A Micro Data Analisys Of Italy's Brain Drain

Monteleone, Simona and Torrisi, Benedetto

University of Naples "Parthenope", Department of Economic Studies, Via Medina 40, 80133 Naples, University of Catania, Faculty of Economics DEMQ

8 January 2010

A Micro Data Analisys Of Italy's Brain Drain*

Simona Monteleone † – Benedetto Torrisi ‡

Contrary to current thinking which views the European brain drain as a transitory phenomenon, this paper shows, using a micro-data analysis, that, as far as Italy is concerned, such migration is permanent. The present study provides new empirical evidence on the propensity to return. The empirical approach and analytical models used outline the profile of the emigrants, their reasons for flight, the drawing factors and the aspects governing return.
Our findings are robust and statistics significant in the results and to the choice of instruments and the empirical model we apply.

JEL Codes: F22, J24, O15

Keywords: permanent migration, propensity of return, OLS, GLM

I. INTRODUCTION

Recently the Italian press, popular newspapers as well as more academically oriented articles, have reported the uneasiness of many Italian college graduates forced to work abroad for the lack of jobs and research opportunities in their home country (Johnson, 1967; Grubel and Scott, 1966; Mountford, 1997; Beine et al., 2001; Beine, Docquier and Rapoport, 2006).
While there is undeniably a rich theoretical literature, empirical literature is scarce. Recently, a number of authors have undertaken the study of the stock of skilled workers in different countries of origin with a view to obtaining information on the brain drain(Carrington and Detragiache 1998, Docquier and Marfouk 2006, Doquier Lowell and Marfouk 2009).
Doquier and Rapoport (2009) assess the overall impact the brain drain has on countries of origin, evaluating the costs and benefits of such migration for developing countries both in macro- and micro-economic terms.
The micro-economic analysis offers the more interesting focus of study. Assessing the brain drain and testing hypotheses through micro-data seems to be the least studied aspect in the literature, at least as far as Italy is concerned (Brandi, 2004, Becker, Ichino and Peri, 2002).

* This contribution is the result of reflections shared between the authors. Sections II - VI shall be attributed to Simona Monteleone, section III- IV- V can be attributed to Benedetto Torrisi. Sections I and VII are attributed to both authors. The data base and the project to collect contacts, counting of data and processing can be attributed to the group StatEcon-Area of Economic Statistics, University of Catania. We would like to thank M.R. Carillo and B. Chiarini for helpful comments and suggestions.

The present paper aims to elaborate an empirical model which identifies the main factors determining Italy's brain drain, assesses the propensity to return of highly qualified Italian emigrants and highlights those factors which stimulate the return.
This goal is achieved by means of a sample survey. The respondents were selected at random among Italian graduates, doctoral students, researchers and academic who had emigrated abroad.
Given the multidimensional nature of the data collected, the authors opted to apply descriptive and multi-variant statistical methods, namely the Ordinal Linear Squared (OLS) and Generalized Linear Model.
Study of the survey sample showed that it would be useful not only to examine the brain drain quantitatively and qualitatively, but also to assess to what extent, if any, the phenomenon is seen as permanent or transitory in Italy. A review of the literature shows that the return of "brains" to Europe and other regions, such as Asia, is far from marginal; a quarter of emigrants return to their home country and an even greater proportion are highly qualified. Recent studied have tended to consider the migration of qualified individuals as transitory (Batista et al. 2007, Gundel and Peters 2008, Mayr and Peri, 2008, Dustmann and Weiss, 2007).
The present study brings a number of significant quantitative and policy aspects to light. In Italy, the brain drain would seem to be on the whole permanent; emigrants do not seem willing to return to their country of origin as they are attracted by better conditions in the country of destination; 70% of respondents reported a low or absent propensity to return to Italy; the majority of respondents see the need to invest in factors to make the return to Italy more attractive and agree upon what those factors are.
The choice of a micro-data analysis allows us to overcome the informational limits imposed by the use of macro-data (Brandi, 2001; Piras 2005; Lacuesta 2006, Cattaneo 2009). The Likert scales used in the survey provide a deeper view of respondents' attitude to returning to Italy than would have been obtained using dichotomous variables (Dastmann 1996, 2007).

The paper is organized as follows. Section 2 reviews the theoretical and empirical approach to brain drain and brain return. Section 3 presents the data set and the methodological statistics applied. Section 4 shows the principal descriptive results. Section 5 presents the model estimated. Section 6 suggests some policy implications. Section 7 provides concluding remarks.

II. THE THEORETICAL APPROACH

The brain drain is a phenomenon related to the migration of highly qualified individuals from developing countries to developed countries (Commander *et al* 2003).Numerous works in the literature have shown the effects that the brain drain produces on the countries of origin.
A number of authors consider the phenomenon to be negative for the country of origin (Bhagwati e Hamada, 1974; Miyagiwa, 1991), in that qualified individuals leave their country of origin with consequent harmful effects for the country's economic growth.
Other more recent works consider the effects to be positive (Docquier and Rapoport, 2009; Montford, 1997; Stark et al., 1998; Vidal, 1998; Beine et al., 2001). The most recent theoretical and empirical literature has identified three aspects of the

phenomenon: incentives, remittances and returns. Beine, Docquier and Rapoport (2001) Stark (2003) Schiff (2005) Beine, Docquier and Rapoport (2006) hold that the possibility of unhindered access to the International job market (where the yield on human capital is higher than in the home market), provides incentives for individuals in less developed countries to gain better qualifications, with a positive knock-on effect for the country of origin. The analysis of the remittances made by individuals who have emigrated to another country is not particularly extensive and is does not provide conclusions relevant for our purposes. (Lucas and Stark 1985, Faini 2007). Borjas and Bratsberg (1996), Dustmann and Weiss (2007), Dustmann (2009) show the positive effects return migration generates in the country of origin: 25/30% of emigrants return to their country of origin after ten or 20 years, and the majority of these are highly qualified (Batista et al. 2007, Gundel and Peters 2008). Dustmann and Weiss (2007) show that in countries with high rates of growth, such as China and India, a great many emigrants return to their country of origin, often because they can also expert to receive a bonus for their experience abroad. This evidence highlights the need to distinguish between permanent [1] and transitory[2] migration.

Dustmann and Weiss (2007) contend that the return of emigrants is substantial and suppose that emigrants decide to return home when the benefit of staying abroad (salary) is greater than the cost (expenses and household costs). The authors provide three main reasons for why individuals decide to return "home": consumption in the home country supplies a greater degree of satisfaction than consumption abroad; purchasing power in the home country is lower, the salary abroad is higher and prices in the country of origin are lower; the accumulation of capital achieved by emigrants in the foreign country, through a process of learning by doing, enhances their earning power in their home country.

Transitory migration comes to the fore in the work of Mayr and Peri (2008). The authors examine the migration of qualified subjects from countries with average levels of per capita income, such as countries in East Asia and East Europe, towards countries with high income levels. Mayr and Peri show that subjects from richer countries (East Europe, Asia and Latin America) have a higher propensity to emigrate and to return home compared with subjects from poor countries such as countries in Africa. The work focuses on the brain return, highlighting the extent to which the experience abroad increases the productivity of human capital in the country of origin.

There are very few empirical studies of the brain drain in Italy which show its permanent or transitory nature (Avveduto and Brandi, 2004; Becker, Ichino and Peri, 2002; Brandi and Cerbara, 2004; Gagliarducci, Ichino, Peri, Perotti, 2005; Brandi and Segnana, 2008; Tito Boeri, 2009).

III. DATA SET AND METHODS

[1] Migration is considered permanent if the emigrant does not return home before retirement.

[2] Migration is considered transitory if the emigrant spends a certain period in a foreign country but returns home before retirement. Return migration is part of this phenomenon.

The scarcity of empirical contributions derives from the difficulty of collecting micro-data. Indeed, most of the studies analyze the phenomenon taking macro-data as their starting point. This trend is all the more common in with regard to Italy.
The present paper is based on a data set of micro-data (individual respondents) relative to a number of Italians who have emigrated abroad[3].
The data set is based on a sample of 350 contacts among PhD researchers (assistant professors) and professors in different universities of the world. This work develops a platform of data, in relation to the participation and involvement in the chain of an Italian immigrant researcher sample in countries with strong research appeal: Canada, Germany, France, Switzerland and Australia.
The sample of respondents is represented by individuals who are highly educated in different fields of scientific research or highly skilled workers. The lack of official statistics or surveys on the size of population, did not allow any estimate of the number to be sampled and primarily of a criterion of selection of units.
The 350 contacts are classified in 67 variables into the following macro areas of interest *(see Table 1)*. The data set consists of the general aspects of the job, the field of employment, the types of contract, the assessment of academic preparation in the Italian market for foreign workers, the reasons for migration, the quality of work, quality of social life and the propensity to return.
Related to the studied phenomenon, the subdivision of the field into homogeneous areas presupposes the identification of specific indicators able to synthesize the required statistic information. Each variable was analyzed according to different scales of measurement on a case by case basis. For the most part, the study uses Likert scales, while for some variables it was necessary to associate ordinal, nominal and interval-based scales[4].
An exhaustive variables set was identified in relation to the hypothesis regarding the follow aspects of the phenomenon grouped in 5 groups.
For collection data we administered a questionnaire to a sample of contacts who agreed to participate in the survey. In descriptive analysis, we reclassified the results in pivot tables and we used association measures with the Chi-square test ($p < 0.05$) and analytical techniques for the relationship between ordinal variables (*Kendall's Tau b*[5]).

[3] In Italy there are a number of databases relative to the number of graduates who emigrate that are suitable for the purposes of a micro-data analysis. More precisely, it is possible to trace the trend, but it is not possible to provide a deeper analysis of attitudes and propensity. Using databases with micro-data makes it possible to gain an insight into the opinions of individuals.

[4] The Likert scale measures attitudes. The technique is particularly useful as it allows for the application of methods of item analysis based on the statistical properties of interval or ratio based scales. The Likert method, faster and simpler than the Thurstone method, has been used extensively in applied research. The technique involves fine-tuning a number of affirmations (known as "items") which express a negative or positive attitude towards a given subject.

[5] The Kendall tau b rank correlation coefficient (or simply the Kendall tau coefficient, Kendall's τ or tau test(s)) is a non-parametric statistic (Kendall, M., 1938: 81-89). This is a measure of correlation between two ordinal-level variables.

For estimating the prediction model, we used models of multivariate analysis (PCA[6], OLS, GLM[7]).

IV. THE DESCRIPTIVE RESULTS

Who are the people who emigrate?

The descriptive analysis generated the following results: the subjects who leave Italy do so in order to go to another country which can offer them better living and working conditions. Respondents' preferred destinations are Britain, Switzerland and Canada (see Fig. 1). These findings are in keeping with the literature which has identified these countries as those which are the most capable of attracting workers, especially highly qualified workers.

The Italian researchers abroad mainly have an age between 31 and 40 (46.6%), most migrating with the qualification of a PhD (47.7%), 53.1% have fixed-term contracts and work mostly at public universities (70.8%); 59% of respondents are men; most people have lived abroad for more than a year; at the age of 30, subjects can become researchers abroad at the age of 30, while older subjects become teachers, whereas subjects are usually much older when they reach similar positions in Italy (*see Tab. II*).

Young migrants have a basic preparation (degree) and education (PhD or specialization) which is clearly valued abroad, given the results of respondents for both the period of stay, and the type of host research body.

Only 3.3% of respondents had been abroad for less than a year (X_9), while the remaining percentage of respondents show a degree of integration in the host country consolidated over the years (*see Tab. II*).

Around 67% of respondents are researchers who have worked in Italy (having thus achieved a degree of experience and a reasonable ranking in the comparative evaluations in which they have participated), compared with 33% who have no previous working experience. The position of researcher or professor does not appear correlated in any significant way with basic education in Italy or with working experience in Italy (*see Tab. III*). The analysis shows that those individuals who leave Italy are well-

---

[6] Principal component analysis (Joliffe I.T., 1986; Beccari A. Torrisi B. ,2003) involves a mathematical procedure that transforms a number of (possibly) correlated variables into a (smaller) number of uncorrelated variables called *principal components*. The first principal component accounts for as much of the variability in the data as possible, and each succeeding component accounts for as much of the remaining variability as possible.

[7] The *general linear model* is a generalization of the linear regression model (McCullagh P.; Nelder, J. 1989), such that effects can be tested for categorical predictor variables, as well as for effects for continuous predictor variables and in designs with multiple dependent variables as well as in designs with a single dependent variable.

In statistics, the generalized linear model (GLM) is a flexible generalization of ordinary least squares regression (OLS). The GLM generalizes linear regression by allowing the linear model to be related to the response variable via a link function and by allowing the magnitude of the variance of each measurement to be a function of its predicted value.

One way in which the general linear model differs from the multiple regression model is in terms of the number of dependent variables that can be analyzed. The Y vector of n observations of a single Y variable can be replaced by a Y matrix of n observations of m different Y variables. Similarly, the β vector of regression coefficients for a single Y variable can be replaced by a β matrix of regression coefficients, with one vector of β coefficients for each of the m dependent variables.

informed about research in Italy; individuals who have had working experience in Italy before leaving the country demonstrate significant understanding *(p-value=0,000)* of how research is financed (*see Tab. IV*).
A fundamental aspect of the survey is understanding how the countries which host Italian emigrants perceive the career of individuals engaged in research and what are the mechanisms governing career progression (see Tab. V).
A clear majority of researchers (93.5%) confirmed that career progress is judged as significantly meritocratic (p-value=9.37).
The results of our investigation show that the young people who emigrate have a level of basic and higher academic achievement (degree, and doctorate or specialization, respectively) which is widely recognized abroad, both in terms of the results relative to the length of stay, the type of host research body, and the position occupied. In Italy, the type of work the subjects can find after many years of study does not correspond to their level of academic qualification, either in terms of salary or job satisfaction.

Reasons for leaving Italy

The reasons for emigrating are: 1st employment (x_{24g}) opportunities (95.7%), 2nd prestige (x_{24d}) of the host organization (82.7%), 3rd the enhancement (x_{24e}) of their skills (78.3%), 4th extension (x_{24c}) skills (75.5%), 5th economic (x_{24h}) reasons (72.8%) followed by the possibility of using new technologies (x_{24f}), particularly the host country's interest for the topics of research proposed and finally to a fully functional bureaucratic system (*see Tab. VI*).
With regard to the opinions expressed in relation to the main integration indices (see Tab. VII), 79% express overall satisfaction with how work is organized, their workplace, policies supporting research, freedom to pursue different avenues of research, career prospects, working hours, relationships with their superiors and colleagues, the availability of scientific equipment, affinities in working groups, the level of bureaucracy, the ease of access to information, and workplace safety.
Another significant emigration aspect concerns the relationship between age and career progress. At the age of 30, subject go abroad to become researchers; older subjects become teachers (see Tab. VIII).
The targets for young migrants are significantly age-correlated.

Propensity to return

Contrary to the prevalent thrust of the literature which sees recent migration as a transitory phenomenon, the results of our analysis show that in Italy it is permanent. This result is obtained by evaluating the emigrants' propensity to return. This degree of propensity has been assessed on the basis of the percentage of responses given in relation to a scale of evaluations designed to highlight the subjects' attitude to the idea of returning to their home country.
Over 70% of respondents have a low or no propensity to return to Italy (*see Fig 2*).
The main factors that discourage the propensity to return to Italy *(see Tab. IX)*, (the greater the positive perception of the majority decreases the propensity to return in Italy) are access to funding for research, development of new research abroad, greater earnings and more job opportunities, better perception of work and organization of

work, perception on the quality of life and the possibilities for inclusion in the social fabric of the host country (*Kendall's tau b negative*).

V. THE MODEL RESULTS

We considered a database of 350 lines (statistical units) and 67 rows (variables). In relation to the complexity of variables, the propensity to return was studied through multivariate analysis models. For the type of variables, we applied different regressive models (OLS[8] and GLM) and finally, we chose the best data fit.

We performed a multivariate analysis of the information provided by the PCA. We analyzed the number of PCs that explain the 73% of the total variance of the data set.

The PCA analysis produced two components that show higher variability. In the first component there are 22 indicators over all 52, and in the second one 23 over all 52 *(see Table X*).

The OLS, of which only the results are reported for the sake of brevity, was less significant than the GLM (see Table XI).

We generated a multiple regression model (GLM) that estimated the regression coefficients (β_i ,γ_i ,) between the covariates (Z_i ,W_i) of main factors and the propensity to return *(see table XII*).

The model (1) measures the intensity that each predictor or combination exerts on the propensity to return (X_{27}).

$$(1) \qquad X_{27} = \alpha_i \pm \beta_{i[see-table-XII]} X_{i[see-table-XII]} \pm \gamma_{i[see-table-XII]} Z_{i[see-table-XII]} + \varepsilon'$$

The coefficients included in the function are highly significant, and confirm that X_{27} depends on the predictor's combination at 95% probability and a good adaptation of 0,9831 (p=0,000) *(see Table XII*).

Model (1) obtained significantly linear residual distribution that is (p-value = 0.000) *(see Fig III).*

The GLM model produces the following ratios: if interest (X_{24b}), prestige (X_{24d}), employment opportunities (X_{24g}), work team (X_{26l}), the quality of life in the host country (X_{29}) and social inclusion abroad (X_{31}), the propensity to return decreases. On the other hand, the propensity to return increases proportionately to the increase in employment opportunities in the home country (X_{28}).

Furthermore, the GLM results showed that the propensity to return decreases further in the presence of the highest views in the combination of variables (X_{24b}*X_{24d}, or X_{24b} * X_{24g}, or X_{24d}* X_{24g}, or X_{24b}* X_{26l}).

The difficulties in the host country (X_{25b}* X_{25d}) do not discourage the return, whereas the combination of the main factors (X_{28b}* X_{28c} or X_{28b} * X_{28e}), stimulate greater propensity to return.

We have calculated the mode, the median and the mean of the variables that belong to the same group ($X_{24=}$ *justification migration*, $X_{25=}$ *difficulties in host country*, $X_{26=}$ *satisfaction levels with the following factors in host country*, $X_{28=}$ *pull factors for return*) and they present the same results. These variables are predictors of the propensity to return.

Through the interpretation of the model, it can be observed that:

[8] Ordinal Regression allows you to model the dependence of a polytomous ordinal response on a set of predictors, which can be factors or covariates. The design of Ordinal Regression is based on the methodology of McCullagh (1980, 1998).

- the greater trial on the factors that led to migration from Italy ($X_{24=}$ *justification migration*), the lower the propensity to return (β =-.093 p <.05);
- the greater the degree of perceived satisfaction in the work abroad ($X_{26=}$ *satisfaction levels the following factors in host country*), the lower propensity to return to Italy (β = -.298 p <.05);
- the more the basic elements ($X_{28=}$ *pull factors for return*) in the Italian university system (career opportunities, availability of more funds for research, revision of the Italian research system as a whole, access to cutting-edge technology, salary, family reunification)are lacking, the more the subjects tend not to return (β = .238 p <.05);
- the more gap in the perception on the quality of life abroad (X_{31}) (β = -.151 p <.05) compared to (X_{30}) (β = .180 p <.05) widens, the more the propensity is reduced.

VI. POLICY IMPLICATIONS

The results of this paper provide highly stimulating policy implications.
The shift in the profile of individuals emigrating from Italy is almost paradoxical. Initially, the subjects in question had basic education; they were followed in the 1990s by waves of graduates; and today emigrants are chiefly highly qualified workers.
While Italy may well provide a high level of education and training, the real beneficiaries are the countries of destination. This phenomenon generates a range of negative effects on the economic and social development of the country. On one hand there is the clear difficulty highly qualified workers have of finding suitable jobs in Italy; such works are obliged to engage with a system that is unable to provide them with suitable compensation and meritocratic career progress; on the other, the fact that destination countries have over time consolidated strategies to attract qualified workers.
The propensity to return on the part of emigrants increases in relation to their age at the time of arrival in the foreign country, but decreases in proportion to the number of years spent in the country. The greater the extent to which emigrants are integrated in the host country, the looser their ties to their home country and consequently the lower their desire to return home. These results from our survey sample are in keeping with existing literature (Dustmann, 2009). Having shown the low propensity to return, our investigation highlights the fact that Italy's migration bucks the trend present in literature. In Italy, the brain drain is permanent. Highly qualified individuals are not willing to return to Italy once they have been exposed to the job possibilities in the host country. The knock-on effect hinders social and economic growth in Italy.
Against such a potentially negative background, it is necessary to envisage political models to provide incentives to return as well as a review of the main success factors in host countries.
While our results clearly show that researchers remain abroad because they find favourable factors (X_{26}) such as access to funding for research, the development of new research abroad, greater earnings and more job opportunities *(see above)*, by the same token our investigation shows which factors play a leading role in encouraging emigrants to return (career opportunities, availability of more funds for research, revision of the Italian research system as a whole, access to cutting-edge technology, salary, family reunification, *see above).*
The policy implications to be applied to the Italian system should

- create more opportunities for highly qualified subjects;
- stimulate research, use resources appropriately with the aim of creating suitable infrastructure for the development of research environments;

- revise appropriately the recruitment system for more qualified subjects, in order to make the best use of available human capital, thus contributing to the economic growth of the country ;
- align salaries with the qualifications of personnel working in research.

The return migration is a very important channel and is able to reverse the brain drain into brain gain for the sending country.

VII. CONCLUSION

This analysis clearly outlines the profile of Italian researchers. The researchers are young, with a good education, they decided to emigrate to enhance their knowledge and work experience has higher quality than in Italy.
The researchers abroad are not disappointed in their expectations. Generally, the level of social and working satisfaction is very good.
Researchers say that they work abroad for a long time, that the longer they stay abroad the lower is their propensity to return to Italy.
People who work in a foreign country are more satisfied with their jobs and have more incentive to increase their productivity as they live in an economic and social context which appreciates, both in terms of retribution and in terms of recognition, the work they do.
The model studied has led to the estimation of single or multiple factors affecting willingness to return home.
These results are in line with the recent literature which sees the growing phenomenon and the difficulty of importing as many brains as they export.
The propensity to return is very low and this confirms the decrease in the degree of research appeal.
This work represents a first attempt to estimate the main factors that determine research migration in Italy. It is the first study on specialist brain drain (PhD students and researchers). The models and the additional motivations assessment are the elements that provide greater knowledge to study the degree of appeal of a given country for research. It contains many tools for analyzing policy decisions.
The evidence obtained in this study should lead policymakers in both developing and developed countries not to focus their attention in restricting migration flows of educated individuals. Not only are destination countries likely to benefit from the inflow of these skilled immigrants, as is relatively undisputed, but these flows may also be beneficial for countries of origin.

REFERENCES

Amendola, A., Autiero, G., e Nese, A. (2002) "Mobilità intergenerazionale nel livello di istruzione in Italia: un'analisi comparata tra Centro-Nord e Sud". *Economia & Lavoro,* vol. XXVI, pp. 131-151.
Avveduto, S. e Brandi, M. C. (2004), "Le migrazioni qualificate in Italia". *Studi Emigrazione,* vol. XLI, pp. 797-829.
Batista C., Lacuesta A. and Vicente P. (2007) "Brain Drain or Brain Gain: Evidence from African Success Story" *IZA discussion paper 3035, Bonn, September.*
Basile, R. e Causi, M. (2005), "Le determinanti dei flussi migratori nelle province italiane:1991-2001. WorkingPaper No. 49, Dipartimento di Economia, Università degli Studi di Roma Tre.

Beccari A.- Torrisi B., "New statistical methodology for variable selection: a chemiometric application", in *Italian Journal of Applied Statistics*, Vol.15 n.3 (2003).
Becker, S. O., Ichino, A. e Peri, G. (2004), "How large is the "brain drain" from Italy?". *Giornale degli Economisti e Annali di Economia,* vol. 63, pp. 1-32.
Bein M., Docquier F. and Rapoport H., (2001), "Brain drain and economic growth: theory and evidence" *Journal of Development Economics, 64(1),* pp. 275-89.
Bein M., Docquier F. and Rapoport H., (2003), "Brain drain and LDCs' Growth: Winnerrs and Losers", *IZA Discussion Paper n° 819, July.*
Bein M., Defoort C. and Rapoport H., (2006), "Skilled migration, human capital inequality and convergence", *Manuscript, Universitè Catholique de Louvain-La-Neuve.*
Bein M., Docquier F. and Rapoport H., (2006a), "Alternative measures of the brain drain", *Research report, World Bank, Washinton DC.*
Bein M., Defoort C. and Rapoport H., (2006b), "Brain drain and human capital formation in developing countries: winners and losers', *IRES Discussion Paper n° 2006-23, May.*
Beltame (2007), "Realtà e retorica del brain drain in Italia Stime statistiche, definizioni pubbliche e interventi politici", Università di Trento.
Bertoli S., Brücker H., Facchini G., Mayda A.M., Peri G., (2009), "The Battle for Brains: How to Attract Talent", *CEPR project, Fondazione Rodolfo Debenedetti.*
Bhagwati j., Hamada K. (1974), "The brain drain, international integratio of markets for professional and unemployment". *Journal of Development Economics,* 1 (1), 19-42.
Boeri, T. (2006), "Per il Mezzogiorno, ma non solo per il Mezzogiorno". *L'Industria,* vol.27,pp.103-106.
Bonifazi, C. e Heins, F. (2001), "Le dinamiche dei processi di urbanizzazione in Italia e il dualismo Nord-Sud: un'analisi di lungo periodo". *Rivista Economica del Mezzogiorno,* vol. XV, pp. 713-747.
Brandi, M.C. (2001), "Evoluzione degli studi sulle skilled migration: brain drain e mobilità", *in Studi Emigrazione,* XXXVIII n.141, pp.75-93.
Brandi M.C., Cerbara L., (2004) "I Ricercatori stranieri in Italia: fattori di push e pull", *Studi Emigrazione, anno XXXI , n 156.*
Brandi M.C., Segnana M. L., (2008), "Lavorare all'estero: fuga o investimento?" in Consorzio Interuniversitario Alma Laurea (a cura di) *X Indagine Alma Laurea sulla condizione occupazionale dei laureati, Il Mulino*
Cariaci, D. (2005), "La fuga del capitale umano qualificato dal Mezzogiorno: un *catching-up* sempre più difficile". *Rivista Economica del Mezzogiorno,* vol.XIX,pp.369-403.
Carrington W.J. and Detragiache E. (1998) "How big is the brain drain?" *IMF Working paper n°201.*
Cattaneo C., (2009) "The Decision to Migrate and Social Capital: Evidence from Albania" *Fondazione Eni Enrico Mattei and University of Sussex.*
Commander, S., Kangasniemi, M. e Winters, L.A. (2003) " The brain drain: Curse or Boon?", *IZA Working Discussion Paper 809.*
Del Boca, D. e Venturini, A. (2003), "Italian migration". *IZA Discussion Paper* N°. 938.
Defoort C. (2009) "Tendances de long term des migrations internationals: Analyse partir des 6 principaux pays receveurs », *Population, 2, (forthcoming).*
De Man H., (1931) "La gioia nel lavoro", *Laterza, Bari*.

Docquier F. and Marfouk A. (2004), "Measuring the international mobility of skilled workers" *1990-2000(Release 1.0), Mimeo.,The World Bank.*
Docquier F. and Marfouk A. (2006), "International migration by educational attainment (1990-2000)", in: Ozden, C. et Schiff (eds), International migration, remittances and the brain drain*, Chap 5, Palgrave-Mcmillan.*
Docquier F., Lowell B. L. and Marfouk A. (2009), "A gendered assessment of the *brain drain*", *Population and Development Review*, forthcoming.
Docquier F. and Rapoport H. (2009), "Quantifying the Impact of Highly-Skilled Emigration on Developing Countries" *CEPR project, Fondazione Rodolfo Debenedetti.*
Defoort C. (2009) "Tendances de long term des migrations internationals: Analyse partir des 6 principaux pays receveurs », *Population, 2, (forthcoming).*
Dos Santos M. and Postel-Vinay F. (2003) "Migration as a source of growth: the prespective of a developing country" *Journal of Population Economics,* 16(1) 161.
Dustmann C. (1996), "Return migration. The European experience", in Economic Policy 22.
Dustmann C. and Weiss Y. (2007), "Return migration: Theory and Empirical evidence", *CReAM, CDP No 02/07 London.*
Dustmann C., Fadlon I. and Weiss Y. (2009), "Return migration and Human Capital Accumulation" *workin paper* .
Faini R., Galli G., Gennari P., Rossi F. (1197), " An empirical puzzle: Fallino migration and growing unemployment differentials among Italian regions". *European Economic Review 41,* pp. 571-579.
Gagliarducci S., A. Ichino , G.Peri e R. Perotti (2005) "Lo Splendido Isolamento dell' Universita' Italiana" Working Paper, *Fondazione Rodolfo De Benedetti, Milano, www.igier.uni-bocconi.it/perotti*
Grubel H. and Scott A. (1966), "The international flow of human capital", *American Economic Review,* 56:268-74.
Gundel and Peters, (2008) "**What Determines the Duration of Stay of Immigrants in Germany?: Evidence from a Longitudinal Duration Analysis**," *SOEPpapers 79, DIW Berlin, The German Socio-Economic Panel (SOEP).*
Haque NU and Kim S-J. (1995) "Human capital flight: impact of migration on income and growth" *IMF Staff Papers* 42:577-607.
Johnson H. (1967), "Some economic aspects of the brain drain", *Pakistan Development Review,* 7, 3:379-411.
Joliffe I.T., (1986) "Pricipal Component Analysis", *Springer Velag, NY* .
Kendall, M. (1938) "A New Measure of Rank Correlation", in *Biometrika*, 30, 81-89.
Lacuesta, A. (2006) "Emigration and Human Capital:Who Leaves, Who Come Back and What Differences does it Makes?" *Bancodeespana.*
Mattana, P. e Piras, R. (2006), "The contribution of human capital to the growth process: new panel results for Italy". Lavoro presentato al *Final Workshop del Gruppo di Ricerca su Mezzogiorno: Sviluppo e Nuove Teorie della Crescita,* Napoli 10-11 febbraio 2006.
Mayr K. e Peri G. (2008), "Return Migration as a Channel of Brain Gain, *Working Paper n° 14039. http//www.nber.org/papersw14039.*
McCullagh P. Nelder J., (1989) "Generalized Linear Models, Second Edition". *Boca Raton: Chapman and Hall/CRC.*
Miyagiwa K. (1991) "Scale economies in education and brain drain problem" *International Economic Review.* 32:743-759.

Mountford A. (1997) "Can a brain drain be good for growth in the source economy?" *Journal of Development Economics,* 53:287-303.
Sestito, P. (1991), "Sviluppo del Mezzogiorno e capitale umano" *Economia & Lavoro*, vol.25, pp.3-13.
Stark O. (2003), "Rethinking the brain drain" , *Discussion Paper.*
Stark O. (2005), "The new economics of the brain drain", *World Economics, v6 n2.*
Stark O., Helmenstein C. and Prskawetz (1997), "A brain gain with a brain drain", *Economics Letters,* 55:227-34.
Stark O., Helmenstein C. and Prskawetz (1998), "Human capital depletion, human capital formation, and migration: a blessing or a curse?", *Economics Letters,* v60, n30 (Settember), pp. 363-67.
Stark O. and Wang Y. (2002), "Inducing human capital formation: migration as a substitute for subsides", *Journal Public Economics,* 86(1): 29-46.
Piras R, , (2005), "Un'analisi dei flussi migratori interregionali dei laureati: 1980-1999", *«Rivista Economica del Mezzogiorno», vol. XIX, pp. 129-162.*
Piras R, (2005), "Il contenuto di capitale umano dei flussi migratori interregionali: 1980-2002", *«Politica Economica», vol. XXI, , pp. 421-451.*
Venturini A., Villosio C., (2008) "Labour-market assimilation of foreign workers in Italy", *Oxford Review of Economic Policy, 2(3), pp. 517-541.*
Vidal J.P. (1998), "The effect of emigration on human capital formation", *Journal Public Economics,* 11, 4: 589-600.

FIGURES

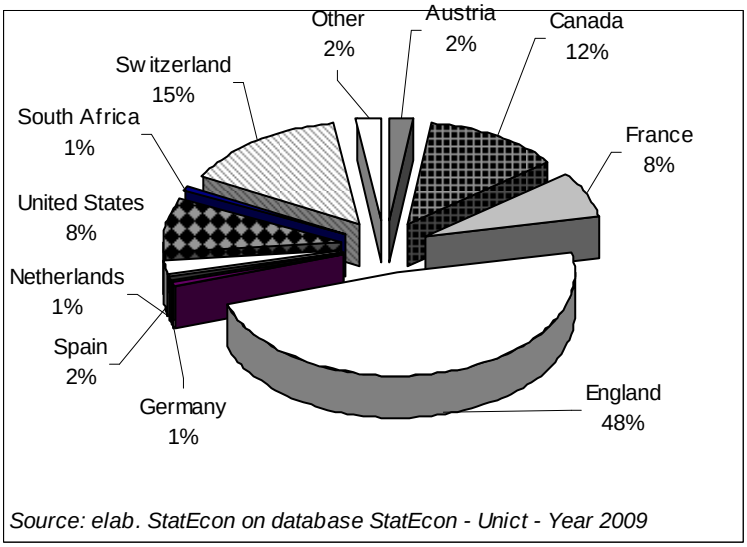

FIGURE I
Distribution % of respondents by host country

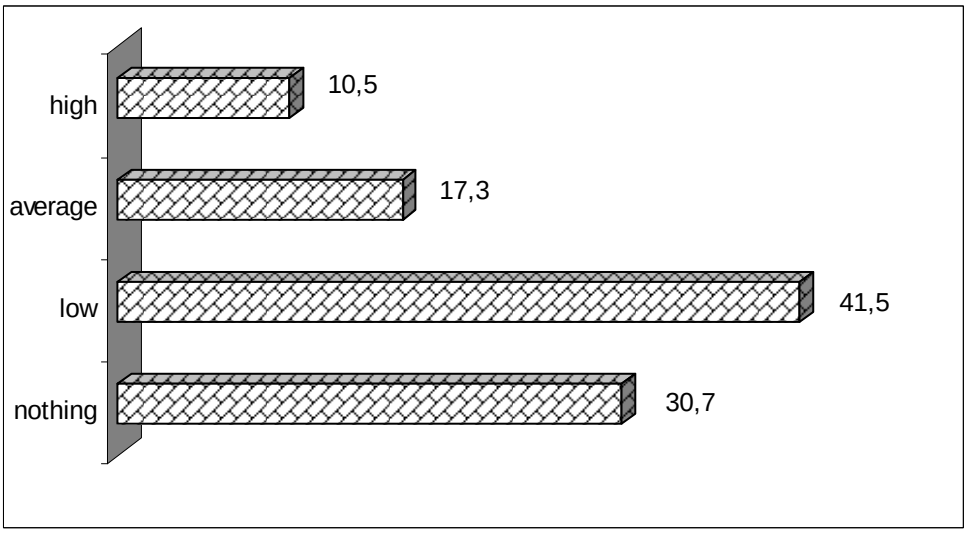

FIGURE II
DISTRIBUTION % OF THE PROPENSITY TO RETURN TO ITALY
Source: elab. StatEcon from StatEcon database - Unict - Year 2009s

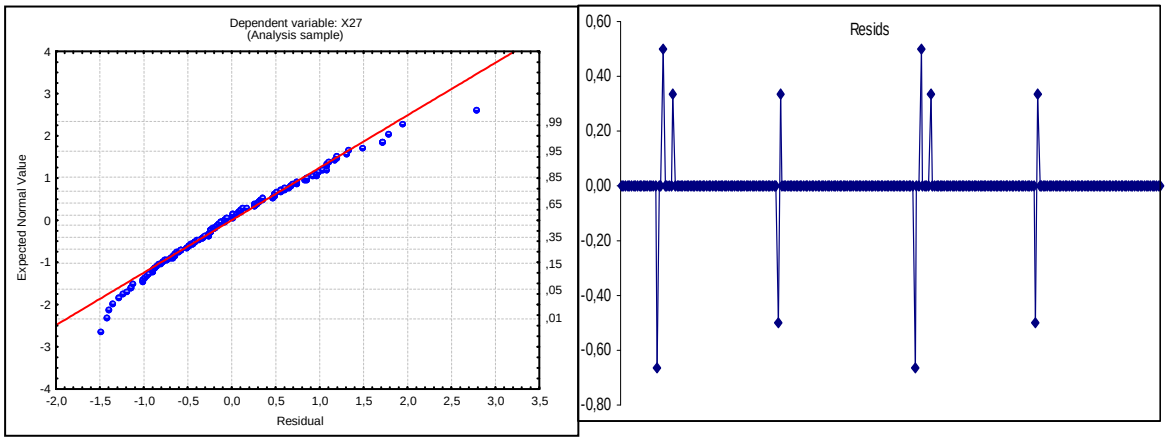

Figure III
Normal plot and residuals distribution

TABLES

TABLE I
CLASSIFICATION OF VARIABLES

Groups	*Single variables*	*Variables types*
General aspects	X_1 Sector	Nominal scales
	X_2 Sex	‘’
	X_3 Age	Interval scales
	X_4 under study	Ordinal scales
	X_5 Current Position	‘’
	X_6 Type of contract	Nominal scales
	X_7 Current works	‘’
	X_8 Host State	‘’
	X_9 Time Abroad	Interval scales
	X_{10} Prepare basic Italy	Scale Likert
	X_{11} Experiences in Italy	‘’
	X_{12} Findings in Italy	‘’
Evaluation and comparison of the Italian system and host	X_{13} Findings on the funding of research in Italy	
	X_{14} Access funding	
	X_{15} Ratio of Basic Research and Applied	
	X_{16} promotion of research by Italian firms	
	X_{17} Universities and Enterprise Value in Italy	Scale Likert
	X_{18} Value Universities and Enterprise Abroad	‘’
	X_{19} possibility of development of research abroad	‘’
	X_{20} Current salary	‘’
	X_{21} Possibility of career advancement abroad	‘’
	X_{22a} Relation between seniority and career	
	X_{22b} relationship between curriculum and career	
	X_{22c} relationship between knowledge and career	
	X_{23} Guest rewarding system in Italy	
Justification migration	X_{24a} Bureaucracy in Italy	Scale Likert
	X_{24b} Interest in specific research	‘’
	X_{24c} Extension of powers	‘’
	X_{24d} Prestige in host institution	‘’
	X_{24e} Enhancement of skills	‘’
	X_{24f} Availability of new technologies	‘’
	X_{24g} Employment opportunities	‘’
	X_{24h} Economic reasons	‘’
Difficulties in host country	X_{25a} Entry permit	‘’
	X_{25b} Social integration	‘’
	X_{25c} Accommodation	‘’
	X_{25d} Local travel	‘’
Satisfaction levels the following factors in host country	X_{26a} Organization	Scale Likert
	X_{26b} Place	‘’
	X_{26c} Policies	‘’
	X_{26d} Freedom	‘’
	X_{26e} Prospects	‘’
	X_{26f} Hours	‘’
	X_{26g} Relations with superiors	‘’
	X_{26h} Relations with colleagues	‘’
	X_{26i} Equipment	‘’
	X_{26l} team work	‘’
	X_{26m} bureaucracy	‘’
	X_{26n} Access information	‘’
	X_{26o} Security	‘’
Motivation to return	X_{27} Trend to return to Italy	Scale Likert
Pull factors for return		‘’
	X_{28a} Career possibilities	‘’
	X_{28b} Availability of funds for research	‘’
	X_{28c} review system	‘’
	X_{28d} Access new tech.	‘’
	X_{28e} Salary	‘’

	X_{28f} Reunion career	‘’
	X_{29} Assessment of quality of life abroad	‘’
	X_{30} Assessment of quality of life in Italy	‘’
	X_{31} Social inclusion abroad	‘’

TABLE II

DISTRIBUZIONE % IN RELATION TO AGE , QUALIFICATION(S), TYPE OF CONTRACT, AND PLACE OF WORK

X_1 Age	%	X_4 Study Title	%	X_6 Contract type	%	X_7 work sector	%	X_9 time abroad	%
		Phd						Less than 1	
20-30	18,4		22,7	Fixed time	53,1	Industry	1,8	year	3,3
		Degree							
						Private research			
31-40	46,6		27,8			centers	15,9	1 to 5 years	35,4
		Post Phd							
				Indefinitely		Private		5 to 10	
41-50	23,8		47,7	time	46,9	university	11,6	years	23,1
						Public		more than	
51-60	7,6	n.r	1,8			university	70,8	10 years	38,3
over 60	3,6								
Total	100,0	Total	100,0	Total	100,0	Total	100,0	Total	100,0

Source: elab. StatEcon from StatEcon database - Unict - Year 2009s

TABLE III – Distribution % of respondents by current position with respect to initial preparation and work experience in Italy

		X10 Preparation				
	X5 Current position	poor	adequate	good	excellent	Total
X11 Experience in Italy=NO	doctoral student		6,5	4,3	9,7	20,4
	professor	5,4	4,3	16,1	16,1	41,9
	Researcher		7,5	16,1	8,6	32,3
	other			5,4		5,4
	Total	5,4	18,3	41,9	34,4	100,0
X11 Experience in Italy=SI	doctoral student		2,2	6,0	4,9	13,0
	professor	2,2	4,3	15,2	11,4	33,2
	Reseacher	3,3	10,9	22,3	13,0	49,5
	Other		2,2	1,1	1,1	4,3
	Total	5,4	19,6	44,6	30,4	100,0
Chi square Test= 24,974–p-value= 0,125 α=5% per esperienza SI Chi Quadro square= 28,089–p-value= 0,06070 α=5% per esperienza NO						

Source: elab. StatEcon from StatEcon database - Unict - Anno 2009

TABLE IV– Distribution % of respondents based on opinion of suitable financing for research in Italy and on access criteria for the same with respect to working experience in Italy

		X14 Funding access		
X11 Experience in Italy=	**X13 Research funding**	meritocratic	not meritocratic	Total
	no	7,3	88,7	96,0

	yes		4,0	4,0
	Total	7,3	92,7	100,0
X11 Experience in Italy=YES	no	10,0	80,0	90,0
	don't know		8,0	8,0
	yes		2,0	2,0
	Total	10,0	90,0	100,0
Chi square Test= ,393–p-value= ,942 α=5% per experienca YES Chi square Test square= 42,849–p-value= ,000 α=5% per experienca NO				

Source: elab. StatEcon from StatEcon database- Unict - Anno 2009

TABLE V – Distribution % of opinions by host country in relation to assessment of career progress

	X21 career progress abroad					
	Fairly meritocratic	Absolutely meritocratic	notmeritocratic	Not meritocratic	hardly meritocratic	Total
Austria	3,0	2,2	0,0	0,0	0,0	5,2
Canada	4,0	10,8	0,0	0,0	1,4	16,3
France	5,0	6,1	0,4	0,4	0,7	12,6
England	6,0	3,6	0,0	0,0	0,0	9,6
Germany	2,0	0,7	0,0	0,0	0,0	2,7
Holland	4,0	0,7	0,0	0,0	0,0	4,7
Spain	1,0	1,4	0,0	0,0	0,7	3,2
USA	9,0	8,3	0,0	0,0	0,0	17,3
South Africa	1,0	0,7	0,0	0,0	0,0	1,7
Switzerland	9,0	12,3	0,0	0,0	2,9	24,2
Other	1,1	1,4	0,0	0,0	0,0	2,5
Total	45,1	48,4	0,4	0,4	5,8	100,0
Chi square Test= 51,153–p-value= ,937						

Fonte: elab. StatEcon from StatEcon database - Unict - Anno 2009

Table VI

DISTRIBUTION % OF RESPONSES IN RELATION TO THE EXPRESSED OPINION ABOUT THE REASONS FOR DEPARTURE ABROAD

	X_{24a}	X_{24b}	X_{24c}	X_{24d}	X_{24e}	X_{24f}	X_{24g}	X_{24h}
for nothing	22,7	16,2	11,2	10,5	10,5	9,7	0,7	12,9
a little	20,6	13,0	13,4	6,9	11,2	20,6	3,6	14,3
Enough	18,8	23,1	15,5	26,7	19,1	17,7	9,0	17,7
Much	15,5	24,5	33,6	29,2	19,5	27,1	26,4	25,1
so much	22,4	23,1	26,4	26,7	39,7	24,9	60,3	30,0
Total	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0
ANOVA test between variables F= 4,2E-07 p-value= ,9999 α=5%								

Source: elab. StatEcon from StatEcon database - Unict - Year 2009s

Table VII – Distribution % of responses in relation to factors found in the host country

	X26a Organization	X26b Place	X26c Policies	X26d Freedom	X26e Prospects	X26f Working hours	X26g Relations with superiors
very poor	1,4	1,4	0,7		1,4	2,9	0,7
poor	4,3	0,7	1,4	2,2	2,2	3,6	2,2
adequate	15,2	15,9	20,6	13,0	15,9	12,3	9,0
good	52,3	40,8	47,3	27,1	39,4	33,6	37,9
excellent	26,7	41,2	30,0	57,8	41,2	47,7	50,2
Total	100,0	100,0	100,0	100,0	100,0	100,0	100,0
	X26h Relations with colleagues	X26i Equipment	X26l equipe Team work	X26m Bureaucracy.	X26n Access to information	X26o Safety	
very poor	1,4		1,4	6,5		1,4	
poor	2,2	3,6	7,2	12,3	2,9	3,2	
adequate	9,0	13,7	21,3	39,4	11,6	6,9	
good	42,2	27,8	38,6	29,2	36,5	33,6	
excellent	45,1	54,9	31,4	12,6	49,1	54,9	
Total	100,0	100,0	100,0	100,0	100,0	100,0	

Source: elab. StatEcon of StatEcon database - Unict - Anno 2009

Table VIII

DISTRIBUTION % OF RESPONSES IN RELATION TO CURRENT POSITION / AGE

	X_5 Current Position					
X_3 age	Phd	Post Phd	Researcher	Professor	Other	Total
20-30	14,8		3,6			18,4
31-40		1,9	32,4	9,7	4,0	48,0
41-50			7,2	16,6		23,8
51-60				6,9		6,9
Other 60				2,9		2,9
Total	14,8	1,9	43,2	36,1	4,0	100,0
Chi Square Test= 291,437–p-value= 0,000 α=5%						

Source: elab. StatEcon of StatEcon database - Unict - Year 2009s

Over 70% of respondents have a low or no propensity to return to Italy (*see Fig 2*).

TABLE IX

RESULTS OF KENDALL'S TAU COEFFICIENTS SIGNIFICANT (P<0,05)

X27	Kendall's tau_b	p-value	***X27***	Kendall's tau_b	p-value
X_{13}	- 0,1754	0,0035	X_{26f}	- 0,3075	0,0000
X_{19}	- 0,1465	0,0147	X_{26g}	- 0,2190	0,0002
X_{20}	- 0,1684	0,0050	X_{26h}	- 0,3225	0,0000
X_{24d}	0,1704	0,0045	X_{26l}	- 0,1584	0,0082

X_{24g}	-	0,1335	0,0263	X_{28a}	0,3278	0,0000
X_{25b}		0,1217	0,0446	X_{28b}	0,1755	0,0034
X_{25d}		0,1216	0,0431	X_{28d}	0,1190	0,0479
X_{26a}	-	0,1740	0,0037	X_{28f}	0,4949	0,0000
X_{26b}	-	0,1934	0,0012	X_{29}	- 0,2727	0,0000
X_{26e}	-	0,1205	0,0451	X_{30}	0,3188	0,0000
X_{26f}	-	0,3075	0,0000	X_{31}	- 0,3391	0,0000

Source: elab. StatEcon of StatEcon database - Unict - Year 2009s

TABLE X

FACTOR LOADINGS (VARIMAX NORMALIZED) CLUSTERS OF LOADINGS ARE MARKED

Extraction: principal component (*The significant weight > ,70000)

	Factor 1	**Factor 2**		**Factor 1**	**Factor 2**		**Factor 1**	**Factor 2**		**Factor 1**	**Factor 2**
X_5	-0,009	0,026	X_{20}	*0,347	-0,172	X_{25a}	-0,178	*0,202	X_{26l}	*0,729	-0,066
X_6	-0,021	*0,186	X_{21}	*0,405	-0,088	X_{25b}	-0,073	*0,417	X_{26m}	*0,308	0,003
X_9	0,073	0,014	X_{22a}	-0,222	*0,379	X_{25c}	-0,263	*0,315	X_{26n}	*0,591	0,003
X_{11}	*0,291	-0,247	X_{22c}	-0,419	*0,451	X_{25d}	*0,266	-0,260	X_{26o}	*0,498	0,053
X_{12}	-0,268	*0,387	X_{23}	0,014	*0,164	X_{26a}	*0,758	0,064	X_{27}	-0,139	*0,383
X_{13}	0,034	*0,202	X_{24a}	*0,205	-0,192	X_{26b}	*0,691	-0,019	X_{28a}	0,137	*0,752
X_{14}	*0,208	-0,078	X_{24b}	-0,098	*0,273	X_{26c}	*0,645	0,143	X_{28b}	0,146	*0,725
X_{15}	*0,187	-0,013	X_{24c}	0,104	0,077	X_{26d}	*0,582	-0,053	X_{28c}	0,240	*0,544
X_{16}	0,064	0,054	X_{24d}	0,024	*0,560	X_{26e}	*0,662	-0,147	X_{28d}	0,160	*0,767
X_{17}	*0,231	0,026	X_{24e}	-0,179	*0,336	X_{26f}	*0,589	-0,214	X_{28e}	0,195	*0,695
X_{18}	*0,201	-0,141	X_{24f}	*0,279	0,167	X_{26g}	*0,700	-0,024	X_{28f}	0,149	*0,539
X_{19}	*0,450	-0,169	X_{24g}	0,188	*0,268	X_{26h}	*0,581	-0,087	X_{29}	*0,347	-0,239

Source: elab. StatEcon on database StatEcon - Unict - Year 2009s

TABLE XI

	R^2	R^2 Adjusted	*F*	*p*
GLM MODEL OLS MODEL	0,995	0,983	135,76	0,0000

TABLE XII

GLM RESULTS

		R^2	R^2 Adjusted	*F*	*p*
		0,995	0,983	135,76	0,0000
X_i	β_i	p-value	Z_i	γ_i	p-value
X24b	-.265	0,00000	*X24b *X24d*	-.440	0,00000
X24d	-.322	0,00118	*X24b *X24g*	-.436	0,00000
X24g	-,.394	0,00072	*X24d *X24g*	-.541	0,00011
X25b	-.156	0,00000	*X25b *X25d*	+.236	0,00000
X26l	-.265	0,00663	*X24b *X26l*	+.436	0,00000
X28a	+.450	0,00013	*X28b *X28c*	+.246	0,00035

X29	-.233	0,00079	*X28b *X28e*	+.577	0,00000