Towards a cashless economy: The case of Argentina

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The views expressed herein are those of the author and are not necessarily those of the Central Bank of Argentina, the Federal Reserve Bank of Richmond, or the Federal Reserve System.
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 \(t^b_h\) per transaction in cash, \(t^b_d\) 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 \(t^s_h\) per in-cash transaction; credit card services entail a fixed cost \(F > 0\) and a cost \(t^s_d\) per credit card transaction
    - \(0 \leq m^s \leq 1\): proportion of sellers that accept credit card payments

- Assumptions: \(t^b_d < t^b_h\) and \(t^s_d < t^s_h\)
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 $\alpha ((1 - \alpha) \text{ can only use cash})$
  - $0 \leq m^s \leq m^b \leq \alpha$: $u^b = m^s(v - t^b_d) + (1 - m^b)(v - t^b_h)$
  - $0 \leq m^b \leq m^s \leq \alpha$: $u^b = m^b(v - t^b_d) + (1 - m^b)(v - t^b_h)$
  - The same expected utility holds when $0 \leq m^b \leq \alpha \leq m^s$.
  - In sum: $u^b = \min\{m^s, m^b\}(v - t^b_d) + (1 - m^b)(v - t^b_h)$
  - Best response: $m^b = m^s$ for all $m^s$, subject to $m^b \leq \alpha$

- **Sellers**
  - $m^b \geq m^s$: $u^s_d - u^s_h = 1 - t^s_d - F - \frac{(1 - m^b)}{(1 - m^s)}(1 - t^s_h)$
  - $m^b < m^s$: $u^s_d - u^s_h = \frac{m^b}{m^s}(t^s_h - t^s_d) - F$
  - Best response: $m^s$ determined by $\Delta(m^s, m^b) \equiv u^s_d - u^s_h = 0$
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 \( t^s_h, t^s_d \), 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

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<tr>
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<th>cash + debit</th>
<th>credit</th>
<th>transfer</th>
<th>total</th>
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<th>cash</th>
<th>debit</th>
<th>credit</th>
<th>transfer</th>
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2012 | 2017

---

9
## Empirical Evidence: Means of payment by province

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<tr>
<th>PROVINCE</th>
<th>% Expdt cash + debit 2012</th>
<th>% Expdt cash + debit 2017</th>
<th>% Expdt credit card 2012</th>
<th>% Expdt credit card 2017</th>
<th>% HH with credit card 2012</th>
<th>% HH with credit card 2017</th>
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<td>0.133</td>
<td>0.493</td>
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<td>0.580</td>
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<td>0.072</td>
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<td>0.058</td>
<td>0.630</td>
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<td>TUCUMAN</td>
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<td>0.897</td>
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<td>Total Argentina</td>
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<td><strong>0.856</strong></td>
<td><strong>0.073</strong></td>
<td><strong>0.082</strong></td>
<td><strong>0.520</strong></td>
<td><strong>0.528</strong></td>
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## Empirical evidence: Means of payment by income decile

<table>
<thead>
<tr>
<th>Decil</th>
<th>% with CC 2012</th>
<th>% with CC 2017</th>
<th>% Expdt CC 2012</th>
<th>% Expdt CC 2017</th>
<th>% Expdt Cash 2012</th>
<th>% Expdt Cash 2017</th>
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<td>2</td>
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<td>0.3299</td>
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<td>0.9148</td>
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<td>3</td>
<td>0.4724</td>
<td>0.3848</td>
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<td>0.8966</td>
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<td>4</td>
<td>0.5004</td>
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<td>0.0960</td>
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<td>6</td>
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<td>0.8867</td>
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<td>10</td>
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<td>0.2090</td>
<td>0.7838</td>
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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

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coef.</th>
<th>dy/dx</th>
<th>ey/ax</th>
<th>% Exp. CC</th>
<th>Use CC</th>
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<tr>
<td>Expenditure/income</td>
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<tr>
<td></td>
<td>0.0000134***</td>
<td>0.00000297***</td>
<td>0.0092898***</td>
<td>0.00000103***</td>
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<tr>
<td>Expenditure decil</td>
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<tr>
<td></td>
<td>0.0081444***</td>
<td>0.001754</td>
<td>0.0181458***</td>
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</tr>
<tr>
<td>Age group</td>
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<td>-0.0467107</td>
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<td>Age group</td>
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<td>Home Ownership</td>
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<td>Formal worker</td>
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<td>0.0075923***</td>
<td>0.0054542***</td>
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<tr>
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<td>cons</td>
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<td>0.1076817***</td>
<td>0.1047609</td>
<td>0.00031547***</td>
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</table>

**Expenditure decil**
- Age>24
- Informal worker
- cons

**Observations**: 20960

**arhbo**
**Insigna**

*p<0.10, **p<0.05, ***p<0.01
### Results: 2017

<table>
<thead>
<tr>
<th>Logit Use Credit Card</th>
<th>Heckman Use CC</th>
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<td><strong>Expenditure/income</strong></td>
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<tr>
<td>Coef.</td>
<td>dv/dx</td>
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<tr>
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<td><strong>Expenditure dec</strong></td>
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<tr>
<td>Coef.</td>
<td>dv/dx</td>
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<td>0.00956***</td>
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<td><strong>Age group</strong></td>
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<tr>
<td>Coef.</td>
<td>dv/dx</td>
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<td>0.0152***</td>
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<td>dv/dx</td>
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<tr>
<td>0.033000</td>
<td>0.00713</td>
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<tr>
<td>(0.0305)</td>
<td>(0.00659)</td>
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<tr>
<td><strong>Home Ownership</strong></td>
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<tr>
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<td>0.00756***</td>
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<td>0.00939***</td>
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<tr>
<td><strong>Network prov.</strong></td>
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<tr>
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<tr>
<td><strong>cons</strong></td>
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<tr>
<td>Coef.</td>
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<td>0.104***</td>
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- * p<0.10, ** p<0.05, *** p<0.01
Recent Events: Covid 19

Retail Payments

Mobile QR Payments
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