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drain and spatial inequality. The case of  
Italy.**

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# **University quality, interregional brain drain and spatial inequality. The case of Italy.**

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## ***Abstract***

From a regional development perspective, a better understanding of the causes of Italian interregional brain drain may help to guide policy intervention aimed at reversing or partially compensating for its negative effects on the source regions. This paper analyses three different migration choices of Italian graduates: (1) migration to study; (2) non-return from a migration; (3) migration to work. A proxy for university quality is included as a determinant of migration choice. The results confirm 'university quality' as a «supply» tool for policy makers to counterbalance the negative effects of the brain drain on human capital accumulation.

JEL classification: R23; R58; J 24; J 61

Keywords: Brain-drain, labour mobility, university quality, regional economic disparities.

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## INTRODUCTION

As stressed in the literature, the accumulation of human capital and skilled individuals is fundamental for regional growth and competitiveness (Lucas, 1988). This may be part of the reason why the literature on migration of skilled workers, or 'brain drain', focuses mainly on growth effects and assumes that migration is the result of wage differentials (Kwok and Leland, 1982, Miyagiwa, 1991; Haque and Kim, 1995) among regions<sup>1</sup>. In terms of the consequences of brain drain, during the 1980s and the early 1990s, building on the idea that any reduction in the stock of human capital is detrimental to current and future growth, there was an assumption that the loss of skilled workers from a country or region resulted in an economic loss to that area (Miyagiwa, 1991; Haque and Kim, 1995; Wong and Kee Yip, 1999). However, later studies have shown that the process of brain drain could favour the country of origin by inducing an increase in the average level of human capital and, consequently, labour productivity (Mountford, 1997; Stark et al., 1997 and 1998; Vidal, 1998; Beine et al., 2001; Stark and Wang, 2002; Stark, 2004; Kanbur and Rapoport, 2005).<sup>2</sup> In addition to the positive impact of remittances, it has been argued that the brain drain may increase the incentive to acquire education in the source economy. In fact, a brain drain may help a source economy '[...] if the probability to emigrate is low, if there is a high wage differential and if the proportion of educated people in the economy was previously low'.<sup>3</sup> That is to say, if the brain drain succeeds in reducing the weight of the 'under educated' class, then average labour productivity 'would be higher under a brain drain because all agents remaining in the country would be at the high education steady state, whereas under a general emigration only a fraction of the population would be at the high steady state'. In short, the idea is that in the presence of uncertainty into the migration process (migration is not always possible) and of significant 'inter-

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<sup>1</sup> Kwok and Leland (1982) see the existence of a wage differential as a consequence of asymmetric information, Miyagiwa (1991) stress the existence of increasing returns to education which generate an agglomeration externality, while Haque and Kim (1995) discuss the result of different government policies that determine after-tax wage differentials.

<sup>2</sup> This strand of the literature builds on the work of Grubel and Scott (1966).

<sup>3</sup> Cf. Mountford (1997: 295, 302).

country wage differentials, emigration prospects will foster human capital formation at home even after netting out emigration'<sup>4</sup>. Bein *et al.* (2001, 2007) found evidence supporting this incentive mechanism, while Stark and Wang (2002) demonstrated that in allowing a controlled number of skilled individuals to migrate to a richer country, government might stimulate return to/demand for schooling. Also, a brain drain could become a brain gain - through return migration, which enables the transfer (at home) of knowledge acquired abroad (Dustmann and Kirchkeim, 2002), and the choice of self-employment and entrepreneurial activity by the returnees (Domingues dos Santos and Postel-Vinay, 2003; Mesnard and Ravallion, 2001)<sup>5</sup>.

However, in developing countries - where skilled labour is already a scarce resource - brain drain may negatively contribute to the source economy's welfare (Doquier *et al.*, 2005; Pieretti and Zou, 2009). The remittances from high skilled workers are not necessarily higher than those from uneducated migrants (Faini, 2002; Kanbur and Rapoport, 2005); and, in general, return migration is not significant for the highly educated and is generally characterized by a negative selection bias (Borjas and Bratsberg, 1996). Besides, if the theoretical framework for brain drain outlined above is applied to interregional brain drain - namely to a *within* country case, the benefits to the source economy may be lower or equal to zero. In fact, as Mountford (1997) stresses, in the case of a brain-drain between regions of the same industrialized country, when the probability to migrate is equal to 1 (namely, there are no legislative barriers to migration) brain drain will have only negative consequences for the region of origin as everybody who reaches the required level of education will migrate.<sup>6</sup> Nonetheless, even *within* countries - especially for countries, such as Italy, characterized by low inter-generational

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<sup>4</sup> Cf. Kanbur and Rapoport (2005: 47).

<sup>5</sup> Also, it is generally recognized that there are positive externalities associated to a skilled labour force. Haque and Kim (1995) assume an intergenerational externality in terms of the human capital attained by the parents being transferred to their children. Ciriaci (2005) stresses that brain drain contributes to the endogeneity of the regional natural rate of growth (Thirlwall and León-Ledesma, not in refs2002) through its impact on labour and productivity growth.

<sup>6</sup> Clearly, there are other kinds of barriers in the real world that prevent total migration.

mobility in terms of both educational level and employment opportunities (Checchi, Ichino, Rustichino, 1999), migration towards wealthier regions makes the possibility of improving the standard of living more realistic and stimulates the accumulation of human capital. Thus, an increase in the human capital endowment of the source economy may still be observed.

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Despite recognition of the fundamental role of human capital for economic growth, interregional human mobility has not generated as much academic and political debate as its international flight. This can be explained perhaps by the fact that when the *within* country situation, involving the outflow of skills/brain power from region *i* to the rest of the country is expected to be compensated for by a corresponding inflow from these other regions of the country.<sup>8</sup>

However, the geographic movement of the youngest component of the skilled labour force is a fundamental concern for Italian regional development. From the second half of 1990, Italian interregional migration flows have increased significantly. Unlike the mass international migration waves of the 1950s and 1960s, the situation in Italy in the 2000s is one of migration from the Southern to the Northern regions,<sup>9</sup> fuelled by a young and skilled labour force (Svimez, 2009 and 2007; Ciriaci, 2006, 2005; Piras, 2005; Jahnke, 2001). There is not any *brain exchange* between the Southern (the so-called 'Mezzogiorno') and Northern regions, only benefits to the North (Ciriaci, 2005).

In light of these considerations, the aim of this paper is twofold. First, it focuses on the causes of Italian interregional brain drain since an understanding of its determinants could guide public policy. This objective departs from previous work on the human capital theory approach to skilled migration in evaluating

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<sup>7</sup> This positive outcome does not emerge if the human capital accumulated in the source economy is largely unemployed or under-employed.

<sup>8</sup> In the absence of regional structural differences, this situation may emerge.

<sup>9</sup> In this paper Northern regions include Lazio, Tuscany, Umbria, Marche, Emilia-Romagna, Liguria, Valle d'Aosta, Piedmont, Lombardy, Trentino A.A., Friuli Venezia-Giulia, Veneto and Southern regions include Campania, Abruzzi, Molise, Puglia, Basilicata, Calabria, Sicily and Sardinia, which represent the so-called 'Mezzogiorno'.

empirically three different migration choices. The first migration choice regards the individual who migrates in order to study (*ante-lauream* migrant). The second choice is of an individual who obtains a degree 'abroad' and then decides to stay there (not return migrant); the third case is when the individual decides to study in the source economy and, after graduation migrates (*post-lauream* migrant). We estimate three probit models to take account of these different migration choices, analysed at a very detailed level of regional aggregation, the NUTS-3 regional level. We use data from the last survey by the Italian National Statistics Institute (ISTAT) of labour market entry conditions three years after graduation (2007) for Italians who finished their degrees in 2004, and match it with other ISTAT data. The individual migration choice is modelled as a function of individual characteristics, field of study, wage differentials, and of a number of 'push and pull' socio-economic factors (quality of life, employment opportunities, standard of living in the source economy, etc.).

However, as there are other factors that might play a role in the decision of highly skilled people to migrate, and in their choice of destination, such as better education, quality of the university chosen or/and attended, this choice is included as an explanatory variable.

Although there is an extensive literature<sup>10</sup> on the impact of university quality on labour market outcomes among tertiary education graduates, to my knowledge there are no statistical studies that focus on the role of university performance indicators on migration choices.<sup>11</sup> The results of the government research quality assessment of Italian universities, which is designed to improve the efficiency and effectiveness of the higher education sector and is carried out

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<sup>10</sup> See e.g. Ciriaci and Muscio (2009), Brunello and Cappellari (2007), Boero *et al.* (2001), Checchi (2001).

<sup>11</sup> One attempt in this direction is by Güngör and Tansel (2008) who model return intentions for Turkey using a dataset compiled from an Internet survey of Turkish students residing abroad. They model the intentions as a function of a set of individual and socio-economic variables, and 'academic conditions'. However this proxy is based on individual judgment – students were asked to compare the academic environments in their current countries of study to that in Turkey, and cannot be considered a proxy for university performance and research quality.

by the CIVR (Comitato Interministeriale per la Valutazione della Ricerca; MIUR, 2007) are used as proxies.<sup>12</sup>

The paper is organized as follows. Section 2 describes the empirical framework, the methodology and the data. Section 3 discusses the empirical results and Section 4 concludes the paper.

## **2. EMPIRICAL FRAMEWORK AND DATA**

This paper investigates the migration choices of Italian graduates. It uses individual-level data from the last survey administered by ISTAT on labour market entry conditions among 2004 Italian graduates, three years after graduation. The survey was conducted in 2007 on a cohort of students who graduated in 2004 and includes sections on previous educational attainment, degree results, employment status, parents' socio-economic status, as well as a range of personal attributes. About 47,300 individuals were interviewed by telephone (Computer Assisted Telephone Interview, CATI); they came from 16 different faculty groups distributed across 67 universities in 103 Italian provinces/counties. They represent 17.3% of the cohort of 2004 graduates. Our database was matched with the university-level data on university quality published by the Italian CIVR, NUTS-3 regional data on employment and value added published each year by the ISTAT, and NUTS-3 regional level data on quality of life carried out each year by the Italian financial newspaper *Il Sole 24ore* (see next sub-section).

To avoid specification problems due to intra-regional migration, which is not the subject of this paper as it occurs mainly among the Northern counties and follows different patterns (Svimez, 2009; Ciriaci 2005, 2006), the analysis focuses on individual movements implying change of residence between the two main Italian macro areas: the Northern area and the Mezzogiorno (see fn 9). Therefore, Italian graduates are classified on the basis of comparison

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<sup>12</sup> The Italian tertiary education sector has been widely criticized. Its graduation and survival rates are lower than the OECD average: the 2006 Italian completion rate (calculated as the ratio of the number of students who graduate from their first degree during the reference year to the number of new entrants in this degree  $n$  years before, with  $n$  the number of years of full-time study required to complete the degree) is 45% versus 68% for the OECD countries (OCSE, 2006).

between their province of residence before enrolment at a university, location (province) of the university, and their residence in 2007. They are considered 'migrants' only if they moved from one macro area to another.<sup>13</sup>

There are two relevant moments for brain drain analysis. The first is when an individual chooses where to study: in the macro area of origin or elsewhere. The second is after graduation, when an individual decides whether or not to stay in the study location. There are three different migration choices associated with these two moments: an individual might decide to study in a different macro area from the region of origin (*ante-lauream* migrant); an individual who graduated in a different macro area with respect to that its province of origin belongs to might decide to stay 'abroad' (*non-returning* migrant); an individual who graduated in his/her province of origin might decide to move to another macro area (*post-lauream* migrant).

In 2007, 41.5% of graduates from the South of Italy who graduated in 2004 were working in Northern Italy, and this percentage has increased by about 10 percentage points over a period of six years (in 2001 it was 31%; Ciriaci, 2006, 2005).<sup>14</sup> Over the same period, the percentage of Southern respondents who, after graduation, moved to a Northern region increased from the 18% in 2001 (Ciriaci, 2005) to 24% in 2007. On the other side, the proportion of return migrants went from 9% of Southern graduates to 6.8% (Ciriaci, 2005). Thus, the brain drain has increased, and the channel that might have operated to compensate for the negative effects on human capital accumulation in the source economy is showing negative results. For Northern graduates, the empirical evidence shows that mobility is negligible: 90% stay in their own regions to study and to work and only 1% moved to the South - mainly after graduation.<sup>15</sup>

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<sup>13</sup> Individuals going abroad to study or work are not included in the sample.

<sup>14</sup> In 2001, 31% of the those who graduated in 1998 were working in Northern Italy; in 1998 the percentage of graduates of 1995 working in the North area of the was 23,5%.

<sup>15</sup> This percentage is lower than that observed in 1998. However, the increase in Northern graduates' mobility is due to an increase in post-lauream mobility to other countries.



Table 1. Brain Drain in Italy: Ante and Post-Lauream migration (obs. not weighted).

		Ante Lauream Brain Drain		
		Study in macro area of origin	Study in a different macro area	Total
Post lauream Brain Drain	After graduation stay where they studied	39,606	2,799	42,405
	After graduate move to another macro area	2,435	2,502	4,937
	Total	42,041	5,301	47,342

Source: Author's elaborations on ISTAT data (2009).

Of the 47,342 individuals interviewed in 2007, 2,435 individuals graduated in their original macro area and migrated after graduation (*post-lauream* migrants); 5,301 migrated to study and graduated in a different macro area from their area of origin (*ante-lauream* migrants), of which 2,799 decided to remain «abroad» after graduation (*non-returned* migrants) (see Table 1). The sample is constituted of 47% male graduates and 53% female graduates and, once adjusted for missing values, is constituted by about 46,000 respondents.

## 2.1. THE ESTIMATED EQUATIONS: ANTE LAUREAM, POST LAUREAM AND NON-RETURN MIGRATION

To model the migration choices of Italian graduates, the human capital theory approach to modelling skilled migration is adopted. On the one side there are characteristics emanating from the home country's environment that prompt individuals to migrate abroad, such as unsatisfactory income levels, inadequate work conditions, economic and political uncertainty, high unemployment, etc. (Güngör and Tansel, 2009). On the other side, there are pull factors in the form of the opportunities offered by the destination country (higher wages, greater learning and professional development), which attract students and graduates to the host country (Güngör and Tansel, 2009; Kwok and Leland, 1982, Miyagiwa, 1991; Haque and Kim, 1995). Pull factors include '*the migration of labour, both intra-national and inter-national, is not determined by earning*

differences alone; given such differences, it is very much conditioned by the existence of employment opportunities at the receiving end<sup>d</sup>, and the role of demand for labour.<sup>16</sup>

For simplicity, in the following we discuss only the general specification of the model. Section 3 presents the results of the estimations and comments on the different migration choices. The general empirical model is:

$$P_{ijur} = \beta_0 + X_{ijur}\beta_1 + G_{ijur}\beta_2 + E_{ijur}\beta_3 + R_{ijur}\beta_4 + Q_{ijur}\beta_5 + \varepsilon_{ijur}$$

where  $i = 1 \dots 47,342$ ;  $r = 1 \dots 103$ ;  $u : 1 \dots 64$  (Italian Universities);  $j = 1 \dots 16$  (field of studies).

Clearly, the dependent variable  $P_{ijur}$  changes according to the type of migrant considered. Furthermore, given the non-linearity of the migration choices, we use a probit econometric approach: the dependent variable  $y$  takes the value 1 if individual  $i$  migrates, and 0 otherwise.

The probit regression model in the case of multiple regressors is:

$$\text{Pr}(y = 1 | X_1 \dots X_n) = \Phi(\beta_0 + \beta_1 X_1 + \dots + \beta_n X_n)$$

If  $\beta_1$  is positive, then an increase in  $X_1$  increases the probability that  $y=1$  (namely, the skilled individual chooses to migrate or, in the case of non-return, stays abroad); if it is 0, then the probability decreases. As the distribution of  $y$  is not normal - it can take only two values: since it is a nonlinear function of the coefficients  $\beta_1 \dots \beta_n$ , the probit regression assumes the coefficients follow a standard normal cumulative density function ( $\Phi$ ).

As ordinary least squares (OLS) is inefficient, the estimation is carried out using maximum likelihood: if there is a range of possible values for  $\beta$ , the value for which the model is most likely to have generated the observed sample of data is chosen. That is, the likelihood function is maximized: the success probability of event «individual  $i$  will migrate» is not constant, but depends on  $X$ . The effect of a change in the regressor on the probability that  $y=1$  is computed by taking the difference between the predicted probability for the initial value of the regressor and the predicted probability for the new or changed value of the regressor.

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<sup>16</sup> Kaldor, 1981, p. 212.

In the case of *ante-lauream* migration the model describes the choice of individual  $i = 1 \dots N$  about whether or not to migrate in order to study:  $P_{ijur}$  takes the value 1 if individual  $i$  originally resident in province  $r = 1 \dots R$  decides to enrol in the field  $j = 1 \dots J$  at the university  $u = 1 \dots U$  located in a province in another macro area with respect to the macro area of origin, and 0 otherwise.<sup>17</sup> Namely, it is the likelihood of studying 'abroad', where 'abroad' is the other macro area. To avoid specification problems related to intra-regional migration, only individual movements between the two main Italian macro areas (Central-North and Mezzogiorno) are considered as 'brain drain/gain'.

In the case of *post-lauream* migration, the dependent variable is the likelihood of leaving the county of origin  $r = 1 \dots R$  after graduation and migrating to the other macro-area with respect of the macro-area of origin.

In the case of *non-return* migration,  $P_{ijur}$  takes the value 1 if individual  $i$  who graduated in a university  $u = 1 \dots U$  that is located in a different macro area with respect to the area of origin  $r = 1 \dots R$  after graduation decides to stay there, and 0 otherwise. Hence, the dependent variable is the likelihood of not returning to the source economy.

Table 2 presents the control and explanatory variables initially included in the model. The set of control variables  $X_{ijur}$  includes information related to the respondent's personal characteristics, family and education. The literature on self-selection (e.g. Chiswick, 2000; Borjas, 1987; Kwok and Leland, 1982) suggests that certain characteristics/skills may make it more profitable for some individuals to move and, therefore, they will be self-selected. It follows that the migrant 'brains' may not be representative of a random sample of the source province population, but rather a sample systematically selected from the relevant distribution. The personal characteristics considered include sex, age, marital status, and progeny. The controls for family and education background include educational level and profession of the student's parents, student's high school type, university performances, and post-graduate qualifications. While sex, age, family background, etc. are clearly observable there are unobservable

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<sup>17</sup> This definition allows solving the problem of whether the respondent may decide to study in a different province belonging to the same macro area of origin because there is not a University in his/her original province.

individual characteristics such as, ability and ambition. For the former, high school and university performance can be used as proxies; the latter, ambition, is unobservable.

Individuals may also be self-selected on the basis of field of study. Thus, we include a set of 16 faculty group dummies (see Table 2) ( $G_{ijur}$ ). Also, given the persistent economic and social gap between the Southern and Northern counties in Italy, residence and/or university location in a Southern province might constitute a source of selection bias, thus, we include the vector  $E_{ijur}$ , which changes according to the kind of interregional migration considered. In the case of ante-lauream and no,-returning migrants it takes the value 1 if the province of residence of individual  $i = 1 \dots N$  enrolled in course  $j = 1 \dots J$  at the university  $u = 1 \dots U$  is in Southern Italy, and 0 otherwise. For post-lauream migration,  $E_{ijur}$  takes the value 1 if the province of residence of individual  $i = 1$  and the university  $u = 1 \dots U$  from which he/she graduated are located in Southern Italy, and 0 otherwise.

For the explanatory variables, a vector accounting for differences in employment and economic environment between province of origin and province of destination, and a set of university quality variables are included. In particular,  $R_{ijur}$  is a set of socio-economic variables accounting for differences in the 'employability' of young individuals (employment, value added, and unemployment; see Table 2), monthly wage, and quality of life and/or standard of living (depending on the migration choice considered) between the counties of origin and migration.

The source of the annual data on employment, value added, and unemployment at the NUTS 3 province level is ISTAT. Since data on wages are not available (particularly in the case of skilled labour and at the geographic level needed), we built a wage differential based on the survey data.<sup>18</sup> Firstly,

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<sup>18</sup> Clearly, endogeneity is a problem if the wage of the individual is included as an exogenous variable. In fact a higher wage might be a consequence of the migration choice (and of individual characteristics, university background, etc.). To detect whether or not this is an important problem, an equation aimed at explaining the individual's wage as a function of his/her migration choice (and of individual characteristics, university background, province dummies etc) was estimated: the variable was found not

we calculated a weighted<sup>19</sup> average wage at the NUTS-3 level. Then, we introduced into the equation a wage gap based on the difference between the weighted average wage in the province of migration and in the province of origin. The source of the data on quality of life and standard of living - available at the NUTS-3 level (i.e. at the level of the 103 Italian provinces) -, is the annual research of the Italian financial newspaper 'Il Sole 24ore'. The first composite index - which has the advantage of summarizing quality of life (QoL) within a one-dimensional index - is based on the aggregation of 36 indicators split into 6 groups: standard of living, job or business, environment and health, public order, population, and free time (see Mazziotta and Pareto, 2009).<sup>20</sup> The index for standard of living (which is part of the QoL composite index) is based on the aggregation of 6 indicators: bank deposit (average per inhabitant); monthly pension (average); inflation 'foi' index; gross domestic product (GDP) (average per inhabitant); house prices (price per m<sup>2</sup>); consumption (average per inhabitant). While in the case of QoL the higher the value of the index, the higher the quality of life (the index is expressed in levels), in the case of standard of living, the index gives the position of a province with respect to others and goes from the best province (ranked 1) to the worst (ranked 103), hence the higher the number, the lower the standard of living. Finally, in the case of the QoL, we consider the average over the period 2001-04 (in the case of ante-lauream migration) and 2004-07 (in the case of post-lauream migration). In terms of the standard of living index, given its 'structural' nature and the fact that it exists only in the form of a ranking, we use the ranking for 2007. The set of socio-economic variables changes, in any case, depending on the migration choice modelled - which is discussed alongside the estimation results.

Finally,  $Q_{ijur}$  is a set of university quality variables including the ranking of the

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to be significant (Ciriaci and Muscio, 2009). Moreover, individual performance at high school and university are also not significant determinants of *ante-lauream* and *post-lauream* migration choices (Section 3.1 and 3.3), suggesting there is no selection bias due to different abilities (which might lead to wage differences based on the selection among which individuals do and do not migrate).

<sup>19</sup> The individual weights used are the carry-over coefficients of the original universe calculated by the ISTAT.

<sup>20</sup> See the appendix for a description.

university attended by individual  $i$ , and the size of the university.<sup>21</sup> While there is an extensive literature on the role of university performance and quality on the labour outcomes for young graduates, there is no statistical focus on the role of university quality on migration choices.

As far as the Italian higher education system is concerned, Brunello and Cappellari (2008) find that *Alma Mater* influences the probability of being employed and also the net monthly wages of Italian graduates, at least in the short run: college related differences are significantly large both among and within Italian regions, but not large enough to trigger substantial mobility flows from poorly performing to better performing universities.

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<sup>21</sup> The Italian Ministry of University (MIUR, 2007) classifies university into the following size categories:  
Small universities = up to 10,000 students; Medium universities = 10,000-15,000 students;  
Large universities = 15,000-40,000 students; Mega universities = over 40,000 students.

Table 2. Definition of variables initially included in the model.

<b>Dependent variables</b>	
Mobile_Ante Lauream	Dummy variable taking on the value one if the individual migrate to study, zero otherwise.
Mobile_Post Lauream	Dummy variable taking on the value one if the individual migrate after graduation, zero otherwise.
Mobile_Not Returned	Dummy variable taking on the value one if the individual migrate to study and after graduation remain in the destination macro area, zero otherwise.
<b>Control variables</b>	
<b>Education Background</b>	
Higher secondary school type	Technical/Vocational or General secondary school: a dummy variable taking on the value one if the individual attended a technical or vocational secondary school, zero otherwise.
Score: School leaving examination	Higher secondary school diploma score (scale 0-20).
<b>Student's characteristics</b>	
Age	Age of the individual in classes (increasing from 1 to 8)
Sex	Dummy variable taking on the value one if the individual is a female, zero otherwise.
Marital status	Dummy variable taking on the value one if the individual is a married or divorced/separated, zero otherwise.
Children	Dummy variable taking on the value one if the individual has children, zero otherwise.
Employed	Dummy variable taking on the value one if the individual was working while attending the University, zero otherwise.
<b>Family background</b>	
Father education	Indicator of the level of education attained by the individual's father.
Mother education	Indicator of the level of education attained by the individual's mother.
Father professional role	
-executive	Dummy taking on the value one if the individual's father is employed an executive, zero otherwise.
-entrepreneur or self-employed	Dummy taking on the value one if the individual's father is a self employed or entrepreneur, zero otherwise.
<b>Field of Study and University background</b>	
Kind (Tipologia1)	Dummy taking on the value one if the individual concluded a first level degree, zero otherwise.
Second level degree (Laurea specialistica)	Dummy taking on the value one if the individual concluded a second level degree, zero otherwise.
Field of study	16 field of study dummies (Sciences, Chemistry/Pharmacy, Geo/Biology, Medicine, Engineer, Architecture, Agrarian, Economics/Statistics, Political Sciences, Literature, Linguistic, Teaching, Law, Psychology, Defense).
University score	Higher university score.
Summa cum laude	Dummy variable taking on the value one if the individual graduated with distinction, zero otherwise.
Late graduation	Dummy variable taking on the value one if the individual graduated later, zero otherwise.
<b>County of residence and University location</b>	
Residence before the enrolment	Dummy variable taking on the value one if the individual was resident in a Southern region before his/her enrolment at the university.
Residence and University location	Dummy variable taking on the value one if the individual was resident in a Southern region before his/her enrolment at the university and he/she attended a Southern University, zero otherwise.
<b>Explanatory variables</b>	
<b>University quality</b>	
Total Rating	Average rating of the University attended
Rating of "local" Universities	Average rating of the Universities located in the county of origin of the individual.
Dimension	4 University dimension dummies (small, medium, big, very big).
<b>Quality of life</b>	
Life quality	Index of the quality of life in the county where the individual is resident at the moment of the interview, namely the present residence.
Standard of living	Index of the standard of living in the county of origin of the individual.
<b>Employment and Economic opportunities</b>	
Value added ratio_1	Ratio of the average value added over the period 2001-05 between the county of origin and that of destination.
Value added ratio_2	Ratio between the value added of the county where the individual studied and the national value added (average 2001-05).
Employment rate aged 25-34	Employment rate 25-34 in the county of origin.

Di Pietro and Cutillo (2006) evaluate the impact of university quality on the early labour market outcomes of the same cohort of 1998 Italian graduates. Their main empirical finding, and the most relevant to our work, is that individuals who graduated from research-oriented universities are likely to achieve better labour-market outcomes than their peers who graduated from a research-active institution. Unlike previous studies which use the university performance league tables published by *La Repubblica* as an index of university quality, in this paper we use a proxy based on the results reported in the final report of the Valutazione Triennale della Ricerca (VTR) for the period 2001-2003 (VTR 2001-2003). However, as evaluation of research performance is conducted by scientific area, we calculated an average 'university ranking index' for each university.

### **3. COMMENTS AND RESULTS**

The econometric analysis is based on backward stepwise *probit* regressions in order to try to identify the significant control variables and to achieve a similar procedure for the three models considered.<sup>22</sup> Clearly, this procedure has been considered as complementary to what suggested by economic theory. The stepwise regression starts with the full model and, one at a time, drops the variables that are not significant at least the 10% level, starting with the least significant. The variables dropped were control variables, not any of the variables considered to contribute to explaining brain drain based on economic theory. Table 3 provides the estimation results for the variables used in the final model. Column 2 in Table 3 reports the probit estimates and their z values. Since parameter estimates from the probit models need to be transformed to yield estimates of the change in predicted probability associated with changes in the explanatory variables (Greene, 2003), Table 4 provides estimates of the marginal effects of the explanatory variables. Finally, a robust weighted probit regression model was adopted, where the individual weights used are the carry-over coefficients of the original universe (ISTAT, 2009).

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<sup>22</sup> Logit models were also estimated; the results did not differ significantly.



For clarity, in what follows, separate results are presented for each migration choice.

### 3.1. *ANTE LAUREAM* MIGRATION CHOICE

In line with the theoretical and empirical literature, all the explanatory variables<sup>23</sup> enter the equation with the expected sign.

In line with previous empirical results (e.g., Gross and Paul, 1986; Demet and Tansel, 2009), student age has a negative effect on the probability of migration: the younger the student, the higher the propensity to migrate. Furthermore, if we consider respondents gender (the dummy variable for gender takes the value 1 for 'female' and 0 otherwise), being female decreases the probability of migration, a result that can be interpreted as being due to their traditionally relatively less freedom. The probability of migration increases if the respondent is married or divorced, a results that, at first sight, might seem counter-intuitive. However, as migration is almost exclusively confined to Southern students, and employment outcomes for those who graduate in the Northern regions are significantly higher (SVIMEZ, 2009; Ciriaci, 2006, 2005), the results suggest that if a student is responsible for his/her husband/wife (and children) the incentive to migrate is higher and he/she expects a higher return on the investment in education.

Father's level of education has an interesting influence on the ante-lauream migration choice: the higher the level of education attained by the student's father, the higher the incentive to migrate. In general, this suggests that the family 'push' factor is likely due to socio-economic reasons: the higher the level of father's education, the higher the family income. On the other side, the father's profession and qualification were found to be not significant.

For university quality, in the case of *ante-lauream* migration choice, both the average rating of the universities in the province in which the student was resident before enrolment at a university, and the ranking of the university chosen (and located in a province of destination belonging to the other macro area) were included as explanatory variables. The results strongly support the importance of research quality in the migration choice of the individual. The

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<sup>23</sup> Among the control variables excluded by the stepwise procedure, are graduate's mother's profession and qualifications, and graduate's high school experience and performance.

higher the research quality of the universities in the province of origin of the student, the lower his/her propensity to migrate.<sup>24</sup> Moreover, the probability an individual will migrate to study is positively influenced by the research quality of the university chosen. Not surprisingly, the individual decides where to study on the basis of the quality of the university supply.

In terms of push and pull variables, the results suggest that the probability that an individual will migrate is strongly influenced by the quality of life in the destination province<sup>25</sup> (average 2001-04). Moreover, the higher the standard of living in the source economy, the more likely that the individual will migrate to the other macro area to study. In other words, individuals who want to study away from 'home' need more economic support from their families. *Ceteris paribus*, the higher the standard of living in the source province, the higher the probability the family can afford the cost of supporting the student to study 'abroad'. The importance of the socio-economic environment is corroborated by the significance of the ratio between value added in the destination province and Italian value added.

This last variable could be seen as a proxy for the attractiveness of a province with respect to the others. Hence, the higher the relative value added of the province where the university is located, the higher the probability the individual will migrate there. The unemployment rate in the province of origin was found to be not significant as a push factor.

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<sup>24</sup> A variable for the difference between the average rating of the universities in the province of origin of the student and the university chosen, was initially used. However, two issues emerged. Firstly, when this gap variable is included, multicollinearity problems are observed (a quite high correlation among the income/employment/unemployment differentials). Secondly, it would seem rather implausible that students are comparing ratings among different Italian universities as information is neither perfect nor easily available. Hence, a more plausible hypothesis is that they know what is going on in their province of origin.

<sup>25</sup> Initially, a variable 'employment differential' was introduced to consider the different employment opportunities offered to the younger part of the labour force, namely a variable accounting for labour demand differences between the two counties. However, its inclusion created significant multicollinearity problems (there was a high correlation with the value added ratio, and the quality of life index).

### 3.2. RETURN AND NON-RETURN MIGRATION CHOICE

Return migration is one of the main channels through which brain drain may positively contribute to the accumulation of human capital in the region of origin: *ceteris paribus*, the higher the percentage of no-returning migrants, the lower the contribution. As already underlined, after an individual migrates to study and graduates in a different macro area from the area of origin, he/she can decide whether to remain there or move back to the province of origin bringing with him/her the knowledge accumulated. As far as individual characteristics are concerned, in contrast to the results obtained for the other two migration choices, neither sex nor age are significant determinants of the decision not to return to the source economy. That is to say, age and sex are discriminating factors in the initial migration choice, but lose importance: once you are 'abroad', other things matter, for instance, the economic support and network of your family. As far as marital status is concerned, this dummy enters the equation with a significant and positive sign, confirming that responsibility for a wife/husband<sup>26</sup> increases the probability you will remain 'abroad'.

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<sup>26</sup> A dummy to control for the presence of children was initially considered, but dropped in the course of the stepwise procedure.

**Table 3. Weighted probit robust results.**

Dependent variable	Mobile_Ante Lauream	Mobile_Post Lauream	Mobile_Not Returned
Pseudo R2	0.37	0.65	0.62
<b>Student's characteristics</b>			
Age	-.11002*** (-5.13)	.1861843*** (5.03)	-.218 (-.62)
Sex	-.1394*** (-5.31)	-.1850289*** (-3.28)	-.0432 (-1.19)
Marital status	.08629** (2.76)	.4214927*** (6.47)	-.1221*** (-2.22)
<b>Family background</b>			
Father's education	.0439*** (3.98)	-	-
executive	-.068 (-1.42)	-	.014** (2.02)
entrepreneur or self employed	-	.1906979** (1.95)	-
<b>Field of Study and University background</b>			
First level degree (Laurea magistrale)	-	-.1213276** -2.09	.0314** (2.43)
Second level degree (Laurea specialistica)	-	-	-
Field of study_9	-	-	.2886256*** (3.67)
Field of study_14	-	-.5629279*** (-4.66)	-
Field of study_16	-	1.33*** (4.34)	-
Summa cum laude	-	-	-.02243*** (-3.80)
Late degree	-	-	-.229*** (-4.46)
<b>County of residence and University location</b>			
Residence before the enrolment	2.285*** (25.88)	-	2.06*** (19.34)
University location	-	2.91*** (17.00)	-
<b>University quality</b>			
Total Rating University chosen or attended	9.059*** (15.91)	-2.60** (-3.01)	9.92*** (11.62)
Rating of "local" Universities	-3.022206** (-2.97)	-	-
Dimension_3	-	-	-1033053*** (-6.61)
Dimension_4	-	-	-1195654** (-2.62)
<b>Quality of life</b>			
Life quality in the destination county	.00600*** (20.14)	.0356483*** (14.09)	.0105341*** (14.11)
Standard of living in the source county	0.0036*** (3.46)	.0107062*** (4.86)	-.00855*** (-4.35)
<b>Employment and Economic opportunities</b>			
Value added ratio_1	-	3.31*** (5.86)	-
Value added ratio_2	8.317*** (16.44)	-	-
Employment rate aged 25-34	-	-.0450948*** (-5.63)	-
Employment differential 25-34 - county of origin and of destination	-	-	.07264*** (18.93)
Unemployment rate	-.0027 (-0.43)	-	-
Wage differential	-	.0029588*** (3.61)	.00142*** (3.04)

\*\*\*Significant at 0.001; \*\*Significant at 0.05; \*Significant at 0.10.  
z values in brackets.

The results reported in Table 3 corroborate previous empirical evidence for Italy (Ciriaci, 2006, 2005) on selection bias: among those individuals who decided ante-lauream to migrate after graduation, the 'best' student is the more likely to return. Table 3 shows that the dummy included for those who graduated with distinction (*summa cum laude*) is significant and enters the equation with a negative sign: the best student (who, however, needs the longest time to graduate: *late graduation* is the dummy introduced to consider this event and is significant and with a negative sign) is less likely to stay 'abroad'. For this reason, some effort is needed to attract them to return: returning migrants are the best of the graduates from 'abroad'. This positive selection bias partially contrasts with the results in the literature on international migration of highly skilled workers. Borjas and Bratsberg (1996), for instance, find that return migration is characterized by 'negative selection' and is very unlikely unless sustained growth in the source economy precedes their return. However, the brain drain between a developing and an industrialized country (frequently, the US) is motivated by relevant differences in real wages and employment opportunities. Clearly, when a within Italy brain drain is analysed, the observed differences in terms of real wages and employment opportunities are less significant, although still present. It could be argued that in the case of international skilled migration the incentive to return is lower than in the case analysed in this paper, namely the brain drain between more and less industrialized regions belonging to the same country. Moreover, it could be argued also that skilled individuals migrate to other countries on a more permanent basis (with families and at long distances, implying higher economic and social costs; Kanbur and Rapoport, 2005) than a young student who migrates for graduation studies, *within* his/her country, when aged around 19, or at the age of 23-24 years old when he/she decides where to work after graduation.

Another interesting source of selection-bias is the profession of the individual's father's: if study and graduation occurred in another area with respect to the 'source' area, and father is an entrepreneur, the probability of returning is lower. This result corroborates the empirical evidence on Italian scarce social mobility (SVIMEZ, 2009; Censis, 2006): to study 'abroad' you need the economic support of your family.

In terms of university characteristics, only one faculty group dummy is a significant determinant of the probability of staying 'abroad': that is, graduating from a faculty in the political or social sciences positively influences the probability of remaining 'abroad'. Moreover, if you graduated from a 'mega' or big university (e.g. University of Rome La Sapienza), there is a higher probability of remaining abroad. This result might be interpreted as the sign of an 'aggregation effect' (Kanbur and Rapoport, 2005; Venables, 2005) as the biggest universities (in terms of number of students) are generally located in the biggest and wealthiest cities (Rome and Milan), where the opportunities offered to skilled and young graduates are relatively higher.

As far as research quality is concerned, the average rating of the university attended by the respondent is a highly significant determinant of the migration choice. That is, academic rating has a strong explanatory power on non-return, the higher the research quality of the university attended by the individual the higher the probability he/she will remain in the destination economy. It could be argued that the quality of the university attended will positively affect the probability that the individual finds a job in the same town (Ciriaci and Muscio, 2009). Moreover, the empirical results confirm the relevance of the economic environment for the graduate's choice to remain in the area of destination or to return to the area of origin: all the variables inserted to take account of potential differences in the employment and economic opportunities between the source and the destination counties are highly significant and have the expected sign. On the one side, both the employment gap, namely the difference between the employment rate of 25-34 year olds between province of study and province of origin, and the quality of life in the province of destination positively influence the probability a graduate will choose to remain 'abroad'. On the other side, the 'push' factor, the total unemployment rate in the province of origin, a good proxy for the general condition of the labour market, enters with a positive sign.

Finally, given the importance attributed to wage gap in the economic theory on skilled and non-skilled migration, the wage gap between the province where the respondent studied, graduated and decided to remain, and that of the province of origin is significant and enters the equation with the expected sign: the higher the wage gap, the higher the probability an *ante-lauream* migrant will choose to stay on in the province where he/she studied.

### 3.3. POST LAUREAM MIGRATION CHOICE

In terms of the post-lauream migration choice, the results confirm the theoretical expectations about determinants, signs and regression significance. First, the probability to migrate after graduation is positively correlated with the age and marital status of the respondent: this suggests that the older the graduate, the lower the probability of finding a job in the province of origin (or the more likely that after not being able to find a job in the province of origin he or she will decide to move away; Ciriaci, 2005) and, the higher the individual's 'responsibilities', the greater the necessity to move to where employment opportunities are higher. Again, a gender difference emerges: females are less likely to migrate than males. In terms of family background, while mother's profession and qualifications are not significant, if the student's father is a manager the probability that the graduate will migrate after graduation is higher, confirming the scarce social mobility that characterizes Italian society (Censis, 2006). Not surprisingly, the dummy controlling for graduation from a university located in Southern Italy is strongly significant and positive.

In relation to university background, students who graduated after a first degree course are less likely to migrate at the conclusion of their studies. This result might be due to the effect of 'Bologna process' which has changed the Italian degree structure.<sup>27</sup> From 2000 on, Italian universities changed from offering a four year module to a 3+2 model, hence respondents who graduated from a four year course are significantly older than those who graduated from a first degree course as they enrolled at the latest most in 1999 (although some Italian universities have yet to introduce the reform). Therefore, *ceteris paribus*, students graduating from a first degree course in our study are likely to be

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<sup>27</sup> The Bologna process changed the Italian degree structure to increase the participation rate of young people in higher education, and to better adapt the supply of higher education to the demand for tertiary education and the supply of human capital to the new economic context, namely demand for labour in the knowledge society. This transformation has affected many aspects (D.M 509/99): length of undergraduate degree programmes, content and structure of degrees which now distinguish between ordinary and specialist degrees following a 3+2 model,<sup>27</sup> and pre-requisites and objectives of the programmes (Boero *et al.* 2001).

younger and to have graduated in a shorter time than those who finished a four year course, resulting in smaller incentive to move and a better change of finding a job in their province of origin. Moreover, it is likely that students graduating from a three year course will prefer to continue to study (+2), rather than moving somewhere else to start working.

The quality of the university attended robustly influences the individual's migration choice: the higher the average rating, the lower the probability to migrate after graduation. Again, this result supports the idea that a degree from a highly rated university, increases the chance of finding a job, and hence reduces the need to move elsewhere. This interpretation is corroborated by the results of a Student's T-test (2 code) conducted to verify whether university performance is a discriminating factor in finding a job, one and three years after graduation. The results of this test are interesting:<sup>28</sup> on average, the quality of the university attended is a discriminating factor only for Southern graduates wanting to find a job in a Southern region, and within one year after graduation. University quality is not a factor in finding a job for Northern graduates: Northern regions are characterized by a quite dynamic labour market with an unemployment rate close to its natural level; therefore, *ceteris paribus*, graduates have relatively higher chances to finding jobs there (SVIMEZ, 2009). The results of the economic variables for push and pull economic factors go in the same direction. The higher the employment rate for 25-34 year olds (average over the period 2004-07) in the province of origin,<sup>29</sup> the lower the

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<sup>28</sup> These results are available on request, but also are published in SVIMEZ (2009: 233).not in refs

<sup>29</sup> Due to the high correlation between the employment and income gaps, only employment rate in the province of origin is considered as a push/pull factor. However, if the income gap is excluded, the employment gap becomes significant and with the expected sign.



probability to migrate, while the higher the gap in terms of per capita income (given the period covered by the survey, and the willingness to consider a

Appendix.

Quality of Life index – List of Groups and indicators description (*Source: Mazziotta, and Pareto, 2009*)

N.	Description	Correlation sign with QoL
Life standard		
1	Bank deposits (Average per inhabitant)	+
2	Average monthly pension	+
3	Inflation "Foi" index	-
4	Gross Domestic Product (Average per inhabitant)	+
5	House price (Amount per m <sup>2</sup> )	-
6	Consumption (Average per inhabitant)	+
Job & business		
7	Defaultings firms (On 1,000 new firms)	-
8	New economy firms (On 100 inhabitants)	+
9	New/dead enterprises	+
10	Protests (Amount per inhabitant)	-
11	Persons in search of job (On labour forces)	-
12	% employed aged 25-34	+
Environment & health		
13	"Tagliacarne" infrastructure index	+
14	Road accidents (On 100,000 inhabitants)	-
15	Climate (Thermal excursion)	-
16	"Legambiente" index	+
17	Civil actions speed index	+
18	School dispersion index	-
N.	Description	Correlation sign with QoL
Public order		
19	Car thefts (On 100,000 inhabitants)	-
20	Thefts at home (On 100,000 inhabitants)	-
21	Denounced minors (On 1,000 inhabitants)	-
22	Robberies (On 100,000 inhabitants)	-
23	Pocket robberies (On 100,000 residents)	-
24	Murders trend	-
Population		
25	Population density (Inhabitants per km <sup>2</sup> )	-
26	% foreign citizens	+
27	% graduates (On 1,000 inhabitants aged 25-30)	+
28	Births (On 1,000 inhabitants)	+
29	Registrations/cancellations	+
30	Ratio of population aged 15-29 to population aged 65 and over	+
Free time		
31	Books reading index	+
32	Bars and restaurants (On 100,000 inhabitants)	+
33	Concerts (On 100,000 inhabitants)	+
34	Sporting index	+
35	Associations of voluntary service (On 1,000 inhabitants)	+
36	Cinemas (On 100,000 inhabitants)	+

structural indicator, we used average 2001-05 per capita income), the higher the probability to migrate. Moreover, the lower the standard of living in 2007 (the index gives the ranking of Italian counties, from 1 - best position - to 103 - worst) in the province of origin the higher the probability the individual will choose to migrate. Finally, quality of life (average 2004-07) of the province the respondent moves to increases the probability of migration.

Clearly, in line with the theoretical and previous empirical evidence, the wage gap between province of destination and province of origin is significant and enters the equation with the expected sign: the higher the wage gap, the higher the probability a graduate will choose to migrate after graduation.

Table4. Marginal effect of the selected variables in the probit model of migration choices.

Dependent variable	Mobile_Ante Lauream	Mobile_Post Lauream	Mobile_Not Returned
Pseudo R2	0.37	0.65	0.62
<b>Student's characteristics</b>			
Age	-.0085*** (-5.13)	.0009245*** (5.03)	.00036 (-.62)
Sex	-.0104223*** (-5.31)	-.0009187*** (-3.28)	-.000183 (-1.19)
Marital status	.0063398** (2.76)	.002908*** (6.47)	.000928*** (-2.22)
<b>Family background</b>			
Father's education	.0033*** (3.98)	-	-
executive	-.005 (-1.42)	-	-.001336** (2.02)
entrepreneur or self employed	-	.0011915** (1.95)	0.0005363 (0.98)
<b>Field of Study and University background</b>			
First level degree (Laurea magistrale)	-	-.0005748** (-2.09)	-.00115** (2.43)
Second level degree (Laurea specialistica)	-	-	-
Field of study_9	-	-	.00333*** (3.67)
Field of study_14	-	-.0014118*** (-4.66)	-
Field of study_16	-	.0491864*** (4.34)	-
Summa cum laude	-	-	-.00158*** (-3.80)
Late degree	-	-	-.0020*** (-4.46)
<b>County of residence and University location</b>			
Residence before the enrolment	.3475*** (25.88)	-	.1820052*** (19.34)
Residence and University location	-	.1924944*** (17.00)	-
<b>University quality</b>			
Total Rating	0.7006*** (15.91)	-.0129126** (-3.01)	(11.62)
Rating of "local" Universities	-.2342** (-2.97)	-	-
Dimension_3	-	-	-.0033*** (-6.61)
Dimension_4	-	-	-.0013** (-2.62)
<b>Quality of life</b>			
Life quality	.0004645*** (20.14)	.000177*** (14.09)	.0000902*** (14.11)
Standard of living	.00028*** (3.46)	.0000532*** (4.86)	-.000717 (-4.35)
<b>Employment and Economic opportunities</b>			
Value added ratio_1	-	.0164664*** (5.86)	-
Value added ratio_2	.6431*** (16.44)	-	-
Employment rate aged 25-34	-	-.0002239*** (-5.63)	-
Employment differential 25-34 - county of origin and of destination	-	-	.0027*** (18.93)
Unemployment rate	-.00021 (-0.43)	-	-
Wage differential	-	.0000147*** (3.61)	.0000117*** (3.04)

\*\*\*Significant at 0.001; \*\*Significant at 0.05; \*Significant at 0.10.  
z values in brackets.

#### 4. CONCLUSIONS AND POLICY IMPLICATIONS

Over the period 1998-07, the percentage of Southern graduates employed in Northern Italy three years after graduation increased from the 23.5% to 40.5% of Southern employed graduates. The data and the results presented suggest that the migration of the more skilled component of the young labour force is not beneficial for the region of origin: the two main channels through which brain drain could positively affect the source economy seem not to operate any longer. While brain drain from the less developed Southern regions continues to increase, the number of university enrolments in Southern regions and the number and percentage of Southern returning migrants sharply decreases. In particular, the decrease in enrolment rates may be due to the worsening the economic situation in the Northern regions due to stagnation in economic activity which has decreased the returns to education and emigration of Southern students. Therefore, instead of acting as a mechanism to equalise growth, income and unemployment rate differences between the more industrialized and richer area of Italy (the Northern regions) and the less industrialized (the Mezzogiorno) area, the phenomenon of human capital flight acts as a dis-equilibrating mechanism. Italian interregional brain drain seems to be part of a cumulative causation process and contributes to enlarging the existing social and economic gap through its influence on regional natural rates of growth (Lèon-Ledesma and Thirlwall, 2002a). Therefore, from a regional development perspective, understanding the determinants of brain drain can help guide policy intervention aimed at reversing or partially compensating its negative effects.

The empirical results in this study confirm the presence of a significant gender and age selection bias in the initial migration choice, namely in the case of ante and post lauream migration. In those cases, females are less likely to migrate to study or to migrate after graduation (and age has a negative impact). In the case of the intention to return, gender and age are not relevant as individuals have been already selected on the basis of these characteristics. While in the first two cases, marital status positively influences the choice to

migrate, in the case of non-returning migration enters the equation with a negative sign. Another source of selection bias is the individual's family background, a result that confirms the scarce social mobility that characterizes Italy's social structure: if the father in the family is an executive or a manager the probability is that the student will migrate to study and will be less likely to return (or there is a likelihood that the family will have a valuable 'network' that will help in finding a job). If the student's father is an entrepreneur, the probability of returning is lower (the family will be better able to support the student). On the other side, the individual's university background and performance are not significant in the case of either ante-lauream and post-lauream migration. For return migration, the estimates suggest a significant positive selection bias: return migrants are the best students among those who graduated 'abroad', but the percentage of these return migrants is small. Wage differentials, geographical differences in young labour force 'employability', differences in quality of life and, more generally, in the social and economic environment in the host and source counties, are all important determinants of migration choices.

Not surprisingly, the (better) quality of the universities located in the province of origin reduces both the probability the individual will migrate to study, and the probability the individual will migrate after graduation. For instance, for a Southern student, graduating from a Southern university, the probability of migration after graduation is inversely related to the quality of the university that awarded the degree. This is in line with the empirical finding that in Southern regions the better the quality of the university in which the student studied, the higher the probability of finding a job (Ciriaci and Muscio, 2009; SVIMEZ, 2009). At the same time, the probability that an ante-lauream migrant will decide not to return to his/her province of origin increases. Therefore, the lower the university quality in the source economy, the lower the probability an individual will stay or return there.

Undoubtedly, government can do a great deal to mitigate the causes of brain drain through the design of measures aimed at increasing skilled workers' «employability» and attracting return migrants. For instance, the relative success of Chinese Taipei, Korea and Ireland in fostering return migration has been attributed to the opening of their economies and policies to foster

domestic investments in innovation and research and development (OECD, 2008). Grass roots initiatives in South Africa and Latin America have been developed to link researchers abroad to networks in their home countries. Indian professionals in the US are among the primary drivers of knowledge and capital flows to India thanks to the Indian government's efforts to promote these private networks through legislative and tax rules that encourage remittances and investment from Indians abroad.

Clearly, the case analysed in this paper differs significantly from these international examples, but the empirical results discussed above confirm that there is room for policy interventions. Southern regions offer too few job opportunities to their highly skilled graduates: in Southern regions the employment rate of young graduates three years after graduation is almost 12 points lower than in Northern ones. At the same time, the empirical evidence implies that investing in the quality of university supply creates opportunities for young graduates as the higher the university quality in the province of origin the lower the probability an individual will choose to migrate.

Systemic interventions are needed first to stimulate demand for skilled labour through proper fiscal policy measures, second to favour a stronger interaction between universities and firms within the «space». The task will not be easy and will take time. Many of the benefits for source regions, in fact, can only be realized in the longer term and require investment in science and technology infrastructure and the development of opportunities for young skilled workers. As stressed in the literature on international brain drain, developing centres of excellence for scientific research and framing the conditions for innovation and high tech entrepreneurship can make a region attractive to both home and foreign young students. Such policies embrace promotion of entrepreneurship, training and education, mechanisms influencing the allocation of capital, public research and its links with business. There is the need, in source regions, to develop an adequate technological, scientific and business environment that will provide satisfying opportunities for returning individuals who have upgraded their skills abroad and/or serve to persuade these skilled people to remain in their home regions.

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