The role of innovation in the firms performance: the South Italy case

P.Rizzi and A.Dallara
Local Economy Laboratory
Università Cattolica di Piacenza
Italy

Laboratorio Economia Locale

Università Cattolica del Sacro Cuore

Research question:
- analyze the characteristics shared by the companies that have had good perfomance (company virtuosity) (in Italy)
  (Bottazzi et.al.2009; Dallara et.al. 2012, Coad et.al. 2009, Geroski-Jacquemin 1988, JRC 2008)
- studying the role to:
      - innovation
      - territory localization
      - use of public subsidies
      in Convergence Regions of Italy (South)

Research phases:
- Step 1 - definition and identification of "virtuous" firms

- Step 2 - determinants of the performance of virtuous / non-virtuous firms in 4 South Italy Regions

PQN R&C 2007-2013 VIP - Ministry of Economic Development

Step 1

definition and identification of "virtuous" firms

Step 1

- The **"virtuosity"** is defined <u>if</u> the company's performance <u>exceeds the average values</u> of the variables before and during the crisis (2002-2007 and 2008-2010) <u>in 80</u> sectors at national level (Nace two-digit).

- the variables that identify successful businesses:

  -ROI (return on investment) as an indicator of PROFITABILITY

  -value added per employee for the LABOUR PRODUCTIVITY

  -change in turnover as an indicator of FIRM'S GROWTH

- Each average is the national industry-level average for the period, and represent the 'threshold' values.

Businesses that have financial ratios above the thresholds at least <u>in 4 of 6 possible cases</u> are called "virtuous companies" (3 var in 2 period).

In total we have **44,651 virtuous firms on 132,082 in Italy**

Methodology

➤ **Source**: the financial statements of all Italian companies 1,250.000 *(DB Aida – Bureau Van Djik).*

➤ **Productive sectors investigated:** 80 industries identified by two-digits Nace.

➤ **Two periods: 2002-2007 and 2008-2010** (the time element allows you to analyze the persistence of the performance of enterprises and more generally their medium-term trends).

➤ **Variables investigated**: the dynamics of turnover, value added per employee, return on investment.

➤ **Companies analyzed: 132,082 companies** with data in the two periods

➤ **The role of the territory** is investigated by combining data on the virtuosity of enterprises, the data on territorial competitiveness and sustainability on a provincial scale resulting from the ESA model.

Calculation of the virtuosity index (IV) of companies

to attribute to each company a <u>cardinal value of the degree of virtuosity</u>.

algorithm that satisfies two conditions:
1.take into account the fact that **the values of the financial ratios of a given society may be above or below the industry average of belonging _(business comparative succes)_**;

2.take into account the **number of times that the same company is above the industry average _(persistence)._**

Calculation of the virtuosity index (IV) of companies
The following formula takes into account these two aspects.

$$IV_{società} = \frac{2}{3}\left[n.\left(\frac{ROI^{soc}_{2002-07}}{ROI^{settore}_{2002-07}} + \frac{VApc^{soc}_{2002-07}}{VApc^{settore}_{2002-07}} + \frac{DFatt^{soc}_{2002-07}}{DFatt^{settore}_{2002-07}}\right)\right] + \frac{1}{3}\left[n.\left(\frac{ROI^{soc}_{2008-10}}{ROI^{settore}_{2008-10}} + \frac{VApc^{soc}_{2008-10}}{VApc^{settore}_{2008-10}} + \frac{DFatt^{soc}_{2008-10}}{DFatt^{settore}_{2008-10}}\right)\right]$$

where:
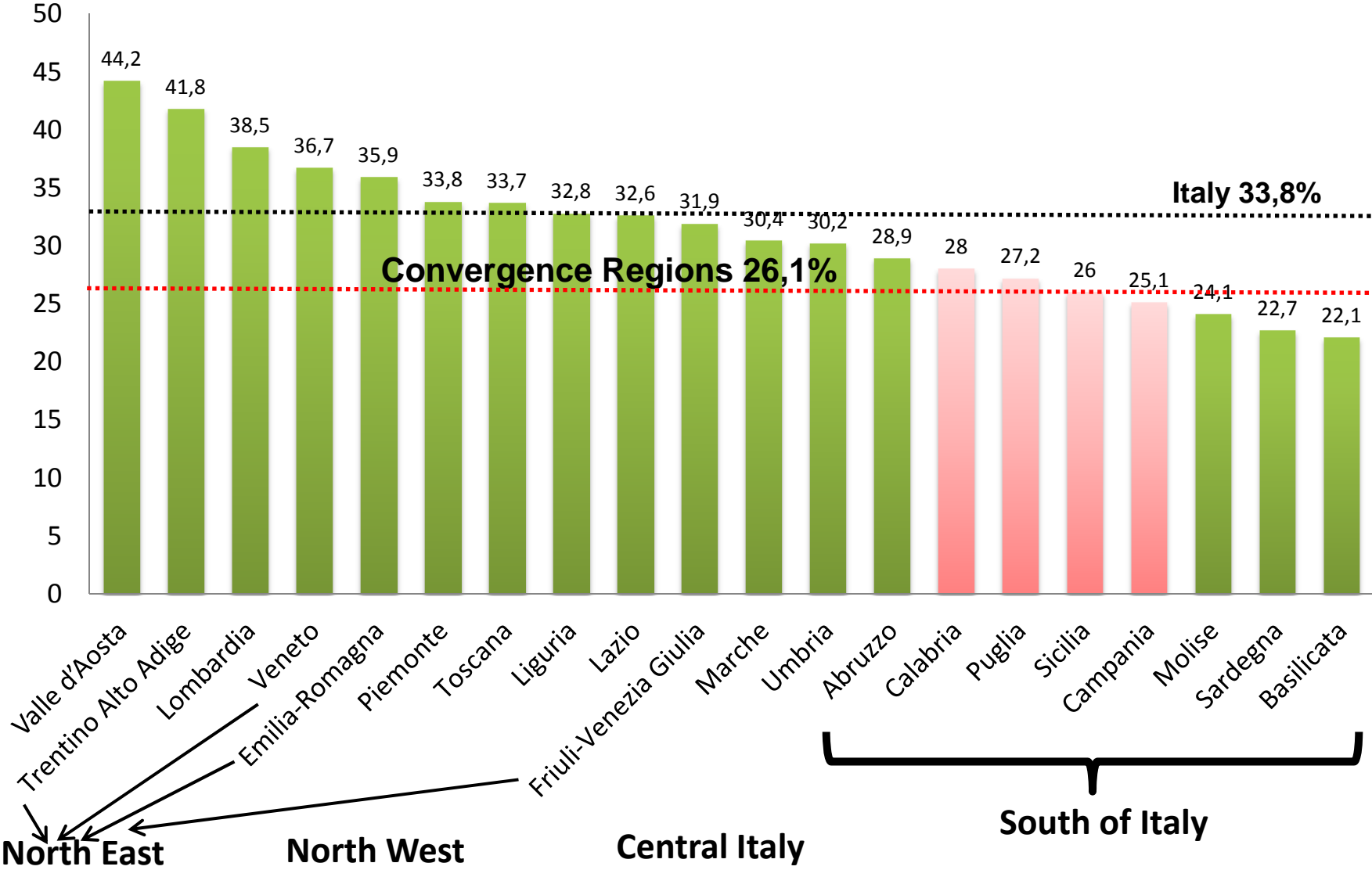
-n.: is the premium of virtuosity, defined as the number of times that the company has values higher than the industry average

- $ROI^{soc}_{2002-07}$ is the average of the ROI of a given society in 2002-2007

- $VApc^{soc}_{2002-07}$ is the average value added per employee in a given society in 2002-2007

- $DFatt^{soc}_{2002-07}$ is the average of the turnover annual change of a given society in 2002-2007

Some results of Step 1

The measure of the virtuous firms in the Italian regions
(% on total capital companies)

•The first way to verify the importance of the virtuous society in the Italian economy is to assess the **weight in terms of the total number of companies** for which it was possible to calculate the values of profitability, productivity and growth.

•The weight of the virtuous firms is greater in the North

•So the underdevelopment of the South of Italy derives from

-greater presence of less dynamic sectors

-lower relative number of virtuous businesses

The weight of the virtuous firms in the Italian regions
(% on total capital companies)

Italy 33,8%

Convergence Regions 26,1%

Region	Value
Valle d'Aosta	44,2
Trentino Alto Adige	41,8
Lombardia	38,5
Veneto	36,7
Emilia-Romagna	35,9
Piemonte	33,8
Toscana	33,7
Liguria	32,8
Lazio	32,6
Friuli-Venezia Giulia	31,9
Marche	30,4
Umbria	30,2
Abruzzo	28,9
Calabria	28
Puglia	27,2
Sicilia	26
Campania	25,1
Molise	24,1
Sardegna	22,7
Basilicata	22,1

North East

North West

Central Italy

South of Italy
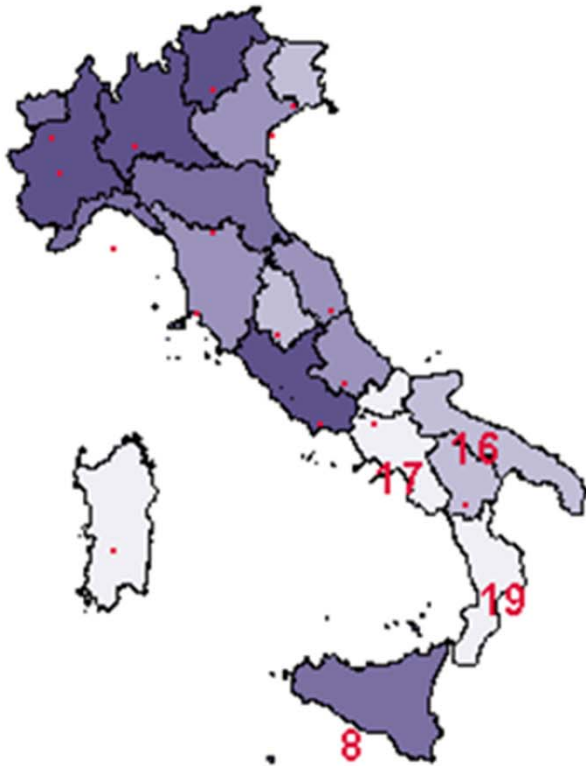
The distribution of the virtuous firms in the Italian regions
(Index of virtuosity)

108.9 - 111.2	
111.2 - 111.6	
111.6 - 111.9	
112.0 - 112.4	
112.7 - 113.1	
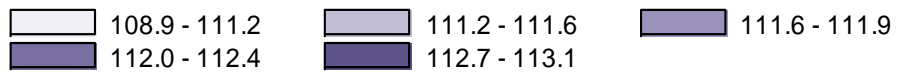
The economies of scale confirm to affect much the weight of virtuous companies

The % Weight of virtuous companies (on total companies) by size of company (Turnover class)
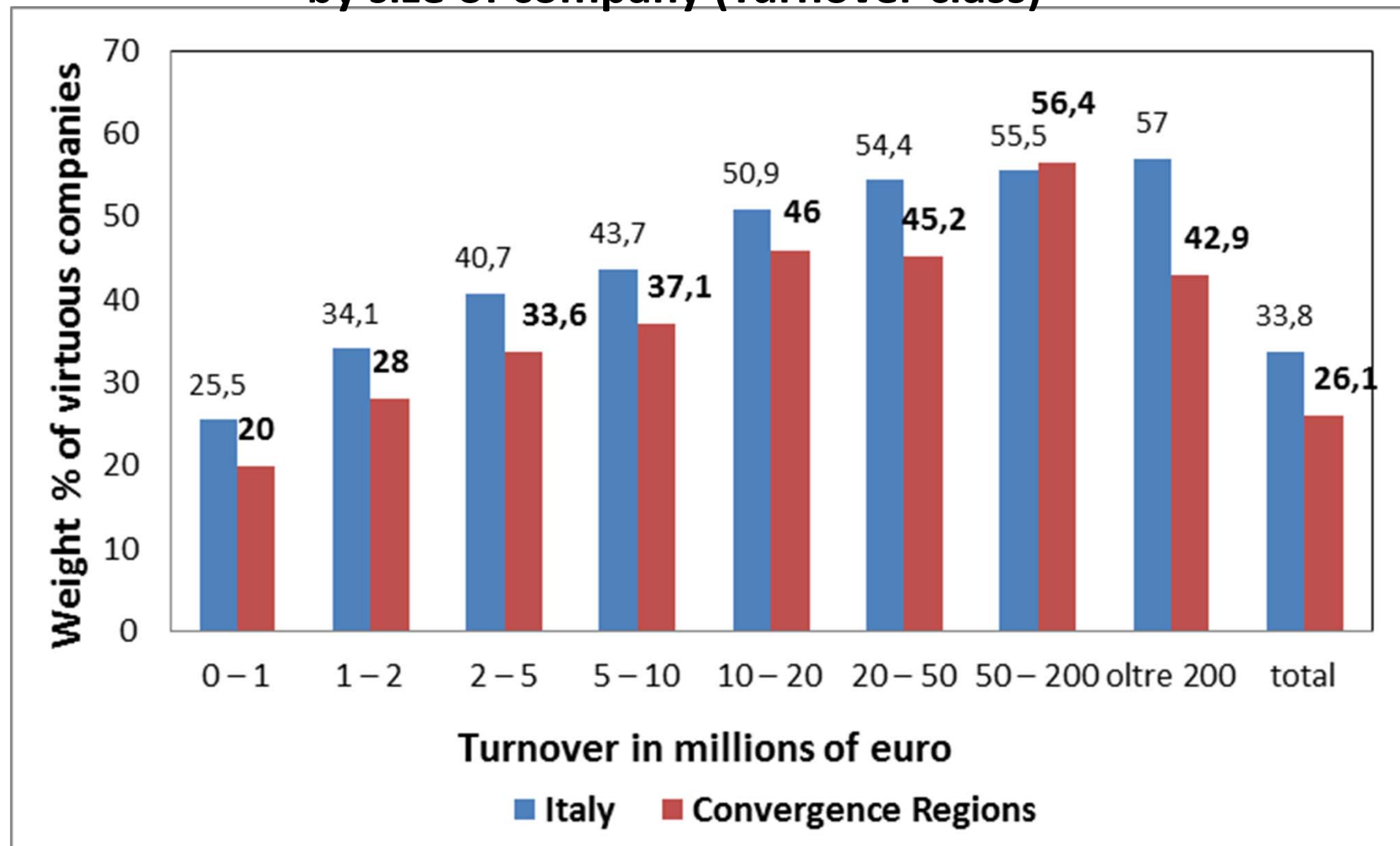
There is a **close link** between the **index of virtuosity (IV)** and macro-variables describing the **economic territorial perfomance of the provinces** (Economy-Society-Environment ESE Model: *Rizzi-Dallara, "A Map of sustainability in Italian Provinces", Regional Studies 2, 2012)*

In the provinces with the **strongest economy** (in terms of structural performance and strategies) also the virtuous business is very high, as well as where the economy is weaker than even the virtuosity is lagging behind.

The provinces of Convergence Regions are all characterized by **weak economy** (but environmental quality) and **low level of virtuous business.**

Virtuosity Index (province average 2002-2010)
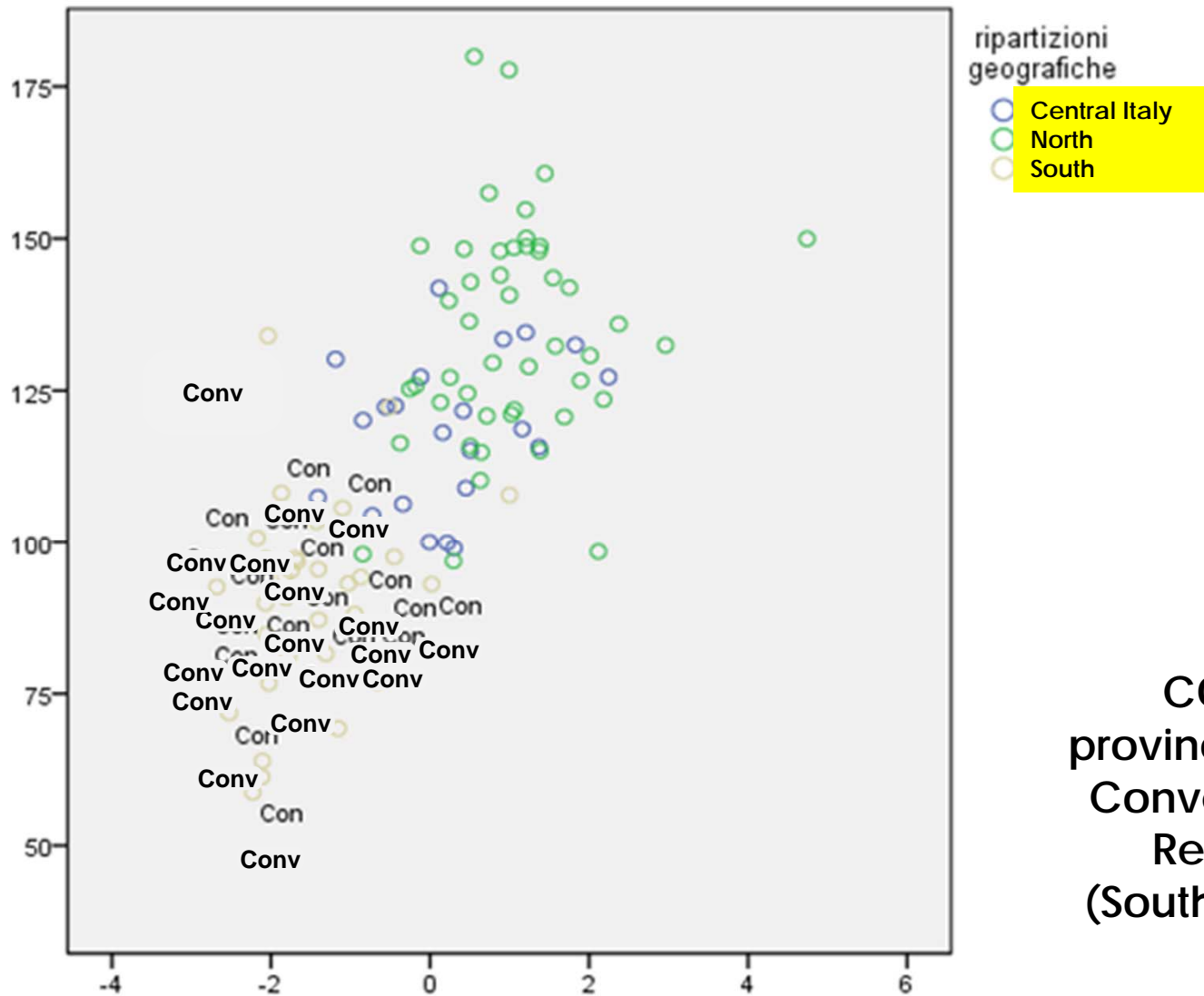
Economy ESA index 2002-2010

ripartizioni geografiche
- Central Italy
- North
- South

CONV:
provinces in the
Convergence
Regions
(South of Italy)

Step 2

determinants of the performance of virtuous / non-virtuous firms in 4 South Italy Regions

Methodology

➢ **Source:** 2014 Survey CATI Computer-Assisted Telephone Interviewing on **800 companies** (representative sample by sector and size) of 4 Convergence Regions matched with financial statements (DB Aida - Bureau Van Djik)

➢ **Productive sectors investigated:** 80 industries identified by two-digits Nace.

➢ **Variables investigated**: companies strategies of organization, internationalization, **innovation** and use of incentives

➢ **Calculation of the virtuosity index (IV2) of companies**: included also the dynamics of the **market share** in the period considered (weight ¼ to ¾ of virtuosity index 1). Again dichotomous index (virtuous / non-virtuous) and continuous

The virtuosity of enterprises: indicators and determinants

Output

-profitability
-productivity
-growth of turnover
-growth of market share

persistence
in time

Company Virtuousity

Structural Input

Economic Sector

Territory/ Region Context

Exogenous Input

Demand/ market

National Context

Strategic Input

Organization Strategies
-multi-plants
-multi-localization
-group/network

Investments Strategies
-phisical capital
-human capital
-R&D

Innovation Strategies
-product
-process
-organization

Internationalization Strategies
-export
-FDI
-global chain

Public Subsidies and Policy

The characteristics of the sample
(absolute and % values)

	Virtuous	Non virtuous	TOTAL	
			Absolute values	% values
	199	601	800	100%
classes of employees				
0-5	36,4%	44,0%	333	42,1%
6-10	27,8%	30,4%	236	29,8%
11-25	27,8%	20,7%	178	22,4%
over 25	8,1%	4,9%	45	5,7%
	100%	100%	793	100%
average number of employees	12,7	12,7	12,7	
Graduates				
% graduates on employees	12,8%	12,2%		12,3%
Industry / economic sector				
C.Manufacture	29,1%	23,1%	197	24,6%
F.Costruction	11,1%	14,0%	106	13,3%
G.Trade	30,7%	31,6%	251	31,4%
H.Transport	6,0%	5,7%	46	5,8%

The dynamics of employees
(% of companies)

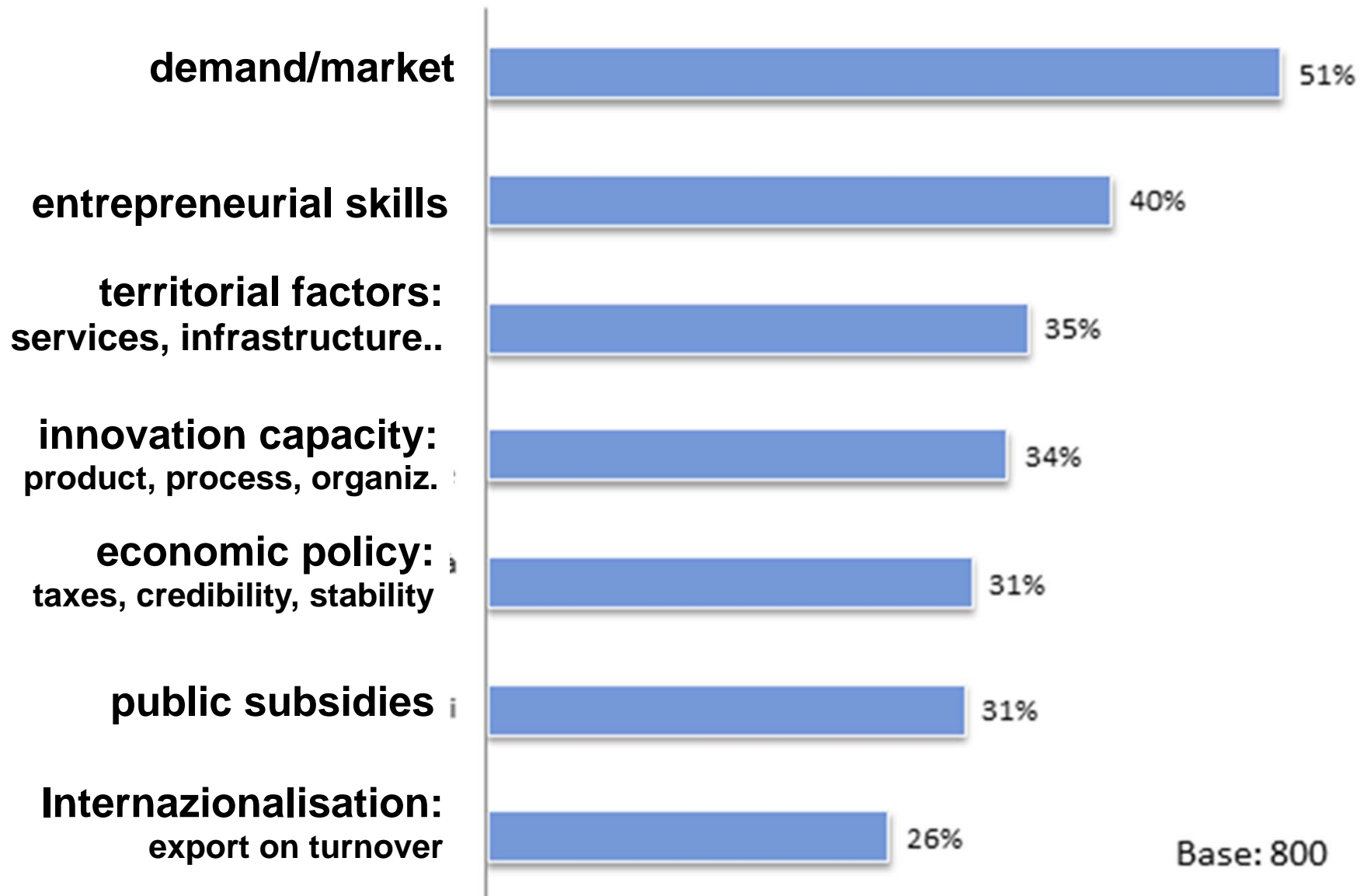|	Virtuous	Non virtuous	Total
Var. employees 2006-2013			
Increased	27,7%	5,0%	10,6%
Stable	48,4%	44,1%	45,2%
Decreased	23,9%	50,9%	44,2%
	100%	100%	100%
Var. % 2006-10	+4,7%	-4,3%	-2,1%
Var. % 2010-12	+4,2%	-6,8%	-3,9%
Var. % 2012-13	+0,0%	-7,3%	-5,2%
Var. % 2006-13	+9,1%	-17,3%	-10,8%
Var. market share 2011-13			
Decreased	21,1%	54,9%	46,5%
Stable	40,7%	43,6%	42,9%
Increased	38,2%	1,5%	10,6%
	100%	100%	100%

The definitions and determinants of virtuosity

Subjective voice of entrepreneurs

The factors that indicate the virtuosity of an enterprise (average on 1-3 scale)

Base: 800

Dynamics of turnover	1,07
Profitability: ROI	2,34
Productivity VA per empl	2,35
level and dynamics of the market share	2,43
Financial strength	2,51
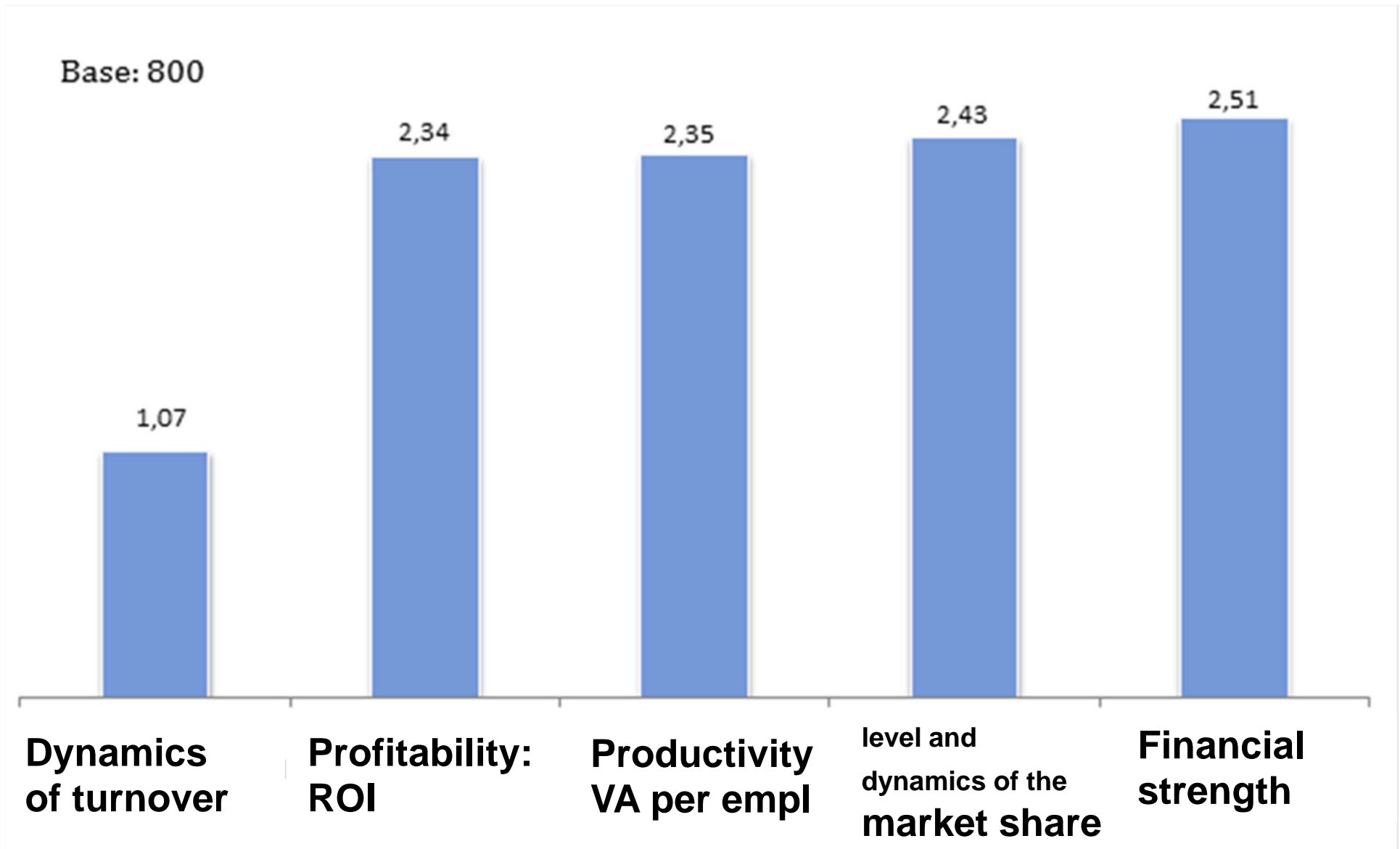
The factors affecting the virtuosity of an enterprise
(% of companies with 8-10 rating on 1-10 scale)

Factor	%
demand/market	51%
entrepreneurial skills	40%
territorial factors: services, infrastructure..	35%
innovation capacity: product, process, organiz.	34%
economic policy: taxes, credibility, stability	31%
public subsidies	31%
Internazionalisation: export on turnover	26%

Base: 800

The business strategies

The organizational structure
(% of companies)

	Virtuous	Non virtuous	TOTAL
Number of local units/establishments			
1	81,9%	90,8%	88,6%
2	11,1%	6,7%	7,8%
Over 2	7,0%	2,5%	3,6%
	100%	100%	100%
Plants in more than one region			
Yes	10,1%	3,8%	5,4%
No	89,9%	96,2%	94,6%
	100%	100%	100%
Group membership			
Yes	8,5%	6,0%	6,6%
No	91,5%	94,0%	93,4%
	100%	100%	100%
Network with other companies			
Yes, in a systematic way	4,0%	4,0%	4,0%
Yes, occasionally	6,5%	4,8%	5,3%
No, it operates autonomously	89,4%	91,2%	90,8%
	100%	100%	100%

The level of internationalization
(% on companies)

	Virtuose	Non virtuose	TOTALE
Markets %			
Regional Market	77,0%	83,7%	82,0%
National Market	16,8%	13,3%	14,2%%
European Union	4,4%	2,2%	2,7%%
Extra EU	1,9%	0,8%	1,1%%
	100%	100%	100%
% export/turnover of exporters			
2002-2007	30,3%	28,2%	29,0%
2008-2010	34,6%	28,2%	30,8%
2011-2013	35,7%	35,2%	35,4%
% exporters companies	14,1%	6,8%	8,6%

Investments
(% of companies)

	Virtuous	Non virtuous	TOTAL
Significant investments made			
% companies 2002-2007	19,2%	6,7%	9,8%
% companies 2008-2010	20,2%	10,1%	12,6%
% companies 2011-2013	25,1%	6,5%	11,2%
Dynamics of investments 2008-10			
Increased	14,1%	4,5%	6,9%
Stable	80,9%	77,4%	78,3%
Decreased	4,0%	17,3%	14,0%
Dont know	1,0%	0,8%	0,9%
	100%	100%	100%
Dynamics of investments 2011-13			
Increased	21,1%	5,3%	9,3%
Stable	71,9%	73,2%	72,9%
Decreased	6,5%	21,1%	17,5%
Dont know	0,5%	0,3%	0,4%
	100%	100%	100%

The innovation strategies

R&D
(% of companies)

	Virtuous	Non virtuous	TOTAL
% companies with R&D structure	5,5%	4,8%	5,0%
n.R&D employees (on firms with R&D)	4,8	3,1	3,6
n.R&D employees (total firms)	0,27	0,15	0,18
% graduates in R&D (on firms with R&D)	84,8%	72,4%	75,8%
% graduates in R&D (total firms)	4,7%	3,5%	3,8%
% companies with investmens in R&D	6,0%	4,5%	4,9%
% R&D/turnover on investing companies	16,8%	20,3%	19,2%
% R&D/turnover on total companies	1,0%	0,9%	0,9%
% companies investing in R&D			
more than the industry average	16,7%	11,1%	12,8%
less than the industry average	33,3%	33,3%	33,3%
as the industry average	50,0%	55,6%	53,8%
	100%	100%	100%

The type of Innovation
(% of companies)

	Virtuous	Non virtuous	TOTAL
Product innovation			
new products to the market	13,6%	7,5%	9,0%
new product for the company	13,1%	7,5%	8,9%
source of product innovation			
the company itself	94,5%	98,2%	97,3%
cooperation with other companies	1,5%	0,8%	1,0%
other companies or institutions	4,0%	1,0%	1,8%
	100%	100%	100%
Process innovation			
New or improves process	15,6%	7,2%	9,3%
Logistics or distributing systems new or improved	12,1%	7,2%	8,4%
source of process innovation			
the company itself	89,1%	92,3%	91,1%
cooperation with other companies	5,5%	3,3%	4,1%
other companies or institutions	5,5%	4,4%	4,8%
	100%	100%	100%

The use of incentives and subsidies

Has the company received some form of public support ?
(% of companies)

	Virtuous	Non virtuous	TOTAL
% companies that received incentives			
2000-2006	15,6%	9,0%	10,6%
2007-2013	17,6%	12,3%	13,6%
2000-2013	28,6%	20,6%	22,6%
Initiatives funded by incentives			
Products/services new or improved	61,4%	44,4%	49,7%
Peoduction Processes / machinery / plant	66,7%	70,2%	69,1%
Logistic Systems or supply chain	14,0%	7,3%	9,4%
Marketing, promotion	3,5%	4,0%	3,9%
Other kind of investments	1,8%	4,0%	3,3%

In the absence of the incentive, the investment would be carried out?
(% of subsidized companies)

	Virtuous	Non virtuous	Total
Yes with the same amount	14,0%	12,9%	13,3%
Yes with much lower amount	33,3%	20,2%	24,3%
Yes with slightly lower amount	22,8%	18,5%	19,9%
The investment would not be made	**29,8%**	**48,4%**	**42,5%**
	100%	100%	100%

The econometric exercise

- The use of **different indices of virtuosity** (two dichotomous to distinguish virtuous businesses and not, and two of a quantitative dimension to the level of business performance) has highlighted some **common results**.

- Whether measuring the virtuosity only starting from the financial statements (productivity, profitability and revenue growth: IV1) and by inserting in this index also the dynamics of the company's market share (IV2), confirmed some **factors that affect the performance of companies**.

dependent variable Independent variables	Virtuosity Index 1		Virtuosity Index 2	
	OLS	LOGIT	OLS	LOGIT
Significant Investments (2002-2007)	**61,57** (26,38)	**0,37** (0,31)	**0,04**** (0,01)	**0,97** (0,41)
Significant Investments (2011-2013)	**59,90** (26,20)		**0,05**** (0,01)	**1,20***** (0,39)
Decreasing Investments			**-0,07**** (0,01)	**-1,24***** (0,40)
Customer Portfolio		**0,29**** (0,10)		
Low entrepreneurial quality	**-41,96** (18,64)	**-0,24*** (0,13)	**-0,02**** (0,01)	**-0,29*** (0,16)
Low technical /scientific System	**-29,36*** (16,01)	**-0,36**** (0,11)	**-0,02**** (0,01)	**-0,24*** (0,13)
Business Services high quality	**29,92*** (16,32)	**0,28**** (0,11)		**0,32**** (0,13)
Business Services low quality			**-0,02**** (0,01)	
Small size of firm (turnover)	**-39,67** (25,39)		**-0,03**** (0,01)	
Public subsidies (2000-2013)	**-36,43*** (19,50)			
Graduates (0%)			**-0,01*** (0,01)	
Product Innovation with other companies			**0,06**** (0,03)	
Costant	195,75*** (27,71)	-0,28 (0,28)	0,22*** (0,01)	-0,72 (0,56)
F	4,47		14,24	
prob > F	<0,0001		<0,0001	
adj. R2	0,03		0,1422	
Chi-quadrato		5,77		2,28
prob > Chi-quadrato		0,67		0,94
n. observations	800	800	800	800

What factors affect the virtuosity of enterprise?
The results of the econometric tests

-the **implementation of significant investments** in the period

-the **growth of business investment**

-the firm size in terms of employees

-the **entrepreneurial quality**

-the **human capital** of the company, measured by percentage of graduates among professionals

-the **product innovations** carried out in **collaboration with other companies or institutions**

-the presence of **business services quality in the territory** of location of the company

-the **technical / scientific system** of the area of activity of the enterprise

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