Collateral Damage: Low-Income Borrowers Depend on Cash Flow-Based Lending

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Motivation

Two key forces that animate (consumer) credit markets:

- Asset-based lending (ABL) linked to the physical collateral value of the asset (Assunçao et al., 2014; Argyle et al., 2020; Ratnadiwakara, 2021)

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This paper:

★ We assess the relative importance of CFBL and whether low-income borrowers rely more on ABL or CFBL.

Motivation

Understanding the relative importance of ABL and CFBL in facilitating financing for disadvantaged consumers helps us to understand:

- The importance of pledging human capital
- How economic fluctuations affect access to credit markets
- Which financial innovations aid or hurt low-income borrowers

Empirical Challenge

- ABL and CFBL are intertwined, which presents challenges when empirically assessing their relative importance across borrower types.

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- ABL and CFBL are intertwined, which presents challenges when empirically assessing their relative importance across borrower types.

→ Loan contracts do not assign weights to the ABL and CFBL components.

- To distinguish these two types of lending, we develop a theory showing that they respond differently to changes in the economic durability of collateral.

★ Predictions of the model allow us to empirically assess the importance of CFBL for different kinds of borrowers.

Collateral value shocks: contrasting implications for lending

We assess the relative importance of ABL and CFBL in consumer finance by exploiting 209 vehicle model and 8 vehicle make discontinuations as a shock to the economic durability of the asset.

- Shock doesn't directly affect the car $\rightarrow$ No change in adverse selection
- Two mechanisms plausibly affect vehicle price and residual value:
  1. Parts availability and servicing expertise degrade more quickly for discontinued vehicles.
  2. Discontinued vehicles lose some cachet.
- While discontinuation is a deliberate choice of the manufacturer, it is not under the control of other auto market participants.

Preview of main results

A stylized model of lending generates contrasting empirical predictions depending on the relative use of CFBL.

Using vehicle model discontinuation as a shock, we find that:

- CFBL plays a crucial role in auto lending, especially for lower-income borrowers;
- Reliance on CFBL by lower-income consumers can explain some potentially unexpected market features.
- The results stand in stark to contrast to the corporate lending market where ABL is crucial for the financing of resource-constrained firms (Leeth and Scott, 1989; John et al., 2003; Jimenez et al., 2006; Lian and Ma, 2021).

Model: Setup

Contrasting effects of two lending regimes:

- Two types of consumers (high and low income)
- Two types of assets (durable and non durable) – markup for seller (i.e., car dealer)
- Two sources of financing:
  - ABL – secured by residual value of asset (physical capital)
  - CFBL – secured by borrower's future income (human capital)
- Both types of lending subject to pledgeability constraint $\rightarrow$ limits extent of use
- Verifiable assumption: Low-income borrowers can only afford the non-durable good (i.e., the discontinued vehicle).

Prediction for income pledgeability & down payment

Empirical Prediction:

a) If income is sufficiently pledgeable, then the down payment is higher for low-income borrowers purchasing the non-durable asset than it is for high-income borrowers purchasing the durable asset.

b) Otherwise, the down payment is lower for low-income borrowers.

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$\downarrow$ Durability $\rightarrow$ $\downarrow$ collateral value (less than 1:1 due to pledgeability constraint; Rampini, 2019)

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Low income borrowers have less income to pledge $\rightarrow$ smaller CFBL $\rightarrow$ **larger down payment**

Prediction for income reliance & loan-to-value (LTV)

Empirical Prediction:

a) If low-income borrowers rely relatively more on CFBL than high-income borrowers, then the LTV ratio is higher for low-income borrowers purchasing the non-durable asset than it is for high-income borrowers purchasing the durable asset.

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Intuition:

If low-income borrower relies more on CFBL $\rightarrow$ larger portion of loan is CFBL $\rightarrow$ offsets lower residual value $\rightarrow$ **higher LTV for lower income**

Prediction for income reliance & payment-to-income (PTI)

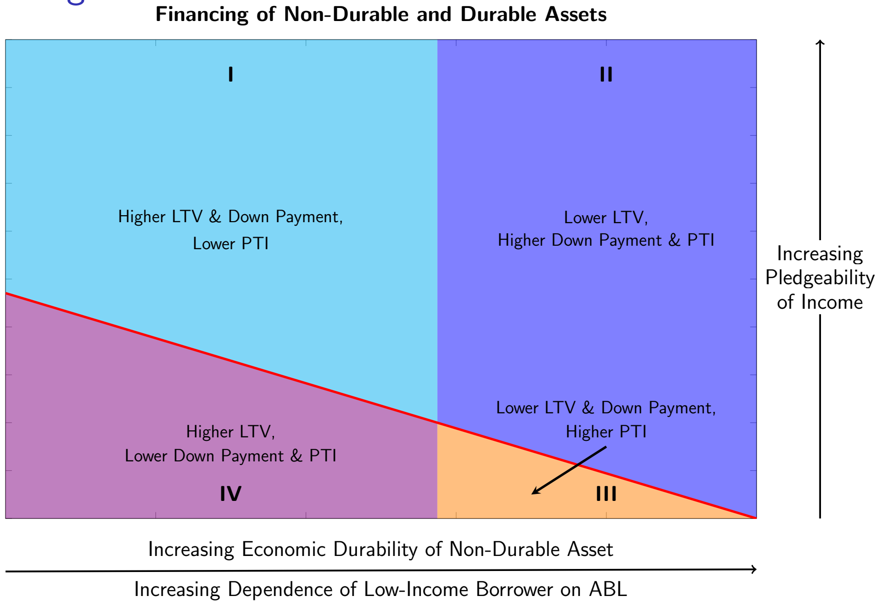
Empirical Prediction:

When income is pledgeable, the PTI is lower for low-income borrowers as long as the low-income borrower is more dependent on cash flow based lending.

Intuition:

Low-income consumers purchase less durable (discontinued) vehicles $\rightarrow$ debt financing from collateral is restricted $\rightarrow$ **lower PTI for low-income**

Equilibrium Regions



Summary statistics

	Mean	S.D.	25th Pctile	Median	75th Pctile	N
Vehicle						
Wholesale Value ($)	13636	4385	10696	13075	15900	342611
Mileage	38864	21801	24500	38077	52782	339387
Scaled Price (%)	0.72	0.18	0.60	0.70	0.83	291493
Dealer Profit ('000 $)	4.31	2.47	2.60	4.20	6.03	342589
Post Discontinuation (=1)	0.05	0.22	0.00	0.00	0.00	342619
Loan						
Down Payment ($)	1024.29	1136.20	0.00	800.00	1500.00	342350
LTV	1.29	0.18	1.18	1.29	1.42	342488
Loan Term (Months)	67.57	7.32	66.00	72.00	72.00	342611
Payment to Income (PTI)	0.104	0.034	0.080	0.107	0.129	299771
Borrower						
Monthly Income ($)	4426	1811	3101	3984	5296	299769
Credit Score	532	50.12	497	531	566	325715
Prior Ch. 7 Bankruptcy (=1)	0.22	0.41	0.00	0.00	0.00	342619
Prior Ch. 13 Bankruptcy (=1)	0.08	0.28	0.00	0.00	0.00	342619
Homeowner (=1)	0.06	0.23	0.00	0.00	0.00	342619

Diff-in-diff (DiD) to test the shock to depreciation

For a transaction i, of model j, with dealer d, during period t, we run the following regression:

$$Y_{i,j,d,t,v} = \tau_t + \iota_{j,v} + \xi_d + \beta X_{i,j,d} + \phi_{j,t}\text{Treated}_{j,t} + \epsilon_{i,j,d,t}, \tag{1}$$

where Y is an outcome such as vehicle price or financing term, τ is a transaction year fixed effect, ι is a car model x vintage year fixed effect, ξ is a dealer fixed effect, X are a series of vehicle, borrower, and dealer controls, and Treated is an indicator if the make of model j has been discontinued prior to time t.

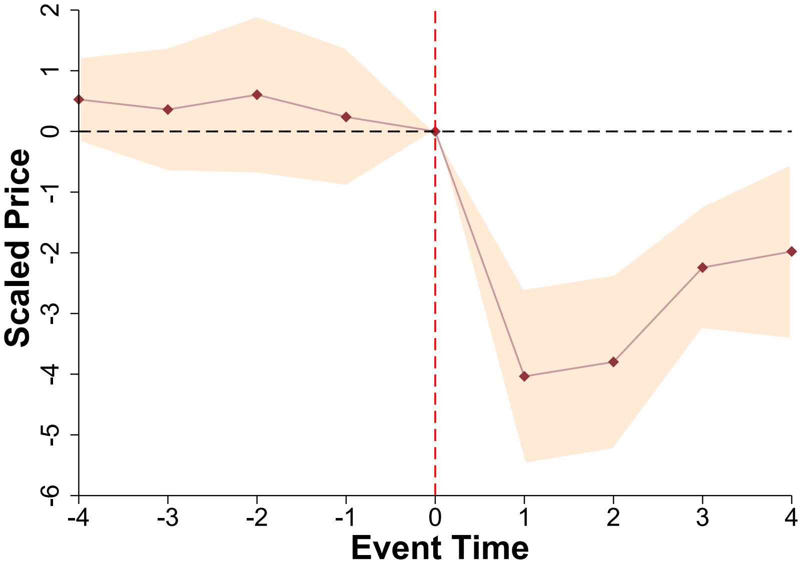
- ★ We are comparing cars within the same period, absorbing any non-time varying attributes related to the specific model-vintage year and dealer, and clustering by make.

Does discontinuation impair collateral? Prices $\downarrow$

Durable assets have higher prices. If discontinuation reduces durability, then it should reduce the vehicle price.

	Vehicle Wholesale (\$)			**Scaled Price (%)**	
Post Discontinuation (=1)	-297.56**	-371.27***	-277.88**	-3.89***	-3.16***
	(-2.58)	(-3.52)	(-2.57)	(-4.59)	(-6.35)
Borrower Controls	No	Yes	Yes	No	Yes
Vehicle Controls	No	No	Yes	No	Yes
Vehicle Model x Vintage FEs	Yes	Yes	Yes	Yes	Yes
Dealer FEs	Yes	Yes	Yes	Yes	Yes
Parent x Contract Year FEs	Yes	Yes	Yes	Yes	Yes
Observations	332337	278938	278259	289778	252422
Adjusted R^2	0.771	0.758	0.816	0.673	0.777

Impact of discontinuation against event time



Does discontinuation impair collateral? Recovery ↓

Durable vehicles have high ratio of recovery value to wholesale price at origination. If discontinuation reduces durability, then it should reduce the recovery value.

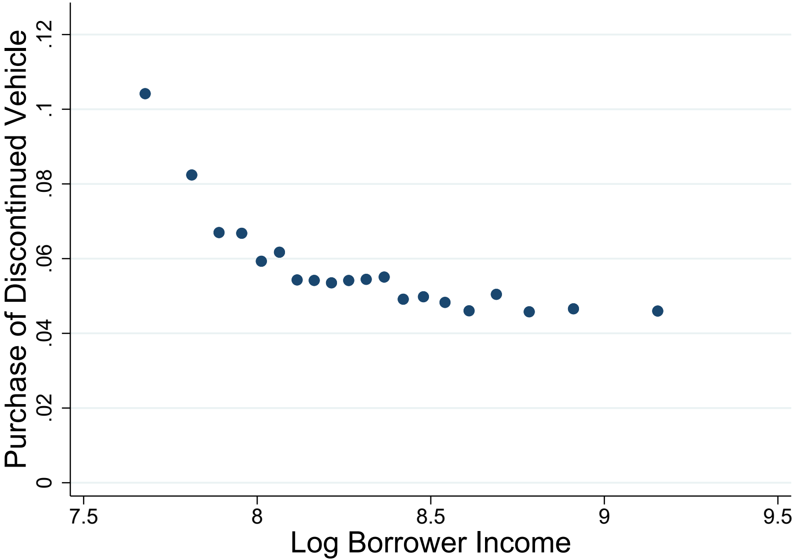
	Recovery Percent (%)		
Post Discontinuation (=1)	-1.05**	-1.99***	-1.80***
	(-2.56)	(-5.70)	(-5.18)
Controls	No	Yes	Yes
Baseline FEs	Yes	Yes	Yes
Parent x Default Year FEs	No	No	Yes
Observations	54496	47510	47488
Adjusted R^2	0.168	0.521	0.548

Consistent Model Predictions

Assumption: Low-income borrowers are more likely to purchase discontinued vehicles.

	Bottom Quartile (=1)		Log Income	
	(1)	(2)	(3)	(4)
Post Discontinuation (=1)	3.45***	3.57***	-0.01**	-0.01*
	(2.93)	(3.05)	(-2.03)	(-1.96)
Baseline FEs	Yes	Yes	Yes	Yes
Vehicle Controls	No	Yes	No	Yes
Observations	290435	289733	290435	289733
Adjusted R^2	0.141	0.183	0.241	0.281

Purchase of discontinued vehicle and borrower income.



Discontinuation and loan maturity

Model is single period, but intuition suggests that less durable assets will be financed with shorter-term asset-backed debt.

	Term (Months)	
Post Discontinuation (=1)	-0.82***	-0.81***
	(-5.64)	(-5.18)
Controls	No	Yes
Baseline FEs	Yes	Yes
Observations	332340	278259
Adjusted R^2	0.579	0.385

Discontinuation as a shock to economic durability.

What have we learned?

- Discontinuation reduces current prices.
- Discontinuation reduces recovery values.
- Low-income borrowers are more likely to purchase discontinued cars.
- Discontinuation reduces loan maturity.

Now we focus on the contrasting predictions:

- Income pledgability & downpayment
- Income reliance & LTV
- Income reliance & PTI

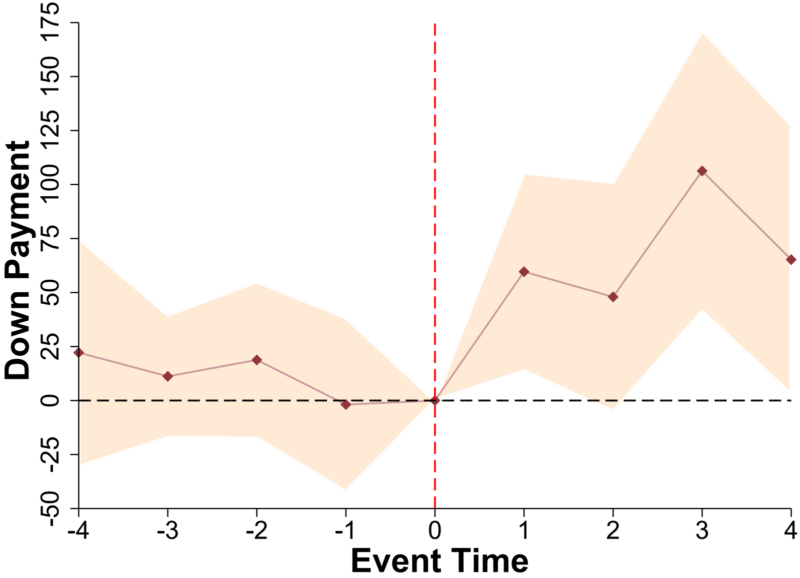
Discontinuation and down payments

Predictions for income pledgability and down payment:

- Less pledgability of income: Smaller down payment with discontinuation
- More pledgability of income: Larger down payment with discontinuation

	Down Payment ($)		
Post Discontinuation (=1)	85.28***	68.76**	88.34***
	(3.76)	(2.31)	(3.30)
Vehicle Book ($)			0.06***
			(20.84)
Controls	No	Yes	Yes
Baseline FEs	Yes	Yes	Yes
Observations	332078	277997	277997
Adjusted R^2	0.208	0.226 0.239	

Down payment against event time



Implications of down payment result

We showed that discontinued models are...

- less expensive; and
- purchased by lower-income borrowers who presumably have less cash for a down payment,

...which should lead discontinued vehicles to be purchased with *smaller* down payments.

We find the opposite.

- ★ Income pledgability is an important feature of auto lending.
- ★ Low-income borrowers have smaller future incomes against which to borrow which requires them to provide *larger* down payments to close the transactions for less durable vehicles.

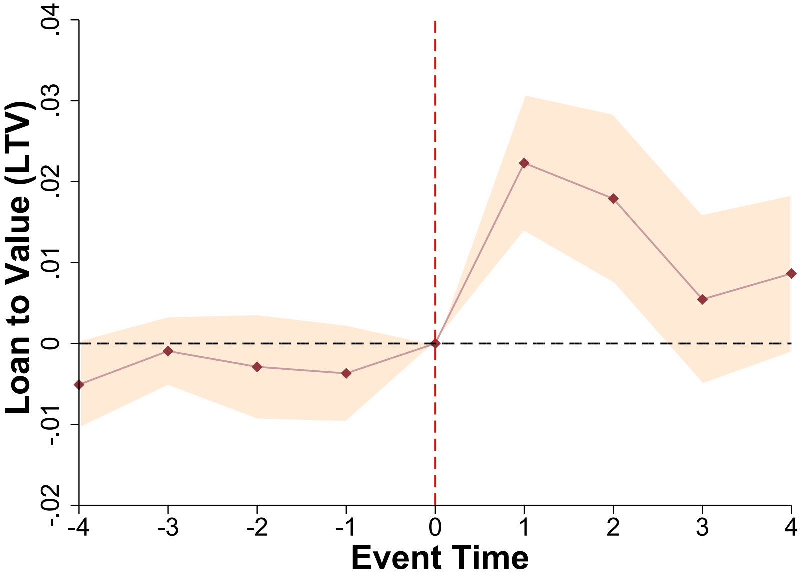
Discontinuation and LTV ratios

Predictions for degree of reliance on income pledgability (CFBL):

- Low-income less reliant: LTV decreases with discontinuation
- Low-income more reliant: LTV increases with discontinuation

	LTV	
Post Discontinuation (=1)	0.02***	0.02***
	(3.63)	(6.74)
Controls	No	Yes
Baseline FEs	Yes	Yes
Observations	332236	278204
Adjusted R^2	0.352	0.717

LTV against event time



Implications of LTV finding

When low-income borrowers are less reliant on CFBL: LTV increases with durability (Hart and Moore, 1994; Rampini, 2019).

- More durable assets with higher liquidation values support larger loans relative to current values.

When low-income borrowers are more reliant on CFBL: LTV decreases with durability.

- Low-income borrowers, in particular, use their future income to purchase non-durable assets. If the value of the non-durable asset is relatively low, then low-income borrowers will purchase it with a relatively high debt ratio, as the debt is secured by their incomes, not by the physical collateral.

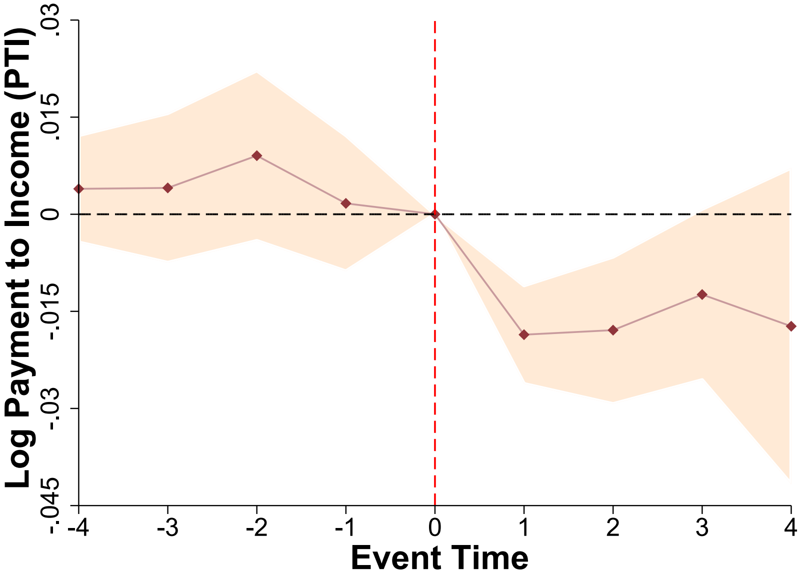
★ Our LTV finding suggests that low-income are more reliant on CFBL.

Discontinuation and PTI ratios

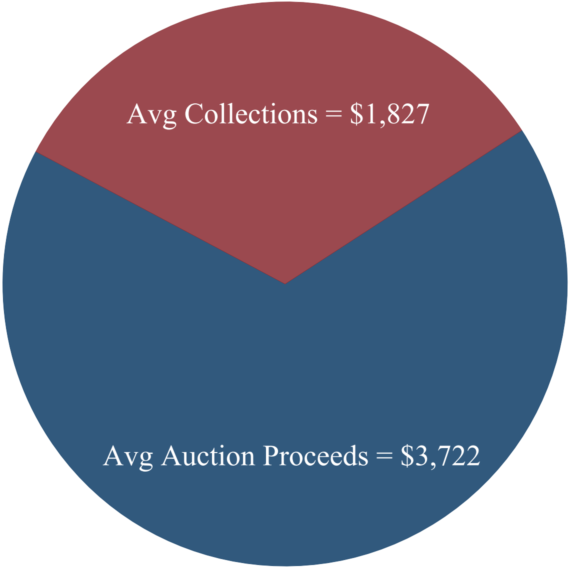
Prediction: When income is pledgeable, the PTI is lower for low-income borrowers as long as the low-income purchase is more dependent on cash flow based lending.

	Payment-to-Income (ln)			
Post Discontinuation (=1)	-0.02**	-0.02***	-0.03***	-0.02***
	(-2.51)	(-5.26)	(-6.29)	(-5.36)
Controls	No	No	Yes	Yes
Baseline FEs	Yes	Yes	Yes	Yes
Income Decile FEs	No	Yes	No	Yes
Observations	290437	290435	278259	278259
Adjusted R^2	0.042	0.528	0.567	0.546

PTI against event time



Do lenders recover from personal resources of borrowers?



Discontinuation and recovery in default

If low-income borrowers are particularly reliant on CFBL, then personal income recovery should be higher for non-durable assets.

Recovery:	Vehicle		Income		Income
	(%)	**($)**	**(%)**	**($)**	>0**(=1)**
Post Discontinuation (=1)	-595.12**	-3.50**	286.19***	1.77*	6.73***
	(-2.50)	(-2.44)	(2.85)	(1.82)	(4.59)
Controls	Yes	Yes	Yes	Yes	Yes
Time to Default	Yes	Yes	Yes	Yes	Yes
Baseline FEs	Yes	Yes	Yes	Yes	Yes
Parent x Default Year FEs	Yes	Yes	Yes	Yes	Yes
Observations	22221	22217	24336	24331	24336
Adjusted R^2	0.259	0.141	0.039	0.040	0.040

Implication of collections result

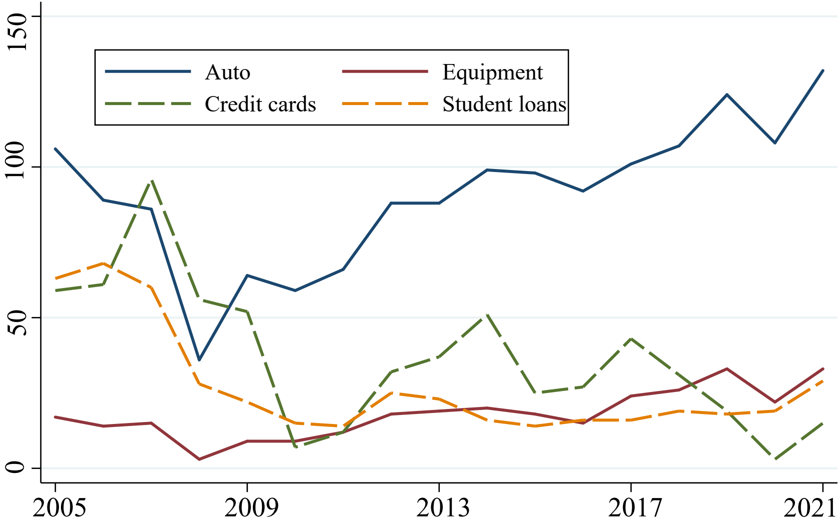
A decrease in durability leads to greater reliance on the personal income of the borrower as a source of collateral.

- Purchasers of discontinued vehicles have lower incomes and buy less expensive vehicles.
- Yet, they are more likely to have their personal resources pursued by a lender after default.

Our model supplies the intuition for our finding:

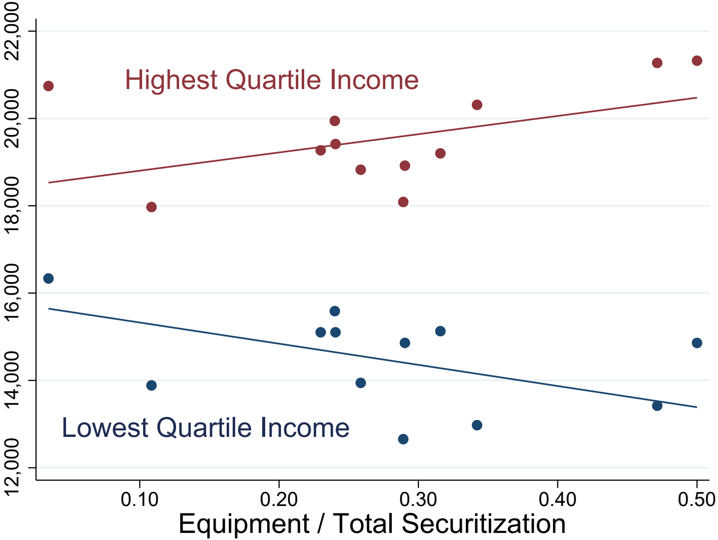
- To receive a loan, purchasers of less durable (discontinued) vehicles must pledge their income since the collateral depreciates quickly.
- In the event of default, a lender thus relies more on borrower income, as the physical collateral does not retain as much value.

How economic fluctuations affects access to credit



US ABS issuance ($ bln); Data from Bloomberg, Dealogic, Thomson Reuters via SIFMA

Does securitization aid low-income borrowers



Amount Financed ($) and Asset-Based Securitization; Data from Bloomberg, Dealogic, Thomson Reuters via SIFMA

Conclusion

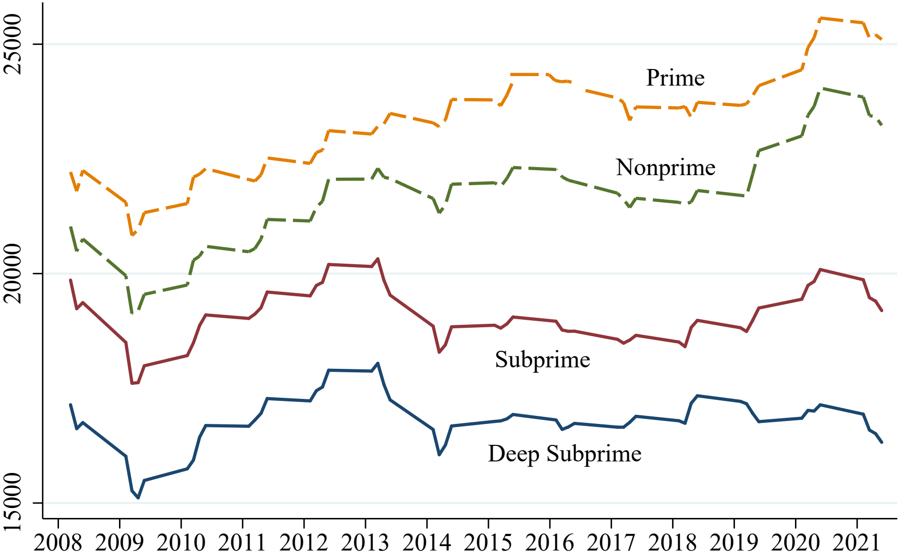
Vehicular access facilitates employment opportunities and mobility. Restricting the auto finance access of poorer consumers may have serious implications for income inequality.

- CFBL is particularly important for the less economically-durable goods that poor borrowers can afford.
- Reliance on CFBL as durable assets degrade exacerbates the pressures of inequality.

Policy implications:

- Government policies aimed at helping poor people are focused on moving jobs to poor people rather than improving their mobility.
- Reducing the pledgeability of future income (e.g., by restricting wage garnishment or making bankruptcy less costly) will impact the ability of lower-income borrowers to finance cars.
- Regulations that make unsecured lending more expensive for banks can adversely affect low-income borrowers more.

Average amount financed by credit tier



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