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UMR 7522

Documents de travail

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Document de Travail n° 2017 – 01

Janvier 2017

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Human capital accumulation in France at the dawn of the XIXth century: Lessons from the Guizot Inquiry

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Abstract: Building on the results of the Guizot Inquiry, carried out in autumn 1833 on the initiative of François Guizot, the minister of public instruction, this article examines the process of human capital accumulation in early nineteenth-century France. We rely on an original proxy for human capital – student achievement – to highlight the high level of heterogeneity in human capital accumulation in this period. We identify two types of schools in the French educational landscape: first, large schools, well-endowed in human and material resources, which contributed a great deal to human capital accumulation; second, small schools, characterised by some degree of amateurism and improvisation, which weakly contributed to human capital formation. We note that the use of literacy rates or school enrollment rates can be misleading with regard to the estimation of French human capital endowments, laying emphasis instead on the heterogeneity in the French educational landscape at the dawn of the nineteenth century, as the country embarked on the process of industrialisation.

Keywords: Guizot Inquiry, Human Capital Accumulation, France, Nineteenth Century

***JEL* codes**: C10, I21, N33

1. Introduction

It is not easy to provide a clear picture of human capital endowment in early-nineteenth-century France. Indeed, because of poor statistical information, this is a difficult task for most countries in this period. Human capital endowment in the early nineteenth century is generally approached through literacy rates, though in some cases statistical information about enrolment in elementary schools is also used to approximate human capital accumulation. These two procedures both involve important flaws.

Because statistical information is poor – at least for the beginning of the nineteenth century – literacy rates are difficult to measure. For France, the first statistical data available to measure literacy directly is the education level of French conscripts from 1827 onwards. Conscripts' declarations about their capacity to read, write, or to read and write, are often used to extrapolate regional literacy rates. From the second half of the nineteenth century onwards, direct measures of education level become available from the censuses (1851, 1866 and 1872 for instance). But for prior periods (especially the eighteenth century, but also before), it is also common to evaluate literacy rates by reference to signatures in marriage registers. Louis Maggiolo (1877-79) was the first to use this procedure so as to trace the history of literacy in France (see Fleury and Valmary 1957). According to this method, the capacity of individuals to sign their names on official documents is considered a proxy for their ability to read and write.[1] Yet although this procedure is widely used by historians, its relevance remains questionable. It has been shown that individuals who were able to sign their name were able to read, but weren't necessarily able to write. Nilsson (1999), for instance, has stressed the frailty of such extrapolations for pre-industrial societies.

Another method for measuring human capital at the dawn of French industrialisation uses educational variables reflecting the density of the education system in a given area (number of schools, number of pupils enrolled, number of teachers). Notably, Dupin relied on such an approach to map French schooling in 1826 (see Dupin 1827). This led him to divide France into two zones: an advanced France, north of the now famous Saint-Malo–Geneva line, and backward areas south of the line. It is now recognised that caution is required when it comes to inferring information about the level of instruction of young French people from the

[1] Given the lack of data, new strategies to measure human capital (within the spirit of the procedure based on marriage registers) have recently been developed. The *age heaping method* (see for instance A'Hearn et al. 2009, Crayen and Baten 2010, and Baten et al. 2014) uses accuracy of age reporting as a proxy for numeracy. This method relies on "*the tendency of poorly educated people to round their age erroneously. For example, they answer more often '40', if they are in fact 39 or 41, compared with better educated people*" (Crayen and Baten 2010, p. 452).

density of the education system. Due to considerable heterogeneity in school quality, level of instruction is not necessarily accurately related to school enrollment rates. Several scholars have developed this argument for the present day. The vast research program on the quality of education has highlighted that, due to quality disparities between and within education systems, the same amount of education can lead to different levels of human capital accumulation. Hanushek's work (see for instance Hanushek and Kimko (2000), Jamison, Jamison and Hanushek (2007) or Hanushek and Woessmann (2008, 2011, 2012)), which has significantly contributed to the development of so-called "quality of education" approaches, advocates taking into consideration proxies for human capital that can better reflect these quality disparities. Hanushek and Woessmann (2015) propose relying on scores on international tests (e.g. PISA, TIMSS) to account for those disparities. The use of enrollment rates (or any measure reflecting schooling density) to evaluate human capital endowment at the dawn of the nineteenth century is evidently affected by the criticism formulated in these modern approaches. The limitations of this proxy are even more severe in the case of France in that earlier period, since the heterogeneity within the education system is recognised to be particularly strong in the first half of the nineteenth century (probably far stronger than nowadays). Therefore it is unwise to base conclusions about human capital endowment upon it.

So, neither the approach based on the estimation of literacy rates, nor that based on enrollment rates (school density), provide a fully convincing evaluation of French human capital at the time France embarked on the process of industrialisation. Yet, regrettably, only this kind of statistical information has been used thus far to evaluate human capital in the first decades of the nineteenth century.

In this paper, we propose to rely on an original statistical source, namely the results of the *Guizot inquiry*, carried out in autumn 1833 on the initiative of François Guizot, then minister of public instruction. This promises to provide a better understanding of the process of human capital accumulation in early nineteenth century France. This statistical information, which to our knowledge has never been used to examine French human capital endowment, provides much broader information about the French educational system than indications only about its density. The inquiry, which followed the Guizot law adopted in June 1833, had the purpose of appraising the state of primary education in France. Therefore, besides quantitative information (about the size of schools, for instance), the inquiry provides details about the quality of the schools and the teaching therein.

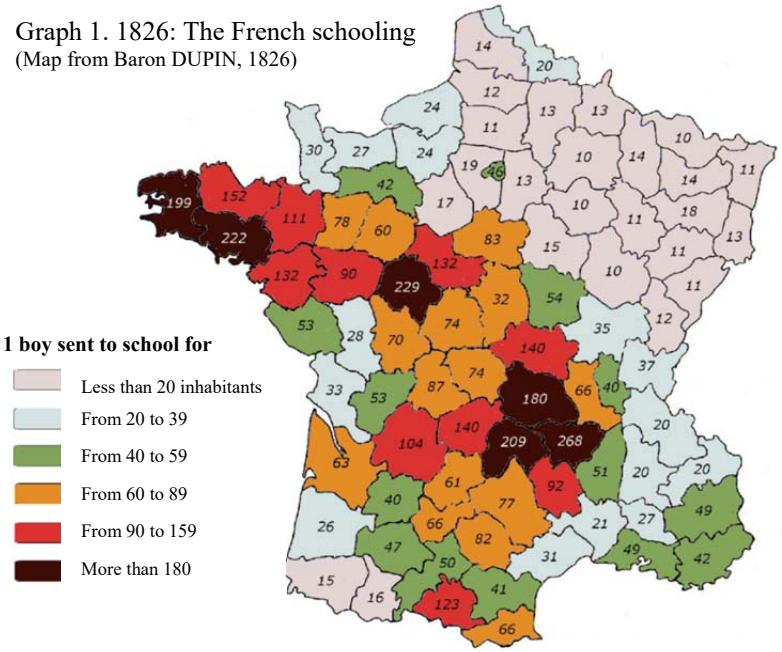
We build on this information to understand the determinants of human capital accumulation in French schools at this time. We rely on an original proxy for human capital – student achievement – and shed light on the factors behind it.

Our aim is to determine what kind of schools contributed to efficient accumulation of human capital in early nineteenth century France. The aim of our approach is not to provide a full picture of French human capital endowment at the beginning of the nineteenth century, but rather to highlight the profile of nineteenth century French schools – their characteristics and diversity – in order to better understand the way in which they contributed to the accumulation of human capital in this period.

2. Elementary education in France and the Guizot inquiry

The Guizot inquiry covered all French primary schools and took place from September to December 1833. Its aim was to provide an inventory of the education system in order to guide the arrangements for the Guizot Law, which had been approved in June 1833. The Guizot law was the first legislation to organise primary education in France, with the objective of spreading literacy in a country where primary education was left to local communities or private agents, or to religious institutions. The law was designed to meet a growing concern about slow progress in literacy, and tremendous educational inequalities. Primary education in this period was fragmented, and the schools landscape very disparate. The work of Dupin (1827) had shed light on the huge inequalities in French education at the departmental level: Dupin's statistical approach, which was first motivated by the issue of the link between education and economic development, led to the highlighting of the now famous "*ligne Saint-Malo Genève*" (see Graph 1). As previously mentioned, this line divides France into two groups of departments: those located north of the Saint-Malo–Geneva line, which are characterised by high education density, and those south of the line which are mired in backwardness (regarding education).

Graph 1. 1826: The French schooling
(Map from Baron DUPIN, 1826)



It is now recognised that Dupin's statement must be treated with caution. In their analysis of the development of literacy in France, Furet and Ozouf (1977) agreed that there were important inequalities in schooling between departments at the dawn of the nineteenth century, but they insisted that other heterogeneities than the one between north and south must also be considered. Inequalities between urban and rural areas and especially between cities (new industrial towns *vs.* the towns of the *ancien régime*), are often more relevant, according to them, for characterising inequalities in literacy.

It was against this background – the recognition of the lack of homogeneity of the education system, and of France's educational backwardness relative to its neighbours – that the Guizot law was adopted. It laid the foundations for a highly centralised public primary education system.

The first goal of Guizot's administrative inquiry, as previously mentioned, was to provide an exact overview of the state of French primary schools in order to guide government action. But the inquiry must also be seen as a political gesture. By hiring almost 500 inspectors to visit nearly 30,000 private and public boys' schools and coeducational schools [2] in all French departments (except Corsica), Guizot's aim was also to affirm the leading role of the state at this educational level.

[2] Girls' schools were outside the scope of the Guizot Law.

This unprecedented inquiry covered all administrative, financial, educational and material aspects of the schools thus visited. It also gave information about each teacher. It can be considered as the first inspection of the national education system.

The inquiry contained 67 questions (see Appendix 1) grouped into various topics:

- Material and financial aspects (place of teaching, wages, cost of education)
- Pupils (coeducation, worship, age of admittance, number, etc.)
- Teaching method (educational methods, furniture, books, board and map, notebook, taught disciplines, level and quality of teaching, etc.)
- Teachers (professional qualification, diploma and training, personal skills, etc.).

3. Data and descriptive statistics

The data come from the results of the Guizot inquiry provided by the French National Institute of Educational Research (INRP) on its website. The database only covers 11 departments, covering 2,043 schools from 3 regional education authorities: Bourges (Centre of France), Nimes (South-Eastern France) and Rennes (Brittany, North-Western France). Despite the large loss of information, these three regional education authorities offer a reasonably representative sample of the French education system at this time. They are each composed of rural and urban areas. Among the urban areas, the sample covers towns of different sizes (see Table 1). Referring to Baron Dupin's map, we see that the three regional education authorities of our sample are very different in terms of education density: Brittany and North-Western France were weakly educated; the Centre of France offered a little more schooling; and South Eastern France appeared better educated.

To examine the process of human capital accumulation at the beginning of the nineteenth century we thus rely on an original proxy built from the results provided by the inquiry: pupil's progress. In the spirit of the literature on school quality, our approach is to measure human capital accumulation directly – that is, via the progress of the pupils, and what they have learned through exposure to education – instead of using approximations based on school density indicators. From this point of view our proxy is closer to the literacy rates than to enrolment rates. But, compared with literacy rates, the pupil's progress has the advantage to measure knowledge accumulation in a more direct way. As we have previously mentioned, literacy rates, for the beginning of the nineteenth century, are extrapolated from signatures on marriage registers or from conscripts' declarations, both of which may induce important

biases. Our proxy has the advantage of evading such biases, since it measures knowledge accumulation as noted by Guizot's inspectors.

We use the following question asked by the inspectors: "Did pupils progress?". Answers vary according to 5 modalities that we code with ordinal numbers: 0 = No, 1 = A little, 2 = Enough, 3 = Yes, 4 = A lot.

In order to examine the process of human capital accumulation, we try to explain changes in this variable by reference to school characteristics, material resources, aspects related to pedagogy, and certain characteristics of teachers. The variables are listed in table 1.

Table 1. Variables

Variable	Description	Modalities
Schools characteristics		
Town size	Size of the town (number of inhabitants) where the school was located	
Number of pupils	Maximum number between summer and winter[3]	
Schooling duration	Average number of schooling years	
Enrolment cost	Minimum enrolment cost that parents had to pay	
Schools material resources		
Material means	Number of missing equipment (evaluated from the general comments on the school which precise what was missing or not into school)	0 : Nothing is missing 1 : 1 equipment is missing (Board **or** furniture **or** map **or** teaching place too small) ; 2 : 2 equipment are missing (ex: board **and** furniture) ; 3 : everything is missing
Notebooks	Did the pupils have notebooks?	Yes/No
Pedagogical aspects		
Number of taught disciplines	-	1 to 8
General level of pupils	What is the general level of the pupils?	A : very good B : good C : medium D : bad E : very bad
Teaching Method	What was the teaching method?	Individual Mutual Simultaneous
Teachers' characteristics		
Teacher's diploma	Is the teacher a qualification certificate holder and of which degree?	no degree (no certificate) 3rd degree 2nd degree 1st degree
Teacher training college	Did the teacher go to teacher training college?	Yes/No
Other occupation	Did the teacher have another occupation?	Yes/No

[3] In rural departments the number of pupils varied significantly between summer and winter, since many pupils did not go to school during the summer and instead helped their parents in farming tasks.

Table 2: School characteristics – descriptive statistics

Variable	Min	Max	1st Quartile	Median	3rd Quartile
School duration	1	9	3	3	5
Nb of pupils	2	1200	25	35	50
Enrolment costs	0	1250	75	100	125
Town size	117	77992	817	1485	2848

Our sample includes schools located in towns of different sizes.

Variable	< 800 inhabitants	800-2000	> 2000 inhabitants
Town size	24.1%	37.7%	38.2%

One can observe that school size, in terms of the number of pupils, is very variable, ranging from 2 to 1200 pupils. 25% of schools have less than 25 pupils and 25% have more than 50. The duration of schooling is also very variable (from 1 year to 9 years of schooling). Enrolment costs also vary: from 0F (free access to education) to 1250F, though the cost of most schools (75%) is less than or equal to 125F – nevertheless, that sum still represented a significant outlay for families, especially those from rural backgrounds who sometimes preferred that their children did not go to school and instead helped with farm work.

Table 3: School material resources - Descriptive statistics

Variable	Modalities	Nb	%
Material means	0	1114	54.5
	1	599	29.3
	2	87	4.3
	3	243	11.9
Notebooks	No	172	9.1
	Yes	1730	90.9

Material resources are unequally distributed. More than half the schools reported that they were not lacking any equipment (map, board, furniture, etc.), but approximately 12% were very badly endowed. Concerning the notebooks at disposal of the pupils, we observe that almost 10% of schools reported they didn't have notebooks.[4]

[4] We also note that almost half of the schools of our sample didn't have enough books for the pupils.

Table 4: Pedagogical aspects

Variable	Modalities	Nb	%
Teaching method	Individual	536	29.5
	Mutual	186	10.3
	Simultaneous	1093	60.2
Nb taught disciplines	1 or 2	175	8.9
	3 or 4	1240	63.2
	5 and more	547	27.9
General level of pupils	A	118	6.3
	B	483	25.8
	C	331	17.7
	D	862	46.0
	E	78	4.2

France in this period had no official method of learning. Three teaching methods coexisted at the beginning of the nineteenth century: the individual method, the mutual method, and the simultaneous method.

The *individual method* was common in small schools. It was based on the idea that pupils should learn alone with their own book, and the teacher had only to verify their learning. This didn't require specific premises, books or training for the teacher, and represented a lower investment for parents and for towns. It was very common in mountainous areas and on the Atlantic plains.

The *mutual method* was used with very large groups of pupils (more than a hundred). Pupils were grouped according to their level and instructors supervised the learning. Learning was strictly structured and depended on good material resources (board, map, etc.). It was costly and used primarily in large towns and in river and manufacturing areas. This method was supported by the liberal elite (of a more Protestant tradition) and was often funded by philanthropic societies. Proponents of this method were opposed to the individual method. It was implemented by a minority of schools.

The *simultaneous method* was born within the secondary school. It involved grouping pupils of same level in order to educate them with one teacher. At the beginning of the eighteenth century this was linked to the clergy, especially Christian Monks.

Nine disciplines were taught in French schools at the time of the Guizot inquiry: Reading, Writing, Spelling, Grammar, Arithmetic, Religious Instruction, Land Surveying, Drawing, and History. For each discipline, Guizot's inspectors had to specify whether or not it was

taught in the schools they visited. From this information we can build up the *Number of taught disciplines*. This number varies from 1 to 8,[5] with 28% of schools of our sample offering 5 disciplines or more.

The general level of pupils appears quite worrying: half the schools report a bad or very bad level.

Table 5: Teachers' characteristics – Descriptive statistics

Variable	Modalities	Nb	%
Teacher's diploma	No diploma	259	13.1
	3	1062	53.9
	2	631	32
	1	20	1
Teacher training college	No	1739	86.8
	Yes	264	13.2
Other occupation	No	1519	74.4
	Yes	524	25.6

The Order of 29th January 1816 provided that the teacher, to be allowed to teach, must hold a qualification certificate issued by the regional school authority inspector. The certificate had three degrees. Basic reading, writing and numeracy skills were needed for the third degree. Holders of the second degree had to have more developed skills in spelling, calculation and calligraphy. Finally, holders of the first degree had in addition to have skills and knowledge in surveying, grammar, arithmetic, geography and "further knowledge for elementary teaching". In spite of this obligation, many teachers (13.1% of our sample) did not have the required certificate. The vast majority of them held the third degree and only 1.1% held the first degree. Furthermore, only 13.2% of the teachers of our sample had been to a teacher training college.

This heterogeneity in teachers' level of training and qualifications is also illustrated by the fact that almost 26% of the teachers of the sample had another occupation. Among the 524 teachers who had another occupation, half were also secretary of the district (secretary of town/town clerk/mayor's secretary). We also have, for instance, twelve farmers, seven tobacconists, four storekeepers, two weavers, and two customs officers.

[5] Religious Instruction was taught in all schools in the sample, so we don't count it.

4. Empirical analysis

4.1. Human capital accumulation

In this section, we analyse whether our explanatory variable – the progress of the students – varies with schools or teachers' characteristics. We estimate equations of the form:

$$\mathbf{Y_i = \alpha + \beta D_i + \delta P_i + \gamma Q_i + \theta L_i + \phi D_i + \eta T_i + \varepsilon} \qquad \mathbf{(1)}$$

For each school i, Y is our proxy for human capital accumulation (the progress of students), D_i represents school duration, P_i is the size of the school (number of pupils), Q_i is the number of taught disciplines, L_i is the general level of the pupils, D_i is the teacher's diploma and T_i represents the teaching method. ε is a residual term.

We estimate the model with the OLS method (Table 4). For the last regression, which includes all the variables, we also analyze the Type III SS table (Table 5). This is computed by removing one variable from the model to evaluate its impact on the quality of the model. If the F probability corresponding to a given variable is lower than 5%, that means that the variable has a strong impact on the model.

The estimations show that schooling duration and school size have little or no effect on pupils' progress. The table confirms this: all the variables improve the quality of the model except school duration and school size.

On the contrary, the general level of pupils has a positive effect on progress: the better the level, the higher the progress. The same is the case concerning teacher's qualification. Progress appears to be higher in schools where the teacher is better qualified.

We note that the mutual and simultaneous methods are positively linked with pupils' progress, while this is not the case for the individual method. Teaching method thus plays a part in progress: the simultaneous and mutual methods seem to stimulate learning far more than the individual method.

Finally, and notably, the accumulation of human capital is strongly and positively linked with the number of taught disciplines. This reveals that human capital accumulation is dependant on the amount of human capital – the number of taught disciplines – that the schools provided. We assume, in the next part, that the number of taught disciplines provides

important information about the profile of the schools and displays their general quality. We thus try to determine what the essential factors behind it are.

Table 4. Estimation of the human capital accumulation (Pupils progress)

Explicative variables	School duration	Nb of pupils	Nb of taught disciplines	General level of pupils (ref : C)	Teacher's diploma (ref : 1st)	Teaching method (ref : indiv)	R^2
Regression 1	NS						0
Regression 2	NS	0.004***					0.06
Regression 3	-0.02*	0.002***	0.30***				0.2
Regression 4	NS	NS	0.08 ***	A 1.22*** B 0.56*** D -0.56*** E -1.09***			0.53
Regression 5	0.02*	NS	0.07***	A 1.15*** B 0.55*** D -0.55*** E -1.08***	3rd -0.29** No -0.28*		0.53
Regression 6	NS	NS	0.06***	A 1.13*** B 0.53*** D -0.54*** E -1.06***	3rd -0.32** No -0.30*	Mut. 0.16*** Sim. 0.16***	0.54

*** significant at 1% level; ** significant at 5% level; * significant at 10% level; Ref.: category of reference.

Table 5. Type III SS for the regression 6

Source	Pr > F	Signif.
School duration	0.218	NS
Nb of pupils	0.305	NS
Nb of taught disciplines	0.000	***
General level of pupils	< 0.0001	***
Teacher's diploma	0.047	**
Teaching method	< 0.0001	***

*** significant at 1% level; ** significant at 5% level; * significant at 10% level;

4.2. School quality: the number of taught disciplines

The previous part allowed us to underline that pupils' progress depends on the number of taught disciplines. We include this variable in the analysis because we frame the assumption that it is a relevant approximation of the general quality of the school. In fact, one may expect that schools which taught disciplines other than writing, reading and basic numeracy skills are in general better endowed with human and materials means, and thus are of a better quality than schools that are not able to provide such educational supply. We thus examine this assumption by determining the factors behind this variable.

We here analyse if this varies according to teacher's skills and according to the material means. We also assume that enrolment cost and town size may have an impact on it, as well as the teaching method.

In order to evaluate the various impacts, we use the OLS method to estimate equations:

$$\mathbf{Q_i = \alpha + \beta\ P_i + \delta\ C_i + \gamma\ S_i + \theta\ T_i + \rho M_i + \eta N_i + \phi D_i + \tau O_i + \mu W_i + \varepsilon} \qquad (2)$$

For each school i, Q_i is the school quality (the number of taught disciplines), P_i is the size of the school (number of pupils), C_i is the cost of enrolment, S_i is the town size, T_i represents the teaching method, M_i indicates the material means, N_i indicates the presence of notebooks in the school, D_i is the teacher's diploma, O_i indicates if the teacher has another occupation, and W_i indicates if the teacher had been to teacher training college. ε is a residual term.

Table 6. Estimation of the amount of human capital (number of taught disciplines)

Explicative variables	Nb pupils	Enrolment cost	Town size (ref: 800-200)	Teaching method (ref : indiv)	Material means	Notebook	Teacher's diploma (ref : 1st)	Teacher training college	Other occupation	R^2
Regression 7	0.01***									0.1
Regression 8	0.01***	0.003***								0.13
Regression 9	0.01***	0.002***	<800 -0.28*** >2000 0.21***							0.15
Regression 10	0.01***	0.002***	<800 -0.20***	Mut.1.33*** Sim.0.44***						0.24
Regression 11	0.01***	0.002***	<800 -0.21***	Mut. 0.33*** Sim. 0.43***	-0.08***					0.25
Regression 12	0.01***	0.002***	<800 -0.18***	Mut. 1.25*** Sim. 0.35***	-0.05**	0.95***				0.3
Regression 13	0.005***	0.001***	NS	Mut. 1.06*** Sim. 0.31***	-0.06**	0.85***	2nd -0.49** 3rd -0.85*** No -1.30***			0.34
Regression 14	0.005***	0.002***	<800 -0.11*	Mut. 1.04*** Sim. 0.30***	-0.06**	0.85***	2nd -0.49** 3rd -0.85*** No -1.31***	NS		0.34
Regression 15	0.005***	0.001***	<800 -0.11*	Mut. 1.05*** Sim. 0.30***	-0.06**	0.86***	2nd -0.47** 3rd -0.83*** No -1.29***		-0.11*	0.34
Regression 16	0.005***	0.001***	<800 -0.11*	Mut. 1.05*** Sim. 0.30***	-0.06**	0.86***	2nd -0.48** 3rd -0.84*** No -1.31***	NS	-0.11*	0.34

*** significant at 1% level; ** significant at 5% level; * significant at 10% level; Ref.: category of reference.

Table 7. Type III SS for the regression 16

Source	Pr > F	Signif.
Nb pupils	< 0.0001	***
Enrolment cost	< 0.0001	***
Material means	0.030	**
Town size	0.180	NS
Teaching method	< 0.0001	***
Notebooks	< 0.0001	***
Teacher's diploma	< 0.0001	***
Other occupation	0.068	*
Teacher training college.	0.735	NS

*** significant at 1% level; ** significant at 5% level; * significant at 10% level;

There appears to be a positive and significant relationship between the number of disciplines taught by the school and school size: the higher the school size, the broader the range of disciplines taught. Our estimations show that the teaching method is also positively linked with the number of disciplines. The mutual and simultaneous methods (the ones which play a positive role in pupils' progress) are generally implemented in the schools which teach a larger range of disciplines. Even though town size is not an indispensable element of the model (Table 7), its impact agrees with this result: schools located in small towns were mostly confined to teaching basic literacy and numeracy; on the contrary, schools that taught a large range of disciplines are generally located in larger towns.

As expected, the number of taught disciplines in schools positively depends on both material and human means. Indeed, on the one hand, the presence of notebooks is positively linked to this, whereas a shortage of materials negatively affects it. On the other hand, we observe that teacher's capacity, represented here by the level of their diploma, is strongly and positively linked with the number of taught disciplines. The fact that teachers had no other occupation, that is, that they are full-time teachers, is also a characteristic of schools that provided a broader range of disciplines.

These results support our hypothesis that the number of disciplines taught, which appears to be an important factor explaining pupils' progress, is a relevant indicator to identify schools' profiles and their quality. Schools that provided a large range of disciplines are in fact the ones that are the best endowed with material means, that implemented the two most modern methods of teaching, and that hired the best qualified teachers. Our analysis indicates that these schools are generally of large size and located in large towns.

The fact that enrolment costs are positively related to the number of taught disciplines can be interpreted in the following way. It means that school quality represents a significant cost, especially for families; and this phenomenon is certainly related to the teaching method and to the geographical position of the school, but it also reveals that families didn't really choose the quality of the human capital provided to their children. From that point of view, the enrolment costs supported by the parents could be seen as an obstacle to children's education.

4.3. Schools' profile

We complete these regression analyses with a multiple factorial analysis (MFA), in order to profile French schools at the beginning of the nineteenth century. This is a method of data mining on qualitative variables which exhaustively describes the phenomenon of study. Proposed in the 1960s by Benzécri, it has become the favoured method of data analysis, especially in sociology. It is based on the fact that the existence of common occurrences can highlight, in an inductive manner, and without any hypothesis, certain structures of dependence between variables.

In concrete terms, we represent the modalities of all the variables on the same graph, in order to underline the role played by the totality of the modalities. Although the graph represents the essential results, one must take into account both the amount of information contained in the data (Relative contribution) and the contribution of the various modalities to the study (Absolute Contribution). The MFA takes place in four steps:

Eigenvalue analysis: Eigenvalues represent the amount of information contained in the data. It is advisable to select a number of eigenvalues implying the smallest loss of information. We use the Kaiser criterion: this consists in selecting the eigenvalues representing up to (1/P) % of the information, P being the number of variables. The number of the selected eigenvalues also represents the number of axes used for the graphical representation: if two eigenvalues are selected, this means that two axes (called factorial axes), that is to say one system, contain the bulk of the data information.

Contributions study: There are two contributions: the absolute contribution (CTA), which represents the weight of the modality of the variable in the definition of the factorial axis, and the relative contribution (CTR), which is the quality of representation of the modality along an axis. The critical values are respectively equal to 0.1 for the CTA (the definition of the axis, that is to say the information contained in this axis is due to less than

10% of the modality), and 0.3 for the CTR (the quality of representation of the modality upon the axis is smaller than 30%). If modalities present CTA and CTR as below the critical values, they are removed from the analysis. These values are weaker than those used in Simple Factorial Analysis because the MFA is a pessimistic method.

Graphical Analysis: We interpret the groups of modalities which appear on the system of axes. This part of the analysis is the most interesting, because it allows us to highlight the various profiles of success.

Projection of additional modalities: In most studies, the analysis is carried out on a sample of the variable, called active variables, on which previous criteria are calculated (eigenvalues, contributions); the non-selected variables are called additional variables and they are only taken into account in the graphical analysis. Indeed, in the MFA it is possible to project all the modalities of the variables, active and additional, in order to make the interpretation deeper.

We consider the following as active variables (that is to say, variables used to lead the analysis and on which all calculations are based): pupils' progress, number of disciplines, size of schools, presence of notebooks, and teaching method. We code pupils' progress in three modalities: high human capital accumulation (Yes and A lot of progress), medium human capital accumulation (Enough), and weak human capital accumulation (A little and No progress).

Five other variables (enrolment cost, town size, books, teacher's diploma, and shortage of material means) are considered as additional variables (that is to say, they don't appear in the calculations but we take them into account to interpret our results). We here add town size because it appears as important in the determination of the teaching method, and so in the amount of human capital provided.

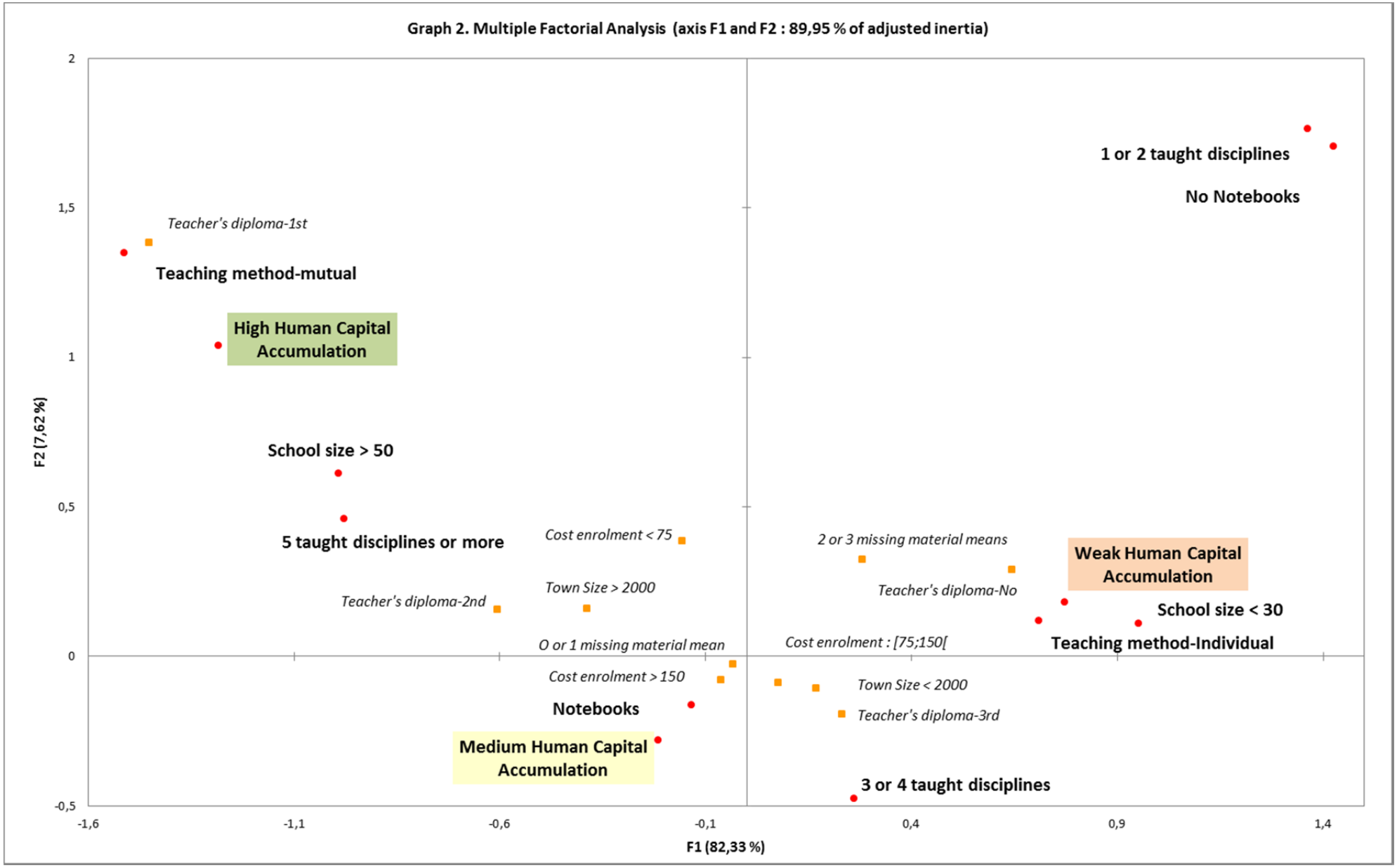
Two axes group more than 89% of the adjusted inertia (Greenacre, 1984) essentially supported by the first axis. According to weakness of their relative contribution, '*simultaneous method*' and '*school size [30; 50[*' will be removed from the analysis.

This highlights a polarisation of French education along the first axis (horizontal). The left end of the axis represents a situation favourable to human capital accumulation and the right end a situation unfavourable to human capital accumulation. These two situations highly depend both on the human and material resources of the schools.

So, it seems that at the beginning of the nineteenth century, France had a two-speed educational system: on the one hand, we observe large schools that are well-endowed in human and material resources, which contributed strongly to human capital accumulation;

and, on the other hand, small schools less well-endowed and which played a lesser part in human capital accumulation.

It appears that most of the best schools are costly and generally located in large towns. We can see that these schools are also linked with low enrolment costs. This can be explained by the fact that schools using the mutual method were located in large towns. This was indeed costly, but sometimes it was supported by philanthropic societies. Still, these costs were an impediment to the education of children from rural backgrounds, whose families had difficulty meeting enrolment costs and preferred their children to help them on the farm.


Graph 2. Multiple Factorial Analysis (axis F1 and F2 : 89,95 % of adjusted inertia)
2
1,5
1
0,5
0
-0,5
F2 (7,62 %)
-1,6
-1,1
-0,6
-0,1
0,4
0,9
1,4
F1 (82,33 %)
1 or 2 taught disciplines
No Notebooks
Teacher's diploma-1st
Teaching method-mutual
High Human Capital Accumulation
School size > 50
5 taught disciplines or more
Cost enrolment < 75
Town Size > 2000
Teacher's diploma-2nd
O or 1 missing material mean
Cost enrolment > 150
Notebooks
Medium Human Capital Accumulation
2 or 3 missing material means
Weak Human Capital Accumulation
Teacher's diploma-No
School size < 30
Cost enrolment : [75;150[
Teaching method-Individual
Town Size < 2000
Teacher's diploma-3rd
3 or 4 taught disciplines

Conclusion

This paper uses the results of Guizot's inquiry to examine the process of human capital accumulation in France at the dawn of the nineteenth century. Indicators such as literacy rates or education enrolment rates are proxies commonly used in the literature to evaluate the French endowment in human capital, but both have significant flaws and produce evaluations of questionable reliability. We proposed to use data from the inquiry to frame an original proxy for human capital, namely student achievement; this allows us to measure the accumulation of knowledge directly, evading the problems associated with the fact that literacy rates for this period are extrapolated from signatures on marriage registers or conscript's declarations. Instead, our examination leads us to emphasise the heterogeneity of the French educational landscape in this period. We reveal a two-speed educational system: on the one hand, there were large schools well-endowed in human and material resources which contributed strongly to human capital accumulation, and on the other hand, small schools less well-endowed which played a weak role. This result also underscores that the use of enrolment rates in elementary education can be misleading in the evaluation of human capital, since some schools contributed very weakly to knowledge accumulation; yet these rates are still very often used to analyse the role that human capital played in the beginning of the French industrial revolution. In further research, our approach invites a reappraisal of the role of human capital in the process of industrialisation – which is currently thought to be minor, at least for the first phase of industrialisation – by using the proxy we propose here, namely pupil's achievement.

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Appendix 1: The original questionnaire of the Guizot inquiry

QUESTIONS.	Canton nord d'Issoudun les bordes	id. id. Issoudun	id. id. Issoudun	id. id. Issoudun	id. id. Saudy	id. id. Reuilly
L'instituteur est-il logé? La commune lui fait-elle un traitement fixe? Quel en est le montant?	non oui 200f	non non "	non non "	non non "	oui oui 200f	oui oui 160f
L'instituteur jouit-il de quelque autre traitement comme secrétaire de la mairie, chantre, etc.?	non "	non "	non "	non "	non "	Secrétaire de la mairie 300f
L'école est-elle entièrement gratuite; ou bien n'y admet-on gratuitement que les enfants indigents? Quel est le nombre de ceux-ci?	Payante "	Payante "	Payante "	Payante "	Payante 10 gratuits	Payante 6 gratuits
Quelle est la rétribution payée par les élèves non gratuits?	1.50; 1; 0.75	1.50; 1.00	2f; 1.50	3f	1.25; 1; 0.75	1.50; 1f
L'école est-elle commune aux enfants des deux sexes?	oui	non	non	non	non	non
A quel culte appartient-elle? Les élèves d'un autre culte y sont-ils admis?	catholique	catholique	catholique	catholique	catholique	catholique
L'instituteur est-il autorisé à recevoir des élèves pensionnaires?	non	non	non	non	non	non
A quel âge les enfants sont-ils admis à l'école?	6 ans	5 ans	4 ans	7 ans	5 ans	5 ans
Quel est le nombre moyen des années qu'ils y passent?	4 ans	3 ans	6 ans	6 ans	[illegible]	6 ans
Quel est le nombre des élèves? En hiver. En été.	30 20 10	24 id. id.	35 id. id.	54 id. id.	35 35 incertain	50 50 20
Quelle est la méthode d'enseignement suivie dans l'école?	Simultanée	Individuelle	Simultanée	Simultanée	Mutuelle	Simultanée
Si c'est la méthode mutuelle, le mobilier de classe est-il suffisant? Se compose-t-il des tableaux et autres objets d'enseignement envoyés dès l'origine par l'une des sociétés pour l'instruction primaire, ou bien les tableaux ont-ils été renouvelés? Par qui ces tableaux ont-ils été publiés?	"	"	"	"	mobilier suffisant Tableaux id. acquis par la commune Colas, à Paris	"
Les élèves sont-ils pourvus de livres uniformes et en nombre suffisant?	oui, pour la 1re Div. non pour les autres	non	oui	oui	oui	oui
Quels sont ces livres?	Télémaque, Alphabets de textes différens	abécédaires, Bible, histoire sainte	Télémaque, Catéchisme historique, abécédaires manuscrits	Télémaque, Simon de Nantua	morale en action, Tableaux de lecture, Gram., arith.	morale en action, Simon de Nantua, Civilité, Gram. d'Lhomond
Quels sont les objets dont manque l'école?	Tableaux de lecture id. d'arith. id. noir en bois	id. id. id.	id. id. id.	rien	rien	rien
Quels sont les moyens de les lui procurer?						
Quelles sont les matières de l'enseignement: instruction religieuse (histoire sainte et catéchisme), lecture, écriture, orthographe, grammaire, arithmétique, arpentage, dessin linéaire, géographie, histoire, musique.	lecture écriture arith.	lecture écriture	lecture écriture [illegible]	lecture écriture, Gram. [illegible]	lecture écriture [illegible]	lecture écriture [illegible]

QUESTIONS.	Canton nord d'Issoudun, les Bordes	Canton nord id. Issoudun	id. id. Issoudun	id. id. Issoudun	id. id. [illegible]	id. id. Reuilly
Comment l'école est-elle tenue, sous le rapport de l'ordre, de la discipline et du travail?	bien	assez mal	bien	Très bien	Très bien	faiblement tenue
Quel est l'état de l'enseignement? Les élèves font-ils des progrès?	faible peu	très faible bien peu	assez bon oui	bon oui	bon oui	faible peu
Leurs cahiers sont-ils bien tenus? (Les visiter, interroger les élèves, les faire interroger devant soi par le maître, et faire faire tous les exercices de l'école.)	passablement	mal	assez bien	très bien	très bien	assez bien
Nom et prénoms de l'instituteur.	Martinet Étienne Maurice	Courant Antoine	Collas Jean Bte.	Dessiaux Joseph	Ravaud Jean Auguste	Guillero Louis Antoine
Son âge. Est-il célibataire, marié ou veuf?	61 ans marié	54 ans marié	58 ans marié	35 ans marié	20 ans célibataire	25 ans célibataire
S'il est marié ou veuf; a-t-il des enfants; quel en est le nombre, l'âge, le sexe; sont-ils à sa charge?	un enfant; 30 ans non.	4 enfants mâles de 10 à 27 ans. un seul à sa charge	non	un enfant; 12 ans à sa charge	"	"
Quelle est sa position de fortune personnelle?	1200f. à lui	rien	rien	de 4 à 5000f.	rien	rien
A-t-il un brevet; de quel degré? A-t-il une autorisation; de quelle date?	3e degré 1er juillet 1817	3e degré 26 juillet 1820	3e degré 15 avril 1826	2e degré 5 juin 1819.	2e degré non reçue	2e degré 22 juin 1833
L'instituteur a-t-il été exempté du service militaire en cette qualité?	Ancien militaire	non	non	non.	"	remplacé
Sort-il d'une école normale, et de laquelle?	non	non	non	non	non	non
A-t-il obtenu une médaille d'encouragement ou une mention honorable?	non	non	non	oui	non	non
A-t-il de la capacité, de l'aptitude et du zèle pour ses fonctions? Comment s'acquitte-t-il de tous ses devoirs d'instituteur?	oui bien	peu assez zélé	du zèle, quelque capacité. bien	beaucoup. bien	beaucoup bien.	capacité, zèle bien
Quelles sont les qualités qui le distinguent? Quel est son caractère? Est-il exempt de toute violence, de tout emportement? S'abstient-il toujours de frapper les élèves? Fait-il remarquer en lui quelque défaut? Sa conduite est-elle régulière?	honnêteté, conduite bonne doux. oui oui non oui	id. un peu emporté pas toujours non oui	bonne conduite, honnêteté, doux oui pas toujours non oui	honnêteté, douceur doux oui oui non oui	id. doux oui oui non oui	id. un peu léger oui oui non oui
Sait-il s'attirer le respect et l'affection de ses élèves, l'estime de ses concitoyens et la bienveillance de l'autorité? Est-il bien avec le curé ou ministre, et, dans le cas de la négative, de quel côté paraissent être les torts?	oui	oui	oui	oui	oui	oui
Ne forme-t-il que des relations honorables, et évite-t-il les sociétés et les habitudes qui ne conviennent pas à la gravité de son état?	oui	oui	oui	oui	oui	oui
N'exerce-t-il pas quelque autre profession ou commerce peu compatible avec les fonctions de l'enseignement?	non	non	non	non	non	non
Indiquer les communes où les instituteurs se réuniraient en conférences, et où existerait une bibliothèque contenant des livres d'instruction primaire.	Issoudun	Issoudun	Issoudun	Issoudun	Issoudun	Reuilly