No. 7 S. Morano-Foadi and J. Foadi
Italian Scientific Migration: From Brain Exchange to Brain Drain

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Abstract
The present paper is based on the findings of a research project on “Mobility and excellence in the European Research Area” (herein called Mobex) financed by the ESRC and still ongoing. It studies the mobility of Italian scientists and the consequences of this for scientific excellence and competitiveness in Italy, as sending country. The paper focuses on physics and life-sciences and on the flows between Italy and the UK. Its aim is not to present a quantitative analysis of the flow of scientists moving from Italy to the UK, but it tries to understand the causes of such a phenomenon, considering the factors shaping the migration decisions of scientists and potential barriers to mobility for out-going and returning scientists. The research presented tries to cover mainly qualitative aspects of the brain drain, replying to the need of knowing the real causes that have determined such a phenomenon. The Mobex project comprises a total sample of 52 respondents. 27% of the sample were 30 or younger, 58% were aged between 31-40 and 15% were 41 or older. The sample has been drawn using diverse sources such as for instance universities, the Marie Curie Fellows Association, the Italian Embassy, industries and companies operating in the scientific field. All the scientists interviewed in the Mobex project expressed their worries about the brain drain phenomenon and its consequences for Italy.

Introduction

A previous study on the mobility of female researchers within European Union, directed by Louise Ackers, has shown that Italians constitute the largest single nationality group applying for and awarded scholarships for scientific mobility (at postgraduate level) within the Training and Mobility of Researchers scheme (TMR) in Europe. The UK and France are the key destinations, with the UK accounting for 35% of applications, where 28% of doctoral applicants were Italian. Interestingly, Italians form a relatively small proportion of those nationality groups eligible for return grants. The percentage of Italian graduates working abroad is 2.3% and the percentage of European graduates working in Italy is 0.3%. This phenomenon is a unique feature

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1 Co-applicants of The Mobex Project are Prof. Louise Ackers director of the Centre for the Study of Law and Policy in Europe and Sonia Morano Foadi, Lecturer in European Law. Dr James Foadi, a physicist crystallographer, has served as scientific advisor for the project. We would like to thank Prof. Paolo Marchesini, Prof. Salvatore Aloj, the APRE Agency, the ADI Association, the MOBEX research team based at Leeds University and all the respondents involved, for their support in the writing up of the present paper.

2 For the purpose of this research, a data-base punctually completed by the scientific attaché of the Italian Embassy in London, Prof Aloj Salvatore, has been accessed. He has tried to locate as many scientists as possible working in the UK.


4 Evaluation of all seven rounds of the TMR fellowship programme. Document from Commission Services, TMR 18/5.1.

of Italy and it envisages a *brain drain* problem\(^6\). On the contrary, other large economies in the European Union experience a *brain exchange*\(^7\). Italian brain drain has also been repeatedly denounced by popular newspapers, books and more academic-oriented articles, which have in addition called for a solution\(^8\).

There is a lack of quantitative data on the actual number of scientists who have moved or are on the move from Italy to the UK. The latest statistics on science and technology have been published in Italy in 1997 and therefore refer to the first half of the nineties. However, international statistics report some general data on migration, even though they do not register skilled migration flows from Italy\(^9\).

A study on brain drain performed by the CENSIS\(^{10}\) has revealed the presence of about 2,600 researchers and Italian professors working abroad, focusing only on some universities and public research bodies. Out of this sample, 737 researchers have been interviewed. A map of the main research attraction poles has thus been traced: first the United States attracting 34.3\% of Italian researchers; among those, the majority are engaged in doing research in physics (23.8\%) and medicine (18.9\%). The UK comes second with 26.0\% of Italian researchers, especially in the medical sector (20.6\%) and in particular in neurosciences. France is the third recipient country with 11.4\% of researchers mainly working in the medical field. Reasons to move have been the scarcity of resources available for research (59.8\%), better economic conditions abroad (56.6\%) and better career opportunities (52.1\%).

In addition to the CENSIS report, an interesting paper\(^{11}\) makes an attempt to give a quantitative dimension of the phenomenon, using data released by the Register of the Italians Resident Abroad (AIRE), edited by the Italian embassies around the world. Nonetheless, data therein reported do not give us an exhaustive dimension of the problem, being the only scientists included those who voluntarily decided to enrol in the register and thus leaving out other researchers. Furthermore, data in this field are very volatile due to the high mobility of researchers.

Acknowledging such limitations, the present paper, based on the findings of the Mobex project, is not engaged in a quantitative analysis, but tries to explore the reasons why Italian scientists “escape” from Italy. It is structured into three main parts. In the first, an outline of the Italian higher education system is presented. The main differences between the old and newly reformed university structure are also contemplated. In this part are described the public research sector and the typical career progression for researchers. Following a historical analysis of the development

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\(^7\) Considering outward and inward migrations of skilled workers from and into a country as a flow balance, we define *brain exchange* a situation in which, on average, these flows are equal. When the outward flow far exceeds the inward one, we talk of *brain drain*.

\(^8\) See for instance the Italian Association of Doctoral students and Doctors (ADI) web-site [http://www.dottorato.it](http://www.dottorato.it) and [http://www.bur.it/sez-2b91.htm](http://www.bur.it/sez-2b91.htm); articles concerned with brain drain from Italy can also be found at [http://www.corriere.it/speciali/fugacervelli.html](http://www.corriere.it/speciali/fugacervelli.html).


of a mainly humanistic Italian culture, its damaging effects on scientific research, and its negative influence on the attitude towards the research itself by the Italian ruling class, the second part tries to understand some anomalies of the system. The third part is based on the interviews with Mobex respondents. These empirical findings present the perception of a brain drain issue and its causes. A short description of the Italian policy for the return of migrant scientists follows.
The Italian Higher Education System

Academic institutions in Italy are densely present on the whole national territory. There are 77 universities (athenaeums) and more than 1500 degree courses expressing extremely articulated training opportunities. In response to such a growing offer, training demand has grown consequently. Most of the universities are State institutions with a normal range of teaching and research, but there are a few private universities (università libere) recognized by the State. In addition, there are higher institutes governed by special regulations (istituti superiori con ordinamento speciale), such as the Istituto Universitario Orientale and the Istituto Universitario Navale, both in Naples; the Scuola Normale Superiore and the Scuola Superiore di Studi Universitari e di Perfezionamento, both in Pisa, and the Scuola Internazionale di Studi Superiori Avanzati in Trieste. There are three polytechnics (politecnico), institutions teaching exclusively engineering and architecture; they are in Bari, Milan and Turin. A professional and more focused training in art, music and drama is offered by specialist academies (Accademia) and conservatories (Conservatorio). In Italy there is no equivalent of the British “The Open University”, but some institutions do offer degrees by distance teaching (Università Nettuno). Recently, a new law has introduced the possibility of public and private universities to offer degrees by distance learning.

While still at the end of World War II a few thousands privileged students had access to university, the undergraduate population in Italy has increased from 217,000 units enrolled in the academic year 1960-61 to roughly 500,000 in 1966, 981,000 in 1976, and 1.7 million of students in 2000-2001. It is thus evident that a transition from an elite educational system to a mass university has occurred in the sixties-seventies, mainly due to the economic boom in the Country. The concept of a limited access to university, numero chiuso, is politically unacceptable, with very few exceptions (e.g. dentistry). Therefore, all students holding a Diploma di Maturità are entitled to enter any degree. However, in recent years, there has been a growing tendency to introduce "entrance tests" and other devices to reduce the number of entrants to a more manageable figure.

One of the effects of mass university is overcrowding, for which Italian universities are well-known. It is not unusual, for instance, to attend most of the first year lectures standing, given that classrooms are not designed to accommodate such a high number

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14 For more information about Nettuno University, see http://www.uninettnuo.it
16 See footnote no. 12, p 23
17 There are several A levels (diploma di maturità) in Italy ranging from Classical, Scientific and Artistic Lyceum to other technical and professional schools. Best performances of students from Lyceum (55% get a degree) and then Teaching Institutes (37%). Data ISTAT, see web-site Italian National Statistic Institute http://www.istat.it
18 From 1993/94 there has been a drastic drop of enrolment for the introduction of the entrance test in medicine; Data ISTAT see footnote no. 17
of students. However, such a phenomenon only occurs in the first year course. In most of the degrees, except perhaps those which are fashionable, students attendance is lower in later years; certainly inferior to UK proportions. In fact, the number of people having a first degree and/or a PhD were less than 9% of the population between 25 and 64 years old in 1999, against 35% of the USA, 25% of the United Kingdom, 23% of Germany, and 21% of France\(^\text{19}\)

Whilst the enrolment rate of students is in line with other OCSE countries, it is evident a strong dropout from university studies. In 1996, for example, more than 60% of the students enrolled have withdrawn; in other countries the numbers for the same year were different: 45% in France, 37% in USA, 28% in Germany and 19% in the United Kingdom. Correlated to the dropout rate is the delay in taking a degree. Again in 1996 only 9% of the graduates obtained their qualifications within the normal length of studies (before the reform all degrees were of 4-5 years and medicine was 6) and more than 60% of the students took a degree with a delay of 3 years or more.

The dropout rate and the excessive length of university studies have led, in the year 2000, to a higher education reform, the Zecchino Reform\(^\text{20}\). The university training system has been revised and changes have been introduced in terms of autonomy of the management and didactic organisation. Industries have welcomed the reform, because their main interest is to have young graduates with no specific training, at least at their first employment experience. On the contrary, most academics generally disagree with the higher education reform. They think the system is producing low quality graduates and the Italian primacy to produce top quality people, who are typically competitive at high levels abroad, is becoming only a memory of the past.\(^\text{21}\)

**The old university system**

Prior to the reform, universities were legally conferring the following qualifications, the *Diploma Universitario* (DU), the *Diploma di Laurea* (DL), the *Corso di Perfezionamento* (CP), the *Diploma di Specializzazione* (DS) and the *Dottorato di Ricerca* (PhD).

The DU was introduced in 1990 in an attempt to reduce congestion in several degree courses, to provide a more vocationally-oriented type of education, and to have something corresponding to other EU short-cycle higher education courses\(^\text{22}\). The first degree holders emerged in 1994, but the "market value" of the qualification with potential employers has not yet been established. The length of a DU course was two or three years, depending on the subject.

\(^{19}\) See footnote no. 12


\(^{21}\) There is concern about this issue. It has been suggested that it would be desirable to have two different possible routes: the first should provide a five-year top level education, for those students (at least 20%) who want to be employed in academic or industrial research sectors or have a top managerial position. The second should give the opportunity to the remaining students who want a degree, to have a quick access to the labour market and/or the possibility to get a master afterwards. From an interview with one of the Mobex Key informants.

\(^{22}\) The Dus, since their inception, have restricted student numbers, usually to 100 per course. For further details see footnote no. 13.
Within the old university system, the DL (degree) was the second degree. The official
duration of university courses varied according to the subjects, being 4 academic
years for some disciplines (mathematics, physics, law, literature), 5 for others
(chemistry, engineering), and 6 years for medicine. The effective duration of
university education was, on average, two years longer than the "official length", due
to the possibility of delaying the exams after the end of the courses. After the
successful completion of all exams, students were required to submit an original
thesis in order to qualify for the final degree (laurea) and to obtain the appellation
"dottore" (Dott.)\(^{23}\). Graduates then, could apply for entering in a Corso di
perfezionamento (CP), Diploma di Specializzazione (DS), or Dottorato di Ricerca
(PhD)\(^{24}\).

The CP lasted for one year and implied either a deeper study of certain disciplines or
professional re-qualification.

The DS varied in length from a minimum of two to a maximum of five years.
Admission to it was limited to a small number of students. These postgraduate courses
were legally recognised by the State, whilst most of the Master degrees as such in
Italy, are not legally recognised (this is no reflection on their quality; it merely means
that no law has been passed regulating their contents).

The Italian PhD was a third level degree equivalent to the British PhD, German PhD
and French Doctorate. It was established by the 1980 university reform law, but the
first enrolments came only in 1984. Access to a PhD is gained through a public
competition, i.e. concorso, and lasts between 3 and 4 years. At the end the student
needs to defend a thesis in front of an academic panel. Since 1990 almost 4,000 PhD
students have been funded by Ministry of Education, University and Research (then
MURST, now MIUR) every year. The Public Research Institutions can sponsor PhDs,
but the course should be undertaken at a university department.

**The new university system**

In 2000, the Minister for Research, Antonio Ruberti, introduced university diplomas
(DU) with a three-year length, which were running in parallel with the degree courses,
giving students the possibility of moving from a diploma to a degree. In the academic
year 2002-2003, with the decree 509/1999, Minister Ortensio Zecchino has once
again re-formed the university system, the so-called “3+2-reform”\(^{25}\). The reform has
introduced the credit system both to measure the amount of work required to the
students and to allow shifting from diverse curricula inside the university system.

The new structure includes two main cycles: the laurea and the laurea specialistica.
There are then first and second level Masters and PhDs.

\(^{23}\)There are still a number of issues to be resolved as a consequence of the university reform, such as
for example the title of “dottore” awarded with the previous scheme and the one obtained now. As one
of our key informants suggested, the “dottore” qualification should now be reserved to those who
obtain a Ph.D. However, “for a family having a son or daughter, getting a degree without the doctor
qualification is still a big shock. Therefore this issue is still under consideration and meanwhile the
new 3-year graduates get the same qualification than those who graduated before the reform. The
proclamation formula during the degree ceremony should be different and should not include the title
“doctor”. It should be conferred to students the degree (laurea) in... or the specialist degree (laurea
specialistica) in...” (Interview with one of the key informants).


\(^{25}\)See footnote no. 20.
Laurea. (first degree). It is a three-year degree leading to the acquisition of a more general qualification suitable for the labour market. Students need 180 credits to get a degree and it is compulsory to study at least one European foreign language. In the following disciplines the degree is still according to the old system (*laurea a ciclo unico*): Pharmacy, Dentistry, Veterinary Science and Medicine.

1st-level Master. This degree can be accessed after the *laurea* (first degree). It is equivalent to a taught standard UK Master.

*Laurea specialistica*. (Specialised degree) It lasts two years. It is accessible after the *laurea* (first degree). There are several options to gain a more practical preparation for specialist professions. Students need 300 credits to get this degree of which 180 credits have been already obtained with their first degree.

*Laurea specialistica ciclo unico* (Overall Specialised degree). It is foreseen only for Pharmacy, Dentistry, Veterinary Science (five years) and Medicine (six years). No qualification is obtained after the first three years, but only after completing all the courses. To obtain the specialised degree the student has to defend a thesis elaborated in an original fashion under the supervision of a tutor.

*Diploma di specializzazione*. (Specialty diploma) This post-graduate diploma, a feature of the old university system, has been abolished. Some departments had specific expertise in some areas and fields and were organised in schools of excellence (*scuole di specializzazione*). After the reform the old structure of such schools and diplomas has been replaced by Master courses, except for medicine which has still maintained such specialty diplomas. However, they are not comparable to the new Master degrees, differing for length and programmes.

2nd-level Master. It is accessible after the *laurea specialistica* to deepen students’ preparation and/or to acquire further competences useful for the labour market. Master schemes are a one-year postgraduate course and are worth 60 credits.

*Doctoral studies. (PhD)* The law no. 392/1998 has reformed their structure. Every year all interested universities offer a fixed number of grants for PhDs that can be accessed only through a public competition. In addition, a number of students equivalent to up to twice the number of grants offered can now sponsor their own PhD. The average length of studies is 3-4 years with prevalence in the following disciplines: physics, mathematics, natural sciences, medicine and engineering. The total number of PhD students is lower than in other countries. Since its inception the total number of research doctorates awarded in all disciplines has been 62,000 (1983-2001). In 2001 the actual number of doctorate students was 15,000, and 4000 without a grant.26

Public research bodies

As in other nations, scientific and humanistic research is not only carried out at universities, but at public institutions that can have a national or regional status. The biggest public research entity is the National Research Council (CNR), mainly funded by the Government. It is divided into several institutes and centres located on the whole national territory. It supports research in fields ranging from psychology to chemical engineering. The institutes have a political and strategic autonomy, but they

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were not given the potential to interact with industries and universities, and to be more productive in financial terms.

A decree passed in April 1999 proposed a thorough restructuring, condensing the CNR's 330 institutes and centres to 100 units, mostly through mergers designed to achieve a critical mass in each research area. It also sought to introduce a simpler organizational structure by reducing the number of research commissions. As a first step, two years ago, the CNR's 15 discipline-oriented 'advisory' committees, mainly composed by academic professors, were dissolved. The huge task of restructuring the CNR's institutes was being carried out, albeit slowly, by an interim council. The logic was mainly to overcome the fragmentary nature of the research councils and re-direct their research activities towards those promoted by the Government such as, for example, in the high-tech sector. As we will see in the following section, this original, optimistic plan has been carried out with only a partial success.

Smaller research agencies are the National Institute for Nuclear Physics (INFN), the Italian Space Agency (ASI), the Higher Institute of Health (ISS) and the Italian National Agency for New Technologies, Energy and the Environment (ENEA). Reforms are progressing with varying degrees of success. The INFN was always efficiently run, and so has escaped major changes. Scientists funded by the ASI, meanwhile, have profited from the reform process. The ASI has no research institutes of its own, but its new governing statute, passed in 1999, made research its first objective. The ISS in Rome conducts medical research and it is responsible for technical aspects of medical drugs regulation. It was supposed to be reformed to boost its efficiency and make it independent from the Health Ministry. However, in the new statute, research is not even mentioned. The ENEA is a public undertaking operating in the fields of research and innovation and under the new decree passed in 1999 has been reformed.

**Career progression in the public research sector**

In this section, a short outline of the typical research career path will be attempted. Our description could well start with the appellation *cultore della materia*. Graduates, namely *cultori della materia*, are not always paid but have the opportunity to be members of the examination commission of a selected discipline, often with more administrative than didactic duties. Usually this stage (that could be skipped) is followed by the *dottorato di ricerca*.

With the new reform a graduate can have access to a PhD after the specialist degree, which lasts 5 years, whilst the PhD generally lasts 3 years. The admission is restricted and is by means of a competitive state examination, *concorso*. A graduate student could remain in the position of *cultore della materia* for several years, with little possibility to access any doctorate. The actual number of doctoral positions available with a grant, is fixed by the Ministry and in addition students can start their PhDs with external or personal funding. The extension of the number of doctoral students is at

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the discretion of the department. Before the law D.M. 224/99\(^{30}\) there was a centralised system and all PhDs were funded by the Ministry of Education. Successful graduates had a grant which was covering tuition fees and maintenance. However, only a limited number of positions were available and there was no possibility of getting a PhD in the country without passing a concorso. Now doctorates are offered both by a single and a consortium of universities and research institutes able to coordinate higher research. These bodies have the option to decide the number of PhD students and the programme to be undertaken. Students can now be awarded external funding or can support themselves, if they are considered suitable (idonei) but not selected, after the concorso. Also industries have started funding some doctoral studies, obviously on more applied subjects. The new reform has not changed the PhD training. It varies according to disciplines and universities. In some universities, mainly scientific departments, PhD students have to attend courses and seminars, take exams and give monthly presentations about their progress to a supervision panel\(^{31}\). In other universities a doctorate is considered no less than a “parking area” for good students who want an academic career and are waiting for better university employment opportunities. The Italian PhD is granted by MIUR, not by the university, and the students have to defend a thesis in front of a large committee.

The doctorate schools are in principle open to foreign students, but the entrance examination, often only in Italian, is a great barrier to their participation. During the PhD, students can spend a period of time abroad (they are encouraged to spend up to a year) and the amount of the fellowship grant is increased of 50%, but there are negligible opportunities to do an industry-based PhD.

The aim of the PhD school is to produce good researchers for universities and for the national research institutions, and in limited cases for the private research sector.

Following a PhD, post-doctoral fellowships (assegni di ricerca) can be taken. The assegni di ricerca have been introduced in 1997 and are accessible by researchers holding a PhD or graduates who have had at least a three-year research experience. These are temporary research contracts lasting 3 or 5 years. At the expiry of the contract a fellow can carry on research, hoping in an eventual permanent position, or looking for external jobs. The permanent research positions are generally really scarce and the admission to them is by concorso, which includes two written examinations and an oral one.

There is another professional category of researchers, the so-called tecnici laureati who are graduates employed by the university mainly with an administrative role, but having in addition some research duties. These researchers have been hired around the seventies and eighties as a consequence of a temporary suspension of concorsi for teaching and research positions. Given the compromise, these young researchers have been excluded from the traditional academic route. However, in 1999, they have been reinstated in their research role after a restricted concorso.

The next academic position in the university career ladder is as an associate professor. A researcher needs to have a good publication record to get this position. An academic panel, after having evaluated the candidate’s scientific publications, his/her


teaching experience and university administrative duties, ask him/her to give a lecture. At the end of all candidates’ lectures a selection of the “winning” researcher is made.

The top academic career is as a full professor. The candidate needs to show an outstanding publication record and other relevant academic roles and has to give a lecture if he/she is not an associate professor.

The career path is different in the Research Institutions, where generally one can access only with a fellowship or a research contract (from 1 to 5 years). The National Research Council recruitment system is based on a national competition or chiamata diretta, i.e. by means of an evaluation based exclusively on the candidate’s curriculum. It is really difficult to obtain a permanent position as a researcher and often it is achieved after several years. The Director of the Institution is generally a full professor.

Advisory committees, dominated by university professors, control research funds earmarked for the CNR, and decide on appointments. However, with the new reform, the directorships of half of the new institutes have been advertised internationally, whilst previously they were not even advertised in Italy. Disappointingly, the first round of appointments, for the largest of the new institutes, suggests examples of clear injustices, where scientists with significant scientific and research-management experience have been passed over in favour of those scientists of lesser merit who have served as CNR directors.

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33 See footnote 28.
Scientific research and politics in Italy

Italian culture is seen abroad mainly as a humanistic one, Italy being a country where the arts and literatures have reached sublime heights. It is very often paid little attention to the fact that Italy has also witnessed the birth of modern science with Galileo and the introduction of his experimental method. Although many Italian scientists have played a major role in the creation of important scientific theories in the 20th century, yet the majority of them was forced to work in foreign laboratories and institutions because they did not find a positive working environment at home. Famous names include the physicists Enrico Fermi and Emilio Segre and the medical biologists Renato Dulbecco and Rita Levi Montalcini. In this section we will shortly cover some of the key events that have been instrumental to these celebrated migrations and have contributed to the general attitude toward scientific research by Italian politicians.

During the twenties a harsh cultural debate raged across the most important Italian intellectual groups. The two main protagonists of this controversy were the mathematician Federico Enriquez on the one side and the philosopher Benedetto Croce on the other. The last set up to make a general classification of knowledge, ranking all subjects according to their absolute importance. According to Croce, philosophers and historians own a higher form of scholarship than scientists; the first are endowed with a “universal mind”, while the second category use a “particular mind”. Enriquez tried to contrast this view, which drastically relegated all science to a secondary aspect of human knowledge, with the creation of a journal, “Scientia”, where scientific articles where succeeded by articles on more philosophical issues; important people, like Albert Einstein, were often invited to write on the journal, so to attract more interest. But all efforts by Enriquez were in vain, especially since Croce allied to the thinker Giovanni Gentile who was, shortly afterward, called to reform the Italian school and university systems on account of the Fascist rulers. The close relationship between culture and politics during those years was a key factor for the penetration in the Italian cultural milieu of the view that humanities and not sciences contribute to real knowledge. Until modern times it was not uncommon, especially in southern Italy, to hear parents claiming that their children had a proper education because were sent to attend classical-studies schools (liceo classico). Enrico Bellone, historian of science and chief editor of “Le Scienze”, the most widespread scientific Italian magazine, states that “...a segment of the (Italian) humanistic intellectuals contributed in the past, as it is doing today, to the categorization of the scientific enterprise as useful or harmful knowledge...”34. According to this limited view, scientific research is generally to be looked at with suspicion, and only those discoveries which are conducive to immediate social welfare are worth to be pursued and to receive financial funding from the State. This is obviously not true, as the most abstract and theoretical findings of today scientific research can be transformed in powerful industrial applications, sometimes even after several decades; the history of science is full of similar episodes35. Many Italian researchers think that the smaller number of scientists in Italy compared to that of countries like the UK or the USA, is

partly due to the cultural dispute just described. The Italian physicist Carlo Bernardini, for example, says that “…the dualism between humanistic culture and scientific culture … has penalized the second, which is considered as a second-class type of knowledge…”\textsuperscript{36}.

In the twenties and thirties, while the cultural background we referred to above was being formed and established, small but successful groups of scientists, especially in the mathematics and in the physical sciences, were nonetheless able to carry out good-quality research. Very famous is the case of the Italian physicist Enrico Fermi, who, together with Emilio Segre’, Edoardo Amaldi and other researchers known as “ragazzi di via Panisperna”, made outstanding discoveries in the field of Nuclear Physics. The Fascist regime was in general not interfering with the researchers, during these years, mainly because the majority of them swore allegiance to the regime in order not to be excluded from their laboratories. Things became more difficult with the emanation of the leggi razziali (bill on differences in race) in 1938, were all Jewish scientists were shut out from their offices. Fermi migrated to the USA in 1938, never to come back. Similar episodes happened throughout the rest of Europe, under the pressure of Nazi persecutions. Truly, World War II is the official act which inaugurates European brain drain towards the United States of America. The political and economic isolation caused by the Fascist planning determined a progressive deterioration of Italian science. At the end of the war the situation for all scientific research was catastrophic\textsuperscript{37}. At the same time the American laboratories became the receptacle of the best minds world over. The polarization between a Europe where scientific research had been nearly completely demolished during the war, and the USA which benefited from this demolition, became an irresistible call for young Italian scientists, just come out of a university degree. Two of the most important characters who went to the States for research in this period are Nobel laureates Rita Levi Montalcini and Renato Dulbecco.

It is thus surprising to find that, during the fifties, Italy has been able to recover completely from the poor condition in which it found itself immediately after the war. Key characters like Giulio Natta in Chemistry, Domenico Marotta in Medicine and Edoardo Amaldi in Physics have been able to re-direct their studies along lines which will turn out to be important fields both for international pure research and for national industrial applications. During the fifties and sixties, important national laboratories like the National Institute for Nuclear Physics (INFN) and the Higher Institute of Health (ISS) are created, as well as two important new companies for the production of plastic (Montecatini) and early electronic components (Olivetti)\textsuperscript{38}. Thus, although immediately after the war the politicians attitude towards scientific research was not changed (for instance the Italian prime minister Alcide De Gasperi stated in this period that scientific research is a luxury which cannot be afforded by a country like Italy, destroyed by the war), the creativity and energetic attitude to reconstruction of few charismatic individuals helped out the revitalization of the Italian research fabric. The fifties and early sixties are, in fact, the only period when

\textsuperscript{37} Di Giorgio, C. (2003), Cervelli Export, Adnkronos Libri, p 39
\textsuperscript{38} Amaldi, E. (1979), Gli anni della ricostruzione I - Scientia 114; Amaldi, E. (1979), Gli anni della ricostruzione II - Scientia 114. See also footnote 37.
there is a real brain exchange, given a certain number of foreign famous scientists who moved to Italy for research purposes.

When the size of the Italian scientific research, though, started to be noticed by the political class, things stopped to proceed so smoothly. Especially in the field of new energy sources, like the nuclear energy, Italy was making real progress and economic interests of national and international groups began clashing with each other. The situation exploded during the summer of 1963, when the director of the National Committee for Nuclear Energy (CNEN), Felice Ippolito, was unjustly accused of wasting State money for carrying forward useless research, and to actually use part of the money for personal purposes. After heavily biased legal proceedings, Ippolito went to jail for two and a half years. With the beheading of the CNEN, its activities are paralysed. While until then the Italian nuclear adventure ranked Italy among the only three nations, together with USA and UK, with nuclear power stations, now this enterprise was temporarily abandoned, and the connected research suspended, with uncountable damage for the national research system. This event can be connected to the strong tensions caused by the enormous interests in the exploitation of nuclear energy from private and public sectors. Shortly afterward though, in 1964, another director, this time of the ISS, Domenico Marotta, was accused of bad administration of the national institute and sentenced to jail. Marotta was able to avoid prison, but his name was ruined and with it all the positive collaborations that medical and biological Italian research had with other foreign countries. In her recent book on brain drain the journalist Claudia Di Giorgio claims that there is a connection between Ippolito and Marotta’s sentences. This is due, according to her, “...to the belief, very old and deeply radicated in the Italian political leadership, that Italy is unable to carry out scientific research, because it has no money for doing it...” This attitude towards scientific research and the heavy atmosphere of witch hunting that reigned during the second half of the sixties were sufficient to dismay scientists. After a decade of positive research in their own nation, Italian scientists started having problems in getting funding and in the administration of their laboratories, which was becoming more and more entangled with the State bureaucracy, after the Ippolito and Marotta cases. At first few individuals, and later entire groups, started leaving Italy, mainly directed to the USA, where other Italian colleagues were having success and were not meeting with any obstructionism from the Government.

The difficult relationship between the scientific and political classes has never improved even in modern times and at present. The recent Government cutting funds for research, and the attempt to re-structure the National Research Council (CNR) in order to put it under a more direct control from the State, are just the latest episodes to witness that the conflict is still alive and kicking. In the meanwhile, the migrations of skilled scientists abroad live on, at an ever-growing pace. A changing attitude of Italian politicians towards scientific research could be the only way to stop the drain. Perhaps this, in turn, has to be strongly correlated to a change of attitude in the role

40 Di Giorgio C. (2003), Supra footnote no. 37, at p 63.
41 The Government appointed a special commissioner to lead the CNR. The President Lucio Bianco resigned and appealed against the Government’s decision. The Rome’s administrative tribunal (TAR) annulled the Government’s decision. For more details, see the following newspaper’s articles: (2003) CNR, si e’ dimesso presidente Lucio Bianco, 12 maggio 2003, La Repubblica; (2003) CNR, il TAR del Lazio annulla il commissariamento, 6 marzo 2003, Il Sole 24ore.
scientific knowledge needs to cover in the Italian general culture. The old dualism between humanistic and scientific research will have to be re-considered in the light of the tremendous impact science has had on society in the last forty years.

**Some inadequacies of the public research system**

This section is an attempt to clarify some of the issues reported by the media and shared by scientists and non-scientists about the problems of science in Italy.

As explained before, the majority of the Italian ruling class has a humanistic background and it is diffident towards science. Scientific outputs are not a priority and for more than 30 years universities and research centres have been considered votes tank, *serbatoio di voti*, and ground for political lotting. As a consequence, resources devoted to research are both fewer and less productive than in other advanced economies. The limited sums made available for research are spread thinly across disciplines and research groups, with little attempt to promote priority projects. Private funds are limited or inexistent and the Italian research sector employs a very small fraction of Italian graduates. In addition, those who are interested in pursuing an academic career have to do un-paid jobs and serve a powerful professor, nicknamed *barone*, for a while if they want to get a temporary contract or sit a *concorso*.

Certainly, the problems of Italian science are partly a result of chronic under-investment, but decades of a corrupt political and academic *élite*, exacerbated it. Patronage holds sway and academic appointments are placed in the hands of powerful committees.

The lack of adequate infrastructures, low salaries, *concorsi* and *baronato*, obtuse bureaucracy and the inability of Italy to compete with those countries whose investment in the research sector is a fraction of GDP at least two or three times superior to the Italian one, are some of the reasons why scientists migrate.

In what follows, we will classify them into three main sections.

**The Italian concorso: an optimal tool for the proliferation of corrupted practices**

In general, the Italian labour market is rigid and protects those who already have a job. These features are present also for the highly skilled segment of the labour market and affect mostly young graduates who are searching for their first job. It is difficult for a graduate to find a job after his/her university degree and this can vary according to disciplines. Consequently, more students are forced to get a specialised post-graduate degree. Often this trend creates a non-desirable effect: high-specialised human resources accept less qualified jobs, sometimes part-time or temporary. They follow a pattern of getting unskilled jobs in order to keep going and build up their *curriculum*.

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44 Recently funding from private companies and no-profit organisations such as for example Telethon have increased, particularly to support the medical research sector but still most of the funding are from the Government.


The situation is even more dramatic for those who get a doctorate qualification and cannot find an academic position. Avveduto & Egle Cipollone argue that “research doctors have been considered as a small group...of an elite of graduates...[and it is necessary that they] acquire general competences and flexibility to adapt to different types of work”47. In Italy, graduates decide to take a PhD mainly if they intend to have an academic career. The relevance of doctorate studies for a job outside academia is still debated48. That is why Sacca’ argues, “many of these researchers escape abroad for the lack of adequate career opportunities [...]”49.

The procedure to get a permanent contract at universities and public research bodies, designed to be fair and impersonal (through the system of concorsi), is in practice complex and cumbersome. The concorso is the sole possible route towards a stable career in science which represents the final gratification for a young researcher after years of dependence from an elder academic. For years this “subordinate” young researcher has to help a professor (barone) in his/her academic or administrative duties often without any salary. If the research student is not from a wealthy family, he/she has to live with his/her parents while waiting for a temporary contract and eventually for a concorso. Those who get temporary research contracts are the luckiest among the young scientists. In addition, it is not so easy to pass a concorso. As above explained, the candidate has to go through two written examinations and an interview. The exam papers can cover any areas of a subject, for instance the whole of Physics or of Chemistry etc. If the candidate is for example a theoretical physicist, he/she could nonetheless be asked questions on applied physics. Moreover, the system is biased and there is no guarantee that the best candidate gets the job. It is often the barone who allows his/her disciple to sit the concorso, officially open to everybody. The barone, or somebody who is politically-academically connected with him/her needs to sit in the appointment commission.

In 1998 the Government tried to reform the concorsi procedure. The national concorsi were replaced in the universities with a system that allows individual universities to make their own appointments. However, nepotism is still dominant in academic choices and the baroni control allocation of positions50. As Paul Bompard writes, “Until 1999, national commissions made up of senior academics from different universities filled vacancies in each field countrywide. Posts were often assigned to disciples of those sitting on the commission, or trade-offs for previous favours. After 1999, each university was given responsibility for filling posts, on the assumption that it would lead to the appointment of the best-qualified candidate. But it usually results in the local candidate, with roots in that university, getting the post. The others who take part hope to be rated “suitable but not chosen”. They can then be called to a post at another university without a “concorso”. The suitable candidate is called to a university where he or she has acquired patronage”51.

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Dario Braga, a chemist at the University of Bologna who plea for reforms for more than a decade, says that the advantage of the new system is speed only. "The old concorsi procedures used to take ages to draw conclusions, and the value of speed in Italy should not be underestimated". But he is disappointed that deal-making is still a large part of the process. Appointments at each university are now made by five-member committees, four of whom are elected at the national level by the relevant academic community. These elections are frequently rife with deal-making, the goal being the selection of committee members who will favour the 'right' candidate who are often internal candidates.

**Nepotism and corruption in the academic career path**

Once passed through this intricate iter, the selected young scientist becomes a researcher, the first step of the academic ladder. To be able to progress in his/her career, he/she has to work hard and sustain his/her protector, barone. If the barone is not very powerful, or leave his/her protégés behind, or even if he dies, the young researcher, brilliant as he could be, will not be promoted. Also the barone needs to be supported, because in the Italian universities, the one who gets more votes is in command. The leaders of such a corrupted system have more a political than a scientific mentality. There are some exceptions, but professors who are in such a group are often isolated and do not have “friends”.

In 1961, William Consolazio, an American biologist wrote an article published by Science, about the university customs in Europe. He reported in his paper the result of a year’s stay in Europe. He described this corrupted system in the following terms, “Junior faculty members seeking permanent university appointments tend to cultivate the good will of the institute director and of members of the academic senate rather than to concentrate on scholarly accomplishments. It is the tragedy of many European [he mainly refers to Italian and Southern European] universities that their young people must cater to the powers that be if they are to receive rewards.”

After forty years nothing seems to be changed, on the contrary as Di Giorgio affirms in her book “academic nepotism is further worsened, as often is the case when a non-treated plague gangrenes”.

One of the key informants interviewed in the Mobex project, confirms such a view about the system, “Academic appointments are not fostered at a purely qualitative level. For example, I cannot stand my colleagues who pride themselves with having placed their protégés in key positions. I argue with them saying: if you have

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53 This is confirmed by one of the Mobex key informants, “I have been member of several promotion committees and I had the impression I could decide exactly what I wanted. Unless I had made a mistake in the writing of a minute or something similar that could be contested before the Court, I could have exercised choices being completely free by liability. Academic choices need to be determined on the basis of merit only. Universities have to compete for excellence and if they do not produce the required standard they should close down. In Italy such a system has been debated and it seems not consensually accepted. Competition can be violent in same cases but it is the price to pay if we want to achieve excellence”.
54 Alberoni, F. (20/01/03) Pochi ricercatori in Italia perché l’Università li mortifica, Corriere della sera.
sponsored an incompetent you should be ashamed of yourself; on the contrary, if that person is clever and efficient it is not thanks to you that he/she got that position."57. To make things worse, often young-academics are exploited by mediocre elder scholars. Creative scientists are independent individuals who resist any form of pressure and like pretty much flexibility and freedom. It is unlikely that a brilliant young scientist, subordinate to an older mediocre supervisor, can bear this situation for a long time. As Consolazio reflects, if "the elder scholar happens to be a brilliant individual, the young man may suffer but society and science nevertheless gain. If, on the other hand, the same youth is exploited by mediocrity, everyone loses." He then concludes, "Unfortunately, in any society, mediocrity is more apt to be prevalent than genius".

The system has been challenged several times but with no tangible results. During the mid-1990s, state prosecutor Adelchi D'Ippolito brought 50 cases alleging corrupt practices during concorsi — although none has yet led to a conviction.58

Temporary contracts the new route for an academic career

Such a complex and unfair recruitment system, generally criticised and defined as anachronistic, is being slowly replaced by the introduction of temporary contracts, as an alternative route to the concorsi. Moreover, in recent years, a blockage of all concorsi has followed. Italian science policy has welcomed these contracts as a mean to improve productivity and competitiveness in the scientific sector, although research has not yet shown this to be the case.59 Whilst this trend is common to other European countries such as the UK, their available science resources are several times superior to the Italian ones. However, even in the UK, such a trend is not necessarily positive.

As several studies have shown, the financial instability of those researchers having temporary contracts generally jeopardise the quality of research outcomes.60 A study of temporary research staff employed in the National Research Council has proved how these employees suffer rivalry and competitiveness by other colleagues in the same position and their productivity decreases towards the end of their contracts.61 Most of them, although complaining about their low salary, have not changed job, and this confirms the fact that these temporary contracts are now replacing the old recruitment form based on permanent contracts. In addition, these are persons who are particularly motivated and have decided to work in the research sector as a specific choice of life. Most of them argue that their precarious conditions exacerbate their personal choices, for example maternity or paternity.62 For those who actually have been forced to abandon the public research market it has been difficult or impossible to find another job in the private sector. In Italy a research market outside the public research sector does not exist.

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57 Interview with one of the Mobex key informants.
The Government has tried to promote industrial research and, introducing the higher education reform, to create a young class of graduates attractive to industries. The new scientific policy closely follows the liberal orientation of the present Government which is above-all protecting the interests of the entrepreneurial class. The 2002 National Research Plan is focused on creating networks between research councils, industries and universities to boost economy, leaving some limited space to “free” research interests. In it there is no reference to the brain drain phenomenon or any real policy to attract back Italian scientists.

In addition to what has been said before, the Government in 2003 has blocked all the concorsi in the universities and research institutes. As a consequence of that, in December 2002, all rectors in Italy presented en-block dismissals and for about a month Italian universities had no leadership. In the current year, if universities are not allowed to hire new academic staff, frightening consequences will arise. The average age of academic staff in Italy is fairly high, and such a measure have a clear worsening effect on this phenomenon. According to Sveva Avveduto, who researches science and education policy at CNR, the population of active scientists is now quite old, with about 30% expected to retire by 2005. To keep numbers steady, universities should be producing 12,000 new researchers every year instead of the current 4,000. On top of this, several hundred scientists leave the country each year, and the chances that they will return are slim. Academics are characterised by an international mobility, which is higher than any other professionals. Therefore such a blockage even if temporary, is expected to produce permanent boomerang effect on the already unhealthy Italian universities.

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63 Linee Guida per la Politica Scientifica e Tecnologica del Governo, Supra footnote no. 12.


**MOBEX empirical findings**

In the second part of this paper we have thoroughly analysed the main reasons for the Italian brain drain, as reported by the media, various scholars and writers. In this third part it will be shown that these issues are mostly confirmed by our respondents, mainly as a perception of the problem, due to influences from the public opinion or to personal experiences.

As described above, we can single out two main sources of difficulty in the setting up of a healthy scientific research system in Italy; they are essentially the distrust the Italian political leadership generally has for science as a useful enterprise for society, and the corrupted academic system. These two arguments are related to each other and can be sub-divided into smaller topics, like the inefficient and impenetrable recruitment system and the sluggish career progression, the chronic lack of public and private investments, and the feudal structure of research groups.

**Perception of the brain drain problem**

We tried to investigate the perception of the fellows interviewed in the Mobex project about the increasing number of academics moving from Italy, mainly to the UK. Our aim was to understand if some of the language used, such as brain drain, was shared by them and if they felt this exodus had an impact first on them and secondly on Italy.

In general there was nearly unanimous consensus to the acknowledgment of the phenomenon as a real one. Only one interviewee suggested that there was no drain of skilled resources from Italy at all. Quoting from some of the interviews:

*I think it's a true problem, it's not propaganda. I think it's mostly a mental problem. Broadly speaking there is not enough funding for research and that causes all the problems.* [F]

*There has been a huge opinion movement on the "brain drain" in Italy. Hundreds of articles, broadcasts and so on. The result is that the mafia-led Italian universities cling even more to their old habits and the current Minister of Education is unable to cope with this.* [M]

*I think it is a brain drain because it would be very positive if it was mobility into directions but once you have specialised abroad and once you have built up a good CV you are not necessarily offered anything in your country of origin, you have lost your contacts and you simply don't want to go back. You realise that reality could be different, you could work better abroad so you do not want to go back.* [F]

* [...] the problem is when you are forced to do it or when you are forced to stay abroad, that's different. It's different from moving to learn and then going home.* [M]

*I really do hope Italy will change the way it is allowing research at present, otherwise the mobility started at the beginning of the last century will be a never ending story.*

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66 The references in brackets at the end of the quotes indicate the gender of the respondents (M=male and F=female)
Mobility would have to be intended as temporary and just to improve personal skills when back to Italy and not as it is at present, i.e., a forced choice in order to be allowed to do research. [F]

[...]] if I think about my sixth form mates half of them are living abroad and they are all kind of having high profile jobs obtained by getting qualifications, a PhD or Masters or post-doctoral or whatever abroad in high profile institutions and whoever is left either couldn't leave in the first place for family reasons or because they just didn't want to risk anything and preferred to stay home but they are not running that's for sure. Again in my class in my environment there is a definite brain drain. [F]

I think it's not as drastic as probably it is a strong term, it is strong language. Maybe the Italian scientists, they go abroad so they have more impact because they start to work in an international community with international standards. Linking to what I was saying before that they learn what each word is, they learn the language and so on and it is possible that there is an equal number of brains that are not drained from Italy, just stayed there, that is much under-valued. [M]

From the quotes above-listed we can conclude that some of the fellows are concerned about the fact that they were forced to migrate and that was a forced choice. This has some implications on the impact of migration in their personal lives. The impact on Italy as sending country has been mentioned by some of them in the following quotes:

Well Italy is losing a lot, I really think Italy is losing a lot. I'm not saying it's losing the best but for sure it's not offering enough opportunity to people to stay in Italy to retain their position or to gain position in Italy. [F]

I think that scientific mobility, at its current stage, has mainly a negative impact on research in Italy. There is evidence of an increasing outflow of researchers due to poor funding, over bureaucratic procedures and lack of recognition of young researchers. Recent and possibly future reforms do not seem to compensate for these problems and research environments in many other European countries are much more favourable. [F]

1) Italy has lost and will keep losing some of its most promising graduates 2) The UK is getting some of the best Italian graduates who are willing to relocate for at least 3 years if not more. 3) In a few cases scientific collaborations have been or could be set up between the UK and Italy. 4) Scientific research in Italy might not be getting any better if some of the best people keep moving abroad. [F]

They do go back in the end but it's not the same, there is a problem. If they leave there is a problem otherwise they wouldn't and when they go back it's always when they say okay I've had enough staying abroad, it's not because of the place that they were is bad, it's sometimes just missing home and wanting to be back to normality somehow. [M]

The corrupted and bureaucratic system.
Corruption, mainly in public research institutions, has very often been advocated as one of the main reasons for skilled migrations abroad. It is very recent the news of the arrest of a big number of staff and students of the Department of Law at university
“La Sapienza” in Rome, accused of having set up a system for passing examination by paying a small bribe\textsuperscript{67}; this would imply that the problem is far from being solved. When it comes to topics on corruption, our interviewees speak with one voice:

*It is because it's very important to know the right people that can either help you. [...] In Italy sometimes you get jobs basically because you are the son of the director of the bank. [F]*

*[Italian research] should be more competitive [...] The position should be down to the person who deserves it and not because you know people or because it's a friend or something like this. It shouldn't be politicised at all. [F]*

*I think there are some very good Italian researchers but still in Italy the way the university works the conditions are just not there. [F]*

*Oh yes, obviously because even if he or she is admitted in the system it's not so nice to be in a system which maybe yes they admitted you because you are good but the good ones and then you constantly see people becoming part of the Faculty without any qualifications and this is disturbing. [M]*

*It's very hard for Italians really to have positions in most cases you need to have a sort of political connection, someone pushing for you, someone powerful so that's one of the reasons why there are lots of Italians academics. [M]*

*Make the Italian job market fairer (an example: make university positions available to people who are qualified but don't have any friends in high places, or pre-existing strong ties with the institution in question). [F]*

On the bureaucracy side, the Government has set things moving with the reduction, for instance, of the 330 institutes to 100 only at the CNR. But there is no unanimous consensus from the Italian scientific community on the manoeuvre, and things are still proceeding slowly\textsuperscript{68}. Bureaucracy is one of the many things stuffed into migrated skilled workers’ luggages; we find, for instance, declarations like these:

*Researchers who remain in Italy tend to get disenchanted and demotivated. They tend to give the priority to academic politics, bureaucracy, administrative duties and hunt for research funding, as this provides more opportunities for career improvement. Hence, even good researchers who stay in Italy become less and less productive over time. [M]*

*That's the same problem with Germany [...] In Italy a lot of people come across in their thirties and still being told what to do so we are different to other senior scientists. [M]*

*Researchers are generally willing to go back to Italy to carry on their studies back home. Conditions need, though, to change drastically:*

*Scientifically, I think I would return to Italy only if the situation at universities and research institutions changed dramatically. However, from a personal point of view, I am missing Italy, my family and my friends quite a lot and it is not completely excluded that in the long term that could become a reason strong enough for me to return. [F]*


\textsuperscript{68} See footnote no. 28.
Make the prospect of coming back to Italy after years abroad after postgraduate experience) both appealing and worthwhile. Make PhDs in Italy more appealing, both financially and, more than anything else, academically (good research projects). Invest in research (the Government should intervene, at least at the beginning, to set up laboratories with sound research facilities and funding: good research ideas exist in Italy, but often there is no money to start them up) [F]

If more and more people leave Italy for research reason will give the chance to form a new generation of scientists far from the corrupted mentality of the Italian academic system [M]

But even recent attempts by the Government to invert brain drain flow, are not 100% trusted:

The Italian government offered huge benefits for those universities wishing to catch back the lost "brains": Well, most universities said "no" even to free and big government money, in order to avoid hiring some good people. Worse than Mafia, if you offer money to Mafia they normally say "yes". Some bullets spared! We should put an end. Now we go against the Italian reputation. [M]

The inefficient and impenetrable recruitment system and the sluggish career progression
Most of the interviewed people, probably the totality of them, has faced the difficulty of getting a job or a promotion within academy or research councils. Very often the failed admittance to one of these jobs was the determining factor in taking the decision to migrate abroad. We felt that this topic was very much shared among all researchers in our sample:

If Italy has any interest in retaining its scientists, it should rework the foundations of its academia, starting from admission procedures to University: I am not optimistic in the short term; in the long term generations things will eventually change, but it will take a change of mentality: forcing policies on people would not work (as Italian history shows) [M]

[...] You should change the professional mentality of people, which probably will happen in a few generations, I mean it will take time so it is possible but it is difficult. First of all in medicine they should drastically reduce the number of graduates, they have done it to an extent in the last 15 years but they should continue but also further decrease the number of students, that is the first thing. The second thing is be more selective in allowing people into universities and these are the main things. [M]

First of all I think this idea of a public competition should be changed completely just because this is just a way for people who actually decide about new jobs and new opportunities to say this is not our responsibility. It's written over there so he's the winner because of the rules. You should give responsibility to the people who actually choose and this is the very first important change in Italy. In that case everything would change because you would be responsible for the choices you do, you can even choose anybody in the world with any particular background because it fits with your research programmes. At the end you will have to testify your decisions and show that they were appropriate. [M]

I believe that the quality of research in Italy will gradually degrade to a low-standard level. This will happen in first instance because of the selection process, which is very seldom based on merit. [F]
Also career progression was recognized to put a strong limit to researchers’ willingness to carry on their activity within one institution. Very often good-quality work cannot be continued because, either for lack of funding or for bad planning, a successive position has not been created for the researcher. Age limits make the situation even worst:

*Oh yes, obviously because even if he or she is admitted in the system it's not so nice to be in a system which maybe yes they admitted you because you are good but the good ones and then you constantly see people becoming part of the Faculty without any qualifications and this is disturbing.* [M]

*Sometimes even if you are inside you don't get any offers, that's why sometimes it happens that you move out because ......at the end of the PhD ...[there was no] great offer anyway ....if you go abroad and then you come back after 6 months the situation isn't changed so you can't find anything but you couldn't find even if you were there. When you go abroad you probably have bigger expectations when you go back you are inevitably disappointed* [F]

*I think that the Italian academic system should change completely. For example, for the "contratti di ricerca" to become an attractive alternative to post-doc positions abroad, they should be better paid and have a higher profile, suitable for professional researchers (at present post-doc are treated like student grant-holder and, for example, there are no provisions for paid maternity leave). A scale should be established in order to make it possible to distinguish, both in terms of salary and of responsibilities, between a newly graduated and an experienced researcher. The distribution of positions, especially the permanent ones, should be based on truly objective criteria, and not on the personal preferences of few senior researchers/professors, who often privilege young researchers without initiative because they are much easier to control than intellectually more independent ones. Mobility of students/post-docs between different institutions should be recommended, if not made compulsory.* [F]

*The fact that the research is mostly done by these temporary positions like post-docs the problem is that a lot of people leave the field and that's very bad. I would most probably leave the field unless I found a permanent job very soon because I'm almost 40 years old and after 40 years old it's very difficult if not impossible to find a post-doc position unless you go to the United States and so probably the field completely so I will take with me all this experience that I have developed through all these years and nobody will ever have that experience and I will not transmit experience to anybody else, I didn't have time to form a group because I keep moving from one place to the other and I've seen a lot of people like where they have done some good piece of research but then they left astronomy completely.* [M]

*Overall we found people moved out because of a general perception of scarcity of jobs in scientific research:*

*...Italy is loosing many researchers since not many are going back due to lack of opportunities and job conditions. It is not a balanced exchange.* [F]

*Italy is spending money for educating postgraduate students to research, but many of them leave Italy when they become productive, as they are not given adequate job opportunities. Thus, Italy is bearing a cost for preparing researchers, whereas other countries (especially US and UK) are exploiting their production afterwards.* [M]
The number of jobs in science in Italy is to my opinion really low, I am not saying that there should be no competition, science is also based on competition but in our case the rate is very low. [M]

[...] people find it difficult to get a job in academia or research institutes so there is probably an excess supply on one side but on the other side there are universities with huge classes, like they use cinema theatres and I wonder whether if they let fewer people in they could avoid this situation? [F]

...Another issue is about salaries which are very low for research in general. Salaries are an important issue but it is not probably the most important issue. [M]

The reason why some friends of mine left was because there were no salaries at all [F]

It's really difficult to find a job and the people who want to stay quite often stay in the labs 1 or 2 years without any salary or with a minimal you know really really small money and you cannot afford to live. That is blocking the mobility also inside in Italy because you don't have enough money to want to live on your own. You can afford it if you are living with your parents actually. [F]

I think that scientists will go back to Italy if they can get a job comparable, in terms of money and access to resources, to their job abroad. [F]

Even in those cases where a job was secured, the working environment and the conditions in which research was being carried out, played a negative role. With such working conditions Italy cannot hope to attract brains from abroad:

[...] the working conditions in Italy are sometimes so frustrating and the salaries so low that research institutions fail to attract those who have been abroad. [F]

The quality of the jobs is the main reason for me to stay away from Italy. [F]

Worthy Italian and foreign scientists should be integrated in the Italian job market, by creating jobs, careers and working environments of international quality. Functional structures, relief from bureaucracy, reliability of personnel and funds would make of Italy a dream place to work. [F]

The chronic lack of public and private investments

We have seen how the ruling class in Italy has always had an ambiguous attitude towards scientific research. Most of the politicians think that public spending needs to be kept to a minimum when it comes to scientific research funding. Politicians have a general lack of trust in the power science has to affect people lives, at least in the immediate future. Rather, it is more useful to invest money in ready products that can be bought from private companies or foreign countries. This approach has been, we believe, influenced by the higher position in Italian culture of humanities as compared to sciences, a classification of knowledge which dated back, as seen, to the beginning of the 20th century.

Our interviewees had in general the perception that the Government is not very keen in public funding of scientific research, although we are not quite sure how much is known of the vicissitudes Italian science had to undergo during the sixties. On this widespread perception we find, for example the following quotations:
The system is like this, and as unchangeable as the second principle of thermodynamics. After all, if good Italian brains stay abroad, it is a good thing for not-Italian dept. and research units. Italy is a great place for holidays. [M]

I think research is not a priority. My feeling is that for example you need to have a working democracy in order for the government to make decision which are in the interest of the whole country. Italy is now one of the worst countries it must be even worse than Greece or Portugal in that sense. [F]

Research in Italy is not taken into proper account, researchers have a ridiculous salary… Italy does not invest enough in research, and almost nothing in those fields from which there is no immediate money back [F]

It is a problem but the government is not interested at all. In fact they are cutting money for research. They are forcing people to leave. [M]

I think there’s a recognised problem over the lack of funding and if you don’t pay people there’s no jobs. [M]

The government should allocate more funds to research. Fixed term appointments, tenable only if a person has delivered good quality science should increase the number of jobs available and improve the scientific output. [F]

For some reason politicians are probably people in Italy who believe that universities are very efficient anyway so if you cut money in a university they will arrange themselves in a different way, it's ridiculous because I think there is a problem essentially. [F]

My personal experience across Italy, France and UK, shows me that scientific research in Italy is more difficult than in other countries. The main reason is probably to be found in the low level of funding of research in Italy, one of the lowest in the entire EU. [F]

We also found some feeling that Italian background culture does not favour a proper environment for scientific research:

Italy should also change its attitude towards scientific research. From the economic point of view, it should promote initiatives also to create a new culture in which research is considered essential for development. [M]

[...] You should change the professional mentality of people, which probably will happen in a few generations, I mean it will take time so it is possible but it is difficult. [M]

My feeling is that in general research in our country is not considered as it should. I am concerned about that because we cannot talk anymore only as a country, but as a part of Europe. We don't really have too much of a future in research, in this country [M]

I think that the countries that manage to attract not the most but the best researchers will have an advantage. This attraction depends on factors that go beyond the academic environment (which is still very important) and certainly involve the cultural aspects of a country. As far as the academic environment in particular is concerned, not only should it be characterised by high research standards but it should also provide support services for the researchers’ (not only strictly academic) needs. In this respect it is too inappropriately general to talk about Italy and the UK as a whole. I am sure that there are large differences
between universities within one country. On the other hand, as far as the cultural aspects are concerned it is easier to talk about the country as a whole, and I can see many reasons why somebody might be put off by some Italian cultural aspects. [M]

To conclude, there were in general also considerations on the involvement of industries in the research arena, as well as the impression that public and private research should be interlaced:

There should also be more connections between governmental agencies, private firms and the academia, as I think that the academia in Italy is too isolated from the "real world". [F]

So what Italian government should do is to build infrastructures for researchers then we can actually deal with trying to find the money between the charities and the people but what we need is infrastructures to create opportunities for people to go to Italy and work there. [M]

Obviously it is a problem of money. [...] There is no money at the university from the Government or from industries and things like that [...] [M]

The feudal structure of research groups
We have previously described the feudal-like Italian university system, where a barone professor sets up his/her research group in a highly structured way, where only seniority and nepotism matter, while researchers’ merits are left behind. Although in the interviews carried out the term barone has not explicitly been mentioned, the following descriptions, where sometimes this unofficial, internal practice is indicated as a “law”, leave no doubt to what migrated researchers are referring to. It is even stated that skilled migrations abroad are welcomed by most professors in order to weaken the pressure on this baronato system.

A genuinely free circulation of human capital and ideas is the real key to effective scientific research. If realised, it greatly reduces the infamous practice (very common in Italy) of privileging someone less competent over someone better qualified, only because the former has been working in the same group for ages. [F]

The law is that if you want the job you’ve got to be there and do what the professor tells you and wait and wait and wait. [M]

I feel that the Italian academic system does not mind too much the "escape" of researchers, as this helps maintaining a stable "power" situation. It is a static system, where innovation is feared because it might lead to a loss of privileges. [M]

The feudal-like academic system is sensed by Italian researchers abroad as something to be constantly taken into account in one’s plans to return working at home. Very often, in fact, researchers who migrated to foreign universities, remain in contact with their old supervisors at home or, even, build new contacts, aware that they will need allied to go back to Italian research. The following couple of quotes, neatly describe these perceptions:

[...] In Italy there is already a system based on the old time Italian University: too much politics, too much power too much hierarchy so every Italian scientist who has worked in very good scientific environment abroad would hardly feel comfortable when back in the Italian scientific community. [M]
But the main point is that there are so many people there waiting to become permanent that these people have the priority. [M]

As it is now, the Italian system makes it very difficult for experienced researchers, who have been working abroad, to bring their valuable experience back to Italy, in particular if they have not maintained good links with the right persons at the institution of origin. Unlike any other country I am aware of, in Italy a researcher is most often penalised if he/she has been working abroad for a few years. [F]

**Will brain drain ever be turned back into a brain exchange?**

The Government is trying to turn the brain drain into a gain. The so-called operation ‘brain buster’, launched by the MIUR (with the law DM 26/01/2001) aimed to attract back Italian scientists and/or foreign academics working in the research sector abroad. In 2003 (DM 20/3/2003) the Government allocated some resources to call back some of those brains researching abroad. Following such operation, at present 96 researchers have moved back to Italy. The candidates willing to work in an Italian university are selected through the *chiamata diretta* system and not through the usual *concorsi* procedure. The programme is addressed to scholars of any nationality holding a PhD qualification in any discipline or equivalent experience and residing abroad from at least three years. Contracts are temporary and they last a minimum of two years and a maximum of four years. Scholars can apply directly to the universities they are in contact with, to the CRUI (Italian Rectors’ Conference), which will identify an interested university, or directly to the Evaluation Committee of the MIUR. Universities then have to apply to the MIUR. Through an academic senate deliberation, they call a researcher back, co-fund (10% of all the costs of his/her research programme), and provide him/her with facilities and resources to allow the research to be carried out.

We have asked our respondents if they were aware of any policy of the Italian Government to attract brains back to Italy. In general, they express some doubts about the programme ‘brain buster’. The main reasons they advocated were: short-term appointments and transparency of the system. Some of them were aware about this new programme, while others did not know about it or were sceptical and express their views in a critical fashion.

I doubt that this exists in Italy. [M]

We heard about something but we never took it very seriously because it's the sort of things that governors say just to make images of themselves but it's nothing. [F]

It's not really something that is advertised. No-one's saying 'If you want to come back this is the ideal opportunity.'[M]

These schemes seem very interesting for British people that want to go to Italy or any other foreigner that wants to go to Italy and have an experience in Italy, they are very good for those. [F]

I've heard of this plan that the in the government paid for researchers to go back to universities. I don't know exactly what you need to do, I think you need to write research project and it has to be agreed by the university and the government. [F]
What I know is there is some bursary under a programme called 'Brain Drain' which I think are financed by the Italian Ministry for Education and University. However, I am a bit sceptical that this measure can help because essentially this measure as far as I understand it, result in the fact that you need a professor to be in charge of the project and the professor signals you as an incoming researcher so that you can get a three year temporary contract, which is not a measure I would accept both in terms of money and the support that you get. In the Italian environment at whichever university you are, if you come from outside and you have been alone, you will be faced with a very difficult situation. So, essentially this measure can only help in my opinion researchers who have been sent by a professor abroad to specialise in something and then who are called back by the same professor so they are still working within the same group and there are using, they have been paid by different funding. [M]

Emergency measures, like those recently discussed in the media of making a few researchers return to Italy with an "ad hoc" short-term solution, will not stop the brain drain process in act and can hardly be taken seriously. Even more so if at the same time funds for research are cut to risible levels and key research institutions, not productive enough according to the current business-oriented mantra, are threatened to be dismantled overnight. [F]

The Italian government offered huge benefits for those universities wishing to catch back the lost "brains". Well, most universities said "no" even to free and big government money, in order to avoid hiring some good people. Worse than Mafia, if you offer money to Mafia they normally say "yes". Some bullets spared! We should put an end. Now we go against the Italian reputation. [M]

Some of them did not take into any serious consideration the actual commitment of the Government in this area and call for a specific policy to attract back scientists, especially those who have been particularly brilliant. One suggestion is to involve the European Community to balance scientific growth promoting the return of scientists back to their country of origin.

We should have back the brains especially in science they are doing well, they are going prestige, [and] the last Nobel Prize winner [in physics] was born in Genova. [M]

[Policy to attract back academics] listed in order of relevance according to my opinion
1. An objective research assessment system (e.g. ISI impact factor, etc.) which will determine the level of funding for institutions (as the RAE in the UK)
2. A reform of the academic decision system: now it is a self-assessing system, governed by the full professors lobby. This is especially negative when resource are scarce, as they are now. Decision-makers should be not directly interested parties, but they should have management and financial responsibilities.
3. A complete reform of the recruiting system: e.g. direct responsibility given to heads of departments, without the "farce" of competitions.
4. A change in the research funding system: no more little money to all researchers, but more money to those who prove to be productive. [M]
To fully delegate the return of researchers within EU to their original country... a Central Authority in the frame of The European Union, [should be appointed] with a specific policy to avoid the concentration of researchers in only some countries (UK and France) [F]

In addition to the “brain buster” operation, there are isolated and sporadic initiatives promoted by local authorities and private companies. Among others we can mention some temporary contracts available to young researchers who wish to pursue a research project in a company based in Piedmont and small grants for training-courses, conferences, workshops\textsuperscript{69}. Moreover, Telethon has sponsored some researchers (about 20 up to now) resident abroad and willing to go back to Italy\textsuperscript{70}.

\textsuperscript{70} (2003) \textit{Ricerca: Dulbecco, non e’ fuga ma rigetto di cervelli} 31 marzo 2003, AGI, Press Review.
Conclusions

It has always been usual for scientists to pay a few visits to foreign laboratories in order to get skills and methodologies which are difficult to acquire at home. Scientific communication and exchange across different national and international laboratories has never ceased to be a common practice of any scientific community. But such a positive exchange of skills and information has never the effect of reducing the cultural wealth of a country. We started this research already with the feeling that a brain drain in scientific research was being unfolded in Italy. Personal experiences, several articles on Italian and British newspapers, and TV programmes have slowly built what we can consider the main motivation behind this paper, a curiosity to see whether this phenomenon, which we have been part of, could be investigated systematically, using some sort of technical tool. Beside the traditional research carried out in newspapers, books and on the internet, we have greatly benefited from the Mobex interviews because, apart from giving to our investigation a strong qualitative support, it puts us in touch with the very fabric of the Italian brain drain, i.e. with the brain itself, the community of Italian researchers forced for various reasons to migrate abroad.

This paper does not claim any new original contribution to previous findings on the same topic; but we feel we have, for the first time, assembled various aspects of the problem in one overall work and, what is more important, have related them with the perception researchers have of the issue. Our hope is that this work will be used in future as a guiding map in the meandering territory of brain drain research.

It has been a surprise for us to discover that Italian research reached levels of excellence during the fifties, to such a degree as to attract scientists from abroad. This brain exchange mode has, in the course of the following years, been turned into scientific migration which, up to these days, has assumed the distinguishing features of a brain drain. While fundamentally unanimous consensus was given in the interviews to the recognition of a brain drain going on in Italy at present, we have found no indications that the interviewees knew of the brilliant scientific achievements the Country endured during the fifties, let alone the dramatic atmosphere of witch hunting arisen during the Ippolito and Marotta trials. It is easy to speculate on the reasons of such a lack of information, if we look at the relatively young age (30 to 40 years) of the Mobex respondents. The above mentioned trials happened forty years ago, very often when the interviewed people were not even born. But after the recent publication of several books and articles on the subject, we are sure more awareness will be circulated among the Italian scientists.

In this paper we attempted to reduce the causes of Italian brain drain to two large rationales. The first is related to the attitude Italian politicians have towards scientific research; under a mainly humanistic education, the average politician believes that science cannot have an immediate, useful effect on society, and that, consequently, most of the scientific research does not deserve to be funded by the Government. The second concerns the academic system and the academic community, seen as a place where nepotism, bureaucracy and corruption hold sway. These two hypothesis are correlated; a certain degree of nepotism and corruption was certainly favoured by the tight finances the scientific academic community was forced to administrate, given that Government funding has never been very generous.
All interviewed people were very conscious of the lack of funding from the State as the main reason for the Italian brain drain. Indeed, many of the respondents were forced to migrate in order to find a job, better salaries, and better laboratory equipments. The totality of them recognized that the public funding to scientific research was still a very controversial problem, one very difficult to solve. On the corruption side, we found again a general agreement on the belief that universities are under the hidden direction of the baroni and the occult influence of politicians looking for illicit connections. It is very difficult to find solid ground for declarations like these, given the elusive nature of secretive and unofficial agreements. But investigations like the one carried forward by Adelchi D’Ippolito\textsuperscript{71}, or the more recent bribed exams at “La Sapienza” university in Rome\textsuperscript{72}, are sufficient to justify the migrants statements.

The attempts made recently by the Government to arrest migrations of skilled academics abroad (“brain buster”), as well as the large space allocated by the Italian press to brain drain articles, have never been as intense as in recent years. Time seems to be ripe for researching a valid solution to this problem. The interviewed migrants do not seem to trust very much any Governmental solution; for the time being most of them prefer to remain abroad. We have to admit, though, that public opinion pressure is playing a decisive role in changing the Government attitude towards the problem. More and more articles and books are written in Italy by scientists trying to show the benefits and the inevitability of scientific research in modern society. We feel that some decisive lines of action could be taken by the next governments on this topic and on the more general issue of scientific research.

To conclude, we would like to add a couple of points which have emerged by the interviews and that have been not reported previously. The first point concerns the role played by the language in the choice of the USA and the UK as principal targets of the Italian migration. Several respondents considered the possibility of improving the knowledge of English as a bonus to the research period spent abroad. This has not been a decisive factor, though, because English is the main language spoken in laboratories throughout the world. Basically, a migrant researcher is going to improve his/her level of English even researching in countries different from USA and UK. The second, and more interesting point, has emerged as a possible feature of modern-time migrations. It is more and more common for academic researchers working in Italy to send their “pupils” to spend long periods abroad, while waiting for a position to become available at their research centres. Although at present these young researchers are considered by the press to be part of the brain drain phenomenon, it would be more appropriate to collocate them among the restricted and luckiest group of migrants destined to return home. Some of the migrants not belonging to this category expressed their worries on this new trend in Italian migrations. One of the hopes migrant scientists have of returning back to Italy as permanent researchers or professors, is that, having acquired strong skills abroad, makes them appealing to the university market. If now the barone professors start sending their own protégés to acquire skills abroad, this exclusivity is going to be lost. We can look at this possibility as the next evolutionary step that would allow the barone system to

\textsuperscript{71} See Supra footnote 43.
\textsuperscript{72} See Supra footnote 57.
survive future changes. It is certainly interesting to deepen this aspect of modern brain drain.
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