Dissertation Defense

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What have I learned?

Three Chapters:

1. Pareto weights as wedges in two-country models (with Dave Backus, Axelle Ferriere, and Spencer Lyon)
2. Global solution methods for macroeconomic models (with Spencer Lyon, Lilia Maliar, and Serguei Maliar)
3. Cost of income-driven repayment for student loans

Pareto weights as wedges in two-country models

Introduction

Environment: Recursive preferences in a typical two country, two (tradeable) goods, exchange economy (a la Backus Kehoe Kydland 1994).

Want: Understand the stochastic process that governs the relative pareto weights in a two country economy with recursive preferences

What did we learn?:

- While in one-good models pareto weights are unstable, a risk adjustment associated with the addition of a second good implies stability of the stochastic process governing pareto weights.
- Time-varying pareto weights imply a "wedge" in model that can help address various puzzles — One example is the Backus-Smith puzzle

Global Solution methods for macroeconomic models

Global solutions

Global solutions allow more accurate characterizations of model dynamics than perturbation methods. Certain models/questions should not use less accurate methods — For example, models of labor search, sovereign default, and certain classes of NK models.

Want: Global solution method that can work reasonably well for "medium-sized" (8 state variable model) so these models can be calibrated.

Solution: Perturbation of *Epsilon-distinguishable sets* methods. Rather than simulate to get grid, use pseudo-random points in hypercube.

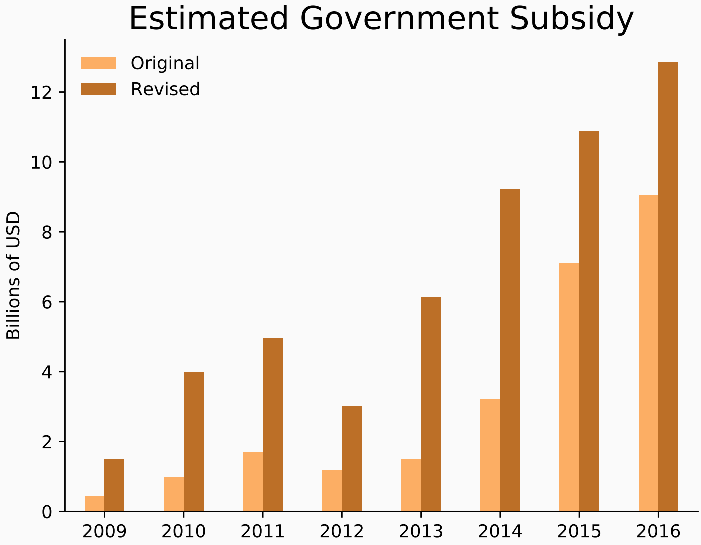
Performance: See 50x speed up related to EDS and can solve 8-state model in about a second.

Cost of income-driven student loans

U.S. student loan repayment plans

Name	Payment	Forgiveness
AMR	Amortized over 10 years	None
Graduated	Fixed schedule which increases over 10 years	None
IBR	15% of disposable income (up to AMR)	25 years
REPAYE	10% of disposable income	20 years
Trump Proposal	12.5% of disposable income	15 years

Hard to determine cost



Hard to determine cost

" ...there are a number of factors that make forecasting future IDR participation inherently difficult...it entails behavioral effects that are extremely difficult to incorporate and project into the future — Department of Education response to Goverment Accountability Office "

Paper counterfactual

In this paper, I run the following counterfactual:

Consider two economies

1. All student loans held in AMR repayment plan
2. All student loans held in IDR repayment plan

Will determine how much it costs for the government to support IDR relative to AMR

Government subsidy

Key variable of interest: Subsidy required to keep student loans program solvent (Δ_{SL}):

$$\Delta_{SL} = \sum_i (d_i - X_i)$$

where d_i is debt accumulated by individual i and X_i is the present discounted value of the payments they make

Government subsidy decomposition

Decompose Δ_{SL} by

$$\Delta_{SL} = \underbrace{\frac{\sum_i (d_i - X_i)}{\sum_i d_i}}_{\text{subsidy rate}} \times \underbrace{\frac{\sum_i d_i}{N_d}}_{\text{average debt}} \times \underbrace{\frac{N_d}{N_e}}_{\text{fraction in debt}} \times \underbrace{\frac{N_e}{N}}_{\text{enrollment rate}} \times N$$

What we will learn today

We find that going from an economy with only AMR to an economy with only IDR results in

- A 1 pp increase in enrollment rate
- 24 pp increase in percent of students with debt
- 17% increase in average student loan size
- 50% increase in subsidy rate

These result in a 15% increase in the cost of running the student loans program

Model outline: idiosyncratic type

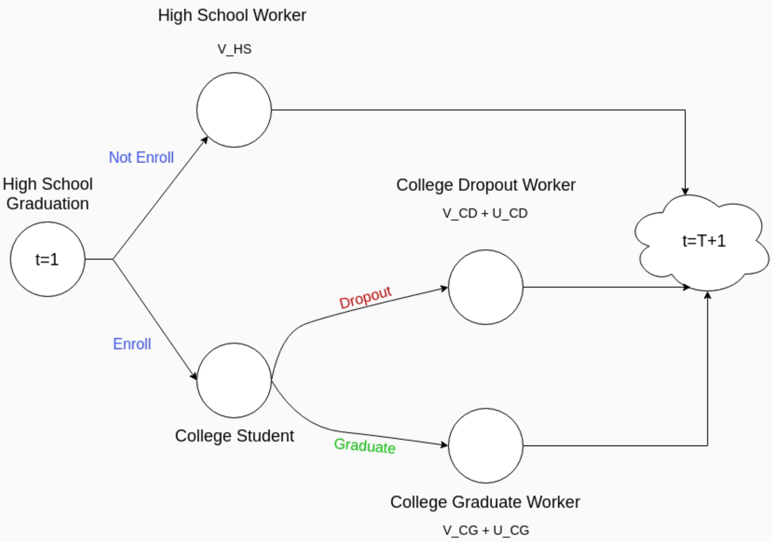
All students begin as high school graduates. Draw three idiosyncratic states:

- Ability level (a): Unobservable to individuals and will affect the probability with which they pass classes in college and their labor earnings.
- Type (j): Type consists of 4 components (m, k, q, z) — m is a signal about an individual's ability level, k is the initial risk-free holdings, q is the cost of college, and z is they yearly parental transfer.
- Financial state (ζ_1): Stochastic component of the cost of college and college work opportunities.

Additionally, assume econometrician cannot observe m, but rather observes

$$\text{GPA} = m + \varepsilon_{\text{GPA}}$$

Model outline



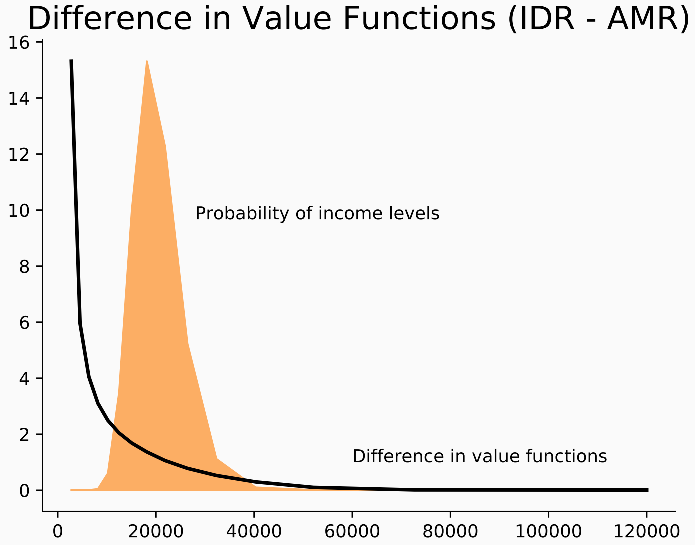
Enrollment effects

The probability of enrollment is given by:

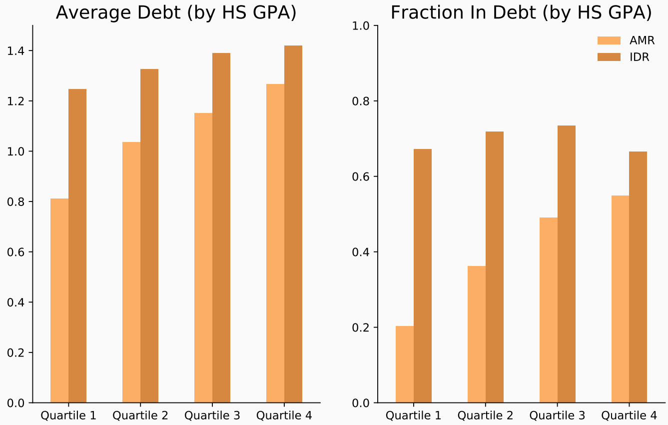
$$\text{prob(enroll)} = \frac{\exp(V^S)}{\exp(V^S) + \exp(V^{HS})}$$

V^{HS} unaffected by changes in repayment plan which means all changes must come through changes in V^S. V^S is itself only indirectly affected by changes in V^{CD} and V^{CG}

Enrollment effects



Debt effects



Debt effects: Thought experiment

Imagine that an individual gets an information shock at beginning of the last period of their college degree.

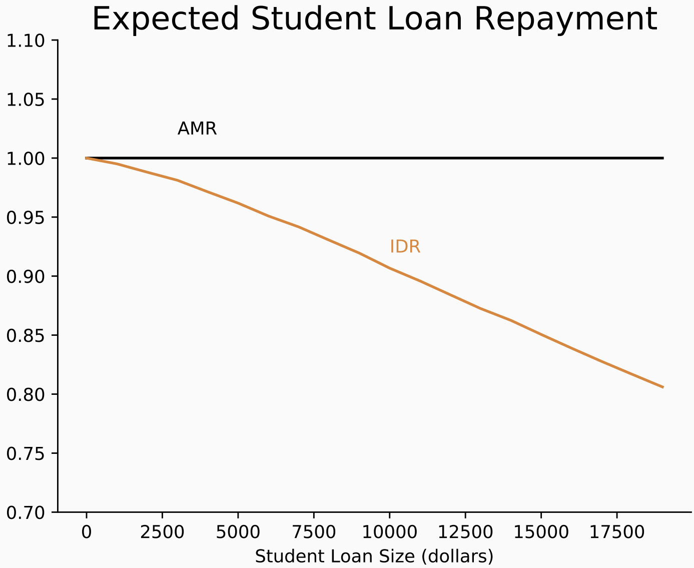
They find out that they will experience low income for 20 years and, at their current student loan level, will experience loan forgiveness. What are implications for student loan accumulation this period?

If forgiveness, $\frac{\partial V^{CD}}{\partial d_t} = 0$ implies $\frac{\partial V^{S}}{\partial d_t} > 0$ for all amounts of debt larger than current student loans...

Optimal response: Take out maximum level of student loans.

Lowest quartile increases debt accumulation the most because highest probability of forgiveness

Expected repayment by loan size



Government subsidy rate by HS GPA quartile

	AMR	**IDR**
Quartile 1	-0.13	0.11
Quartile 2	-0.13	-0.01
Quartile 3	-0.13	-0.07
Quartile 4	-0.13	-0.11

Conclusion and next steps

IDR is expensive — More targeted policies to reduce student loan repayment risk may be more successful.

For example, one policy that reduces overall government subsidy in the IDR economy to the level from the AMR economy is offering IDR only to those in top 3 GPA quartiles.

Occupation choice? Major choice? Higher frequency model to capture more labor market risk?