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« Educational Mismatches, Wages and
Economic Growth : A Causal Analysis for the
French Case since 1980 »

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Educational Mismatches, Wages and Economic Growth: A Causal Analysis for the French Case since 1980

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In the last two decades, France has experienced an increase in mismatches between education and work. This article studies twenty two years of French productivity to highlight the causes and effects of overeducation on the employee wages and the national income. From the INSEE and Cereq data, this analysis shows a positive effect in the short term on wages of the least qualified and overeducated worker. Furthermore, overeducation phenomenon does not penalize the higher graduates. Paradoxically, if it is always profitable for individuals to increase their education investment; in term of growth, overeducation of the higher graduates produce an unfavourable short term effect on GDP.

Key Words: growth; overeducation; causality.

JEL-classification: C32, I21, O4.

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INTRODUCTION

In this last four decades, the French growth of the number of students has increased at unprecedented rate: in one half-century, the studies duration doubled (Estrade and Minni, 1996). This evolution is explained by the expansion of compulsory schooling, the training diversification offer by the educational system and the selectivity decrease (Magnac and Thesmar, 2002). This large extent of the number of students, and the employment crisis in these last decades, modified the functioning of the labour market: for example, Forgeot and Gautié, 1997; Guironnet, 2006a show a large overeducation extent for younger graduates.¹

Freeman (1976) was one of the pioneers in research on the overeducation phenomenon: his work had a catalyst effect. In the USA, he finds that the benefit rate for a degree level had significantly decreased on the Seventies. Freeman assigned this fall to an excess of graduates offer. The interest of his results is that they call into question the belief that a higher degree represented a profitable investment and a virtual guarantee of economic success.² On this basis, overeducation literature develops the idea of a mismatch between supply and demand of graduates (Hartog, 2000; Freeman, 1971; Diebolt, 2001).

The overeducation evolution reflects some rigidity on the labour market like the problems of information asymmetry described by theoretical models (Thurow, 1972; Arrow, 1973 and Spence, 1973). But, it also highlights the existence of labour underutilisation and under optimal employment. This situation can be connected at the opposite phenomenon preached by Akerlof (1984): the theory of efficient wages. This latter advances the idea that the productive effectiveness of an employee depends mainly on the feeling which it has "to be well treated" by his employer. Thus, to offer higher wages than the reservation ones constitutes a kind of gratification likely to encourage the individuals to increase their effort level. On the contrary, an overeducated worker can tend to become under productive by a fall in motivation (see for example, Tsang, 1987). The immediate consequence of this reduction is a repercussion on firm. Generalized at the productive system, it is the whole of the economy which is concerned. Overeducation can be a transitory phenomenon in the professional careers of the individuals but permanent for the economy (Rubb, 2003). However, the majority of work measures the unfavourable effect of overeducation on the individual wages

¹ i.e. for a given job, required competences are lower than those accredited by the education system.

² In France, Baudelot and Glaude (1989) find also a degree devalorization.

(Guironnet, 2006a). These researches do not identify the causes, or consequences, of overeducation at an aggregate level.

In this context, we propose to work on this new research, by analyzing the links between the economic growth and the overeducation situations. In particular, we seek to know how these two entities evolve, one compared to the other. In other words, we try to answer a key question: is the rise of overeducation phenomenon due to the unfavourable economic situations or does the general crisis of the economic system result from the overeducation development?

From this point of view, we choose to work in term of causality (Granger, 1969; Engle and Granger, 1987) particularly adapted to these problems (Jaoul, 2004a). After a presentation of databases and methodology (I), we study, on one hand, the relations between education and wages (II) and, on the other hand, the links between overeducation and growth.

I. DATA, INDICATORS AND METHODOLOGY

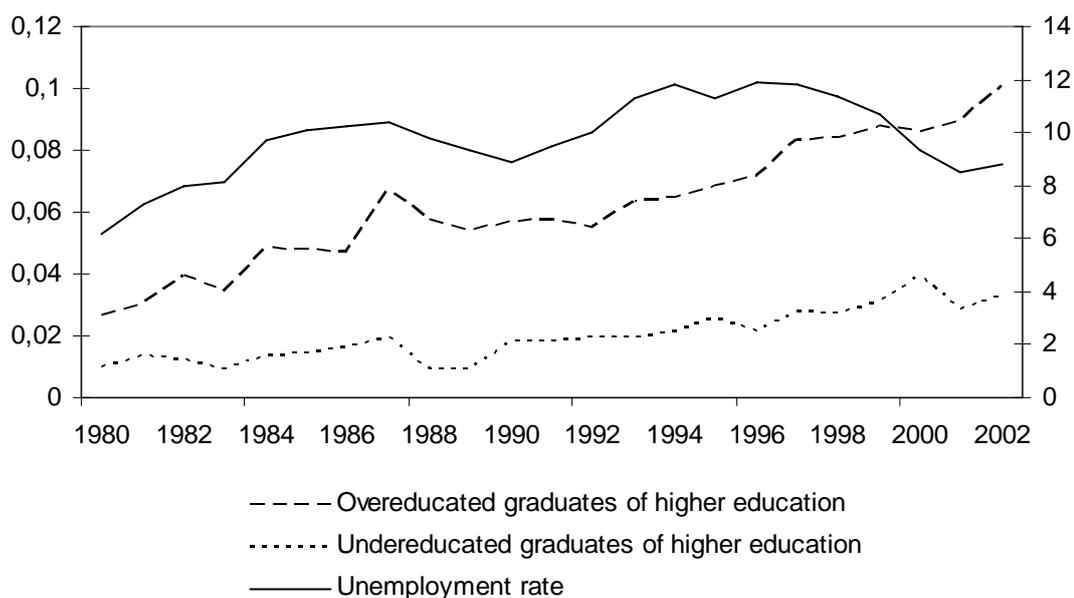
Contrary to the previous studies, the interest of our approach in term of causality is to take into account the needs of labour market and the utilisation factor of employee competences. For this purpose, we choose to re-use the time series elaborate in a previous analysis (Guironnet, 2006b).

Temporal indicators of overeducation and undereducation

To obtain homogeneous data over the period 1980-2002³, our series are built with a wage downgrading measure (see framed #1 in appendices), initially investigated by Nauze-Fichet and Tomasini (2002). In this step, we choose to favour in our analysis, the leavers of higher educational system. In this way, figure 1 (see below) presents the evolution of relative numbers (compared to the working population in employ) of higher education, overeducated and undereducated.

³ We are conscious that the number of observations is weak for a study in time series. This study opening a new track of research, we do not have yet a data base more packed.

Fig. 1. Evolution in the higher education of the share of mismatched workers and unemployment rate.



Source: Employment surveys, INSEE.

Field: working population in employment gathered by age groups.

Globally, the mismatch evolution of the higher graduates is increasing. More and more trained, these leavers of educational system have greater difficulties to obtain an employment corresponding to their degree level. In addition, the increasing variation between the two curves shows a growing release of the links between degree level and wage. Nowadays, the overeducated share of higher education, compared to the whole of working population in employment, reached approximately 10% in 2002 against 2.6% in 1980. In the same time, the growth of undereducated population of the higher education moves from 0.9% in 1980 to 3.3% in 2002. These two results lead us to think that the higher degree levels protect relatively from the overeducated risk at the recruitment time. However, this phenomenon is today not negligible for the most levels of the school hierarchy.

In comparison to unemployment rate, the overeducation phenomenon displays comparable evolutions with a weak temporal delay. However, the changes in the economic situation are not the only explanatory factors. In effect, we can see some evolutions in opposite direction of the unemployment rate and the overeducated population of higher education, over these last years. The more prosperous periods of economic situation do not stop the downward trend of recruitment levels of the overeducation rate for the individuals (Fondeur, 1999). This observation leads us to think that the overeducation evolution would come from a more

structural phenomenon than the economic situation (Guironnet, 2006c). It would be the result of an increasing mismatch between supply and demand of graduates.

Under these conditions, our objective is to study the consequences and causes of the growth structural of overeducation phenomenon on the individual wages and the GDP growth.

Methodology

The VAR models form a continuation of the work of Granger (1969) on the causal relation between two variables. Using this viewpoint, Sims proposes modelling that extends analysis of causality to a system of several variables. For this, he proposes to treat all the variables in an identical manner without a condition of exclusion or exogeneity and selecting the same delay for each of them in all the equations.

A criticism often aimed at VAR models is the small amount of theory to which they refer, describing them as a-theoretical models. This 'theory versus measurement' debate had already opposed economists in the 1920s following the work of Mitchell (1913)⁴ and reappeared in the 1980s with that of Sims. However, this debate is far from settled, and if VAR models are criticised for their lack of theory, the theoretical models of supporters of the Cowles Commission are also criticised for their lack of flexibility (Lucas, 1976)⁵. In the face of these differences of opinion, our approach proposes the reconciliation of theory and measurement in proportions providing both the theoretical and empirical debate required in economics.

In these models, each equation of the model describes the evolution of a variable in function of its last values and of last values of the other variables of the system. Once the optimal lag ' p ' has been determined, the analysis can then be taken in two directions: on the one hand, study of the dynamics of the model and on the other, analysis of causality. The latter has two forms: analysis of the long-run relationship using cointegration and the study of causality relationships.

⁴ The 'theory versus measurement' debate started in the analysis of Mitchell cycles (1913) that laid the empirical foundations of modern macroeconomic theory.

⁵ Lucas (1976) used strong theoretical bases to argue that these models are fundamentally imperfect for assessing the consequences of the results of political alternatives. He puts forward the reason that, for example, their functioning plans little advice for political managers with regard to predicting changes of effect in economic policy because it is improbable that the parameters of the models remain stable under alternative economic policies.

The existence of cointegration between variables implies that the framework within which the causality is examined is modified with a VECM (Vector Error Correcting Model), which takes into account this relation in order to avoid spurious regressions (Granger & Newbold, 1974). Indeed, when series are cointegrated, there is an estimation and the good quality of the model is only due to the fact that series are non stationary; in this case, forecasts made from the model are not robust.

In addition to the identification of the generating process of each variable of the model with unit root tests, the finality of a model VAR is the identification of the relations of causality between the variables. Demonstrating causal relations between the economic variables enables better understanding of economic phenomena and brings supplementary information with regard to the anteriority of the events. This also engenders the establishment of an optimised economic policy.

The definition of causality is given by Granger (1969): variable y_{1t} causes variable y_{2t} if the forecasting of the latter is improved by incorporating in the analysis information concerning y_{1t} and its past.

There are two approaches of causality: Granger (1969) and Sims (1980). Causality within the meaning of Granger (1969) relates to the propagation of interpretable deterministic impulses like modifications related to structural changes. On the contrary, the analysis of Sims (1980) is based on the propagation of stochastic impulses representative of "surprises". On the level of the results the two approaches are generally equivalent (Bruneau, 1996) but one chose here a test of Granger, because we consider that it is legitimate to associate the labour market and the higher education to a non stochastic context.

With two variables, the VAR(p) model is as follows:

$$\begin{bmatrix} y_{1,t} \\ y_{2,t} \end{bmatrix} = \begin{bmatrix} A_0^1 \\ A_0^2 \end{bmatrix} + \begin{bmatrix} A_1 & B_1 \\ C_1 & D_1 \end{bmatrix} \begin{bmatrix} y_{1,t-1} \\ y_{2,t-1} \end{bmatrix} + \begin{bmatrix} A_2 & B_2 \\ C_2 & D_2 \end{bmatrix} \begin{bmatrix} y_{1,t-2} \\ y_{2,t-2} \end{bmatrix} + \dots + \begin{bmatrix} A_p & B_p \\ C_p & D_p \end{bmatrix} \begin{bmatrix} y_{1,t-p} \\ y_{2,t-p} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1,t} \\ \varepsilon_{2,t} \end{bmatrix}$$

The test proceeds in two stages :

- H_0 is tested: y_{2t} does not cause y_{1t} , that is to say that the coefficients of the matrix blocks B are nil.
- H'_0 is tested: y_{1t} does not cause y_{2t} , that is to say that the coefficients of the matrix blocks C are nil.

It is then possible of calculates the sign of the relation of causality.

The sign of the relation of causality from Y1 to Y2 is calculated by: $\eta_{Y1 \rightarrow Y2} = \frac{\sum_{i=1}^p C_i}{1 - \sum_{i=1}^p D_i}$

If $\eta > 0$, the relation of causality is positive and we can confirm a complementarity between the two entities; if not, it is a relation of substitutability which is highlighted.

I. LINKS BETWEEN EDUCATION AND WAGES

In this section, we choose a micro-econometric approach to analyze the qualification impacts on wages. Contrary to our second section devoted to a macro-econometric approach. According to this prospect, our objective is double: on the one hand, we pursue Jaoul's work (2004b) in analysing the effects of higher qualifications on wage and in addition, we supplement this first analysis by the impact of the structural growth of overeducation phenomenon on the employee salaries.

Jaoul's work (2004b) of the effect of the higher qualifications proposes an empirical evaluation of the theories of signal (Spence, 1973) and parchment (Berg, 1970).⁶ According to Spence, the wages depend on the signal emitted by the degree attainment. In order to evaluate this model, we estimate the logarithm of wages according to the various levels of degrees. We retain six levels of degrees of the higher education: first cycle (DEUG⁷, DUT⁸, DEUST⁹); second cycle¹⁰; third cycle¹¹; high schools (Commercial school; engineer school); baccalaureate health and social; first cycles not validated. The estimation shows a positive influence of the degree levels of 3rd cycle and high schools on the wages level and a negative influence of the other degrees. Indeed, a higher degree according to Spence's theory, a higher degree generates a better signal to employers and implies a higher wage. Here, the two higher levels of degree have a positive influence on wages whereas the four lower levels of degree have negative influence on wages. It means that the signal emitted by the first ones is better for employers than the signal emitted by the four others. This fact tends to confirm the analysis of Spence (see table #1 in appendices).

For Berg, at the same level of study, there is a difference in wages between the individuals who failed the examination and those which obtained the degree. To test this

⁶This analysis uses the Cereq database, "Generation 98".

⁷ Degree awarded after 2 years in academic higher education.

⁸ Degree awarded after 2 years of studies after baccalaureate in a technical school.

⁹ Degree awarded after 2 years in academic higher education for a professional scientific specialisation.

¹⁰ Bachelor's degree.

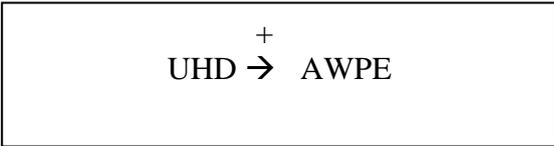
¹¹ PhD and Master's degrees.

assumption, we consider the individuals having followed a first cycle after the baccalaureate. This whole of individuals is divided in two samples: individuals of first cycle having the degree and individuals without corresponding degree. The Darmois test (1934) of averages comparison (here wages) of two samples, leads us to accept the Berg assumption: there is a significant difference in wages between graduate and individuals without corresponding degree. The actual degree attainment is one of the determinants of individual wages.

However, these analyses neglect the demand side of labour market. Indeed, what do these results become when we take into account the overeducation situations for the individuals? Accordingly, we produce two types of analysis: in the first time, one is interested at the overeducated workers and, in the second time, we undertake a similar study for the undereducated workers. Thus, we are lead to consider the following variables:¹²

- Overeducated workers of the higher degree (OHD);
- Undereducated workers without higher degree (UHD);
- the annual average wages of the working population in employment (AWPE);

Unit root tests (Elliott, Rothenberg & Stock, 1996) shows that the variables are stationary. A necessary condition of cointegration between two variables being that these last are integrated in the same order, there isn't relation of cointegration between the various variables. Thus, one can show an absence of long term relation between the studied variables. With these results, we find the Rubb's idea (2003) concerning the transitory character of the overeducation influence on the professional careers. The test of causality highlights only one significant relation, with a threshold of 10%:



This relation is confirmed by the variance decomposition: wages are more sensitive to a variation of the overeducated workers without any degree of the higher education (95 %) that the latter are not sensitive to a wage variation (2 %). So, an increase in overeducated workers, with a low level of qualification, produces a positive effect on the corresponding wages. For the individuals, it is more profitable to continue their school course to the baccalaureate level (or formation of a similar level) that the overeducation risks produce an advantage in wage term. On the contrary, we do not find any significant relation between the

¹² We reason in growth rate for each one of our variables.

overeducated workers of higher education and the wages. The overeducation, for the highest levels of degree hierarchy, does not modify the profit prospects, in particular their relative advantage in term of salary (high schools and 3rd cycles).

In our second analysis, the variables taken into account are identical but concern the undereducated workers. However, the econometric analysis does not reveal any relation between the variables. Thus, we can conclude that these mismatches do not produce any unfavourable wage effect. On the contrary, our analysis in term of causality reveals a wage advantage for the overeducated workers holding a qualification level lower or equal to the general baccalaureate. In long period, the employees must adopt a strategy to protect themselves from their not-adaptability to anticipate the future developments and the new needs of firm competences.

II. LINKS BETWEEN EDUCATION AND GROWTH

The object of this second analysis is to study the impact of the overeducation evolution, either on the individual wages, but on the national income. Indeed, in a previous study (Jaoul, 2004b), we had highlighted a relation between higher education and economic growth over the period 1820-2000. However, we have found an absence of relation since 1950. This observation reflects a lack of coordination between the economic and educational policies. These results translate the problems of France to adapt its higher educational system at the economic system.

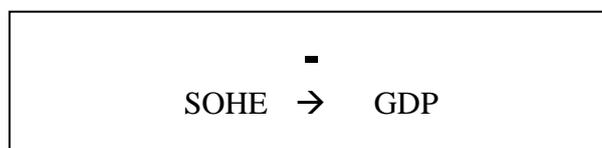
A more specific analysis in degree terms (Jaoul, 2002) underlined the impact of the high levels of degrees (higher education degrees) on the French economic growth. Among them, the doctorates, and more particularly those of the health sector (Medicine and Pharmacy) have a positive influence on the national income (Jaoul, 2004b). However this analysis does not take account the possible effects of the mismatches between training and employment.

Also, the objective is here to determine in which way the overeducation evolution has an impact on the economy. For this purpose, we consider the growth rates of the following variables:

- GDP;
- The share of overeducated workers of the higher education (SOHE);
- The share of overeducated workers without any degree of higher education (SOWHE).

Unit root tests reveal a stationnarity of all variables. These last do not present any relation of long term what tends to contradict Rubb (2003) and the permanent character of the

overeducation on economy. On the short term, only a causality relationship is highlighted (significant threshold of 10 %) ¹³:



Thus, a share increase of overeducated workers of the higher education produces an unfavourable effect on the economic growth. Over these two last decades, we find that the recruitment of overqualification workers would produce a growth deceleration rather than unfavourable economic conditions producing an increase of overvaluation competences during the candidate recruitments. In addition, we find a similar result to that established in a previous study with the same database (Guironnet, 2006b): the overeducated workers of higher education reduce significantly the national productivity.

CONCLUSION

With an increasing phenomenon of overeducation over these two last decades, the overeducation literature shows an unfavourable effect of this phenomenon on wages. However, the overeducation phenomenon is not without advantage: for a given job, the overeducated workers have always higher wages compared to the workers adequately matched (Sloane *and al.*, 1999). Moreover, overschooling can lead to an advantageous situation with the valorization of the professional experience. ¹⁴

From twenty two years of French productivity, our analysis in productivity term seems to confirm that the overeducation phenomenon does not produce any unfavourable effect on the individual level. More precisely, this phenomenon would produce on the one hand some advantages for the least qualified workers. On the other hand, it would not affect, or little, the most qualified workers: the latter preserving their wage advantage (in particular for high schools and 3rd cycles). Thus, the credentialism scenario ¹⁵ or the qualification inflation does not seem irrational: the individual prospect, to obtain highest levels of feasible degree,

¹³ Relationship between GDP and Under-education has also been studied and results show that there's not causal link.

¹⁴ This type of result falls under the theory of the professional courses (Sicherman, 1991). Empirical work, taking again these assumptions, shows that the overeducation would produce an advantageous effect on the development of professional careers, as well in term of promotions than wages (Groeneveld and Hartog, 2004; Dekker *et al.*, 2002).

involves always a rentable investment. However, our analysis exceeds this individual framework in analyzing the links between overeducation and GDP growth.

Indeed, and paradoxically, we find that this phenomenon seems to reduce the GDP growth. This result is pregnant in term of policies of professional insertion: over these last decades, the French policy tends to reduce the unemployment of young people, in particular for the least qualified (see “young employment¹⁶” and “apprenticeship contract¹⁷”). However, they must improve now professional insertion of the most qualified in the way that the latter can find an employment corresponding to their educational level. Such prospect would allow reduce the underutilization of the most qualified and would make it possible to improve the economic growth.¹⁸

However, this document is registered like a new research and our results can be considered as intuitive. Our objective is to underline the possible character of an unfavourable effect of the overeducation phenomenon on growth and to catch a particular attention at the professional insertion of most graduate. Other studies must supplement this analysis: for example, the series developments over a longer period would undoubtedly make it possible to specify our results. In the same way, the formalization of macroeconomic models would supplement our approach.

¹⁵See Spence (*op. cit.*).

¹⁶ Employment contract in definite duration (maximum 5 years), for young people (from 18 to 26 years old) in unemployment, to finance job of public utility.

¹⁷ Employment contract in definite duration (between 1 and 3 years) for young people (from 16 to 26 years old) which enables to young people to acquire a professional qualification and a technological degree.

¹⁸For an approximate evaluation of the profits of expected growth, the concerned reader can consult Guironnet’s article (2006b).

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ANNEXES

Framed 1

"WAGE" DOWNGRADING AND UPGRADING

An individual will be considered as overeducated (resp. undereducated) so more than 50% of holder individuals of the immediately lower degree (resp. higher) gain more (resp. less) than this last.

With this technique, we determine a relational indicator "degree-employment" which is homogeneous over a long period. It is not affected by "biased technical progress" and the mechanism of "degree inflation". However, this measurement remains affected by other factors contributing to the wage heterogeneity of population.

Tableau 1 – Estimation of Spence model

LEAST SQUARES AJUSTMENT WITH CONSTANT TERM - 12730 INDIVIDUALSS					
TITLE	COEFFICIENT	S.D.	STUDENT	PROB.	TEST VALUE
3rd cycle	303.7080	10.406	29.187	0.000	28.71
Bac health social	-91.9549	10.333	8.899	0.000	-8.88
Bac+1 +2 dip	-266.6343	6.311	42.246	0.000	-40.87
Bac+1 +2 no dip	-389.2516	7.361	52.882	0.000	-50.28
High school	564.9465	11.402	49.546	0.000	47.38
2nd cycle	-120.8137	7.786	15.516	0.000	-15.44
constant	1478.4875	4.081	362.259	0.000	175.69
SUM SQUARED RESID		SSR = 1969392256.0000			
MULTIPLE CORRELATION COEFFICIENT		R = 0.5642	R ² = 0.3184		
ESTIMATED VARIANCE OF RESIDS		S ² = 54777.7656	S = 393.4181		
FISHER TEST = 1188.569		DF = 512724			
P.CRIT = 0.0000		TEST V.= 69.60			

Documents de Recherche paru en 2007¹

- DR n°2007 - 01 : María Noel PI ALPERIN, Michel TERRAZA
« Test d'inférence statistique de l'indice multidimensionnel flou de pauvreté appliqué à l'Argentine »
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¹ La liste intégrale des Documents de Travail du LAMETA parus depuis 1997 est disponible sur le site internet : <http://www.lameta.univ-montp1.fr>

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