Last meeting

Last meeting:

- Presented outline of a research idea about cross-selling

Today's meeting:

- Present model of multi-product banks with switching costs and asymmetric information
- What patterns in the data would be consistent with asymmetric information
- Recommendations on next steps considering that I still have to apply for the data

Model: Setup (Adapting Engelbrecht-Wiggans et al., 1983)

- Model of a banking duopoly
- Two periods:
  - $t = 1$: borrower gets an introductory product
  - $t = 2$: borrower requests a loan
- In $t = 2$ the incumbent bank observes the borrower's default probability h, the entrant only the distribution $F(h)$ with pdf $f(h)$
- In $t = 2$ the borrower incurs a switching cost λ if switching to the entrant bank

Strategies:

- Bank 1 (incumbent): $r_1(h) = \sigma(h)$, an increasing function of h
- Bank 2 (entrant): mixed strategy $G(x) = \Pr(r_2 \leq x)$
- Borrower chooses bank 2 if $r_1 > r_2 + \lambda$

Model: Equilibrium

Expected profits:

$$\pi_1(r_1(h)) = [1 - G(\sigma(h) - \lambda)] \cdot [(1-h)\sigma(h) - 1]$$
$$\pi_2(r_2) = \Pr(\sigma(h) > r_2 + \lambda) \cdot [E[(1-h)r_2 - 1 \mid \sigma(h) > r_2 + \lambda]$$

where $\tau = \sigma^{-1}$ is the inverse of bank 1's strategy.

Equilibrium strategies:

- Incumbent's optimal strategy:

$$\sigma(h) = \lambda + \frac{1}{E[1 - H \mid H > h]}$$

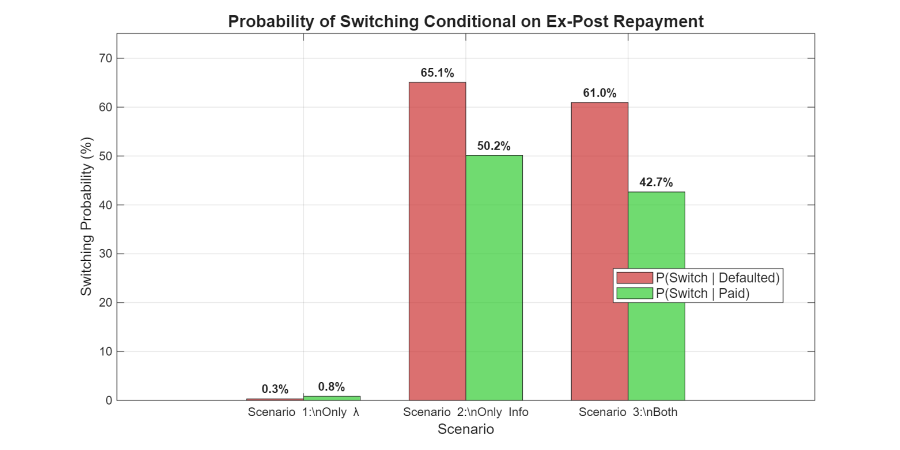
- Bank 2's mixed strategy:

$$G(r - \lambda) = 1 - \exp\left[-\int_{\underline{r}}^{r} \frac{1-\tau(u)}{(1-\tau(u))u - 1} du\right]$$

Observations

- Entrant faces adverse selection: switchers have higher h
- Informational asymmetries create rents due to market power in $t = 2$, but they are competed away in $t = 1$
  - Information asymmetries can lead to higher financial inclusion

Simulation: Switching Probability by Repayment



Mortgage default rates

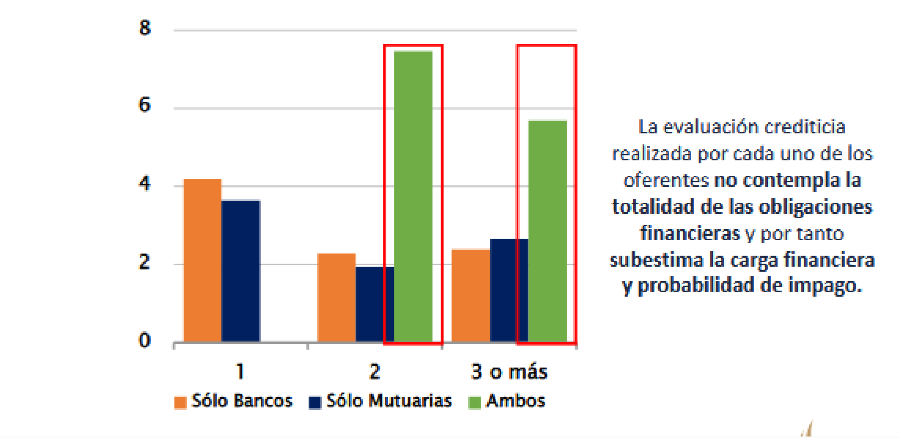


Figure 1: Marcel (2021)

Identification

Observables: winning rate r_i^{win}, winner identity $W_i \in \{1, 2\}$, default $D_i \in \{0, 1\}$

- **Switching cost λ:** Identified from the gap between the minimum incumbent rate and the minimum entrant rate: $\lambda = \min(r_1^{win}) - \min(r_2^{win})$
- Is the model identified? I recovered the parameters of a simulation, but do not have a formal proof.

Estimation: MLE

Each observation is (r_i^{win}, W_i, D_i) a rate, the winner identity and the default outcome.

- **Incumbent wins** $(W_i = 1)$: type is revealed, $h_i = \tau(r_i^{win})$

$$\mathcal{L}_i = \underbrace{f(\tau(r_i^{win})) \cdot |\tau'(r_i^{win})|}_{\text{density of rate}} \cdot \underbrace{[1 - G(r_i^{win} - \lambda)]}_{\text{prob. incumbent wins}} \cdot \underbrace{h_i^{D_i}(1-h_i)^{1-D_i}}_{\text{default outcome}}$$

- **Entrant wins** $(W_i = 2)$: type is unobserved, integrate out h

$$\mathcal{L}_i(r_i^{win}, D_i, W_i = 2; \theta) = \int_{h_{min}}^{h_{max}} \Pr(r_i^{win}, D_i, W_i = 2 \mid h; \theta) \cdot f(h; \alpha, \beta)\, dh$$

$$= \underbrace{g(r_i^{win})}_{\text{density of entrant's offer}} \cdot \int_{\tau(r_i^{win}+\lambda)}^{h_{max}} \underbrace{h^{D_i}(1-h)^{1-D_i}}_{\text{default outcome}} \cdot \underbrace{f(h)}_{\text{type density}} \, dh$$