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BRAIN DRAIN, BRAIN EXCHANGE AND BRAIN CIRCULATION. THE CASE OF ITALY VIEWED FROM A GLOBAL PERSPECTIVE.

National interest
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EXECUTIVE SUMMARY

A pressing and frequently-debated issue in Italy is that of "brain drain", understood as the country's loss of highly-skilled human capital together with a simultaneous lack of "brain circulation", that is, the flow of talent to and from Italy and the important benefits which that would entail for the country. This Report, compiled by Italian professionals working abroad, aims to make a definitive contribution to the debate. As well as offering an analysis of the causes of the brain drain and the lack of brain circulation, it examines tools that could facilitate the necessary transition from the former phenomenon to the latter. The study also identifies Italian and foreign models of excellence, and offers concrete proposals that should form part of a full-scale policy initiative geared towards resolving a longstanding problem that has both immediate and long-range consequences for our country.

The challenge
Italy is facing a twofold challenge: on the one hand, an alarming increase in the skill level of human capital exiting the country's economic system, particularly the veritable diaspora of scientifically- and technologically-skilled personnel, resulting in the erosion of national competitiveness. On the other hand, there is the Italian system's poor ability to attract skilled human capital from the rest of the world. A loss of Italian talent, combined with an inability to attract foreign "brains", heavily penalizes the country in the context of a globalized world that increasingly competes on the basis of knowledge and innovation.

The policies adopted
The policies instituted to date by the Italian government, as well as by the private sector, aimed at reversing outward flows or attracting highly-skilled individuals to Italy have been inadequate. The main shortcoming of these policies has been that they have taken the form of low-key and often uncoordinated initiatives. Decisive policy measures to manage flows and an interdisciplinary approach towards studying the phenomenon and taking effective steps are therefore essential. In concrete terms, there are various measures that could be taken to curb the brain drain and, instead, favor brain circulation. Some of these, used also by several countries that are more advanced in promoting brain circulation, are illustrated here in order to provide models from which inspiration may be drawn.

What is proposed
In order to reverse the negative phenomenon Italy is undergoing and to promote brain circulation in our country, a decisively ambitious policy and targeted and well-coordinated measures must be adopted. We therefore propose the establishment of a task force charged, in close consultation with the Italian government, with the role of formulating – on the basis of this Report – a roadmap with concrete proposals whose costs and cost-effectiveness should be gauged, and which should capable of implementation as soon as possible, from as early as 2012.

In particular, this Report recommends measures that could immediately facilitate the attraction of foreign brainpower and encourage the return of Italian talent. University reform, targeted investment in scientific research and more substantial collaboration between the public and private sectors are the prerequisites for the sort of economic growth that would – with the support of public authorities – link the universities to the productive and social fabric of their local areas, made up of public and above all private operators.

The concrete proposals are aimed at two levels: (i) government authorities; and (ii) universities and other research centers.

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(i) In terms of **government authorities**, five main areas of action are proposed: investment in research on par with that of other major economies; clear-cut policy choices that promote brain circulation; the adoption of models apt to encourage study and specialization abroad, and a subsequent return to Italy; the establishment of public-private partnerships; and the facilitation of entry visa procedures for foreign researchers and talent.

(ii) In terms of **universities and other public and private research centers**, the work to be done is extensive and should form part of an earnest reform of the university system. There are at least nine main areas of action proposed: an overhaul of competitive exams for academic posts; the establishment of PhD courses in line with modern and competitive criteria; the delocalization abroad of periods of university and postgraduate study; the creation of academic centers of excellence; a shake-up of research funding; the conduct of university courses in English and the internationalization of curricula; the optimization of remuneration packages; mandatory retirement at age 65 in respect of all managerial roles performed by university academics, with a view to facilitating renewal; and the establishment of exchange programs.

In conclusion, in order to bring about a reversal in trend, and sow the seeds for a systemic transition from a phenomenon of brain drain to brain circulation, there is a need for resolve and investment on the part of government authorities, civil society and business operators. In this Report, we have put forward some concrete proposals aimed at facilitating this turnaround in trend in the academic sphere.

Regulatory simplification, autonomy, internationalized curricula, centers of excellence, and meritocracy: these are the watchwords of this sea change, which must necessarily involve public authorities, universities and businesses, but above all, those among the younger generations, since the verdict as to whether it has been a success or a failure will ultimately be theirs.

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INTRODUCTION

This work provides a critical overview of the vast body of literature on migration and mobility of highly-skilled persons, commonly referred to as brain drain. It should be noted that the phenomenon has taken on different connotations over time, which is testament to its fluid nature. The perspective which has dominated the literature is the nationalist or standard view, which tends not only to describe the phenomenon but also to characterize it negatively as regards the countries from which these flows originate. Subsequent studies have shown that the migration of skilled individuals does not always have negative effects, and have suggested if not abandoning the standard view then significantly expanding its horizons by taking into account that these flows may not be unidirectional between countries, that the effects of the phenomenon may vary according to the profession profiles analyzed, and that the underlying mechanisms may need to be understood better. Unfortunately, many of today's policy choices fail to take into consideration these new findings, which would help to avoid the pursuit of ideological dead-ends and to opt for tools adapted to the economic situation in which highly-skilled migration takes place today.

This Report is comprised of five sections: Section 1 provides a brief rundown of the major shifts in the international economic landscape that have resulted in profound changes in labor markets. This section also contains some useful definitions, which, instead of being placed at the end of the section dealing with the literature on this subject, are set out in advance in order to help readers find their bearings within this vast topic.

The second section describes the brain drain phenomenon in line with the two most common approaches in the literature – the nationalist or standard view approach and the internationalist approach (in which the movement of skilled persons is considered in terms of global development, see Section 2.1) – and looking at them through the lens of different disciplines: firstly, from the point of view of economics (Section 2.2), which looks at the effects of the phenomenon in terms of "loss" and "gain" for a country; and secondly, by considering the sociological aspects, which enrich the debate by acknowledging the differentiated effects of the phenomenon according to the professional profiles considered (section 2.3). Section 2.4 provides data which brings the prevailing perspective up-to-date, debunking certain stereotypical views and citing positive effects of migration flows for countries both of origin and destination, from a "circulationist" standpoint.

These benefits are, however, mainly due to policy choices of countries rather than to profound changes in migration habits (as is shown in Sections 3 and 4).

Section 5 aims to explain the situation in Italy, where the phenomenon is particularly glaring. A classical reading will be given of the brain drain, that is, focusing on the costs to our country stemming from the emigration of talented people. We will then see how, when the issue is viewed from a more modern (or "circulationist") perspective, our country fits into a regular flow of exchange and circulation of professionals and students between countries. The emphasis is thus not only placed on brain drain, but also – and above all – on brain exchange and brain circulation.

This will lead into, firstly, an examination of whether the policy initiatives undertaken thus far are consistent with the available data, by discussing, for instance, whether and how the resources that Italian nationals abroad constitute are incentivized and utilized (Section 6), and then, to the formulation of policy recommendations (where necessary) with a view both to promoting the return of Italians from abroad and to making Italy more appealing to foreign talent (Section 7).

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1 DEFINITION OF SOME CONCEPTS

By the term brain drain, what is intended is the phenomenon of abandonment of a country in favor of another by professionals or people with a high level of education, generally following an offer of better pay or living conditions (Grubel, 1994), as well as improved conditions for conducting one's professional activities.

This definition, although clear, does not capture the complexity of a phenomenon that has been the subject of studies since the late 1960s and which has now come to the fore, having taken on additional facets and assumed considerable proportions by dint of globalization. For this reason, the first part of this Report will provide some useful definitions for finding one's bearings within this vast and complex field. We will see that the issue of the effects of brain drain has long been the subject of economics literature; this is because, especially according to endogenous theories of growth, the endowment of skilled human capital is one of the determinants of the economic growth and development of a country (Romer, 2001). It will become apparent that migration of skilled persons, within the broader framework of the mobility of workers, is a topic which is not only linked to social aspects, but also to those of an economic and/or professional nature. It is no coincidence that the term "war for talent" has recently emerged, referring to the contest for skilled human capital being fought between developed economies and emerging economies in the realization that, within a knowledge-based society, the presence of talent becomes a primary factor of competitiveness.

In particular, the sectoral structure of the economy has changed markedly, with a significant loss of jobs in manufacturing in favor of the services sector, and consequently, a greater demand for skilled individuals. New technologies have also revolutionized both processes and products, altering the traditional relationship between capital and labor (Lindblom, 1977). Thus, with the delocalization of production processes and the spread of new information technologies, human capital can be freed from the physical presence of its holders (Meyer *et al.*, 2001). The speed with which goods and people can move between regions has increased considerably, as a result of which so has the geographic distribution and complexity of the industrial organizations capable of operating in new territories and markets. This has thus led to a greater mobility of workers within external or internal labor markets, under the impetus of the allocative decisions made by businesses on the one hand, and of the policies of attraction and exclusion of certain categories of workers of some countries (such as the USA and Australia) on the other.

In summary, the profound alteration in the international scenario has led to a high level of mobility of workers and students in search of employment or further training and education. The issue must therefore be considered within the context of migration flows and population mobility. It is essential to understand – including in the case of Italy – the quantity and quality of the human capital contained in these flows, the effects on countries of emigration and those hosting immigrants, and, finally, the mechanisms and motivations that drive mobility.

Based on one of the best-known OECD studies on the phenomenon during the early years of globalization – *International movements of the highly skilled* (Salt, 1997) – we provide some definitions of the concept below as a necessary preliminary to exploring the subject, making a distinction between students, recent graduates looking for work, and different categories of workers, as well as the resulting patterns and timing of mobility according to the level of human capital and the relevant field of activity.

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Who are the highly skilled?

First, it must be said that there is not yet full agreement on the definition of highly-skilled individuals, due to the dissimilarities between different countries in terms of education systems and in the recognition of qualifications. Unsurprisingly, in recent years, under the guidance of supranational institutions such as the European Union, various countries have embarked on harmonization processes as regards mutual recognition of qualifications and the standardization of qualifications: the Bologna Process is one such example. Generally speaking, however, the persons recognized as being highly-skilled individuals are those with a first-stage or second-stage tertiary education[1]; thus, as far as the Italian situation is concerned, we are dealing with individuals who have the Italian equivalent of a bachelor's degree, master's degree or doctorate.

This definition assumes, however, that those in possession of a higher education are necessarily employed in highly-skilled jobs, whereas this is not always the case. Indeed, although access to certain professions is often correlated to holding a degree, in many other cases the ability to work in highly-skilled environments is linked to specific training courses, previous experience and informally-acquired knowledge, continuing education, or no further qualification requirement.

This variety of situations represents a further complication in defining the highly skilled, who, from henceforth in this Report, we will assume to be specialist professionals, managers and skilled technicians that also have a first- or second-stage tertiary qualification. This segment of the population, within the broader context of migration flows, may in turn be divided into heterogeneous groups that are not in competition because they pertain to different professions and milieux, and are likewise characterized by different incidences and patterns of mobility, as we shall see in Section 2.3. The major categories are set out below.

Categories of highly-skilled persons

a) Corporate transferees. These persons operate at an international level through internal labor markets. Their transfers are prompted by various reasons and may last for periods of time of varying length. Frequently, such transfers are motivated by career advancement and training needs. This category also includes specialists in production systems, marketing and research; their transfers meet the organizational needs of the firms for whom they work.

b) Technicians and visiting firemen. These are individuals whose movements reflect the specific occupational skills they possess. Their movements can take place within international labor markets or within the ambit of the operations of multinationals. Transfers may be related to specific development projects, or they may come about unforeseeably or in response to management needs in crisis situations.

c) Professionals, who often work in the healthcare or education sector, and are frequently engaged by non-governmental organizations (NGOs). Selection takes place on an individual basis and is for specific periods of time abroad. In some NGOs, deployment abroad may become permanent.

d) Project specialists. Their migration is related to specific projects being carried out abroad. Transfers technically speaking go through internal labor systems, although sometimes these persons are recruited on the external labor market for limited contract periods.

[1] According to UNESCO's *International Standard Classification of Education*, a first-stage tertiary education includes courses having an educational content more advanced than those offered at (upper) secondary and post-secondary non-tertiary levels. In the Italian education system, this corresponds to the *laurea* (or bachelor's degree) and the *laurea magistrale* (or master's degree). Second-stage tertiary education refers to programs that lead to the award of an advanced research qualification. The programs are therefore devoted to advanced study and original research and are not based on course-work only. In the Italian education system, this corresponds to the *dottorato di ricerca* (or PhD).

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e) Consultant specialists. An increasing number of white-collar organizations are resorting to engaging specialists for a wide range of activities. The destinations are global, according to the organizational structure of the client. The consultancy firms themselves are becoming transnational in nature.

f) Private career development and training. Many people are seeking opportunities through external labor markets for career advancement and further training, which necessitate stays of varying lengths abroad. This group includes different professions, but also young people in their early career years seeking experiences in foreign settings. This category also includes those who are in later stages of their career and whose transfers may be read in terms of "chasing the dollar".

g) Priests and missionaries. Religious and "semi-religious" orders who traditionally send their members abroad for periods of varying durations. The groups involved overlap with other types of emigrants, especially in the healthcare and education sectors.

h) Entertainers, sportspersons and artists. This is a diverse internationally mobile group of persons whose stays abroad are often for brief periods. Some of them can, however, settle overseas permanently.

i) Businesspeople and the "independently wealthy". This group may include entrepreneurs or investors based abroad for personal reasons, including so as to benefit from tax breaks.

j) Academics, researchers and other academic staff. There is a substantial exchange of academics and researchers between universities and similar institutions for periods of variable length. Many transfers are for relatively short periods, such as an academic term, whilst others are for longer durations (the archetypal brain drain situation).

k) Students in higher education institutions. A growing number of young people are undertaking studies abroad, at all levels and for periods of varying duration, ranging from several months to a number of years.

l) Military personnel. These are normally excluded from being considered as emigrants and the majority of members of the armed forces do not come within the definition of the highly skilled. Nevertheless, a significant number of officers and specialists could undoubtedly fall within the category. Stints abroad in the armed forces may influence the migration decisions of individuals, but in their capacity as civilians.

m) Spouses and children of the abovementioned categories can be reasonably included in all evaluations of the migration processes of highly-skilled individuals, though in strict labor-market terms, their inclusion would be questionable.

Brain exchange (brain drain and brain gain)
The essence of this multifaceted concept is that those who transfer to a new destination for work do it in order to obtain work commensurate with their skills and qualifications. Brain exchange entails a two-way flow of expertise between countries of origin and destination. Where the net flow favors one direction or the other, the terms used are brain gain and brain drain. The exchange of talent in some form is characteristic of all economies and is a component of more complex flows of goods, information and financial capital between advanced economies. Although the notion of brain drain was originally intended to refer to migrations from Europe (particularly from the United Kingdom) to North America in 1960, it is now applied to describe the net loss of skilled workers from Third World countries, and more recently, from Eastern to Western Europe.

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Brain waste
This concept describes the process of deskilling which occurs when highly-skilled workers emigrate to forms of employment that do not require them to apply as high a level of skills and experience as utilized in their previous work.

Brain circulation
This concept describes training and career paths in which students or workers go abroad to specialize and then return to their country of origin, drawing on the experience they have amassed to secure more advantageous employment conditions.

2 THE LITERATURE ON THE PHENOMENON

The previous section provided some definitions that are considered to be settled in this albeit vast and not particularly homogeneous field of study. For the sake of comprehensiveness, we will try to address the issue using a multidisciplinary approach, taking into account various contributions from different areas, namely: economics, sociology, geography, and political science. Nonetheless, for simplicity of treatment, we will confine the discussion to the two major approaches that can be found in the literature, namely, those termed internationalist and nationalist.

After a brief historical overview, it will be useful to linger on these schools of thought since the way they approach the question leads to different causes being identified for the phenomenon that are systemic in varying degrees, to more or less emphasis being placed on the negative and positive effects on countries of origin and destination, and hence, to different policies being prescribed.

Similarly, in the Italian context, the issue will be addressed in the light of both approaches. Our position – devoid of anecdotal digressions – leans towards presenting objective data regarding the impact of the exodus of skilled persons on our country (a nationalist perspective), and exploring how the latter phenomenon fits into the context of population flows between countries, the global labor market, and the attraction of talent from abroad (an internationalist perspective, especially in its revised "circulationist" form).

2.1 Internationalism vs. Nationalism

In the decade after the concept of brain drain was first established (1963), studies concentrated on the movement of skilled labor from less developed countries to those more advanced without distinguishing between professional sectors. This conceptual framework therefore turned the spotlight on global North-South relations (Meyer, 2001), focusing attention on the loss of resources in developing countries (Bhagwati and Hamada, 1974).

According to this view, at their own expense less developed countries train human capital which, instead of contributing towards national economic growth, advance that of destination countries. This position may be termed the standard view pursuant to which highly-skilled migration was for a long time analyzed. In other words, this approach – also known as nationalist (Patinkin, 1968) – focuses more on the needs of individual countries, and in particular those of countries of origin. It follows that the loss of skilled personnel was seen as undermining the chances of growth of developing countries. More generally, this perspective emphasizes the loss of human capital of a country that has invested in training and education to the benefit of another country that is reaping the fruits of that investment at no cost.

In the late 1990s, however, the observation of return migration flows (Boulier, 1999), brain

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exchange (Boussaïd, 1998) and flows directed towards emerging countries in the Persian Gulf and South-East Asia (Rudolph and Hillmann, 1997) lent support to an internationalist or cosmopolitan reading, which views the movement of skilled persons in terms of global development, namely: that human capital employed in more productive contexts adds value to both countries of origin and of destination .

Many scholars were therefore led to conclude that the interpretive framework of the standard view was inadequate (Brandi, 2001). A further paradigm has therefore emerged as an offshoot of the internationalist school of thought and been designated as "circulationist" (Gaillard and Gaillard, 1997; Johnson and Regets, 1998), which tends to describe the movements of highly-skilled personnel as polycentric, circulatory, temporary and prone to phenomena of exchange between countries.

In more recent times, Stark and Fan (2007) have argued that the current exodus of skilled individuals gives rise to an increase in skilled human capital in countries of origin and not the reverse. This argument is based on the observation that the numbers of potential migrants in countries of origin attending courses that lead to jobs abroad is greater than the opportunities that actually exist in destination countries (which operate entry restriction policies). This is said to produce an increase in the quality and quantity of skilled people who do not succeed in migrating and who therefore remain in their home countries adding value. There are, however, opposing views to this new perspective, which dispute the supposed beneficial effects of the *expectation of migration*, noting that an increase in levels of human capital does not necessarily result in a country's development (Clemens, 2009).

Further analysis based on the example of the Indian elite found in Silicon Valley, responsible for significant positive spillovers and networking effects (diaspora option) in their areas of origin, has led the debate to be reconsidered from a broader perspective. Indeed, other authors, in an effort to get beyond a dichotomous vision, have suggested that the issue be de-sensitized by avoiding the use of terms such as "brain drain" and "brain gain", which inherently carry a negative or positive association, instead recommending the use of the expression "skilled migration", especially since the majority of skilled migration interchanges take place in the already-developed global North and not between North and South. This further progression in the debate relates to phenomena that are in part still too recent to be capable of producing a rebalancing effect on the literature – hence, it is brain exchange (encompassing the notions of brain drain and brain gain) that remains the dominant view.

Nevertheless, whilst on the one hand it would seem to us important to cite the economic debate on the brain drain effects of one-way flows between countries, on the other it is necessary to round out that vision by positing the existence of circulatory flows between developing and industrialized countries, and of mobility phenomena within the latter countries. This is so as to enable an up-to-date reading of the phenomenon and its fluid nature which encapsulates the variability that the impact of skilled emigration presents depending on the trajectory, timing and economic sector involved.

2.2 The effects of brain drain: the economic approach

As mentioned in the preceding section, studies under the auspices of the nationalist perspective or standard view do not confine themselves to describing and analyzing migration phenomena as movements that are unidirectional, permanent and directed away from the periphery to the core, but also tend to formulate precise hypotheses on the effects of brain drain, often perceived as being negative. In a 2011 study, Docquier and Rapoport revisit 40 years of economic research on the subject, identifying three generations of studies based on the different economic frameworks

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explained below.

The first such studies correspond to the early pioneering research of Grubel and Scott (1966), according to which skilled migration flows do not have negative effects because the negative externalities produced by the emigration of skilled personnel are limited and more than compensated for by migrants' remittances. Underlying these studies is the neoclassical theory of growth, according to which the labor force is a factor of production with diminishing marginal productivity (Solow, 1956; Mankiw *et al.*, 1992); consequently, the loss of units of labor force does not affect the constant return to scale of the production function, but rather, reduces unemployment and increases the capital/labor ratio (Becker, Ichino and Peri, 2003).

In contrast to this view, the second generation of studies, which developed from the 1970s onwards, argued that skilled migration produces adverse effects for the countries from which the flows originate, generating a reduction in the level of human capital, and a gap in social and private returns to education, as well as negative fiscal externalities. The economy of the country of origin thus suffers a failed return on investment in education and is not able to benefit from the positive externalities generated by the presence of a skilled labor force (Commander *et al.*, 2003).

Finally, the third generation of studies is based on endogenous growth theory, according to which technology and knowledge are endogenous variables that determine the functions of productivity and hence growth. More specifically, human capital is considered a form of built-in, excludable and "rival" knowledge, that determines the possibility of obtaining an edge over the competition. The importance of human capital is thus widely recognized, even if in this current of studies there is no agreement on the nature of the effects of brain drain. Some authors (Haque and Kim, 1995) argue that brain drain causes a reduction in the rate of growth of per capita income, and, thus, in levels of prosperity. Others, as previously noted, identify benefits in the prospect of migration, such as an increase in the number of educated people in the population remaining in their home country and a rise in investment in education (Mountford, 1997; Beine *et al.*, 2001). However, the latter may contribute to a reduction of investment in other areas, such as infrastructure, thereby negating the beneficial effect of a better skilled workforce (Schiff, 2006). This is one of the forms of "brain waste" caused by migration.

Brain waste also occurs when people invest in order to gain a level of training and expertise that they then do not go on to use, despite managing to emigrate (Mattoo, Neagu and Özden, 2008). This happens, for instance, when a Filipino doctor works as a nurse in London or when an Italian engineer works as a waiter in Germany. Such waste may be due to a number of circumstances in the host country, including a lack of information about job opportunities offered by the market or because the qualifications held may not be entirely transferable.

In summary, these three approaches based on theories of human capital have not come to a consensus on the effects of brain drain, although they are more likely to identify negative outcomes of the phenomenon. These studies have also overlooked – partly because of the paucity of available data on the human capital factor – two key aspects that have recently emerged from empirical studies: the first is the variability of the effects of brain drain when the level of human capital with which the various professions and sectors are endowed is taken into account, and the second is the offsetting nature of certain circulatory and return flows of individuals who, having studied and worked abroad, contribute to:

(i) a net increase in the formation of human capital in their country; and/or
(ii) the creation of networks and exchanges between their countries of origin and those that have hosted them (Gibson and McKenzie, 2011).

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These two aspects will be examined in the next two sections.

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2.3 The effects of the phenomenon according to the level of human capital and the sector of activity: a sociological perspective

Empirical studies show that the effects of brain drain vary according to the field of activity and level of human capital considered within a certain professional category and in a specific geographic area. Analyses carried out on the migration movements of doctors from Africa to developed areas, researchers from Europe to the US, and information technology experts from India (Docquier and Rapoport, 2011) also to North America show that the impact of migration of skilled individuals varies depending on the particular characteristics of a sector, as well as on the mechanisms that regulate such movements, and consequently on the policy measures which should govern them.

For ease of navigation between the various professional areas, it might be useful to draw a distinction between commercial sectors and non-commercial sectors (Vinokur, 2006); the latter would incorporate those professional figures tasked with furthering the propagation and the training and education of the population, and hence of the future labor force. These roles entail the physical presence of professionals in those places where the populations they serve are found; this is the case with teachers and health professionals (doctors, nurses, dentists, paramedics, and so on). A negative impact of the migration of teachers, for example, is the weakening of the role of education systems in transferring knowledge and skills to future generations (Appleton *et al.*, 2006; Logan, 1992).

The migration of health workers produces negative externalities (Awases *et al.*, 2004) especially in those places where the workforce is threatened by the presence of epidemics, as is the case with Africa and the problems associated with AIDS (Tawfik and Kinoti, 2001). This position has recently been challenged by Skeldon (2009), according to whom the migration of healthcare professionals stems from the poor state of a country's health system.

This contention thus broadly calls into question policies restricting outward migration flows of medical personnel from Africa, which tend to point to emigration – rather than systemic problems – as the cause of the poor state of health of the population. In other words, the fact that skilled professionals leave difficult places does not necessarily convey any information about whether or not their departure made those places more difficult (Clemens, 2009). Even in areas no longer subject to the risk of epidemics, such as Italy, the lack of effective planning in respect of the number of graduates in the health sector has led to a glut of highly-qualified personnel and has contributed to emigration in this field.

In contrast, there are other categories of skilled workers whose presence *in loco* is rendered less necessary by the development of communications technologies and the trend towards delocalizing production, as in the case of ICT (or information and communications technology) professionals.

Lastly, in terms of the migration of scientists, a question arises as to whether, faced with a field of scientific endeavor that is becoming increasingly globalized and characterized by international collaborations and communities (UNCTAD, 2005), it still makes any sense to dwell on the localization of research activities.

There are, however, two elements which cannot be disregarded:

* firstly, science is not a pure public good as neoclassical theory characterized it – a case in point being patents and other industrial offshoots such as spin-offs – and thus constitutes a significant competitive advantage that generates wealth in places where it is found; and

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* secondly, the existence of research in centers of excellence – at present still located within industrialized countries – becomes essential to facilitating the exchange and transfer of knowledge and information and thereby generating catalysts for positive externalities.

The case of science therefore serves as a paradigm to illustrate that human capital can generate economic value in those places where, however, there is a greater endowment of infrastructure and resources in support of knowledge production. Indeed, whilst it is true that several research epicenters are emerging around the world, it is also true that very often these are destinations for activities with a low spillover potential. These considerations lead to the conclusion that a community of researchers and research activity itself cannot be altogether extricated from their original geographic setting.

This assertion becomes even more valid if one takes into account the notion of tacit knowledge, that is, all those items of knowledge which cannot be codified and transmitted – as information can – through documents, academic publications, lectures, conferences and other channels of communication. This knowledge is more efficiently transmitted among individuals residing in the same place, or belonging to socially and physically proximate contexts (OECD, 2005).

In terms of the segmentation of flows, the specific level of internationalization of professions should also be borne in mind. According to Khadria (2001), ICT professionals are the knowledge workers (Drucker, 1993) with the greatest ease of migration, since they possess generic knowledge readily adaptable to various employment settings. However, the data on this professional group in the US tells us that only 25% of those who possess an ICT qualification have attained it in their home country, whilst 70% have acquired it in the US (National Science Foundation). There is thus a trend underway which sees prospective migrants tending to undergo training in destination countries in order to increase their chances of integration. This leads to a modification of the position on the impact of the prospect of migration and the idea that training costs are borne by the country of origin, as determined by the standard view.

Finally, from an empirical point of view, the available data shows certain tendencies towards specializations based on place of origin: among Africans and Caribbeans in the US, there is a higher than average percentage of doctors and nurses; a similar phenomenon occurs among Asians with respect to ICT, and among Central Americans in terms of non-university teaching, whilst Europeans exhibit the highest percentage of persons engaged in research and development activities (after having emigrated already in possession of a PhD). We will see further details in Section 3 of how Italy fares in this regard.

In essence, the phenomenon and its effects appear to be as varied as the nature of the professions themselves. Each field presents different specificities to which we have briefly alluded, and although the studies on the subject deal with matters that fall outside the scope of this current discussion, the contributions from this literature suggest expanding the horizons of the standard view by opening it up to a revised segmentation of flows of skilled personnel and the need to carefully analyze the new mechanisms underpinning mobility.

2.4 Beyond the dichotomy: the circulationist perspective

The foregoing clearly links into the circulationist approach, globalization phenomena, and transnationalism. This approach positions itself as a major revision of the classical nationalist perspective, and incorporates a greater segmentation of flows and a consequent redefinition of their effects.

The works of Gaillard and Gaillard (1997) have focused on such circulatory flows, described as

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being polycentric, temporary, subject to exchange phenomena, and characterized by return flows of talent.

The observations which underpin this position are:

* the emergence of new destinations for skilled migration flows;
* the presence of brain exchange between countries;
* the actions of multinationals in transferring personnel to various parts of the globe;
* the increase in temporary migration flows; and
* The increase in return migration flows.

3 NEW AND OLD DESTINATIONS

As regards the existence of new destinations, even authors whose works are more in line with the standard view argue that certain countries, such as those of the Persian Gulf, the Asian Tigers, and – in the near future – China, have attracted and will attract more and more highly-skilled personnel, although the OECD countries continue to draw around 85% of global high-skill flows (Carrington and Detragiache 1998 and 1999; Docquier and Marfouk 2004 and 2006). The emergence of new destinations has led some authors (Meyer *et al.*, 2001) to insist on the need for a new geopolitics of knowledge which endeavors to plot a more complex map of flows and which does not think in terms of a simple core-periphery dichotomy, but rather accounts for the existence of a plurality of centers, ranged in a multilayered hierarchy.

At any rate, as other authors (for instance: Logan, 1999) have highlighted, even in regions characterized by poor countries, such as sub-Saharan Africa, there are intraregional movements of skilled personnel. The available data on the directions of flows (OECD, 2005) points to the existence of certain phenomena, namely:

(a) a great power of attraction exerted by the United States, which attracts 42.4% of flows of highly-skilled workers directed towards OECD countries;
(b) a high degree of interchange between English-speaking countries (the United States, Canada, Australia and Great Britain); and
(c) the existence of direct flows from countries that were once colonies to the capitals of their respective former colonial powers (for instance, Africans mainly tend to head for France, Belgium and Portugal, and South Americans for Spain).

In particular, the fact that in many developing countries the language of higher education is that of former colonial masters tends to explain these preferences, although there are other intervening factors, such as the existence of bilateral agreements. This would account for some of the difficulties Italy has in attracting foreign students.

The data on the mobility of university students (UNESCO, 2006) would seem to indicate that about one third of flows remain within regions of origin, though these figures can be countered with the observation that not all student movements are akin to those of highly-skilled workers. The reality, however, is that the UNESCO (2006) and OECD (2004) data on mobile students appears to suggest a certain isomorphism with flows of highly-skilled workers, since many of the skilled foreigners present were foreign students who subsequently settled in the host country permanently.

This gives rise to some important observations regarding the directions of the flows, namely, that notwithstanding the fact new destinations have emerged, even in the presence of flows that remain within their areas of origin, the majority of movements continue to be directed towards

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core countries.

These considerations bring us to the theory of brain exchange, of which it is possible to distinguish between a weak and strong version.

The former states that, in respect of every country, for any outflow of talent there will be an influx, without however making any further assumptions.

The strong view tends to maintain that each country exports certain skills but imports others, and that in some way, the exchange is equal. Testing the brain exchange hypothesis becomes difficult since there are no systematic statistics of inward and outward flows for many countries. In addition, countries use different criteria to classify migrants and do not always collect data on specializations. The strong iteration is therefore still impossible to verify at a systematic and global level.

The weak version holds that there is in any case a tendency to migrate towards major economies and that the exchange is not always equal, especially when considered in terms of a country's "stock" of human capital.

According to OECD estimates (2005), the USA, Canada, Germany, Australia and the United Kingdom are the countries that attract the most highly-skilled migrants; but whilst for every graduate leaving the US around 20 immigrate to the country, in the United Kingdom this ratio is almost even.

Amongst the countries with negative graduate migration balances, such as Japan, the Netherlands, Italy, Ireland, Mexico and Poland, the first two have a one-to-one ratio of exchange, whilst in Italy and Ireland, for every incoming brain around one and a half leave; as regards Mexico, for every incoming talent more than five actually leave, and in the case of Poland, it is more than three.

3.1 The role of multinationals

The extent of the role played by multinationals in reshaping migration flows is also a subject of debate. Although some authors (Salt and Singleton, 1995) maintain that migration is increasingly taking place through the organizational channels of transnational firms and is less and less a matter of the independent choices of individuals, other authors (Peixoto, 2001) argue that the volume of such flows is not particularly high and that, being mostly temporary in nature, they tend to go unnoticed against the backdrop of broader movements.

Some of the available data would, at any rate, seem to bear out this second interpretation. In case of Australia, for example, figures for the last ten years show that despite the decline in independent skilled migration, in 2005 they accounted for approximately 61% of the influx of skilled personnel, whereas company-run entry programs did not account for more than 5% (Birrell *et al.*, 2001). Similarly, in the US, over the last ten years the number of L1 temporary visas (for intra-company transferees) has never exceeded H1B visas (INS, 2003).

The role of multinationals should therefore not be underestimated, since they carry out a complex operation of delocalization of activities on a global scale, which determines transfers of financial and human capital; yet nor should their impact be overestimated, as these transfer channels add to rather than supplant other channels.

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4 TEMPORARY AND RETURN MIGRATION FLOWS

The circulationist paradigm holds that migration flows are increasingly transitory and prone to return and circulation phenomena. The question as to how prevalent temporary migration is becomes a matter of some contention if it is sought to argue that this phenomenon stems from the choices of individuals. In reality, much depends on temporary policies related to visas. In the US, for instance, permanent visas are mostly granted to people who already have a temporary visa, hence temporary migration would appear to be a necessary first step – given US policy choices – towards permanent settlement. A re-segmentation of flows on this basis would therefore not seem feasible.

A similar argument can be made regarding the notion of increasing return flows of the highly skilled. In this case, it is the works of Johnson and Regets (1998) that have brought the phenomenon of return flows – especially among foreigners who have gone to the US to obtain a PhD – to the attention of scholars. Even here, the return home of foreign talent is due to specific public policies, such as those of the Taiwanese government, which since the 1990s has focused heavily on industrial development and attracting its talent back from the US (Saxenian, 2002a).

The inference is that the trends towards temporary and return migration do not stem from a change in migration habits, but are the product of policies by which governments seek to control and shape skilled migration.

Leaving to one side the causes of temporary and return migration flows, Saxenian (2002b), drawing on the concept of transnationalism[2], examined the relationship between transnational professional communities and the reverse brain drain phenomenon, identifying exchange relations between emigrants, countries of origin and countries of destination. However, in this case too, the volatility of these links seems to be connected with specific government programs. As Meyer *et al.* (2001) admit, it is difficult in these cases to assess the impact of such networks, for which reason the likelihood of brain drain giving rise to an offsetting effect *ex post* remains weak.

Indeed, the so-called diaspora option – as the study of the relationship between transnational professional communities and the reverse brain drain is termed – seems more of a strategic option for seeking to exploit any resources resulting from skilled migration (Brown 2000; Cemmel 2004) than an actual phenomenon that might call into question the framework of the standard view, even if it leaves open the possibility of offsetting effects which the classical approach does not contemplate. The criticism that can be leveled at this option is that in order for the transfer of knowledge to be effective, infrastructure, expertise and resources capable of enabling the implementation of that knowledge must exist in the countries of origin. In fact, as noted by Kuznetsov and Sabel (2006), most of these networks confine themselves to acting by facilitating migration chains, without committing to projects involving the transfer of knowledge and resources to countries of origin.
AnnaLee Saxenian's studies set out to demonstrate how this potential can be truly effective where the governments of countries of origin intervene constructively and with a view to furthering national development.

In the cases of Taiwan (Saxenian, 2002a), India's science parks (Saxenian, 2001) and the Chinese semiconductor industry (Saxenian, 2005), an interplay emerged between: State intervention aimed at creating industrial clusters linked to science and university parks, programs for the creation of start-ups by returnee talent (often owing to government programs geared to that end), and the

[2] Concept defined as the set of processes by which immigrants create and maintain relations of various kinds with countries of origin.

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actions of expatriates as "transnational professional communities" (Saxenian, 2002a) which procure commercial and service contracts between US companies they work for (especially in Silicon Valley) and firms based in the home country. In general, it is well documented that the share of foreign direct investment which countries receive from the United States is positively correlated to the number of graduates from those countries present in the United States (Javorcik *et al.*, 2006; Kugler and Rapoport, 2007; Docquier and Lodigiani, 2010).

Other authors have also investigated the positive effects of return migration in other spheres, such as improvements in the public institutions of migrants' native countries. Spilimbergo (2009) highlights that democratic reforms have progressed much further in those countries that have sent greater numbers of students to universities in democratic states.

Thus, it can be seen that the resources represented by migrants can become efficacious if accompanied by targeted interventions for industrial development. However, the opportunities offered by the globalization of production as well as the development of technologies, communications and transport only apply to certain sectors; in contrast, in the case of those professional figures tasked with furthering the propagation and the training and education of the labor force, such opportunities would not appear to be applicable, since in this instance, the professionals involved need to be located in those places where the populations requiring their services are to be found (Vinokur, 2006).

Numerous other examples could be cited, though these fall outside the specific ambit of this study.

In conclusion, it is possible to affirm that, as the empirical and theoretical literature has recently shown, highly-skilled migration does not necessarily reduce the stock of human capital, but rather can generate positive networks and diaspora externalities. Nevertheless, the brain drain as amplified by globalization has created countries that are winners and others that are losers: this is more due to the institutional characteristics of the country of origin, its technological gap, its population size, and the interaction between these characteristics and the ability of the country to encourage the new formation of human capital, the institution of brain drain reversal policies, and efforts to capitalize on the knowledge and skills of those who have already returned. In other words, the circumstances determining whether a country wins or loses largely hinge on policy choices (Skeldon, 2009; Clemens, 2009).

4.1 Policy responses to brain drain

As shown in the preceding sections, the phenomenon of brain drain is heavily influenced by two policy-related aspects. The first consists of the various policies put in place by various actors in respect of the migration of skilled persons. The second is the ideological – as it were – vision which in some cases underlies such policies.

In this section, we will therefore deal with the two issues separately, even though they are clearly linked.

In terms of the various actors and policy responses, Lindsay Lowell (2002) proposed a classification scheme which identifies 6 types of policy:

Return policies: this group of policies aims to bring about the adoption of measures to encourage the return of native talent that has fled abroad. It presumes that migrants will have acquired skills that could be very useful in the country of origin. Incentives can vary in nature, but tend to involve tax breaks, relaxed citizenship requirements for foreign spouses and children, or discounted schooling for children of returnees.

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Restriction policies: these are measures which involve putting in place barriers to migration, adopted predominantly by destination countries to control the influx of immigrants. These can be based on a system of annual quotas, or on special temporary entry programs. One such example is the "J" visa system in the US, which allows students and professionals to study or work in the US for a maximum period of five years.

Recruitment policies: these are policies aimed at attracting expertise, predominantly for two reasons: on the one hand, they may be policies geared towards filling labor shortages in certain sectors, whilst on the other, they may seek to offset losses in skilled personnel. An example is the German Green Card, introduced to help attract ICT experts (Straubhaar, 2000).

Reparation for loss policies: this group of policies aims to compensate countries of origin for the loss of human capital they have suffered. They are fiscal-type policies that propose the introduction of taxes to recoup the investment lost through emigration. Such taxes may be levied on emigrants' incomes or on destination countries, as in the case of the "tax on brains" (Hamada, 1977) and other policy proposals that have never been implemented.

Policies for the resourcing of expatriates: these are policies associated with the so-called diaspora option (Brown, 2000), and which represent a fundamental shift in perspective in the management of skilled migration. In this type of policy, brain drain is no longer seen as a necessarily negative phenomenon, but as a pool of potential that can be tapped into.

Retention policies: are a set of policies aimed at giving a boost to certain sectors so as to counteract losses or increase productivity, notwithstanding the "flight of talent". Countries can do this by increasing investment and salary levels and/or improving infrastructure. Indeed, these strengthening measures can make tapping into emigrant resources through networks more effective, as illustrated by the example of Bangalore discussed by Saxenian (2001).

In general, governments tend to apply a mix of these policies, although particular policies seem to characterize certain geographical areas. Indeed, in Asian countries, measures that link retention policies with industrial development policies tend to predominate, whilst in South America, there is a greater focus on tapping into the pool of resources abroad with a view to organizing networks of migrants. Finally, in Africa, Central America and the Caribbean, where there is a considerable shortage of human capital, policies are aimed at reversing or curbing the brain drain. In any event, the effect of these policies is mitigated by macroeconomic conditions that are not optimal, as well as by budget and expertise constraints which see to it that programs are often run by international organizations.

International organizations are the second major player in the management of skilled migration. The UNDP manages the TOKTEN program through which, over the years, it has funded short-term visits (from three weeks to three months) of highly-skilled expatriates in order that they may use their expertise to run various research and development or teaching projects in universities. The TOKTEN program was devised in 1977 by UNDP, and, in its years of operation, has placed five thousand volunteers in 25 developing countries. The program's goal is to utilize the expertise of expatriates of a given country to develop specific areas in the country of origin.

Another example is the Return of Qualified African Nationals (RQAN) program run by the International Organization for Migration (IOM).

Finally, mention can be made of the role played by the World Trade Organization (WTO). Of the three trade agreements which underpin the WTO – namely, GATT (the General Agreement on

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Tariffs and Trade), TRIPS (the Agreement on Trade-Related Aspects of Intellectual Property Rights) and GATS (the General Agreement on Trade in Services) – it is the latter which has the greatest bearing on skilled migration. Indeed, the aim of the GATS is to promote the liberalization of foreign trade in the services sector, whilst also seeking to regulate transfers of people who go abroad to provide a service.

The role of regional blocs such as the European Union, the North American Free Trade Agreement (NAFTA), Mercosul (in South America) or the Asia-Pacific Economic Cooperation forum (APEC) should also be noted. The purpose of these groupings is to establish agreements that favor free trade, free movement of people, as well as the mutual recognition of certain qualifications. All this is not always automatic, but in point of fact it does carry some importance for skilled migration between neighboring countries (Iredale, 1999). Thanks to mutual recognition agreements, these blocs are at the heart of the internationalization of professions, a process that facilitates the mobility of the highly skilled (Iredale, 2001). The policy of European countries aimed at governing skilled migration, for instance, is heavily focused on cooperation at EU level with a view to increasing collaborative efforts between member states. The approach of such initiatives follows the same collaborative logic (Van der Wende, 2001) used in the Socrates/Erasmus and Marie Curie programs (Ackers, 2005).

Lastly, as we shall see further on, universities play an essential role in promoting the mobility and attracting flows of skilled individuals, especially in a society that hinges heavily on knowledge as a key factor of production. This idea of competitiveness based on the skills of human resources has led many developed countries to adopt policies geared towards increasing the qualification levels of workers. Below we will provide a few concrete examples of European projects and initiatives aimed at attracting talent or curbing brain drain in the field of research.

4.1.1 Great Britain

Concerned over the potential loss of British talent, a phenomenon which had already begun to emerge in the 1990s, the British government together with the Wolfson Foundation, a charity supporting excellence in research, launched a new 5-year 20-million-pound initiative in 2000 aimed at encouraging the return of British scientists working abroad, whilst also attracting the cream of young foreign researchers to the United Kingdom.

Some impressive figures bear witness to the UK's ability to attract foreign researchers, with an estimated annual investment of no less than 62 million pounds in foreign students and 254 million pounds in local students, a more than respectable ratio of 1:4. In 2002, the British government decided to go ahead with a plan to boost salaries for scientists and post-doctorate researchers by 25%, and to increase funding for university professors. Finally, in 2004, the British government published a document entitled the "Science and Innovation Investment Framework (2004-2014)", which contained guidelines aimed at bolstering research and innovation over the course of a decade as well as setting the goal of investing 2.5% of GDP in the field of research and development.

These initiatives did not, however, entirely curb the flight of British talent, so much so that in 2008 an OECD study showed that 1.1 million British high-level graduates were living abroad, a greater exodus than that of other OECD countries, representing one in ten of the UK's skilled citizens.

These figures also carry important economic implications given that training a young doctor, for example, costs the public purse up to 250,000 pounds. Of the "fleeing talent", 27% have health or educational qualifications, 38% hold humanities or social science degrees, and 28% are scientists or engineers. In many instances, the reasons for this exodus are linked to higher earnings

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opportunities, prospects of a better-structured career – especially in the field of research – in highly competitive academic environments such as those in North America, or even simply the pursuit of a better lifestyle, climate and general conditions than those present in the United Kingdom.

In 2009, calls were made by several British academic institutions for a sharp rise in university tuition fees (to a maximum of 20,000 pounds per year), in order to enable them to compete with the revenues generated by the top American universities. Indeed, British academics bemoan the scarcity of financial resources available for research and teaching as compared to those not only in the US but also in developing countries such as India, China, Singapore, South Africa and Brazil. The limited nature of these resources is undoubtedly one of the factors behind the mass departure from the United Kingdom.

At the same time, however, thanks to reasonable salaries and the attractiveness of the UK system, more than one million foreign talents have gradually replaced the British that have left, such that the damage caused by the British brain drain has been partially contained and the shortage of highly-skilled personnel has been redressed. In the OECD, 80% of foreign students are concentrated in 5 countries: the US (34%), the United Kingdom (16%), Germany (13%), France (11%) and Australia (8%). These figures clearly show that the investment made by the British government, whilst it has not succeeded in curbing the flight of local talent, has at any rate ensured its replacement and a genuinely intensive level of brain circulation.

4.1.2 The Swiss Confederation

The Swiss National Science Foundation (SNSF) is the most important agency in the country for the promotion of scientific research. It is a foundation established under private law that seeks to ensure the necessary autonomy of research and its development, including at an international level.

Pursuant to a federal mandate, the SNSF annually supports some 7200 scientists and researchers (almost 80 percent of whom are aged 35 years or younger), and offers an extensive range of fellowships and grants for basic and applied research in all disciplines, from philosophy and biology to medicine and physics. With an annual budget of approximately 700 million Swiss francs, the SNSF provides focused support for the careers of up and coming researchers, responding to the needs arising from the various stages of their professional development by funding the best projects (currently around 3,000). The monies provided cover the costs of staff, equipment, materials and travel. The SNSF's efforts thus help lay the necessary foundations for the success of Swiss research activities.

Twice a year, researchers working in Switzerland may submit grant applications to the SNSF which are evaluated according to several criteria including scientific value and relevance, originality, feasibility and methodology. Applications are first of all assessed through a peer review procedure by experts mostly from outside Switzerland. Based on the experts' appraisals and opinions, at least two members of the National Research Council examine the application and submit the proposal to a specialist review panel which, after a rigorous selection process, makes a decision approving or rejecting the application. This decision is finally ratified by the presiding board.

The SNSF offers funding for the career development of individuals in scientific research disciplines, thereby fostering the professional growth of young scientists. In addition, National Research Programs are established at the behest of the Swiss Federal Council in order to imbue the nation's scientific agenda with a focus on pressing issues arising in environmental, social, political

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and economic fields. By placing crucial knowledge at the disposal of the political sphere and interest groups, these programs help inform their actions in the medium term.

There are currently fifteen such programs in course. They last for five years as a rule and have an average funding allocation of five to twenty million Swiss francs. Finally, in order to help reinvigorate research facilities in Switzerland and strengthen their competitiveness in sectors deemed to be of strategic importance, National Centers of Competence in Research (NCCRs) have been established. Each NCCR consists of a center of competence situated at a university and serves a national and international network. NCCRs place special emphasis on interdisciplinary working approaches, the transfer of knowledge and technology, the nurturing of young talent, and the advancement of equal opportunity. Each receives from the Swiss National Science Foundation a total of between 20 and 60 million Swiss francs in funding for a period of 10-12 years, complemented by resources from universities and third-party contributions.

The SNSF is mindful of the fact that bolstering Swiss research at an international level is a key objective, and endeavors to maximize brain circulation whilst minimizing brain drain. Three-quarters of the projects funded by the SNSF have an international component. In addition, the SNSF supports several multilateral research organizations and programs and maintains relationships with counterpart funding agencies around the world. Through specific partnership facilitation initiatives (such as bilateral seminars), the SNSF demonstrates its interest in countries with high scientific potential but little contact with Switzerland, such as China and Japan.

Among the main scientific research funding instruments offered by the SNSF to counter the brain drain and increase brain circulation, we analyze in detail below fellowships for researchers to finance stays abroad, funding for SNSF professorships, and grants for short visits abroad and for international workshops.

Fellowships for researchers: these fellowships enable young scientists wishing to pursue an academic career to benefit from a stay abroad at a renowned institution in their field, with a view to building their reputation and knowledge, as well as establishing international contacts. Normally, the SNSF awards these fellowships to researchers intending to carry out post-doctoral studies, or, in exceptional cases, in order to finish a PhD.

Around 500 fellowships are awarded every year in all disciplines supported by the SNSF. Funding includes personal maintenance, a fixed sum for travel expenses and may include a contribution towards research and conference expenses. The period covered ranges from 12 to 36 months, whilst the amount of the fellowship depends on the length of stay and cost of living in the host country. The favorite destinations are the United States and Europe. To be eligible to participate, applicants must hold Swiss nationality or a Swiss permit of stay, and demonstrate that their research is in some way linked to research undertaken by one of the country's research institutes.

Surveys carried out indicate that recipients of these fellowships are generally very satisfied, and that they manage to integrate very well within the host institutions. It is obviously difficult to assess the impact of these fellowships on the phenomena of brain circulation and brain drain. Statistics show that approximately 60% of fellowship awardees return to Switzerland, in most cases for family reasons. It has also been noted that the careers of the recipients typically progress faster than those of their peers who have not been granted a fellowship, and many of them manage to secure prominent academic positions within a fairly short period of time.

Funded professorships: with the aim of supporting the academic careers in Switzerland of promising researchers, the SNSF funds 30-40 professorships overall per year. The grant, of over one million Swiss francs for a funded professorship of four years, enables a team to be assembled

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to get a recipient's own research project off the ground. In order to take part, candidates must submit a detailed research proposal which must be endorsed by the university that will host them. Typically, 150 researchers apply each year for these professorships and the selection process also involves attending an individual interview in Berne. By offering recipients attractive career prospects in Switzerland, the SNSF encourages the return from abroad of particularly well-qualified researchers.

Brain gain is a key objective of this process, as is evidenced by the fact that 33% of the researchers come from abroad. This funding places young professors in an optimal developmental position during the early stages of their career. In point of fact, 85% secure an academic post, in most cases with unlimited tenure. It should be noted that around 30% of the academic positions obtained in these successful cases are at universities abroad. Whilst it is true that this brain drain detracts from the brain gain achieved at the commencement of the funded professorships, it must not be forgotten that during their four-year stay in Switzerland many of these professors establish collaborative relationships that endure beyond that period.

International Short Visits: these are programs that allow researchers working in Switzerland to make short research trips abroad, or researchers from elsewhere to make visits to Switzerland (lasting between one week and three months). The aim is to initiate or to consolidate international collaborations through research activities carried out in conjunction with the host institute or visiting fellow.

International Exploratory Workshops: these programs enable researchers working in Switzerland to organize workshops with the participation of partners from abroad (lasting between two and five days). Up to 30 participants may take part, 10 of whom are funded by the SNSF, and the workshops are typically held in Switzerland. The main aim of this funding instrument is to allow researchers to advance their knowledge of and exchange information on a specific topic area. In order to obtain funding, it is necessary to show that the workshop allows for an exchange of information that is not possible from a distance, and that the workshop's internationality brings added value. It is also important to demonstrate that there is a good balance of established and young promising researchers among the participants.

As a final point, it is worth highlighting that all these initiatives are set within an academic landscape which is already characterized by a high degree of internationalization, given that more than 50% of teaching and non-teaching staff in the country's two main polytechnic universities is not of Swiss origin, and that in general, there is a high level of receptiveness to the outside world at all universities in the country.

The examples cited above, as with the preceding discussion of the extant literature, make it possible to appreciate that the effects of brain drain cannot solely be considered negative. However, if we assume that the goal of raising skills levels is one properly associated with the pursuit of competitiveness, then brain drain also becomes a political problem over and above the question of the empirical determination of the phenomenon's actual effects. This means that although it may be arguable that brain drain has beneficial effects (both having regard to advantageous brain drain and to offsetting effects *ex post*), the main political and economic actors that manage the processes of development and growth view brain drain as a problem for the creation of a knowledge-based society and act accordingly. This entails that certain policies may be brought into play with a view to evening out the numbers of incoming and outgoing talent. Both the cases of the United Kingdom and Switzerland suggest that it is possible to establish mechanisms and policies that ensure foreign talent is attracted and local talent can effectively compete for high-level positions abroad. Indeed, whilst in countries like the US and Canada the largest contingent of skilled foreigners is British, it also true that the United Kingdom has derived

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a net gain out of flows of talent from the European Union, thereby securing highly-qualified personnel alongside its loss of local talent.

In the next section, we will provide some figures on the phenomenon in Italy, analyze its underlying causes and examine the role played by major institutions, as well as giving additional information on the costs of brain drain for the country and the profile of foreigners who choose to emigrate to Italy. The section will also discuss a number of policies that address the phenomenon, using the cases of the United States and Sardinia for illustrative purposes.

With a view to putting the Italian situation under the microscope, we will endeavor to present empirical data and evidence capable of providing a snapshot of the phenomenon in our country, and then in Section 6 describe the policy measures adopted so far, which in most cases seem dictated by political stances than by any assessment of field data.

5 THE PHENOMENON IN ITALY

Before giving an account of the brain drain situation in Italy, it should be noted that both the availability and validity of data on the subject are not always a straightforward matter. For this reason, we will use multiple sources in order to substantiate the cogency of the figures.

Avveduto and Brandi (2004), working from ISTAT data relating to the removal of Italian graduates from the residency register, calculated that between 1996 and 1999, the number of graduates who had themselves removed from the register never fell below 2,000 in any year and that it exceeded 4,000 in 1999. In addition, this number was never matched by the number of returning graduates. The conclusion drawn by Avveduto and Brandi is that in the four years considered, around 12 thousand graduates left the country – an average of 3 thousand a year.

The figures in Docquier and Marfouk (2006) tell us that in Italy the emigration rate of the tertiary educated (or brain drain) stood at 7% in 2000, placing the phenomenon in Italy in the medium-low range.

Table 1 shows the emigration rates for several European countries, Canada and the United States, as well as the averages for certain regions of the world, including those where there are countries with very high rates. Italy does not seem to present a very marked brain drain situation, since its rate is lower than the averages for Europe and far below those of areas of the world where peaks exceeding 50% are recorded (in the Caribbean, for example, the rates for Jamaica and Haiti are over 80%).

Table 1 - Emigration rates of graduates in certain OECD countries and world regions of origin

World region and country of origin	Year			
	1990		2000	
	Migration rate - Tertiary education	Migration rate - all education groups	Migration rate - Tertiary education	Migration rate - all education groups
Northern Europe	**16.2**	**6.9**	**14.3**	**6.8**
Ireland	34.4	28.5	34.4	22.8
United Kingdom	18.9	6.9	16.7	7.0
Western Europe	**10.4**	**3.4**	**7.3**	**3.2**
Austria	18.3	6.2	11.1	5.8
Belgium	7.0	2.7	5.9	2.9
France	5.1	1.7	3.9	1.9

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Germany	14.3	4.0	8.8	3.6
Netherlands	11.3	5.1	8.9	4.9
Southern Europe	**11.2**	**6.4**	**9.0**	**6.2**
Greece	18.9	9.4	14.0	9.1
Italy	*9.9*	*5.8*	*7.0*	*5.0*
Portugal	14.6	13.9	13.8	14.3
Spain	3.4	2.2	2.6	1.8
North America	**0.8**	**0.8**	**1.0**	**0.8**
Canada	4.8	4.7	4.9	4.3
United States	0.4	0.3	0.5	0.4
Western Africa	**20.7**	**0.5**	**26.7**	**0.8**
Eastern Africa	**15.5**	**0.4**	**18.4**	**0.6**
Central America	**12.9**	**7.3**	**16.1**	**11.0**
The Caribbean	**41.4**	**11.6**	**40.9**	**13.9**

Source: Adapted from Docquier and Marfouk [2004]

Docquier and Marfouk (2006) show however that, as is happening in nearly all countries in the world, the level of emigration among highly-educated workers is higher than the overall rate of migration for all education groups, proving that highly-skilled migration flows are having a proportionately greater brain drain effect. This finding is consistent with those of other studies. Becker *et al.* (2003), working on data from the Registry of Italians Residing Abroad (AIRE), calculated that over the course of the 1990s, the human capital level (measured in years of education) of Italian emigrants was increasing. Thus, even if the rate of brain drain has decreased, those who emigrated were increasingly more skilled and relatively better educated than those who remained (Becker *et al.*, 2003); Saint-Paul (2004) arrived at a similar finding for the major European countries. OECD figures also estimate that the proportion of graduates among Italians in other OECD countries is 12.4% (approximately 300 thousand individuals).

These figures therefore seem to suggest that the Italian problem concerns not so much the size of the brain drain, but rather the large proportion of highly-skilled personnel represented amongst those who have left the country. In addition, OECD (2005) figures showing a negative graduate migration balance (of -47,842) for Italy would tend to indicate that the problem lies more in Italy's poor ability to attract talent, as a result of which the country is not managing to offset its losses in this regard. The OECD figures enable us to analyze this information further by comparing it with data on the qualification levels of people coming to the country.

Table 2 - Education levels of foreigners in 29 countries of destination

Country of destination	**Level of education**				**Total (no.)**
	Tertiary %	**Secondary %**	**Primary %**	**Unknown %**	
Canada	38.0	31.9	30.1		5,355,575
Mexico	21.6	14.7	20.9	42.9	415,728
USA	25.9	34.3	39.8		31,723,097
Total - Americas	**27.2**	**33.7**	**38.7**	**0.4**	**38,415,704**
Japan	24.2	35.7	20.9	19.2	1,157,354
South Korea	32.2	44.0	23.7	0.1	140,816
Total - Asia	**16.5**	**31.3**	**46.0**	**6.3**	**1,415,024**
Austria	11.3	39.3	49.4		924,487
Belgium	17.4	19.4	43.5	19.8	1,019,827
France	18.1	27.2	54.8		5,600,198
Germany	15.3	41.1	35.2	8.5	12,881,500
Greece	15.3	39.9	44.8		1,001,024
Ireland	38.7	27.6	27.9	5.8	333,004
Italy	*12.2*	*33.5*	*54.3*		*2,020,934*
Portugal	19.3	25.9	54.7		585,932

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United Kingdom	30.5	21.5	35.6	12.4	4,503,321
Spain	21.8	22.8	55.4		1,857,047
Total - Europe	**18.6**	**33.3**	**39.7**	**8.4**	**37,837,380**
Australia	33.5	14.9	31.4	20.2	4,605,408
New Zealand	23.2	38.0	14.5	24.3	743,817
Total - Oceania	**27.9**	**17.2**	**30.9**	**24.0**	**5,859,576**
Overall Total	**23.2**	**32.3**	**38.7**	**5.8**	**83,527,684**

Source: Based on data from OECD [2005]

Table 2 clearly illustrates that the proportion of foreigners with a tertiary education in Italy (12.2%) is amongst the lowest in the OECD countries, and well below the overall average for destination countries (23.2%) and the average for European countries of destination (18.6%). This can be attributed to a lack of restrictive and selective immigration policies (Brandi, 2004). Indeed, Italy has not adopted programs that facilitate the entry of highly-skilled personnel, such that the majority of immigrants in Italy are unskilled. Hence, if we compare this data with OECD (2005) figures on the number of graduates who have immigrated to (246,925) and who have left (294,767) Italy, we can conclude that the country's problem lies in its limited capacity to attract skilled human capital, rather than in the fact that a percentage of our graduates move abroad.

A recent study conducted by the Economist Intelligence Unit (Global Talent Index Report, 2011) demonstrates that our country is plodding along in the "war for talent", ranking in 23rd place in the league table for "ability to attract and produce talent". From Table 3, it can be seen that within the European context, Central and Northern Europe represent a more powerful center of attraction at the cost of Mediterranean and Eastern Europe. The report concludes by noting that the outlook for 2015 seems to offer no different prospects.

Table 3 – Global Talent Index

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2011 RANK	COUNTRY	SCORE/ 100	2011 RANK	COUNTRY	SCORE/ 100
1	United States	74.2	31	Chile	43.7
2	Denmark	64.7	32	Slovakia	43.3
3	Finland	63.2	33	China	41.1
4	Norway	61.9	34	Russia	40.8
5	Singapore	60.2	35	India	40.5
6	Australia	60.1	=36	Malaysia	40.1
7	Sweden	59.5	=36	Romania	40.1
8	Hong Kong	59.1	38	Mexico	39.7
9	Switzerland	58.5	39	Venezuela	39.4
=10	Israel	58.3	40	Colombia	39.1
=10	Netherlands	58.3	41	Saudi Arabia	39.0
12	United Kingdom	58.2	42	Brazil	38.2
13	Germany	57.9	43	Ukraine	38.0
14	Canada	57.8	44	Philippines	37.6
15	New Zealand	57.7	45	South Africa	37.4
16	Ireland	57.4	46	Thailand	36.8
17	Austria	55.7	47	Peru	36.4
18	Belgium	55.5	48	Turkey	35.0
19	France	55.1	49	Bulgaria	34.7
20	Taiwan	54.5	50	Ecuador	33.5
21	Spain	49.7	51	Egypt	32.8
22	South Korea	48.4	52	Vietnam	30.7
=23	Greece	46.7	53	Kazakhstan	30.5
=23	Italy	46.7	54	Azerbaijan	29.8
25	Czech Republic	45.9	55	Iran	29.7
26	Portugal	45.4	=56	Algeria	27.0
27	Japan	45.0	=56	Pakistan	27.0
28	Argentina	44.6	58	Indonesia	26.5
29	Poland	44.0	59	Sri Lanka	26.3
30	Hungary	43.8	60	Nigeria	23.1

Source: Economist Intelligence Unit, 2011.

5.1 Italian talent abroad and foreigners in Italy

There are around 300 thousand highly-skilled Italian workers living abroad in OECD countries (Table 4). Of these, 45% are located in North America, namely, 32% in the US (approximately one-third of the total) and 12.6% in Canada. 40% remain in Europe, where the preferred destinations are France (9.3%), the United Kingdom (8%), Switzerland (6.9%), and Germany (6.2%). Outside Europe, the country which draws the most Italians is Australia (with 13.6%, it is the second most popular destination), whilst the Asian countries taken into account by the OECD (Japan, South Korea and Turkey) only attract 0.6%.

According to European Union figures (DG Research, 2003), there are around 34 thousand Italians employed in science and technology (S&T) in other European countries, for whom the preferred destinations are Germany (15 thousand), France and Belgium (more than 5 thousand) and the United Kingdom (over 4 thousand). The discrepancies in these figures may be attributed to the fact

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that they are estimates whose level of reliability is undetermined; the trait that emerges, however, seems to suggest that there is a high proportion of scientists, engineers and researchers among highly-skilled emigrants. In other words, if the data on skilled migration in general is left aside to focus on migration in the scientific field, it would seem that the Italian problem is not solely one of a failure to attract talent but is also a matter of failing to retain it. As we shall see, this phenomenon is characteristic of all European countries, where the migration of S&T personnel is the most significant of flows among the highly skilled. We shall return to this issue later when dealing with the US case study.

Table 4 – Main OECD destinations (countries and world regions) of Italian graduates

Country of destination	Italian graduates	
	No.	%
Canada	37,280	12.6
USA	94,420	32.0
Total - North America	**131,700**	**44.6**
Total - Asia	**10,893**	**3.7**
Austria	3,472	1.2
Belgium	7,421	2.5
France	27,372	9.3
Germany	18,250	6.2
United Kingdom	23,547	8.0
Spain	7,686	2.6
Switzerland	20,286	6.9
Total - Europe	**118,812**	**40.3**
Australia	40,220	13.6
Total - Oceania	**40,487**	**13.7**
Total	**294,767**	**100.0**

Source: Based on data from OECD [2005]

The number of foreign workers with a tertiary education living in Italy is estimated to be 246,925. Their main regions of origin are Western Europe (22.6%), Southern Europe (13.3%), South America (11.6%), Eastern Europe (10.8%) and North Africa (8.9%). The countries most represented are Germany (6.6%), France and Switzerland (6%) and Albania (4.5%). European states tend to recruit foreigners from Europe itself or from ex-colonies. Italy, whose geographical position facilitates migration from North Africa, finds itself in a peculiar situation which differentiates it from other European countries at one time (almost) bereft of colonies. In addition, Italy offers scant attraction to Asian nations, whose citizens predominantly opt for the US (INS, 2003), Canada (CIC, 2004) and Australia (Birrell *et al.*, 2001).

5.2 What Italians abroad do and the case of Italian migrants to the US

It is difficult to gauge the levels of brain drain according to professional sectors, since the relevant OECD and World Bank data is not broken down by this parameter. The composition of flows can only be explored indirectly by studying the specializations of foreigners in the US. The National Science Foundation (NSF), through SESTAT (the Scientists and Engineers Statistical Data System), provides statistics on the highly-skilled foreign population living in the United States. This data therefore relates to a single destination country, which, however, attracts around one-third of the world's highly-skilled emigrants.

According to NSF data, 58.6% of Italians in the sample have a postgraduate qualification and 16.5% have a doctorate, a percentage that is lower than the average for Europeans in the US (21%). 74.7% obtained their highest qualification in the US, whilst 17.2% did so in Italy, 2.7% in Canada,

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and around 2% in the United Kingdom.

Excluding from the analysis Americans born in Italy and considering the place of training by nationality, we note that 63.8% of Italians who work in the United States in the field of science and technology completed their education within the US, whilst the proportion of those who for the most part trained in Italy and later settled in the US permanently (that is, talent that has fled) amounts to 23.6% in total, as against a corresponding average for Europe of 41.5%. However, of those with a doctorate, 32.6% obtained it in Italy. This percentage is very close to the European average (32.8% of doctorate holders from Europe attained it in their home country), which is the highest for foreigners living in the US. Hence, amongst the European immigrant population, there is a greater proportion of highly-skilled people trained in their home country to carry out research activities that then emigrate to the US. As regards their fields of specialization, the majority of Italians do not have a degree in a scientific discipline (47.9%). Those with scientific degrees specialize predominantly in engineering (14.2%) – in particular, electronic and computer engineering (6.1%) – and in social sciences (10.7%) such as economics and psychology (3.1%). The most common non-scientific disciplines are management and accounting (15.3%), the humanities (13.8%) and health-related fields (10.7%), whilst biology (4.2%) is the natural sciences field that features most significantly. Those employed work mainly in industry (69.6%) – a lower proportion than both the overall average (67.2%) and the average for Europeans (74.6%).

The most interesting figure is that the percentage of Italians who work in academia is very high (20.2%) compared to the overall average (6.1%) and that for Europeans (10.4%). This seems to suggest that, within the context of highly-skilled migration flows from Italy to the US, the proportion of researchers who migrate to the US academic system is very high and that the Italian brain drain is a phenomenon that particularly concerns the area of scientific and technological research. This finding is reinforced by an analysis of the type of work duties performed by Italians in the US. As shown in Table 5, 17.2% of highly-skilled Italian emigrants to the US carry out research and development activities, as against an overall average of 9.4% and an average of 17% for Europeans. Italy is therefore in line with the trend for Europe, where individuals employed in science and technology represent a sizeable proportion of the highly-qualified personnel who emigrate. The finding also conforms with public opinion on the issue of brain drain in Italy and Europe, which above all views the phenomenon as one chiefly involving the migration of scientific personnel.

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Table 5 – Main work activities of highly-skilled Italian emigrants to the US

Main work activity	Italians		Overall average	Average for Europeans
	No.	%	(%)	(%)
Research and development	8,984	17.2	9.4	17.0
Computer applications	809	1.6	6.1	8.3
Teaching	5,356	10.3	15.4	9.3
Professional services	7,341	14.1	17.3	15.7
Management and other	29,681	56.9	51.9	49.8
Total	**52,171**	**100.0**	**32,574,266**	**944,529**

Source: NSF – Scientists and Engineers Statistical Data System, 2008

The case of research in the US

The brain drain of students and researchers towards the United States is a phenomenon that has existed for decades, and in the twentieth century, played an important role in enabling American universities to achieve the level of excellence that marks them out today. The number of international students is particularly high in the field of science and technology. Statistics collected by the National Science Foundation for 2008 indicate that over 50% of all doctorates in engineering, mathematics, computer science, physics and economics were awarded to foreign students (60% for engineering). Two-thirds of them are still in the United States two years after completing their studies, and in the case of those from China and India, the percentages after 5 years are even as high as 92% and 85% respectively. Between 1990 and 2000, the number of individuals born in Asia who possessed at least a college degree and were employed in the United States in science and technology increased from 141 thousand to 460 thousand. These figures are bound to fall in the coming years due to growth in China and India, but they give an idea of the extent to which American economic development, heavily based on technological innovation, is linked to the ability to attract highly-skilled workers from other nations.

Italian students make up less than 1% of the total number of international students in the US, but this does not mean that the loss of talent this represents for Italy should be underestimated. First of all, the fact that many of them attend the most prestigious American universities, which have very high admission standards, suggests that these are not just any Italians, but some of the best of their respective generations. This is a loss that is not compensated for in any way and constitutes one of the curbs on Italy's growth in a global system where other economies are expanding thanks precisely to innovation. Secondly, statistics show that the brain drain to the United States mainly relates to people who are already graduates – leaving to pursue a master's or doctorate – and to people who have completed their studies and to whom a postdoctoral or professorial contract is offered. The extent of the economic damage can thus be imagined, considering that each graduate costs the Italian State around 500 thousand euro, taking into account the entire schooling career as well as university students who abandon their studies, and that those who leave the country are often the "cream of the crop".

Almost all those who have studied the phenomenon concur that the solution lies not so much in holding on to those who wish to go abroad to pursue career opportunities, but rather in attracting an analogous flow of incoming talent from the United States. In other words, the aim should be to "even out the balance", turning the brain drain into brain circulation. According to statistics from the Institute of International Education (IIE), the underpinnings for such a reversal in trend already exist. Indeed, Italy is the firm second favorite destination of students from American universities for short study visits abroad, only just trailing behind Britain (where there is no language barrier).

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Unfortunately, however, it is widely acknowledged – even in the absence of precise corroborating data – that almost none of them will choose Italy as the place to pursue their career after completing their studies. In this regard, one need only consider that all competitive exams for posts with Italian research organizations are still advertized and conducted in Italian. It is in this area that greater efforts are needed, with a view, on the one hand, to removing those factors which limit the integration of skilled international human capital within the Italian system, and on the other, to strengthening those elements that facilitate it.

The United States is thus adept at exploiting the brain drain, "buying" some of the best Italian brains with a few thousand dollars in scholarships. Reaping – at almost no cost – the fruits of an investment brought to maturity elsewhere is not, however, the only advantage accruing from the presence of foreign students and researchers.

NAFSA – an association promoting international education – has estimated that, in the 2009-2010 academic year, 723,277 foreign students and their families contributed almost 19 billion dollars to the US economy. This total was calculated by subtracting the amount of scholarships (approximately 7 billion dollars) from the sum of university fees and living expenses (around 25.5 billion dollars) and dependents' living expenses (roughly 500 million dollars). The net gain would be even higher if the contribution of the 113,494 postdoctoral researchers employed during the same period in American universities were added to these figures. Indeed, these returns should also include the income derived from patents and the economic impact of start-ups.

The American university system is very different from that in Italy, and some form of introduction is needed to gain access to it. For the vast majority of Italians enrolled in a master's or doctorate course or employed as researchers in the United States, it was an exchange program that opened doors for them. Some get in through official channels administered by the two governments, and others by way of agreements signed between their own university and one or more colleges in the US. For the most part, these are bidirectional exchanges, which favor brain circulation, even though only a few can count on well-oiled mechanisms that facilitate two-way traffic.

The most important such program between Italy and the United States is the Fulbright, which has existed since 1946 and each year facilitates the movement of an average of 50 grantees (students, researchers and professors) between the two countries. In order to avoid mass exoduses and ensure that the experience abroad is turned to maximum advantage, participants are obliged to return to their country of origin for at least two years upon the expiry of their visa. One of the aims of the Education Abroad Program (EAP) of the University of California network is to internationalize the campuses of local universities. Every year, hundreds of Italians are hosted on the west coast of the United States by the program. Indeed, Italy's main universities have joined the program and have signed a reciprocal exchange agreement, which involves a mutual exchange of students for a maximum period of one academic year. On the east coast, there is the MIT-Italy program, which aims to introduce Italian excellence to MIT and create opportunities for students and researchers of the Boston-based university to research and work in Italy. To achieve this goal, MIT-Italy funds fellowships that facilitate the reciprocal exchange of ideas and people for short periods, with a view however to fostering long-term collaborative relationships. There are also many agreements between individual universities, or specific departments, which enable a double degree to be obtained provided some of the relevant exams are sat abroad. Many of these agreements have come into existence thanks to the efforts of Italian professors installed at American universities, who have chosen to formalize cooperative arrangements already in place with certain colleagues in Italy. One of the reasons that leads the exchange of students and researchers to be formalized is the greater ease with which permits of stay may be obtained for periods exceeding three months. This is a critical issue which the United States has resolved by

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introducing specific types of entry visa for academic exchanges, whilst in Italy, it continues to be an obstacle to the internationalization of universities.

Hence, in conclusion, the available data indicates that whilst the rate of brain drain from Italy is not particularly high, skilled migration flows from the country are problematic due to:

(a) the high human capital level of those leaving the country;
(b) Italy's poor ability to attract talent; and
(c) the low qualification levels of those immigrating to Italy.

If the specializations of those who have left our country are examined, it is notable that there is a substantial proportion of people working in the field of science and technology. It can thus be said that if one passes from a consideration of highly-skilled migration flows in general to focus on the migration of scientific personnel in particular, the problem of attraction is also compounded by a problem of retention.

5.3 Reasons for the phenomenon and the costs of the non-circulation of talent

The biggest problem for Italy is therefore the negative net flows between incoming and outgoing talent, exacerbated by the high qualification levels of those leaving the country compared to those arriving. Moreover, as noted by Becker *et al.* (2003), the number of skilled Italians that have been leaving northern Italy since the 1990s is high, despite having studied in the best universities. The authors conclude that the emigration of talent and the lack of circulation of human capital is a phenomenon that is having a considerable impact in the Italian scenario. Without entering into any anecdotal digressions, it is a problem that would seem to point to several systemic causes, with governments and the business world being among those bearing responsibility. In fact, in Italy, both investment and incentives for research are not as substantial as – and less productive than – in other advanced economies (Iavarone and Lasorella, 2000; Abbott, 2001).

The Italian labor market also has a mix of institutions and traditions that mostly protect those who already have a job and penalize those who are looking for one. This also applies to the highly-skilled segment of the labor market, and impacts to a greater degree on young graduates seeking their first job, which is why they are compelled to emigrate. The situation is also particularly difficult for women. Here too it is the young that are worst affected by the lack of competition and transparency in recruitment practices. Indeed, personal and family contacts continue to be the predominant vehicle for finding a first job (Pistaferri, 1999, Soro-Bonmatí, 2001, Checchi *et al.*, 1999; Fabbri and Rossi, 1997; Schizzerotto and Bison, 1996).

Finally, the country's migration policies do not place emphasis on the education levels of incoming foreigners, and in some cases, because of the red tape involved in the immigration process, they create an adverse selection effect, whereby high-quality migrants, that is, those educated and having a greater range of options open to them, choose to go elsewhere.

In the case of scientific migration in particular, among the causes cited for the flight of talent are the lack of funding and sponsorship, lower salary levels (compared to many foreign countries), the non-meritocratic criteria pursuant to which funds are allocated, and the lack of adequate infrastructure and equipment. Salary levels, career opportunities and a lack of job security are viewed as major issues by Italian researchers (CENSIS, 2002; Morano-Foadi and Foadi, 2004).

The brain drain thus appears to be the result of a concatenation of problems weighing down on Italian scientific research. The responsibility for this situation is predominantly attributed to the scant heed paid by governments to scientific endeavor, which is not regarded as being sufficiently strategic. There is, however, no shortage of those who ascribe responsibility to Italian firms, seen

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as incapable of adequately supporting scientific research efforts. The debate over the brain drain thus comes to be linked with that regarding competitiveness in a globalized economy, as owing to the problems of which the brain drain is a symptom, Italy runs the risk of rapidly losing the position it has secured itself among the world's industrialized nations.

A study by the Institute for Competitiveness (I-Com) has calculated the economic value of the patent activity of Italy's 20 most productive scientists abroad. Assigning an average of 3 million euro per patent (a conservative assumption if one considers the pharmaceutical sector), the current value of the work of the top 20 scientists was found to be 861 million euro, with a projected cumulative value of 2 billion euro over the 20 years of patent protection. Based on these estimates, the authors of the study calculate that if the patent output of a scientist who moves abroad were in line, over the course of his/her career, with the average of the top 20 scientists considered in the research, the loss to Italy – net of costs – would be 63 million euro, or 148 million in projected cash flows over twenty years. This figure would rise to around one billion euro for a scientist specializing in chemistry.

One limitation of the abovementioned study is its assumption that a scientist would be just as productive working in Italy rather than abroad. Unfortunately, this is not the case, especially in those fields where the cost of research and development is high and requires substantial funding. It is difficult to envisage investment in research, both public and private, approaching (within the space of a few years) the European average or levels in the US. A change of mentality is needed, which cannot be imposed from above by means of simple reform, but must come from within, through the internationalization of universities and research centers. The solution, in this case also, is to facilitate the circulation of talent.

This naturally leads to the question of how open our country and its research centers are to foreign students and researchers. According to a survey conducted by the consulting firm Vision & Value on the ranking of Italian universities (2010), the country's tertiary institutions are finding it difficult to compete internationally. Indeed, their capacity to attract foreign students from the most advanced academic systems and from high-growth economies was found to be poor. For instance, it emerged that very few students came from the US, whilst Germany and France attracted 3,000 and the UK 13,000. There were 270 students from China as against 24,000 in Germany, and 270 from India whereas 14,000 were hosted in the UK. The majority of foreign students in Italy hailed from Mediterranean countries, with the biggest contingent being that of students from Albania (8,500), who numbered 10 times more than those from France and 20-fold those from Spain.

Those found to be suffering most from this lack of competitiveness were universities in the south of the country, whilst in the north it was observed that there are institutions (such as, for instance, the Polytechnic Universities of Milan and Turin) that have both the managerial and academic potential to become globally competitive and successful, provided that, as the authors of the survey suggest, those that perform well are encouraged through incentives. One possible way of facilitating the influx of a greater number of foreign students would be to relax the fees payable by non-EU students, bringing them into line with those applicable to EU students.

Other measures that could help attract students would be lengthening the duration of exchange visits, making it compulsory for universities to set up Erasmus programs, and offering a greater number of courses in English.

By way of conclusion of this section, it can be said that the brain drain and lack of circulation of talent may be considered symptomatic of the problems plaguing scientific research in Italy due to inadequate investment (both by the State and industry), low salary levels, clientelist management of financial resources and careers, and the limited openness of the university system, which

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problems are reflected in a lack of competitiveness. Efforts to solve the brain drain should thus focus on increasing funding for research, but also on fostering talent.

6 BRAIN DRAIN REVERSED: THE STEPS TAKEN TO MITIGATE THE BRAIN DRAIN AND FACILITATE THE CIRCULATION OF TALENT

In this part of the work, we examine the main policy measures adopted by the Italian government to manage highly-skilled scientific migration. We provide some examples below of steps taken by the government which – in line with the prevailing characterization of the problem that sees brain drain as confined to the migration of scientists and researchers – have been geared exclusively towards addressing the issue of scientific migration. The case of Sardinia and the return policies implemented there represents a new experimental approach also applied to migration in other fields.

6.1 Return Policies

In 2001, the then Italian Minister for Universities, Ortensio Zecchino, introduced the first brain drain reversal program. Article 1 of Ministerial Decree no. 13 of January 26, 2001 dealt with incentives for the contracting by universities of foreign or Italian scholars and experts engaged overseas on an ongoing basis in teaching and research for at least the last three years. The contracts (for a minimum of 6 months and up to a maximum of 3 years) were required to cover both research and teaching activities. Universities were to undertake to provide adequate facilities to host contract awardees, support their activities, and in addition, finance 10% of the costs of the proposed research program. The salary of the contract awardee would be paid by the Ministry, which was also responsible for evaluating the proposals submitted by universities and determining which of them to approve and fund (from resources of around 40 billion Italian lira annually for the years 2001, 2002 and 2003). The commitment, from a salary standpoint, was that invited scholars from abroad would be offered a European-level salary. The program went ahead and – by virtue of the Ministerial Decree of March 20, 2003 and Law no. 326 of November 24, 2003 (the conversion into law, with amendments, of Decree-Law no. 269 of September 30, 2003, containing "Urgent measures to promote development and to repair the state of public finances) – tax cuts were introduced (under Article 3: "Incentives for the return to Italy of researchers residing abroad") in order to facilitate the return of talent that had left the country.

As at the beginning of 2007, the results of this program were rather disappointing, in that, according to newspaper reports, only 466 talents (of whom around 300 were Italian) returned to Italy. As mentioned, we do not have any precise estimates of the number of Italian researchers abroad. However, if we add the NSF's estimate of 8 thousand living in the US to the 34 thousand estimated by DG Research (2003), or if we take 17.2% (the percentage of Italians working in R&D in the US) of the approximately 300 thousand highly-skilled Italians living in OECD countries, we arrive at a figure of between 40 and 50 thousand Italian researchers abroad.

Based on these estimates, the brain drain reversal program led to no more than 1% of Italian researchers returning from abroad. Moreover, in 2006, the Italian Ministry for Education, Universities and Research announced that the re-entry program would be suspended due to a lack of funds and would be deferred until 2007.

This policy initiative based on encouraging the return of talent therefore does not seem to have produced significant results; furthermore, return policies in general do not appear to be very effective (Ziguras and Law, 2006). Such programs also have another limitation: studies into the motivations behind migration (CENSIS, 2002; Terouanne, 1997; Dell'Anno, 2004) indicate that the main push factor is the possibility of working at the leading edge of research. Although this motivation can be considered to stem from the professional ideology of scientists or the norms of

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the scientific ethos, the fact remains that it is a widely-held one. Based on these considerations, the lure of a good salary alone – without a boost in infrastructure and scientific equipment – may not prove particularly attractive to researchers. In addition, sociological studies of scientific migration concur in finding that the major reason for returning is the desire to go back to the home country once interest in working at the leading edge of research has waned (Cemmel, 2004). It thus follows that, unless return policies are combined with strategies aimed at developing certain industries (as in the cases of India, Taiwan and China), there is a risk of attracting researchers that are less active and who are motivated to return for family or personal reasons.

An example of a more recent return policy initiative that seems promising is the "Master's and Back" program introduced in Sardinia, which has granted 3,500 scholarships to fund overseas study with a view to awardees returning to the region.

Sardinia's "Master's and Back" program

According to ISTAT national data, as at 2009, Sardinia was the region with the highest youth unemployment rate: 44.7% versus an average for Italy of 25.4% and 19% for the EU-27 states. Although Sardinia's per-capita income – at 16,280 euro – was the highest among the regions of Italy's *Mezzogiorno* (a figure pointing to the existence of economic activity within the region), high rates of unemployment certainly contributed to the brain drain towards destinations with better job opportunities.

It was against this backdrop that the Master's and Back program was instituted in 2005, funded pursuant to Sardinia's ROP (for 2000-2006, and then 2007-2013) under the European Social Fund. The program is aimed at young graduates and seeks to strengthen the Sardinian higher education system and employment market by funding attendance in higher education (that is, postgraduate) courses conducted outside the region, and by providing financial support to institutions and businesses operating within Sardinia to encourage the recruitment of highly-skilled young people within the regional labor market, thereby enabling the latter to be geared towards a more globally competitive form of economic development.

Excluding calls for applications currently in progress, to date approximately 3,500 scholarships have been awarded for educational training and nearly 1,500 grants have been made to fund "re-entry pathways" – that is, jobs and traineeships for returnees – available even to those who have not (via the Master's and Back scheme) attended a higher education course (representing a total of 150 million euro). Applicants for course funding must have been resident in the region for at least three years at the time of applying.

Preliminary figures indicate that, of the 3,328 awardees of scholarships to attend higher education courses, 2,030 have chosen institutes of excellence in Italy, 1,118 have opted to study in one of the other EU-27 countries, and 180 have gone to destinations outside Europe. Of the 770 re-entry pathways examined (and the figures here are also preliminary), 540 have involved individuals coming from institutions elsewhere in Italy, 194 from other EU-27 countries, and 35 from countries outside Europe.

In terms of those participating in the "outbound" (or "master's") phase of the program, funding covers PhDs, second-level vocational master's degrees in Italy, and master's degrees abroad.

Whilst in its early years the program operated on a "first-come, first-funded" basis, under which – subject to obtaining a minimum threshold score – applications were funded in chronological order of presentation, the procedure since 2009 has changed and a ranking system has been developed.

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In recent years, efforts have also been made to introduce greater objectivity into the application selection process, by assigning automatic scores according to CVs of candidates (based on their final degree grade, time taken to complete studies, age, and any other training undertaken and/or professional experience) as well as the host university chosen. In the latest calls published, a decision has been made to place greater weight (in assessing applications) on the choice of host university, with the aim of steering the postgraduate studies of young Sardinians in the direction of courses of recognized international merit and prestige (gauged and scored accordingly on the basis of the QS World University Rankings by academic discipline, compiled annually by the research firm Quacquarelli Symonds).

Hence, in order to be granted a scholarship, it is not only necessary to have an excellent CV, but also the drive and willingness to push themselves further. Consequently, if a young Sardinian who has graduated with excellent results chooses to attend a master's course at one of the top 30 universities in the ranking, he/she will have more chance of obtaining a scholarship than those opting for "cushier" and less selective universities.

Those awarded a scholarship receive a lump sum allowance of 2,000 euro gross per month for the duration of the course (up to a maximum of 18 months for master's courses or 36 months for doctorates), and are reimbursed university fees up to a maximum of 18,000 euro, except for courses offered by the top 30 universities in the QS ranking, in respect of which the entire amount paid in fees by the candidate is covered.

The second (or "back") phase of the program provides incentives for skilled young people to return to Sardinia by funding so-called "re-entry pathways".

In this case too, objective criteria and automatic scoring parameters have been introduced in the application selection process in recent years.

Here, the funding is disbursed to Sardinian host organizations that intend to contractually engage young people returning from having undertaken a higher education course and covers up to 85% of employment costs (for a period of two years, or three in the case of permanent contracts).

Indeed, in order to ensure a stronger commitment and interest on the part of hiring organizations in delivering the re-entry program, over the past year firms have been asked to contribute a minimum amount towards financing the scheme; organizations that offer more also earn bonus points towards accessing further funding, which is in addition to that allocated on the basis of the duration of the contract.

The Region of Sardinia should carry out an analysis of the cost-effectiveness of the program. The approximate cost of each outbound (or "master's") and return track is around 30,000 euro. However, this figure on its own is of little significance if it is not better contextualized based on the purposes of the program. In particular, the objectives of the return phase, in terms of the number of highly-skilled work placements effected, should be more readily quantifiable.

6.2 Retention Policies

In 2003, in the same law which refinanced the brain drain reversal program, the guiding principles were laid down for the establishment of the Italian Institute of Technology (IIT), modeled on the renowned Massachusetts Institute of Technology, which would be dedicated to applied research in the field of technology and aimed at facilitating interaction with industry. In other words, the Italian government was preparing to adopt a return policy coupled with the creation of a center of

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excellence.

The initiative did not fail to attract criticism, both because of the amount of funds earmarked, which could instead have been used to give a boost to already existing centers of excellence, and because the lead time required to get such an undertaking up and running would of necessity be lengthy. In point of fact, the development of the laboratories started in 2006 and was virtually completed by 2011.

The idea of developing a center of excellence – a strategy which scientists themselves suggest as a way of stemming brain drain – was based on various findings thrown up by studies of the sociology of science, the new economic geography, and the knowledge-based economy. Indeed, hubs of knowledge-intensive activity are "catalysts of externalities" produced by physical proximity and the sharing of context, codes and meanings that are implicit in the localized experience (Rullani, 2004). Geographic concentration, as in the case of Silicon Valley (Saxenian, 1994), favors the creation of informal networks that stimulate exchange between actors, on the basis of knowledge already available, and leads to the generation of new knowledge (Foray, 2000) and technology transfer.

Put another way, having centers of excellence means having a greater power of attraction and better chances of producing economic externalities, which are pivotal in the new modes of knowledge production (Gibbons *et al.*, 1994; Ziman, 2000).

Given this scenario, the problems the IIT has so far encountered could be attributed to the lack from the outset of already well-established scientific capital to exploit and develop. The phenomena considered by Saxenian (2001; 2002a; 2005) in relation to Taiwan, India and China showed that the creation of centers of excellence and science parks requires not only the investment of significant resources, but also having a competitive advantage at one's disposal to exploit.

The IIT could nevertheless serve as a test case to guide other similar initiatives.

6.3 Network policies

A third form of policy initiative undertaken by the Italian government was aimed at establishing a network to coordinate the diaspora of Italian scientists abroad. The opportunity was afforded by former Minister for Italians Abroad Mirko Tremaglia, who organized a conference to create a network of researchers and foster links between them and their homeland. The conference was held in Rome in March 2003 and it was followed up, in April 2004, by a series of meetings of the Permanent Consultative Committee of Italian Scientists Abroad. It was during the conference that the DAVINCI network (*D*atabase *A*ccessible *V*ia the *I*nternet of Italian researchers *N*ot residing in Italy and working abroad at university *C*enters, industrial laboratories or *I*nternational organizations) was unveiled. As can be read on the website of the Italian Ministry of Foreign Affairs, DAVINCI is an online database made available by the Ministry itself and supplied with information posted voluntarily by registered users. It pools together details of the activities, research interests and expertise of the community of Italian researchers working abroad, which are used for the purposes of networking, information exchange and dialogue. The network now has a membership of 1,357 researchers and scientists (including 427 in Germany, 295 in the United Kingdom, 124 in France and 119 in the US). Unlike other scientific networks, however, DAVINCI has not yet been used to develop projects.

In recent years, further scientific networks have also emerged. One of these is Urania, a network of life sciences experts aimed at fostering ties between Italian researchers in the US and their

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homeland. For the moment, Urania is limited to providing information on job offers in the US, and it is still in the process of recruiting potential members.

There is also a network established by the Region of Friuli-Venezia Giulia, which brings together a number of researchers of Friulian origin who are working abroad. None of these networks, however, offer activities particularly geared towards tapping into the diaspora as a means of transferring knowhow and technology. The shortcomings of these networks well epitomize the critical failings of Italian policies aimed at managing the issue of brain drain, namely: a lack of coordination between the various measures taken, and a lack of policies for developing and bolstering the country's research structures to accompany the policy initiatives adopted. Metaphorically speaking, it could be said that Italy's policies are networks without nodes, that is, efforts have been made to attract or link up talent though without human resources and knowledge having at their disposal the facilities and infrastructure that would render the mustered brainpower efficacious. In other words, these measures seem to be a response to public alarm over the brain drain – a response which, however, pays more heed to concerns of national pride than to any suggestions thrown up by researchers, successfully-trialed experiences (such as those in Asia) or studies of the sociology and economics of science.

7 CONCRETE PROPOSALS FOR ACTION BY GOVERNMENT AUTHORITIES AND UNIVERSITIES

The overview of case studies and macro-phenomena outlined in this Report clearly illustrates the alarming rise in the skill level of human capital exiting the country's economic system, and in particular underlines the existence, among skilled migration flows in general, of a veritable diaspora of scientific personnel, resulting in an erosion of the global competitiveness of the country. The phenomenon becomes even more of a concern when the Italian system's scant ability to attract skilled human capital from the rest of the world is added to the mix.

This problem is not only evident to Italian expatriates or experts in the field, but also emerges in Italian public debate, which attributes the brain drain to government inefficiencies, a lack of interest in research on the part of industry, and academic mismanagement, whilst seeing the issue as a threat to the country's ability to compete. As demonstrated, the phenomenon entails significant economic costs, both in terms of lost investment in education and lost output.

In light of the observations made in the preceding chapters regarding the situation in Italy, as well as the examples of best practices and policies in other countries, it would seem clear that the policy initiatives undertaken thus far may be considered unsatisfactory. The main limitation of these policies is that they have not been coordinated or supported by programs aimed at developing the country's scientific research sector, and at fostering more meritocratic and open universities that serve as catalysts for local economic development by promoting centers of excellence and partnerships with public institutions and industrial clusters. These problems not only demonstrate the pivotal role of policy intervention to manage flows, but also the productiveness of an interdisciplinary approach to studying and (hence) responding to the phenomenon.

The authors of this Report therefore wish to emphasize the importance of targeted and coordinated strategies to curb the damage caused to our country by the flight of talent and by the limited ability to attract skilled human capital. It is therefore necessary to act simultaneously on two fronts, namely: by promoting brain circulation, and by boosting the appeal of Italy as a magnet for talent.

On the basis of the literature outlined here and examined through the critical lens of the personal

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experiences of Italians abroad, the authors of this work believe it is crucial to put forward the following recommendations or proposals for action by government authorities and universities. These proposals could serve as a concrete roadmap for making the Italian system more competitive by promoting brain circulation. With a view to proceeding in a pragmatic manner, it is proposed that a task force be created and charged, in close consultation with the Italian government, with the role of formulating – on the basis of this Report – a set of concrete recommendations whose costs and cost-effectiveness should be gauged and which should possibly be implemented by 2012.

7.1 Proposals for action: government authorities

A boost in research investment

First and foremost, we note that research cannot be undertaken without investment. Italy spends 1.2% of GDP on research and development (2008 figures). This percentage is surprisingly low compared to that for countries such as the United States (2.8%) or the Swiss Confederation (2.9%), but also relative to the European average (1.8%). This also applies to research and development performed by the business sector, with the R&D-to-sales ratio of firms in Italy at 1.1% compared to 3.5% in the US.

The adoption of policy choices aimed at promoting brain circulation

Policy choices apt to facilitate the departure and arrival of skilled human capital from around the world are a necessary precondition for Italy to be geared towards social and economic development that is competitive with that of other countries. Such policies should also tackle the social immobility, patronage, parochialism and vested interests that have historically contributed to the brain drain from Italy and, at the same time, hinder the influx of skilled human capital to our country.

The review of the Master's and Back program and similar models

The model offered by Sardinia's Master's and Back program, an example of public-private partnership, indicates that policy responses apt to facilitate the departure and return or arrival of skilled human capital are workable and do have an appreciable impact on local economic systems. This Report also mentions other models that should be reviewed and adopted by government authorities. The State, as well as private consortia, could instigate an initiative to export the Master's and Back model to other Italian regions, and, at the same time, promote other models that would see universities become more meritocratic and open, serving as catalysts for local economic development

The creation of public-private partnerships

Government institutions should encourage partnerships with the private sector and with universities, and strengthen their links with the local labor market. Such collaborative relationships would also instill a more international and global culture in a society that would become more competitive and transparent.

The streamlining of entry visa procedures

The procedures for obtaining entry visas and permits of stay for non-EU researchers who wish to work in Italy need to be streamlined. It is only in recent years that non-EU citizens working in academia have been exempted from the maximum immigrant quotas set annually. However, the red tape involved is the same as for other types of work, with long processing times and queues at immigration counters. In the United States, there are various categories of entry visas for foreign students and researchers. The required documentation can be issued within a few days directly by the university or research organization, after which the individual concerned makes an appointment at the nearest consulate for the visa to be entered in his/her passport. An F-1 student visa allows the holder to work in the US after obtaining a degree for a period ranging from one

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year to three years, depending on the field of study. Thanks to this add-on period, many students are able to integrate into American society and do not return to their home countries. The introduction of specific visas, similar to those that exist in the United States, as well as the fast-tracking of bureaucratic procedures, would facilitate the circulation of highly-skilled human capital, both in Italian universities and industry.

7.2 Proposals for action: universities and other research bodies

It is essential that our universities and other research centers be made attractive, international and accessible to foreign students and researchers, in order to help even out the balance between incoming and outgoing talent. This obviously entails making the university system more open and meritocratic, giving rise to a need for serious and farsighted reforms.

An overhaul of competitive exams for academic posts

All attempts to make Italian universities attractive and international will be futile if they continue to remain places that are inaccessible to foreigners or anyone unaccustomed to Italian praxis. Currently, if a foreign researcher decides to seek appointment as a university professor in Italy, at best he/she would be offered an annually renewable research fellowship, pending the announcement of a public competitive exam. Such exams are not held at regular intervals and the language typically used is Italian. Debate often revolves around how to improve competitive exams for university academic posts, without realizing that there is no such thing as a perfect competitive exam procedure. If Italian universities wish to compete with the rest of the world, the holding of competitive exams at a national level must firstly be eliminated. Indeed, it is absurd that in order to hire a new professor it is necessary wait for nationwide competitive exams to be called, out of which will perhaps emerge one candidate with the necessary requirements, assuming that he/she is not sent to another university.

In such a system, it is clearly waiting lists and seniority-based criteria that hold sway.

What the authors propose is:

(i) the introduction of competitive exams at the level of individual universities, with the possibility of hiring people as needed;
(ii) the publication in English of exam announcements in international journals;
(iii) the inclusion of international members in boards of examiners; and
(iv) the adoption of objective criteria for quantifying the scientific productivity of candidates (the H-index, bibliometric indicators, and so on).

A revamp of PhD courses

In Italy, PhD courses are often where postgraduate students bide their time waiting for a stable job. It is partly for this reason that they are not well-regarded by industry, which does not set great store by those who have obtained a PhD. Admission is decided by consultation between professors, the duration is three or four years, irrespective of the results achieved, and except in some cases, candidates do not have to sit exams during the course. In the United States, the admission procedure begins a year before the start of the course, is very competitive, and requires, among other things, sitting an entry exam, reference letters and personal interviews with the board of examiners. The duration is 6 years on average (depending on the research results obtained), during which candidates attend advanced courses and must undergo – usually within 2 years – a qualifying exam, which for those who do not pass entails expulsion from the doctorate program. In order to improve the quality of Italian PhD programs substantially, we propose:

(i) the introduction of minimum publication criteria in order to obtain a doctorate;

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(ii) final PhD exams with the involvement of international experts; and
(iii) quotas for internal and external candidates in order to encourage mobility between universities.

The delocalization of periods of university and postgraduate study
In countries abroad, it is almost impossible for a student to obtain a degree, a doctorate and a postdoctoral research fellowship from the same university. The mobility of students within Italian and foreign universities should be encouraged. We propose, the introduction – in respect of competitive exams – of quotas for internal and external candidates so as to promote mobility between different universities. In addition, we recommend a system that rewards those candidates who have undertaken a period of study/research abroad.

The creation of centers of excellence
In order to ensure the workability of two-way exchange programs, it is necessary to create centers of excellence capable of attracting and hosting the best international students and researchers, providing them with a standard of quality similar to that in their sending country or which they would be able to find elsewhere in the world. In Italy, little regard is paid to rankings of the best universities, in which Italian universities are typically placed outside the top 100. Even if some of the criticisms leveled at the criteria used to compile these league tables might have some foundation, the fact remains that today the most talented young people who decide to continue their education abroad will look at these rankings to decide where to apply for admission. If Italy wishes to attract the best students in the international knowledge market, it must abandon its practice of indiscriminate funding and invest more resources in 2 or 3 top-notch institutions, for example, one excelling in technological fields, one in the sciences and one in economics, so as to bring them within the top 20 rankings. These centers should function as campuses, where students study and live in the same place. It is out of this interaction between students, professors and researchers that the best ideas spring. As mentioned previously, it is not necessary to create centers of excellence from scratch; rather, it is sufficient to boost the capacity of a few centers that are able to avail themselves of structures already in place and integrated within their local area.

A shake-up of research funding
We propose that an end be put to indiscriminate funding, which should instead be allocated according to peer-reviewed proposals with calls issued on a regular basis. Adjudication panels should draw on international experts with no ties to the research institutes associated with the proposals. Medium-term and final reports should be required and be a key condition for obtaining further funding.

The conduct of university courses in English and the internationalization of curricula
One of the biggest barriers for those who wish to study in Italy is the extremely low proportion of degree courses with lessons conducted in English, so much so that many opt for branch campuses of American universities that exist in several Italian cities, rather than enrolling in an Italian university. Whilst having too many undergraduate-level courses in English might – both for students coming from senior high schools and professors – prove unfeasible, master's and doctoral-level courses should all be conducted in English, as should final exams.

Similarly, in order to internationalize curricula and attract foreign students to Italy, it would be worthwhile encouraging the establishment of specifically-themed "Summer schools" or "Summer institutes" in topic areas of proven Italian excellence (for instance, scientific research in the field of cultural heritage, and so on). These Summer institutes should be particularly aimed at "young" personnel (under 40), and could serve as an effective vehicle for the exchange of ideas at an international level, as well as an attractive entry point for foreign students, encouraging them to pursue studies in the Italian education system. The introduction of a rule which stipulates that

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university students should spend a period of time abroad (one or two semesters, along the lines of Erasmus) or at another Italian university would promote mobility between Italian universities and between the latter and foreign universities. This rule should be phased in over time and made compulsory for all students within 5-10 years. A system should also be introduced with a view to encouraging exchanges with leading universities, as determined using the QS World University Rankings.

The optimization of remuneration packages
In order to cultivate mobility and promote the influx of foreign researchers and professors, salaries need to be attractive. Currently, the starting salary for researchers is very low and increases with length of service. This discourages younger researchers from embarking on an academic career in Italy. By linking salary levels to scientific productivity, it would be possible on the one hand to attract young talent, and on the other, to stimulate productivity at all levels.

The introduction of mandatory retirement
In Italy, the proportion of university academics over 65 years of age is 14%, whilst in all other countries surveyed by the OECD this percentage does not exceed 2% (with the exception of Slovakia, where it is 6.8%). Over-65s account for 22% of full professors alone. This represents a significant curb on generational turnover and penalizes the salaries of younger researchers. We propose the introduction of mandatory retirement at age 65 in respect of all managerial roles (department heads, chief clinicians, and so on) and the setting of a maximum cap, in line with that of other countries surveyed by the OECD, for the number of professors emeritus, who would only perform academic duties.

The expansion of exchange programs
The two-way exchange programs already in place could be developed further. Based on the model in Asian countries, government scholarships could be set up to finance the specialization abroad of top graduates, imposing an obligation on them to return and work in Italy for at least 2 years after completing their studies (as per the Fulbright program). The idea would only be viable if those taking part were guaranteed employment, upon returning, in universities or the public service, as it can be readily foreseen that very few would participate in the initiative otherwise. The State could rely on existing organizations, such as ISSNAF (the Italian Scientists and Scholars in North America Foundation) to manage the scholarships and choose the university or research laboratory best suited to each fellow. At the same time, networks of Italian researchers abroad could also be expanded and better organized around disciplines or areas of interest, so as to "pull together" more effectively and work with Italian institutions towards expeditiously opening up structured channels for conducting such exchange visits. Establishing a system of "double appointments" for Italian researchers and professors working abroad could help open up further conduits for bidirectional exchanges. Private investment and support from businesses for programs of exchange and overseas training of talent should also be encouraged.

7.3 Concluding Remarks

In conclusion, in order to bring about a reversal in trend, and sow the seeds for a systemic transition from a phenomenon of brain drain to brain circulation, there is a need for resolve and investment on the part of government authorities, civil society and business operators. In this Report, we have put forward some concrete proposals aimed at effecting this turnaround in trend in the academic sphere. Regulatory simplification, autonomy, internationalized curricula, centers of excellence, and meritocracy: these are the watchwords of this sea change, which must necessarily involve public authorities, universities and businesses, but above all, those among the younger generations, since the verdict as to whether it has been a success or a failure will ultimately be theirs.

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