingness, rather than