

A New Recipe for Public Higher Education

Are Higher Fees & Reduced Supply Diversity the Right Ingredients?

Stijn Kelchtermans

Hogeschool-Universiteit Brussel & Katholieke Universiteit Leuven

stijn.kelchtermans@econ.kuleuven.be

Ireland's Knowledge Economy in the 21st Century:
Educational Perspectives

*Conference, The Swan Group
Dublin, Ireland, 8 October 2008*





A New Recipe for Public Higher Education

- Today's talk is a summary of
 - Participation and Study Decisions in a Public System of Higher Education, *Journal of Applied Econometrics*, forthcoming (with Frank Verboven, KU Leuven)
 - Reducing Supply Diversity in a Public System of Higher Education, *R&R Journal of Public Economics* (with Frank Verboven, KU Leuven)



Overview

- **Introduction**
 - The Debate on Higher Education
 - Empirical & Policy Questions
 - Key Findings
 - Dataset & Econometric Model
- **Participation & Study Decisions**
 - Parameter Estimates
 - Demand & Welfare Effects of Increased Fees
- **Reducing Supply Diversity**
 - Policy Background
 - Economic Framework
 - Profit and Welfare Effects of Unilateral Supply Reductions
- **Takeaway Results**



Overview

- Introduction
 - **The Debate on Higher Education**
 - Empirical & Policy Questions
 - Key Findings
 - Dataset & Econometric Model
- Participation & Study Decisions
 - Parameter Estimates
 - Demand & Welfare Effects of Increased Fees
- Reducing Supply Diversity
 - Policy Background
 - Economic Framework
 - Profit and Welfare Effects of Unilateral Supply Reductions
- Takeaway Results



Debate on Higher Education

- Since 60's **mass 'democratization'** and corresponding increase in **public spending**
- Initiatives to reform public systems
 - **Increase tuition fees:** e.g. U.K.
 - Participation?
 - Uniform vs non-uniform fees?
 - **Rationalize supply** (lower geographic coverage of study programs): e.g. Flanders
 - Associations and mergers of institutions
 - Financial incentives for institutions



Debate on Higher Education

- **Methodology** for analyzing policy measures
 - Focus on cost side (see rationalization)
 - Demand side underexplored
 - Welfare implications unclear
- **Lack of empirical support** needed for evidence-based policy making



Overview

- Introduction
 - The Debate on Higher Education
 - **Empirical & Policy Questions**
 - Key Findings
 - Dataset & Econometric Model
- Participation & Study Decisions
 - Parameter Estimates
 - Demand & Welfare Effects of Increased Fees
- Reducing Supply Diversity
 - Policy Background
 - Economic Framework
 - Profit and Welfare Effects of Unilateral Supply Reductions
- Takeaway Results



Empirical Questions

- What are the **determinants of choices** in higher education?
 - Participation decision (“whether”)
 - Study decision (“where & what”)
- Based on a detailed data set of all pupils eligible to start higher education in Flanders in 2001
- Key variable = **location** of pupils & institutions
 - mobility cost



Policy Questions

- What are the effects of uniform or non-uniform **tuition fees increases** on **participation, study decisions** and **welfare**? (paper 1)
- What are the **institutional incentives** and **welfare effects** of a new funding system aimed at **rationalizing supply**? (paper 2)
 - We studied the policy proposal where institutions' fixed subsidies would be replaced by subsidies based on the '**concentration index**' (#students / #study programs)



Overview

- Introduction
 - The Debate on Higher Education
 - Empirical & Policy Questions
 - **Key Findings**
 - Dataset & Econometric Model
- Participation & Study Decisions
 - Parameter Estimates
 - Demand & Welfare Effects of Increased Fees
- Reducing Supply Diversity
 - Policy Background
 - Economic Framework
 - Profit and Welfare Effects of Unilateral Supply Reductions
- Takeaway Results



Key Findings – Choice Model

- **Mobility costs** matter very little for “whether”, but do matter for “where” and “what”
 - Students perceive institutions and programs as close substitutes (conditional on observed factors)
- **High school background** matters for “whether”, “where” and “what”



Key Findings – Policy Simulations

- Increased fees
 - Little effect on **participation**
 - Important **welfare gains** and redistribution from students to outsiders
- Reductions in supply
 - **Rarely desirable** to rationalize supply (<10% of study programs)
 - A financial incentive like the **concentration index** would nevertheless supply an incentive to reduce variety for 1/3 of all study programs
 - We separate possible outcomes in
 - Desirable versus undesirable status quo cases
 - Desirable versus undesirable reform cases



Overview

- Introduction
 - The Debate on Higher Education
 - Empirical & Policy Questions
 - Key Findings
 - **Dataset & Econometric Model**
- Participation & Study Decisions
 - Parameter Estimates
 - Demand & Welfare Effects of Increased Fees
- Reducing Supply Diversity
 - Policy Background
 - Economic Framework
 - Profit and Welfare Effects of Unilateral Supply Reductions
- Takeaway Results



The Dataset

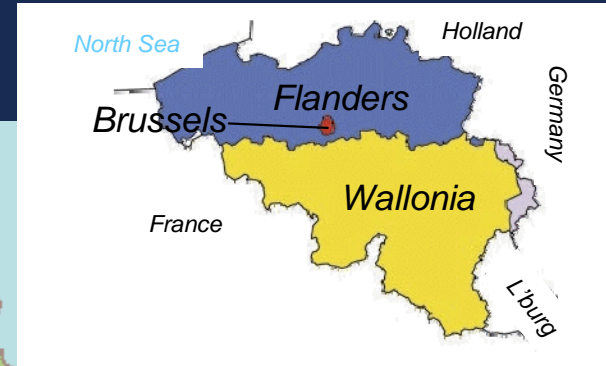
- The choice set
 - **Institutions** (campuses)
 - 8 (9) universities and 24 (44) colleges: academic ↔ vocational
 - Religious orientation: catholic ↔ non-catholic
 - **Programs**
 - Type: three-pronged structure
 - Academic
 - Vocational 'long' (2 cycles)
 - Vocational 'short' (1 cycle)
 - Study field: sciences, social science, biomedical, arts
- Elemental alternatives: examples
 - law at Leuven campus of Katholieke Universiteit Leuven
 - hotel management at the Bruges campus of Katholieke Hogeschool Brugge-Oostende
 - ...



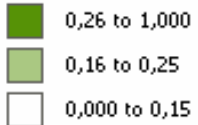
The Dataset

- $\pm 55,000$ high school pupils in Flanders (“class of 2001”)
- Pupil characteristics
 - Demographic
 - Gender
 - Age (‘delay’)
 - Nationality
 - High school background
 - Religious orientation: catholic high school or not
 - Type: general, technical, professional, arts
 - Study field: mathematics, classical/modern languages, sciences...
 - Location
 - Travel distance to each campus
 - Travel time to each campus

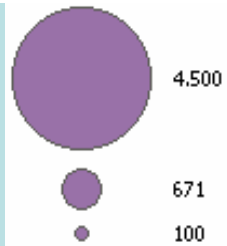
Higher Education Participation & Campus Locations



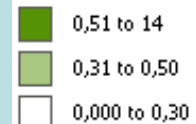
% academic



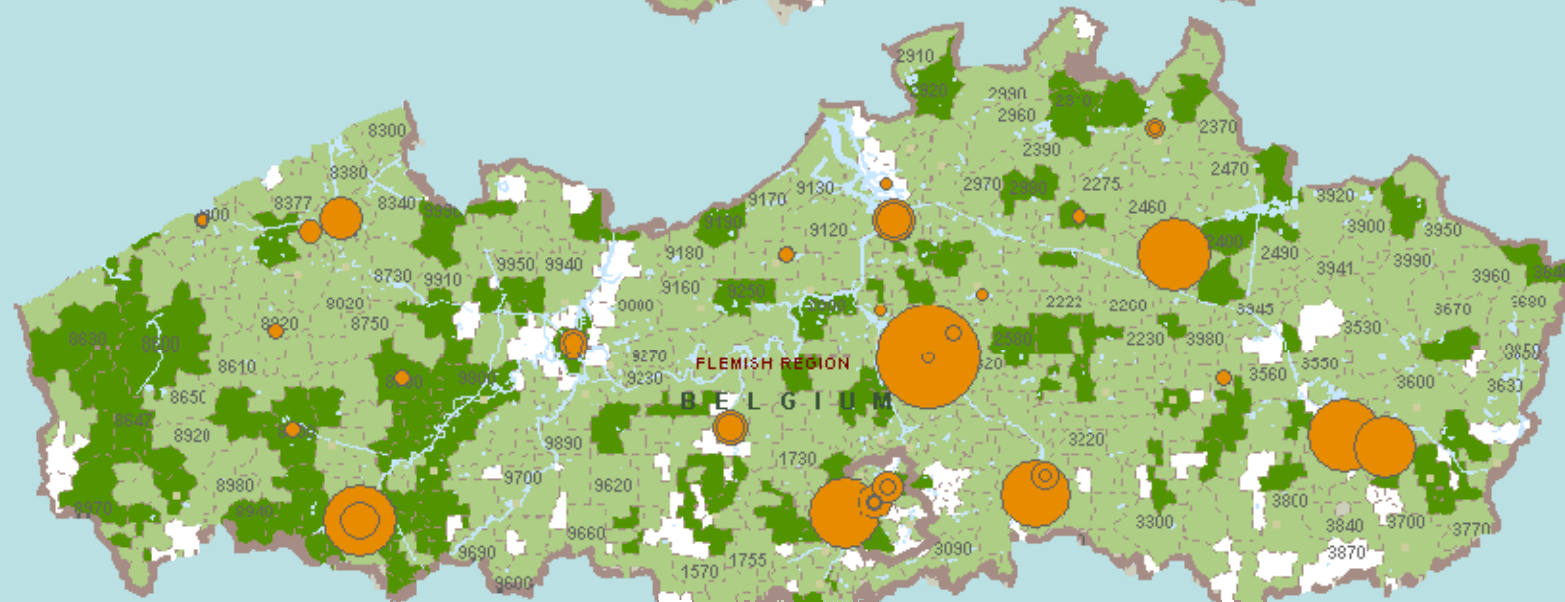
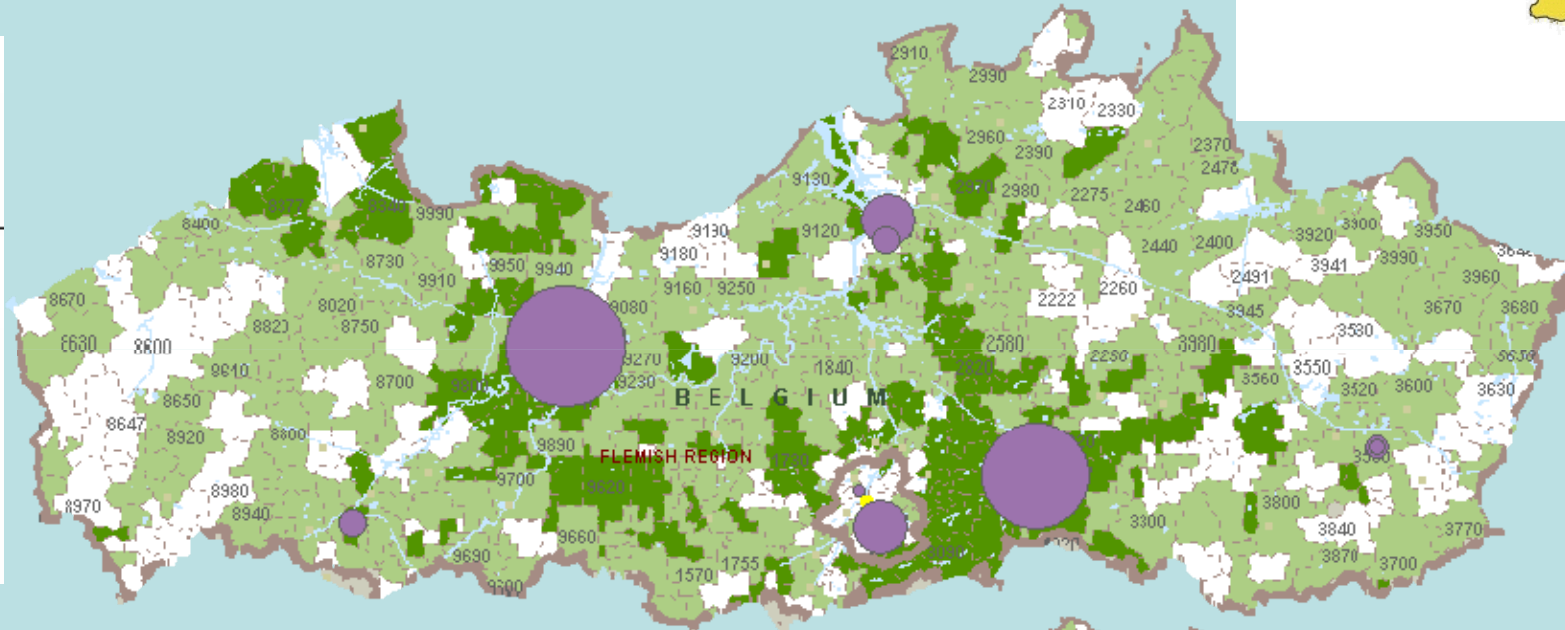
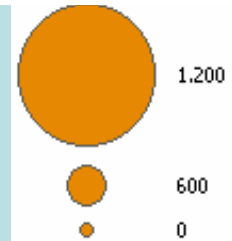
University campuses



% vocational



College campuses



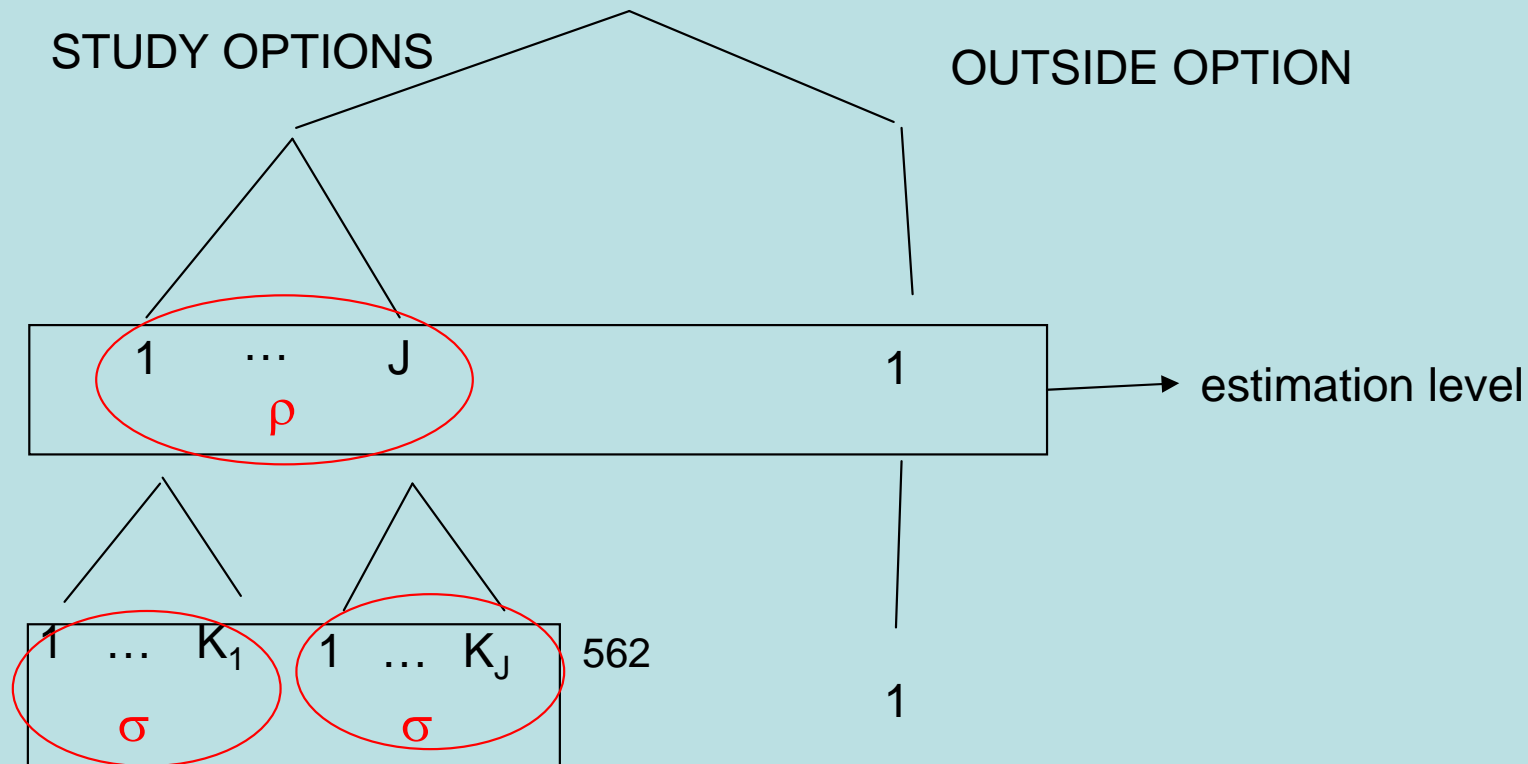


Econometric model

- Nested logit model
 - Pupils choose among **563 elemental alternatives**
 - 562 study alternatives
 - 1 outside option
 - Different levels of **aggregation** for the choice set
 - Campus level (54 alternatives)
 - Campus + study field level (155 alternatives)
 - Campus + detailed study field level (226 alternatives)
- Correlated **unobserved preferences**
 - Across study alternatives (relative to outside good)
 - Across elemental alternatives



Econometric model



$$0 \leq \rho \leq \sigma \leq 1$$



Overview

- Introduction
 - The Debate on Higher Education
 - Empirical & Policy Questions
 - Key Findings
 - Dataset & Econometric Model
- Participation & Study Decisions
 - **Parameter Estimates**
 - Demand & Welfare Effects of Increased Fees
- Reducing Supply Diversity
 - Policy Background
 - Economic Framework
 - Profit and Welfare Effects of Unilateral Supply Reductions
- Takeaway Results



Results – “whether to study”

Disaggregate nested logit model

Parameter	Estimate	t
Outside option	1.16***	(11.67)
<i>male</i>	0.24***	(5.32)
<i>foreign</i>	0.71***	(5.17)
<i>years of repetition</i>	0.5***	(19.67)
<i>general high school</i>	-2.08***	(-20.91)
<i>technical high school</i>	-1.2***	(-15.81)
<i>catholic high school</i>	-0.36***	(-7.66)
<i>classical languages</i>	-0.06	(-0.67)
<i>modern languages</i>	0	(0.03)
<i>economics</i>	0.01	(0.092)
<i>sciences</i>	0.01	(0.124)
<i>mathematics</i>	0.02	(0.213)
<i>'hard' technical</i>	0.43***	(7.081)
ρ	0.05*	(2.32)
Observations	2,981,735	
<i>individuals</i>	19237	
<i>alternatives</i>	155	

$$\frac{\partial P_{ij} / \partial x_{ij}}{\partial P_{i0} / \partial x_{ij}} \approx \frac{1}{1 - \rho}$$

↓

Pupils are $1/(1-0.95) = 20$ times more response to travel costs in their **study decision** than in their **participation decision**



Results – “where & what to study”

Disaggregate nested logit model

Parameter	Estimate	t
Institution dummies	<i>included</i>	
Correction for aggregation	0.98***	(39.02)
Travel cost	-5.82***	(-16.99)
φ	0.49***	(13.48)
<i>male</i>	0.27*	(2.22)
<i>foreign</i>	-0.08	(-0.16)
<i>years of repetition</i>	-0.24*	(-2.57)
<i>general high school</i>	-0.33	(-1.26)
<i>technical high school</i>	-1.45***	(-5.44)
<i>catholic high school</i>	0.46**	(2.69)
Observations	2981735	
<i>individuals</i>	19237	
<i>alternatives</i>	155	



Overview

- Introduction
 - The Debate on Higher Education
 - Empirical & Policy Questions
 - Key Findings
 - Dataset & Econometric Model
- Participation & Study Decisions
 - Parameter Estimates
 - **Demand & Welfare Effects of Increased Fees**
- Reducing Supply Diversity
 - Policy Background
 - Economic Framework
 - Profit and Welfare Effects of Unilateral Supply Reductions
- Takeaway Results



The Effects of Tuition Fee Reform

- Current fees are about uniform at **500€/year**
- **Uniform** fee increase
 - Market-level elasticities ←
- **Non-uniform** fee increases
 - By type: universities versus colleges ←
 - By type and study field (science / social science / biomedical / arts)



Uniform fee Increase: Comparison of Models

Market Shares	Status quo predictions	Semi-elasticities for uniform fee increase with 1,000 €
Overall Participation	66.00%	-1.09%
Academic HE	20.47%	-0.47%
Vocational HE	45.53%	-0.90%

Results for disaggregate nested logit (155 options). All changes in choice probabilities significant at 95% level.



Differentiated Fee Increase: By Type

Market Shares	Status quo Predictions	Semi-elasticities when raising fee with 1,000 € for:	
		Academic options only	Vocational options only
Overall Participation	66.00%	-0.13%	-0.72%
Academic HE	20.47%	-24.03%	26.30%
Vocational HE	45.53%	10.61%	-12.88%

Results for disaggregate nested logit (155 options). All changes in choice probabilities significant at 95% level.



Welfare Analysis of Tuition Fee Increases

- **Consumer surplus:** students and outsiders

$$CS_i(t) = \frac{1}{\alpha_i} \left(\sum_{j=1}^J \exp(V_{ij}^*(t)/(1-\rho)) \right)^{(1-\rho)} + \exp(V_{i0})$$

Assumption: private returns = social returns

- **Producer surplus:** government + universities

$$PS_j(t) = (t_j - c_j) \sum_i P_{ij}(t)$$

- Variable subsidies are cost based

	Colleges	Universities
Total	3,113	3,937
Arts	2,456	2,652
Social Sciences	2,865	2,807
Biomedical Sciences	3,683	5,000
Exact Sciences	3,448	5,290

- Cost of public funds = 0.23 € (Diewert et al., 1998)



Welfare Analysis of Tuition Fee Increases

- **Uniform fee increase**
 - Lowers consumer surplus, raises producer surplus
→ Strong distributional effects from students to outsiders
 - Important welfare effect if accounting for cost of public funds
- **Differentiated fee increase**
 - Only modest additional beneficial effects
 - Strong distributional effects

	Fee increase		Welfare effects [♦]			Participation effects [*]
	colleges	universities	consumer surplus	producer surplus	welfare ($\lambda=0.23$)	
Uniform small increase	+1,000€	+1,000€	-657.0	670.1	167.2	-0.91%
Non-uniform small increase	+750€	+1,579€	-645.1	670.1	179.2	-0.80%
Uniform cost-based increase	+2,810€	+2,810€	-1,830.8	1,852.3	447.6	-2.58%
Non-uniform increase to MC	$t_j = c_j$	$t_j = c_j$	-1,736.8	1,851.8	541.0	-2.35%

[♦] The changes are in €/capita and relative to the status quo. ^{*} Reported as semi-elasticities.



Overview

- Introduction
 - The Debate on Higher Education
 - Empirical & Policy Questions
 - Key Findings
 - Dataset & Econometric Model
- Participation & Study Decisions
 - Parameter Estimates
 - Demand & Welfare Effects of Increased Fees
- Reducing Supply Diversity
 - **Policy Background**
 - Economic Framework
 - Profit and Welfare Effects of Unilateral Supply Reductions
- Takeaway Results



Policy Background

- Policy objective = **cost savings** through reduced supply diversity
- Main questions
 - Does reduction in product diversity increase **welfare**?
 - Does the new funding system **induce institutions** to take the ‘right’ decisions?
 - Assessment of formula-based funding by means of a ‘**concentration index**’ (#students / #study programs)



Overview

- Introduction
 - The Debate on Higher Education
 - Empirical & Policy Questions
 - Key Findings
 - Dataset & Econometric Model
- Participation & Study Decisions
 - Parameter Estimates
 - Demand & Welfare Effects of Increased Fees
- Reducing Supply Diversity
 - Policy Background
 - **Economic Framework**
 - Profit and Welfare Effects of Unilateral Supply Reductions
- Takeaway Results



Profit Effect

- Consider a unilateral **elimination of a study program** by an institution
- Profit effect composed of
 - 1. **tuition fee revenue loss (-)**
 - But less than total fee revenues from the program due to 'diversion' of affected students to other programs of the same institution
 - 2. change in subsidies due to **concentration index (+/-)**
 - Positive if program small enough
 - 3. **fixed cost saving (+)**
 - Not measured (but upper bound approach)



Welfare Effect

- Composed of

1. Change in **consumer surplus** (-)

2. Change in **producer surplus**

- 2a. Change in **variable costs** due to reallocation of students (+/-)

	Colleges	Universities
Total	3,203	4,075
Architecture	3,527	5,290
Engineering	3,594	5,290
Science	n/a	5,290
Economics & Business	2,333	2,921
Education Science	3,633	3,767
Other Social Sciences	3,220	2,785
Medicine & Paramedics	3,711	5,444
Bio-engineering	3,721	4,527
Languages	2,760	2,719
Cultural Studies	2,331	2,713

- 2b. **Fixed cost saving** (+)



Overview

- Introduction
 - The Debate on Higher Education
 - Empirical & Policy Questions
 - Key Findings
 - Dataset & Econometric Model
- Participation & Study Decisions
 - Parameter Estimates
 - Demand & Welfare Effects of Increased Fees
- Reducing Supply Diversity
 - Policy Background
 - Economic Framework
 - Profit and Welfare Effects of Unilateral Supply Reductions
- Takeaway Results



Welfare versus Profit Effects

Profit Incentive	Welfare Effect			Total
	Negative	Unknown	Positive	
Negative	136 cases (desirable status quo)	2 cases	1 case (undesirable status quo)	139 cases
Unknown	171 cases	0 cases	17 cases	188 cases
Positive	197 cases (undesirable reform)	5 cases	33 cases (desirable reform)	235 cases
Total	504 cases	7 cases	51 cases	562 cases

- In the majority of cases it is **not desirable to cut program diversity** (504 versus 51 cases)
- The **concentration index** funding rule
 - Study programs to drop: **undesirable reform** in 40 to 70% of these cases (197+171)
 - Study programs to keep: **desirable reform** in up to 35% of these cases (1+17)



Overview

- Introduction
 - The Debate on Higher Education
 - Empirical & Policy Questions
 - Key Findings
 - Dataset & Econometric Model
- Participation & Study Decisions
 - Parameter Estimates
 - Demand & Welfare Effects of Increased Fees
- Reducing Supply Diversity
 - Policy Background
 - Economic Framework
 - Profit and Welfare Effects of Unilateral Supply Reductions
- **Takeaway Results**



Takeaway Results

- Tuition fee increases
 - Little effect on **participation**
 - Important **welfare gains** and **redistribution** from students to outsiders
- Reductions in supply
 - **Rarely desirable** to rationalize supply
 - When using simple **formula funding**, institutions' incentives may be severely misaligned with welfare objectives