

The Impact of Economic and Financial Aid Indicators on Graduate Enrollments

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Overview

- Introduction
- Problem Statement
- Framework & Literature
- Methods
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- Discussion
- Implications

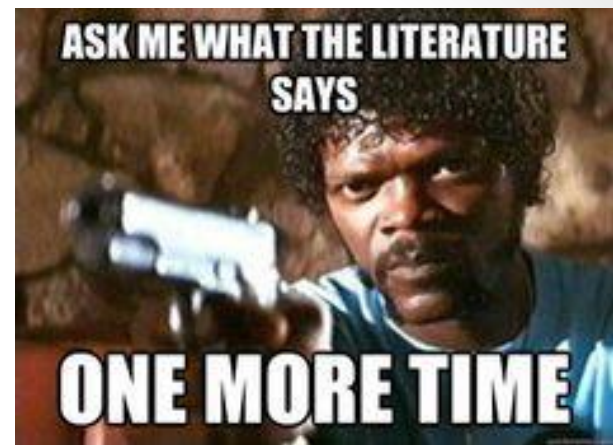
Introduction

- Graduate Students Benefits
 - Institutional
 - Revenues
 - Prestige
 - Increase faculty productivity and strengthen academic programs
 - Research output
 - Social
 - Advancing knowledge
 - Innovation, R&D & global competitiveness
 - Talented workforce benefiting the knowledge economy
 - Cultural diversity
 - Personal
 - Higher earnings and lower unemployment rates
 - Better educational options for their children
 - Higher chances of becoming millionaires and/or receiving a sizable gift/inheritance



Problem Statement

However, little is known about the factors that may be related to graduate enrollments.



FRAMEWORK & LITERATURE

Theoretical Framework

Human Capital Investment Theory

- Investments in human capital (education, on-the-job training, medical care, and migration) can pay off in the long run in terms of personal, social, and societal returns
- Education increases earnings & protects against unemployment

(Becker 1962, 1993)

- Higher unemployment rates prompt individuals to invest in education due to lower opportunity costs (foregone earnings).

(Betts & McFarland, 1995; Dellas & Koubi, 2003; Dellas & Sakellaris, 2003; Perna 2005; Stratton et al, 2007; Arkes, 2010)

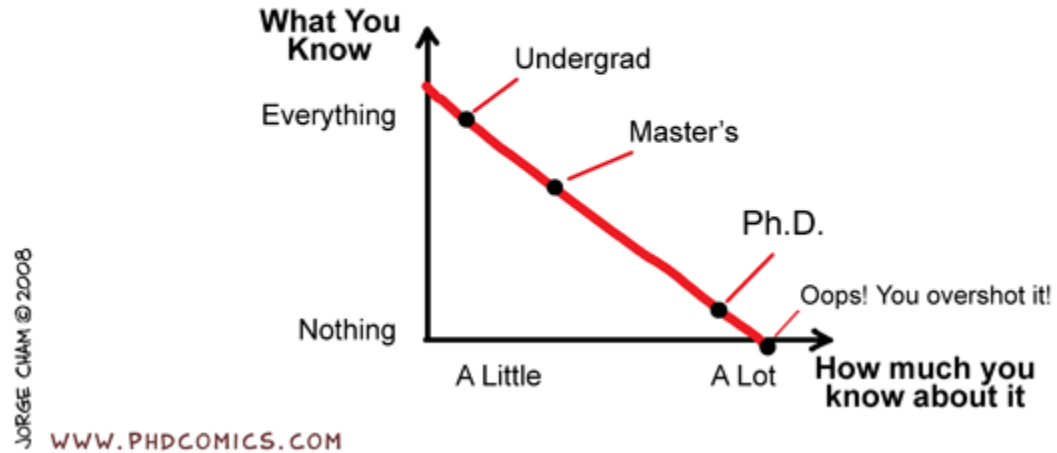
Literature

		Dependent Variables	Independent Variables			
Bedard & Herman (2006)	Dataset: National Survey of Recent College Graduates included only the sciences and engineering baccalaureate graduates (student level data)	Enrollments	State Unemployment Rate (SUR)	National Unemployment Rate (NUR)	Income	College Loans
		Males (doctoral prg.)	+			
		Males (master prg.)	-			
		Females	No Relationship			
		Total Graduate Enrollments	Differed by student characteristics			
Johnson (2013)	Dataset: National Survey of Recent College Graduates included all baccalaureate graduates (student level data)	Males	No Relationship			
		Females	+			
		Total Graduate Enrollments	No Relationship			
Bogan & Wu (2013)	Dataset: National Longitudinal Survey of Youth 1997 - NLSY (student level data)	Total Graduate Enrollments		+	-	Students more likely to enroll
Goh (2009)	Dataset: HEGIS/IPEDS 1976-2002 (institutional level data)	Enrollments in professional prgs.	+			
		Total Graduate Enrollments	-			

Purpose Statement

Examine whether variations in macroeconomic and financial aid indicators impact graduate school enrollments. Plus, determine the magnitude of this impact across different postsecondary sectors.

What You Know vs How much you know about it



DATA & METHODS

Sample and Data

- Pooled time-series panel data
- Delta Cost Project dataset, 1990-2012
 - All public, private not-for-profit and private for-profit postsecondary institutions in the US
- Integrated Postsecondary Education Data System (IPEDS)
- Bureau of Labor Statistics
- Bureau of Economic Analysis
- US Census
- College Board
- National Center for Educational Statistics

Variables

Dependent

- All graduate enrollments
- US residents graduate enrollments
- Internationals graduate enrollments

Independent

- Annual national and state unemployment rate (at times t , $t-1$, and $t-2$)
- Annual national and state per capita personal income (at times t , $t-1$, and $t-2$)
- Gross domestic product and gross state product (at times t , $t-1$, and $t-2$)
- Undergraduate loans in 2013 dollars at time t (federal & non-federal)
- Graduate loans in 2013 dollars at time t (federal & non-federal)
- Tuition (publics and privates) in 2013 dollars at time t

Control

- Annual national and state population (at times t , $t-1$, and $t-2$)
- Number of baccalaureate degrees awarded at time t

Graduate enrollments = first professional + masters+ doctoral students

Methods

Data structure

- Observation = one university in one year
- $N \sim 38,000$ observations

Data processing - Paired DCP with other datasets by unitid, year, and state

Linear regression model

- De-trendified variables to remove the effect of the year
- Fixed Effects – Institution
- Outlier detection and removal
- Variable selection and collinearity diagnostics

Analysis

De-trendified variables

- Variables in the models were de-trendified using academic year
- The dependent variables were transformed using the natural logarithm function and then de-trendified with academic year
- Regressions were run with de-trendified variables

Fixed effects

- Binary indicator variables for each institution

Analysis

Outlier detection and removal

- Outliers were detected using the studentized residuals and the Bonferroni correction at the $0.05/N^{\text{obs}}$ level
- Iterative procedure alternating removing outliers and refitting the model until no more outliers were detected
- About 10-200 outliers were removed

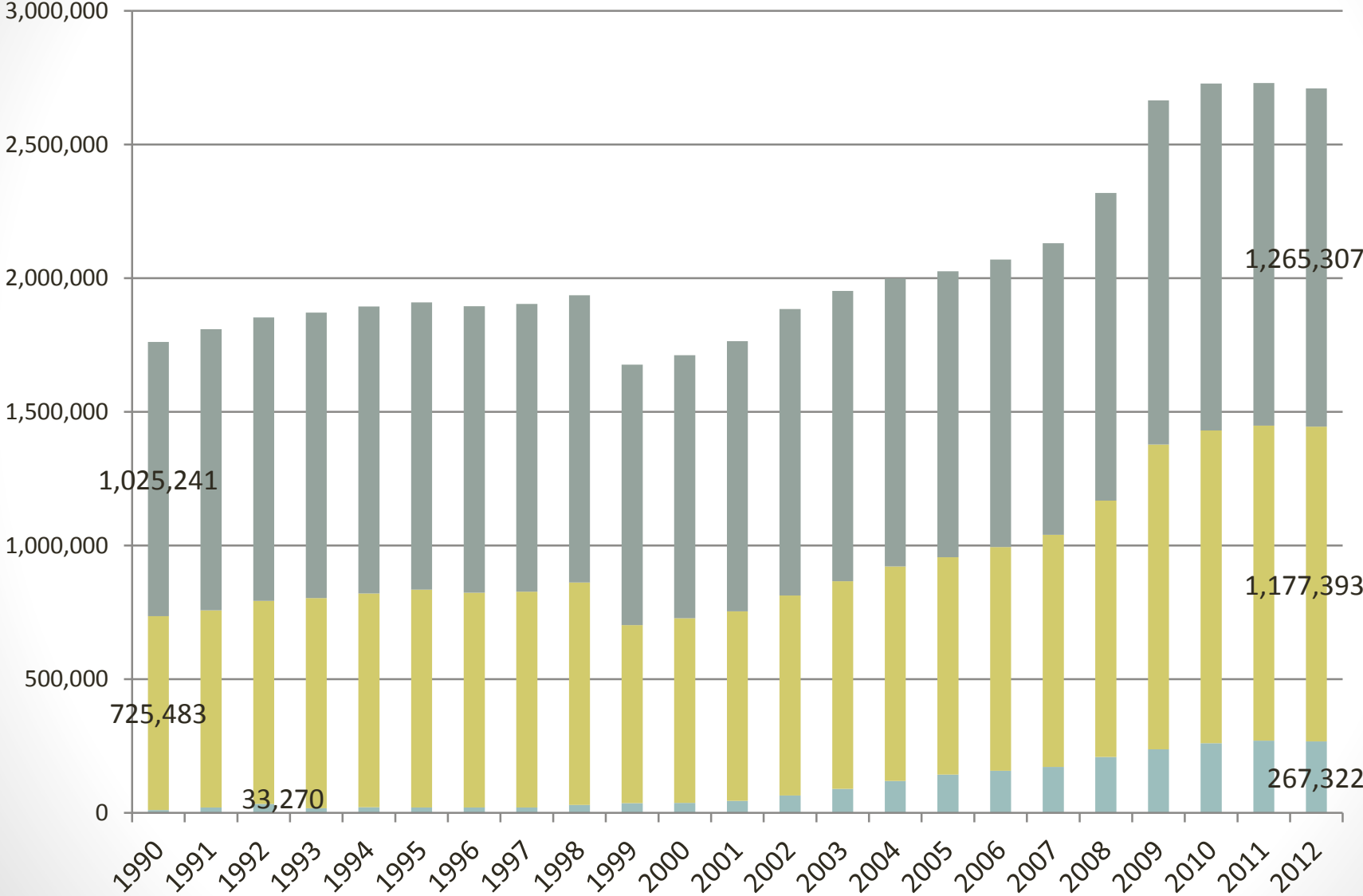
Variable selection

1. Variable selection using the AIC criterion
2. Collinearity diagnostics using the condition number
3. If necessary, manual variable elimination until condition number is below 10
4. Obtained models have between 3 and 12 variables

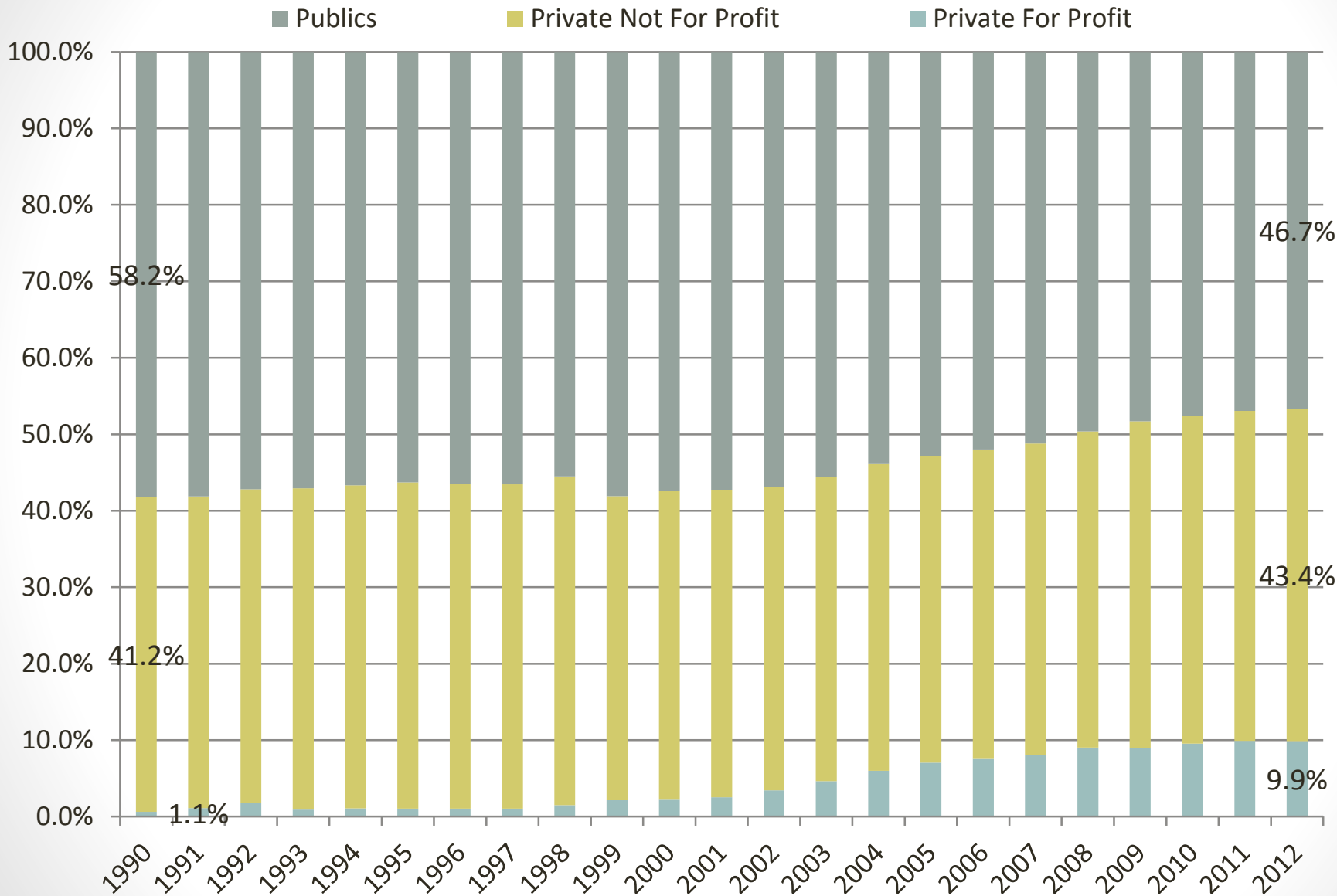
FINDINGS

Graduate Enrollments by Sector

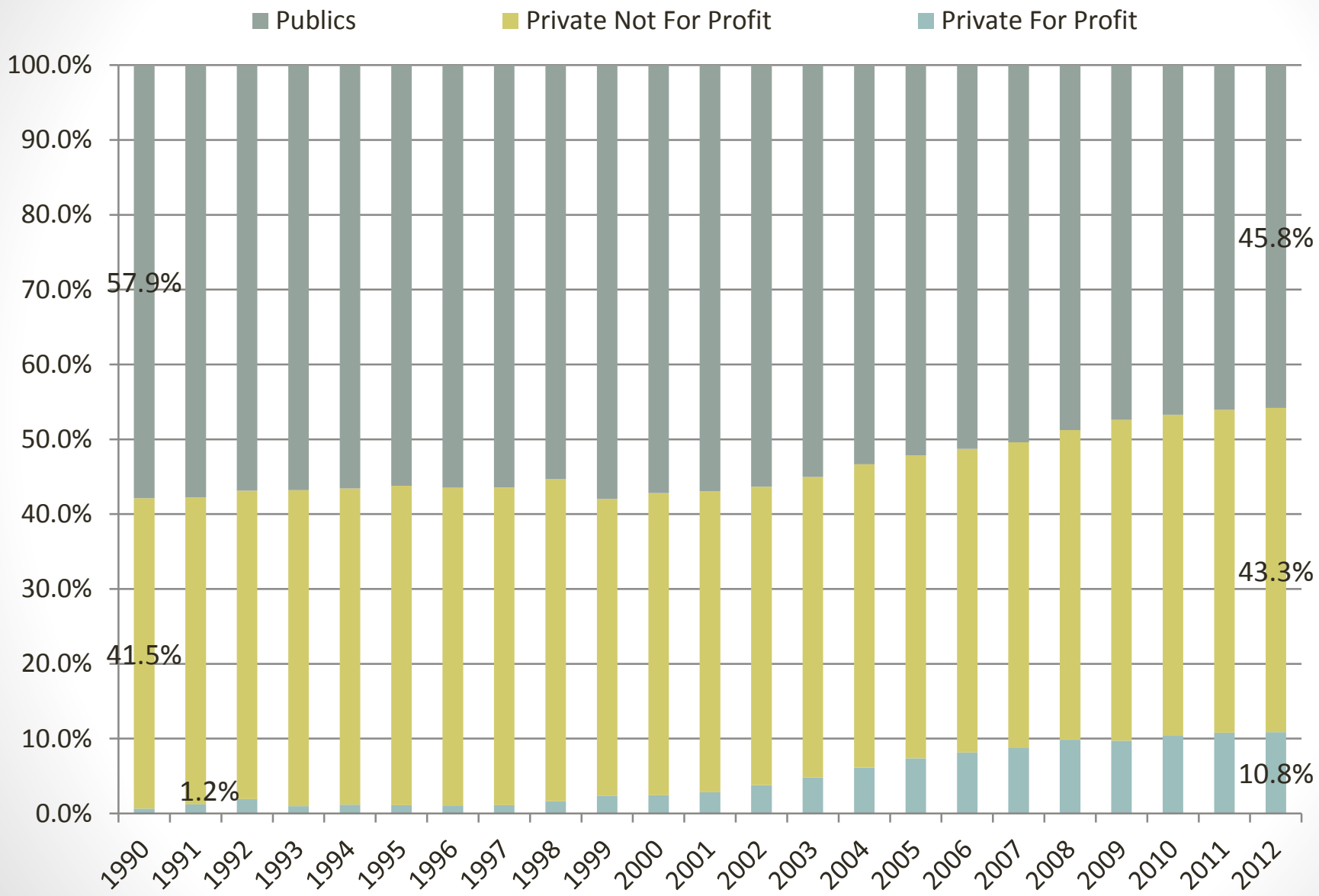
Publics Private Not For Profit Private For Profit



Graduate Enrollments by Sector

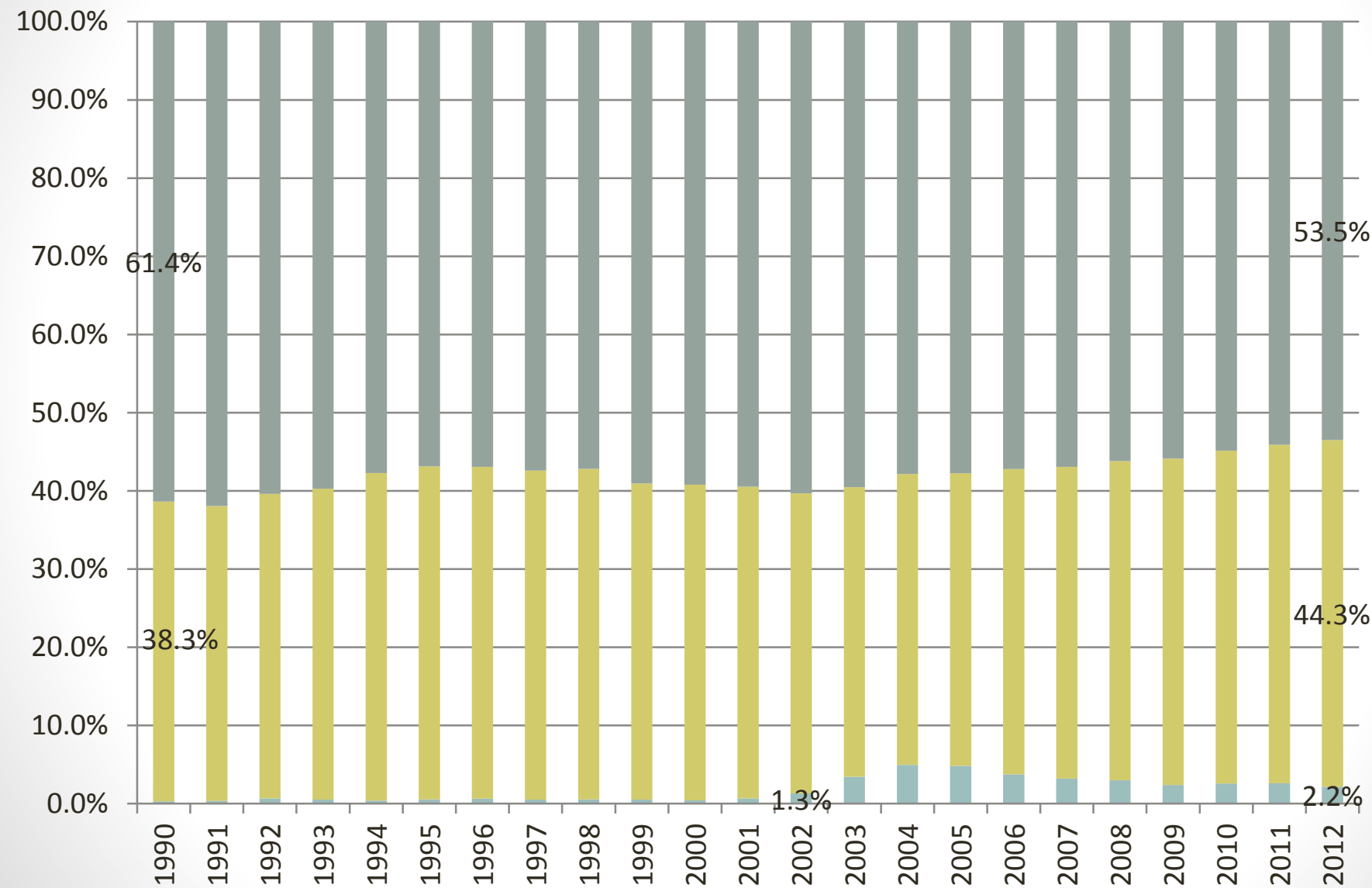


US Resident Graduate Enrollments by Sector



International Graduate Enrollments by Sector

Publics Private Not For Profit Private For Profit



Regression Findings

*p<0.01; **p<0.0001

	Public			Private Not-For-Profit			Private For-Profit		
Graduate Enrollments	All	US Res.	Int'l	All	US Res.	Int'l	All	US Res.	Int'l
National Unemployment Rate at time t	+4.73% **	+5.1% **	+3.62% **	+1.79%	+2.15% *				
National Unemployment Rate at time t-1								-6.52% **	
National Unemployment Rate at time t-2				-1%	+1.06%				-6.56%
Gross Domestic Product at time t (in trillions)				-20.7% **	-10.9% **	-8.18% **			
Per Capita Personal Income at time t (in thousands)				-5% *					+24.1% **
Per Capita Personal Income at time t-1 (in thousands)								-9.1% **	
State Unemployment Rate at time t	-2.72% **	-2.17% **							
State Unemployment Rate at time t-1				-1.3% *	-1.75% **	+3.1% **			+10.8% **
Gross State Product at time t (in billions)	+0.05% **	-0.07% **		-0.04% **	-0.08% **	-0.06% **			
State Per Capita Personal Income at time t (in thousands)		+0.52% *				+2% **			
State Per Capita Personal Income at time t-1 (in thousands)				-1.89% **	-1.34% **				
State Per Capita Personal Income at time t-2 (in thousands)								+4.23% **	

Regression Findings (continued)

*p<0.01; **p<0.0001

	Public			Private Not-For-Profit			Private For-Profit		
Graduate Enrollments	All	US Res.	Int'l	All	US Res.	Int'l	All	US Res.	Int'l
National Population at time t (in millions)					-2.3%				
National Population at time t-2 (in millions)	-1.70% **			-10.6% **					+13.1%
State Population at time t (in millions)		+9.26% **	+3.25% **		+ 8.4% **	+12.9% **			
State Population at time t-1 (in millions)	+8% **			+2.5% **					+5.05% **
State Population at time t-2 (in millions)							+7.2% **	+2.64% **	
Number of Bachelor Degrees Awarded (in thousands)		+1.17%	+3.93% *	+68.58% **	+64.3% **	+37.8% **	+23.9% **	+17.2% **	+10.5% **
Undergraduate Loans (in billions)					+1.7% **				
Graduate Loans (in billions)				+3.4% **					+10.8% **
Graduate Grants (in billions)				-5% **	+3.56% **		-19.9% **		-87.8% **
Graduate Tuition (in thousands)			-15.1% **						
R-Square	96.21%	96%	93.6%	92.29%	92%	87.3%	85.7%	83.8%	73%

DISCUSSION

Unemployment Rates

*p<0.01; **p<0.0001

Graduate Enrollments	Public			Private Not-For-Profit			Private For-Profit		
	All	US Res.	Int'l	All	US Res.	Int'l	All	US Res.	Int'l
National Unemployment Rate at time t	+4.73% **	+5.1% **	+3.62% **	+1.79%	+2.15% *				
National Unemployment Rate at time t-1								-6.52% **	
National Unemployment Rate at time t-2				-1%	+1.06%				-6.56%
State Unemployment Rate at time t	-2.72% **	-2.17% **							
State Unemployment Rate at time t-1				-1.3% *	-1.75% **	+3.1% **			+10.8% **

- National
 - Grants/waivers opportunities in public and not-for profits
 - Decreased opportunity costs
- State
 - Out-migration
 - Capital constraints
 - Int'l students less likely to know about state unemployment rates

Gross Product

*p<0.01; **p<0.0001

Graduate Enrollments	Public			Private Not-For-Profit			Private For-Profit		
	All	US Res.	Int'l	All	US Res.	Int'l	All	US Res.	Int'l
Gross Domestic Product at time t (in trillions)				-20.7%	-10.9%	-8.18%			
				**	**	**			
Gross State Product at time t (in billions)	+0.05%	-0.07%		-0.04%	-0.08%	-0.06%			
	**	**		**	**	**			

National & State

- Employment opportunities
- Potential for higher salaries
- Increased opportunity costs

Per Capita Income

*p<0.01; **p<0.0001

Graduate Enrollments	Public			Private Not-For-Profit			Private For-Profit		
	All	US Res.	Int'l	All	US Res.	Int'l	All	US Res.	Int'l
Per Capita Personal Income at time t (in thousands)				-5% *					+24.1% **
Per Capita Personal Income at time t-1 (in thousands)								-9.1% **	
State Per Capita Personal Income at time t (in thousands)		+0.52% *				+2% **			
State Per Capita Personal Income at time t-1 (in thousands)				-1.89% **	-1.34% **				
State Per Capita Personal Income at time t-2 (in thousands)								+4.23% **	

- National
 - Employment opportunities and increased opportunity costs;
 - International students are unable to work in US & have different funding streams. Hence, it is unclear why increases in enrollments in for-profits are so high since opportunities for grants/waivers are lower here and why the relationship is not significant for other sectors.
- State
 - Out-migration

Financial Aid

*p<0.01; **p<0.0001

Graduate Enrollments	Public			Private Not-For-Profit			Private For-Profit		
	All	US Res.	Int'l	All	US Res.	Int'l	All	US Res.	Int'l
Undergraduate Loans (in billions)					+1.7% **				
Graduate Loans (in billions)				+3.4% **					+10.8% **
Graduate Grants (in billions)				-5% **	+3.56% **		-19.9% **		-87.8% **
Graduate Tuition (in thousands)			-15.1% **						

Undergraduate Loans

- Unexpected
- Grants/waivers options
- Deferred loan repayments

Graduate grants

- Grants/waivers options

Graduate loans

- Both variables measured at time t

Graduate tuition

- Out-of-state tuition
- Grants/waivers

CONCLUSION

Limitations

Data

- Graduate enrollments
 - IPEDS reporting requirements (professional, master, and doctoral programs)
 - Institutional reporting

Institutional level data vs. student level data

Enrollments impacted by personal factors, institutional policies, and initiatives

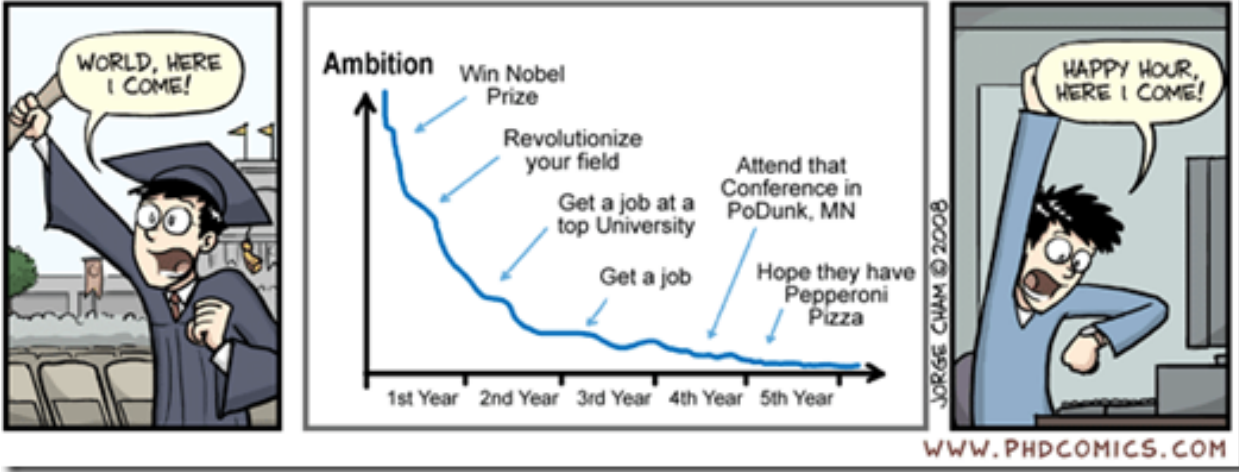
Generalizability

- All postsecondary sectors in the US

Implications

- Policy & Research
 - First study to look specifically at how all postsecondary sectors are impacted by variations in the macroeconomic and financial aid indicators
- Practice
 - Revenue planning, strategic investment, institutional prestige, and research output

YOUR LIFE AMBITION - What Happened??



Thank you!
QUESTIONS

Limitations

In the past I reported first-professional student enrollment separately in Part A. Why is there no column for reporting first-professional students?

Since the 2010-11 collection year, institutions have been required to use the new postbaccalaureate degree categories (eliminating the first-professional category and reclassifying those programs). In part A, all postbaccalaureate students are to be reported as graduate students (including students formerly reported as first-professional).

In Part B, Doctor's-professional practice activity (formerly first-professional) will be reported separately from the graduate instructional activity. FTE for these programs should be reported as defined by the institution. Source:

<https://surveys.nces.ed.gov/ipeds/VisFaqView.aspx?mode=reg&id=11&show=all>