



COINVEST

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COINVEST

Competitiveness, Innovation and Intangible Investment in Europe

Micro-data Exercises: Results for Portugal

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Plan

1. Cooperation in Innovation Activities: The Importance of Partners
2. Interdependence and Spillovers: Is Firm Performance Affected by Others' Innovation Activities?
3. Organizational Change and Firm Performance: Product and Process Flexibility
4. The Value of Training
5. Establishment of Higher Education Institutions and New Firm Entry
6. The Value of Organizational Capital: Can it be measured?

1. Cooperation in Innovation Activities: The Importance of Partners

with

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1. Cooperation in Innovation Activities: The Importance of Partners

The boundaries of innovation are shifting

From a situation in which firms perform R&D activities mostly at the internal level

To a configuration in which corporate partnering, collaboration and external sourcing in R&D are widespread

The open innovation model is being adopted by firms (Chesbrough, 2003a, 2003b; Laursen and Salter, 2006)

Firms invest resources to search for innovative opportunities through the establishment of external linkages

1. Cooperation in Innovation Activities: The Importance of Partners

Objective

Analyse the relevance of cooperation partners for the success of innovation activities

Determinants behind the decision to cooperate are different from the determinants behind the importance attributed to the cooperation agreement

Classify firms according to the importance they attach to innovation cooperation activities - mapping of the perceived benefits of cooperation for the innovation process

Method

Distinguish firms according to their evaluation of cooperation partners in the development of innovation activities

Apply a probit model with sample selection to account for the firm's decision to cooperate (or not)

Data – CIS III

1. Cooperation in Innovation Activities: The Importance of Partners

Results

Value on cooperation partners in the innovation process: firms from high-tech industries, with higher levels of absorptive capacity and of innovation investment, who give importance to incoming spillovers management, and who cooperate with firms from the same group or with suppliers

Stress the value of the firm's internal capability to capture the benefits obtained through the decision to cooperate

Contribution

The variable under analysis is a measure of firms' benefits concerning the innovation cooperation activities and not just the decision to cooperate or not

2. Interdependence and Spillovers: Is Firm Performance Affected by Others' Innovation Activities?

with

Pedro Faria

(submitted)

2. Interdependence and Spillovers: Is Firm Performance Affected by Others' Innovation Activities?

R&D and innovation have characteristics of public goods

The investments and results achieved by one agent can produce knowledge that is available to other actors almost freely (Nadiri 1993)

This process is possible when the reproduction costs for information are low, allowing the diffusion of knowledge to actors that did not invest in its production (Crespi 2004)

Knowledge production processes have two different kinds of effects

One direct, to the firm that is enrolled in the knowledge production activity

One indirect, to other firms that benefit from the public availability of some of the knowledge (Adams and Jaffe, 1996)

2. Interdependence and Spillovers: Is Firm Performance Affected by Others' Innovation Activities?

Objective

Detect the existence of knowledge spillovers from innovation activities on the performance of innovative and non-innovative firms

Method

A production function is estimated, in which the percentage of innovative firms by industry, sector and size are measures of possible spillovers

The inclusion of firm innovation amongst the determinants of productivity raises a possible endogeneity problem

The solution adopted was to implement an instrumental variable (IV) approach (instrument: engagement in intellectual property protection)

Data

CIS III Portugal

Production function OLS and IV estimations

	(1)	(2)	(3)	(4)	(5)	(6)
	Value Added (log)					
	OLS			IV		
Engagement in innovation activities (dummy)	0.198** (0.099)	0.212** (0.099)	0.206** (0.098)	0.523* (0.306)	0.528* (0.306)	0.520* (0.306)
Capital (log)	0.175*** (0.051)	0.177*** (0.050)	0.177*** (0.051)	0.160*** (0.053)	0.161*** (0.052)	0.162*** (0.053)
no. of employees with higher education (log)	0.256*** (0.062)	0.257*** (0.063)	0.253*** (0.063)	0.234*** (0.064)	0.236*** (0.065)	0.232*** (0.064)
no. of employees without higher education (log)	0.543*** (0.084)	0.563*** (0.087)	0.548*** (0.080)	0.552*** (0.084)	0.569*** (0.087)	0.554*** (0.080)
Part of a National Group (dummy)	0.309** (0.128)	0.310** (0.128)	0.312** (0.128)	0.300** (0.126)	0.301** (0.127)	0.303** (0.126)
Part of a Multinational Group (dummy)	0.373** (0.158)	0.371** (0.158)	0.372** (0.158)	0.404** (0.159)	0.401** (0.159)	0.402** (0.159)
Exports Dummy (> 10%)	0.142 (0.102)	0.154 (0.102)	0.150 (0.102)	0.152 (0.101)	0.162 (0.101)	0.158 (0.101)
% innovative firms by industry, region and size	0.012*** (0.004)			0.010** (0.005)		
% product innovative firms by industry, region and size	0.010* (0.006)			0.009 (0.006)		
% process innovative firms by industry, region and size				0.012*** (0.004)		
Industry Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Region Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1396	1396	1396	1396	1396	1396
Adjusted R-squared	0.48	0.48	0.48	0.47	0.47	0.47
F statistic	56.94	56.88	56.83	57.36	57.31	57.22

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

2. Interdependence and Spillovers: Is Firm Performance Affected by Others' Innovation Activities?

Results

Firms that invest in innovation activities achieve significant returns in terms of economic performance

Firm's innovation can also produce knowledge that positively affects the performance of other firms, whether or not they are involved in innovation activities

Contribution

Existence of knowledge spillovers that spring from non-radical and non-science-based innovation activities of firms and that have an impact on the performance of surrounding firms

3. Organizational Change and Firm Performance: Product and Process Flexibility

with

Pedro Faria

Presented at the

Coinvest & Cost

Workshop on Firm-level Micro Data

Amsterdam

Motivation

Intangible investment

Increase in product and process flexibility (Athey and Schmutzler, 1995)

Managerial practices and firm performance (Bloom and Van Reenen, 2007)

Portugal

CIS: “Other important strategic and organizational changes”

- Implementation of new corporate strategies
- Implementation of advanced management techniques
- Implementation of changed organizational structures
- Changing enterprise's marketing concepts/strategies
- (Significant changes in aesthetic appearance of at least one product)

3. Organizational Change and Firm Performance: Product and Process Flexibility

Does the firm perception of the innovation effects change with the engagement in organizational change?

Product and Process flexibility: The decision to invest in process and/or product innovation is affected by the organization change (and R&D investment)?

Estimate the relationship between several measures of firm performance and org change – directly or through the other investments?

3. Organizational Change and Firm Performance: Product and Process Flexibility

Results

There is a relationship between organizational change and

Product and process flexibility – increases the probability of simultaneously engage in product and process innovation

Firm performance – positive relationship with sales and sales growth

Contribution

Investments in internal capabilities and flexibility are important for the implementation of more diversified innovation strategies

Organisational capital amplifies the advantages obtained with innovation

4. The Value of Training

with

Susana Neves,

INE – Statistics Portugal

Presented at the Coinvest Lisbon conference

Training

Intermediate expenditure or investment?
Affects productivity? Reflected in wages?

Objective: use the recent Adult Education Survey (AES) to measure the relationship between training and wages

Adult participation in formal and non-formal education and training and informal activities

Results

Training (and education) – associated with higher wages

The benefits of investing in training spread for several periods (higher marginal product) – otherwise, no relationship with wages

given the estimates for a sample of the population of workers

Investment

More work – able to improve the estimates with the information at hand?

5. Establishment of Higher Education Institutions and New Firm Entry

With

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Scope and Objectives

What is the real impact of new universities on entrepreneurial activity in regions?

Assess the effect of the establishment of a new higher education institution in a region on the subsequent levels of new firm entry in that region

H: The creation of a new higher education institution in a region has a positive effect on subsequent levels of new firm entry in knowledge based sectors in that region

5. Establishment of Higher Education Institutions and New Firm Entry



Universities and location

- Firms' location decisions should be influenced by access to the sources of spillovers, including specialized human capital, R&D institutions and scientists
(Baptista and Swann, 1999; Stahlecker and Koschatzky, 2004; Audretsch et al., 2005; Karlsson and Nystrom, 2006)
- Complex technological knowledge contains a strong element of tacitness meaning its flow and diffusion is constrained by the geographic proximity
- Firms can cultivate relationships with universities, participating in research consortia and partnering with academics who do related scientific work
(Audretsch and Stephan, 1996; Zucker et al., 1998; Zucker et al., 2002; Audretsch and Feldman, 2004; Fritsch and Falck, 2007)

5. Establishment of Higher Education Institutions and New Firm Entry

Universities as knowledge sources

- Commercialization of knowledge depends on knowledge generation
- A low level of new business formation in knowledge dependent sectors should be associated with a lack of knowledge-generating sources (Cohen and Levinthal, 1989)
- Evidence of spillover effects from proximity to universities on firms' innovative activities (Jaffe, 1989; Acs et al., 1992)
- Evidence of local spatial externalities between university research and high technology innovative activity (Anselin et al., 1997)
- Strong evidence in favour of a growth effect of geographical clusters influenced by active research universities for the US (Feldman, 2000)

Data



Quadros de Pessoa

longitudinal matched employer-employee database covering the Portuguese economy from 1982, comprising detailed linked information on private firms, including the location of individual establishments, and workers' and business owners' characteristics

Start-ups entering in 1992-2003, which were assigned to the 275 Portuguese continental municipalities

OECD classification of knowledge based enterprise (KBE) sectors: high and medium-high technology manufacturing; post and communications; finance, insurance and business services (OECD, 2002)

Data on the 275 Portuguese continental municipalities collected from the National Institute of Statistics

Information on universities collected from the Portuguese Ministry for Science and Technology and Higher Education

Methodology

Econometric Estimation: Estimation with the propensity score matching estimator

Establishment of new universities = an exogenous shock (natural experiment?)

Treatment: creation of a new institution in 1993 and 1994

Treatment variable has the value 1 if there was an increase in the no. higher education institutions in the region; 0 otherwise

No. treated municipalities = 17

Control groups:

A) regions where no. institutions is 0 and remains 0 during the entire time

No. municipalities = 204

B) regions where the no. institutions is $\neq 0$ and remains constant.

No. municipalities = 17

Matching: made with pre-treatment characteristics ($t-2$)

5. Establishment of Higher Education Institutions and New Firm Entry



Effect of a new higher education institution on firm entry in regions – ATT Estimation with the stratification matching method

	<i>No. Treated</i>	<i>No. Control</i>	<i>ATT</i>	<i>Std. Err.</i>
Difference in the share of new firms between $t = 3$ and $t = -2$				
Control group A+B	15	441	-2.176	1.448
Control group A	13	406	-2.806	2.125
Control group B	13	37	0.087	2.185
Difference in the share of new firms between $t = 5$ and $t = -2$				
Control group A+B	15	441	0.115	1.799
Control group A	13	406	-1.247	1.995
Control group B	13	37	6.511*	2.036
Difference in the share of new firms between $t = 7$ and $t = -2$				
Control group A+B	15	441	-1.489	2.146
Control group A	13	406	-2.712	2.593
Control group B	13	37	2.436	2.319

ATT - Average Treatment effect on the Treated

Group A = Regions with no. institutions equal to zero

Group B = Regions with no. institutions constant and different from zero

Effect of a new higher education institution on the entry of knowledge based firms in regions – ATT Estimation with the stratification matching method

	<i>No. Treated</i>	<i>No. Control</i>	<i>ATT</i>	<i>Std. Err.</i>
Difference in the share of new firms between $t = 3$ and $t = -2$				
Control group A+B	15	441	23.862*	13.069
Control group A	13	406	30.338*	17.132
Control group B	15	35	166.945	120.570
Difference in the share of new firms between $t = 5$ and $t = -2$				
Control group A+B	15	441	26.739**	13.286
Control group A	13	406	33.068**	15.715
Control group B	15	35	172.001	118.146
Difference in the share of new firms between $t = 7$ and $t = -2$				
Control group A+B	15	441	27.014*	16.047
Control group A	13	406	---	---
Control group B	13	37	321.946	225.462

ATT - Average Treatment effect on the Treated

Group A = Regions with no. institutions equal to zero

Group B = Regions with no. institutions constant and different from zero

5. Establishment of Higher Education Institutions and New Firm Entry

Results

- Increase of the number of Universities/higher education institutions has a positive effect on new firm entry in a region in KBE
- Effect is stronger in regions where there was no institutions and when compared with regions where there is no institution
- Universities enhance regional development - less favored regions would benefit from establishment of a new institution
- They can benefit not only from knowledge spillovers from the institutions, but also from the setting of more educated people
- Local educational facilities have to develop effort in technology transfer and entrepreneurship programs, in order to take advantage of the concentration of human capital existent in the region

6. The value of organizational capital: Can it be measured?

Typically there is no information on investment on organizational capital

- *Translate firms' documentation in performance tracking, target time horizon, human-capital management, and the rewarding of high performance, etc., into dollar values*

Firm balance sheet (and CIS)

Explore the longitudinal nature of the firm survey to isolate the value of organizational capital

Compare the estimates with the ones obtained with the national accounts perspective, both at the national level and across industries

6. The value of organizational capital: Can it be measured?

Prescott and Visscher (1980) - Information as an asset to the firm - organization capital

- The role of adjustment costs in constraining the firm's growth rate
- Examples of organization capital are the knowledge about the firm's personnel and firm-specific human capital possessed by the firm's employees

Milgrom and Roberts (1990) –

- Role of non-convexities and complementarities that leads to need for coordination between functions inside the firm (e.g., production and marketing) and jointly reinforcing organizational changes
- In an setting of increasing flexibility of manufacturing leads to low vertical integration (or low formal vertical governance) and close links with suppliers and subcontractors
- Examples - AT&T and Ford use of multidepartment teams or setting wages according to skills instead of job assignments (e.g. Motorola)

Radner (1993) - Information processing by managers - the decision-making part of the firm

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The End

Thank you