Job Search under Debt: Aggregate Implications of Student Loans

Yan Ji

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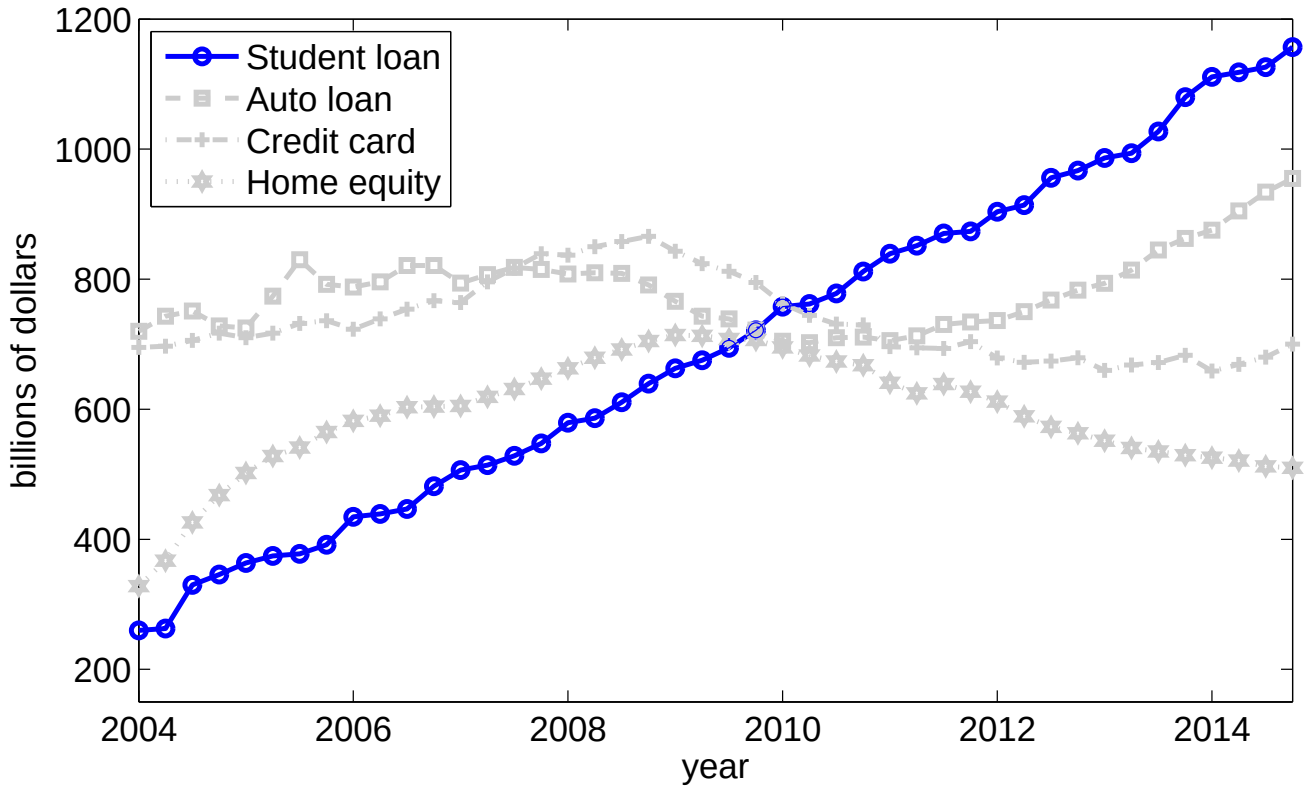
Student loans are large and rising



- Lively discussed during the presidential campaign.
- What is the implication on labor market outcomes?

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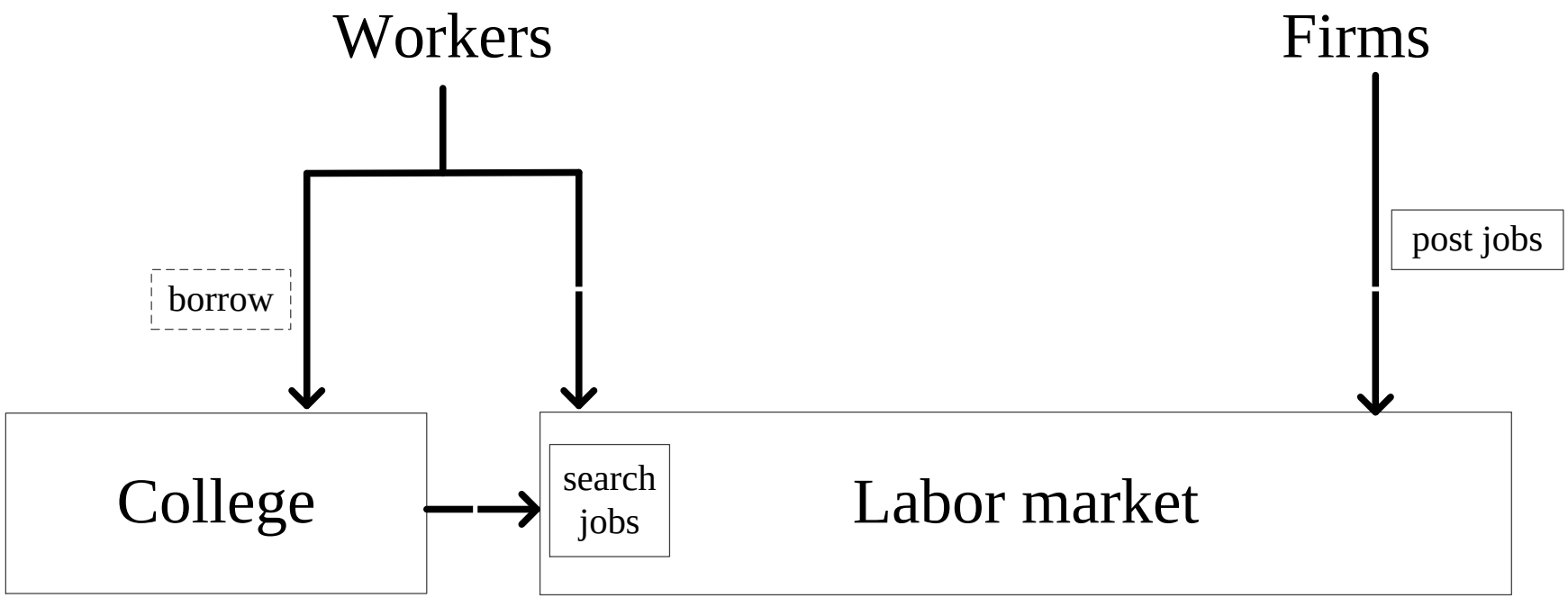
- Methodology: Develop and estimate an equilibrium life-cycle model with college entry and job search.

Overview of model and main results



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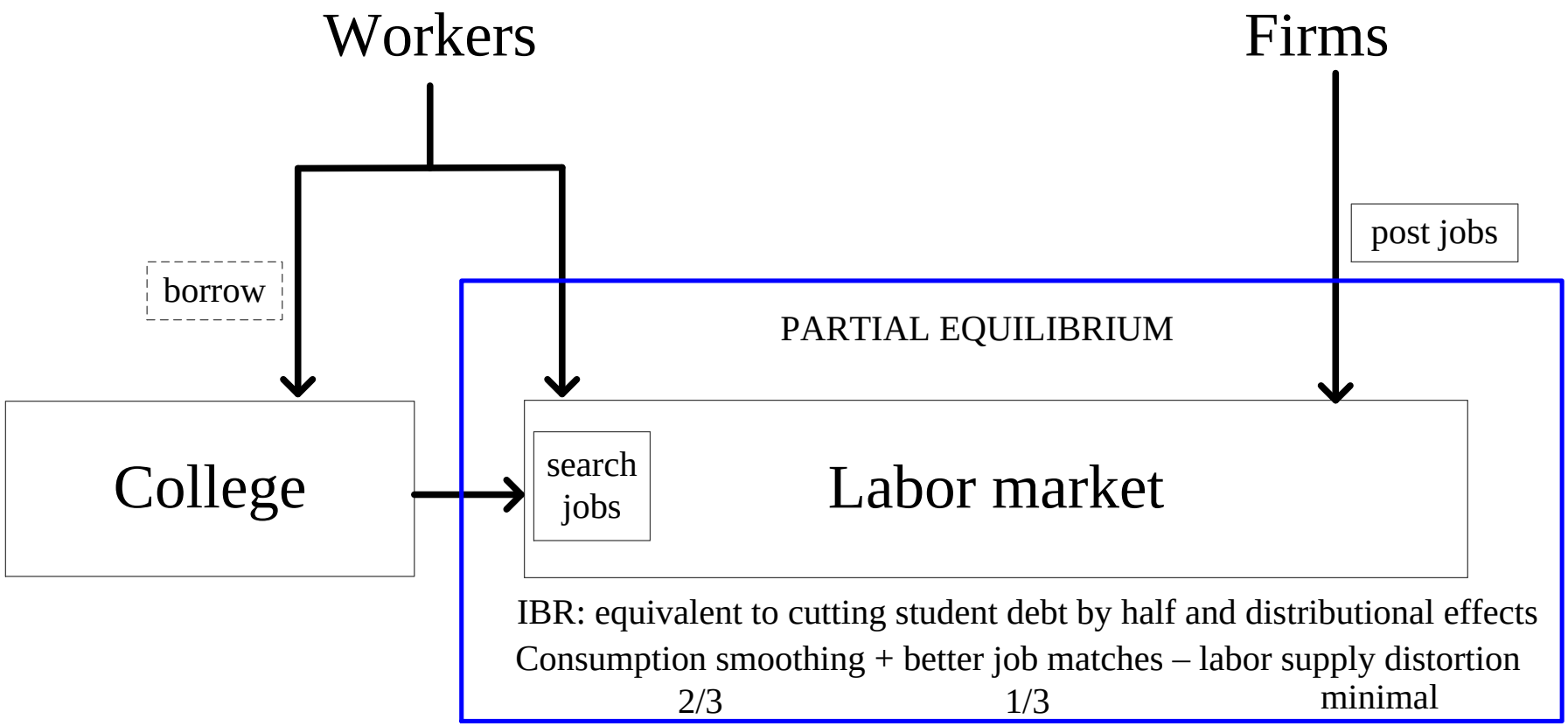

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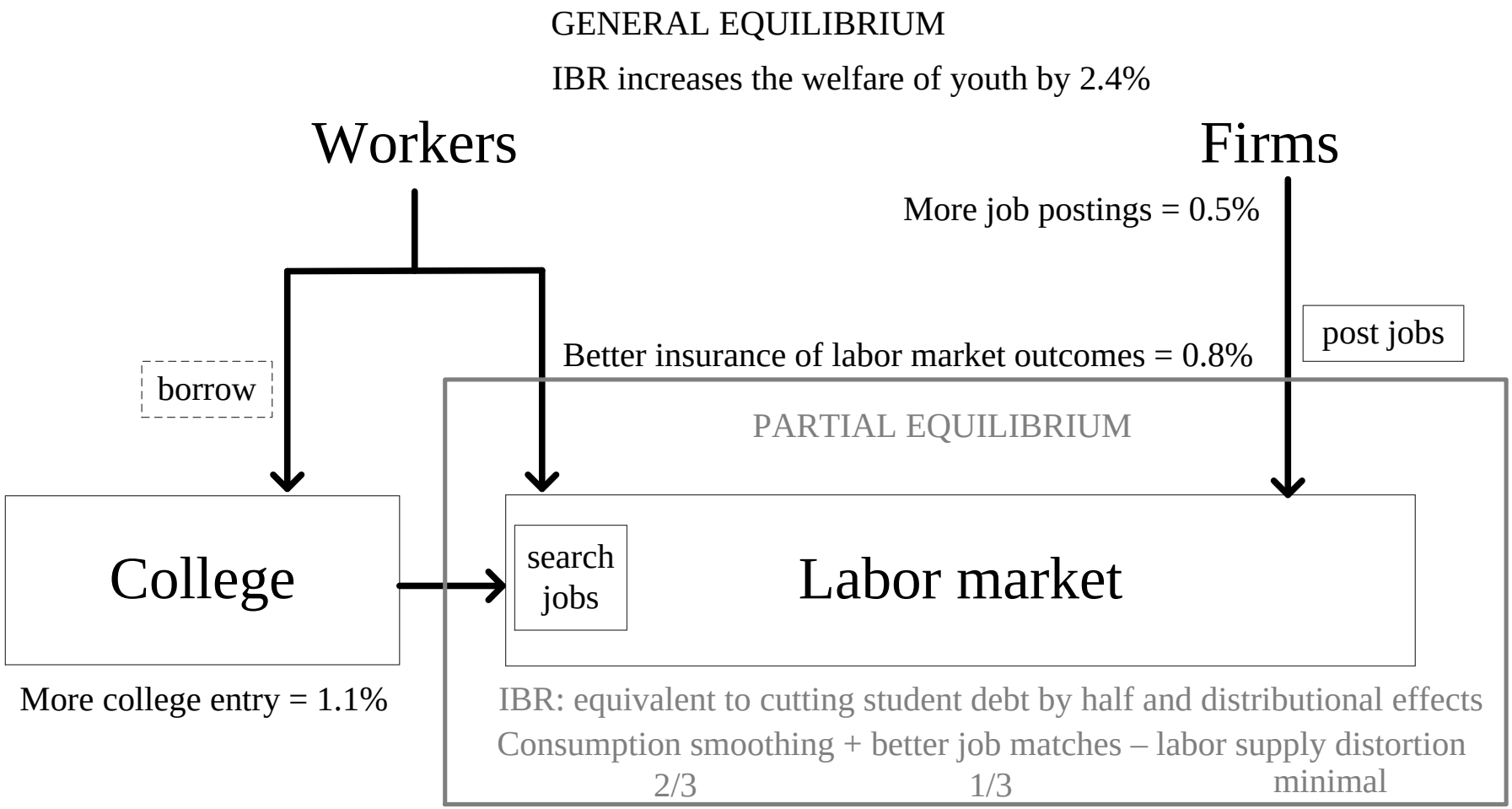

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Related literature

- Risk and liquidity channels of job search
  - Danforth (1979); Acemoglu, Shimer (1999); Chetty (2008); Herkenhoff, Phillips, Cohen-Cole (2016); etc.
- Student loans and income-based repayment plans
  - Abbott et al. (2016); Stiglitz, Higgins and Chapman (2014); Dearden et al (2008); Ionescu (2009); Mattana, Joensen (2014); Joensen and Mattana, 2016; etc.
- Household debt and labor market outcomes.
  - Aggregate demand: Eggertsson, Krugman (2012); Mian, Sufi (2014);
  - Risk shifting: Donaldson, Piacentino, Thakor (2016);
  - (Non-)Wage tradeoff: Rothstein, Rouse (2011); Luo, Mongey (2016).
- Quantitative search models of labor market.
  - Krusell, Mukoyama, Sahin (2010); Lise, Meghir, Robin (2015); Bagger, et al.(2014); Herkenhoff et al. (2016); etc.

Road map

- Quantitative model
- Data and Estimation
- Quantitative analysis
- Conclusion

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- College study increases labor productivity

$$z(a, n, t) = A_n a g(t),$$

  - $A_2 - A_1$ reflects college premium, $g(t) = \mu_0 + \mu_1 t + \mu_2 t^2 + \mu_3 t^3$.

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- College decision is made to maximize utility.

Labor market

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$$u(c_t, l_t) = \frac{1}{1-\gamma}\left(c - \phi\frac{l^{1+\sigma}}{1+\sigma}\right)^{1-\gamma}.$$

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- Matched worker-job pair produces a flow of output

$$F = z(a, n, t)\rho l.$$

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- Matches formed if exists w, s.t. $W(.) \geq U(.)$, $J(.) > 0$.
- Matches break up exogenously at rate κ.

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- The maximal employment value that job ρ can offer:

$$\overline{W}(\Omega, \rho) \equiv W(\Omega, \rho, z\rho)$$

- $\rho_u(\Omega)$ is the reservation productivity:

$$\overline{W}(\Omega, \rho_u(\Omega)) = U(\Omega)$$

- Mechanism: higher s results in lower ρ_u.

On-the-job search

- If worker Ω in job ρ' and wage w', poached by vacancy ρ.
  - Bertrand competition (Postel-Vinay and Robin, 2002).

- Case 1: $\overline{W}(\Omega, \rho) \leq W(\Omega, \rho', w')$, nothing changes.

- Otherwise,
  - Case 2: $\rho > \rho'$, transfer to ρ, negotiation benchmark is ρ'.

$$w^e(\Omega, \rho, \rho') = \arg\max_w [W(\Omega, \rho, w) - \overline{W}(\Omega, \rho')]^\xi J(\Omega, \rho, w)^{1-\xi}.$$

  - Case 3: $\rho \leq \rho'$, stay in ρ', negotiation benchmark is ρ.

$$w^e(\Omega, \rho', \rho) = \arg\max_w [W(\Omega, \rho', w) - \overline{W}(\Omega, \rho)]^\xi J(\Omega, \rho', w)^{1-\xi}.$$

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- IBR

$$y_t^{ibr} = \min\left(0.15 \max(w_t l_t - pov, 0), \quad y_1^{fix}, \quad s_t\right), \quad \text{for } t <= 25.$$

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- Taxes used to finance UI and non-valued government spending:

$$(1-\overline{u})T \iint wl[1-\varkappa(wl)^{-\tau}]d\Phi^{e}(\Omega,\rho) = \overline{u}T \int \varkappa\theta^{1-\tau}d\Phi^{u}(\Omega) + G.$$

Stationary competitive equilibrium

- The stationary competitive equilibrium consists of stationary distributions of unemployed agents, $\Phi^u(\Omega)$, employed agents $\Phi^e(\Omega, \rho)$, vacancies $V(\rho)$, the number of vacancies N_v and unemployment rate $\overline{u}$, such that:

  (1). Job contact rates are determined by meeting technology.

  (2). Agents optimally make consumption, labor supply, and default decisions depending on default status. timing value functions

  (3). Wage rates are determined by Nash bargaining.

  (4). N_v and $V(\rho)$ are determined by the free entry condition.
  - Expected value of creating a vacancy is equal to ν. formula

  (5). $\overline{u}$ is determined by equilibrium flow equation:

$$(1-\overline{u})\kappa = \overline{u}\lambda^u \left[\int [1 - V(\rho_u^d)]\phi^u(\Omega, 1)d\Omega + \int [1 - V(\rho_u)]\phi^u(\Omega, 0)d\Omega \right].$$

Data and Parametrization

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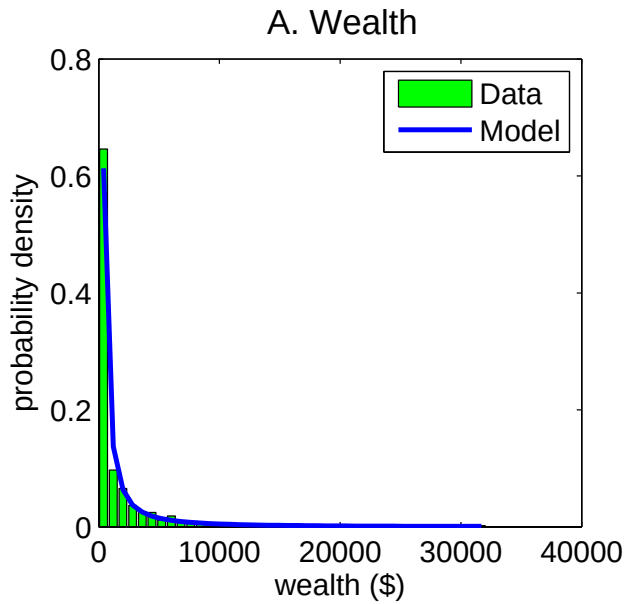
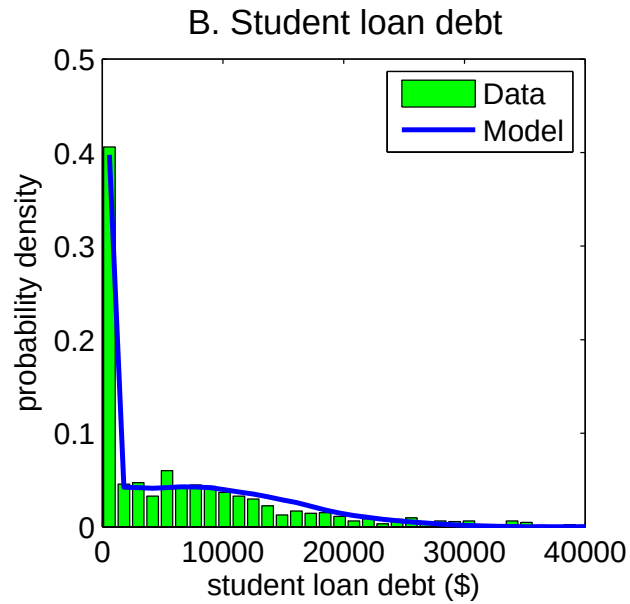
  - $b_0 \sim \text{Pareto}(\underline{b}, \zeta, \varphi)$, $z \sim \text{Beta}(f_1^a, f_2^a)$, correlation ϑ.
  - $\rho \sim \text{Beta}(f_1^\rho, f_2^\rho)$.
  - $k \sim \text{Truncated-Normal}(\mu_k, \sigma_e^2)$ and $e \sim \text{Normal}(\mu_k, \sigma_e^2)$

Model fit


A. Wealth
Data
Model
probability density
0.8
0.6
0.4
0.2
0
0
10000
20000
30000
40000
wealth ($)


B. Student loan debt
Data
Model
probability density
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0.4
0.3
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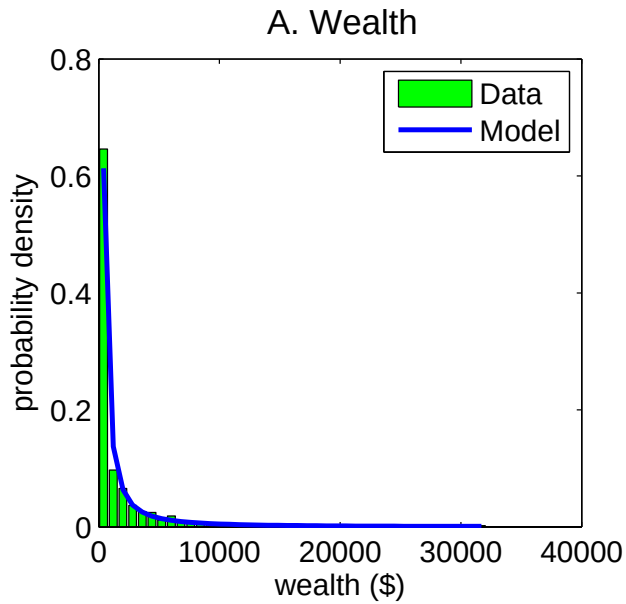
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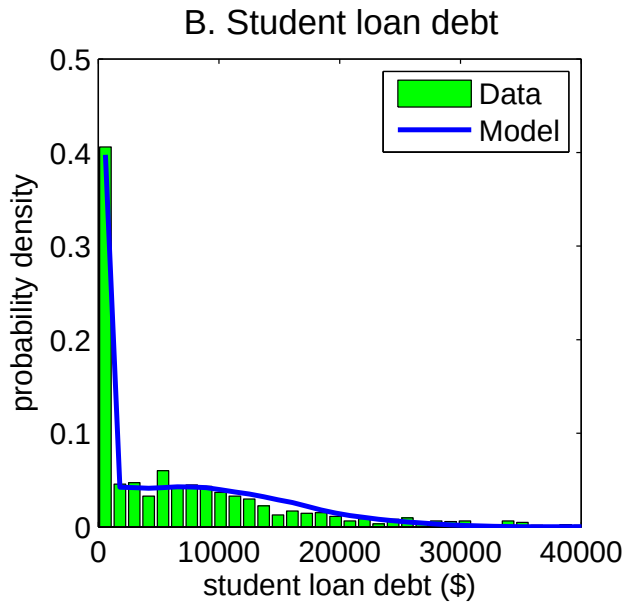
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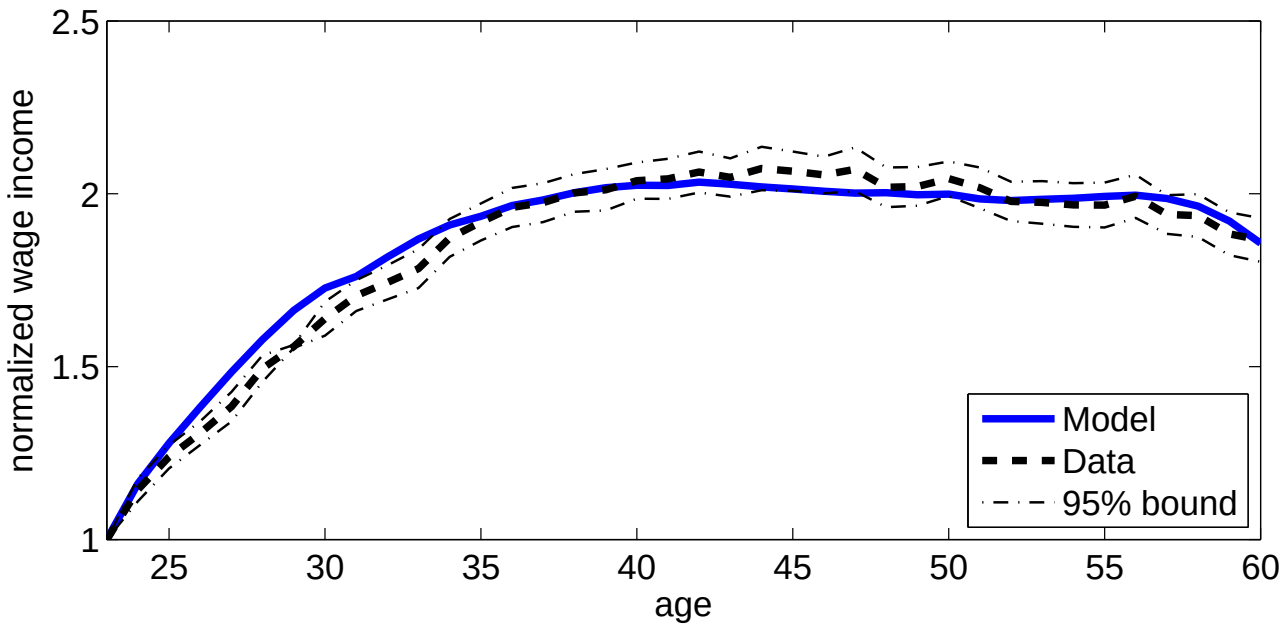
normalized wage income
2.5
2
1.5
1
25
30
35
40
45
50
55
60
age
Model
Data
95% bound

Model fit

Labor Market Moments	**Model**	**Data**
Mean of wage income among high school graduates in first 5 years	\$26,364	\$26,736
Mean of wage income among college graduates in first 5 years	\$40,354	\$40,619
Mean of employment duration (year)	2.2	2.2
Mean of unemployment duration (week)	27.2	27.2
Mean of job tenure (year)	1.5	1.5
Variance of log wage income	0.180	0.155
Skewness of log wage income	0.068	-0.174
Mean of log wage increase upon job-to-job transitions	0.132	0.150
Variance of log wage increase upon job-to-job transitions	0.023	0.042
Vacancy to unemployment ratio	0.409	0.409
Average hours worked per year	1,731	1,729
College and Debt Moments	**Model**	**Data**
Fraction of agents with a bachelor's degree	41.4%	42.2%
Unexplained variance in college entry decisions ($1 - R^2$)	0.64	0.64
Correlation between talent and student debt	0.05	0.04
Default rate	9.65%	9.26%

Comparing regression coefficients and elasticities

	Uemp. dur.	**Wage income**		
	First spell	First year	Second year	Third year
Actual data				
"Impact" coefficient	-2.08***	-2,067**	-2,152**	-2,619**
Standard error	(0.68)	(890)	(865)	(1,309)
Simulated data				
"Impact" coefficient	-1.83**	-2,411**	-2,122*	-1,810*
Standard error	(0.70)	(914)	(1,254)	(1,121)
Chow test p-value	0.81	0.83	0.85	0.83

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	Model	Micro Estimates	Source
UI on unemp. dur.	0.50	0.35-0.9	Card et al. (2015)
UI on res. wage	6.4%	4%	Feldstein and Poterba (1984)
Credit on unemp. dur.	0.7 weeks	0.15-3 weeks	Herkenhoff et al. (2015)
Credit on reemploy. wage	1.4%	0.8%-1.7%	Herkenhoff et al. (2015)

Average effects on young borrowers (ages 23-32)

- Focus on partial equilibrium
  - No change in college entry and borrowing decisions.
  - No change in firms job posting decisions

	Non -borrowers	**Normalized borrowers**			**Difference**
		FIX	IBR	IBR(w^*_{FIX})	IBR-FIX
Compensation ($)	N/A	6,274	3,003	4,214	-3,271
Unemp. dur.	23.8	22.0	23.4	22.4	1.4
(week)		(-7.6%)	(-1.7%)	(-5.9%)	(5.9%)
Match quality	0.836	0.812	0.826	0.813	0.014
		(-2.9%)	(-1.2%)	(-2.8%)	(1.7%)
Wage income	47,697	45,689	46,586	45,121	897
($)		(-4.2%)	(-2.3%)	(-5.4%)	(1.9%)
Output	60,235	57,976	58,756	56,862	780
($)		(-3.8%)	(-2.5%)	(-5.6%)	(1.3%)
Labor supply	1,737	1,724	1,711	1,695	-13
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- 1/3 of debt alleviation is attributed to better job matches.

General equilibrium implications of student debt

	FIX	**IBR**		
		(1)	(2)	(3)
Fraction of college graduates	41.4%	47.5%	47.7%	41.4%
Fraction of borrowers	62.2%	67.5%	67.6%	62.2%
Average debt among borrowers ($)	10,370	16,960	17,013	10,370
Job contact rate	0.82	0.88	0.82	0.82
Wage income ($)	37,212	38,452	38,018	37,445
		(3.3%)	(2.2%)	(0.6%)
Output ($)	45,600	46,512	46,317	45,829
		(2.0%)	(1.6%)	(0.5%)
Welfare (%)		2.4%	1.9%	0.8%

(1) - Full effect of IBR
(2) - Fix job contact rates are.
(3) - Fix college entry, borrowing, and job contact rates.

- Welfare decomposition: More college entry (1.1%) + More job postings (0.5%) + Better insurance in job search (0.8%).

Discussions on college premium and tuition subsidy

- College premium
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  - Borrower under FIX = \$47,697 - \$30,505 - \$2,008 = \$15,184
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- IBR essentially provides a tuition subsidy of \$2,252.
- This increases college enrollment by 6.1%.
- Implied college enrollment elasticity = 0.82 (0.52-0.83, Kane, 2006).
- Much less costly due to few debt forgiveness!

Conclusion

- Develop and estimate a quantitative equilibrium model of college entry and job search.
- The model implies
  - Borrowers are less picky and accept lower-paid jobs.
  - IBR makes borrowers "pickier" and largely alleviates the debt burden.
  - IBR may bring two general equilibrium effects that encourage college entry and job postings.