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ABSTRACT

Where Do the Brainy Italians Go?*

This paper studies the major determinants that affect the country choice of the talented Italian scientists and researchers who have at least a bachelor's from Italy and live abroad. There are three alternative country choices: the US/Canada, the UK, and other EU countries. On average, the brainy Italians exhibit a higher predicted probability to go to the US. *Ceteris paribus*, both push and pull factors are important. While having a Ph.D. from outside Italy predicts the UK choice, having extra working experience from outside Italy predicts migration to other EU countries. Those who stay abroad temporarily for two to four years are definitely more likely to go to the UK. Specialization in the fields of humanities, social sciences, and health are strong determinants of migration to the UK. For the move to the US, while the humanities area is a significant deterrent, health is a positive deciding factor. Lack of funds in Italy constitutes a significant push to the US.

JEL Classification: J61, J24, F22

Keywords: brain drain, skilled migration, Italy, push-pull factors

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1 Introduction

Hundreds of thousands of highly educated and skilled Italians take their talents in search of better funds, career opportunities and payoffs abroad. While the brainy Italians are leaving, not many other qualified scientists go to Italy to support a balanced exchange of brains. Italy exports 30,000 researchers per year and imports only 3,000 (The Chronicle, 2006). It is no wonder why the term “brain drain” is seriously employed by the media, policy makers, and scholars in the last couple of years. Coined by the British Royal Society in the 1950s the term brain drain refers to the escape of scientists and other highly skilled workers towards the US and Canada from developing countries. At the time, the debate centered upon the detrimental effects of the net outflow of skilled people in terms of welfare for a country suffering from qualified emigration.

Over the last decade renewed attention has been paid to this issue. New terms like brain gain, brain circulation, and brain waste have been introduced, and international institutions like the OECD and World Bank have made a big effort to measure the phenomenon. A permanent exodus of gifted scientists and researchers from Europe to the US and Canada can have grave consequences even for these developed countries. The costs and benefits of the circulation and migration of the “brains” are hotly debated.¹ Foreign skilled workers contribute to innovation, research and development, and economic growth, and are in high demand. As long as migration is not permanent and the brains go back to the country of origin, this can be a win-win scenario. For scientists, it is understandable and advisable to be involved in brain circulation and exchange. This is not only natural in a globalized world like today, but it is necessary if an individual or a country wants to keep up with excellence and stay competitive.

Undoubtedly, the US, with its magnetic centers and universities of scientific excellence and its ample availability of research funds claims scientific preeminence, and ranks the highest among all OECD countries in attracting the highly skilled.² Alarmed by the “fugitive” European brains and the global competition for the highly skilled, the European Union (EU) created the European Research Area (ERA) in 2000, a central pillar of the Lisbon Agenda. The aim is to make Europe an attractive place for the high skilled in general, retain its brains, inspire expatriates to return, ensure

¹ Regets (2001) provides a nice overview of global effects as well as of the pros and cons of brain drain for the sending and receiving countries.

² In 2001, the US accounted for 30% of the foreign student enrollment. The second key destination is the UK, with 14% (OECD, 2004). It is also true that in the US immigrant scientists and engineers are more likely to engage in research than their native-born counterparts. This pattern holds true for each major science and engineering (Regets, 1995 and Johnson and Regets, 1998).

seamless mobility and interaction, and develop strong links with partners around the world (EC Green Paper, 2007).

Italy, like many other European countries with a public education system (that is, with very low tuition fees) spends money to educate its people, and it produces highly skilled personnel. It appears, however, that it cannot keep them and benefit from their skills and education. The question is why do the brainy Italians go abroad, where do they go, and will they come back? Among the top five reasons for the Italian brain drain we find an overregulated bureaucracy, rigid hierarchies, scientific fragmentation, and lack of resources and facilities. Lately, some attempts have been made to overturn the brain drain in Italy. With the creation of the National Research Plan, aiming at better managing resources and increasing competitiveness in research, with operations “brain buster” and “brain re-entry” and with other initiatives there is a glimmer of hope for the future of the bright and talented Italians. Recent initiatives by the Italian government aim not only at stopping the brain drain, but at ever reversing it. According to *La Repubblica* the “brain re-entry” program has brought back to Italy more than 460 researchers (half of them are Italians) from 2001 to 2006 (The Chronicle, 2006).³

The purpose of this paper is to empirically investigate the major determinants that influence the country choice of Italian scientists and researchers who migrate abroad. Using a unique dataset, CENSIS, we specify a multinomial logit model that can best answer our question. We consider three country choices as follows: the US/Canada, the UK, and all other EU countries. We proceed with a brief overview of the Italian research and education system and of the recent related literature on brain drain. Next, we outline the empirical and conceptual framework of the country choice, the basic structure of the multinomial logit model, and the variables adopted for the analysis. We continue with the description of the data and our sample. Then, we present the raw statistics and the results from the econometric analyses. Finally, we offer some concluding remarks.

³ In March 2006, the departing minister put the program on hold.

2 The Italian Research System and Related Literature

2.1 The Italian System

In Italy, there are dozens of universities, mostly public, although there are a few private institutions that are recognized by the state, there are polytechnic institutes, academies, and some high ranked institutes and conservatories that can also sponsor Ph.D.s.⁴ Universities confer the equivalent degrees of a bachelor's, master's, and Ph.D. Under the old system (before the 2000 and 2002 reforms) the first level degree (*Diploma Universitario*) was analogous to a two year college degree. The second level degree (*Diploma di Laurea*) required four to six academic years, depending on the discipline, but most people extended it to two additional years. After the Laurea graduates qualify to apply for the post-graduate degrees of *Corso di Perfezionamento* (one year study) and *Diploma di Specializzazione* (2 to 5 years). The third level degree, *Dottorato di Ricerca* (a 3 to 4 year degree), is only accessible through a public competition called *concorso*.

Under the new system, there are two levels: *Laurea* (a three year program) and *Laurea Specialistica* (a two year program). There is also a 1st-level Master's, a 2nd-level Master's and Doctoral Studies (about three years). Ph.D. students have to pass the *concorso* to enter the doctoral studies program. Some funding (scholarships) is available by the Ministry (MUIR), but the amount of the scholarship is low (about 850 Euros per month), and most students are supported by their parents or try to find other sources. Unlike in other countries, the Italian Ph.D. is granted by MIUR, and at the end of the program the students have to defend their dissertation to a large committee. Post-doctoral studies are also possible in the form of temporary contracts for three to five years. To secure one of the few permanent positions, graduates still have to pass additional written and oral exams (*concorsi*). In academia, such a permanent position would be the rank of an associate professor.⁵ Still, at this position and after so many years of being in academia, people earn a comparatively meager salary. The ultimate position is a full professor.

While Italian universities offer high quality and competitive education and in the past have attracted first rate scholars, the system suffers from cumbersome bureaucracy, cronyism, nepotism, and political interventions. This does not only constitute a push factor for the gifted Italian scientists, but it is also a barrier to other talented scientists who may want to go to Italy. For

⁴ For an excellent description of the Italian system, its problems and merits see Morano-Foadi (2004).

⁵ There is also the permanent researcher (assistant professor) position. This position is obtained by passing a written and an oral exam. It used to come before the associate professor position in the old system. Now there is a transitory regime in which one can compete for this position permanently. When the reform will be completely in effect the researcher position will not be permanent anymore.

example, it often happens that Ph.D. students have to wait forever for their professor to allow them to graduate while in the mean time they have to carry on many of the professor's duties for free. Full professors, the *baroni*, are very powerful and in control of the academic positions.

Unlike the US, outside the university and institutes circle, there are not many positions available for scientists and researchers. The industry and the private sector cannot or do not want to absorb scientists at the Ph.D. level, thus contributing to the mismatch of demand and supply. Low rates of interregional migration also contribute to this mismatch. In addition, as the system is under the call of politicians it suffers from inadequate funding and low investment in science. Statistics show that in 1999 Italy invested only about 1% of its gross national product in scientific research. This is half of the EU average. It is not surprising for scholars, who want to be independent and carry on first rate research, to want to migrate to countries where the system is more flexible, salaries are higher, facilities are superior, funds are ample, and prospects are brighter. Moreover, those Italians who obtain their higher degrees from abroad find it very difficult to go back to Italy and thus stay abroad.

In short, the causes of the emigration of Italian talents are also the results of structural deficiencies of the economic system (Censis, 2002). First, it is the low capacity of human capital absorption (that is, people with higher levels of education) by the labor market. The increasing supply of labor (at the graduate and/or post-graduate level) does not meet the low demand of labor in research departments, neither public nor private. The phenomenon of the "intellectual unemployment" (graduate and post-graduate) is high in Italy compared to other European countries. At the same time, a low level of research and development investment in Italy from both the public and private sector, reinforce this situation. As a consequence, the outcomes of the research activity produce also low levels of performance. The Italian invention rate, which measures the number of patents for 10,000 inhabitants, is very low (1.2 against 5.3 on the average for OECD countries). In a nutshell, there are problems at the aggregate level (macro level – Italian economic system) and at the university level (micro level – research system managed by *baroni*).

2.2 Related Previous Research

Mainly due to lack of micro data in some countries or incomplete data in others,⁶ the issue of brain drain has not been studied adequately. A seminal paper by Carrington and Detragiache (1998) estimates the magnitude of the brain drain from developing countries to OECD countries. The authors point out the lack of systematic data sources for highly skilled emigration and suggest a preliminary method to estimate these figures from developing countries. They find a substantial brain drain from the Caribbean, Central America, and some African and Asian countries. Emigrants are definitely much better educated than those who stay in their country, having usually tertiary education. Dumont and Lemaître (2004) describe a new data collection from OECD that measures the level of qualification of expatriates. The expatriate community is identified from data on the foreign born by place of birth in all OECD countries using Census Data. A general finding is again that international migration is quite selective towards highly skilled migrants.

Doquier and Marfouk (2004) undertake the difficult task to provide the scientific community with good and reliable data on brain drain. Mostly using aggregate data, they estimate skilled workers' emigration rates for about 190 countries in 2000 and 170 countries in 1990, including both developing and developed countries. They show that the largest numbers of highly educated migrants are from Europe, Southern and Eastern Asia. They evaluate the changes in brain drain intensity from 1990 to 2000 and show that Western Africa, Eastern Africa and Central America experienced a remarkable increase in the brain drain during the past decade.

Few works in the economic literature have attempted to explain why highly educated people leave the developed countries. Recently, the OECD (2002) has highlighted that "like other categories of migrants, skilled people mostly move in response to economic opportunities abroad that are better than those available at home. Other factors, however, also play a role in the decision of the highly skilled to migrate and include intellectual pursuits, be it education, research, or language training. In the case of researchers and academics, the conditions in the host country regarding support for research and demand for R&D staff and academics can be an important determinant in the migration decision and destination" (p. 3).

Saint-Paul (2004) studies the skilled expatriates in the US and documents the existence of brain drain from Europe to the US. Using US Census data he shows that 33.8% of the expatriate

⁶ See Regets (1999) for an overview of available data and basic characteristics.

population from EU⁷ living in the US in 2000 have tertiary education, and the highly skilled are over-represented abroad compared to those who stayed in the home country. With regards to the level of education, the proportion of expatriates with a Ph.D. is growing among the expatriates: from Germany it was 1.72% in 1990 and 2.39% in 2000; from Italy 0.96% in 1990 and 2.0% in 2000; from UK 3.2% in 1990 and 3.9% in 2000; from Spain, 2.7% in 1990 and 4.6% in 2000; from Belgium, 4.33% in 1990 and 5.78% in 2000; and from France 3.1% in 1990 and 4.9% in 2000 (US Census Data).

For the case of Italy, to the best of our knowledge, only a few descriptive papers dedicate attention to the causes of the Italian brain drain. A notable exception is the study by Becker et al. (2004). Using a new dataset of Italian émigrés abroad, they show that Italy has been indeed suffering a loss of human capital per worker since 1994. They assess – from a macro level – that since 1992 emigration has been a source of reduction in the percentage of college graduates in the working age population of Italy. The years 1996 and 1997 evidenced a higher relative flow of college graduates, and about 3-5% of new college graduates in Italy have moved out since 1996. Their share among emigrants was more than twice their share in the resident Italian working age population. Their findings confirm the anecdotal evidence of an increased brain drain in Italy, and explain the increasing tendency of the college graduates to go abroad against a constant flow in overall emigration, during the 1990s. During the second half of the 1990s, they state that “the share of college graduate young workers (aged 26-45) and older workers (aged 45-65) was larger than the share among the residents”. Lastly, emigration seems to characterize students of the best Italian universities and in the highly productive and demanded fields of engineering, finance, and economics.

Morano-Foadi (2006) suggests a comprehensive picture on the nature of the Italian scientific migration. She describes the approach employed to analyze an important pilot study on the Italian-UK flows concerning the discipline of physics and the life sciences. This method integrates descriptive information (through narratives) gathered in the interviews of the Mobex project with those brought together from national and local newspapers to the aim of examining the media debate. The ensuing outcome is to cluster the main aspects into pull and push factors that conform to similar classification by others (Di Giorgio, 2003). Among the pull factors she lists the Italian scientist perception of a better scientific reputation in other European countries and the US.

⁷ Including people from Belgium, France, United Kingdom, Spain, Italy, and Germany.

Another magnet is the existence of a meritocratic career progression system abroad. The last luring factors are the better salaries, opportunities, and investments that exist in the UK. The push factors have to do with the challenges in Italy. Low investments in research, low salaries, lack of facilities, a cumbersome recruitment system, corruption, and bureaucracy are the top reasons for the exodus.

Overall, all studies agree with the press and the media that there is a serious exodus of Italian brains that is mostly due to the inefficiency of the Italian system. The two main reasons are the lack of research funds and the bureaucratic university system, as Savaglio states (Savaglio, 2004). She also explains that the American recruitment system is a much better mechanism compared to the Italian one. Moreover, Beltrame (2007) believes that political failures in adopting accurate measures to tackle this issue are also responsible for the serious problems of scientific research in Italy. He suggests a comprehensive approach to solve the crisis that includes both a political intervention and an interdisciplinary scheme to study the phenomenon.

3 Model, Variables, and Data

3.1 Model of Country Choice

To study the allocation of Italian researchers and scientists around the world we use the Multinomial Logit Model (MNL) as our methodological framework. This model is based on the principle that individuals choose, among several options, the outcome that maximizes their utility gained from the choice. A rational person always opts for the alternative that maximizes the utility derived from the choice. An individual i ($i = 1, \dots, N$) faces m possible choices, with Y_{ij}^* denoting the level of indirect utility associated with the j th choice, called the latent variable. The observed variables Y_{ij} are defined as:

$$Y_{ij} = 1 \quad \text{if } Y_{ij}^* = \text{Max} (Y_1^*, Y_2^*, \dots, Y_m^*)$$

$$Y_{ij} = 0 \quad \text{Otherwise}$$

If $Y_{ij}^* = V_j (X_j) + \varepsilon_j$ where X_j is the vector of attributes for the j th choice and ε_j is the random error associated with that choice,⁸ the specific form of the model is determined by the assumed distribution of ε and the specification of how $V_j(X_j)$ is related to the measured variables. If the ε s are independent and have a type I extreme-value distribution with cumulative distribution

⁸ It captures the unobserved variations in tastes and in the attributes of alternatives and errors in the perception and optimization by the chooser.

function $F(\varepsilon_i < \varepsilon) = e^{(-\varepsilon_i - e^{-\varepsilon_i})}$ and probability density function $f(\varepsilon) = e^{(-\varepsilon - e^{-\varepsilon})}$ then, it can be shown

$$\text{that } P(Y_i = 1 | X) = \frac{e^{V_i}}{\sum_{j=1}^m e^{V_j}} \quad (1)$$

Defining Y_{ij}^* to be the level of indirect utility for the i th individual making the j th choice, then

$$Y_{ij}^* = 1 \quad \text{if the } i\text{th individual makes the } j\text{th choice and}$$

$$Y_{ij}^* = 0 \quad \text{otherwise}$$

Assume that $Y_{ij}^* = \beta'X_{ij} + \alpha'Z_t + \varepsilon_{ij}$ is a linear combination of explanatory variables representing the individual-specific variables (Z_t), that is, the characteristics of the chooser and the vector of values of the attributes of the j th choice as perceived by the i th individual. Then we have

$$\text{that } P_{ij} = \text{Pr ob}(Y_{ij} = 1 | X, Z) = \frac{e^{\beta'X_{ij} + \alpha'Z_t}}{\sum_{k=1}^m e^{\beta'X_{ik} + \alpha'Z_t}} \quad (2)$$

As it is clear from equation (1), the model has the property referred to as the “independence of irrelevant alternatives” (IIA). This is because the odds ratio of the two choices ($\exp(V_i)/\exp(V_j)$), is the same irrespective of the total number m of the choices considered. That is, if the individual is offered an expanded choice set, this does not change the odds ratio.

The estimation of the MNLM can be carried out with the maximum likelihood method. The resulting estimates are consistent, asymptotically normal and asymptotically efficient. Amemiya (1985) shows that under certain conditions that are likely to apply in practice, the likelihood function is globally concave, ensuring the uniqueness of the ML estimates. The normalization rule is $\alpha_m = 0$, and the marginal effects are given by $\delta_j = \partial P_j / \partial X$, $j = 0, 1, \dots, J$.

In our case, we study the characteristics that affect the migration decisions of Italian scholars, who choose to exit Italy to go to different countries. The dependent variable is a categorical variable of three unordered outcomes, carefully constructed to have enough variation and independence among the choices: (i) go to the US or Canada, (ii) go to the UK, or (iii) go to other EU countries.⁹ In estimating the model, the third choice alternative (other EU countries) is the reference alternative to which the remaining alternatives are compared. The US/Canada and the

⁹ A handful of individuals living in Australia, Japan, Mexico, and Chile are included in this category.

UK naturally have the English language as a common characteristic against the other countries. Because English has become the language of science, Europeans who want to stay in Europe will have to go to the UK. However, the US and the UK are sufficiently different in their research system, culture, and in distance from Italy. The UK and the other EU countries are also distinct choices, not only because the language and culture are different but also because they have different comparative advantages in different fields. Lastly, each country choice has a distinct reputation in its scientific advantage. Nonetheless, we tested our model for the IIA. The null hypothesis is that the IIA exists and the ratio of the probability of going to the US/Canada or the UK to the probability of going to other EU countries is unaffected by the presence of the other alternative. The test shows that we cannot reject the null, and we proceed with the MNLM estimation.¹⁰

3.2 *Independent Variables*

On the basis of the theoretical framework outlined in the previous section we select a group of variables as plausible independent variables that can explain the country choice of individuals. Human capital theory implies that people differ in their marginal valuations of relevant location attributes. We include demographic, human capital, and other variables that can explain the country choice of Italian scientists with different profiles. It is possible that men might choose a different country than women. We, thus, control for gender. If women are more conservative and/or pressured by their families not to leave the country, they will be less likely to move to the US/Canada which are countries far away from Italy. We also account for the effect of age on the country choice and its square as there maybe serious nonlinearities in choosing the alternative country. It is possible that younger individuals might be more inclined to go further away from Italy, perhaps to the US or Canada, and more mature individuals to stay closer to Italy within the EU.

The type of education individuals have is also an important determinant of the country choice. We carefully created five categories for educational attainment: Those who have a Ph.D. from Italy, a Ph.D. from abroad, some post-graduate or post-doctoral specialization from Italy, and some post-graduate or post-doctoral specialization from abroad. The reference category is having only a bachelor's degree from Italy and no further education. It is a plausible hypothesis that those

¹⁰ See Table 3.

who have a Ph.D. from Italy (or even some specialization from Italy) would be more likely to go to another European country as opposed to going to the US or Canada. Similarly, those who have working experience from Italy would be more likely to go to other EU countries than to the US or Canada. For example, a long working experience from Italy as well as a Ph.D. from Italy might not be as easily recognized in the US as in other European countries. Besides, it is more difficult to migrate to the US than to other European countries.

The field in which Italian scientists are specialized in is another important determinant that captures not only human capital effects, but it also reflects different demand structures in the country allocation. With *natural sciences* being the reference group, we consider the fields of *humanities*, *social sciences*, *engineering*, *health*, and *agriculture and services*. We posit, for example, that engineering or health scholars would be more likely to go to the US as the returns are much higher there. Likewise, individuals in humanities would be less likely to go to the US or Canada, where it is known that demand and payoffs are low.

We also include other variables that can capture some “push/pull” factors for Italian researchers to leave their country and go abroad. We consider three reasons: *find better economic conditions abroad* (the reference group), *better perspective career*, and *experience lack of research funds in Italy*. We speculate that those who value research funds and better economic conditions might go to the US or Canada as these countries are known to offer better economic conditions, benefits, and research funding. The last group of variables captures the exposure of Italians abroad, that is, the time Italians have been living abroad. Living less than two years abroad, between two and four years, between four and ten years, and more than ten years (reference category) are the four exposure categories. These variables can capture several reasons. The longer migrants stay abroad, the less likely they are to return to their home country, because they get more used to the new host country, its culture and way of living. At the same time a long residence abroad, especially in the US or Canada, might indicate a looser relationship with the country of origin. We can then hypothesize that Italians who are longer abroad will more likely go to countries closer to Italy so they can keep the ties alive. The time Italians left can also capture some cohort effects. Table 1 contains the list and explanation of the variables selected for the analysis.

3.3 Data

For our empirical analysis we employ a new dataset that is drawn from the 2001 *Censis* database.¹¹ With the turn of the 21st Century, the Italian Ministry of Foreign Affairs set up the “DA VINCI” database in order to collect information on Italian researchers and scientists who live and work outside Italy. A big effort has been put forth by this Institution to put the data together. Who are the Italian researchers abroad was not known ex-ante, and they had to be identified. The target was to find all Italian researchers¹² and professors who work either in universities, colleges, or in Public and Governmental Institutes. The starting point was the “DA VINCI” database, which in 2001 had information on 1,302 persons spread out in 25 countries and provided information on their location and address. Subsequently, other people were included following different sources of information. For example, they selected a group of countries where it was more likely to discover Italian researchers. They checked either the percentage of Italian researchers in every country, included in the DAVINCI database, or verified the country through destination countries of total Italian migration flow data. They obtained names, addresses and other information about researchers from the Embassies and consulates of the selected countries by means of official letters of request. With additional help from international associations (like the country’s association of economists, physicists, etc.) they found out more information about the brainy Italians who live outside Italy.

By the end of October 2001, 2,678 individuals were identified and recorded. A questionnaire was sent out to all subjects. The questionnaire asked detailed information on education, current research activities and motivation that pushed researchers abroad, as well as their situation abroad, and their intentions to return back to Italy. *Censis* was collected in 2001 on the basis of voluntary self-reported information. Only 737 individuals answered the inquiry. Identified by *Censis*, the main destination is the US attracting about 34% of the Italian brains. Among them, physics and medicine are the largest groups of disciplines. Second in attractiveness comes the UK where 26% of the talented Italians are fleeing. Medicine and neuroscience have the highest preponderance. Among the rest of the destinations, France ranks high attracting 11% of the Italians. Top three reasons to migrate abroad are: lack of funding for research in Italy, better conditions from an economic standpoint abroad, and better career opportunities abroad (*Censis*, 2002).

¹¹ Specifically, two institutions are involved in collecting these data, *Censis* and Cassa di Risparmio di Venezia Foundation; we refer to *Censis*, for conciseness.

¹² Ph.D. students are excluded.

Based on Censis, our sample is restricted to individuals who are between 24 and 65 years of age, a prime age in the labor market. To study brain drain, we also need a homogeneously educated sample. We thus consider only those Italians who received a Laurea (B.A.) from Italy. That is, we look at individual men and women who were educated in Italian Universities and therefore have been living in Italy until they were at least 22 years old. After we exclude persons with missing values in the relevant variables, we end up with 672 individuals, 230 of whom are females and 442 males.

4 Results

4.1 *Sample Characteristics*

In Table 2 we present the summary statistics of our sample's characteristics by country of sorting. These raw statistics show that there are differences among the individuals living in the US or Canada, the UK, and the other EU countries. On average, Italians abroad have the same age (about 38 years of age). Differences arise in their gender. While more men are abroad than women, many more men are in the US and the other EU countries than in the UK (about 68% and 59% respectively), making the UK a more preferable destination for women. In the UK we also find, comparatively, the largest percentage of Italians with a Ph.D. from outside Italy. For example, 53% of the Italians in the UK have a Ph.D. from outside Italy while only 31% of the Italians in the US have a Ph.D. from outside Italy. Italians who have a Ph.D. from Italy seem to be migrating to the other EU countries and not to the US or the UK. A larger percentage of the Italians in other EU countries have a Ph.D. from Italy (36%) than the Italians in the UK (28%). In contrast, those with some specialization, whether from Italy or from outside Italy, are more likely in the US. And clearly more Italians among those in other EU countries have no post-graduate education (about 20%) than among those in the UK (8%). Overall, the vast majority of the Italians in the UK has a Ph.D. (81%). While this is also true for the US, only 65% of the Italians have a Ph.D. It is possible that Italians go to the US to study and then leave.

A sizeable number of Italian scientists abroad has experience from Italy; the largest percentage of them is in the US, followed by the UK and the other EU countries. However, we see a different picture when it comes to having experience from outside Italy. While about 57% of the Italians in other EU countries have experience from outside Italy, only 46% of the Italians in the US do. It is also interesting that the push/pull factors differ by country choice. Among the Italians

in the US, 64% claim that they have better economic conditions than in Italy, 39% have better careers than in Italy, and 37% left Italy due to lack of funds. In contrast, only 43% and 27% of the Italians in the UK claim that they have better economic conditions and career, and only about 20% of Italians in other EU countries left Italy because of lack of funds.

Comparatively, the largest percentage of Italians in humanities is in the UK (16%) and the smallest in the US (4%). There are also field differences among those in the UK (who are mostly in the social sciences), those in the US (who are mostly in health), and those in the other EU countries (who are mostly in natural sciences, services, and engineering). As for the time living abroad, 16% of those in the other EU countries have spent less than two years there but only about 12% of those in the US or the UK are there for less than two years. The majority of the UK Italians live there for four to ten years (41%). In the US we find that 36% of the Italians have been living there for four to ten years and 32% for more than ten years. Comparatively, this is the largest percentage among the other country options.

The following statistics give us a nice picture on how Italians outside Italy evaluate the Italian system, their satisfaction abroad, and their intentions to return.¹³ On average, a small percentage of Italians think that going abroad is natural and due to globalization. In principle, scientists and researchers benefit from going abroad, from visiting other institutes and Universities and from being exposed to new ideas and techniques. However, this understanding is not pronounced among the Italians in the US or the UK. Only about 10% of Italians in the US and the UK say that it is natural to go abroad. A slightly higher percentage (17%) of the Italians in other EU countries shares this statement. This could be because of the EU conscience that is developing for quite a while in Europe. European scientists now think that it is natural to circulate in the EU countries. It is interesting that the overwhelming majority of Italians abroad think that they were “pushed” to go outside Italy because of structural deficiencies in the Italian system. Among the US migrants 90% thinks that there are problems with the Italian Universities and research institutes and this is why researchers move abroad. Likewise, 90% of the UK Italians and 84% of the Italians in other EU countries agree with this statement. This expresses an alarming dissatisfaction with the Italian system that does not seem adequate to absorb and satisfy its bright scientists and researchers.

¹³ Due to some missing values on these variables we did not include them in the regressions.

This general discontent is echoed by the following raw statistics in Table 2 as well. The overwhelming majority of Italians abroad rank the Italian research system below average vis-à-vis other advanced countries. Italians in the UK are the most critical (87% of them think that it is below average), followed by Italians in the US (85%) and Italians in other EU countries (75%). Consistent in their evaluation, no Italian in the US thinks that the research system in Italy is above average and only 01% of the Italians in the UK and in other EU countries shares this judgment. There are some Italians abroad, however, who think that the Italian system is about average vis-à-vis other advanced countries; namely, 15% of the Italians in the US, 13% of the Italians in the UK, and 24% of the Italians in other EU countries.

Overall, the US ranks the highest in satisfaction both from an economic and a professional point of view. Almost half of the Italians in the US feel very satisfied with their current position from an economic standpoint. While a much smaller percentage of Italians in the UK (20%) is happy with their position, about 40% of Italians in other EU countries are happy with their economic situation. Almost three quarters of the Italians in the US say that they are very satisfied with their current position abroad from a professional standpoint. More than half of the Italians in the UK (54%) and in the other EU countries (52%) also feel very happy with their career abroad.

When they were asked whether they would like to return to Italy after their experience abroad, they said that they would but only under certain conditions. The number one perspective that would convince them to go back to Italy is to receive remuneration competitive with payments abroad. Among the Italians in the US, who would contemplate to go back, 50% want a better salary than the going rate in Italy. Likewise, 50% of the Italians in the UK and 58% of the Italians in other EU countries would need a better pay in Italy. As a second condition they would like to have research funds. Forty three percent of the Italians in the US feel strong about this. This reason is less strong among the Italians in other EU countries (34% would require research funds), followed by the Italians in the UK (only 29% would require research funds).

4.2 *Multinomial Logit Results*

The results of the basic and augmented MNLM are presented in Tables 3 and 4. Table 3 reports the coefficient estimates, that is, the ratio of the probability of choosing one country over the probability of choosing the reference country category. This is often called the relative risk or log odds. A positive coefficient indicates that a one unit change in the variable is expected to increase

the relative risk of choosing one country over the other by $e^{(\text{coefficient})}$, ceteris paribus. In Table 3 we provide information on the log-likelihood, the pseudo R^2 , the Wald X^2 statistic, and the individual coefficient estimates. The fit of the MNLM is evaluated by the Wald X^2 statistic (44.51 with 18 degrees of freedom for the basic and 114.37 with 38 degrees of freedom for the augmented), which indicates that the fitted model improves the ability to predict the choice outcome. Based on these statistics, the augmented model proves to be a better model. In Table 4 we report the marginal effects (or the probability change) and the predicted probabilities for the country choice for a person with average characteristics.

The asterisks show the significance level of the coefficients associated with each independent variable and the robust standard errors are reported in parenthesis. In the following, we concentrate in the statistically significant results. The male coefficient shows that men are less likely to migrate to the UK (as opposed to migrating to other EU countries) than women. In fact, Table 4 shows that men are 7% less likely to go to the UK than women, given the basic choice of going to other EU countries. Apparently, Italian women who speak English and want to go abroad seem to prefer to go to the UK so they can stay in Europe. However, in the augmented model, when we control for field of specialization, motives, and exposure the gender effect disappears.

Italians with a post-graduate degree or specialization exhibit a clear preference for the UK. Specifically, those who have acquired a Ph.D. from outside Italy are more likely to go to the UK (compared to the reference group). In the basic model, they are 25% more likely and in the augmented model they are 22% more likely. Similarly, Italians who have a Ph.D. from Italy are also more likely to go to the UK, but this effect only appears in the basic model of Table 3 and it is rather weak. This is perhaps due to the high migration restrictions in the US as well as the fact that both Italy and the UK are in the EU, where movement is unfettered. Having some other specialization from Italy appears to be a positive determinant, albeit a weak one, to go to the US. This could indicate that Italians can move to the US with some specialization to continue studying. Italians with some working experience from outside Italy are definitely less likely to go to the US by 8% and 9% in the basic and augmented models respectively. This could indicate that it is more difficult to go to the US, but also that Italians who live abroad prefer to stay closer to Italy by moving to other EU countries. It is also possible that these people have some experience from the US and then return to Europe.

The augmented model results show that country choice decisions are well explained by the field of specialization (or sector of work). Italians in the field of humanities, such as languages and

literature, history, philosophy, theology, etc., demonstrate a positive proclivity to go to the UK instead of going to other EU countries (compared to those in the field of natural sciences) by 22%. In sharp contrast, the humanities majors show a lower probability to go to the US by 22%. This reflects the fact that the area of humanities is not well rewarded in the US or it is in demand. Italians in the social sciences, such as economics, education, sociology, law, etc., have a 16% higher probability to go to the UK (as opposed to other EU countries). In general, demand and payoffs in the social sciences should be comparable between the US and the UK. This clear preference indicates that Italians prefer to stay in Europe when possible. The health sector encompasses medicine, surgery, dentistry, veterinarian, pharmacy, nursing, etc. The significant and positive sign of the health coefficient demonstrates an unequivocal preference for the US and the UK as opposed to other EU countries. This is because this field is in high demand in these countries and remuneration and career prospects are high. However, there is a higher preference for the UK: Italians in health are 21% more likely to go to the UK, but only 13% more likely to go to the US.

Looking at the motives, our results show that push factors are more important than pull factors in the country choice exercise. For example, only the lack of research funds in Italy is a significant determinant and only for the US choice. The lure of a better career abroad is not significantly different from zero. A 21% higher probability to go to the US because there is lack of funds in Italy cannot be easily dismissed. This shows that it is not their own personal benefit Italians scientists expect to gain by going to the US, but it is their drive to be able to carry on independent research and advance the science. The opportunities and incentives to secure research funds in the US that enable scientists to be paid and rewarded for doing what they love and contribute to their field is what places the US above other countries. Controlling for all other covariates, lack of funding in Italy appears to be a serious and compelling reason for the exodus of the brainy Italians, and the availability of it in the US (more than in the UK or in other EU countries) constitutes an irresistible American pull factor.

The last group of variables appears to predict only the UK choice. That is, crossing the Atlantic is not affected by the duration of residence abroad. The time frame of being abroad for two to four years (compared to more than ten years), that is exit Italy between 1997 and 1999, significantly increases the probability to go to the UK compared to the alternative to go to other EU countries by 17%. This suggests a couple of reasons: that Italians prefer to stay in Europe, where they are closer to Italy and the familiar lifestyle, and that they would rather stay abroad for a short

period of time enough to give them a competitive edge when they return to Italy. Results on the predicted probability, calculated at the mean of all characteristics, show that the brainy Italians are more likely to go to the US. The last row of Table 4 shows that for the average person, this probability is 36%.¹⁴

5 Summary and Conclusion

Over the last decade, many European countries and especially Italy have been noticing that their brightest people leave for the US and Canada. Both the EU and the Italian government have taken serious steps to plug the drain and even reverse it. The issue of brain drain is relevant (and can have grave consequences) not only for developing, but also for developed countries that offer public education like Italy and want to be competitive in a globalized world. The few previous studies in Italy confirm that there is a serious exodus of highly skilled Italians and point out that problems with the Italian system are the culprits of the brain drain. The purpose of this paper has been to estimate a reliable choice model, by which the country choice of migration of Italian researchers and scientists can be evaluated. Given that our sample has obtained at least a bachelor's from Italy and is already living abroad, a multinomial logit model is employed to find the country allocation of Italians scientists and researchers with a particular profile. Using the Censis dataset, the country choice is expressed by three alternative choices: the US/Canada, the UK, and the other EU countries.

The findings reveal that there are indeed certain characteristics that can predict the country choice of the brainy Italians well. In general, both push and pull factors are at play. Overall, Italians with a Ph.D. from outside Italy are more likely to go to the UK and those with some working experience from outside Italy are less likely to go to the US. These results can be explained by the fact that the US has higher immigration restrictions for professionals, that the UK is more approachable for Europeans, that Italians usually go to the US to study and not to live, and that Italians prefer to stay on the European continent.

The specialization of Italians in a certain field or area is a powerful predictor of country choice. Italian scientists in humanities, social sciences, and health exhibit a high positive proclivity to go to the UK. In contrast, Italians in humanities have a high negative probability to go to the US

¹⁴ Note that while the predicted probability to go to the UK is 25%, there is still a high probability to go to other EU countries (39%); the sum of probabilities adds up to 1.

while those in health have a positive probability. These significant odds reflect the different structural demand for a field in the different countries. For example, the field of humanities does not offer a glorious career or high remuneration in the US and naturally people stay away from it. Moreover, the positive and significant health sector probabilities show that both the US and the UK are strong poles of attraction. However, the probability to go to the UK is higher than to go to the US (relative to other EU countries) revealing a clear preference by Italians to stay in Europe when possible.

The probability to go to the US, *ceteris paribus*, is strongly determined by the lack of research funds in Italy. This indicates that Italian researchers and scientists are seriously deprived from the ability to conduct research and advance the science in their own country. Put differently, the opportunities that exist in the US to secure research funds that enable scientists to be paid and rewarded for doing what they love and contribute to their field is what places the US above others in the country choice. Lastly, the only significant time spell abroad is two to four years and only for the UK choice. This result reinforces the overall story that Italians do not want to stay abroad for ever and if they had adequate research funding they would probably not leave Italy. If they have to go abroad for some time, they prefer the UK over other EU countries. Results on the predicted probabilities, calculated at the mean of all characteristics, show that the brainy Italians are more likely to go to the US with a 36% probability. The probability to go to the UK, however, is not negligible at 25%.

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Table 1: List and Definition of Variables

<i>Variables</i>	<i>Definition</i>
<i>Country Choice Alternative</i>	
US/Canada	The United States and Canada
UK	The United Kingdom
Other EU countries (reference category)	France, Switzerland, Netherlands, Spain, Germany, Sweden, Norway, Finland, Ireland, Austria, Belgium, Denmark, Japan, Australia, Mexico, Chile
<i>Explanatory Variables</i>	
Age	Age in Years
Gender	Male = 1
<i>Education:</i>	
Have a Ph.D. from Abroad	PhD from outside Italy
Have a Ph.D. from Italy	PhD from Italy
Have other specialization from Abroad	Other type of specialization from outside Italy
Have other specialization from Italy	Other type of specialization from Italy
Have no higher education (reference category)	Have only a Bachelor's degree from Italy
<i>Experience:</i>	
Have Previous Working Experience from Italy	
Have Previous Working Experience from Abroad	
<i>Push/Pull Reasons to Move Abroad:</i>	
Found Better economic conditions Abroad (reference category)	
Found a Better Perspective Career Abroad	
There was Lack of Research Funds in Italy	
<i>Field of Specialization:</i>	
Humanities	Languages and literature, history, philosophy, theology, archeology, music, communication, etc.
Social sciences	Economics, sociology, law, education, etc.
Natural Sciences (reference category)	Astronomy, biology, chemistry, physics, mathematics, etc.
Engineering	Electrical, mechanical, civil, computer science, etc.
Health	Medicine, surgery, dentistry, veterinarian, pharmacy, nursing, etc.
Agriculture/Services	Agriculture and other services
<i>Time Working and Living Abroad:</i>	
Less than 2 Years	
Between 2 and 4 Years	
Between 4 and 10 Years	
More than 10 Years (reference category)	

Table 2: Selected Summary Statistics by Country Choice

<i>Characteristics</i>	<i>US / Canada</i>		<i>The UK</i>		<i>Other EU Countries</i>	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Age	38.301	7.739	37.622	6.849	37.487	7.509
Male	0.678	0.468	0.587	0.494	0.686	0.465
Have a Ph.D. from Abroad	0.310	0.463	0.529	0.501	0.337	0.474
Have a Ph.D. from Italy	0.339	0.474	0.279	0.450	0.364	0.482
Have Other Specialization from Abroad	0.054	0.227	0.029	0.168	0.031	0.173
Have Other Specialization from Italy	0.134	0.341	0.081	0.274	0.073	0.260
No Post-graduate Education	0.163	0.370	0.081	0.274	0.195	0.397
Have Experience from Italy	0.762	0.427	0.750	0.434	0.728	0.446
Have Experience from Abroad	0.460	0.499	0.535	0.500	0.567	0.496
Have Better Economic Conditions Abroad	0.644	0.480	0.430	0.497	0.590	0.493
Have Better Perspective Career Abroad	0.385	0.488	0.273	0.447	0.330	0.471
Lack of Research Funds in Italy	0.372	0.484	0.227	0.420	0.195	0.397
Humanities	0.046	0.210	0.163	0.370	0.130	0.337
Social sciences	0.134	0.341	0.209	0.408	0.107	0.310
Natural Sciences	0.347	0.477	0.256	0.437	0.479	0.501
Engineering	0.088	0.284	0.058	0.235	0.126	0.333
Health	0.326	0.469	0.262	0.441	0.084	0.278
Agriculture / Service	0.059	0.235	0.052	0.223	0.073	0.260
Time Abroad is less than 2 Years	0.126	0.332	0.116	0.321	0.161	0.368
Time Abroad is Between 2 and 4 Years	0.188	0.392	0.203	0.404	0.180	0.385
Time Abroad is Between 4 and 10 Years	0.364	0.482	0.407	0.493	0.368	0.483
Time Abroad is More than 10 Years	0.322	0.468	0.273	0.447	0.291	0.455
Going Abroad is Natural due to Globalization	0.096	0.295	0.105	0.307	0.165	0.372
Going Abroad is due to Structural Deficiencies of Italian Research Institutes and Universities	0.904	0.295	0.895	0.307	0.835	0.372
Italian Research System is Below Average of Advanced Countries	0.854	0.354	0.866	0.341	0.751	0.433
Italian Research System is Above Average of Advanced Countries	0	0	0.006	0.077	0.008	0.087
Italian Research System is at the Average of Advanced Countries	0.146	0.354	0.128	0.335	0.241	0.429
Very Happy Abroad from an Economic View Point	0.481	0.501	0.198	0.399	0.395	0.490
Very Happy Abroad from a Professional View Point	0.724	0.449	0.535	0.500	0.521	0.500
Willing to Go Back Under Certain Conditions	0.418	0.494	0.517	0.501	0.418	0.494
Number One Reason to Go Back: Competitive Remuneration	0.590	0.493	0.500	0.501	0.578	0.495
Second Reason to Go Back: Research Funds	0.427	0.496	0.291	0.455	0.341	0.475
Number of Observations	239		172		261	

Table 3: Country Choice Coefficient Estimation Results. Comparison Outcome is the Probability to Migrate to Other EU Countries

<i>Independent Variables</i>	<i>Probability to Migrate to the US/Canada</i>		<i>Probability to Migrate to the UK</i>	
Constant	-1.517 (1.977)	-0.694 (2.768)	-2.795 (2.422)	-4.812* (2.957)
Age	0.057 (0.099)	-0.007 (0.127)	0.082 (0.119)	0.128 (0.134)
Age ²	-0.001 (0.001)	0.0002 (0.001)	-0.001 (0.001)	-0.001 (0.002)
Male	-0.027 (0.199)	0.061 (0.213)	-0.374** (0.211)	-0.207 (0.227)
Have a Ph.D. from Abroad	0.166 (0.276)	0.249 (0.302)	1.319*** (0.348)	1.246*** (0.393)
Have a Ph.D. from Italy	0.192 (0.273)	0.321 (0.299)	0.607* (0.360)	0.575 (0.391)
Other Type of Specialization from Abroad	0.684 (0.493)	0.662 (0.514)	0.753 (0.635)	0.476 (0.664)
Other Type of Specialization from Italy	0.733** (0.364)	0.105 (0.408)	0.935** (0.469)	0.188 (0.471)
Have Experience from Italy	0.128 (0.219)	-0.018 (0.231)	0.216 (0.239)	-0.137 (0.262)
Have Experience from Abroad	-0.420** (0.185)	-0.419** (0.202)	-0.186 (0.208)	-0.033 (0.222)
Humanities		-0.830** (0.406)		0.689** (0.333)
Social sciences		0.336 (0.312)		0.942*** (0.327)
Engineering		-0.030 (0.326)		-0.186 (0.413)
Health		1.569*** (0.321)		1.939*** (0.351)
Agriculture/Services		-0.104 (0.388)		0.226 (0.465)
Better Perspective Career Abroad		-0.175 (0.233)		-0.336 (0.271)
Lack of Research Funds in Italy		0.966*** (0.256)		0.258 (0.290)
Time Abroad is less than 2 Years		-0.225 (0.477)		0.590 (0.480)
Time Abroad is between 2 and 4 Years		0.048 (0.414)		0.813** (0.401)
Time Abroad is between 4 and 10 Years		0.061 (0.310)		0.450 (0.318)
<i>Log-Likelihood</i>	-706.16	-658.16	-706.16	-658.16
<i>Pseudo R²</i>	0.030	0.096	0.030	0.096
<i>Wald X² Statistic</i>	44.51	114.37	44.51	114.37
<i>IIA (Hausman's test)^a</i>	<i>p</i> = 1.000 (<i>df</i> = 9)	<i>p</i> = 1.000 (<i>df</i> = 19)	<i>p</i> = 1.000 (<i>df</i> = 9)	<i>p</i> = 1.000 (<i>df</i> = 19)
<i>Number of observations</i>				672

Notes: *** significant at 1 percent; **significant at 5 percent; *significant at 10 percent.

Robust standard errors in parentheses.

^a For the other EU countries, *p* = 0.999 for the basic model and *p* = 1.000 for the augmented model.

Table 4: Marginal Effects on Country Choice Estimation Results

<i>Independent Variables</i>	<i>Migrate to the US/Canada</i>		<i>Migrate to the UK</i>	
Age	0.006 (0.021)	-0.013 (0.027)	0.010 (0.020)	0.025 (0.023)
Age ²	-0.00004 (0.0003)	0.0002 (0.0003)	-0.0001 (0.0002)	-0.0003 (0.0003)
Male	0.028 (0.040)	0.033 (0.043)	-0.069* (0.037)	-0.045 (0.039)
Have a Ph.D. from Abroad	-0.089 (0.058)	-0.066 (0.063)	0.245*** (0.065)	0.223*** (0.073)
Have a Ph.D. from Italy	-0.013 (0.060)	0.019 (0.064)	0.099 (0.067)	0.080 (0.070)
Other Type of Specialization from Abroad	0.079 (0.114)	0.109 (0.116)	0.075 (0.124)	0.020 (0.116)
Other Type of Specialization from Italy	0.068 (0.083)	0.006 (0.084)	0.109 (0.093)	0.026 (0.083)
Have Experience from Italy	0.011 (0.046)	0.009 (0.047)	0.028 (0.039)	-0.024 (0.045)
Have Experience from Abroad	-0.080** (0.038)	-0.094** (0.042)	0.003 (0.035)	0.032 (0.036)
Humanities		-0.222*** (0.059)		0.224*** (0.077)
Social sciences		-0.026 (0.062)		0.162** (0.066)
Engineering		0.009 (0.073)		-0.031 (0.069)
Health		0.128** (0.060)		0.209*** (0.060)
Agriculture/Services		-0.045 (0.079)		0.055 (0.089)
Better Perspective Career Abroad		-0.011 (0.048)		-0.046 (0.044)
Lack of Research Funds in Italy		0.206*** (0.053)		-0.048 (0.044)
Time Abroad is less than 2 Years		-0.106 (0.085)		0.145 (0.096)
Time Abroad is between 2 and 4 Years		-0.072 (0.080)		0.165** (0.081)
Time Abroad is between 4 and 10 Years		-0.028 (0.062)		0.081 (0.055)
<i>Predicted Probability^a</i>	0.360	0.364	0.247	0.251
<i>Number of observations</i>	672			

Notes: *** significant at 1 percent; **significant at 5 percent; *significant at 10 percent.
Robust standard errors in parentheses.

^a Calculated for a person with average characteristics.