

# Towards a cashless economy: The case of Argentina

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# Motivation

- The adoption of alternative means of payments to cash is driven by both demand and supply factors
- In developing economies, the size of the informal economy introduces additional challenges and constraints
- The present study attempts to examine the determinants of the observed forms of payments used in Argentina in order to quantify and understand the effects of moving towards a cashless economy
- Understand the spatial variation in the use of different payment systems

# The model

- Simple two-sided market: buyers,  $b \in [0, 1]$ , sellers,  $s \in [0, 1]$ 
  - Sellers: endowed with one unit of good; don't derive utility from consuming the good; charge  $p = 1$
  - Buyers: utility  $v > 1$  from consumption
  - Buyers and sellers are randomly matched
- Two payment systems: cash (universally accepted), credit card (accepted by some sellers)
  - Buyers: cost  $t_h^b$  per transaction in cash,  $t_d^b$  when they use a credit card
    - A proportion  $\alpha$  of buyers can freely choose among the two options;  $(1 - \alpha)$  are credit constrained (informal market)
    - $0 \leq m^b \leq \alpha \leq 1$ : proportion of buyers that choose credit card only
  - Sellers: cost  $t_h^s$  per in-cash transaction; credit card services entail a fixed cost  $F > 0$  and a cost  $t_d^s$  per credit card transaction
    - $0 \leq m^s \leq 1$ : proportion of sellers that accept credit card payments
- Assumptions:  $t_d^b < t_h^b$  and  $t_d^s < t_h^s$

# The model

- Timing:
  1. Buyers decide whether to pay for the good with cash or card; sellers decide whether to accept credit cards as a means of payment
  2. Buyers and sellers are randomly matched
    - A transaction takes place, if the payment method chosen by buyers and sellers coincide

# The model

## ■ Buyers

- Decision of unconstrained buyers  $\alpha$  ( $(1 - \alpha)$  can only use cash)
- $0 \leq m^s \leq m^b \leq \alpha$ :  $u^b = m^s(v - t_d^b) + (1 - m^b)(v - t_h^b)$
- $0 \leq m^b \leq m^s \leq \alpha$ :  $u^b = m^b(v - t_d^b) + (1 - m^b)(v - t_h^b)$
- The same expected utility holds when  $0 \leq m^b \leq \alpha \leq m^s$ .
- In sum:  $u^b = \text{Min}\{m^s, m^b\}(v - t_d^b) + (1 - m^b)(v - t_h^b)$
- Best response:  $m^b = m^s$  for all  $m^s$ , subject to  $m^b \leq \alpha$

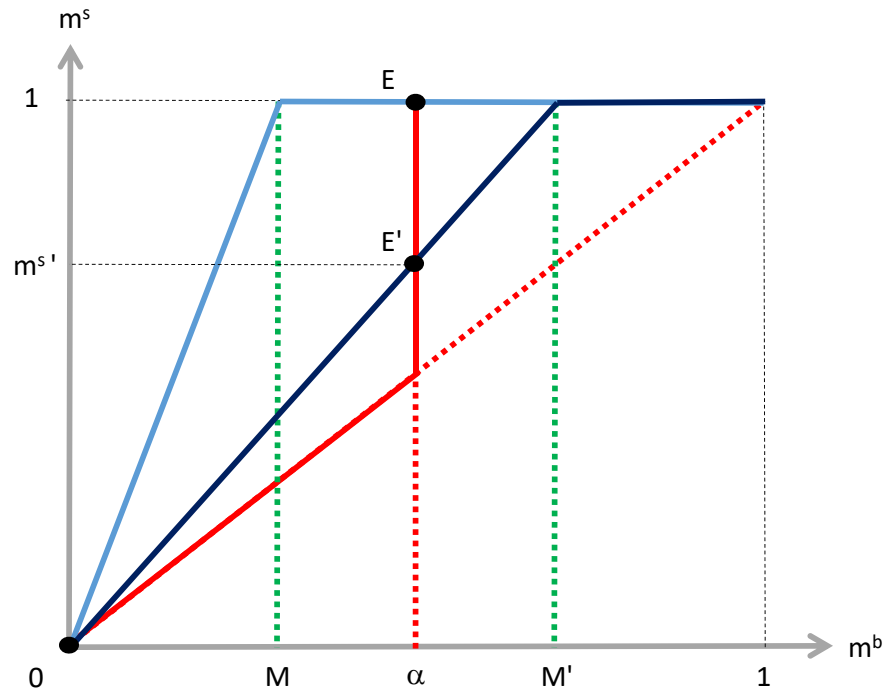
## ■ Sellers

- $m^b \geq m^s$ :  $u_d^s - u_h^s = 1 - t_d^s - F - \frac{(1 - m^b)}{(1 - m^s)}(1 - t_h^s)$
- $m^b < m^s$ :  $u_d^s - u_h^s = \frac{m^b}{m^s}(t_h^s - t_d^s) - F$
- Best response:  $m^s$  determined by  $\Delta(m^s, m^b) \equiv u_d^s - u_h^s = 0$

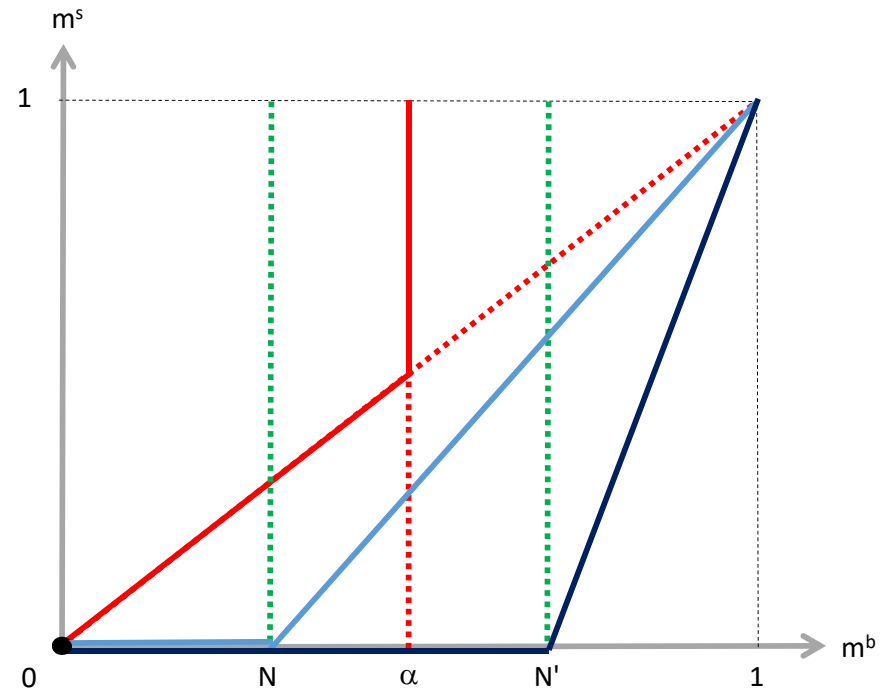
# Equilibrium

- An equilibrium is defined as  $\{m^b, m^s\}$  that satisfies:
  1. Buyers choose  $m^b$  that maximizes the expected utility (i.e., the number of buyers that accept credit cards is given by  $m^b = m^s \leq \alpha$ );
  2. The number of sellers that accept credit cards is given  $\Delta(m^s, m^b) = 0$ , for a given  $m^b$ .
- The model is characterized by the presence of multiple equilibria
- $\{m^b, m^s\} = \{0, 0\}$  is always an equilibrium
- Other equilibria will arise depending on the relative values of  $t_h^s$ ,  $t_d^s$ , and  $F$

# Characterization of the equilibrium



$$F \leq (t_h^s - t_d^s)$$



$$F > (t_h^s - t_d^s)$$

# Empirical strategy

- Analyze demographic and economic determinants of means of payments chosen by households in Argentina
  - Impact of informality, income level, education and other demographic and socioeconomic characteristics of households on the demand credit card
  - Analyze regional variation
  - Include network effects
- Data
  - National Household Expenditure Survey (ENGHO)
    - National and regional (provincial) information regarding expenditure and income, as well as socioeconomic characteristics of Argentinean households
    - The 2012 and the (recently published) 2017/18 survey include information regarding the type of payment instruments used by the households



# Empirical Evidence: Payments methods

#	cash + debit	credit	transfer	total
1	x			47,4
2	x	x		50,6
2	x		x	0,7
3	x	x	x	1,3
				100,0

2012

#	cash	debit	credit	transfer	total
1	x				48,5
2	x	x			10,5
2	x		x		14,6
2	x			x	2,2
3	x	x	x		9,5
3	x	x		x	2,8
3	x		x	x	3,3
4	x	x	x	x	8,5
					100,0

2017

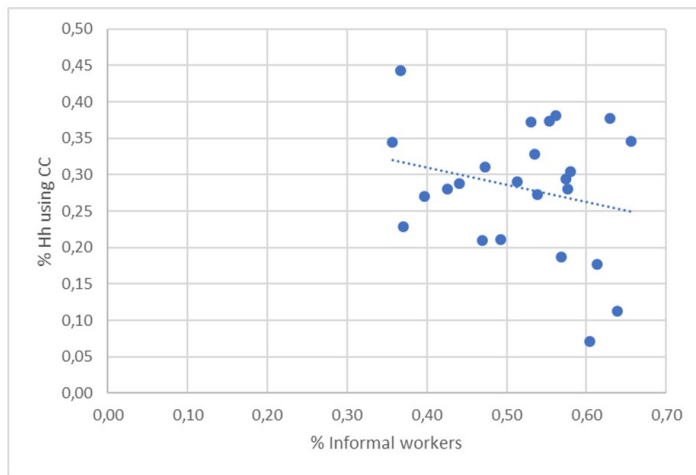
# Empirical Evidence: Means of payment by province

PROVINCE	% Expdt cash + debit		% Expdt credit card		% HH with credit card	
	2012	2017	2012	2017	2012	2017
CIUDAD DE BS AS	0,910	0,736	0,082	0,133	0,493	0,682
BUENOS AIRES	0,915	0,858	0,072	0,077	0,513	0,492
CATAMARCA	0,938	0,899	0,044	0,062	0,370	0,499
CORDOBA	0,920	0,895	0,062	0,073	0,580	0,580
CORRIENTES	0,899	0,890	0,081	0,063	0,562	0,352
CHACO	0,948	0,922	0,047	0,052	0,367	0,270
CHUBUT	0,874	0,866	0,120	0,062	0,569	0,420
ENTRE RIOS	0,874	0,880	0,100	0,095	0,576	0,519
FORMOSA	0,906	0,924	0,079	0,065	0,655	0,451
JUJUY	0,932	0,907	0,049	0,056	0,426	0,555
LA PAMPA	0,921	0,876	0,062	0,077	0,397	0,557
LA RIOJA	0,918	0,928	0,074	0,061	0,441	0,431
MENDOZA	0,901	0,869	0,066	0,075	0,575	0,587
MISIONES	0,916	0,876	0,064	0,081	0,357	0,486
NEUQUEN	0,893	0,810	0,092	0,139	0,613	0,720
RIO NEGRO	0,897	0,891	0,095	0,062	0,469	0,381
SALTA	0,908	0,910	0,068	0,050	0,530	0,463
SAN JUAN	0,934	0,916	0,047	0,039	0,473	0,435
SAN LUIS	0,909	0,910	0,072	0,062	0,554	0,558
SANTA CRUZ	0,834	0,911	0,159	0,068	0,639	0,387
SANTA FE	0,886	0,857	0,086	0,085	0,539	0,621
SGO.DEL ESTERO	0,947	0,919	0,049	0,058	0,630	0,514
TUCUMAN	0,933	0,897	0,052	0,062	0,535	0,603
TIERRA DEL FUEGO	0,778	0,661	0,214	0,227	0,605	0,781
Total Argentina	0,911	0,856	0,073	0,082	0,520	0,528

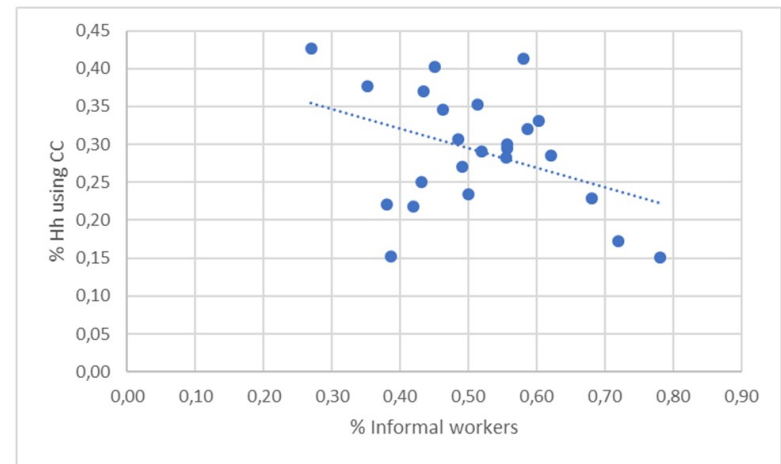
# Empirical evidence: Means of payment by income decile

Decil	% with CC		% Expdt CC		% Expdt Cash	
	2012	2017	2012	2017	2012	2017
1	0,3182	0,2452	0,0693	0,0417	0,9204	0,9118
2	0,3995	0,3299	0,0760	0,0544	0,9136	0,9148
3	0,4724	0,3848	0,0925	0,0598	0,8966	0,9125
4	0,5004	0,4538	0,0960	0,0723	0,8952	0,9020
5	0,5172	0,4771	0,1047	0,0776	0,8855	0,8967
6	0,5641	0,5408	0,1151	0,0924	0,8765	0,8867
7	0,5829	0,6271	0,1238	0,1091	0,8669	0,8689
8	0,6320	0,6738	0,1344	0,1339	0,8567	0,8475
9	0,6777	0,7410	0,1643	0,1491	0,8253	0,8323
10	0,7404	0,8109	0,2051	0,2090	0,7838	0,7696

# Empirical Evidence: Credit card and labor informality



2012



2017

# Empirical strategy

- We run the following baseline regression model

$$P_{i,d} = \beta_0 + \beta_1 \text{income}_{i,d} + \beta_2 \text{demographic}_{i,j,d} \\ + \beta_3 \text{employment}_j + \beta_4 \text{network}_d + \varepsilon_{i,d}$$

$P_{i,d}$ : credit card use (or % of expenditure paid with credit cards)

$i$ : household,  $j$ : household head  $j$ ,  $d$ : province

- Informality: employment of household head  $j$
  - Network: % of population using credit card at province  $d$
- We run two different regression methods
    - Logit model for credit card use
    - Heckman model for credit card use and expenditure

# Results: 2012

	Logit Use Credit Card			Heckman	
	Coef.	dy/dx	ey/ex	% Exp. CC	Use CC
Expenditure/Income	0,000042	0,000009	0,028857	0,000011	
	0,0000134***	0,00000297***	0,0092898***	0,00000103***	
Expenditure decil	0,140479	0,0334632	0,3473573		
	0,0081444***	0,001754	0,0181458***		
Age group	-0,210051	-0,0467107	-0,2553683	-0,0054226	
	0,016194***	0,0035479***	0,0203777***	0,001945***	
Education (univ.)	-0,271797	-0,0604417	-0,0140178	-0,0165484	
	0,0479459***	0,0106329***	0,0027473***	0,0052227***	
Female	0,034457	0,0076625	0,0059116	0,000286	
	0,0320886***	(0,0071351)	(0,0054542)	0,0037186	
Home Ownership	0,449052	0,0998594	0,1472488	0,0218623	
	0,034653***	0,0075925***	0,0054542***	0,0039526***	
Formal worker	0,576481	0,1281968	0,0794862	0,0129226	
	0,0351691***	0,0076333***	0,004148***	0,0040486**	
Informal worker	0,117836	0,0262041	0,0092425	-0,0177324	
	0,0436797**	0,009707**	0,0032984***	0,0053173***	
Network prov.	3,890158	0,865086	0,9434841	0,0766227	
	0,17676***	0,0376021***	0,0423342***	0,021296***	
cons	-2,849473				
	0,1076817***				
Expenditure decil				0,1047609	
				0,0031547***	
Age>24				0,3455149	
				0,0434373***	
Informal worker				-0,0522639	
				0,02505**	
cons				-0,8480346	
				0,0158624	
Observations	20960	20960	20960		
artho				-0,0761637	
Insigna				-1,737***	

\* p<0.10, \*\* p<0.05, \*\*\* p<0.01

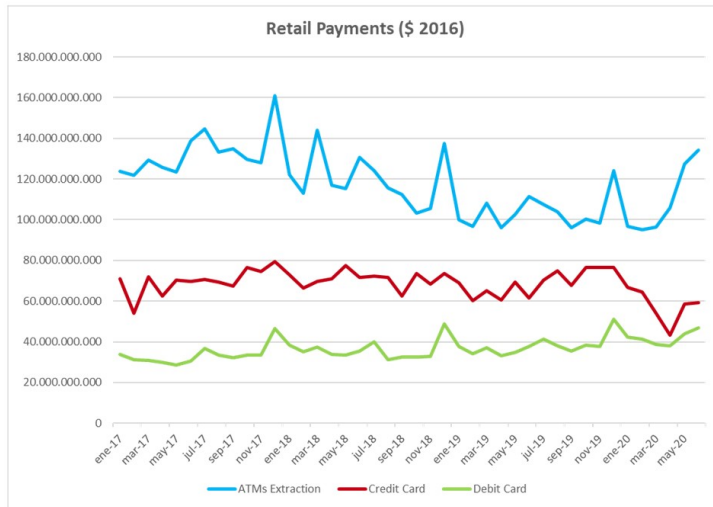


# Results: 2017

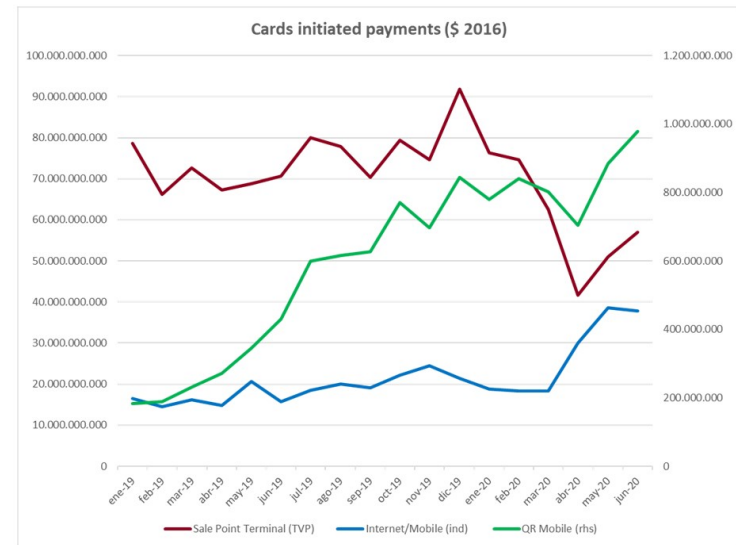
	Logit Use Credit Card			Heckman	
	Coef.	dy/dx	ey/ex	% Exp. CC	Use CC
Expenditure/Income	0,000017	0,000004	0,055900	0,000001	
	0,00000339***	0,000000731***	0,0108***	0,000000185***	
Expenditure decil	0,154000	0,0333	0,331	0,00723	
	0,00956***	0,000201***	0,0199***	0,000992***	
Age group	-0,171000	-0,0369	-0,39	0,00254	
	0,0152***	0,00324***	0,0352***	0,00139***	
Education (univ.)	0,108000	0,0233	0,00652	0,0239	
	0,0428***	0,00923***	0,000247***	0,00337***	
Female	0,033000	0,00713	0,00737	-0,00802	
	(0,0305)	(0,00659)	(0,000676)	0,00268**	
Home Ownership	0,342000	0,0739	0,12	0,0166	
	0,0353***	0,00756***	0,00122***	0,00303***	
Formal worker	0,585000	0,126	0,0698	0,0278	
	0,0362***	0,00764***	0,00364***	0,00311***	
Informal worker	0,115000	0,0247	0,00877	-0,00476	
	0,0435***	0,00939***	0,00321***	0,00400***	
Network prov.	3,043000	0,657	0,728	0,0877	
	0,150***	0,0313***	0,0353***	0,0132***	
cons	-2,167000			-0,0783	
	0,104***			0,0138	
Expenditure decil					0,140098
					0,000319***
Age>24					0,209
					0,0484***
Informal worker					-0,0286
					0,0261***
cons					-0,912
					0,0513***
Observations	21547	21547	21547		
athrho					-0.152***
Insigma					-2.000***

\* p<0.10, \*\* p<0.05, \*\*\* p<0.01

# Recent Events: Covid 19



*RetailPayments*



*MobileQRPayments*



# Conclusions and next steps

- The Argentine economy faces the important challenge of becoming a cashless economy
- Achieving this goal requires changes in several dimensions: low level of bank penetration, informal economy, and pervasive tax evasion
- Policies that only target either the demand or the supply side will likely fail to accomplish the goal of moving towards a cashless economy
- Effective policies should, therefore, consider the constraints that limit the behavior on both sides of the market
- Next steps:
  - Include informality on the supply side