

*Ceris-Cnr, W.P. N° 3/2005*

# **Analysis of the resource concentration on size and research performance. The case of Italian National Research Council over the period 2000-2004**

**Mario Coccia, Secondo Rolfo**

*National Research Council of Italy  
Ceris-Cnr - Institute for Economic Research on Firms and Growth  
Via Real Collegio, 30 – 10024 Moncalieri (To) – Italy  
email: [m.coccia@ceris.cnr.it](mailto:m.coccia@ceris.cnr.it)*

**Abstract.** Nowadays the Government of industrialised countries, in presence of reduced public funds, has to manage the public research laboratories to increase the efficiency and research performance, necessary to the competitiveness of firms and of economic systems. The purpose of this paper is to investigate the relationships between size and performance of public research organisations within of the Italian national system of innovation, for the period 2000-2004, which is characterised by two different research policies. The comparative analysis shows that the results can supply useful information to policy makers on the behaviour of these structures. The new research policy based on merger among the research institutes generates higher research performance and scale economies. However some elements suggest to be cautious about this relationship and to further investigate.

**Key words:** Research Laboratories, R&D Performance, Size, Public Research, Research Structure, Research Policy

**JEL Classification:** C10, C20, C30, H10, H41, H50, L30

We wish to thank Diego Margon and Silvana Zelli (Ceris-Cnr) for the research assistance and the participants at 3<sup>rd</sup> International Conference on Management of Innovation and Technology, held at Zhejiang University, Hangzhou (China)-2002, for helpful discussions and suggestions to a preliminary version of this paper. Of course, any errors are our sole responsibility.

WORKING PAPER CERIS-CNR  
Anno 7, N° 3 - 2005  
Autorizzazione del Tribunale di Torino  
N. 2681 del 28 marzo 1977

*Direttore Responsabile*  
Secondo Rolfo

*Direzione e Redazione*  
Ceris-Cnr  
Istituto di Ricerca sull'Impresa e lo Sviluppo

*Sede di Torino*  
Via Real Collegio, 30  
10024 Moncalieri (Torino), Italy  
Tel. +39 011 6824.911  
Fax +39 011 6824.966  
[segreteria@ceris.cnr.it](mailto:segreteria@ceris.cnr.it)  
<http://www.ceris.cnr.it>

*Sezione di Ricerca di Roma*  
Istituzioni e Politiche per la Scienza e la Tecnologia  
Via dei Taurini, 19  
00185 Roma, Italy  
Tel. 06 49937810  
Fax 06 49937884

*Sezione di Ricerca di Milano*  
Dinamica dei Sistemi Economici  
Via Bassini, 15  
20121 Milano, Italy  
tel. 02 23699501  
Fax 02 23699530

*Segreteria di redazione*  
Maria Zittino e Silvana Zelli  
[m.zittino@ceris.cnr.it](mailto:m.zittino@ceris.cnr.it)

*Distribuzione*  
Spedizione gratuita

*Fotocomposizione e impaginazione*  
In proprio

*Stampa*  
In proprio

Finito di stampare nel mese di July 2005

**Copyright © 2005 by Ceris-Cnr**

All rights reserved. Parts of this paper may be reproduced with the permission of the author(s) and quoting the source.  
Tutti i diritti riservati. Parti di questo articolo possono essere riprodotte previa autorizzazione citando la fonte.

## INDEX

<b>Introduction .....</b>	<b>5</b>
<b>1. Theoretical framework.....</b>	<b>5</b>
<b>2. Comparative policy analysis of the Italian National Research Council Laboratories (Cnr): Data and Methodology.....</b>	<b>6</b>
<b>3. Results.....</b>	<b>7</b>
3.1. <i>Size- research performance before the merger (2000-period) .....</i>	<i>7</i>
3.2. <i>Size- research performance after the merger among the institutes (2004-period) .....</i>	<i>8</i>
3.3. <i>T-Test to countercheck the results .....</i>	<i>10</i>
<b>4. Concluding remarks .....</b>	<b>11</b>
<b>References .....</b>	<b>13</b>
<b>Working Paper Series (2005-1993) .....</b>	<b>I-VI</b>

## Introduction

The sector of public research is made up, according to Senker (2001), of those institutions that deal with civil research and benefit mainly from public financing. These organisations are of public property and their chief purpose is to divulge the results of their researches (in other words, military research is excluded). Etzkowitz and Leydesdorff (2000) claim, referring to their own theory of the triple helix, that nowadays universities and public research bodies play a fundamental role in the production of scientific knowledge (such as inventions), necessary to the development of a competitive economic system in a society based more and more on knowledge. Studies about these institutions in many industrialised countries, among which Italy, the United Kingdom, and so on, show a growing interest in evaluating the effects of size on research performance. These studies can mirror the interest shown by the Government in restructuring this sector through suitable research policy (Tassey 2001) to assign clear objectives to public research structure so that it is managed in an effective and efficient way in light of reduced public funds. This situation has pushed many countries, for instance the United Kingdom (Senker 2001) and Italy (Coccia and Rolfo 2002), to increase the size of these structures, reducing the activities in certain scientific fields and at the same time expanding them in other fields. Throughout this process of transformation, the State, which plays the role of the principal according to the terminology used in theory of principal-agent, pursues objectives that are often in conflict with those of research bodies (i.e. agents), especially due to a defective knowledge of the information activities of the latter. Within such a scenario, the purpose of this paper is to investigate the relationship between size and performance of the Italian public research laboratories, making a comparison of two different research policies referred to 2000 and 2004, i.e. before and after a structural reform of the Italian public research system. This research can supply useful information on the behaviour of these structures over a period characterised by a new research policy focused on the achievement of a critical mass of

the research bodies in order to improve the efficiency of the national system of innovation (David *et al.* 1999). In relation to this, section 2 describes the theoretical framework, section 3 develops the methodology of the analysis, the data, and their sources while section 4 presents and the main results drawn from the comparative policy analysis of the Italian situation. The concluding remarks include a discussion and some research policy implications.

## 1. Theoretical framework

The need to improve the performance of the research bodies has generated new fields of study that evaluate research both at a macroeconomic level and at the level of research laboratories (Coccia 2001; 2004), of research teams and researchers (Sirilli 2000; Broadus 1987; Garfield 1979; Luwel *et al.* 1999; Pritchard 1969; Kerssens-van Drongelen and Bilderbeek 1999).

Main studies and reviews about the effects of size on research performance have been carried out by Martin *et al.* (1993), Von Tuzelmann *et al.* (2003), and Johnes and Johnes (1993). Some researches focused the returns from research with respect to the scale of production. The theory of increasing returns in scientific research was at the basis of the public policies applied in the United Kingdom towards the end of the seventies, which aimed to concentrate research resources in large laboratories (Johnston 1993; 1995). The remarks in favour of the existence of economies of scale (internal) in scientific production, are: a) critical mass (size) below which the researchers cannot activate significant cooperative relations; b) inseparable effects of some inputs; c) administrative activity characterised by fixed costs with respect to the volume of activity; d) the research projects produce differing results over time and the larger research bodies can invest in major projects.

On the basis of these facts, it would be desirable for resources to be transferred from smaller laboratories to larger ones (through mergers and acquisitions), characterised by higher production rates that would increase the production of the entire economic system. The theory of increasing returns however is not supported by econometrics research. The studies of Griliches and

Adams (1998) have shown that scientific production in the principal universities shows a linear relationship between the output and the size of the university in terms of budget (Hoare 1995). Narin and Hamilton (1996) did not find significant support for the theory of increasing returns for scientific research, while Johnston (1993) in his studies did not find significant economies of scale.

Other studies on the performance of research teams show that some support an increase, others a reduction, and yet others a combination of the two (Hare and Wyatt 1988). Hicks and Skea (1989) analysed the relationship between size and output suggest that although the larger departments are more productive, this dependence is extremely weak and can be easily explained by characteristics not linked to size.

Recently Bonaccorsi and Daraio (2002) state that the existence of increasing returns is one of the theoretical pillars of public policies and if economies of scale exist, the minimum efficient scale (MES) is positioned at relatively low levels, measured by the sizes of the research team rather than that of the major institutions, as the laboratories or the institutes. In any case the lack of definitive response to the main answer concerning the size of the public research labs represents not only a problem from the managerial point of view, but essentially a serious limit at the policy level (Crow and Bozeman 1998).

## **2. Comparative policy analysis of the Italian National Research Council Laboratories (Cnr): Data and Methodology**

Many European countries have a secondary network of public research (Charles and Howells 1996), operating alongside the universities, and represented by both bodies specialised in scientific disciplines or applications, and generalist bodies which cover the entire fields of scientific and humanistic research. The latter, almost entirely founded in the first half of the last century, are generally divided into institutes and laboratories of varying size and location. Two patterns can be highlighted in Europe: the German model represented by great laboratories

(100-200 permanent staff) belonging to famous research organisations as the Max Planck Society or the Fraunhofer Society or the more recent Leibniz and Helmholtz Societies. At the contrary in France are prevailing the small mixed units sets up by the French National Research Council (CNRS) in the universities. Until the end of the nineties Italy mainly pursued for its main research organisation, the National Research Council (Cnr) founded in 1923 on the model of the Kaiser Wilhelm Society (now Max Planck), a mixed solution represented by research institutes with their own payroll employees and centres set up in the universities and staffed by Cnr and university employees. At the end of the nineties the financial cuts to the public research budgets, of the Governments caused a substantial block in staff turnover in the existing Cnr labs (around 300 institutes and centres) with a decrease of their size and an increase of the average age of the employees. The seriousness of the situation forced in 1999 the Italian government to totally reorganise the institution, also dealing with the question of size. The objective was clear and the process of reorganisation (started in 2001), amongst the various changes, has led to the closure of 32 laboratories and the mergers of the remaining 278 scientific bodies in 108 new institutes.

The aim of this paper is to check whether public research laboratories with the medium-large size have higher levels of research performance than the smaller ones, making a comparative policy analysis before the merger among the Italian Cnr institutes (2000), and after the merger (2004 period). The analysis is carried out with evaluations of the results using two research methods: regression and inference analysis. All data analyzed are from the official documents of the Italian National Research Council: Report, 2000 and 2004 period. The analysis has been carried out using as a proxy of the size the number of employees operating in the laboratories, while the numbers of the domestic and international publications (outputs) of the research laboratories are a proxy of the research performance:

$$\text{NUMBER OF PUBLICATIONS} = \text{NUMBER OF INTERNATIONAL PUBLICATIONS} + \text{NUMBER OF PUBLICATION WITH DOMESTIC DIFFUSION}$$

The first step was a screening of the data to check the normality of the distributions, the presence of outliers and anomalous values, necessary conditions for proceeding with the inference, correlation and regression analysis. After that, we test the cause-effect relationship among size and research performance by the formulation of econometric models of regression which study the intensity and the linear relationship existing between the:

$Y$  = dependent variable = research performance  
= numbers of publications

and

$x$  = explanatory variable = indicator of size  
= number of employees

Therefore the regression model is the following (Spanos 1986):  $y = \alpha + \beta x + \varepsilon$

The results with the regression analysis have been checked by the inference on the arithmetic mean. We calculate the mean of publications (performances) in 2000 (before the merger) and in 2004 (after the merger among the institutes). After that, using the T-test, it is possible to verify the null hypothesis of equality between the arithmetic mean of the two years at probability level  $p=0.99$ .

The complexity and abundance of calculations, due to the high number of variables, has been overcome thanks to the application of the SPSS® statistical package, which has provided all the results described and analysed in the following sections.

### 3. Results

#### 3.1. Size- research performance before the merger (2000-period)

The organisational structure of the Cnr in 2000 was based on 310 institutes and centres of small size similar in terms of size and organisation to the France CNRS. The research structure was divided into 15 scientific fields: 1) Mathematics; 2) Physics; 3) Chemistry; 4) Medicine and biology; 5) Geology and mining; 6) Agriculture; 7) Engineering and architecture; 8) History, philosophy and philology; 9) Law and politics; 10) Economics, sociology and statistics; 11) Innovation and technology; 12) Information technology; 13) Environment and habitat; 14) Biotechnologies and molecular biology; 15) Cultural heritage.

The 310 Cnr scientific laboratories had an arithmetic mean of employees of 19.84 per research institute, and arithmetic mean of number of publications of 31.93 per structure. The variables analysed showed distribution normal. The dependent variable is the research performance ( $Y$ ), measured by the number of publications, of the scientific laboratories, while the explanatory variable is the number of payroll researchers, which are a proxy of the size. The results are presented in the following tables (1-4).

**Table 1: Descriptive Statistics (2000)**

	Mean	Std. Deviation	N.
Number of publications	31.926	26.059	310
Number of employees	19.835	19.357	310

**Table 2: Correlations (2000)**

		Number of publications	Number of employees
Pearson Correlation	Number of publications	1.000	0.514
	Number of employees	0.514	1.000
N	Number of publications	310	310
	Number of employees	310	310

**Table 3: Model Summary <sup>a,b</sup> (2000)**

Model	Variables		R	R Square	Adjusted R Square	Std. Error of the Estimate
	Entered	Removed				
1	Number of employees	<sup>c,d</sup>	0.514	0.264	0.262	22.386

- a. Dependent Variable: Number of publications
- b. Method: Enter
- c. Independent Variables: (Constant), Number of employees
- d. All requested variables entered

The equation estimated in the model 1 is the following:

$$\hat{Y} = 18.194 + 0.692 (\text{number of employees})$$

**Table 4: Coefficients <sup>a</sup> (2000)**

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	95% Confidence Interval For B		Collinearity Statistics
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance
		1	Constant	18.194			1.822		9.986
	Number of employees	0.692	0.066	0.514	10.523	0.000	0.563	0.822	1.000

- a. Dependent Variable: Number of publications

### 3.2. Size- research performance after the merger among the institutes (2004-period)

The new organisation structure of Italian Cnr (since 2002), after a research policy of concentration of institutes, is based on 108 institutes of bigger size which have 191 decentralised units. They operate in five scientific fields: 1) Basic Sciences with 28 new institutes operating in the fields of mathematics, physics and chemistry; 2) Life Sciences, 33 new laboratories in the fields of medicine and biology, agriculture and molecular biology; 3) earth and environmental sciences, concerning geology, environment and habitat for a total of 10 labs; 4) Social and human sciences with 19 laboratories in the fields of history, philosophy and philology; juridical and political sciences; economics, sociology and statistics; cultural heritage; 5) The field of engi-

neering and information-communication technology sciences is formed of 18 laboratories.

Therefore, the new Italian research policy seems to be focused on a organisational structure similar to the German model, but with a spread presence on the Italian territory (108 institutes and 191 units) that is unknown in the German public research organisations. The new Italian organisation is characterised by research groups physically dispersed, but now integrated within bigger laboratories than the old structures in 2000.

The 108 structures have a arithmetic mean of employees of 56.86 per research institute, and arithmetic mean of number of publications of 87.22 per structure. The variables analysed showed distribution normal. The results of single variable statistics and relationship between variables are presented in the following tables (5-8).

**Table 5: Descriptive Statistics (2004)**

	<i>Mean</i>	<i>Std. Deviation</i>	<i>N.</i>
Number of publications	87.222	58.929	108
Number of employees	56.861	33.791	108

**Table 6: Correlations (2004)**

		<i>Number of pub- lications</i>	<i>Number of em- ployees</i>
Pearson Correlation	Number of publications	1.000	0.659
	Number of employees	0.659	1.000
N	Number of publications	108	108
	Number of employees	108	108

**Table 7: Model Summary <sup>a,b</sup> (2004)**

<i>Model</i>	<i>Variables</i>		<i>R</i>	<i>R Square</i>	<i>Adjusted R Square</i>	<i>Std. Error of the Estimate</i>
	<i>Entered</i>	<i>Removed</i>				
1	Number of employees <sub>c,d</sub>		0.659	0.434	0.429	44.549

- a. Dependent Variable: Number of publications
- b. Method: Enter
- c. Independent Variables: (Constant), Number of employees
- d. All requested variables entered

The equation estimated in the model 1 is:

$$\hat{Y} = 21.908 + 1.149 (\text{number of employees})$$

The relationship suggests that each additional employee add about 1.149 to the number of publications

**Table 8: Coefficients <sup>a</sup> (2004)**

<i>Model</i>		<i>Unstandardized Coefficients</i>		<i>Standardized Coefficients</i>	<i>T</i>	<i>Sig.</i>	<i>95% Confidence Interval For B</i>		<i>Collinearity Statistics</i>
		<i>B</i>	<i>Std. Error</i>	<i>Beta</i>			<i>Lower Bound</i>	<i>Upper Bound</i>	<i>Tolerance</i>
1	Constant	21.908	8.420		2.602	0.011	5.215	38.601	
	Number of employees	1.149	0.127	0.659	9.013	0.000	0.896	1.401	1.000

- a. Dependent Variable: Number of publications



3.3. *T-Test to countercheck the results*

The variable number of publications in 2000 and 2004 has normal distribution that makes it possible to carry out the inference correctly. The idea in this section is to evaluate the performance of the research bodies in relation to their size from a different point of view. In particular we would like to check, at the probability level  $p=0.99$ , the null hypothesis that the arithmetic mean of the research performance, measured by number of publications, in the period 2000 is equal to those of 2004 period, against the alter-

native hypothesis that the arithmetic mean of the number of publications, in the 2004 is higher than the 2000 due to Italian research policy based on the concentration among the institutes. In symbols  $H_0 : \bar{x}_{2000} = \bar{x}_{2004}$ . The most feasible alternative hypothesis is that research performance increased due to the merger operations  $H_0 : \bar{x}_{2000} < \bar{x}_{2004}$ . T-test is conducted on the left-hand tail of the  $t$ -distribution. More precisely the rejection region will be that  $t$  assumes values above  $t_{\infty,0.01}$ ;

The results are shown in the following tables (9-10).

**Table 9: One-sample Statistics (T-Test)**

	<i>N.</i>	<i>Mean</i>	<i>Std. Deviation</i>	<i>Std. Error Mean</i>
Number of publications 2000	310	31.926	26.059	1.480
Number of publications 2004	108	87.222	58.929	5.671

**Table 10: One-sample Statistics (T-Test)**

	<i>Test Value = 0</i>					
	<i>t</i>	<i>df</i>	<i>Sig. (2-tailed)</i>	<i>Mean Difference</i>	<i>99% Confidence Interval of the Difference</i>	
					<i>Lower</i>	<i>Upper</i>
Number of publications 2000	21.571	309	0.000	31.926	28.090	35.762
Number of publications 2004	15.382	107	0.000	87.222	72.351	102.093

Therefore:

$$t = \frac{31.9258 - 87.2222}{42.4941 \cdot \sqrt{\frac{1}{310} + \frac{1}{108}}} = -11.646$$

The degree of freedoms are:  $n_{2000} + n_{2004} - 2 = 416$ . The theoretical value of

$t_{\infty,0.01} = 2.576$ . The  $t$  calculated is considerably higher than 2.576 and therefore falls within the rejection region. In other words, at the probability level  $p=0.99$ , the research performance of the research institutes in the 2004 period (with larger size) is higher than the research performance of laboratories in 2000 and with smaller size. It is reasonable to think that the difference in research performance between the two years

where the laboratories have a different size can be attributed to a systematic effect of the composition of the scientific fields (structure). Then, the concentration of research labs produces important scale economies.

#### 4. Concluding remarks

This research shows like, within the Italian National Research Council, the comparison of two different statistical methodologies achieves similar results. The policy of concentration among the Italian public research institutes seems to have generated main economies of scales: in fact in 2004 the research performance of the structures is 1.149, approximately double respect to the 2000 period when it was of about 0.692. Therefore, we could conclude that in the public research bodies there is a positive relationship between the increase in the size and the increase in research performance. However this result seems to be in contrast with previous researches, concerning the Cnr, carried out with different methodologies (Coccia and Rolfo 2002a; Bonaccorsi and Daraio 2003).

A main remark is that the real situation of the actual Italian national system of innovation shows as the research performances can be affected by several factors, which are more powerful than the size. The policy of concentration has been carried out only from a formal point of view because the labs have preserved the old location. In fact, although nowadays there are 108 new institutes, these often have several (2-10) decentralised units spread on the territory and far from the headquarter. This situation creates some diseconomies of scale due to the increased costs of co-ordination, with a negative influence on the research performances. Probably only in the long term we could appreciate the positive effects of a growing scientific integration of the different research groups within the new institutes.

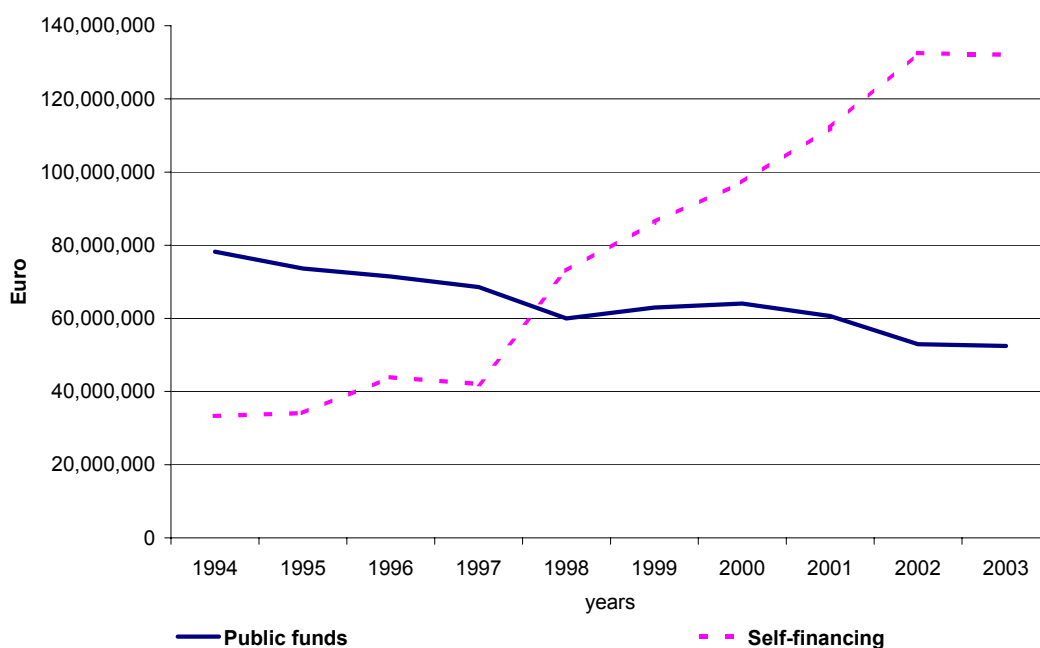
Therefore how can we explain the increased performances of Cnr institutes in 2004? When studying the variations in the performance of an organisation (Ramsden 1994), in relation to the changes in a single factor of the organisational system, it is necessary that the other elements of the system remain unchanged. Otherwise the

variation in performance could be due to these changes, rather than to the variation in the factor we are studying. It is impossible to be certain that other variables are fixed in the dynamic system (as research laboratories) when the size changes, because a variation in size is usually accompanied by variations and changes to the entire organisational system. It is therefore arbitrary to attribute changes in performance merely to changes in size. The scientific production of a research laboratory is a complex process, a combination of factors, of which it is difficult to isolate the action.

There are some elements (connected each other) that can display the increase in the research performances such as: 1) the autonomy of each structure to carry out the scientific research also starting new projects on a contractual base; 2) a process of evaluation that have pushed the Italian researchers within the new 108 institutes to have a different approach towards the environment and the market (Bozeman and Crow 1990) that is now seen as a main financial resource.

These elements, on the managerial side, have generated a new operational attitude of the Institutes that act as quasi-firms "with many characteristics of the business firm, except for the profit motive" (Viale and Etzkowitz 2004); this new behaviour and structure of the institutes have produced, at Macro level, the effect showed in figure 1: an inversion of the trend of the principle financial resources of the research laboratories with an increase of the self-financing.

We can also remark that this positive trend of figure 1 may have negative aspects as already observed by Hare and Wyatt (1992) in the United Kingdom at the end of the seventies when to face a cut of the public financial resources the research and academic institutions moved towards activities capable of capturing funds from the market. This transformed the research institutes into organisations focused on consultancy and applied research, with negative repercussions on basic research and therefore on the long-run development of the country (Callon and Foray 1997). But if these risks at the moment do not appear within the Italian Cnr (as stated by the increase of the publications), at the



**Figure 1: Resources dynamic (market funds-government funds) and strategic behaviour of research laboratories**

contrary it is possible to examine the presence among the Cnr institutes of external and internal diseconomies, such as the co-ordination costs due to the presence of organisational decentralised units (staff missions, duplication of libraries and services, ..). For this reason the Government has issued in 2003 a new law to reform again the Cnr. This rationalisation is based on a grouping process of laboratories and the creation of new co-ordination structures similar to the departments of CNRS in France and the research alliances of the Fraunhofer Society in Germany.

Moreover the public research sector is going through, in all industrialised countries, a rationalisation that, according to Loredo and Mustar (2004), can overcome the institutional differences among universities and public laboratories and converge on some typologies of research units characterised by common “activity profiles” with “only a limited relationship to their institutional affiliations” and their countries. This process of creation of the triple helix is strictly linked to the emergence of polyvalent roles within the universities and the research organisations with a variety of models around the world (Viale and Etzkowitz 2004). In this evolu-

tion while the Italian universities act as uncertain and late follower, the Cnr has been rudely plunged by the government in a strong challenge: accomplish a large range of missions from basic to applied research, from high education to technology transfer in a context of reducing public budget.

This is why rather than the problem of optimal size of the laboratories, it would be more correct to investigate the optimum combination of inputs, of which scientific production is the principal output. In fact, when we say that large size generates internal and external economies, we suggest that the organisational structure, which is intrinsic to large size, brings economic advantages. Observing statistics from the economic system it is possible to state that while the number of large firms has grown, there are numerous medium and small firms that exist and prosper. The same is true in the research fields where a wide number of small and medium laboratories exist, and are efficient within some fields such as economics, psychology, and so forth. This proves that every size has its advantages and it is improbable that a particular size – whether large or small – will overtake all others.

The scale economies are valid to a certain point, if we admit that it is possible to isolate with certainty the influence of size on costs and therefore to be able to study the behaviour of costs in relation to the variation in size. Although large sizes may be more economical in some circumstances, there are certainly limits above which size becomes a synonym for inefficiency with internal and external diseconomies of scale. In fact the cost of some Italian institutes begin to increase, due to cost of co-ordination as already seen, and their large size can acquire the characteristic of administrative encumbrance known as "red tape" (Bozeman and Crow 1989; Gornitzka *et al.* 1998). In any case there is space for further research to investigate the influence of different factors on size and research performance, such as the autonomy of the institutes, the psychological stimulus of the researchers to reduction of the public funds and the new cultural approach to the market which characterise the laboratories as quasi-firms. Research is widely open.

## References

- Bonaccorsi, A. and Daraio, C., 2002, The organization of science: size, agglomeration and age effects in scientific productivity SPRU NPRNNet Conference, Rethinking Science Policy.
- Bonaccorsi, A. and Daraio, C., 2003, "Struttura per età, effetti di scala, dinamica della crescita e produttività scientifica. Un'analisi sugli istituti del Cnr", in A. Bonaccorsi (ed.), *Il sistema della ricerca pubblica in Italia*, Milan, F. Angeli.
- Bozeman, B. and Crow, M., 1990, "The environment of US R&D laboratories: political and market influences", in *Policy Science*, n. 23, pp. 23-56.
- Bozeman, B. and Crow, M., 1989, "Bureaucratization in the laboratory", in *Research and technology management*, vol. 32, n. 5, pp. 30-32.
- Broadus, R.N., 1987, "Toward a definition of bibliometrics", in *Scientometrics*, n. 12, pp. 373-377.
- Callon, M. and Foray, D., 1997, "Nouvelle économie de la science ou socio-économie de la recherche scientifique?", in *Revue d'Economie Industrielle*, n. 79, pp. 13-32.
- Charles, D. and Howells, J., 1996, "Technology transfer in Europe", in *Belhaven Press*, pp. 1-10.
- Coccia, M., 2001, "A basic model for evaluating R&D performance: theory and application in Italy", in *R&D Management*, vol. 31, n. 4, pp. 453-464.
- Coccia, M., 2004, "Spatial Metrics of the Technological Transfer: Analysis and Strategic Management" in *Technology Analysis and Strategic Management*, Vol. 16, n. 1, pp. 31-51.
- Coccia, M. and Rolfo, S., 2002, "Technology transfer analysis in the Italian National Research Council", in *Technovation*, n. 22, pp. 291-299.
- Coccia, M. and Rolfo, S., 2002a, "Size of research labs and performance: an analysis of the Italian national research council" in proceedings 3<sup>rd</sup> International Conference on Management of Innovation and Technology, Zhejiang University, Hangzhou (China), session Global of R&D, E-Commerce, innovation management in cyber-economy.
- Crow, M. and Bozeman, B., 1998, *Limited by design. R&D Laboratories in the U.S. National Innovation System*, New York, Columbia University Press.
- David, P., Foray, D. and Steinmueller, W.E., 1999, "The research network and the new economics of science: from metaphors to organizational behaviours", in A. Gambardella and F. Malerba (eds.), *The Organization of Economic Innovation in Europe*, Cambridge, Cambridge University Press.
- Etzkowitz, H. and Leydesdorff, L., 2000, "The dynamics of innovation: from National Systems and "Mode 2" to a Triple Helix of university-industry-government relations", in *Research Policy*, 29, pp. 109-123.
- Garfield, E., 1979, *Citation Indexing – its theory and applications in science, technology and Humanities*, New York, Wiley.
- Gornitzka Å., Kyvik S. and Larsen, I. M., 1998, "The bureaucratization of universities", in *Minerva*, vol. 36, pp. 21-47.
- Griliches, Z. and Adams, J., 1998, "Research

- productivity in a system of universities”, in *Annales d'économie et de statistique*, n. 49/50, pp. 127-161.
- Hare, P.G. and Wyatt, G.J., 1988, “Modelling the determinant of research output in British universities”, in *Research Policy*, n. 17, pp. 315-28.
- Hare, P.G. and Wyatt, G.J., 1992, “Economics of academic research and its implications for higher education”, in *Oxford Review of Economic Policy*, vol. 8, n. 2, pp. 48-66.
- Hicks, D. and Skea, J.E.F., 1989, “Is gig really better?”, in *Physics World*, n. 2, pp. 31-34.
- Hoare, A. G., 1995, “Scale economies in academic excellence: an explanatory analysis of the United Kingdom’s 1992 research exercise”, in *Higher Education*, vol. 29, pp. 241-260.
- Johnes, G. and Johnes, J., 1993, “Measuring the research performance of UK economics departments: an application of Data Envelopment Analysis”, in *Oxford Economic Paper*, vol. 45, n. 2, pp. 332-347.
- Johnston, R., 1993, “Effects of resource concentration on research performance”, in *Higher Education*, vol. 28, n. 1, pp. 25-37
- Johnston, R., 1995, “Research impact quantification”, in *Scientometrics*, n. 34, pp. 415-426.
- Kerssens-van Drongelen I. C. and Bilderbeek, J., 1999, “R&D performance measurements: more than choosing a set of metrics” in *R&D Management*, vol. 29, n. 1, pp. 35-46.
- Laredo, Ph. and Mustar, Ph., 2004, “Public sector research: a growing role in innovation systems”, in *Minerva*, vol. 42, n. 1, pp.11-27.
- Luwel, M., Noyons, C.M. and Moed, F., 1999, “Bibliometric assessment of research performance in Flanders: policy background and implications”, in *R&D Management*, vol. 29, n. 2, pp. 133-141.
- Martin, B. R., Hicks, D., Ling, E. N. and Skea, J.E.F., 1993, “The effects of size and other factors on research performance of university departments”, in *Report to the Australian centre for innovation and international competitiveness*, SPRU, University of Sussex.
- Narin, F. and Hamilton, K.S., 1996, “Bibliometric performance measures”, in *Scientometric*, n. 36, pp. 293-310.
- Pritchard, A., 1969, “Statistical bibliography or bibliometrics?”, in *Journal of Documentation*, n. 25, pp. 358-359.
- Ramsden, P., 1994, “Describing and explaining research productivity”, in *Higher Education*, n. 28, pp. 207-226.
- Senker, J., 2001, “Changing organisation of public sector research in Europe- implications for benchmarking human resources in RTD”, *Paper prepared for Human resources in RTD session of The contribution of European socio-economic research to the benchmarking of RTD policies in Europe*, Conference, Brussels, March 15-16.
- Sirilli, G., 2000, “La misurazione della ricerca: metodi ed indicatori”, in P. Garonna and S. Iammarino (eds.), *Economia della ricerca*, Bologna, Il Mulino.
- Spanos, A., 1986, *Statistical foundations of econometric modelling*, Cambridge University Press.
- SPSS inc. SPSS 8.0 for Windows.
- Tassey, G., 2001, “R&D Policy Models and Data Needs”, in M.P. Feldman and A.N. Link (eds.), *Innovation Policy in the Knowledge-Based Economy*, Boston, Kluwer.
- Viale, R. and Etzkowitz, H., 2004, “Third academic revolution: polyvalent knowledge; the DNA of the triple helix”, [www.triplehelix5.com](http://www.triplehelix5.com)
- Von Tunzelmann, G.N., Ranga, M., Martin, B. and Geuna, A., 2003, “The effects of Size on Research Performance: A SPRU Review” in *Report prepared for the office on Science and Technology*, Department of Trade and Industry, UK, June.

## WORKING PAPER SERIES (2005-1993)

### 2005

- 1/05 *Gli approcci biologici nell'economia dell'innovazione*, by Mario Coccia
- 2/05 *Sistema informativo sulle strutture operanti nel settore delle biotecnologie in Italia*, by Edoardo Lorenzetti, Francesco Lutman, Mauro Mallone
- 3/05 *Analysis of the Resource Concentration on Size and Research Performance. The Case of Italian National Research Council over the Period 2000-2004*, by Mario Coccia and Secondo Rolfo
- 4/05 *Le risorse pubbliche per la ricerca scientifica e lo sviluppo sperimentale nel 2002*, by Anna Maria Scarda
- 5/05 *La customer satisfaction dell'URP del Cnr. I casi Lazio, Piemonte e Sicilia*, by Gian Franco Corio
- 6/05 *La comunicazione integrata tra uffici per le relazioni con il pubblico della Pubblica Amministrazione*, by Gian Franco Corio
- 7/05 *Un'analisi teorica sul marketing territoriale. Presentazione di un caso studio. Il "consorzio per la tutela dell'Asti"*, by Maria Marenga
- 8/05 *Una proposta di marketing territoriale: una possibile griglia di analisi delle risorse*, by Gian Franco Corio
- 9/05 *Analisi e valutazione delle performance economico-tecnologiche di diversi paesi e situazione italiana*, by Mario Coccia and Mario Taretto
- 10/05 *The patenting regime in the Italian public research system: what motivates public inventors to patent*, by Bianca Poti and Emanuela Reale
- 11/05 *Changing patterns in the steering of the University in Italy: funding rules and doctoral programmes*, by Bianca Poti and Emanuela Reale
- 12/05 *Una "discussione in rete" con Stanley Wilder*, by Carla Basili
- 13/05 *New Tools for the Governance of the Academic Research in Italy: the Role of Research Evaluation*, by Bianca Poti and Emanuela Reale
- 14/05 *Product Differentiation, Industry Concentration and Market Share Turbulence*, by Catherine Matraives, Laura Rondi
- 15/05 *Riforme del Servizio Sanitario Nazionale e dinamica dell'efficienza ospedaliera in Piemonte*, by Chiara Canta, Massimiliano Piacenza, Gilberto Turati
- 16/05 *SERIE SPECIALE IN COLLABORAZIONE CON HERMES: Struttura di costo e rendimenti di scala nelle imprese di trasporto pubblico locale di medie-grandi dimensioni*, by Carlo Cambini, Ivana Paniccia, Massimiliano Piacenza, Davide Vannoni
- 17/05 *Ricerc@.it - Sistema informativo su istituzioni, enti e strutture di ricerca in Italia*, by Edoardo Lorenzetti, Alberto Paparello

### 2004

- 1/04 *Le origini dell'economia dell'innovazione: il contributo di Rae*, by Mario Coccia
- 2/04 *Liberalizzazione e integrazione verticale delle utility elettriche: evidenza empirica da un campione italiano di imprese pubbliche locali*, by Massimiliano Piacenza and Elena Beccio
- 3/04 *Uno studio sull'innovazione nell'industria chimica*, by Anna Ceci, Mario De Marchi, Maurizio Rocchi
- 4/04 *Labour market rigidity and firms' R&D strategies*, by Mario De Marchi and Maurizio Rocchi
- 5/04 *Analisi della tecnologia e approcci alla sua misurazione*, by Mario Coccia
- 6/04 *Analisi delle strutture pubbliche di ricerca scientifica: tassonomia e comportamento strategico*, by Mario Coccia
- 7/04 *Ricerca teorica vs. ricerca applicata. Un'analisi relativa al Cnr*, by Mario Coccia and Secondo Rolfo
- 8/04 *Considerazioni teoriche sulla diffusione delle innovazioni nei distretti industriali: il caso delle ICT*, by Arianna Miglietta
- 9/04 *Le politiche industriali regionali nel Regno Unito*, by Elisa Salvador
- 10/04 *Going public to grow? Evidence from a panel of Italian firms*, by Robert E. Carpenter and L. Rondi
- 11/04 *What Drives Market Prices in the Wine Industry? Estimation of a Hedonic Model for Italian Premium Wine*, by Luigi Benfratello, Massimiliano Piacenza and Stefano Sacchetto
- 12/04 *Brief notes on the policies for science-based firms*, by Mario De Marchi, Maurizio Rocchi
- 13/04 *Countrymetrics e valutazione della performance economica dei paesi: un approccio sistemico*, by Mario Coccia
- 14/04 *Analisi del rischio paese e sistemazione tassonomica*, by Mario Coccia
- 15/04 *Organizing the Offices for Technology Transfer*, by Chiara Franzoni
- 16/04 *Le relazioni tra ricerca pubblica e industria in Italia*, by Secondo Rolfo

- 17/04 *Modelli di analisi e previsione del rischio di insolvenza: una prospettiva delle metodologie applicate*, by Nadia D'Annunzio e Greta Falavigna
- 18/04 *SERIE SPECIALE: Lo stato di salute del sistema industriale piemontese: analisi economico-finanziaria delle imprese piemontesi*, Terzo Rapporto 1999-2002, by Giuseppe Calabrese, Fabrizio Erbetta, Federico Bruno Rolle
- 19/04 *SERIE SPECIALE: Osservatorio sulla dinamica economico-finanziaria delle imprese della filiera del tessile e dell'abbigliamento in Piemonte*, Primo rapporto 1999-2002, by Giuseppe Calabrese, Fabrizio Erbetta, Federico Bruno Rolle
- 20/04 *SERIE SPECIALE: Osservatorio sulla dinamica economico-finanziaria delle imprese della filiera dell'auto in Piemonte*, Secondo Rapporto 1999-2002, by Giuseppe Calabrese, Fabrizio Erbetta, Federico Bruno Rolle

## 2003

- 1/03 *Models for Measuring the Research Performance and Management of the Public Labs*, by Mario Coccia, March
- 2/03 *An Approach to the Measurement of Technological Change Based on the Intensity of Innovation*, by Mario Coccia, April
- 3/03 *Verso una patente europea dell'informazione: il progetto EnIL*, by Carla Basili, June
- 4/03 *Scala della magnitudo innovativa per misurare l'attrazione spaziale del trasferimento tecnologico*, by Mario Coccia, June
- 5/03 *Mappe cognitive per analizzare i processi di creazione e diffusione della conoscenza negli Istituti di ricerca*, by Emanuele Cadario, July
- 6/03 *Il servizio postale: caratteristiche di mercato e possibilità di liberalizzazione*, by Daniela Boetti, July
- 7/03 *Donne-scienza-tecnologia: analisi di un caso di studio*, by Anita Calcatelli, Mario Coccia, Katia Ferraris and Ivana Tagliafico, July
- 8/03 *SERIE SPECIALE. OSSERVATORIO SULLE PICCOLE IMPRESE INNOVATIVE TRIESTE. Imprese innovative in Friuli Venezia Giulia: un esperimento di analisi congiunta*, by Lucia Rotaris, July
- 9/03 *Regional Industrial Policies in Germany*, by Helmut Karl, Antje Möller and Rüdiger Wink, July
- 10/03 *SERIE SPECIALE. OSSERVATORIO SULLE PICCOLE IMPRESE INNOVATIVE TRIESTE. L'innovazione nelle new technology-based firms in Friuli-Venezia Giulia*, by Paola Guerra, October
- 11/03 *SERIE SPECIALE. Lo stato di salute del sistema industriale piemontese: analisi economico-finanziaria delle imprese piemontesi*, Secondo Rapporto 1998-2001, December
- 12/03 *SERIE SPECIALE. Osservatorio sulla dinamica economico-finanziaria delle imprese della meccanica specializzata in Piemonte*, Primo Rapporto 1998-2001, December
- 13/03 *SERIE SPECIALE. Osservatorio sulla dinamica economico-finanziaria delle imprese delle bevande in Piemonte*, Primo Rapporto 1998-2001, December

## 2002

- 1/02 *La valutazione dell'intensità del cambiamento tecnologico: la scala Mercalli per le innovazioni*, by Mario Coccia, January
- 2/02 *SERIE SPECIALE IN COLLABORAZIONE CON HERMES. Regulatory constraints and cost efficiency of the Italian public transit systems: an exploratory stochastic frontier model*, by Massimiliano Piacenza, March
- 3/02 *Aspetti gestionali e analisi dell'efficienza nel settore della distribuzione del gas*, by Giovanni Fraquelli and Fabrizio Erbetta, March
- 4/02 *Dinamica e comportamento spaziale del trasferimento tecnologico*, by Mario Coccia, April
- 5/02 *Dimensione organizzativa e performance della ricerca: l'analisi del Consiglio Nazionale delle Ricerche*, by Mario Coccia and Secondo Rolfo, April
- 6/02 *Analisi di un sistema innovativo regionale e implicazioni di policy nel processo di trasferimento tecnologico*, by Monica Cariola and Mario Coccia, April
- 7/02 *Analisi psico-economica di un'organizzazione scientifica e implicazioni di management: l'Istituto Elettrotecnico Nazionale "G. Ferraris"*, by Mario Coccia and Alessandra Monticone, April
- 8/02 *Firm Diversification in the European Union. New Insights on Return to Core Business and Relatedness*, by Laura Rondi and Davide Vannoni, May
- 9/02 *Le nuove tecnologie di informazione e comunicazione nelle PMI: un'analisi sulla diffusione dei siti internet nel distretto di Biella*, by Simona Salinari, June
- 10/02 *La valutazione della soddisfazione di operatori di aziende sanitarie*, by Gian Franco Corio, November
- 11/02 *Analisi del processo innovativo nelle PMI italiane*, by Giuseppe Calabrese, Mario Coccia and Secondo Rolfo, November

- 12/02 *Metrics della Performance dei laboratori pubblici di ricerca e comportamento strategico*, by Mario Coccia, September
- 13/02 *Technometrics basata sull'impatto economico del cambiamento tecnologico*, by Mario Coccia, November

## 2001

- 1/01 *Competitività e divari di efficienza nell'industria italiana*, by Giovanni Fraquelli, Piercarlo Frigero and Fulvio Sugliano, January
- 2/01 *Waste water purification in Italy: costs and structure of the technology*, by Giovanni Fraquelli and Roberto Giandrone, January
- 3/01 SERIE SPECIALE IN COLLABORAZIONE CON HERMES. *Il trasporto pubblico locale in Italia: variabili esplicative dei divari di costo tra le imprese*, by Giovanni Fraquelli, Massimiliano Piacenza and Graziano Abrate, February
- 4/01 *Relatedness, Coherence, and Coherence Dynamics: Empirical Evidence from Italian Manufacturing*, by Stefano Valvano and Davide Vannoni, February
- 5/01 *Il nuovo panel Ceris su dati di impresa 1977-1997*, by Luigi Benfratello, Diego Margon, Laura Rondi, Alessandro Sembenelli, Davide Vannoni, Silvana Zelli, Maria Zittino, October
- 6/01 *SMEs and innovation: the role of the industrial policy in Italy*, by Giuseppe Calabrese and Secondo Rolfo, May
- 7/01 *Le martingale: aspetti teorici ed applicativi*, by Fabrizio Erbetta and Luca Agnello, September
- 8/01 *Prime valutazioni qualitative sulle politiche per la R&S in alcune regioni italiane*, by Elisa Salvador, October
- 9/01 *Accords technology transfer-based: théorie et méthodologie d'analyse du processus*, by Mario Coccia, October
- 10/01 *Trasferimento tecnologico: indicatori spaziali*, by Mario Coccia, November
- 11/01 *Does the run-up of privatisation work as an effective incentive mechanism? Preliminary findings from a sample of Italian firms*, by Fabrizio Erbetta, October
- 12/01 SERIE SPECIALE IN COLLABORAZIONE CON HERMES. *Costs and Technology of Public Transit Systems in Italy: Some Insights to Face Inefficiency*, by Giovanni Fraquelli, Massimiliano Piacenza and Graziano Abrate, October
- 13/01 *Le NTBFs a Sophia Antipolis, analisi di un campione di imprese*, by Alessandra Ressico, December

## 2000

- 1/00 *Trasferimento tecnologico: analisi spaziale*, by Mario Coccia, March
- 2/00 *Poli produttivi e sviluppo locale: una indagine sulle tecnologie alimentari nel mezzogiorno*, by Francesco G. Leone, March
- 3/00 *La mission del top management di aziende sanitarie*, by Gian Franco Corio, March
- 4/00 *La percezione dei fattori di qualità in Istituti di ricerca: una prima elaborazione del caso Piemonte*, by Gian Franco Corio, March
- 5/00 *Una metodologia per misurare la performance endogena nelle strutture di R&S*, by Mario Coccia, April
- 6/00 *Soddisfazione, coinvolgimento lavorativo e performance della ricerca*, by Mario Coccia, May
- 7/00 *Foreign Direct Investment and Trade in the EU: Are They Complementary or Substitute in Business Cycles Fluctuations?*, by Giovanna Segre, April
- 8/00 *L'attesa della privatizzazione: una minaccia credibile per il manager?*, by Giovanni Fraquelli, May
- 9/00 *Gli effetti occupazionali dell'innovazione. Verifica su un campione di imprese manifatturiere italiane*, by Marina Di Giacomo, May
- 10/00 *Investment, Cash Flow and Managerial Discretion in State-owned Firms. Evidence Across Soft and Hard Budget Constraints*, by Elisabetta Bertero and Laura Rondi, June
- 11/00 *Effetti delle fusioni e acquisizioni: una rassegna critica dell'evidenza empirica*, by Luigi Benfratello, June
- 12/00 *Identità e immagine organizzativa negli Istituti CNR del Piemonte*, by Paolo Enria, August
- 13/00 *Multinational Firms in Italy: Trends in the Manufacturing Sector*, by Giovanna Segre, September
- 14/00 *Italian Corporate Governance, Investment, and Finance*, by Robert E. Carpenter and Laura Rondi, October
- 15/00 *Multinational Strategies and Outward-Processing Trade between Italy and the CEECs: The Case of Textile-Clothing*, by Giovanni Balcet and Giampaolo Vitali, December
- 16/00 *The Public Transit Systems in Italy: A Critical Analysis of the Regulatory Framework*, by Massimiliano Piacenza, December

## 1999

- 1/99 *La valutazione delle politiche locali per l'innovazione: il caso dei Centri Servizi in Italia*, by Monica Cariola and Secondo Rolfo, January



- 2/99 *Trasferimento tecnologico ed autofinanziamento: il caso degli Istituti Cnr in Piemonte*, by Mario Coccia, March
- 3/99 *Empirical studies of vertical integration: the transaction cost orthodoxy*, by Davide Vannoni, March
- 4/99 *Developing innovation in small-medium suppliers: evidence from the Italian car industry*, by Giuseppe Calabrese, April
- 5/99 *Privatization in Italy: an analysis of factors productivity and technical efficiency*, by Giovanni Fraquelli and Fabrizio Erbetta, March
- 6/99 *New Technology Based-Firms in Italia: analisi di un campione di imprese triestine*, by Anna Maria Gimigliano, April
- 7/99 *Trasferimento tacito della conoscenza: gli Istituti CNR dell'Area di Ricerca di Torino*, by Mario Coccia, May
- 8/99 *Struttura ed evoluzione di un distretto industriale piemontese: la produzione di casalinghi nel Cusio*, by Alessandra Ressico, June
- 9/99 *Analisi sistemica della performance nelle strutture di ricerca*, by Mario Coccia, September
- 10/99 *The entry mode choice of EU leading companies (1987-1997)*, by Giampaolo Vitali, November
- 11/99 *Esperimenti di trasferimento tecnologico alle piccole e medie imprese nella Regione Piemonte*, by Mario Coccia, November
- 12/99 *A mathematical model for performance evaluation in the R&D laboratories: theory and application in Italy*, by Mario Coccia, November
- 13/99 *Trasferimento tecnologico: analisi dei fruitori*, by Mario Coccia, December
- 14/99 *Beyond profitability: effects of acquisitions on technical efficiency and productivity in the Italian pasta industry*, by Luigi Benfratello, December
- 15/99 *Determinanti ed effetti delle fusioni e acquisizioni: un'analisi sulla base delle notifiche alle autorità antitrust*, by Luigi Benfratello, December

## 1998

- 1/98 *Alcune riflessioni preliminari sul mercato degli strumenti multimediali*, by Paolo Vaglio, January
- 2/98 *Before and after privatization: a comparison between competitive firms*, by Giovanni Fraquelli and Paola Fabbri, January
- 3/98 **Not available**
- 4/98 *Le importazioni come incentivo alla concorrenza: l'evidenza empirica internazionale e il caso del mercato unico europeo*, by Anna Bottasso, May
- 5/98 *SEM and the changing structure of EU Manufacturing, 1987-1993*, by Stephen Davies, Laura Rondi and Alessandro Sembenelli, November
- 6/98 *The diversified firm: non formal theories versus formal models*, by Davide Vannoni, December
- 7/98 *Managerial discretion and investment decisions of state-owned firms: evidence from a panel of Italian companies*, by Elisabetta Bertero and Laura Rondi, December
- 8/98 *La valutazione della R&S in Italia: rassegna delle esperienze del C.N.R. e proposta di un approccio alternativo*, by Domiziano Boschi, December
- 9/98 *Multidimensional Performance in Telecommunications, Regulation and Competition: Analysing the European Major Players*, by Giovanni Fraquelli and Davide Vannoni, December

## 1997

- 1/97 *Multinationality, diversification and firm size. An empirical analysis of Europe's leading firms*, by Stephen Davies, Laura Rondi and Alessandro Sembenelli, January
- 2/97 *Qualità totale e organizzazione del lavoro nelle aziende sanitarie*, by Gian Franco Corio, January
- 3/97 *Reorganising the product and process development in Fiat Auto*, by Giuseppe Calabrese, February
- 4/97 *Buyer-supplier best practices in product development: evidence from car industry*, by Giuseppe Calabrese, April
- 5/97 *L'innovazione nei distretti industriali. Una rassegna ragionata della letteratura*, by Elena Ragazzi, April
- 6/97 *The impact of financing constraints on markups: theory and evidence from Italian firm level data*, by Anna Bottasso, Marzio Galeotti and Alessandro Sembenelli, April
- 7/97 *Capacità competitiva e evoluzione strutturale dei settori di specializzazione: il caso delle macchine per confezionamento e imballaggio*, by Secondo Rolfo, Paolo Vaglio, April
- 8/97 *Tecnologia e produttività delle aziende elettriche municipalizzate*, by Giovanni Fraquelli and Piercarlo Frigero, April
- 9/97 *La normativa nazionale e regionale per l'innovazione e la qualità nelle piccole e medie imprese: leggi, risorse, risultati e nuovi strumenti*, by Giuseppe Calabrese, June

- 10/97 *European integration and leading firms' entry and exit strategies*, by Steve Davies, Laura Rondi and Alessandro Sembenelli, April
- 11/97 *Does debt discipline state-owned firms? Evidence from a panel of Italian firms*, by Elisabetta Bertero and Laura Rondi, July
- 12/97 *Distretti industriali e innovazione: i limiti dei sistemi tecnologici locali*, by Secondo Rolfo and Giampaolo Vitali, July
- 13/97 *Costs, technology and ownership form of natural gas distribution in Italy*, by Giovanni Fraquelli and Roberto Giandrone, July
- 14/97 *Costs and structure of technology in the Italian water industry*, by Paola Fabbri and Giovanni Fraquelli, July
- 15/97 *Aspetti e misure della customer satisfaction/dissatisfaction*, by Maria Teresa Morana, July
- 16/97 *La qualità nei servizi pubblici: limiti della normativa UNI EN 29000 nel settore sanitario*, by Efsio Ibba, July
- 17/97 *Investimenti, fattori finanziari e ciclo economico*, by Laura Rondi and Alessandro Sembenelli, rivisto sett. 1998
- 18/97 *Strategie di crescita esterna delle imprese leader in Europa: risultati preliminari dell'utilizzo del data-base Ceris "100 top EU firms' acquisition/divestment database 1987-1993"*, by Giampaolo Vitali and Marco Orecchia, December
- 19/97 *Struttura e attività dei Centri Servizi all'innovazione: vantaggi e limiti dell'esperienza italiana*, by Monica Cariola, December
- 20/97 *Il comportamento ciclico dei margini di profitto in presenza di mercati del capitale meno che perfetti: un'analisi empirica su dati di impresa in Italia*, by Anna Bottasso, December

## 1996

- 1/96 *Aspetti e misure della produttività. Un'analisi statistica su tre aziende elettriche europee*, by Donatella Cangialosi, February
- 2/96 *L'analisi e la valutazione della soddisfazione degli utenti interni: un'applicazione nell'ambito dei servizi sanitari*, by Maria Teresa Morana, February
- 3/96 *La funzione di costo nel servizio idrico. Un contributo al dibattito sul metodo normalizzato per la determinazione della tariffa del servizio idrico integrato*, by Giovanni Fraquelli and Paola Fabbri, February
- 4/96 *Coerenza d'impresa e diversificazione settoriale: un'applicazione alle società leaders nell'industria manifatturiera europea*, by Marco Orecchia, February
- 5/96 *Privatizzazioni: meccanismi di collocamento e assetti proprietari. Il caso STET*, by Paola Fabbri, February
- 6/96 *I nuovi scenari competitivi nell'industria delle telecomunicazioni: le principali esperienze internazionali*, by Paola Fabbri, February
- 7/96 *Accordi, joint-venture e investimenti diretti dell'industria italiana nella CSI: Un'analisi qualitativa*, by Chiara Monti and Giampaolo Vitali, February
- 8/96 *Verso la riconversione di settori utilizzatori di amianto. Risultati di un'indagine sul campo*, by Marisa Gerbi Sethi, Salvatore Marino and Maria Zittino, February
- 9/96 *Innovazione tecnologica e competitività internazionale: quale futuro per i distretti e le economie locali*, by Secondo Rolfo, March
- 10/96 *Dati disaggregati e analisi della struttura industriale: la matrice europea delle quote di mercato*, by Laura Rondi, March
- 11/96 *Le decisioni di entrata e di uscita: evidenze empiriche sui maggiori gruppi italiani*, by Alessandro Sembenelli and Davide Vannoni, April
- 12/96 *Le direttrici della diversificazione nella grande industria italiana*, by Davide Vannoni, April
- 13/96 *R&S cooperativa e non-cooperativa in un duopolio misto con spillovers*, by Marco Orecchia, May
- 14/96 *Unità di studio sulle strategie di crescita esterna delle imprese italiane*, by Giampaolo Vitali and Maria Zittino, July. **Not available**
- 15/96 *Uno strumento di politica per l'innovazione: la prospezione tecnologica*, by Secondo Rolfo, September
- 16/96 *L'introduzione della Qualità Totale in aziende ospedaliere: aspettative ed opinioni del middle management*, by Gian Franco Corio, September
- 17/96 *Shareholders' voting power and block transaction premia: an empirical analysis of Italian listed companies*, by Giovanna Nicodano and Alessandro Sembenelli, November
- 18/96 *La valutazione dell'impatto delle politiche tecnologiche: un'analisi classificatoria e una rassegna di alcune esperienze europee*, by Domiziano Boschi, November
- 19/96 *L'industria orafa italiana: lo sviluppo del settore punta sulle esportazioni*, by Anna Maria Gaibisso and Elena Ragazzi, November

- 20/96 *La centralità dell'innovazione nell'intervento pubblico nazionale e regionale in Germania*, by Secondo Rolfo, December
- 21/96 *Ricerca, innovazione e mercato: la nuova politica del Regno Unito*, by Secondo Rolfo, December
- 22/96 *Politiche per l'innovazione in Francia*, by Elena Ragazzi, December
- 23/96 *La relazione tra struttura finanziaria e decisioni reali delle imprese: una rassegna critica dell'evidenza empirica*, by Anna Bottasso, December

#### 1995

- 1/95 *Form of ownership and financial constraints: panel data evidence on leverage and investment choices by Italian firms*, by Fabio Schiantarelli and Alessandro Sembenelli, March
- 2/95 *Regulation of the electric supply industry in Italy*, by Giovanni Fraquelli and Elena Ragazzi, March
- 3/95 *Restructuring product development and production networks: Fiat Auto*, by Giuseppe Calabrese, September
- 4/95 *Explaining corporate structure: the MD matrix, product differentiation and size of market*, by Stephen Davies, Laura Rondi and Alessandro Sembenelli, November
- 5/95 *Regulation and total productivity performance in electricity: a comparison between Italy, Germany and France*, by Giovanni Fraquelli and Davide Vannoni, December
- 6/95 *Strategie di crescita esterna nel sistema bancario italiano: un'analisi empirica 1987-1994*, by Stefano Olivero and Giampaolo Vitali, December
- 7/95 *Panel Ceris su dati di impresa: aspetti metodologici e istruzioni per l'uso*, by Diego Margon, Alessandro Sembenelli and Davide Vannoni, December

#### 1994

- 1/94 *Una politica industriale per gli investimenti esteri in Italia: alcune riflessioni*, by Giampaolo Vitali, May
- 2/94 *Scelte cooperative in attività di ricerca e sviluppo*, by Marco Orecchia, May
- 3/94 *Perché le matrici intersettoriali per misurare l'integrazione verticale?*, by Davide Vannoni, July
- 4/94 *Fiat Auto: A simultaneous engineering experience*, by Giuseppe Calabrese, August

#### 1993

- 1/93 *Spanish machine tool industry*, by Giuseppe Calabrese, November
- 2/93 *The machine tool industry in Japan*, by Giampaolo Vitali, November
- 3/93 *The UK machine tool industry*, by Alessandro Sembenelli and Paul Simpson, November
- 4/93 *The Italian machine tool industry*, by Secondo Rolfo, November
- 5/93 *Firms' financial and real responses to business cycle shocks and monetary tightening: evidence for large and small Italian companies*, by Laura Rondi, Brian Sack, Fabio Schiantarelli and Alessandro Sembenelli, December

Free copies are distributed on request to Universities, Research Institutes, researchers, students, etc.

**Please, write to:**

MARIA ZITTINO, Working Papers Coordinator  
 CERIS-CNR, Via Real Collegio, 30; 10024 Moncalieri (Torino), Italy  
 Tel. +39 011 6824.914; Fax +39 011 6824.966; [m.zittino@ceris.cnr.it](mailto:m.zittino@ceris.cnr.it); <http://www.ceris.cnr.it>

**Copyright © 2005 by CNR-Ceris**

All rights reserved. Parts of this paper may be reproduced with the permission of the author(s) and quoting the authors and CNR-Ceris