Skin in the Game:
Colleges’ Financial Incentives and Student Loans

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NBER SI Education

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A privately-run, but publicly-funded, higher education system
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   - **Brazil:** Access grew from 14% in the 2000s to 55% by 2020
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2. Governments have liberalized access of educational providers
   - **Brazil**: 75% of students enrolled in private colleges

Concerns of poor educational quality

- Dropout rate:
  - **Brazil**: 60%
  - **US**: 50%

- Default rate:
  - **Brazil**: 53%
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⇒ High delinquency rate threatening the sustainability of loan programs
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3. Governments have catalyzed growth by facilitating access to state-guaranteed loans
   → Share of undergrads with loan from federal government:
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The economics behind the storm

Misaligned incentives

1. Imperfect information on education **quality**
   - No past experience/one-time decision → Opaque product
   - New students and new programs
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Skin-in-the-game policies
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Skin-in-the-game policies

- Create contracts based on outcomes → hold them accountable for student loan defaults
  - Brazil: Penalize schools for dropouts or defaults starting in 2018 (our experiment)
  - US: Proposed legislation makes institutions liable for 50% of student loans in default
Skin in the Game Act would require colleges pay 50% of student loans for students who default.

As bipartisan consensus emerges in Congress that colleges should share the burden of students who can't repay loans or find jobs, higher ed leaders consider how such a plan would work and whether it would discourage them from educating the disadvantaged.

Executive order under consideration would require schools to take financial stake when students don't repay.
This paper

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Student screening: academically-challenged students from low-income backgrounds may be screened out
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What do we do?:

1. Reduced-form evidence of policy that increased college accountability in 2017 in Brazil
2. Build equilibrium model to compute optimal penalty & conduct counterfactuals
Related Literature


- **Design of Government Loan Programs**: Gale (1991), Brosshardt, Kakhbod and Kermani (2023), Bachas, Kim and Yannelis (2020), Granja et al. (2022), Kuchler et al. (2022)
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Data and Setting
Data

University entrance exam
• Standardized national college entrance exam
• Period: 2009-2022

University census
• Universe of students enrolled in higher education
• Records of faculty composition, payroll, capital costs, maintenance costs, research investment
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Federal student loan program (FIES)
• Loans: amount, interest rate, conditions
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Higher education landscape in Brazil

Market structure

- In 2018: 6 million students in 2,200 institutions
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• Covers 100% of tuition costs
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• Broad coverage:
  - Largest year: 28% of incoming students (80% of degrees)
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The allocation of FIES loans (Since 2015)

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  → Increasing their degrees’ loan cutoff
Skin-in-the-game reform

- Passed in 2017, the program was reformed to increase school liability
- It targeted dropout and default rates
  - Default and dropout positively correlated
- Schools are liable for 10-25% of loans (based on dropout/default of students with loans)
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\[
\text{Revenue per loan student} = (1 - \text{penalty}) \cdot \text{tuition}
\]

\[
\text{penalty(dropout, default)} \in [0.10, 0.25]
\]
Effects of the Skin in the Game Reform: Descriptive Evidence
How did the policy impact dropout rates?
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- Define treatment and control groups based on policy exposure:
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How did the policy impact dropout rates?

- Define treatment and control groups based on policy exposure:
  - **FIES reliance:** $\mathbb{E} \left[ \text{share students w/ loans} \mid \text{major, college, region} \right]$
- **Timing:**
  - Regression sample: 2016, 2017 (pre-policy); 2018, 2019 (post-policy)
  - FIES reliance: Calculated in 2015
Event study

\[ \text{LoanDropout}_{jt} = \alpha_j + \alpha_t + \beta_t \cdot \text{FiesReliance}_j + \epsilon_{jt} \]
FIES dropout decreased for schools with higher FIES reliance

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- FIES reliance ↑ 1 sd ⇒ Dropout rate ↓ 1.3 pp (14%)
Decomposing dropout into degree and composition effects

- Change in dropout driven by:
  - Changes in degree quality
  - Changes in student body composition

\[
d_{ijt} = \alpha_{jt} + X_{ijt} \beta + \epsilon_{ijt}
\]

- Degree-year fixed effects
- \(X_{ijt}\): student characteristics (demographics, hh income, parental educ, test scores, etc)

We can decompose

\[
E[d_{ijt}|j] = \hat{\alpha}_{jt} + E[X_{ijt} \hat{\beta} | j]
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  \[ \mathbb{E} [d_{ijt} | j] = \hat{\alpha}_{jt} + \mathbb{E} [X_{ijt}\hat{\beta} | j] \]

→ Same event study, with degree and composition effects as outcomes
Decomposing dropout into degree and composition effects

\[ \text{LoanDropout}_{jt} = \alpha_j + \alpha_t + \beta_t \cdot \text{FiesReliance}_j + \epsilon_{jt} \]
No effect on composition

\[ \text{Composition}_{jt} = \alpha_j + \alpha_t + \beta_t \cdot \text{FiesReliance}_j + \epsilon_{jt} \]
Degree effect fully explains dropout changes

\[ \text{DegreeEffect}_{jt} = \alpha_j + \alpha_t + \beta_t \cdot \text{FiesReliance}_j + \epsilon_{jt} \]
Mechanisms?

- Faculty-student ratios are a standard measure of quality (Eaton et al., 2020, Angrist & Lavy, 1999; Angrist, et al., 2019; Hoffmann & Oreopoulos, 2009)
Faculty-student ratio went up for degrees with higher FIES reliance

- Faculty-student ratios are a standard measure of quality (Eaton et al., 2020, Angrist & Lavy, 1999; Angrist, et al., 2019; Hoffmann & Oreopoulos, 2009)

\[ \log(\text{Faculty/Student}_{jt}) = \alpha_j + \alpha_t + \beta_t \cdot \text{FiesReliance}_j + \epsilon_{jt} \]

- FIES reliance ↑ 1 sd ⇒ Faculty-student ratio ↑ 8%
Which degrees have incentive to increase screening?

Expected profits from each loan student:

\[ \pi_i = \text{tuition} - \text{marginal cost} - \text{expected penalty} \]

College keeps student if \( \pi_i \geq 0 \) → Higher expected penalty, more screening

Measuring exposure

Dropout risk: \( E_{\text{drop rate}} \) major, college, region

Timing:
- Regression sample: 2016, 2017 (pre-policy); 2018, 2019 (post-policy)
- Dropout risk: Calculated in 2015

Outcome:

FIES Cutoff → Negative correlation between scores and dropout/default
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\[ \text{FiesCutoff}_{jt} = \alpha_j + \alpha_t + \beta_t \cdot \text{DropoutRisk}_j + \epsilon_{jt} \]
FIES cutoff increased in high-dropout degrees

\[ \text{FiesCutoff}_{jt} = \alpha_j + \alpha_t + \beta_t \cdot \text{DropoutRisk}_j + \epsilon_{jt} \]

- Dropout risk $\uparrow$ 1 sd $\Rightarrow$ FIES Cutoff $\uparrow$ 0.08 sd
High-dropout degrees less likely to stay in FIES

$$\text{HasAnyLoan}_{jt} = \alpha_j + \alpha_t + \beta_t \cdot \text{DropoutRisk}_j + \epsilon_{jt}$$

Dropout risk ↑ 1 sd ⇒ Has any loan ↓ 4pp (7%)
Takeaways

Descriptive evidence

1. Degrees more reliant on FIES:
   - Decreased dropout rate
   - Change in dropout rate not explained by student composition
   - Increased faculty-student ratio

2. Degrees with high dropout risk:
   - Increased sorting (FIES cutoff)
   - More likely to opt-out of the loan program

Next: Structural model

(a) Incorporate trade-offs into unified welfare measure
(b) Predict equilibrium outcomes of counterfactual policies

(a)+(b): Study optimal policy design and compare with alternative policy instruments
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Structural Model
The model in a nutshell

1. **Supply**: Colleges choose price, loan cutoff, quality to maximize profits

2. **Demand**: Students choose a degree to maximize utility
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2. **Demand:** Students *choose a degree* to maximize utility
Demand: Degree choice

- Market: All students who took ENEM (centralized exam) in each year $t$
- Choice set: all private degrees in student’s region
- Students choose a degree (or the outside option $j = 0$) to maximize utility:

$$U_{ijt} = \beta_i h_j + \alpha_{ij} p_{jt} + \xi_{ijt}$$
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- $h_j$ are fixed degree characteristics
- $\beta_i^h$ represents preference heterogeneity
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- $\xi_{ijt}$: demand shock
- Parameterization: $\xi_{ijt} = \gamma_j + \gamma_{rt} + \xi_{jt} + \epsilon_{ij}$
- $\epsilon_{ij} \overset{iid}{\sim}$ Extreme Value Type I
- $\gamma$: fixed effects

Student loan allocation
Supply: Colleges choose price, quality, cutoff to maximize net profits

\[
\max_{p, q, r} \left[ p - c(q, r) \right] \cdot s(p, r) - \theta \cdot p \cdot d(p, q, r)
\]

- **\( p \)**: price
- **\( \bar{r} \)**: loan cutoff
- **\( q \)**: quality
- **\( s(p, \bar{r}) \)**: market share
- **\( c(q, \bar{r}) \)**: marginal cost
- **\( d(p, q, \bar{r}) \)**: expected dropout
- **\( \theta \)**: penalty rate
Dropout depends on cutoff, quality

Student $i$ drops out from degree $j$ if:

$$d_{ijt} = \mathbb{1}\{f(q_{jt}, r_i) + \Delta \delta_{it} \geq 0\},$$

- $q_{jt}$: quality
- $r_i$: score
- $\nu$: parameter
- $\nu$: student-level iid dropout shock
Estimation: Method of moments

Key parameters and moments:

- Effect of loans on price sensitivity
  - Moment: Enrollment discontinuity across loan eligibility cutoffs
  - Details
- Dropout function
  - Moment: Each degree's dropout rate; and the correlation between scores and dropout
  - Details
- Marginal cost function
  - Moment: Exposure to policy change uncorrelated with marginal cost shocks
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Results
Welfare

\[ \text{Welfare} = CS + \Pi + T \]

- \( CS \): Consumer surplus
- \( \Pi \): Profits
- \( T \): Government losses due to default
Welfare

\[ \text{Welfare} = CS + \Pi + T \]

- **CS**: Consumer surplus
  - Assumption: Choices of students with loans are welfare maximizing

- **\(\Pi\)**: Profits

- **\(T\)**: Government losses due to default
Welfare

\[ \text{Welfare} = CS + \Pi + T \]

- **CS**: Consumer surplus
  - Assumption: Choices of students w/ loans are welfare maximizing

- **\( \Pi \)**: Profits

- **\( T \)**: Government losses due to default
  - Assumption: All students who dropout default the full amount of their loans
Optimal penalty is 50%
Conclusion
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**Descriptive evidence**: Following a skin-in-the-game policy implemented in Brazil in 2017, colleges:
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Structural model: Colleges should be liable for 50% of loans
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- **Quality improvements**: reduced dropout, hired more faculty
- **Student screening**: increased cutoff scores

**Structural model**: Colleges should be liable for 50% of loans

**Next steps**: Incorporate student-level default data into the analysis
Thank you!
Marginal costs depend on cutoff, quality

\[ c_{jt}(q_{jt}, \bar{r}_{jt}) = \Gamma(q_{jt} - \gamma_{jt})^2 + R(\bar{r}_{jt} - \nu_{jt})^2 + \omega_{jt} \]
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\( \gamma_{jt}, \nu_{jt} \) capture exogenous factors determining quality, cutoff decisions
- Providing quality is costly
- Government imposes minimum cutoff, quality requirements
- Demand might be affected in the long term (prestige etc.)
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\(\gamma_{jt}, \nu_{jt}\) estimated to match observed quality, cutoffs
Students are more likely to enroll if a loan is available
Dropout score
Dropout quality
Skin-in-the-game reform

\[
penalty_j = 0.16 + 0.025 \cdot \frac{x_j - \text{mean}(x)}{\text{sd}(x)}
\]

\[
x_j = \frac{1}{2} \frac{\text{default}_j - \text{mean}(\text{default})}{\text{sd}(\text{default})} + \frac{1}{2} \frac{\text{dropout}_j - \text{mean}(\text{dropout})}{\text{sd}(\text{dropout})}
\]

- The penalty is capped between 10% and 25%.
The allocation of student loans is given by:

\[ L_{ij} = \begin{cases} 
1, & \text{if } B_i = 1 \text{ and } r_i \geq \bar{r}_{jt} \\
0, & \text{if } B_i = 0 \text{ or } r_i < \bar{r}_{jt}
\end{cases} \]

- \( B_i \) : loan take-up indicator
- \( \bar{r}_{jt} \) : cutoff to receive a loan in degree \( j \) in year \( t \)

\[ \rho(x_i) \equiv P(B_i = 1|x_i) \] is a known function
- Up to parameters to be estimated
No significant effects on dropout rates

\[ \text{DropoutRate}_{jt} = \alpha_j + \alpha_t + \beta_t \cdot \text{DropoutRisk}_j + \epsilon_{jt} \]
Dropout and default are positively correlated.

![Graph showing the correlation between dropout rate and percentage of late payment for for-profit and non-profit institutions.](image-url)
How did the policy impact dropout rates?

![Graph showing the impact of the policy on dropout rates](image-url)