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How Master's Level Graduates Fare On The Labor Market: 'Objective' and 'Subjective' Measurement

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Abstract:

This paper investigates the integration of French master's level graduates on the labor market according to social and human capital based on 'objective' and 'subjective' measurement. The objective measurement focuses on the individuals' trajectory on the labor market whereas the subjective measurement is concerned with their opinion on their professional situation. We use data extracted from Cereq's 'Generation 2004' survey on the employment of new graduates with a master's level or higher diploma.

Our findings show that when human capital is measured objectively, the better-endowed individuals fare better on the labor market. Conversely, social capital is a discriminating factor when the subjective dimension is considered. We also evidence gender-related disparities.

JEL: C25, I21, J 19

Keywords: social capital, human capital, labor market integration, educational trajectory, professional trajectory.

Introduction

In the context of the economic crisis and of the growing competition between academic departments, the integration of graduates on the labor market has become a burning issue (Bardaji, 2010). While families and students assign more and more value to employment prospects when picking academic courses, labor market integration is often assessed only on the basis of the employment rate – sometimes calculated on debatable grounds. This results in a fairly restrictive view of reality: indeed, while the choice of an academic course does depend on employment, it is also informed by the individual feeling. Indeed, the subjective measurement appears as important as the objective one to understand economic behavior (Kahneman & Krueger, 2006). So, in order to evaluate the labor market integration, two types of measurement will be provided: an 'objective', measured by the professional trajectory and a 'subjective' one, measured by the individual satisfaction concerning the employment. Other than past training and experience, this individual appraisal depends on many personal and job characteristics (Gazioglu & Tansel, 2006) as the social background (Kalleberg 1977) and differs according the gender and the individual expectations (Clark, 1997). From this point of

view, we may therefore legitimately wonder whether all individuals are equal as far as access to the labor market is concerned, depending on their training and social capital.

In this paper, we argue that additionally to the human capital, social capital is a particularly relevant angle of approach to investigate the access of new graduates to the labor market. Indeed, previous works of Bourdieu (1979) and Bourdieu and Passeron (1964, 1970) underlining the social distinction in education seem to be more than ever newsworthy (Solau, 2011). In his paper, Solau shows that French students are filtered according three criteria: their level of training, their age and their social background.

According to that, our paper aims to analyze the labor market integration, both from a subjective and objective point of view with taking into account human and social capital of individuals in order to answer the following issue: is it possible to associate each measurement to a specific capital?

We focus our analysis on master's level graduates.

In a first part (I), we characterize this population according to the two measurements of the professional integration and according to the two sorts of personal capital. In a second part, we confront the two measurements of labor market integration according to the social and the human capital. The last part concludes.

1. Typology of master's level graduates

Measuring the master's level graduates integration into the labor market requires characterizing this group first. The goal of this first stage was to make maximally homogeneous groups of students. In order to achieve this, we adopted an approach accounting for two types of capital – social and human capital.

1.1. Human capital and social capital

Social capital has been defined as *'the entire range of resources individuals can access through their relational network or the properties of the relationships (trust, reciprocity) that develop within a social structure'* (Ponthieux, 2008, p. 32). While the concept of social capital is generally associated with Coleman's research (1986; 1988), many studies have addressed it, both in individual (Burt, 1992) and collective terms (Bourdieu, 1980; Coleman, 1988; Putnam, 1995).

These diverse approaches of social capital can be divided into two groups (Ponthieux, 2008) – one focused on the concept of social cohesion (Coleman, 1988; Putnam, 1995), the other on the concept of resources (Bourdieu, 1980; Burt, 1992; Lin, 1995).

The former scholars arguably see social capital not actually as a capital but as something external, in the sense that those who have it do not own it. Coleman defines social capital as the characteristics of a social structure in which individuals adopt identical behaviors in terms of rights and duties (mutual expectations and obligations, information/reputation, norms and sanctions) in order to gain social capital while avoiding purely opportunistic behaviors. Though he makes a distinction between social capital within a group (bonding capital) and between groups (bridging capital), Putnam generalizes Coleman's approach at the macro-sociological level: he views social capital as an attribute of regulated societies that determines their performances.

For the latter scholars, social capital results from deliberate strategies of social investment into an often lasting network. Burt and Lin concentrate on the individual's position within the social network, particularly in terms of the reciprocity of relationships between individuals; they highlight the individual benefits one may draw from social networks, such as the acquisition of a better social status (Granovetter, 1973). Conversely, Bourdieu emphasizes the social capital resulting from power relations between different social groups.

Our work essentially partakes in the latter approach, insofar as our objective is to assess the impact of individual social capital on academic trajectories and access to the labor market. Specifically, we may wonder whether at equivalent levels of educational attainment, students from unprivileged backgrounds fare as well as others on the labor market. Carneiro and Heckman's answer to this question (2002) is negative. According to them, there are correlations between family background and educational attainment, and between family background and performance on the labor market: for equally skilled students, differences in educational attainment and performance on the labor market are due to liquidity constraints – short-term liquidity constraints for education (parental income influences schooling at given times) and long-term liquidity constraints for employment (the parents' educational attainment and income influence their children's entire education and future occupation) – due to the shortcomings of the financial markets.¹

In addition to the impact of social background, human capital also matters when it comes to labor market integration. Human capital can be defined by the range of productive capacities acquired by an individual through the accumulation of general or specific forms of knowledge and know-how. In this sense, it can be viewed as a kind of acquired social capital. Lin (2001) divides the social capital of an individual into two components: *ascribed* social capital and *acquired* social capital. The ascribed social capital is received within the family circle and results from the social structure; conversely, the acquired social capital is obtained little by little through individual actions, and in particular through academic choices and the degree obtained. This distinction can be seen as alternative formulation of the three forms of cultural capital proposed by Bourdieu (1979). In the *embodied state* the accumulation of cultural capital results from individual investment; in the *objectified state* cultural goods can be transmitted materially and appropriated if the individual has the relevant embodied capital; in the *institutionalized state* it manifests itself under the form of academic qualifications, which their holders can compare. Ascribed social capital can be seen as a form of the objectified state, whereas acquired social capital can be seen as a form of the institutionalized state. If an individual has a weak cultural capital in the objective state – i.e., if his ascribed social capital is weak (as he comes from a poor background), he may gain cultural capital in the institutionalized state – have a high acquired social capital – but this acquisition process might be long, strenuous and hindered by setbacks.

In the same perspective, we will distinguish for the purposes of this paper social capital (or ascribed social capital), measured on the basis of family background (in this case, the parents' occupations) from human capital (or acquired social capital), measured on the basis of the academic trajectory (delay in training and branch of study).

We initially focus on **human capital**, defined by the individual's academic trajectory – in turn characterized by the level of educational attainment and the branch of study.

¹ In a better-working system, all individuals possessing the requisite skills could have recourse to credit to pay for their education regardless of their social background, which would ensure a degree of equal opportunity.

Regarding educational attainment, our population is made up of master's level graduates (five years of higher education) and therefore homogeneous. Regarding the branch of study, in order to form homogeneous sub-groups, we have classified branches on the basis of the prestige generally granted to them by the individuals (Beaud, 2008) and the resulting hierarchy of academic choices (Convert, 2003). We consider studies in the field of health and in engineering and business schools as 'prestigious'; other scientific subjects and the humanities (Literature/Humanities/Social Sciences/Law) are considered as 'general'.²

With regard to the role of the "Grandes écoles" (prestige university-level college named CPGE in France) to reproduce the privilege of the elites in France, various work highlighted the permanence of a social and cultural selection during the 20th century (Bourdieu, 1989), even of an increase of the inequalities, that Albouy and Wanecq (2003) explain by "*the reinforcement of their own selectivity in order to preserve their specificity and in the largest opening of the third university cycles which propose more and more professionalizing training*". In this context, the acceptance in a Grance école is an essential stage in the reproduction of the elites and the success which contributes to the social and cultural selection since children whom parents are executives and intellectual professions higher represent 30% of the students and 50% in CPGE. Moreover, to pass a CPGE, is the factor more determining for getting a Master level diploma (Lemaire, 2012)

In order to assess the individuals' previous trajectory, a distinction is usually made between students who are 'lagging', 'ahead' or 'on schedule'. Here, we classify individuals who were only one year behind when they left higher education at master's level (in 2004) as achieving students. In order to assess the academic trajectory, we consider two age categories: '24 and under' for individuals who are one year behind at the most and '25 and above' for those more than one year behind.

Based on these two indicators (prestige and lag), we determine three levels of human capital (table 1): low, average, high.

Table 1. The three levels of human capital

		Branch of study	
		General	Prestigious
Age in 2004	24 and under	Average (0.36)*	High (0.29)
	25 and above	Low (0.24)	Average (0.11)

* Frequency in brackets.

We establish **social capital** on the basis of the parents' occupations. This might appear debatable considering that the latter can be seen as cultural capital (Bourdieu and Passeron, 1970). Yet, if we consider not only the parents' occupations, but also the resulting social network (Degenne and Forsé, 2004), the parents' occupations can be considered as a form of social capital.

We took both the father and the mother's occupation into account, as they have a different impact. Regarding academic trajectory, the mother's occupation tends to be correlated with achievement whereas the father's influences academic choices; likewise, the impact of the father and the mother's occupation vary according to the individual's gender – the father's occupation has more influence on male students and the mother's occupation has more influence on female students (Boumahdi and Lemistre, 2007). Regarding integration

² These branches include sometimes very different disciplines, particularly in terms of employment prospects, qualifications required and wages. However, they were not constituted arbitrarily: their choice results from a data analysis on all disciplines, whose results showed similarities in the backgrounds of students who picked them.

into the labor market, the father and the mother's occupation also have different impacts (Gary-Bobo, Prieto et Picard, 2004).

However, classifying occupations and socio-professional categories into social classes remains a delicate matter. In order to establish three levels of social capital, as we have done for human capital, we use the classifications proposed by Thélot (1986) and Duru-Bellat (1988), who both include in the same so-called 'middle' class 'employees', 'intermediate occupations' and 'craftsmen/shopkeepers' (table 2).

Table 2. Occupations classified into social classes

Thélot (1986)	Duru-Bellat (1988)
LEADING CLASS	LEADING CLASS
Industrials, large traders, independent professionals, engineers, top administration executives	Independent professionals, top executives, engineers, professors, CEOs (w/ more than 10 employees)
MIDDLE CLASS	MIDDLE CLASS OR PETITE BOURGEOISIE
Schoolteachers, healthcare workers, mid-level administration executives, employees, craftsmen, fishermen, small business owners, service staff, clergy, artists, army and police (except officers)	Craftsmen, business owners, intermediate occupations, employees, foremen
WORKING CLASS	WORKING CLASS
Farmers and farm workers (including foremen)	Farmers, workers, service staff

Source: <http://aehsc.chez.com/csp.htm>

This allows us to define three levels of social capital (tables 3 and 4): low (L), average (A) and high (H).

Tableau 3. The three levels of social capital

Father / Mother	Worker	Employee	Intermediate occupation	Craftsman, business owner	Executive
Worker	L	L	L	L	A
Employee		A	A	A	H
Intermediate occupation			A	A	H
Craftsman, business owner				A	H
Executive					H

Table 4. Frequency of the three levels of social capital

Low (L)	13
Average (A)	34
High (H)	53

We are then able to divide our sample into homogeneous sub-groups according to the two types of capital (table 5).

Table 5. Division of the sample according to the two types of capital

Social capital/Human capital	Low	High	Average	Total
Low	84	68	177	329
High	311	420	584	1315
Average	189	241	406	836
Total	584	729	1167	2480

12. The data

We extracted the database used for the purposes of this paper from the “Generation 2004” base maintained by CEREQ. We selected the individuals with the highest levels of educational attainment (level 1),³ leaving out PhD students. The individuals whose parents were classified in the ‘farmer’ category were excluded due to the distinctive features of this branch. Lastly, we only considered the individuals for whom each variable was known.

The resulting database includes 2480 individuals, for whom the following variables were initially retained:

Table 6. The data

Variable	Category	Size	Frequency (%)
Gender	Female	1104	45
	Male	1376	55
Age in 2004	24 and under	1612	65
	25 and above	868	35
Branch of study	Prestigious (Engineering and business schools; Health)	1013	41
	General (Humanities/law/management/maths/sciences/sport)	1467	59
Father’s occupation	Craftsman	262	11
	Executive	1181	48
	Employee	385	16
	Worker	285	11
	Intermediate occupation ⁴	367	15
Mother’s occupation	Craftsman	112	5
	Executive	733	30
	Employee	1231	50
	Worker	171	7
	Intermediate occupation	233	9

³ Level 4= completed secondary education; Level 4+= one year of higher education; Level 3= two years; Level 2= three or four years; Level 1= 5 years and above.

⁴ In the French classification system (PCS), the category ‘intermediate occupations’ includes individuals below executives and above employees (so to speak, ‘middle-class’ jobs).

13. Objective and subjective dimensions of the labor market integration

In this paper, we distinguish **two dimensions** of labor market integration. The first dimension is that of **‘objective’ employment**, often expressed by the employment rate. Yet, it requires harmonization, as different definitions of this indicator exist. Here, we consider the individuals’ professional trajectory upon completing their higher education⁵. This variable result from a typology of trajectories built according to the method developed by the LIRHE⁶ (Espinasse, 1993-1994) and taking into account such reports on the labor market: employment, unemployment, inactivity and training or returning to education. This method considers that two young people have closer paths if they are at the same time in the same situation; conversely, they have remote paths when the number of months with different situation is important. Thus, a typical trajectory will bring together all individuals who were in the same situation at the same time on almost the entire period of observation. The determination of the various trajectories is based on a calculation of the distance between two individuals and a classification of these distances in order to minimize the variance within each class and to maximize the variance between classes. There are 8 typical trajectories: Quick, lasting employment, Access to employment delayed after unemployment period, Access to employment delayed after inactive period or training, Training or long-term return to school, Training or short-term return to school, Persistent or recurring unemployment, Lost work, Lasting inactivity.

The second dimension is **subjective**: it accounts for the graduates’ levels of satisfaction and for potential cohort effects. This is intended to shed a different light on the data, by investigating questions relating to the perceptions of labor market integration by the new higher education graduates, drawing inspiration from the Healthy Life Years indicator constructed at European level (Cambois E. et al, 2006), in which questions on perceptions of health were designed to provide maximal comparability.⁷

Table 7 summarizes the variables retained to assess the two dimensions.

Table 7. Description of variables by dimension

Dimension	Variable	Category	Category in Génération 2004	Frequency
‘Objective’	Professional trajectory	Quick, lasting employment	Idem	1695
		Delayed employment / Training	Access to employment delayed after unemployment period/ Access to employment delayed after inactive period or training/ Training or long-term return to school/ Training or short-term return to school	595

⁵ We considered the question on the typology of the respondent’s professional trajectory (Typotraj in the database).

⁶⁶ Interdisciplinary research laboratory on human resources and employment (University of Toulouse).

⁷ We used questions OP2 on the individual’s opinion of his professional trajectory and future.

		Instable employment or unemployment	Persistent or recurring unemployment/ Lost work/ Lasting inactivity	190
'Subjective'	Opinion on current situation	Satisfied	Idem	1871
		Not satisfied	Idem	609

Table 8. Division of the sample according to the objective and the subjective measurement

		Subjective measurement		Total
		Satisfied	Not satisfied	
Objective measurement	Quick, lasting employment	1400 (56,5%)	295 (11,9%)	1695
	Delayed employment / Training	410 (16,5%)	185 (7,5%)	595
	Instable employment or unemployment	61 (2,4%)	129 (5,2%)	190
Total		1871	609	2480

2. Measurements confrontation

Based on the sub-groups established in section 1, we will now study the integration of master's level graduates into the labor market by following a multidimensional approach. Considering the previous remarks and the findings of several studies (Lopez A, Hallier P, 2009), it appears that using only one indicator has little relevance and may cause ambiguity in the measurement of labor market integration. Hence, we have chosen to use a multidimensional indicator. The indicator was constructed on the basis of these methodological imperatives and following the principles of demographical analysis. The aim is to consider two different measurements, one 'objective' and one 'subjective', of labor market integration.

Based on the above, we conducted a multiple correspondence analysis (MCA) in order to investigate the role of social and human capital for each dimension of labor market integration.

MCA is a method of analysis of qualitative variables that allows for an exhaustive description of the phenomenon under study. Introduced in the 1960s by Jean-Paul Benzécri, correspondence analysis has become the most popular method to describe qualitative data, including in sociology. It is based on the idea that the existence of co-occurrences can shed light, with no prior hypothesis and in an inductive manner, on not always readily observable structures of dependence between the variables under analysis. In practice, it consists in representing the modalities of all the variables on the same graph in order to perceive the symmetry of the roles played by all the modalities. Even though graphs constitute the most significant results, it remains necessary to take into account the amount of information contained in the data (relative contribution) and the contribution to the study of the various modalities under study (absolute contribution). We used the variables of gender, social capital

and human capital as well as the entire range of variables which determine the subjective and objective dimension of labor market integration. We have conducted several complementary analyses, for which only the graph stage is displayed here (see Appendix 1 – Methodology).

2.1. The ‘objective’ dimension

The horizontal axis represents oppositions between stable employment situations and the most precarious ones (delayed employment/instable training and employment/unemployment) and between individual gender and human capital characteristics (high and average/low). The social capital variable, here only included as an additional variable (since it is not well represented on the axes system), also shows a divide along the same axis that is identical to the one observed for human capital.

It appears that the ‘objective’ dimension of labor market integration is linked to the possession of both types of capital (Graph 1), and that human capital has a greater impact (quite visible on the axes system). An individual with high social and human capital seems guaranteed to quickly find lasting employment.

Gender also appears to be a discriminating factor in the trajectory. Women are more frequently associated with precarious situations. This distinction might result from the unequal division of men and women according to human and social capital.

All other things being equal, logistic regression analysis (Table 9) shows that the probability of being in stable or delayed employment does not significantly differ according to gender. However, this variable is a discriminating factor as far as the most precarious situations are concerned: the probability of being in unstable employment or unemployment is 1.3 times greater for women than for men. Lastly, while social capital does not seem to impact the probability of being in a stable or precarious situation regarding labor market integration, having a certain degree of human capital can be seen as a buffer against precariousness. Individuals with average or low human capital are significantly less likely to find a lasting job quickly (respectively 2.2 and 1.5 times less than those with high human capital).

In the other two cases – unstable employment and unemployment on the one hand, and delayed employment on the other – human capital also plays a crucial role. Individuals with average or low human capital are respectively 1.7 and 2.7 times more likely to be in unstable employment or unemployed and 1.4 and 1.7 more likely to be in delayed employment.

Graph 1. Labor market integration according to 'objective' dimension

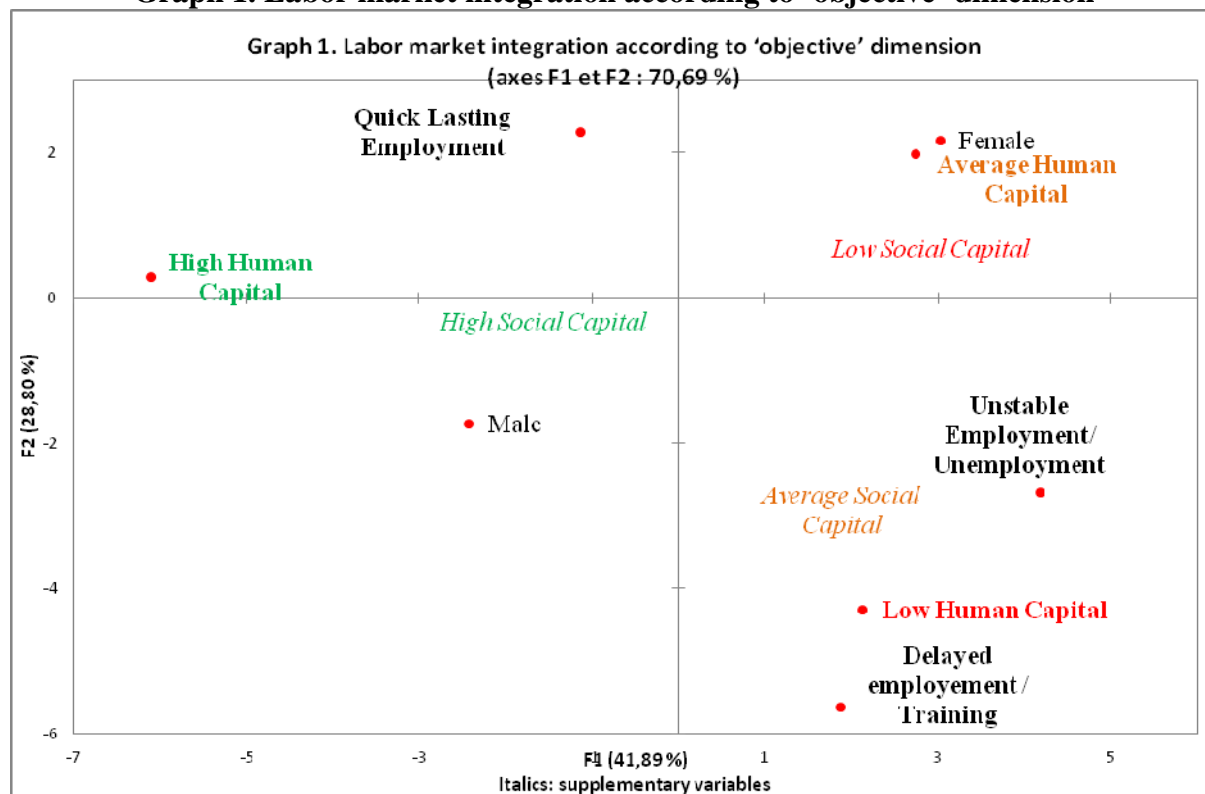


Table 9. Logistic regressions on the 'objective' dimension

Variables	Quick, lasting employment		Delayed employment, training		Unstable employment, unemployment	
	Odds ratio	Significance	Odds ratio	Significance	Odds ratio	Significance
Constant		***		***		***
Social capital						
High	Ref		Ref		Ref	
Average	1.02	NS	0.98	NS	0.99	NS
Low	1.05	NS	0.92	NS	1.07	NS
Human capital						
High	Ref		Ref		Ref	
Average	0.65	***	1.42	***	1.68	***
Low	0.45	***	1.72	***	2.87	***
Gender						
Male	Ref		Ref		Ref	
Female	0.95	NS	0.95	NS	1.32	*

Significance level: * $p < 0,1$; ** $p < 0,05$; *** $p < 0,01$, NS = non significant.

Sample size: 2480

Source: Estimations based on Génération 2004

2.2. The ‘subjective’ dimension

As in the previous analysis, most of the information is contained in the horizontal axis (axis 1). It contrasts two subjective dimensions – one rather optimistic (the individual is satisfied with his situation) and one rather pessimistic (the individual is not satisfied with his situation) – as well as gender and human capital (high/average and low). Likewise, as in the analysis of the objective dimension, the distribution of the social capital variable is similar to human capital.

Opinions on one’s personal employment situation first vary according to gender: men report more satisfaction than women. Due to their working conditions (careers, employment prospects), it appears that women have internalized (Halde, 2010) various forms of negative discrimination compared with men (in terms of wages, recognition and perception) at equal level (of study, background and effective work). Then, it appears that having high human and social capital has a positive influence on the individuals’ subjective assessment of their situation (Graph 2).

On the contrary to the objective dimension, the logistic regression analysis (Table 10) shows “all other things being equal”, that the probability of being satisfied significantly differs according to the gender. The probability of being unsatisfied is 1.3 times greater for women than for men. As previously, the human capital seems to have a more significant impact: individuals with average or low human capital are significantly less likely to be satisfied (respectively 1.5 and 2 times less than those with high human capital).

Graph 2: Labor market integration according to ‘subjective’ dimension

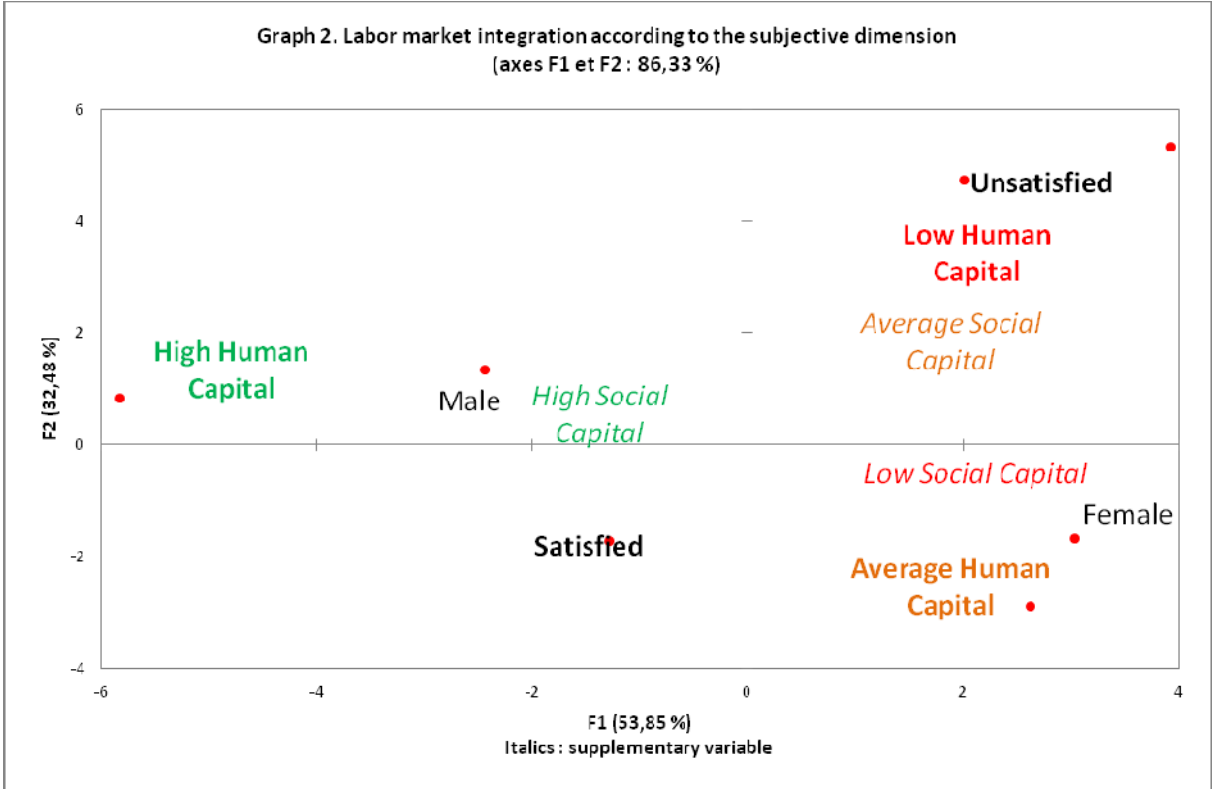


Table 10. Probability of being satisfied with one's situation according to the two types of capital, gender

Variables	Satisfied with situation	
	Odds ratio	Significance
Constant		***
Gender		
Male	Ref	-
Female	0.74	***
Social capital		
High	Ref	-
Average	0.83	*
Low	0.96	NS
Human capital		
High	Ref	-
Average	0.66	***
Low	0.51	***
Sample size: 2480		
Significance level: * $p < 0,1$; ** $p < 0,05$; *** $p < 0,01$;		
NS : not significant		
Source: Estimations based on Génération 2004		

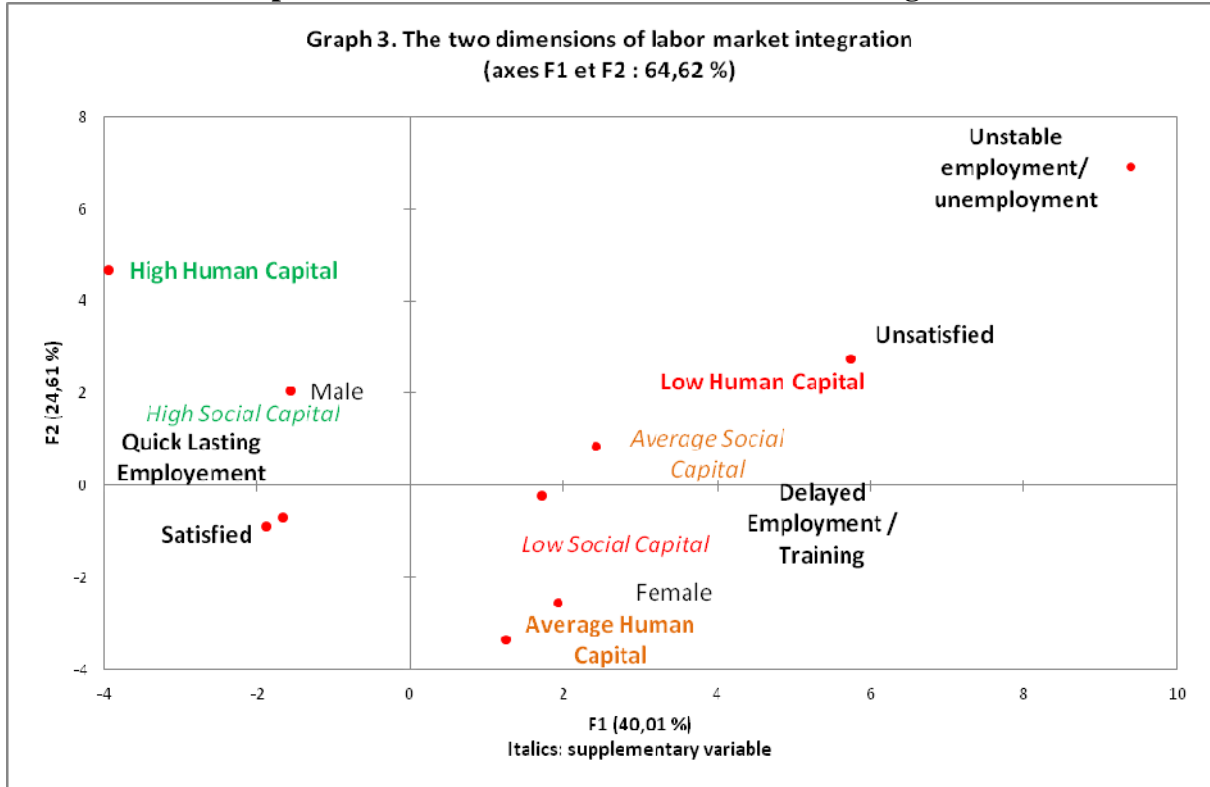
In any case, it is likely that the satisfaction is also connected to the objective dimension of labor market integration. So, in a last part, we will confront the two dimensions.

2.3. Measurement confrontation

First of all, we group into a MCA the two dimensions. As in the previous analysis, the social capital is considered as an additional variable.

It appears that there is a connection between the objective and the subjective dimensions of labor market integration; quickly securing long-term employment is correlated with satisfaction with one's current situation (Graph 3).

Graph 3: The two dimensions of labor market integration



Considering the apparent relation between the objective and subjective dimensions, we choose to take into account the objective dimension in the analysis of the subjective dimension, all other things being equal. We therefore estimate the probability of an individual being satisfied with his situation according to gender, to both types of capital and to his current ‘objective’ situation; then, we estimate the probability of the individuals’ professional priority according to the same variables (Table 11).

Table 11. Probability of being satisfied with one’s situation according to the two types of capital, gender and the ‘objective’ dimension

Variables	Satisfied with situation	
	Odds ratio	Significance
Constant		***
‘Objective’ dim.		
Quick LT empl.	Ref	-
Unst./Unemployed	0.11	***
Delayed/Training	0.48	***
Gender		
Male	Ref	-
Female	0.75	***
Social capital		
High	Ref	-
Average	0.82	*

	Low	0.96	NS
Human capital			
	High	Ref	-
	Average	0.73	**
	Low	0.64	***
Sample size: 2480			
Significance level: * p < 0,1 ; ** p< 0,05 ; *** p< 0,01 ; NS : not significant			
Source: Estimations based on Génération 2004			

The probability that an individual is satisfied with his situation increases when his ‘objective’ situation is stable (respectively 2 and 9 times less likely when in delayed employment or unemployed). The two types of capital also impact satisfaction; the individuals with high social or human capital are more satisfied with their situation. Lastly, the experience of satisfaction also differs according to gender – men are more satisfied than women.

Conclusion

We have established that the ‘objective’ and ‘subjective’ dimensions of labor market integration are closely linked to both types of capital. Having high ‘acquired’ and ‘ascribed’ capital appears to guarantee that an individual will quickly find long-term employment and be satisfied with his professional situation. However, regardless of whether the ‘objective’ or the ‘subjective’ measurement of labor market integration is used, it appears that human capital has a greater influence than social capital. Additionally, although this was not the original focus of our study, we have noted significant disparities according to gender.

The findings of our study confirm the relevance of the multi-dimensional measurement of labor market integration according to human and social capital. The disparities observed according to the individuals’ capital – social capital (parents’ occupation) and human capital (level of educational attainment and prestige of the branch of study) – highlight the importance of these factors. Our analysis of the measurement of the two dimensions of labor market integration shows that each form of capital plays a key role for a specific dimension.

When the two types of capital are considered independently, we observe that the individuals with higher human capital fare better on the labor market in ‘objective’ terms; social capital, conversely, has more impact in ‘subjective’ terms. This measurement of labor market integration confirms the complexity of the phenomenon under study.

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Appendix 1 – Multiple correspondence analysis

Like most data analysis methods, these two methods consist of several steps:

- *Analysis of the eigenvalues:* The eigenvalues represent the amount of information contained in the data. It is therefore important to select a number of eigenvalues that ensures the lowest possible loss of information. For this purpose, we use the criterion of significant percentages, which consists in only retaining the eigenvalues that bring a significant percentage of additional information: based on the curve of the cumulative percentages of information contained in each eigenvalue, we determine the inflection point after which additional eigenvalues do not bring any significant information to our analysis. The number of eigenvalues selected represents the number of axes included in the graph: if two eigenvalues are selected, this means that two axes – so-called factorial axes – (i.e., one axes system) feature most of the information contained in the data.
- *Study of the contributions:* There are two types of contribution: the absolute contribution (AC), which represents the importance of the variable category in the formation of the factorial axis and the relative contribution (RC), which refers to the quality of representation of the variable category on an axis. Regarding the AC, the threshold value for inclusion is 0,1 (the category accounts for more than 10% of the formation of the axis, i.e., of the information contained in the axis); regarding the RC, the threshold value for inclusion is 0.3 (the quality of representation of the category on the axis is above 30%). Variable categories whose AC and RCs are below the threshold value are left out.
- *Graph analysis:* the groups of categories projected on the axes system(s) are interpreted. This is the part that concerns us most here; we evidence different individual profiles on the basis of the graphs.
- *Projection of supplementary categories:* in most cases, analysis is conducted only on selected variables called active variables, for which the afore-mentioned criteria are calculated (eigenvalues, AC, RC). The other non-selected variables are called supplementary variables and only used in the graph analysis. MCA offers the possibility to project all variable categories (active and supplementary) in order to refine interpretation.

Appendix 2. Logistic regression

For an individual i , the endogenous variable y_i takes two values: $\begin{cases} y_i = \text{event } E \\ y_i = \text{non event } E \end{cases}$.

The event E represents for example the possession of a certain characteristic (to have a job). The estimation of the model depends on the hypothesis that y_i depends on a variable y_i^* called latent variable, which can be assimilated to a marginal propensity to have this characteristics.

The model becomes: $\begin{cases} y_i = 0 \text{ if } y_i^* < 0 \\ y_i = 1 \text{ if } y_i^* \geq 0 \end{cases}$ with $y_i^* = a_1x_1 + \dots + a_kx_k + \varepsilon_i$

where x_1, \dots, x_k are exogenous variables ; $X_i' = [x_1 \dots \dots \dots x_k]$

a_1, \dots, a_k are the coefficients of the regression ; $A = [a_1 \dots \dots \dots a_k]$

ε_i is a residual

We can see here the maladaptation of the traditional method since the endogenous variable of the regression y_i^* , is not observable.

If the model is written under its probabilistic form, with F the repartition function of the residuals, we have :

$$\begin{aligned} P(y_i = 1) &= P(y_i^* > 0) = P(X_i' A + \varepsilon_i > 0) = P(\varepsilon_i > -X_i' A) \\ &= 1 - P(\varepsilon_i < -X_i' A) = 1 - F(-X_i' A) \\ &= F(X_i' A). \end{aligned}$$

Finally : $y_i = \begin{cases} 1 \text{ with the probability } p = F(X_i' A) \\ 0 \text{ with the probability } 1 - p = 1 - F(X_i' A) \end{cases}$

The logit model is such as F is a logistic function: $F(h) = \frac{\exp(h)}{1 + \exp(h)}$, $\forall h \in \mathfrak{R}$; $F \in [0 ; 1]$.