Working Paper Ceris-Cnr, N° 9/2009

ISSN (print): 1591-0709
ISSN (on line): 2036-8216

Predicting strategic change of public research institutions under unstable negative growth

Mario Coccia

National Research Council (Italy)
CERIS-CNR
via Real Collegio, n. 30, 10024 Moncalieri (Torino) - Italy
Tel.: +39 011 68 24 925; fax : +39 011 68 24 966
m.coccia@ceris.cnr.it

ABSTRACT: The purpose of this paper is to forecast and analyse, by a demographic perspective, the organizational behaviour of public research labs. The research focuses on the biggest Italian public research body. Demographic models of growth, based on different human resource policies, show the uncertain and retrogressive evolutionary change of Italian public research bodies that would halve their research personnel over the forecast horizon. These results provide vital information to the public management about the weaknesses and environmental threats in order to support decisions for improving the strategic change and survival of public research institutions over time.

KEYWORDS: Organizational Studies, Forecasting, Public Research Institutions, Internal Demography

JEL-CODES: I20, J11, J26

I wish to thank Diego Margon and Silvana Zelli for research assistance and the Italian National Research Council for its financial support to this research. The comments of two anonymous referees and discussions of this topic with Secondo Rolfo (Director of the Ceris-Cnr) have been important for improving the paper.

WORKING PAPER CERIS-CNR
Anno 11, N° 9 – 2009
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
del Consiglio Nazionale delle Ricerche
Via Real Collegio, 30
10024 Moncalieri (Torino), Italy
Tel. +39 011 6824.911
Fax +39 011 6824.966
segreteria@ceris.cnr.it
http://www.ceris.cnr.it

Sede di Roma
Via dei Taurini, 19
00185 Roma, Italy
Tel. 06 49937810
Fax 06 49937884

Sede di Milano
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

Distribuzione
Spedizione gratuita

Fotocomposizione e impaginazione
In proprio

Stampa
Grafica Nizza
C.so Francia 113, 10093 Collegno (TO)

Finito di stampare nel mese di dicembre 2009

CONTENTS

1. INTRODUCTION

Public research institutions play a vital role in modern economic systems to support current competitiveness of firms and competitive advantage of countries (Aghion and Howitt, 1998; Coccia, 2005). As these institutions are social, economic and scientific entities that have been adapting their organization to environmental pressures caused by turbulent markets that reduce public financing, it is interesting to forecast their strategic behaviour in order to analyze the evolutionary change over time. This aim is analyzed in this paper by a demographic approach that can provide useful information to social scientist, policymakers and politicians (Blangiardo, 1997; Livi Bacci, 1999; Caselli *et al*., 2001).

Several attempts were made in the 1950s and 1960s to develop the demography of organizations, however, there were poor results. As a matter of fact, knowledge about the demography of organizations has been slow to develop, although it can provide main findings to predict and analyze their organizational behaviours in turbulent and dynamic scenarios. Scholars have done main contributions about the demography of corporations and industries (Carroll and Hannan, 2000). However, the behaviour of research institutions has been not yet well explored by demographic analyses.

The purpose of this paper is to forecast the evolutionary change of public research organizations operating within the national system of innovation[1], by a demographic analysis that focuses on the biggest Italian public research body: the National Research Council of Italy (CNR), an institution similar to other European research bodies operating in France, Spain, Germany, etc. The demography of public research organizations can help to understand new organizational weaknesses and environmental threats of these research bodies in the forecast horizon (periods between today and the date of forecast), in order to support policymakers' decisions for improving their strategic change (Gioia and Chittipeddi, 1991)[2].

2. DEMOGRAPHIC PERSPECTIVE OF ORGANIZATIONS

Carroll and Hannan (2000) claim that the demographic studies about the corporate populations are much more limited than human population. In fact, the use of publicly available data imposes severe limitations and as consequence, it is difficult to construct estimates of basic demographic facts. Demography in organizational settings involves the work force of organizations, especially its turnover and mobility (Bourdieu, 1988). For instance, the mobility within the organization typically focuses on the characteristics of internal labour markets (Doeringer and Priore, 1971). Recent works in this tradition addresses issues such as the sex segregation in jobs, fragmentation of work, and the opportunity structure within organizations (Carroll and Hannan, 2000; Palomba, 2001; Calcatelli *et al.,* 2003). A main topic of the demography of organizations is called *internal organizational demography*. Pfeffer (1983) defines demography as "the composition, in terms of basic attributes such as age, sex, educational level, length of service, race and so forth of the social unit under study … the demography of any social entity is the composite aggregation of the characteristics of the individual members of that entity". Pfeffer also states a number of specific theoretical prepositions about the causes and consequences of demographic patterns in organizations. In particular, he focuses on the properties of demographic distributions of persons in the focal organization, especially the length of

[1] The national system of innovation (NSI) refers to the complex network of agents, policies, and institutions supporting the process of technical advance in an economy (Lundvall, 1992). The narrow definition of NSI would include the subsystem research sector represented by universities, research laboratories, while the broad NSI includes many subsystems such as finance, firms, government, and so on. The efficiency of this broad NSI supports economic growth patterns.

[2] In general terms, change involves an attempt to alter the current way of thinking and acting by organization's membership. More specifically, *strategic change* involves an attempt to change current modes of cognition and action to enable the organization to take advantage of important opportunities or to cope with consequential environmental threats.

service (LOS) distribution of members of the organization. He claims that the heterogeneity in the LOS distribution affects organizational outcomes, such as turnover (quoted by Carroll and Hannan, 2000).

However, organizations are constructed social and economic entities, not biological organisms. This fundamental feature of organizations has main implications for respects of the organizational demography. Some approaches of human and biological demography can be borrowed, others require to be accommodated to social and economic nature of organizations (Carroll and Hannan, 2000). In fact, demography of organizations should consider, according to Carroll and Hannan (2000) the following main differences between organizations and biological organisms:

- Variety of events that define organizational births and deaths;
- Potential immortality of formal organizations that can persist as an social entity long after its initial members have departed;
- The lack of parentage for organizations;
- The intellectual (and organizational) rather than biological and genetic transmission of information and routines;
- Heterogeneity of organizational populations;
- The ability of organizations to change populations and transform themselves.

In particular, the demographic analysis applied to research organizations can be important to analyze and predict their organizational adaptation and evolutionary change over the forecast horizon.

In order to analyze the demographic patterns of Italian national research council (CNR), section 3 describes its morphology (Ben-David, 1991), whereas section 4 presents the methodology and section 5 discusses the strategic change and different scenarios for this research body.

3. MORPHOLOGY OF ITALIAN NATIONAL RESEARCH COUNCIL (CNR)

The morphology (organization) of Italian National Research Council (CNR) has been affected by Italian research policy, which has been changing according to governments' changes. The first reform of the CNR in 1999 was inspired by the idea to gain more efficiency through larger size of research units (consolidation). Nowadays there are about 100 new institutes (in the past there were around 310 research units), which often have several decentralised units spread on the territory and far from the institute-headquarters. While this reform was still under way in 2003, after the political elections, the government decided to launch a new restructuring based on project management, with an explicit aim of transforming the CNR institutes in entrepreneurial bodies that supply technological services to firms and other external users (Coccia and Rolfo, 2008). Common features of these public management reforms are the shrinking public research unit budgets for reducing high public Italian debt with a main consequence: now the public funds are no more sufficient to cover current expenses of public research units. In fact, the requirements for increased accountability of public funds, increased flexibility of research institutions to adapt at changing environments, and a better inclusion of socio-industrial objectives have led most countries, such as Italy, to change their research funding schemes. In the past, public funding enabled to Italian scientists to carry out normal scientific activities and to send applications of external projects for additional funding (Coccia, 2009). Because of the current decline of public funds (to reduce the high public Italian debt and public expenditure), it is impossible to conduct research solely with public funding. Italian research bodies consider their public resources not sufficient to maintain the structure, which means: turnover of research personnel is not possible, research equipment cannot be maintained, repaired, or renewed, as well as international projects cannot be activated, and participation to international conferences, congresses and meetings is reduced, and so on. Therefore, research institutes are forced to apply for market funds to conduct normal scientific activities as well as to recruit term contract research personnel. The market (external) funding is not just an

additional, but also a main funding source for Italian public research institutes. This strategic change of public research units is functional to cope with environmental threats owing to low public funds in turbulent markets (Coccia and Rolfo, 2007; 2008).

In this context, scientists' behaviour is adaptable to low public funding conditions by several strategies for selecting external funds: targeting easy resources, targeting all resources and targeting appropriate sources (Laudel, 2006). Moreover, to increase the likelihood of external funding, scientists and public institutes change the content of their research, diversifying research, avoiding risky research, avoiding hot topics, as well as supplying all technological services and consultancies demanded by external subjects (e.g. firms and/or public institutions). However, researchers spend a huge amount of time for technological services, for preparing grant applications, managing grants, and so on, reducing in this way the time for fundamental research and the scientific production of public research institutes (Coccia, 2009). In addition, current global economic downturn has been further on reducing public financing as well as the hiring of payroll research personnel such that several lines of research and research units have been dismissed and/or downsized.

This scenario is present not only in Italy but in several countries such as France (Mangematin *et al.*, 2006), Germany, Australia, Norway (Laudel, 2006), Spain (Sanz-Menéndez and Cruz-Castro, 2002) and so on. In fact, the objectives of this restructuring of Italian public research institutions were to reduce general costs and to increase their technology transfer and technological services supplied to firms and other users. In consideration of the widely shared objective of improving scientific research in an industrialised country such as Italy, the organisational reforms of the CNR were designed in theory, since in practise they have been creating problems of coordination and bureaucratization within the research units (Coccia, 2009). In short, organizational reforms in a context of uncertainty and low public funds have generating organizational instability, managerial and organizational crisis, which demand a huge amount of energy and financial resources for the governance of large public research structures in turbulent settings (Coccia and Rolfo, 2007, 2008).

In order to analyze the organizational behaviour of research bodies, it is important to apply alternative approaches to forecast their strategic change, such as demographic methods described in the next section.

4. DEMOGRAPHIC APPROACH FOR FORECASTING THE ORGANIZATIONAL BEHAVIOUR OF RESEARCH INSTITUTIONS

Data of this research are from CNR report 2007. The elementary unit analyzed by the internal demography applied to scientific organizations is the research personnel. A first main respect is to analyze the rate of growth of the research personnel that can be calculated by different approaches (Livi Bacci, 1999):

a) Population is that at beginning of the time interval t (rate of arithmetic growth: ${}^{a}r$);
If the amount of population at beginning is ${}_{a}P$ and at the end of the period is ${}_{t}P$ and the time interval is equal to t, the rate of arithmetic growth ${}^{a}r$ is given by the following equation:

$${}_{t}P = {}_{0}P + {}_{0}P({}^{a}r \cdot t) \text{ where of}$$

$${}_{t}P - {}_{0}P = {}_{0}P\,{}^{a}r \cdot t \text{ and hence}$$

$${}^{a}r = \frac{{}_{t}P - {}_{0}P}{{}_{0}P \cdot t} = \text{rate of arithmetic growth}$$

b) Population is that existing at beginning of each yearly period forming the time interval t (rate of geometric growth: ${}^{g}r$); in this case, equation of the population development obeys to the formula of geometric growth:

$${}_{t}P = {}_{0}P \cdot \left(1 + {}^{g}r\right)^{t} \text{ of which}$$

$$Log\left(\frac{{}_{t}P}{{}_{0}P}\right) = t \cdot Log\left(1 + {}^{g}r\right)$$

$$Log\left(1 + {}^{g}r\right) = \frac{Log\left(\frac{{}_{t}P}{{}_{0}P}\right)}{t} \text{ therefore } {}^{g}r \text{ is}$$

obtained by the exponential transformation.

c) Population is that existing in each time

interval infinitely small (rate of growth compound continuously: *r*). In this case, the function of population development is exponential one:

$_tP = _0P \cdot e^{rt}$ where *e* is the base of natural logarithm (2.71828…).

Hence $\frac{_tP}{_0P} = e^{r\,t}$; $Log\,\frac{_tP}{_0P} = r \cdot t$;

$r = \frac{Log\left(\frac{_tP}{_0P}\right)}{t}$.

This case is often used in the demographic analysis as forecasting approach.

These demographic methods offer an analytical framework for the organization theory and institutional analysis in order to analyze the strategic change of public research organizations.

5. PREDICTING STRATEGIC CHANGE OF PUBLIC RESEARCH INSTITUTIONS UNDER TEMPORAL UNSTABLE GROWTH

First of all, the spatial distribution of the CNR research personnel is represented in the table 1 that also shows the average age per macro region.

Last column of table 1 shows as the CNR has a spatial structure mainly based on senior research personnel (over than 43 years). This confirms that the CNR has rather old personnel, considering that the retirement age in Italy is roughly 60 years.

Instead, the figure 1 shows the typical patterns of public recruitment in Italian research institutions that has an unstable behaviour over time. In fact, the irregular recruitment path is due to hiring-block applied by governmental budget laws in order to reduce the huge Italian public debts. These hiring-blocks have also two negative aspects: *brain drain* and *adverse selection*. In general the best researchers do not wait long term to be hired in public research labs and go towards foreign research labs/universities, generating a growing unidirectional flow towards the most advanced countries (The USA and Europe essentially) that represent for Italy a net economic and scientific loss. The remaining researchers survive with short-term contracts, and in the *long-run*, under the pressure of trade unions, they arrive to a tenured position in advanced age (about forty-year-old). This hiring system has negative effects in the production of the scientific and technical knowledge of public research institutes.

TABLE 1: SPATIAL DISTRIBUTION OF CNR RESEARCH PERSONNEL - YEAR 2004

Macro regions	*CNR research personnel units**	*Average age (Years)*
North Italy	1,889	48
Central Part of Italy	2,752	49
South Italy	1,468	44
Italian Islands	541	43
Total	**6,650**	**47**

*Researchers and Technicians

If the following assumptions are stated:

1: ${}_aP$ is the research personnel of the CNR at 1995

2: ${}_tP$ is the research personnel of the CNR at 2005

3: t is the period of the human resource policy and it is equal to 10 years

4: Human Resource Policy (HRP) over Forecast horizon $]t+n$ onwards] is similar to HRP over $[t; t+n]$ i.e. [1995; 2005]

Table 2 shows the arithmetic, geometric and exponential rates of growth of the CNR research personnel over time.

The rates of growth show a declining trend of CNR research personnel over 1995-2005, that is higher if the hiring of 2001 is not considered: −3.63% vs. −0.70% (see last column in table 2).

These vital results are important to forecast when the research personnel of CNR will be halved, considering the policy of human resources applied by Italian Governments over 1995-2005 period that is characterized by expansion and restriction phases of hiring (see figure 1).

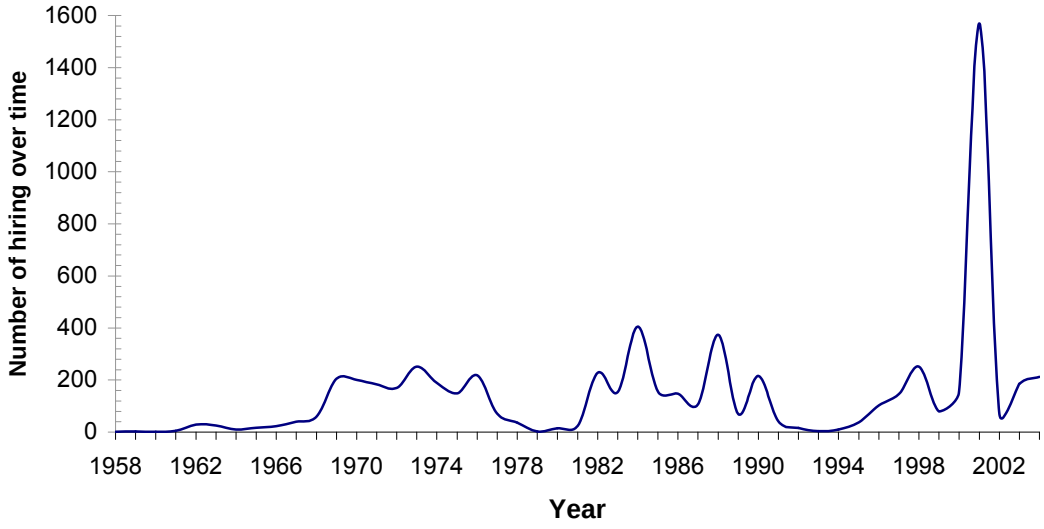
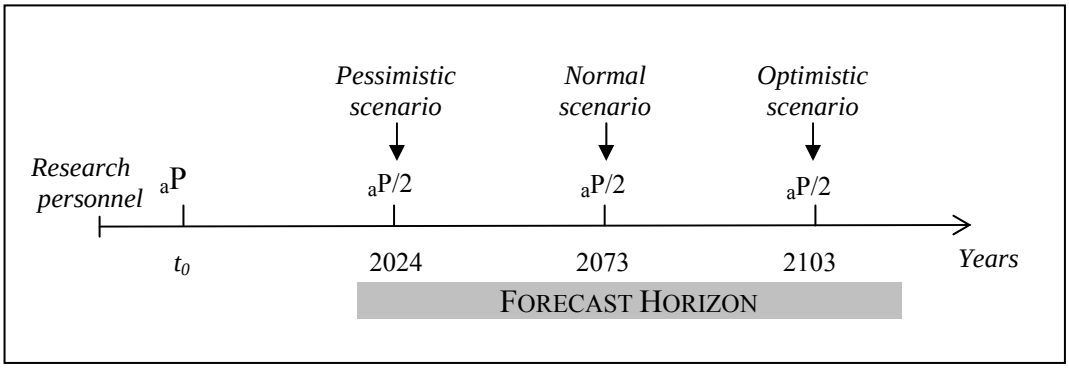


FIGURE 1: UNSTABLE HIRING GROWTH OF CNR RESEARCH PERSONNEL

TABLE 2: CNR PREDICTED DEMOGRAPHIC RATES OF GROWTH OVER 1995-2005

Year	*1995*	*2005*
Research Personnel of CNR (number of units)	7,451	6,945
	Rate	*Rate %*
${}^ar$ = Arithmetic growth 1995-2005	−0.0068	−0.68
${}^gr$ = Geometric growth 1995-2005	−0.0070	−0.70
r = Exponential growth 1995-2005	−0.0070	−0.70
r' = Exponential growth 1995-2005 without 2001*	−0.0363	−3.63

**Note*: Hiring in 2001 is 1,570 employees



Note: $_aP$ = Research personnel at time t_0 ; $_aP/2$ = Research personnel halved

FIGURE 2: HALVING OF CNR RESEARCH PERSONNEL ACCORDING TO DIFFERENT SCENARIOS

In particular, considering the exponential growth, which is an apt model for forecasting the organizational behaviour of research institution, the three main environmental scenarios forecasted are:

a) *Optimistic environmental scenario* based on expansive human resource policy over 1995-2005, that includes the high number of hiring of 2001; the growth model provides the following results:

$$1/2 = e^{r \times t}; ln\,1/2 = -0.00703 \times t; \frac{-0.693147}{-0.00703} = t;$$

$$t = 98.56 \cong 98\ years$$

Therefore, the research personnel of the CNR would be halved in the year 2103 (= 2005 + 98 years).

b) *Pessimistic environmental scenario* based on restrictive human resource policy with low hiring: i.e. if data do not consider the extraordinary hiring in 2001 year of 1,570 personnel units; *mutatis mutandis*, the result in this case is ≅ 19.10 years and the critical year is 2024, when the research personnel of the CNR would be the half of that of 2005.

c) *Normal environmental scenario* based on human resource policy with a steadier pattern of hiring and normal turnover of the research personnel: i.e. as the year 2001 has been an year of exceptional expansion of hiring, the analysis is repeated considering the payroll personnel of CNR over 1991-2000, before the year 2001; in this case the rate of exponential growth is –9.47‰ and applying the model of growth with this rate, the population of the CNR would be halved in the year 2073.

Considering these basic environmental scenarios based on different human resource policies (Fig. 2), public management can work out three strategies in order to maximize the benefits for public research institutions:

1) maximize the hiring in the optimistic environmental situation based on the best scenario *a)*;
2) minimize the losses of hiring and research personnel by a provident behaviour that considers the worst scenario *b)*;
3) maxmin is a mix strategy of two previous ones, considering the normal environmental situation of the scenario *c).*

Table 3 and 4 show the dynamics of research personnel, considering researchers, technicians and administrative as well as payroll and term contract research personnel.

TABLE 3: CNR PERSONNEL PER ACTIVIYU OVER 1997-2005 PERIOD

Year	*Researchers*	*Technicians*	*Administrative*	*Total*
1997	3,600	2,836	1,066	7,502
1998	3,635	2,827	1,022	7,484
1999	3,625	2,730	1,031	7,386
2000	3,650	2,689	1,038	7,377
2001	4,319	2,643	1,120	8,082
2002	n.a.	n.a.	n.a.	n.a.
2003	n.a.	n.a.	n.a.	n.a.
2004	4,146	2,248	671	7,065
2005	3,704	1,947	639	6,290

Note: n.a. = not available data

TABLE 4: CNR RESEARCH PERSONNEL BY TYPE OF CONTRACT OVER 1991-2001 PERIOD

Year	*Payroll*	*Term contract*	*Total*
1991	6,884	n.a.	n.a.
1992	6,846	n.a.	n.a.
1993	n.a.	n.a.	n.a.
1994	6,595	n.a.	n.a.
1995	6,408	1,041	7,449
1996	6,333	1,118	7,451
1997	6,234	1,248	7,482
1998	6,419	1,065	7,484
1999	6,314	1,072	7,386
2000	6,262	1,115	7,377
2001	7,615	467	8,082

Note: n.a. = not available data

Instead, figure 3 and 4 show, respectively, the line graphs of research personnel as well as estimated trends by ordinary least squares method and their coefficients of determination. Judged by the value of R^2, the regression lines provide good fits. However, these results based on linear trends are only an approximation and should be further on examined if they have to be used for forecasting purpose.

In addition, figure 5 shows the exponential rate of growth by activity of CNR research personnel over 1997 - 2005. This figure suggests that the forecasted negative growth of CNR research personnel is mainly due to higher negative rate of growth of technicians (−18.1‰) and in particular administrative staff (−24.7‰).

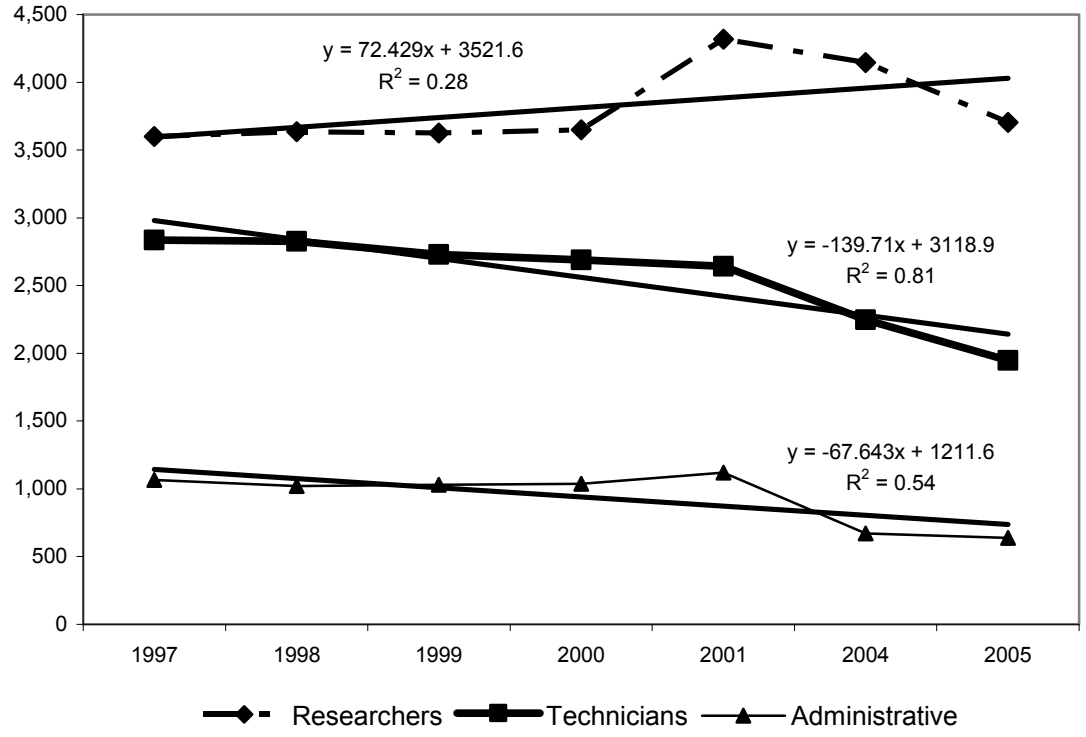


FIGURE 3: TRENDS OF RESEARCH PERSONNEL BY ACTIVITY OVER 1997-2005

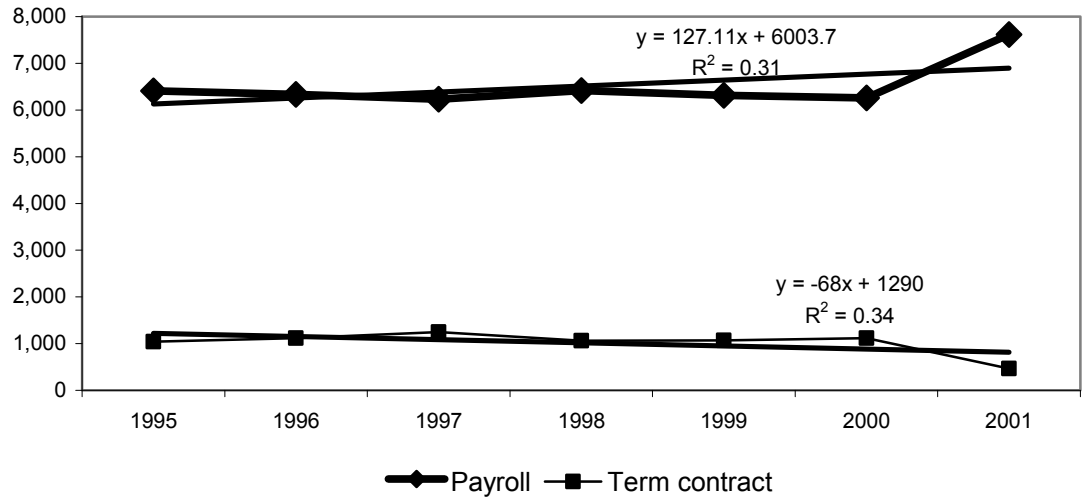


FIGURE 4: TRENDS OF RESEARCH PERSONNEL BY TYPE OF CONTRACT OVER 1995-2001

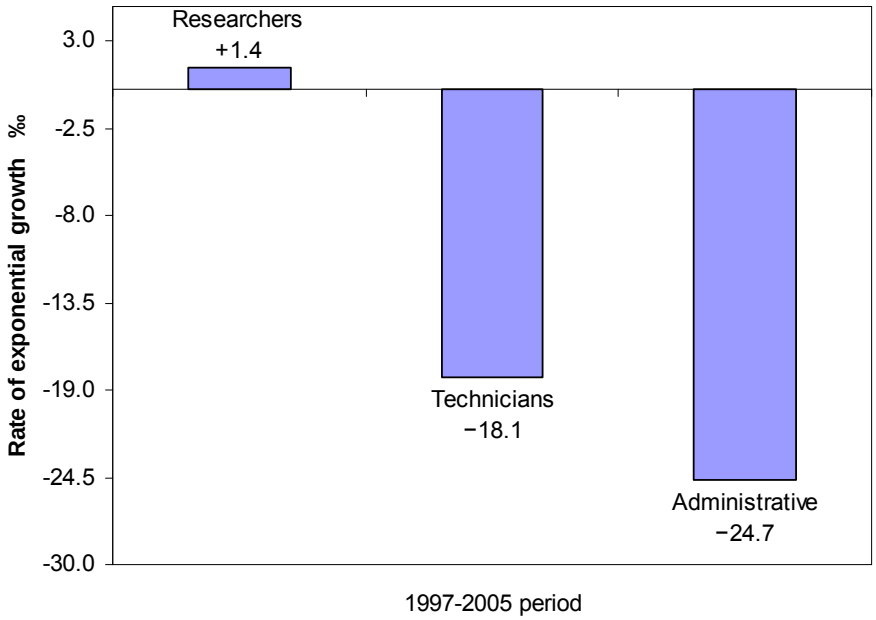


FIGURE 5: EXPONENTIAL GROWTH (‰) OF RESEARCH PERSONNEL OVER 1997-2005

6. DISCUSSION AND PUBLIC MANAGEMENT IMPLICATIONS

The purpose of this research is to apply a demographic approach for forecasting the organizational behaviour of public research labs over time. This approach suggests to policymakers vital information to support rational decisions aimed at reinforcing the survival and strategic change of public research bodies in turbulent scenarios.

The main lessons learned by this demographic analysis applied to Italian CNR are:

- The CNR has a structure of rather old research personnel (table 1);
- The predicted average rates of growth of research personnel of CNR have negative values (table 2) such that there will be a helving of CNR Research Personnel over the forecast horizon;
- With the *optimistic scenario* (*a*) based on expansive human resource policy of hiring, the research personnel would be halved by roughly 2100 or thereabouts, whereas the *pessimist scenario* (*b*) generates this result in the 2024, instead the *standard scenario* (*c*) shows as critical year the 2073 (Fig. 2);
- This declining trend of CNR research personnel is mainly due to higher negative rate of growth of technicians and in particular administrative staff (Fig. 5).

These negative forecasting trends (Diebold, 2004) of the research personnel are due to several causes such as:

- In general, the number of hiring is lesser than retirement (except the 2001-2004 period) because of low public funding invested in research sectors by Italian governments in contexts of environmental turbulence, uncertainty, and global economic recessions that affect the availability of public funds. In particular, national governments have reduced the hiring of research personnel with a real recruitment stop between 2001 and 2008. The main consequences are: i) permanent researchers are forced to apply for more market funds in order to maintain a minimal junior research staff; ii) a large amount of young researchers is now working in the CNR labs (as in the Italian universities) with different juridical status (generally short term contracts) and very low future perspectives; iii) several lines of

research as well as research units have been dismissed and/or downsized;

- The average age of hiring of payroll researchers in CNR is about 35 years over 1995-2004, an old age considering that the high potential of researchers is when they are younger (Diamond, 1986; Levin and Stephan, 1991); in addition this advanced average age of hiring reduces the length of service (Pfeffer, 1983).

These forecasting trends and scenarios confirm how the new public management of Italian research bodies, designed by Italian Governments, has been affecting in negative way the evolutionary change of public research units, generating problems for furthering of research and threatening their survival in the long-term. This negative growth is mainly due to low public funds for research sector owing to high public Italian debt and expenditures in a period of uncertainty for capitalistic systems. This strategic change of research unit is functional to cope with these environmental threats and pressures. The origin of this situation in Italy is rooted within the lack of a long-term national research strategy and of a consistent research policy (shared by Italian governments of different political coalitions), which has been generating structural deficiencies and negative performances of the whole Italian national system of innovation as well as economic system (Coccia, 2005). Therefore, this uncertain and ambiguous Italian research policy is not a sustainable strategy for long-term objectives. Unless this research policy, based on myopia of short-run commercial targets (*massification*)[3] for public research labs rather than long-run scientific goals, is halted soon, important portions of future scientific knowledge will be private property and fall outside the public domain, reducing the future progress of science and technology.

Although this analysis focused on Italian case study cannot be transferred directly to other countries, the worldwide tendency in the research sector seems to be parallel in several countries since universities and public research bodies have similar evolutionary change in presence of interrelated economies and global economic downturn. The threat is that with this declining trend of public research personnel and funding, basic research and knowledge will be reduced in future and there is also the real threat that certain types of basic research institutions might become 'endangered species in science environment'. These results, are a critical basis to a great extent relevant to policymakers in order to underpin sustainable strategies for long-term scientific and technological objectives for supporting the correct strategic and evolutionary change of public research units in the current knowledge era.

In fact, governments have to be aware of the risk of hasty reforms and myopia of short-term research policies based on commercial targets for research labs, rather than leveraging the scientific and technological growth of public research institutions in the long-run. Therefore, it is important that scholars, by accurate researches, help the governments and public management to sustain a fruitful evolutionary change of public research institutions in turbulent markets in order to underpin future wealth of nations. This demographic approach suggests vital findings even if the analogy between human populations and organizations is noticeable, although may be a forced approach in some cases. In addition, over the forecast horizon could occur new political and economic events that can change the trajectories of growth of public research bodies over time. No doubt that to design provident science policy, further research about forecasting trends of public research institutions is needed to enlarge this important research topic in economic and managerial literature and improve so, the governance of research units that have, more and more, a driving role for modern economic growth patterns based on intangible capital.

[3] Because of market-oriented trends of research units - due to low public funds - they are focused on massive increase in technological services rather than fundamental research, therefore there is depersonalisation of researchers and emptying of the scientific research activity of its main contents: i.e. less discovery-based research around longer term needs centred on public welfare; in other words, business and commercial interests are influencing research units and universities in an unsavoury manner, see Musselin, 2007; Schuetze, 2007.

REFERENCES

Aghion P., Howitt P. (1998), *Endogenous Growth Theory*, MIT Press, Cambridge, MA.

Ben-David J. (1991), *Scientific Growth: Essays on the Social Organization and Ethos of Science*, University of California Press, Berkeley.

Blangiardo G.C. (1997), *Elementi di demografia*, Il Mulino, Bologna.

Bourdieu P. (1988), *Homo academicus*. Translated by Peter Collier published in the United States by Stanford University Press, Standford.

Calcatelli A., Coccia M., Ferraris K., Tagliafico, I. (2003), "Donne-scienza-tecnologia: analisi di un caso di studio", *Working Paper Ceris-Cnr*, vol. 7, n. 3, July, Moncalieri (TO).

Carroll G., Hannan T.M. (2000), *The Demography of organizations and industries*, Princeton University Press, Princeton.

Caselli G., Vallin J., Wunsch G. (2001) (Eds), *Demografia. Nuovi approcci: dall'omogeneità all'eterogeneità delle popolazioni*, Carocci editore, Roma.

CNR Report (2007), Consiglio Nazionale delle Ricerche
http://www. cnr.it/sitocnr/home.html

Coccia M. (2005), "Countrymetrics: valutazione delle performance economiche e tecnologiche dei paesi e posizionamento dell'Italia", *Rivista internazionale di scienze sociali*, vol. CXIII, n. 3, pp. 377-412.

Coccia M. (2009), 'Bureaucratization in public research institutions', *Minerva*, *A Review of Science, Learning and Policy*, vol. 47, n. 1, pp. 31-50.

Coccia M., Rolfo, S. (2007), "How research policy changes can affect organization and productivity of public research institutes? Analysis within the Italian national system of innovation", *Journal of Comparative and Policy Analysis*, vol. 9, n. 3, pp. 215-233.

Coccia M., Rolfo S. (2008), "Strategic change of public research units in their scientific activity", *Technovation*, vol. 28, n. 8, pp. 485-494.

Diamond A.M. Jr. (1986), "The Life-Cycle research productivity of mathematicians and scientists", *Journal of Gerontology*, vol. 41, n. 4, pp. 520-525.

Diebold F.X. (2004), *Elements of Forecasting*, Thompson, Louseville, Canada.

Doeringer P.B., Priore M.J. (1971), *Internal Labor Markets and Manpower Analysis*, Heath, Lexington Mass.

Gioia D.A., Chittipeddi K. (1991), "Sensemaking and sensegiving in strategic change initiation", *Strategic Management Journal*, vol. 12, n. 6, pp. 433-448.

Laudel G. (2006), "The art of getting funded: how scientists adapt to their funding conditions", *Science and Public Policy*, vol. 33, n. 7, pp. 489-504.

Levin S.G., Stephan P.E. (1991), "Research productivity over the life cyc1e: evidence for academic scientists", *American Economic Review*, vol. 81, n. 1, pp. 114-132.

Livi Bacci M. (1999), *Introduzione alla demografia*, Loesher editore, Torino.

Lundvall B. (1992), *National systems of innovation*, Pinter Publishers, London.

Mangematin V., Blanco S., Deschamp B., Genet C., Kahane B. (2006), 'Project management: learning by breaking the rule', *Working Papers 2006-06*, Grenoble Applied Economics Laboratory (GAEL), INRA - Université Pierre Mendès, Grenoble-France.

Musselin C. (2007), "The transformation of academic work: acts and analysis", *Center for Studies in Higher Education*, n. 4, University of California, Berkeley.

Palomba R. (2001), "Poche e invisibili: le donne nelle carriere scientifiche", *Analysis, rivista di cultura e politica scientifica*, n. 4, pp. 25-32.

Pfeffer J. (1983), "Organizational demography", in L.L. Cummings and B.M. Staw (Eds.), *Research in Organizational Behavior*, vol. 5, pp. 299-357, JAI Press, Greenwich, Conn.

Sanz-Menéndez L., Cruz-Castro L. (2002), "Coping with environmental pressures: Public Research Organizations responses to funding crisis", *Working Paper 02-19*, Consejo Superior de Investigaciones Científicas (CSIC), Unidad de Políticas Comparadas, Spritte.

Schuetze H.G. (2007), "Research universities and the spectre of academic capitalism", *Minerva*, vol. XLV, n. 4, pp. 435-443.

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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; http://www.ceris.cnr.it

ISSN (print): 1591-0709; ISSN (on line): 2036-8216