# The Role of Frictions on Italian Academic Recruitment System

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**Abstract**

In a matching model of the academic labour market, with high-skilled (brain) and low-skilled (local) workers, this paper shows that brain workers are harmed by the local. This depends on two types of search frictions: information and cooptation frictions. Search frictions reduce the probability to get an academic job for brain workers compared to the local. A high level of cooptation discards the brain workers but, under certain conditions, the absence of cooptation does not decreases the possibility to get an academic job for the local workers. Whithin this framework, some explanations about the low probability to catch the "brains" and the obstacles for a effective equal opportunity between local and outside candidates are discussed.

*JEL*: I23; J45; J71.

*Keywords*: academic labour market, search frictions, cooptation, recruitment system.

## 1 Introduction

In order to get a permanent academic job in Italy, it is necessary to take part in national competitions. Calls for these competitions are rare and positions are few. As a result, it is almost impossible for young researchers to experience career advacements before 10 years after obtaining their Ph.D. Slow career progressions, low salaries, little competitiveness, few resources, bureaucracy, and the lack of a meritocracy are all factors that discourage researchers from pursuing careers in their home country.

European policies for years have been strongly oriented towards the promotion of academic mobility and towards the creation of research networks and projects within Europe. My main argument is that we are still far from this and I shall show that some obstacles such as cooptation and information remain and hinder such an evolution. In particular, I shall argue that the more informal and implicit rules of recruitment that each scientific area (S.S.D) uses to select among numerous candidates reduce the meritocracy and the probability to get a job for high-skilled candidates.

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This paper analyzes an academic labour market with low-skilled (local), and high-skilled (brain) workers that compete for open and cooptated academic vacancies. This paper presents a matching model with search frictions that reduce the probability to get an academic job for the brain workers. In particular, the information about the cooptated vacancies and high level of cooptation are the two search frictions that have to be considered.

The model, a standard matching model, is kept as simple as possible and is based on rather strong assumptions (to be discussed later) to let the possible frictional effects of cooptation emerge. The novelty of the paper, contrary to (or at least not made explicit by) the existing literature, is the emphasis of cooptation on recruitment system of the academic labour market and the effective equal opportunity for all candidates to get an academic position.

The paper is as follows. Section 2 reviews some of the literature and empirical evidence about Italian and European academic labour market. Section 3 provides some characteristics about recruitment system. Section 4 builds the model set-up. Section 5 shows the results of the model simulation. Section 6 concludes.

## 2 Literature Review

This paper is related to the literature on the functioning of academic system and its capability to attract "talents". In Gagliarducci et al. (2005), for example, is explained the extreme localism that characterizes Italian academia and the inability of academic system to attract foreign researchers. The authors conclude that this happens not for a lack of financial resources but rather for a lack of proper incentives reflected, for example, in academic careers based on seniority rather than on research performance.

Becker et al. (2004), have exploited a dataset and the results obtained show that during the 1990's, Italy lost human capital through its emigration flow. In particular, a percentage varying between 3% and 5% of new college graduates created in Italy has gone abroad, while only 0.3% of college graduates resident in Italy were from a foreign EU country. The impression of an increased brain drain is certainly confirmed by these data.

In Perotti (2002, 2008) there is a comprehensive description of the Italian academic system with a particular focus on recruitment procedures. He shows, by means a detailed empirical evidence, the lack of meritocracy and the widespread nepotism in Italian universities. This story is not so much distant from the analysis of Durante et al. (2009) that explores the relevance of family connections in the Italian academia as well as the relationship between nepotism and scientific production.

Finally, this paper is not so much distant from the analysis of Checchi (1999) on the national academic competition for associate professorship which took place in Italy during the academic year 1997-98. He provides an econometric model and the empirical results reveal that the selecting committee has placed great weight on local candidates and, at the same conditions, outsider appli-

cants (located in foreign universities or holding non-academic positions) were penalized.

Beyond the Italian context, Musselin (2004, 2005) provides an accurate picture of the French, Germany and UK academic systems. She finds that there are many formal and informal obstacles for an effective academic mobility and the foreign country careers still are an exception due to "accidental" opportunities.

This paper is directly related to this literature and some extensive anecdotal evidence and proposes a matching model to explain how search frictions (cooptation and informational asymmetries) obstacle academic recruitment system and the mobility of researchers.

# 3 Academic Labour Market

Focusing on Italy, Ichino et al. (2005) finds that it is characterized by low rates of retention and attraction of "talent" such as university graduates, researchers, scientists and other high-skilled human capital. Italian university system rejects the brains, only 2% of Ph.D students comes from a foreign country compared to 26% of USA and 35% of UK. In the sector "Science and Technology"(S&T), only 1% of employed are foreigners. Italy has the negative supremacy for brain gain from UE countries, and for brain drain to UE and USA.

For the first time, in 2001 Italy introduced a national research plan which includes a series of strategic programs to better manage resources and increase competitiveness in basic and applied research. The so-called operation "Brain Buster", launched by the Italian Ministry of University and Research (MIUR)[1] aimed to attract back Italian scientists and/or foreign academics working in the research sector abroad. Candidates willing to work in an Italian university are selected through the "direct call" system and not through the usual procedure contests, but this policy hadn't the expected results and few researchers accepted to come back in Italy. Many formal and more implicit obstacles can thus identified to explain why academics do not apply more often for positions in another country.

Following Perotti (2002), the rules for recruitment for all three researchers' levels (*ricercatore, professore associato,* and *professore ordinario*) changed in the last years. However, the result is that the recruitment process is no competitive and, generally, the *concorso* comes with a label attached, that of the candidate (usually the local candidate) who is intended to win.

In Europe, Kogan et al. (2001), Musselin (2004) have shown that salaries, recruitment procedures, career patterns, promotion rules are very different from one country to another, nevertheless the European countries are experiencing a common convergence towards a more homogenious system. Among the many objectives that can be attached to the European policies one can outline the creation of an European academic labour market and the development of career patterns which are less oriented to the home market. But for this to be the "rule" rather than the exception the academic labour market has to simultaneously

[1] with the Law DM (2001).

present specific properties. First, it has be transparent, so that recruitment has to rely only (or primarly) on impersonal criteria. Second, the information about the distribution of the jobs and theirs characteristics required is explicitly known and diffused. But none of these conditions are satisfied by national academic labour market and these are the main obstacles for an equal opportunity between all researchers.

The aim of this paper is to show how these obstacles represent search frictions that reduce the mobility and hinder the internationalization of academic labour market.

# 4 The model Set-up

Matching models (Pissarides, 2000, Rogerson et al., 2005), which have become the standard reference for the analysis of equilibrium unemployment, focus on the coordination failures stemming from a decentralized search mechanisms. They generally consider both the decisions of workers and the decisions of firms.

Here, I also focus on the coordination failure arising from decentralized search in an economy with a number $V_a$ of academic vacancies. Only a fraction of academic vacancies will be based on meritocratic criteria and will consider the brain workers, while the cooptated academic vacancies can be filled only by local workers. I assume that brain workers, $N_b$, are not able to distinguish between cooptated and no-cooptated vacancies, since applications that are directed toward cooptated jobs are wasted. This seems to be consistent with what we observe in the real world: the brain workers that live in other countries and want to come back in Italy, have an incomplete information about the academic vacancies and which of these are cooptated.

In Italy the recruitment periods are thus disconnected and there is no visibility of all vacant positions for a candidate: if we imagine that s/he applies for different positions, s/he will receive answers at very different moments, thus enable to be in a situation of comparing different alternatives. This is the main reason to assume a one-period matching model in which each candidates posts randomly one application.

Cooptated vacancies are jobs that require an *ex-ante* knowledge of the candidates and their personal characteristics (i.e., a local candidate). I assume that a fraction $\alpha$ of academic vacancies are open and consider brain workers applications too. I assume a distribution function $G(\alpha)$ of vacancy $(V_a)$ with $\alpha[0,1]$, where 0 is the absence of meritocracy (all vacancies are cooptated), while 1 is a meritocratic recruitment with all academic vacancies open. I assume that $G(\alpha)$ is the fraction of academic vacancies that consider brain workers applications, and select on meritocratic criteria.

The information structure and application strategies can be summarized in the Table 2.

| worker type | applies to | considered by |
|---|---|---|
| $N_b$ | $V_a$ | $[G(\alpha)]V_a$ |
| $N_l$ | $[1-G(\alpha)]V_a$ | $[1-G(\alpha)]V_a$ |

Table 2: Information structure and application strategies.

For the sake of simplicity, I keep the total number of available jobs and workers constant and exogenous. I assume the same number of vacancies and workers, with $V_a = N_l + N_b$, and $N_l = N_b$. This modelling strategy also allows simple comparative statics exercises on what happens into the academic labour market, and the different unemployment rates (probability of not finding an academic job) between local and brain workers.

## 4.1 The basic matching model with identical workers

In a simple one-period matching model I assume there are $N$ workers with no distinction between brain and local workers, and $V_a$ academic vacancies. Suppose each worker posts randomly one application, and each vacancy chooses randomly among its list of applicants. A vacancy remains unfilled only if it receives no applications, since a worker remains unemployed only if the vacancy s/he has applied to receives multiple applications and that worker is not selected.

The "one application" assumption is generally used because it provides a minimal model to catch the core coordination problem. Even when workers send multiple applications happen that some vacancies receive no applications at all, and some vacancies are not able to hire any of their applicants because all of them have already been hired by other vacancies[2].

The number of contacts between vacancies and workers is given by

$$m = m(V_a, N). \tag{1}$$

The probability that a vacancy remains unfilled, hence the share of open unfilled vacancy, is:

$$v_a = (1 - \frac{1}{V_a})^N, \tag{2}$$

since each worker has a probability $1 - \frac{1}{V_a}$ not to apply to that vacancy.[3]

Let $\theta_a = \frac{V_a}{N}$ be the measure of market tightness: the higher $\theta_a$, the tighter the market. The share of workers that remain unemployed on the labour market is given by

$$u = \frac{N - V_a(1 - v_a)}{N} = 1 - \theta_a[1 - (1 - \frac{1}{N\theta_a})^N]. \tag{3}$$

Note that the coordination problem is entirely caught by $v_a$: the number of unemployed workers is just $N - V_a(1 - v_a)$, i.e. $N$ minus the number of filled academic vacancies. Note that the unemployment rate is decreasing in the market tighteness and, holding market tightness constant, in the size of the market[4].

[2]The multiple application case has been analyzed in Albrecht (2003).

[3]For large $N$ and $V_a$, a good approximation to $(1 - \frac{1}{V_a})^N$ is the exponential $e^{-N/V_a}$ that gives the matching function $m = V_a(1 - e^{-N/V_a})$.

[4]See the Appendix.

## 4.2 The role of frictions with cooptated vacancies

We can characterize the model according to its informational structure. I assume that local workers are able to recognize cooptated academic vacancies in the sense that they have an informational advantage based on their localization. Moreover, I assume that local workers do not post their application to open vacancies (this assumption will be relaxed in the subsection 5.1). As for what concerns brain workers, they have limited information about cooptated vacancies and they send their application randomly to all $V_a$. Moreover the brain workers applications will be considered only by a $G(\alpha)$ fraction of open academic vacancies, with the consequence that many brain applications are wasted.

The total number of contacts between academic vacancies and workers is expressed in (1), and (2) equations. Now, it will be shown a different situation for local and brain workers.

It is possible to consider the unemployment rate for each side of the market.

The probability that a cooptated vacancy does not receive any application from a local worker equals

$$v_c = (1 - \frac{1}{[1 - G(\alpha)]V_a})^{N_l}.$$

That is, the probability that a cooptated vacancy is filled with a local worker equals $(1 - v_c)$.

The share of local workers that do not get an academic job is given by

$$u_l = \frac{N_l - [1 - G(\alpha)]V_a[1 - (1 - \frac{1}{[1-G(\alpha)]V_a})^{N_l}]}{N_l}. \tag{4}$$

The number of unemployed local workers is just $N_l - [1 - G(\alpha)]V_a[1 - (1 - \frac{1}{[1-G(\alpha)]V_a})^{N_l}]$ , i.e. $N_l$- the number of filled cooptated academic vacancies by local workers.

While, the share of brain workers that do not get an academic job is given by

$$u_b = \frac{N_b - G(\alpha)V_a[1 - (1 - \frac{1}{V_a})^{N_b}]}{N_b}. \tag{5}$$

The unemployment rate ($u_b$) for brain workers is increasing in the market dimension $V_a$, and decreasing in $G(\alpha)$.

It is possible to compare the probability for brain and local workers of finding a job and note that when $G(\alpha) = 0$, that is when there is no meritocracy in the academic system and all vacancies are cooptated; $u_b > u_l$. When $G(\alpha) > 0$, the brain workers probability of finding an academic job increases, while the local workers are progressively discarded.

Brain workers support a double search friction: the level of cooptation $[1 - G(\alpha)]$, and the informational asymmetry about the distribution of the cooptated vacancies.

The question is: what is the level of cooptation $[1 - G(\alpha)]$ that reduces to nil the search frictions and attributes the equal probability to get an academic job for local and brain workers?

# 5 Simulation and results

The simulation[5] is set as follows. At $t = 0$, $N_b$ brain and $N_l$ local workers are create. There are $V_a$ academic vacancies that are distributed between open $G(\alpha)V_a$, and cooptated $[1-G(\alpha)]V_a$. At the beginning of every period, all individuals become unemployed (the separetion rate is 100%), and all jobs become vacant. Hence, every period is equivalent to a new run. Each run involves 100 brain workers, 100 local workers, 200 academic vacancies lasts for 1000 interactions. In each run, the $G(\alpha)$ value is increased of 0.05. The values of the probabilities $u_b$ for brain and $u_l$ for local of not finding a job, are the average of the last 500 iterations of each run. The parameters are described in Table 3.

| Parameter | Range | Default value | Meaning |
|---|---|---|---|
| $N_b$ | $[1, \infty]$ | 100 | Brain workers |
| $N_l$ | $[1, \infty]$ | 100 | Local workers |
| $V_a$ | $[1, \infty]$ | 200 | Academic vacancies |
| $[1 - G(\alpha)]$ | $[0, 1]$ | .05 | Share of cooptated vacancies |

Table 3: Parameters.

The model simulation shows that the probability of not finding an academic job for brain workers ($u_b$) decreases with a decreasing number of cooptated vacancies. There is a level of cooptation ($\backsimeq 0.3$), that ensures an equal probability to find an academic job for local and brain workers. The resulting probabilities of not finding a job, for different share $[1 - G(\alpha)]$ of cooptated vacancies, is reported in Figure 1. However, the net reduction of search frictions is obtained when $G(\alpha) = 0.7$, and $u_b = u_l$. This is the level of sustainable cooptation that reduces to nil the search frictions and guarantees the equal probability to get an academic job for all workers (local and brain). From another point of view, it represents the minimum level of meritocracy that should be attained by a recruitment academic system to give the same opportunity to brain workers.

[5]The simulation is written on NetLogo open source agent-based platform. The code is available from the author upon request.

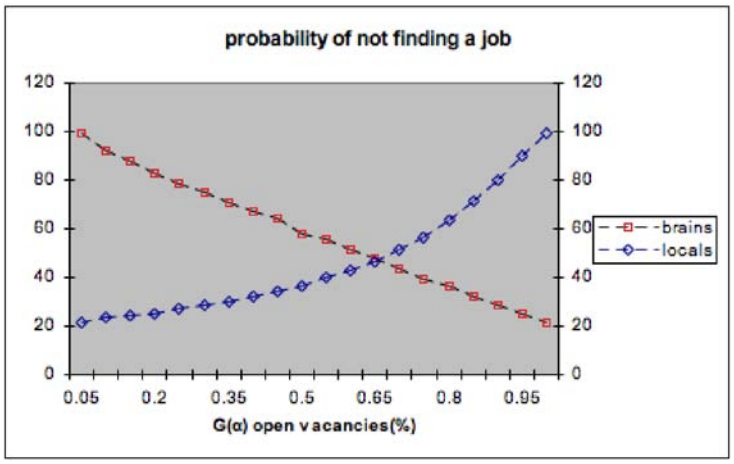


Figure 1: Probability of not finding a job. Local vs. Brain workers with a decreasing level of cooptation.

It can be noticed that for $G(\alpha) = 1$ (i.e. all vacancies are open), local workers are totally discarded and their probability of not finding a job is equal to 1. This is a consequence of the model assumptions, the local workers do not post their applications to open vacancies but only to the cooptated ones. In the subsection 5.1, I assume that the local workers can apply their applications to the open vacancies too.

## 5.1 Local workers apply to all vacancies

Often, the assumption that local workers are able to send out their applications only to cooptated vacancies is quite unrealistic. They are perfectly able to recognize the cooptated vacancies but, at the same time, are able to send their applications to the open vacancies too. In real situations, the recruiting process make a ranking of suitable candidates and then try to hire starting from the top. It is possible that the best candidate (brain) refuses the job or withdraws his/er application during the recruiting process and, in this case, a local worker can be hire. For this reason, I assume that local workers send their applications to all open and cooptated vacancies ($V_a$). The informational structure and application strategies can be summarized in Table 4.

| worker type | applies to | considered by |
|---|---|---|
| $N_b$ | $V_a$ | $G(\alpha)V_a$ |
| $N_l$ | $V_a$ | $V_a$ |

Table 4: Informational structure and application strategies.

The simulation is built as in the previuos section with the same parameters values, for an increasing fraction of open vacancies, $G(\alpha)$. The results show a

symmetric condition between local and brain workers as regard the informational structure. It can be observed in Figure 2 that when all vacancies are opened, $G(\alpha) = 1$, so that there is no cooptation in the academic labour market, the local workers have a positive probability of about $\backsimeq 4\%$ to get a job. This interesting result shows that in a perfectly meritocratic system there is a positive probability to select a local low-skilled worker too.

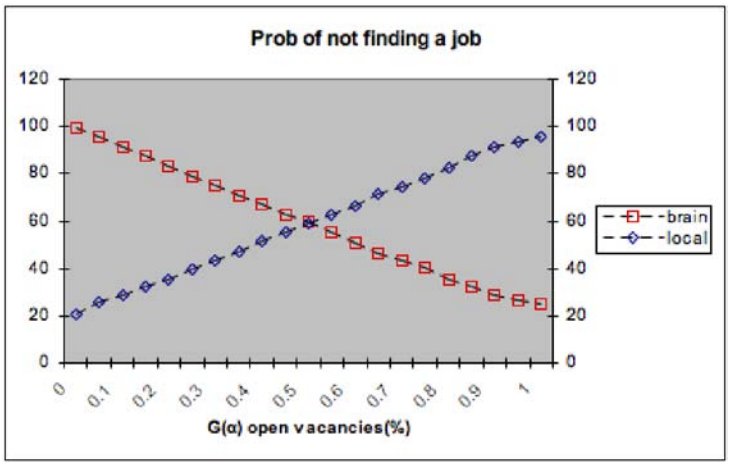


Figure 2: Brain vs. Local without asymmetric information.

This theoretical result is coherent with the empirical analysis of De Paola and Scoppa (2011). They show how the last Italian university reform of the recruitment system[6], does not change the higher probability for a local candidate, that comes from a university opening a position within the present competition, to get a vacancy. In average, a local candidate has about more than 29% of probability compared to the outsiders candidates and this percentage increases when a member of the committee (except the internal one) comes from the same university of the local candidate.

# 6 Concluding remarks

Is this an adequate explanation of frictions and obstacles that reduce the probability to get an academic position for many brain high-skilled candidates? As shown in this paper, the academic labour market suffers two different search frictions obstacles: cooptation and incomplete information. A high level of cooptation has been indicated as the principal cause to explain the low probability for outsiders brain workers to get an academic position and the results of model simulation confirm this. The second obstacle is represented by the lack of transparency and the incomplete information between local and brain workers.

[6]Now, in D.L. 180/2008 the committee is selected randomly.

There are two main reasons to explain the usefulness of conducting this type of analysis. The first one is to provide a generalization and theoretical counterpart to several empirical studies. The first conclusion presented in this paper is that there is a level of suitable cooptation that reduces the search frictions and posits brain and local candidates with the same probability to find an academic job. This is a discrimination problem. Checchi (1999) argues that sometimes the selecting committee takes into account some disadvantage of a restrict number of candidates (women having children, candidates from southern universities, ecc..), and applies a positive discrimination to favor these candidates. In this paper, instead, I focus just on search frictions like as objective causes of discrimination between candidates and provide a framework to their emerging.

The second result of this exercise is that with a totally meritocratic recruitment system (i.e. no cooptation), the low-skilled local workers have also a positive probability to find a job too. This is a good argument for a meritocratic policy into the academic labour market. It shows that in a completely meritocratic recruitment university system, the local low-skilled candidates can play an important role too. It can be expected that the brain high-skilled candidates will compete for the most prestigious academic vacancies avoiding the less ones that will be filled by the local candidates.

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# Appendix A1

Here I prove that the probability of not getting a job ($u$) is decreasing in market tightness and increasing in the size of the market.

The derivative of $u$ with respect to $\theta$ is

$$\frac{du}{d\theta} = \frac{(1-\frac{1}{V_a})^N(N+V_a-1)}{V_a-1} - 1$$

Taking logs, this derivative is negative whenever $N(ln(V_a-1) - ln(V_a) < ln(V_a-1) - ln(N+V_a-1)$, which is always satisfied.

The derivative of $u$ with respect to $N$, holding $\theta$ constant is

$$\frac{du}{d\theta} = \frac{(1-\frac{1}{V_a})^N \frac{V_a}{N}[1+(V_a-1)ln(1-\frac{1}{V_a})]}{V_a-1}$$

and is positive whenever the term in the square brackets is greater than 0, that is whenever $ln(V_a-1) - ln(V_a) > -\frac{1}{V_a-1}$, which is always satisfied because of the curvature of the logarithmic function.