Introduction

Questions

- How do assets affect job choice? ▶ Fig: Increasing student debt
- Do less assets / more debt induce a trade-off of ↑ wages vs. ↓ amenity?
- If so, is it quantitatively important? (i) lifetime utility, (ii) policy

Three parts

1. General theory Bewley + McCall (random search) + Amenities
2. Empirical Confirm theory: ↑ debt, ↑ wages, ↓ amenity, duration
3. Quantitative Framework that we can estimate on our data
   - Novel Use observed search decisions + model to value amenities
   - Policy Decompose welfare under different student debt repayment policies
Theoretical model

Unemployed

\[ U(a) = \max_c u(c, x) + \beta \left[ \lambda \int \max \{ W(a', w', x'), U(a') \} dF(w', x') \right. \]
\[ \left. + (1 - \lambda) U(a') \right] \]
\[ a' = (1 + r)a + \bar{w} - c \]
\[ a' \geq -\bar{w} / r \]

Employed

\[ W(a, w, x) = \max_c u(c, x) + \beta \left[ \delta U(a') + (1 - \delta) W(a', w, x) \right] \]
\[ a' = (1 + r)a + w - c \]
\[ a' \geq -w / r \]

Assume: \( u \) has Inada conditions on both inputs, homogeneous degree one
Theoretical model - Decrease in assets

\[ W(a, h(a, x), x) = U(a) \]
Theoretical model - Decrease in assets

\[ W(\downarrow a', \uparrow h(a', x), x) = U(a) \]
Theoretical model - Decrease in assets

\[ \downarrow W (a', \downarrow h (a', x), x) = \downarrow U (\downarrow a') \]

1. ‘Substitution’ effect
2. ‘Income’ effect

Accept \((\psi, w)\) job offer

Reject \((\psi, w)\) job offer

Wage \(w\)

Low job satisfaction  High job satisfaction
Theoretical model - Decrease in assets

**Proposition**  
*For all* $a$ *there exists some* $x^*(a) \in (0, \infty)$ *such that*

- $x_a(x^*(a), a) = 0$
- If $x < x^*(a)$, then $h_a(x^*(a), a) < 0$
- If $x > x^*(a)$, then $h_a(x^*(a), a) > 0$
Data

Baccalaureate and Beyond Longitudinal Study (NCES)
- Restricted-use representative sample micro-data
- Cohorts of 2000 and 2008 graduates
- Agency reported
  - Government - Federal student aid form (parental income)
  - College - Major, GPA
- Self reported
  - Interviewed one year after graduation
  - Quantitative - Employment status, income
  - Qualitative - Search, job satisfaction → amenity

Link to publicly available college level data
- Integrated Postsecondary Education Data System (grants, loans)
- College Scorecard data (SAT scores)
Job satisfaction is decreasing in debt within income groups.

Debt quartiles computed within income quartiles. Students with no debt constitute 23% of the sample. Job satisfaction equals 1 if answering yes to all questions regarding job (i) security, (ii) career fit, (iii) major relevance, (iv) overall satisfaction, (v) importance in work-place. Full-time workers only (> 35 hrs).
Correlations - On-the-job search

A. Fraction OTJ search by income

- Search is decreasing in job satisfaction
- Search is increasing in debt, decreasing in income within satisfaction groups

B. Fraction OTJ search by student debt

Question Are you currently looking for a job? Zero corresponds to students with no debt (23% of sample).
Full-time workers only where full-time defined as more than 35 hours per week.
IV estimation - Framework

Estimating equation

\[ y_{ijc} = \alpha + \chi_j + \lambda_c + \beta d_{ijc} + \Gamma X_{ijc} + \varepsilon_{ijc} \]

\( i, j, c \) Individual, college, cohort

\( d_{ijc} \) Total borrowing from all student loan sources

\( X_{ijc} \) \{Age, gender, race\}_i, \{GPA, parental income\}_i, \{Average college SAT\}_j\c

\( \varepsilon_{ijc} \) Standard errors clustered to \( jc \)-level

Potential endogeneity

- Correlated \( \varepsilon_{ijc} \) and \( d_{ijc} \)

- Instrument for \( d_{ijc} \) using IPEDS data

\[ Z_{jc} = \frac{\text{total grants}_{jc}}{\text{total loans}_{jc} + \text{total grants}_{jc}} \in [0, 1] \]
### IV estimation - Estimates

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Salary</td>
<td>0.0079 (0.0149)</td>
<td>0.2114*** (0.0680)</td>
<td>0.4548*** (0.0906)</td>
</tr>
<tr>
<td>Amenity</td>
<td>-0.0004 (0.0003)</td>
<td>-0.0029* (0.0016)</td>
<td>— (0.0967)</td>
</tr>
<tr>
<td>Duration</td>
<td>—</td>
<td>-0.1351 (0.0967)</td>
<td>— (0.0967)</td>
</tr>
</tbody>
</table>

- $1,000 increase in debt causes $211 increase in initial earnings
Rothstein and Rouse (2011)
- Event study for a ‘highly selective school’ moving to no loans policy
- Increase in student debt of $1,000, increase in wages of $200

Chapman (2015)
- Uses BB data. RD around state merit aid eligibility
- Increase in student debt of $1,000, increase in wages of $400-800

Weidner (2017), Ji (2017)
- Neither control for endogeneity
- Models imply necessary relationship $\uparrow$ debt, $\downarrow$ wages, $\downarrow$ duration
Quantitative model

Aim
- Quantitatively assess (i) trade-off, (ii) changes to repayment policies
- Leverage observables in the BB09 data

Student debt
- Principal $d_{i,0}$, fixed interest rate $r_d$
- A repayment policy is a pair of functions $R = \{\rho, \Delta\}$
- Baseline $R_F$: Federal Stafford loans under Fixed Repayment
- Experiment $R_I$: Federal Stafford loans under Income-Based Repayment

Additional state variables
- Student debt $d$
- Loan repayment period $t$

Additional features
- On-the-job search $\kappa \sim H(\kappa), \quad \lambda_e \leq \lambda_u$
- Borrowing constraints $a' \geq -\gamma w, \quad a' \geq \min\{a, 0\}$
Quantitative model - Unemployed problem

\[
U(a, d, t) = \max_{c \geq c} u(c, x_b) + \beta \left[ (1 - \lambda_u) U(a', d', t') + \ldots \right]
\]

\[
\lambda_u \int \max \left\{ W(a', d', t', w', x'), U(a', d', t') \right\} dF(w', x')
\]

subject to

**Repayment**

\[
Ra + b + \Gamma_u(a) \geq c + \rho(d, t)
\]

\[
a' = Ra + b - c - \rho(d, t)
\]

\[
d' = R_d d - \rho(d, t)
\]

\[
t' = t + 1
\]

**Delinquent**

\[
Ra + b + \Gamma_u(a) < c + \rho(d, t)
\]

\[
a' = -\Gamma_u(a)
\]

\[
d' = \Delta(a, d, t, b)
\]

\[
t' = \begin{cases} 
\text{Reset if close to } T, \text{ otherwise} \\
\quad t + 1
\end{cases}
\]
Quantitative model - Employed problem

\[
W(a, d, t, w, x) = \max_{c \geq c} u(c, x) + \beta \delta U(a', d', t') \ldots \\
+ (1 - \delta) \int \max \left\{ -\kappa + W^S(a', d', t, w, x), W(a', d', t', w, x) \right\} dH(\kappa)
\]

\[
W^S(a', d', t', w, x) = \lambda_e \int \max \left\{ W(a', d', t', w, x), W(a', d', t', w', x') \right\} dF(w', x') \\
+ (1 - \lambda_e) W(a', d', t', w, x)
\]

subject to

- **Repayment**
  \[
  Ra + w + \Gamma_e(w) \geq c + \rho(d, t) \\
a' = Ra + w - c - \rho(d, t) \\
d' = R_d d - \rho(d, t) \\
t' = t + 1
  \]

- **Delinquent**
  \[
  Ra + w + \Gamma_e(w) < c + \rho(d, t) \\
a' = -\Gamma_e(w) \\
d' = \Delta(a, d, t, w) \\
t' = \begin{cases} 
  \text{Reset if close to } T, \text{ otherwise} \\
  t + 1
  \end{cases}
  \]
Quantitative model - Parameters and functional forms

Fixed  \( \theta_1 = \{ \beta, \delta, r^+_a, r^-_a, \gamma, b, c \} \)

Estimated  \( \theta_2 = \left\{ H(\kappa), v(x), F(w, x), \lambda_u, \lambda_e \right\} \)

-  \( \kappa \sim U[\kappa, \overline{\kappa}] \)

-  \( u(c, x) = \log c + x \), with  \( x \in \{ x_l, x_h \} \) and  \( x_b = 0 \)

-  \( F(w, x) \) described by

\[
\log w | x_k \sim \mathcal{N}(\mu_k, \sigma_k^2)
\]

\[
x_k = \begin{cases} 
  x_l & \text{w.p. } p_h \\
  x_h & \text{w.p. } 1 - p_h 
\end{cases}
\]

- 11 parameters  \( \theta_2 = \left\{ \kappa, \overline{\kappa}, x_l, x_h, p_h, \mu_l, \mu_h, \sigma_l, \sigma_h, \lambda_u, \lambda_e \right\} \)

- Data: Observed distributions of  \( w_i | x_i \)
- Extension: Adding additional heterogeneity
- Borrowing constraint  \( \gamma \)
Quantitative model - Indirect inference

Data
- Graduated unemployed with zero debt $n = 1,439$
- Data 12 months after graduation $X_n^{data} = \{u_i, dur_i, jobs_i, s_i, w_i, x_i\}_{i=1}^n$

Moments
- Means
  $$\mathbb{E}[dur_i], \mathbb{E}[jobs_i], \mathbb{E}[s_i], \mathbb{E}[1[x_i = x_h]]$$
- Means and variances of wages conditional on amenity
  $$\mathbb{E}[\log w_i | x_i = x_k], \mathbb{V}[\log w_i | x_i = x_k]$$
- Estimates $\hat{\beta}_w, \hat{\beta}_x, \hat{\sigma}_e$ of auxiliary linear probability model
  $$s_i = \beta_0 + \beta_w \log w_i + \beta_x 1[x_i = x_h] + e_i, \quad e_i \sim \mathcal{N}(0, \sigma_e)$$

Data: Initial asset distribution $a_i$
# Quantitative model - Target moments

<table>
<thead>
<tr>
<th>Moments</th>
<th>Mean</th>
<th>Std. deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Data (1)</td>
<td>Model (2)</td>
</tr>
<tr>
<td>A. Means</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duration</td>
<td>E[durᵢ]</td>
<td>2.500</td>
</tr>
<tr>
<td>Number of jobs</td>
<td>E[jobsᵢ]</td>
<td>1.524</td>
</tr>
<tr>
<td>Search</td>
<td>E[sᵢ]</td>
<td>0.187</td>
</tr>
<tr>
<td>Probability of xＨ</td>
<td>E[1[xᵢ = xᵢ]]</td>
<td>0.716</td>
</tr>
<tr>
<td>B. Wage distribution</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean log ( w ) for ( x_l )</td>
<td>E[log ( w_i )</td>
<td>xᵢ]</td>
</tr>
<tr>
<td>Mean log ( w ) for ( x_h )</td>
<td>E[log ( w_i )</td>
<td>xᵢ]</td>
</tr>
<tr>
<td>Variance log ( w ) for ( x_l )</td>
<td>V[log ( w_i )</td>
<td>xᵢ]</td>
</tr>
<tr>
<td>Variance log ( w ) for ( x_h )</td>
<td>V[log ( w_i )</td>
<td>xᵢ]</td>
</tr>
<tr>
<td>C. Regression coefficients</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wage ($000) coefficient</td>
<td>( \hat{\beta}_w )</td>
<td>-0.031</td>
</tr>
<tr>
<td>High satisfaction coefficient</td>
<td>( \hat{\beta}_x )</td>
<td>-0.283</td>
</tr>
<tr>
<td>Std. dev. residuals</td>
<td>( \hat{\sigma}_e )</td>
<td>0.364</td>
</tr>
</tbody>
</table>
Valuing amenities - In terms of wages

Question
- What wage cut would a worker in a low amenity job be prepared to take for a free transition to a high amenity job?

\[ W(w, a, x_L) = W(\bar{w}(w, a), a, x_H) \]

Median assets
- If \( w = $35,000 \), then \( \bar{w}(w, a) = $21,000 \) (40%)
- If \( w = $45,000 \), then \( \bar{w}(w, a) = $27,000 \) (40%)

95th percentile assets
- If \( w = $35,000 \), then \( \bar{w}(w, a) = $18,000 \) (49%)
- If \( w = $45,000 \), then \( \bar{w}(w, a) = $23,000 \) (49%)
Valuing amenities - In terms of consumption

Question

- What fraction of lifetime consumption would a worker in low amenity job be prepared to give up for a free transition to a high amenity job at same wage?

\[ W(a, w, x_L) = W^\Omega(a, w, x_H) = \mathbb{E}_0 \sum_{s=0}^{\infty} \beta^s \left[ \log(1 - \Omega(a, w)) c_s + x_s \right] \]

- If \( w = $10,000 \), median assets, \( \Omega(a, w) = 0.1\% \)
- If \( w = $30,000 \), median assets, \( \Omega(a, w) = 4.5\% \)
- If \( w = $50,000 \), median assets, \( \Omega(a, w) = 6.0\% \)
- With higher wages, consumption is higher, prepared to give away larger fraction to increase \( x \) level.

▶ Figure for \( \Omega(w, a) \)
Student debt - Fixed repayment policy

\( \mathcal{R}_F \) modelled on \textit{Federal Stafford Loan} fixed-repayment policy

\( \tau \) Grace period of 6 months

\( \rho \) Repay principal + interest in 10 years (\( T = 120 \))

\( \Delta \) Missed repayments accrue a penalty \( \phi = 18.5\% \)

\[
\rho = \left[ \frac{r_d}{1 - (1 + r_d)^{-(T+1-t)}} \right] d
\]

\[
d' = (1 + r_d)d - \rho_p + \phi \left[ \rho - \rho_p \right]
\]

\[
\rho_p = \max \left\{ (1 + r_a)a + y + \Gamma - c, 0 \right\}
\]

* Add distorting labor income tax \( \tau \) to balance government budget
Experiment - Income based repayment policy

- Introduced by Obama administration in 2009. After our sample
- Repay 15% of disposable income (defined as 150% of poverty line)

\[ \rho = 0.15 \times (w - 1.5 \times c) \]

- All other details same as Fixed repayment policy \( R_F \)

Active area of policy

2008 Approved by congress

2009 Implemented at 15%

2010 Executive action lowered to 10% for loans originated after AY 2013

System used in Australia, UK
Experiment - Welfare

Result

- Welfare **1.3%** higher. 90% of borrowing students prefer $\mathcal{R}_I$
- Measured as total utility value of unemployment with $t = 1$ month

$$\mathcal{W} = \int U(a, d, 1) dH(a, d)$$
## Experiment - Decomposing welfare gains

### Results

- **63%** of increase in welfare due to consumption *(boring?)*
- **30%** of increase in welfare due to improved job satisfaction *(interesting!)*
- If using p.d.v of wages for welfare, then wrongly conclude *Fixed $\succeq$ Income!*
Conclusion

This paper

- **Theory** Assets holdings affect non-wage utility of accepted jobs

- **Empirical** Verified theory. Higher student debt causes graduates to accept jobs with higher wages but lower non-wage amenity

- **Quantitative** (i) Non-wage utility of jobs is important component of lifetime utility, and (ii) plays important role in accounting for welfare response to student debt repayment policy

Revisit important questions from perspective of assets-wages-amenity

- **Inequality** If the rich are better insured, do they choose higher amenity jobs? Does $↑$ income inequality understate $↑$ utility inequality?

- **Cycle** Do financial crises that lower asset prices, lead to rushed take up of high $w$, low $x$ jobs? Do we therefore understate utility costs of recessions?
Thank you!
- Wage on y-axis solves: \( W(\bar{w}(w,a), a, x_H) = W(w, a, x_L) \)
- At a given \( w \) as \( a \) ↑, willing to \( w \) by more
- At a given \( a \) as \( w \) ↑, willing to \( w \) by increasingly more
- For any \((a, w)\) when search is free, willing to \( w \) by more
Introduction - Decomposing the increase in student debt

A. Average loan per borrowing student (2014 dollars)

B. Decomposition of total student loans

\[ \text{Loans} = \frac{\text{Loans}}{\text{Borrowing students}} \times \frac{\text{Borrowing students}}{\text{Students}} \times \text{Students} \]
Valuing amenities - In terms of wages

- What wage cut would a worker in a low amenity job be prepared to take for a free transition to a high amenity job?

\[ W(w, a, x_L) = W(\overline{w}(w, a), a, x_H) \]
Valuing amenities - In terms of consumption

What fraction of lifetime consumption would a worker in low amenity job be prepared to give up for a free transition to a high amenity job at same wage?

\[
W(a, w, x_L) = W^\Omega(a, w, x_H) = \mathbb{E}_0 \sum_{s=0}^{\infty} \beta^s \left[ \log(1 - \Omega(a, w)) c_s + x_s \right]
\]

- Baseline
- Same wage offers: \( F(w|x_L) = F(w|x_H) \)
- No search costs: \( \kappa = 0 \)
1. Credit limits are almost constant in age

2. Variation due to college education larger than variation due to age

- **Source** SCF 2001, sample selection as in Kaplan and Violante (2014). Income includes wage income, unemployment benefits, child benefits, TANF and other. Values represent medians within a cell, approx. 1,000 observations per cell
1. Credit limits are almost constant in age

2. Variation due to college education larger than variation due to age

- **Source** SCF 2001, sample selection as in Kaplan and Violante (2014). Income includes wage income, unemployment benefits, child benefits, TANF and other. Values represent medians within a cell, approx. 1,000 observations per cell
Extension - Additional heterogeneity

Baseline
1. No unobservables: component of wages, or other
   - E.g. Initial assets \( a_{0,i} \), constraints \( r_i^a, \gamma_i \), search costs \( \kappa_i \)
2. Parameters \( \theta \) are constant across individuals
3. No correlation of debt \( d_i \) with other unobservables

Heterogeneity
1. Allow parameters \( \theta_i \) to be correlated with initial states
2. Initial states include unobserved ability \( \varepsilon_i \), potentially correlated with debt \( d_i \)
   \[ \varepsilon_i \sim G(\varepsilon|d_i) \]
3. Wage a function of ability \( \varepsilon_i \) and productivity \( z_i \sim F(z_i|x_i) \)
   \[ \log w_i = \gamma_z \log z_i + \gamma_\varepsilon \log \varepsilon_i \]
Quantitative model - Initial assets \( \log a_{i,0} \sim N(\mu_a, \sigma_a) \)

- **Source** BB09, standard estimation sample.
Extension - Pre-college decision

- **Aim** Use continuation values to estimate discrete choice problem
- **State** Observed assets $a$ and skills $s$, unobserved pref $\eta_i$
- **Decision** (i) College or Labor Force, (ii) college choice $c \in C$
- **College** A *college* is a tuple $c = (\omega_c, h_c, X_c)$
  1. Cost of tuition $\omega_c$
  2. Stochastic skill technology $s' | s_0 \sim h_c(s' | s_0)$
  3. Observed and unobserved give $W_{i,c} = \zeta_c + \gamma_1 X_c + \gamma_2 X_{i,c}$
- **Costs** Takes $T$ periods
- **Wages** Function of skill and match prod. $w(s, z)$
- **Heterogeneity** Can allow $\eta_i$ to be correlated within $(a, s)$

$$\max \left\{ U_i(s_i, a_i) + \eta_i, \max_{c \in C} \left\{ W_{i,c} + \beta^T \int_{s}^{\bar{s}} U_i(a_i - \omega_c, s') dH_c(s'|s_0) \right\} \right\}$$
Quantitative model - $\log w_i | x_k \sim N(\mu_k, \sigma_k)$

Solid is a kernel smoothed estimate using an Epanechnikov filter. Dashed is log-normal fit with parameters estimated by maximum likelihood.
IV estimation - Variation in instrument

A. 2001 and 2009 Grant/Loan Ratios

B. Change in Grant/Loan ratio
Quantitative model - Distributions of \((w, x)\)

### A. Low satisfaction jobs
- Population distribution \(w_i|\psi_L \sim \log N(\mu_L, \sigma_L)\)
- Observed distribution \(w_i|\psi_L \sim \log N(\hat{\mu}_L, \hat{\sigma}_L)\)

### B. High satisfaction jobs
- Population distribution \(w_i|\psi_H \sim \log N(\mu_H, \sigma_H)\)
- Observed distribution \(w_i|\psi_H \sim \log N(\hat{\mu}_H, \hat{\sigma}_H)\)

- Sampling probability of \(x_h\) \(p_h = 0.550\)
- Observed probability of \(x_h\) \(\tilde{p}_h = 0.716\)
- Decompose welfare into components $A. \sum \beta^t u(c_t), B. \sum \beta^t x^{-1}, C. \sum \beta^t \kappa$
### IV estimation - Grants and loans

<table>
<thead>
<tr>
<th>Funding Source</th>
<th>Fraction of total funding (1)</th>
<th>Fraction of students receiving funding (2)</th>
<th>Average value for a receiving student ($) (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Total loans and grants</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loans</td>
<td>30.5</td>
<td>53.9</td>
<td>7,200</td>
</tr>
<tr>
<td>Grants</td>
<td><strong>69.5</strong></td>
<td><strong>72.7</strong></td>
<td><strong>12,223</strong></td>
</tr>
<tr>
<td><strong>B. Disaggregated loans and grants</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loans - Federal</td>
<td>24.7</td>
<td>53.1</td>
<td>5,932</td>
</tr>
<tr>
<td>Loans - Other</td>
<td>5.7</td>
<td>6.3</td>
<td>11,473</td>
</tr>
<tr>
<td>Grants - Federal</td>
<td>12.4</td>
<td>32.2</td>
<td>4,924</td>
</tr>
<tr>
<td>Grants - State</td>
<td>10.5</td>
<td>34.0</td>
<td>3,933</td>
</tr>
<tr>
<td>Grants - College (Institutional)</td>
<td><strong>46.7</strong></td>
<td><strong>56.0</strong></td>
<td><strong>10,639</strong></td>
</tr>
</tbody>
</table>

Notes (i) Source: IPEDS, (ii) Column (1): Aggregates all loans and grants across US colleges in each year and computes the fraction of total funding (grants + loans) accounted for by each source of funding, average then taken over 2007-2011, (iii) Column (2): Computes the coefficient of variation of row-variable across colleges within each year, and then takes average over 2007-2011, (iv) Column (4) replicates column (1) for fraction of students receiving funding, however since data is not available on the total number of students receiving grants, and grants overlap, the denominator is total number of students, (v) Column (5) replicates column (2) for the number of students receiving funding, (v) all dollar values first inflated to 2014 values using US CPI.
IV estimation - Intensive and extensive margins

Decomposition

\[ \Delta_t \log G_{j,t} = \Delta_t \log \left( \frac{G_{j,t}}{N_{j,t}^G} \right) + \Delta_t \log \left( \frac{N_{j,t}^G}{N_{j,t}} \right) + \Delta_t N_{j,t} \]

Intensive margin

Extensive margin

Cohort size margin
Literature

1. **Search with asset accumulation**
   Lise (2013), Rendon (2006), Herkenhoff et. al. (2016)
   
   **New:** Job satisfaction, student debt

2. **Search with non-wage utility**
   Hall, Mueller (2013); Hornstein, Krusell, Violante (2011); Dey, Flinn (2008); Guvenen, Violante (2012)
   
   **New:** Direct survey measurement of non-wage utility

3. **Student debt and labor market outcomes**
   
   **New:** Representative sample

4. **Student debt and borrowing constraints**
   
   **New:** Policy experiments
Experiment - Comparing cohorts - $\mathcal{R}_I$

1. Wage
2. Satisfaction
3. Offer Acceptance Rate
4. Emp: Frac searching
5. Debt Repayments
6. Value

Back - Welfare results
A. Satisfaction by Debt/Income

B. Search by Debt/Income

- Model - High income
- Model - Medium income
- Model - Low income
- Data - Average

Fraction high satisfaction

Fraction of workers searching

Back - Baseline repayment policy
### Quantitative model - Other moments

<table>
<thead>
<tr>
<th>Moments</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Data (1)</td>
<td>Model (2)</td>
</tr>
<tr>
<td><strong>A. Unemployment, consumption and assets</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unemployment</td>
<td>$E[u_i]$</td>
<td>0.079</td>
</tr>
<tr>
<td>Mean log consumption</td>
<td>$E[\log c_i]$</td>
<td>0.685</td>
</tr>
<tr>
<td>Consumption - Income ratio</td>
<td>$E[c_i] / E[w_i]$</td>
<td>0.750</td>
</tr>
<tr>
<td>Mean log assets</td>
<td>$E[\log a_i]$</td>
<td>2.321</td>
</tr>
<tr>
<td><strong>B. Other regression moments</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regression $R$-squared</td>
<td>$R^2$</td>
<td>0.124</td>
</tr>
</tbody>
</table>
# Quantitative model - Parameter estimates

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Search costs</strong></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>$\kappa$</td>
</tr>
<tr>
<td>Upper bound</td>
<td>$\bar{\kappa}$</td>
</tr>
<tr>
<td><strong>B. Disutility of labor, relative to $x_{Unemployment} = 0$</strong></td>
<td></td>
</tr>
<tr>
<td>Low satisfaction</td>
<td>$x_L$</td>
</tr>
<tr>
<td>High satisfaction</td>
<td>$x_H$</td>
</tr>
<tr>
<td><strong>C. Job offer arrival rates</strong></td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td>$\lambda_U$</td>
</tr>
<tr>
<td>Employed conditional on paying $\kappa$</td>
<td>$\lambda_E$</td>
</tr>
<tr>
<td><strong>D. Population distribution parameters</strong></td>
<td></td>
</tr>
<tr>
<td>Probability of high job satisfaction draw $x_H$</td>
<td>$p_H$</td>
</tr>
<tr>
<td>Mean of log $w$ for $x_L$</td>
<td>$\mu_L$</td>
</tr>
<tr>
<td>Mean of log $w$ for $x_H$</td>
<td>$\mu_H$</td>
</tr>
<tr>
<td>Variance of log $w$ for $x_L$</td>
<td>$\sigma^2_L$</td>
</tr>
<tr>
<td>Variance of log $w$ for $x_H$</td>
<td>$\sigma^2_H$</td>
</tr>
</tbody>
</table>