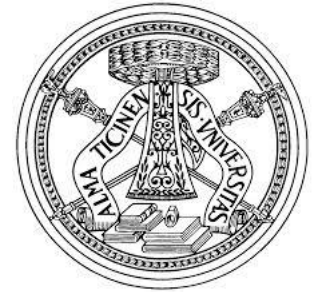




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The Impact of the Financial Crisis on the Efficiency of Italian Universities

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Agenda

- Motivation
- Research objectives and Sample
- Literature review
 - Studies on university efficiency
 - Previous results in Italy
- Literature gaps addressed
- Methodology and variables
- Results of the analysis
- Conclusions and future developments

Motivation

- Recent crisis has significantly affected the public sources to universities
 - Diverging funding policies can be identified among European countries (Paleari et al. 2014)
 - In Southern European countries, public funding for HE system have been significantly reduced
 - Italian HE system is an example of Southern European countries which are facing the severe cut of government funding in the last years

HE public investments per citizen

Country	Funding 2012 - (mln €)	Change 2008- 2012	Change 2008-2012 Inflation-adjusted
Norway	3.621	22,0%	21,0%
Sweden	6.235	22,0%	21,0%
Germany	24.900	23,0%	20,0%
Belgium - French Community	585	19,0%	16,0%
Austria	2.169	15,0%	13,0%
Poland*	3.015	12,0%	8,6%
Netherland	3.232	10,0%	7,5%
Iceland	87	13,0%	7,2%
France	19.800	8,8%	6,4%
Croatia	369	5,3%	1,8%
Slovakia	447	2,1%	-1,5%
Portugal	602	-1,5%	-4,1%
Spain*	7.258	-9,5%	-11,0%
UK	9.815	-10,0%	-13,0%
Italy	6.633	-12,0%	-14,0%
Czech Republic	802	-14,0%	-17,0%
Ireland	1.236	-20,0%	-21,0%
Lithuania	189	-19,0%	-22,0%
Hungary	542	-20,0%	-24,0%
Greece	200	-25,0%	-25,0%

* Including EU Funds

Source Paleari et al. (2014)

Research objective and Sample

- Aims of the paper
 - Evaluating whether the overall university productivity and efficiency have changed since the beginning of the financial crisis (2008) considering simultaneously the three university missions
- Sample: 58 universities
 - All Italian state universities
 - Excluding six state universities focused on doctoral training
 - Excluding the two University for foreigners
 - Excluding University of Urbino, which was private up to 2006
 - Panel data from 2004 to 2011

Literature review: Studies on university efficiency

- Efficient allocation of public resources in university landscape has only recently been investigated (Agasisti 2011)
 - Early studies on university cost efficiency focused on single *departments*
(Dundar and Lewis 1995; Johnes and Johnes 1993, 1995; Madden and Savage 1997; Tomkins and Green 1998)
 - More recent studies evaluated ***entire universities*** in a particular country
(Athanassopoulos and Shale 1997; McMillan and Datta, 1998; Ng and Li 2000; Avkiran 2001; Izadi et al. 2002, Abbott and Doucouliagos 2003; Flagg et al. 2004; Warning 2004, 2007)
 - Performance of the countries' *educational system*
(Clements 2002; Afonso and St. Aubyn 2005, 2006; Gimenez et al. 2007; Agasisti 2014)

Literature review: Previous results in Italy

- Previous results on university cost efficiency in Italy
 - Universities located in Southern Italy (economically disadvantaged regions) underperform (Agasisti and Dal Bianco 2006)
 - They gained efficiency over time (Agasisti and Pohl 2012)
 - Economies of scale and scope are not relevant factors in explaining university efficiency (Bonaccorsi et al. 2006)
 - Italian HEIs seem too big to benefit from significant economies of scale (Agasisti and Johnes 2009)
- Malmquist indexes show TFP progress in Italy from 2001 to 2007, but only a minor function of TFP stems from efficiency change (Agasisti and Pohl 2012)

Literature gaps addressed

- Studies at institutional level usually compare punctually just short-time periods
 - This paper uses a panel data for 8 years
- Previous studies usually do not consider the third mission
 - We aim to evaluate the overall university efficiency considering at the same time teaching, research, and third mission
 - Encompassing possible economies of scope or trade-offs between different missions
 - Complementary and substitution effects between different missions
- Previous studies at institutional level mainly focus on university cost efficiency
 - We focus also on personnel productivity efficiency

Methodology and variables

- Data Envelopment Analysis (Charnes et al. 1978) and Malmquist productivity index
 - Non-parametric approach to compute efficiency scores
 - Output-oriented approach
 - Variable return to scale (VRS, Banker et al. 1984)
- Advantages
 - Not require any *a priori* specification of functional and technical relationship among inputs and outputs
 - Choice of functional form in HE is not straightforward and misspecification may distort the results of an efficiency analysis (Kraus 2004)
 - Manage multiple outputs and inputs at the same time

Methodology and variables: Previous studies

- Variables employed in previous studies
 - Inputs
 - Students
 - Staff numbers
 - Professors
 - Number of PhDs and post-doc
 - Administrative staff
 - Expenditures
 - Library acquisitions
 - Building space
 - Outputs
 - Graduates
 - Publications
 - Citations
 - Number of PhDs
 - Research grants and contracts

Methodology and variables: Our study

Model 1

- Input variables
 - Academic staff
 - Non academic (technical and administrative) staff
 - Contract professors

Model 2

- Input variables
 - FFO + Tuition fees

- Output variables
 - *Teaching*: Regular (on-time) students
 - *Research*: Publications
 - *Third mission*: Patents

Descriptive Statistics

- Average of input and output variables by year

Year	Inputs					Outputs		
	FFO (Mln €)	Fees (Mln €)	Academic staff	Contract professors	Non-academic staff	Regular students	Publications	Patents
2004	111,0	19,6	942	697	1.149	17.617	623	2,8
2005	118,7	20,3	990	724	1.151	17.820	642	3,8
2006	118,2	21,2	1.015	711	1.166	18.031	727	4,8
2007	120,0	22,8	1.015	667	1.159	18.283	790	5,3
2008	124,0	23,9	1.029	563	1.175	18.282	829	6,3
2009	122,8	24,6	998	534	1.043	18.512	878	9,2
2010	118,0	25,7	950	555	993	18.283	894	7,7
2011	115,2	25,8	934	466	968	17.982	958	5,8

Results: DEA with Personnel as input

- DEA-analysis results evidence that, on average, Italian state universities are working not far from the efficient dimension
 - About 18 per cent are scale efficient
 - Decreasing trend in technical efficiency from the beginning of the crisis

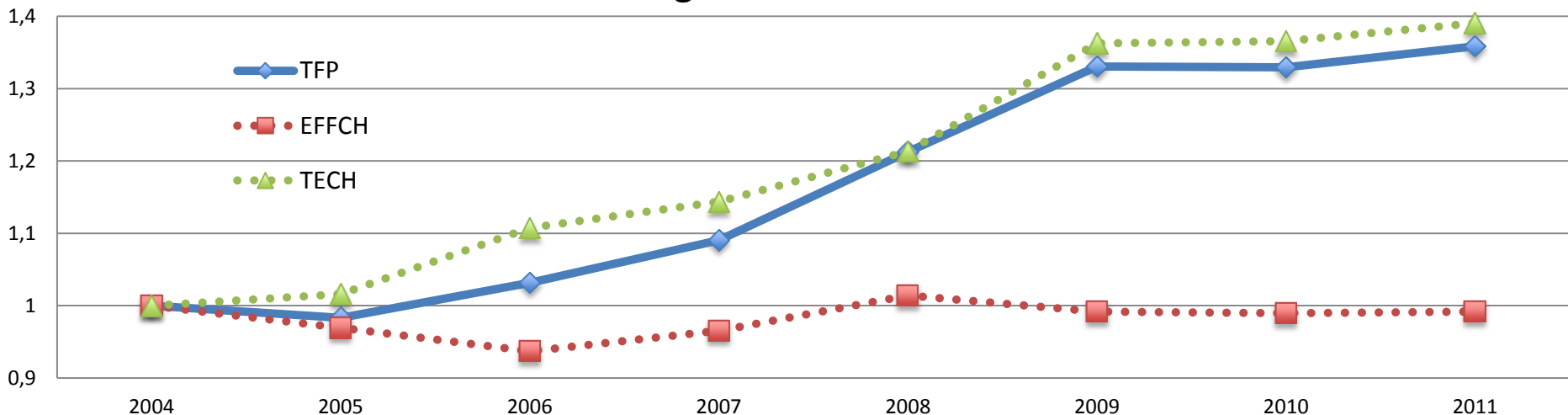
Efficiency analysis			
Year	EFF_CRIS	EFF_VRS	SCALE
2004	0,830	0,880	0,944
2005	0,799	0,852	0,940
2006	0,769	0,838	0,923
2007	0,779	0,854	0,917
2008	0,812	0,879	0,927
2009	0,791	0,861	0,923
2010	0,785	0,840	0,940
2011	0,785	0,836	0,943

Results: Malmquist indexes

Efficiency analysis			
Year	TFP	EFFCH	TECH
2004	1,000	1,000	1,000
2005	0,983	0,969	1,016
2006	1,049	0,967	1,090
2007	1,057	1,030	1,033
2008	1,112	1,051	1,061
2009	1,098	0,978	1,123
2010	0,999	0,998	1,002
2011	1,022	1,002	1,018

- Increase in TFP is due to Technical change
 - Incentives to publish
- Efficiency change recovery stopped with the crisis

Average cumulated value



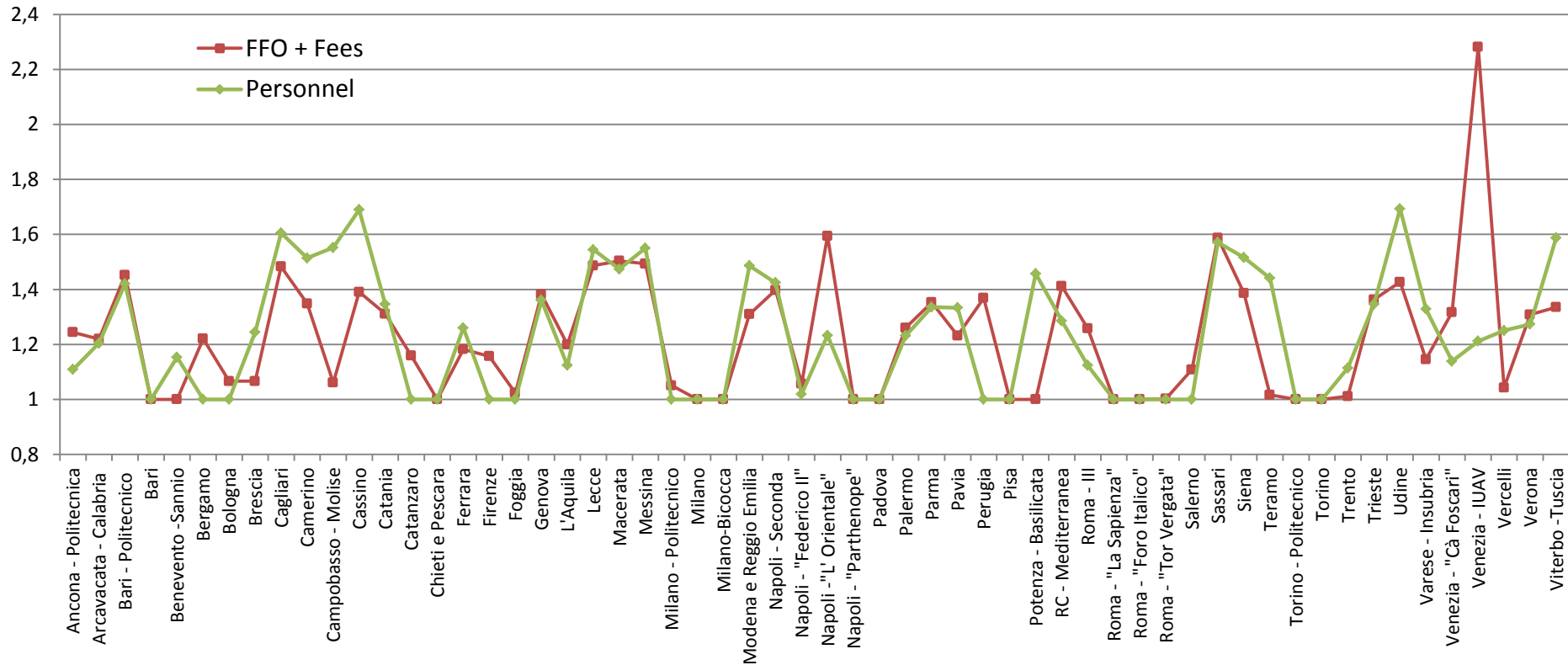
Results: VRS output-oriented scores correlation

- High correlation between Model 1 (Personnel productivity efficiency) and Model 2 (University cost efficiency) VRS output-oriented scores

VRS-Efficiency Score Correlation	
Year	Correlation
2004	0.822
2005	0.611
2006	0.647
2007	0.632
2008	0.732
2009	0.554
2010	0.510
2011	0.536

Results: VRS output-oriented scores – Year 2011

- University cost efficiency (FFO + Tuition Fees as input) vs Personnel productivity efficiency in the year 2011



Limitations: Methodological issues

- Outliers (Bogetoft and Otto 2011)
 - Mostly mega-universities

University	# students 2011/12	# years as outlier
Roma - Università degli studi "La Sapienza"	113.040	5
Napoli - Università degli studi "Federico II"	84.320	3
Bologna - Università degli studi	82.363	5
Torino - Università degli studi	63.107	3
Padova - Università degli studi	59.317	4
Milano - Università degli studi	58.440	6
Firenze - Università degli studi	53.222	1
Pisa - Università degli studi	49.336	4
Milano - Politecnico	37.626	5
Roma - Università degli studi di "Tor Vergata"	33.591	1
Torino - Politecnico	28.777	1

- Difficulties in evaluating the third mission
 - Efficiency is very sensitive to patent numbers
 - Universities which are not focus on medicine and engineering have also different methods to contribute to local social development

Conclusions

- Total Factor Productivity increases over time
- As evidenced in previous studies about Italy, TFP progress is driven by technical change
 - Policies aimed at enlarging the number of publications
- Efficiency change recovery stopped with the crisis
- Personnel productivity efficiency and University cost efficiency present a high degree of correlations

Future developments

- Investigating the determinants of efficiency
- Including also the quality dimension in the efficiency analysis
- Identifying alternative measures which can be added to patents as a proxy for the third mission
- Enlarging the sample to private universities

Thanks for your attention

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