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Gendered Study Choice and Prestige of Professions: France in the Long 20th Century

Claude Diebolt & Magali Jaoul-Grammare[1]

Abstract: School choice factors play a different role according to gender. According to the literature, women have "adaptative exceptations" whereas men have so called "static exceptations". Men and women adopt also different attitudes to expected payoffs, to risk or towards their level of aspiration. Finally, women generally associate their career plans with their life plans, which influences their choice of studies. But, what about social prestige, i.e. does the prestige of profession play an identical role in the demand for education among men and women? More specifically and over the long term, is the phenomenon of substitutability between prestigious career paths equally true for men and women? Finally, does the medical sphere regulate the male and female education systems equally? The ambition of this contribution is to contribute to the discussion using an unpublished historical dataset for France in the long 20th century.

Keywords: Study choice, Gender, Prestige of professions, France.

JEL Codes: I21, J24, N34.

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Introduction

In the late 19th century, the hypothesis was put forward, that a glutting was manipulated and augmented by the conservative Prussian government to prevent members of the lower social classes from studying and to restore the social exclusivity of the Prussian Universities. This crisis had a large impact on the public discussion surrounding academic education and culminated in references to a growing "academic proletariat". During a great debate in parliament the Prussian minister of culture —Gustav von Goßler— asked, with the acclamation of the conservatives: How many students are necessary to maintain the size of the governing classes? A secret prognosis of student enrolments, which had been made by Wilhelm Lexis, was used to successfully push through political measures designed to diminish student populations. But all these efforts were unsuccessful and after a short cyclical recession, student populations grew at a much faster rate than they had beforehand (Titze, 1990, Müller-Benedict, 1991, 2000).

It became rapidly clear that the dynamic of the process that led to glutting was probably independent of political influences. According to Diebolt (1994, 1997, 2001) and Diebolt and El Murr (2004a,b) it appears that expected wages and available positions on the labour market have played an essential role in the evolution of the Prussian and German student enrolments in the various university fields and led to a glutting phenomenon. The glutting itself leads to substitutability between university streams. If substitutability between two thematically similar courses of study is conceivable (e.g. science and medicine), it becomes more complex to envisage between two thematically opposed courses of study (e.g. law and medicine).

In addition to expected wages and available positions on the job market, another factor seems to play a role both in career choices and on the demand for education: the social prestige associated with a profession (Ferschtman and Weiss, 1993, 1998; Diebolt and Demeulemeester, 2011). More precisely, it appears that two thematically different training courses can be substitutes for each other when they are associated with prestigious professions (Jaoul-Grammare, 2014).

In France, despite their thematic differences, the Law and Medicine streams, for example, are substitutes in terms of educational demand, thanks to the prestige associated with them. It also appears that the medical sphere has a regulating role: any event affecting it has implications on the entire system of prestigious studies. However, these results relate to students as a whole. Yet school choice factors play a different role according to gender. First of all, it appears that women have more “adaptative exceptations” whereas men have so called “static exceptations” (Demeulemeester, 1994). Next, men and women adopt different attitudes to expected payoffs (Page, Levy-Garboua and Montmarquette, 2007), to risk (Halek and Eisenhauer, 2001, Eckel and Grossman, 2008) or towards their level of aspiration (Gneezy et al., 2003; Page et al., 2007, Bugeja-Bloch and Couto, 2018). Finally, women generally associate their career plans with their life plans, which influences their choice of studies (Duru-Bellat, 2004, Jaoul-Grammare, 2023, 2024). But, what about social prestige, i.e. does the prestige of profession play an identical role in the demand for education among men and women? More specifically and over the long term, is the phenomenon of substitutability between prestigious career paths equally true for men and women? Finally, does the medical sphere regulate the male and female education systems equally?

Our ambition is to address these questions using an unpublished database spanning more than a century. After a presentation of the state of the art (1), the theoretical model of glutting (2) and its previous empirical evaluations taking social prestige (3) and the gendered roles of study choice factors (4) into account, we present the database (5), the methodology (6), before discussing the results (7).

1. State of the art

If one refers to historical works, there were always (or at least since the end of the 19th century – see Gispen, 1989 for the case of engineering) heavy discussions concerning a possible overproduction of graduates, with concomitant social and political problems (coupled with the emergence of an academic proletariat and the concomitant possible social and political instability; see Windolf, 1990). In 1904 for example, Eulenburg suggests a positive relation between phases of economic depression and development of the higher education in the direction where an economic deceleration or a rise of unemployment supports the increase in the number of students.

The issue of overeducation but also of scarcity of high skills was pervasive since the beginning of the Industrial Revolution. Economic analysis however did not take the problem seriously until very late, despite early considerations by Prussian civil servants in the early 19th century or the concerns of Friedrich List (1841) regarding the proper design of an optimal education policy accompanying the industrial development process led by a (temporarily protectionist) strategic public authority. It was likely that higher education graduates were not central in the early phases of economic development in Europe – so that economists were not very concerned by the issue of human capital. Even if Smith (1776) introduced the concept as early as the end of the 18th century and suggested a formal analogy between investment in skills and in physical capital, one had to await for the post World War 2 period to witness the blossoming of a human capital theory – and by the way a model of educational choice (Becker, 1964). These early analytic contributions mainly dealt with labor economics issue (determinants of earnings) and growth (see the first intuition of Schultz, 1963, on the role of human capital and the model of technological diffusion and imitation by Nelson and Phelps, 1966). The belief up to the end of the 60s was that the development of higher education in an increasingly technological economy was of tantamount importance and that a lack of skilled manpower will be the problem rather than its excess. The early successes of the Soviet spatial programs (Sputnik, 1958) were also instrumental in conveying the intuition that developing technical mass (higher) education could only be positive for growth. Empirical works on the determinants of wages and private rates of return (Mincer, 1958) and theoretical work on growth (Uzawa, 1965) seemed to foster the widespread belief in the virtues of the massive expansion of higher education (that all Western countries witnessed during the 60s), and that the latter should be publicly funded. No debates arose concerning possible cycles in higher education.

One had to await the worldwide economic crisis of the 70s to witness increasing awareness among economists of an excess supply of graduate problem (Freeman, 1976). Richard Freeman (1971, 1973) was a pioneering analyst of cycles in academic markets – using the recursive cobweb models to show that periods of oversupply (and the correlate decline in economic benefits associated to the specific orientation) were followed by periods of scarcity of graduates in specific sectors, as bad economic conditions led prospective students to choose alternative study paths. These first models were quite simplistic as they only allow for static expectations (prospective students tend to assume that future conditions on the labor market will be the same in the next years – when they will enter the labor market after a "production process" of several years at the university). Freeman and other authors also tested for "adaptive expectations" and very soon this line of research was also influenced by the rational expectation revolution. Siow (1984) and Zarkin (1983, 1985) developed sophisticated models including rational expectations assumptions for the labor market of professor and lawyers. Interestingly, they show that even if one assumed rational expectations on the part of the students, cycles appear.

More sociological works (Windolf, 1990, Haas and Windolf, 1993) on the diffusion and expansion of higher education also show the presence of cycles in a long run perspectives as well as phases of expansion (like a diffusion process). The research on cycles in higher education fell asleep during the 90s and early 2000s echoing the renewed interest of economists for growth processes (endogenous growth in peculiar, Romer, 1986, 1990, Lucas, 1988).

However, works in labor economics still continue to analyze such issue as overeducation, the impact of overall unemployment and business cycle on higher education enrollments (Diebolt and Guironnet, 2012). The economic and financial crisis of 2007-2009 led to a renewed interest on the link between business cycle and higher education participation, as well as orientation choices (OECD, 2011). Policy makers and economists worry about the rationality of students choices: do they react to economic incentives, do they choose the "right" fields of study, i.e. those likely to be in demand on the labor market in the near future?; and wonder whether interventions and regulations can improve upon the current situation (e.g. the debate around the so-called numerous clauses in medical schools).

2. Substitutability and the theoretical model of glutting

In economic terms, two goods X and Y are said to be substitutable if their respective demands vary in opposite directions, i.e. if a variation in consumption of one is offset by a variation in consumption of the other. They have identical characteristics and satisfy similar needs. In this case, an upward [downward] variation in the price of good X will lead to a downward [upward] variation in demand for the same good, and an upward [downward] variation in demand for good Y. The cross-elasticity of demand for X with respect to the price of Y is positive.[2]

Thus, two academic sectors are said to be substitutable when a fall in the number of enrollments in one sector is accompanied by an increase in the number of enrollments in the other. Conversely, if the two sectors simultaneously undergo a similar upward or downward trend, we speak of complementarity. Of course, these effects are previously driven by a rise or fall in wages in the corresponding professions. However, we are dealing here with an income effect rather than a price effect, which, if negative, would indicate a complementary relationship. Indeed, if the cross-elasticity between two streams I and J is negative [resp. positive], i.e. if there is substitutability [resp. complementarity], if the income of occupation I increases, students in the corresponding stream will increase and those in stream J will decrease [resp. increase].

The glutting model by Diebolt (2001) accounts for these phenomena by taking as its starting point the choice behavior of students in terms of university courses. Students base their choice of studies on the expected income from the various professions and the availability of funds within the professional sector.[3] As a result, the distribution of students among the various universities is conditioned by this choice behavior.

As by Freeman (1976), the expected salary plays an essential role, and depending on the availability of work and the evolution of salaries, we observe a cyclicality in the distribution of students in the various faculties, which can be modelled in the form of a cobweb model Diebolt & El Murr (2004a,b) on Figure 1.

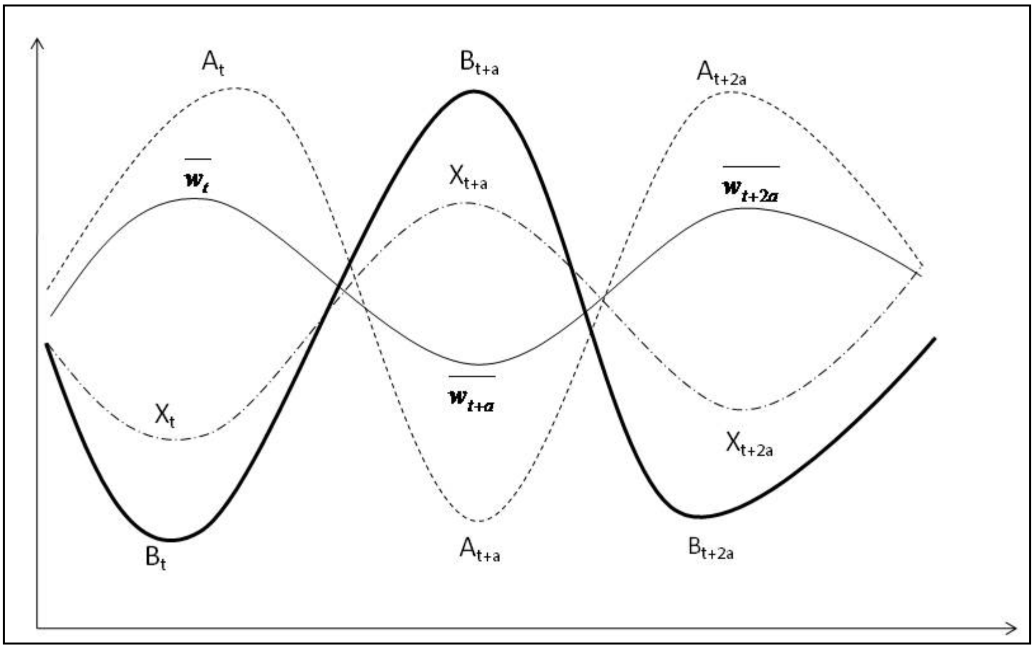
In t, i.e. 2 higher education streams A_t and B_t leading respectively to professions X_t and Y_t for salaries w_t^X and w_t^Y. When profession X tends to be saturated, profession Y experiences a period of shortage; this modifies relative salaries $\overline{w_t} = w_t^X / w_t^Y$ and, by the same token, the study choices of individuals, who will then opt for stream B instead. The

[2]Conversely, two goods X and Y are said to be complementary if their respective demands vary in the same direction, their consumption being proportional. In this case, any variation in consumption of good X will lead to an identical variation in consumption of good Y.

[3]However, the author stresses the restrictive nature of this assumption of perfect rationality on the part of individuals: "*We are nevertheless aware that uncertainty, risk and imperfect information (wage illusion in particular) are essential factors of socio-economic life that students have to deal with when making their investment decision. If necessary, they can help us to better understand the "sub-optimality" of their choice*", Diebolt (2001).

number of B stream graduates will then increase, filling the shortage in occupation Y. We then have a saturation situation in profession Y and a shortage in X.

Figure 1. The glutting cycle (Diebolt and El Murr, 2004a)



To model these phenomena, in the early 2000s, Claude Diebolt (Diebolt, 2001, Diebolt and El Murr, 2004a,b) developed a partial equilibrium model, under conditions of perfect competition and rationality of agents, which he empirically tested for Germany between 1820 and 1941. Indeed, the evolution of students in the various faculties in Germany over this period suggests, on the one hand, a cyclical evolution of the number of individuals within a faculty, and on the other, an a-cyclical evolution of students in two competing faculties. Among other things, it calculates net cross-elasticities between streams and occupations, and shows the existence of substitutability between different streams and occupations. In addition, it highlights the parallel evolution of faculty and profession enrolments and their respective salaries. However, the substitution phenomena described by the glutting model suggest that the courses of study that can be substituted are thematically close: indeed, if an individual's first choice is not satisfied or is poorly satisfied, he or she may opt for a faculty that is thematically close, thus implying substitution between the various courses of study. A law student, for example, is more likely to choose literary studies over scientific ones, partly because of his or her academic background, but also because of a more pronounced taste for literary studies. However, using the same database for Germany, Jaoul (2004ab, Diebolt and Jaoul-Grammare, 2007) highlight substitution effects between different faculties.

In line with the empirical work carried out by Diebolt and Demeleumeester (2011), it appears that there is a factor of choice for individuals that can explain the phenomenon of substitution between two thematically different faculties: the social prestige accorded to a profession (Jaoul-Grammare, 2014).

3. Social prestige: an explanation for the phenomenon of substitution between thematically different streams

Although economists have long recognized the importance of sociological considerations such as honor or esteem in choice theory (Smith, 1776, and Marshall, 1890) already mentioned the importance of recognition in individual behavior-, their introduction into economic theory was much later. As far as social status is concerned, economists have not paid sufficient attention to it (Fershtman and Weiss, (1998) in individual behavior, preferring instead to focus on the monetary aspects of a choice of profession. Conversely, to characterize a profession, sociologists take into account a wide range of variables, of which social status is an essential component.

Weber (1922) was the first to evoke the notion of social status, which he defined as "the demand for social esteem in terms of positive or negative advantages". As early as 1950, De Bruijn emphasized, in the case of the Netherlands, the role of the social prestige attached to certain professions in people's choice of direction, and the discrepancy between the education given to individuals and society's economic needs. Following a survey establishing a social value for a hundred or so jobs in Japan, Nisihira (1968) shows that the professions at the top of the ranking concern managerial functions requiring in-depth knowledge and a high level of qualification. Japan is no exception. Treiman (1977) shows that there is an almost constant ranking of occupations by individuals, whatever the country and whatever the time (Blau and Duncan, 1967, Hodge, Treiman and Rossi, 1966, Treiman, 1977).

In France, the results obtained (Chambaz et al. 1998) are very close to the international SIOPS nomenclatures (Ganzeboom and Treiman, 1996), which show that the professions of doctor and lawyer are at the top of the ranking: they are respectively ranked

3rd and 4th on the French scale, and 1st and 2nd on the SIOPS scale. Indeed, these two professions, presented as "the top layer of the liberal professions" (Haupt, H.G., 1993), have long represented success and upward mobility. "Families perceive careers for their children as lawyers, magistrates, soldiers or tax collectors, but not in commerce or industry" (Chaper, Prefect of Burgundy in 1835, quoted by Haupt, 1993).

However, the prestige of one profession over another depends on the country's historical, economic and institutional conditions. In fact, depending on the socio-economic and historical context, and on the needs of the economy for a given professional, individuals will have a changing perception of professions. So, at a given moment in a society, a profession X may be perceived as more prestigious than another profession Y, and therefore preferred to the latter. This has two consequences: on the one hand, individuals will adapt their educational choices (Fershtman and Weiss, 1993, (1998) by opting for training associated with professions perceived as prestigious, and on the other, professionals perceived as less prestigious, feeling "wronged", will have organized themselves in such a way as to modify and influence educational decisions and sometimes, will even be at the origin of certain economic reforms (Baszanger, 1986, Demeulemeester and Diebolt, 2011). Eventually, another profession will find itself in the position perceived as prestigious, and this will once again turn individuals away. In this way, professions that on the face of it seem to be at odds with each other, such as lawyer and engineer (Demeleumeester and Diebolt, 2011), will tend to be substitutable, and consequently so will the corresponding training. In short, there is a-cyclicality in the demand for education, which is no longer guided by expected salary or availability on the job market, but by the perceived social prestige of a given profession at a given time. Using series on the number of students enrolled in law and medicine in France between 1899 and 2011, Jaoul-Grammare (2014) shows that two thematically opposed courses of study, namely medicine and law, represent two substitutable goods for students, as they are associated with prestigious professions. She also shows that the starting point for possible substitution lies within the medical sphere, with the numerus clausus acting as a regulator not just of medical studies but of the higher education system as a whole.

4. The gendered roles of study choice factors

Guidance strategies play an important role in the literature (Hoxby, 2003), and many factors have been identified as having a more or less decisive role. Risk of failure and anticipation of the future (Boudon, 1973), choice of institutions and cost of studies (Kane, 1995, Rouse, 1998, Van Zanten, 2001, 2009, Felouzis and Perroton, 2009), chance of access and interaction with peers (Montmarquette et al., 1998, Demeulemeester and Rochat, 2001, Manzo, 2007, 2009) and economic and labor market conditions (Fershtman and Weiss, 1993, Stallman et al., 1993, Freeman, 1971, Diebolt, 2001) all play a part in shaping individuals' career choices.

Over and above these factors, which are well identified in the literature, it is clear that there are gender differences in career choices (Stefanovic and Mosconi, 2007). Holland (1966) was one of the first to investigate gender differences in career interests. According to him, women more often opt for occupations with a social and conventional interest, while boys choose occupations with a realistic and investigative interest. This stems from the fact that women are negatively stereotyped in 3 main areas: quantitative skills (Frome and Eccles, 1998, Funham et al., 2002), leadership (Schein, 2001, Atwater et al. 2004, Coffman et al. 2021) and general culture (Furnham and Gasson, 1998, Furnham et al. 2002, Petrides et al. 2004, Bian et al. 2017) This results in less risky behavior on the part of girls (Page et al., 2007, Halek and Eisenhauer, 2001, Gabay-Egozi et al., 2015) associated with a lower level of aspiration (Page et al., 2007) and lower self-confidence (Klinowski, 2019).

In addition to differences of interest, Bandura (1977, 1982) takes into account the influence of the environment in which the individual evolves on his or her sense of competence. According to him, career choices are associated with a positive feeling of self-efficacy and with the fact that the individual's environment reflects such a feeling back to him. The attitude of teachers/adults towards students could then have an effect on choice behavior due to a Pygmalion effect (Rosenthal and Jacobson, 1968). As a result, girls tend to undervalue themselves and make study and career choices by underestimating their skills (Lemaire, 2005), and this is all the more marked when they evolve in an environment traditionally connoted as masculine, such as scientific fields (Bordalo et al. 2019), or when the level of perceived competition is high, as in highly selective streams (Gneezy et al., 2003, Niederle and Vesterlund, 2011, Buser et al., 2017, Cattaneo et al., 2017).

Another element to take into account is the existence of a gendered differentiation in terms of perception of expected returns on educational investment, with men tending to overestimate these returns (Botelho and Costa-Pinto, 2004). This has two consequences: on the one hand, women tend to be satisfied with lower wages than those to which they could aspire, and on the other, they tend to occupy more downgraded jobs than men (Jaoul-Grammare and Lemistre, 2014). Despite this, they display higher levels of job satisfaction than men (Perugini and Vladisavljević, 2019).

Finally, social background remains a determining factor in educational pathways, integration, wages (Dherbécourt and Flamand, 2023) and mobility (Lainé, 2010). First and foremost, the existence of a reference situation, particularly in the family, will condition individuals' decisions regarding their schooling (Easterlin, 1995). In this way, interest in a particular educational speciality can be explained by the imitation effect of individuals in relation to previous generations, or by higher aspirations in relation to their parents - a notion of social mobility (Peugny, 2009). This is referred to as upward or downward intergenerational social mobility, depending on whether or not individuals hold jobs higher than those held by their parents (Lainé, 2010, Razafindranovona, 2017). In this respect, for girls, the mother's position is more decisive than the father's (Razafindranovona, 2017), both in terms of the image conveyed of the mother's work-life balance during childhood (Court et al., 2013) and the gendered influence of the mother's profession on school careers (Bouhmadi and Lemistre, 2007).

According to the bottleneck model, the phenomenon of substitution between fields has three major causes: the expected gains in a given field; the need for young academics due to the ageing of individuals in the corresponding profession; and a significant need due to an increase in the number of jobs to be filled. In theory, when these three aspects coincide, their effects are cumulative, resulting in a considerable aspiration effect. The author's theoretical hypothesis is that this effect mainly affects those sections of the population with the weakest social positions, who seize the opportunities offered to move towards careers with a numerical deficit.

On this basis, our objective here is to see whether the substitution phenomena between law and medicine, due to prestige, can be observed in both women and men.

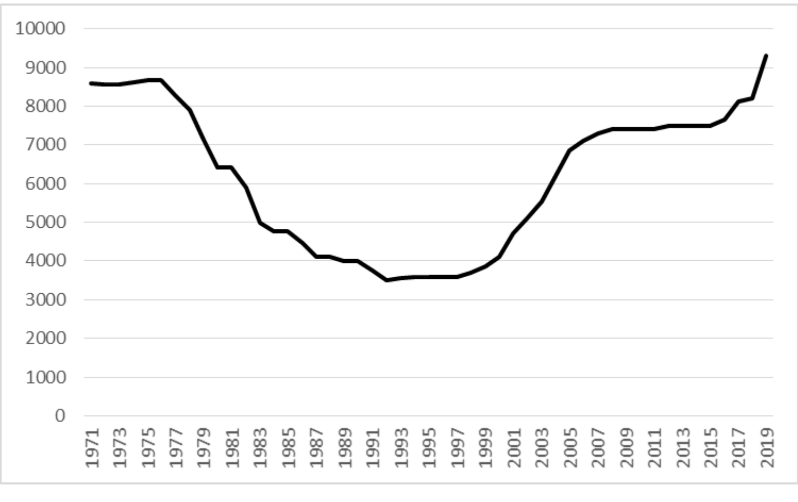
5. The dataset

Our empirical analysis is based on a study of the distribution of students in medical and law faculties in France. This unprecedented database required extensive reconstruction, verification and correction work. The study period covered extends from 1899 to 2022 in mainland France, with territorial mutations inherent to the historical context: from 1900 to 1919, the University of Strasbourg is excluded from the data, and for the period 1915-1918, the University of Lille is excluded from the field of study.

Student numbers in the faculties of medicine and law are taken from Diebolt's cliometric work for the period 1899-1963. The period 1963-2005 is based on the archives of the French Ministry of Education. Finally, from 2005 to 2022, the data is taken from Repères et Références statistiques published by the DEP. We have taken into account the total number of students at all levels, as well as the breakdown by gender.

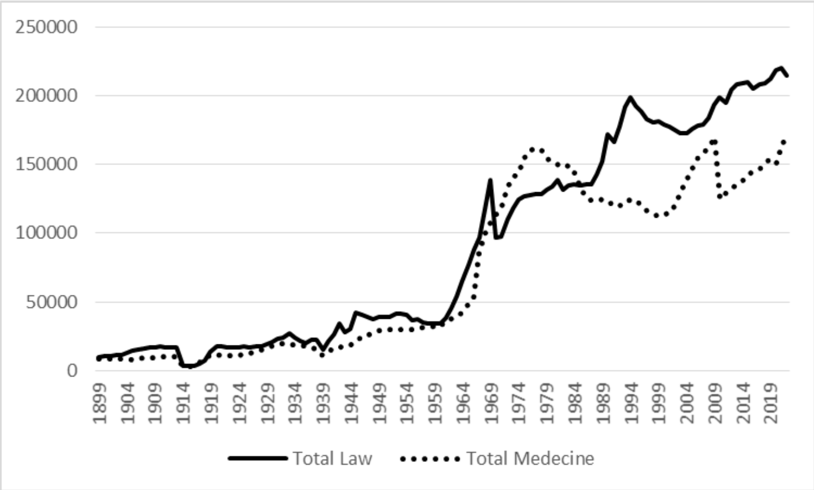
The series relating to the numerus clausus in medicine comes from the "Eco-Santé" statistical database of IRDES (Institut de Recherche et Documentation en Economie de la Santé) and covers the period 1971-2020, when the numerus clausus was replaced by the numerus apertus. While this quota remained relatively stable for the first six years, it fell sharply until 1992, when only 3,500 students were authorized to continue their studies after the first year of medicine. It then rose steadily until 2008, when it stabilized at around 7,400 (Figure 2).

Figure 2: Numerus clausus for medical studies in France, 1971-2019



Apart from declines during the two world wars, total student numbers in medicine and law remained relatively similar until the early 1970s, when the numerus clausus was introduced (Figure 3). From then on, the numbers of students in these two faculties developed a-cyclically.

Figure 3: Total number of students in Law and Medicine in France, 1899-2022



This a-cyclical trend is repeated when considering students by gender, with a phenomenon that seems more marked for male students than for female students, the latter experiencing a general upward trend that goes hand in hand with the expansion of female education in general (Jaoul-Grammare, 2013, 2018, 2022).

Figure 4: Male law and medicine students in France, 1899-2022

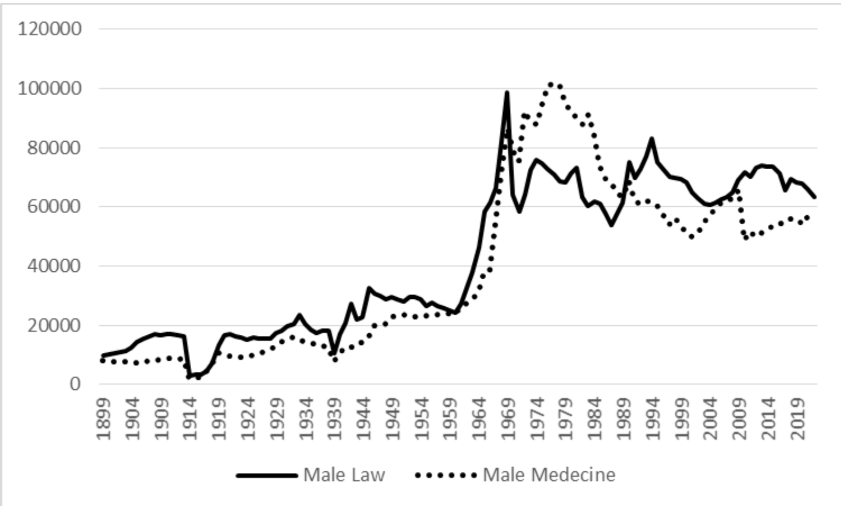
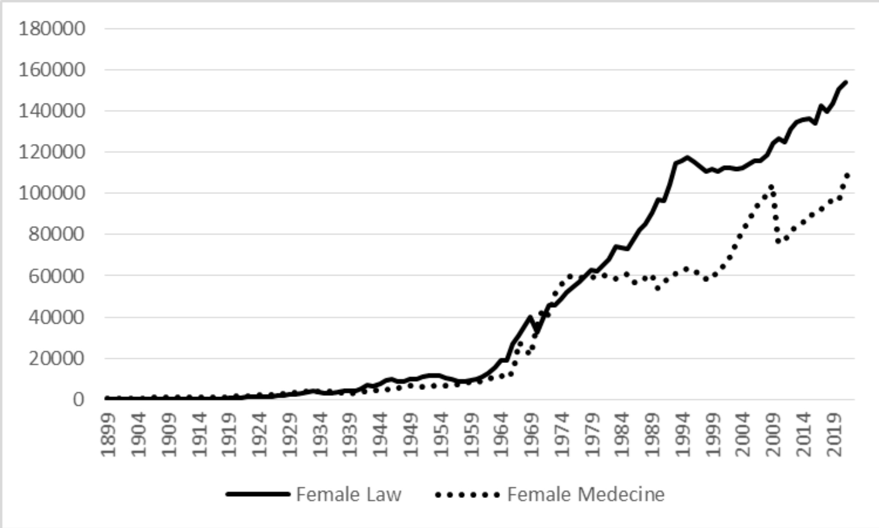


Figure 5. Female students in law and medicine in France, 1899-2022



On this basis, our analysis aims to answer two questions: is the phenomenon of substitution according to prestige between faculties a gendered phenomenon? Does the numerus clausus play an identical role for girls and boys? To do this, we have used the causality approach initiated by Granger.

6. The methodology

Granger's causality requires the work within the framework of the non-structural VAR. In order to analyze the relationship between the various variables, we adopt the framework of Vector Autoregressive Model (VAR), introduced into the historical research by Eckstein *et al.* (1984)[4]. Non-structural VAR models present the advantage to take into account the intrinsic structure of the series and the dynamical effects between variables, offering more reliable analyses at the dynamical level than traditional models.[5] They also offer the possibility to consider all causal relationships between variables without *a priori* on their potential endogeneity. In a VAR model, the variables are both exogenous and endogenous.[6]

[4]"*The methodology of vector autoregression appears useful for studying historical series on climatic, economic and demographic variables where we do not yet have a sufficient theoretical foundation for specifying and estimating structural models*", p. 295.

[5]The intrinsic structure of the series is related to its identification in the ARIMA classification (Box and Jenkins, 1976).

[6]Non-structural VAR models are sometimes criticized for requiring to include in the model a number of variables matching the degree of freedom in order to avoid estimation problems (Johnston, 1999), and for the lack of theory on which they rely.

Despite their historical opposition, there is a link between non-structural and structural model and it's easy to move from one to another (Monfort and Rabemanajara, 1990; Hendry and Mizon, 1993). In such models, each equation describes the evolution of a variable in function of its own lagged values and of the lagged values of other variables of the system.

A VAR modeling can be written as:

$$X_t = \sum_{i=1}^{p} A_i X_{t-1} + \varepsilon_t \quad \Leftrightarrow \quad \Phi(\mathrm{L})\, X_t = \varepsilon_t, \qquad (1)$$

Where, X_t is a $(n \times 1)$ vector of variables, A_i is a $(n \times n)$ matrix, p is the optimal lag of the model,[7] and ε_t is a $(n \times 1)$ vector of innovations /residuals. $E(\varepsilon_t \varepsilon'_t) = \Sigma$ is a symmetric positive $(n \times n)$ matrix. $\Phi(L) = \left(L - \Phi_1 L - \Phi_2 L^2 - \cdots - \Phi_p L^p\right)$ is a polynomial lag operator as $L^k \mathrm{X}_k = X_{t-k}$.

The use of this type of model requires beforehand to test for various assumptions.

Step 1.— First of all, it is necessary to work with stationary variables[8]. Therefore, we use the unit root test of Elliott, Rothenberg and Stock (1996) – that is considered more efficient (Salanié, 1999) than the classic test of Dickey-Fuller (1979) –to determine the order of integration for all the series. Once variables are stationary, we select the optimal number of lags – that needs to be sufficiently big for residuals to become white noises. Several criteria contribute to determine optimal lags. All of them are based on the maximization of the log-likelihood function. Next, we proceed to the bivariate/multivariate cointegration analysis.

Step 2. — The presence of cointegration relationship(s) has then to be tested (Engle and Granger, 1987; 1991). To do so, we use the Johansen test (1988). Variables are said to be cointegrated if they exhibit long-run stable relationship(s), namely if they share common

[7] There are several criteria to determine the optimal lag of a VAR modeling (Akaike, 1974; Schwartz, 1978; Hannan-Quinn, 1979), based on the maximization of the logarithm of the log-likelihood function. Here, the optimal lag of the model is the one which satisfies most criteria.

[8] A X_t process is known as stationary if all its moments are invariants for any change of the origin of time. There are two types of non-stationary processes: the TS processes (Trend Stationary Processes) which present non-stationarity of the deterministic type and the DS processes (Difference Stationary Processes) for which non-stationarity is due to a random type. These processes are respectively stationarized by a deviation from the deterministic trend and with a differences filter. In this last case, the number of filters indicates the order of integration of the variable. A variable is integrated of order "D" if it is necessary to differentiate it "D" times to make it stationary.

trends. The presence of cointegration needs to be corrected (Vector Error Correction Model) in order to avoid any problem of fallacious regressions (Granger and Newbold, 1976).

Step 3. The detection of Granger causal relationships allows for a better understanding of economic, demographic and educational phenomena, but may also contribute to provide better economic policies. There are two approaches of causality (Granger, 1969; Sims, 1980), which are generally equivalent (Bruneau, 1996).[9] We choose here a Granger test (1969) as we consider the potential relationships between our variables not depending on a stochastic context.[10]

To study the direction and sign of causality, we investigate how our variable of interest reacts when a change occur on the second variable. Considering a two-variable model, Equation (1) can be written as follows:

$$\begin{bmatrix} X_t \\ Y_t \end{bmatrix} = \begin{bmatrix} A_1 & B_1 \\ C_1 & D_1 \end{bmatrix} \begin{bmatrix} X_{t-1} \\ Y_{t-1} \end{bmatrix} + \begin{bmatrix} A_2 & B_2 \\ C_2 & D_2 \end{bmatrix} \begin{bmatrix} X_{t-2} \\ Y_{t-2} \end{bmatrix} + \cdots + \begin{bmatrix} A_p & B_p \\ C_p & D_p \end{bmatrix} \begin{bmatrix} X_{t-p} \\ Y_{t-p} \end{bmatrix} + [\varepsilon_t] \quad (2)$$

Then, for a causal relationship going from variable X to variable Y, the sign of this relationship is determined by the sign of the following ratio:

$$\sigma_{X \to Y} = \frac{\sum_{i=1}^{p} C_i}{1 - \sum_{i=1}^{p} D_i}, \quad (3)$$

Step 4. — Finally, we explore the dynamic relationship linking our variables of interest. The dynamic analysis consists in studying the effects of exogenous variables on the endogenous ones. Although VAR models consider all the variables exogenous and/or endogenous, the dynamic analysis requires considering innovations as exogenous variables. The simulation of shocks on innovations for each variable helps us to understand how (impulse response function) and to what extent/proportion (variance decomposition) others variables are impacted. In other words, we observe how a simulated shock on the innovation of the variable X affects the variable Y.

[9] Granger causality relates to the propagation of deterministic impulses such as structural changes. On the contrary, Sims analysis is based on the propagation of stochastic impulses representative of “surprises”.

[10] The definition of causality is given by Granger (1969): the variable X causes the variable Y if the prediction of Y is improved when one incorporates information concerning X and its past into the analysis.

Formally, the dynamic analysis consists in studying the residual part of equation 1. The right-hand part of the equation represents the “infinite moving average” of the VAR modeling, VMA (∞); where M_i is the matrix of impact multipliers and $M_0 = I_n$. Thus, a shock which affects the innovation ε_t at time t will be reflected in all future values of X through M_i.

$$\Phi(L)X_t = \varepsilon_t \quad \Leftrightarrow \quad X_t = \Phi^{-1}(L)\varepsilon_t = \Psi(L)\varepsilon_t = \sum_{i=0}^{\infty} M_i \varepsilon_{t-i}, \qquad (4)$$

where Σ represents the variance-covariance matrix.

We apply the Choleski decomposition to $\Sigma = PP^{-1}$, where P is an upper triangular matrix with positive diagonal elements. Thus equation (4) becomes:

$$X_t = \sum_{i=0}^{\infty} C_i P P^{-1} \varepsilon_{t-i} = \sum_{i=0}^{\infty} \Psi_i \, u_{t-i} \qquad (5)$$

with $\Psi_i = C_i P$ and $u_{t-i} = P^{-1}\varepsilon_{t-i}$. (6)

The variance-covariance matrix of u_t equals the identity matrix and Ψ_i represents the response of the system after i period – following a normalized and independent shock on the innovation. The simulation of shocks allows us to analyze the direction and the intensity of their repercussions and impacts.

7. The results

Our analysis takes place in two stages: firstly, we study the period as a whole and then we analyse the period 1971-2020 in order to measure the effects of the *numerus clausus*.

7.1. 1899-2022

The unit root tests lead us to stationarize all the variables as presented in Appendix 1A. A necessary condition for cointegration between two variables is that they are integrated of the same order, so we test for the presence of cointegration; this is rejected by the Johansen tests (Appendix 1B). We can therefore conclude that there is no stable long-term relationship between the variables studied.

Over the entire period, our analysis reveals a substitution phenomenon between the total number of students in law and medicine faculties. Indeed, there is a negative causal relationship from the total number of students in medicine to the total number of students in law (Appendix1C). Thus when the number of students in medicine knows a decline, the number of students in law increases. This influence is confirmed by variance decomposition and shock simulations (Appendix 1D). 13% of the variations of the number of students in law are caused by those enrolled in medicine. The simulation of a positive shock on the number of medical students initially leads to a positive short-term increase in the number of law students, followed by a negative impact which diminishes after 5 years.

When men and women are taken separately, the substitutability relationship is observed for men, with enrolments in medicine negatively affecting those in law (Appendix 1C). This relationship of dependence is greater than for the total number of students: 34% of variations in the number of law students are due to variations in the number of medical students. The impact is transitory: a positive shock to the number of medical students has a negative effect on the number of law students for 4 years, then diminishes after 5 years (Appendix 1F). The causality analysis also reveals a positive relationship from the number of male students in law to the number of male students in medicine (Appendix 1C). This relationship is lower than the previous one: less than 10% of the variations of the male students in medicine are due to the variations of those in law (Appendix 1F).

For women, if the starting point is also in the medical field, there is no substitutability. The causality test shows that an increase in the number of women in medicine leads to an increase in the number of women in law (Appendix 1C). Changes in the number of female law students are only 11% dependent on changes in the number of female medical students. Simulation of the shocks shows an immediate positive effect, which then becomes negative and decreases after 7 years (Appendix 1E).

The phenomenon of substitution linked to prestige is observed for men but not for women. For these latter, however, the medical sphere seems to play a catalytic role in opening up higher education to women.

6.2. 1971-2020

Unit root tests and cointégration tests for this sub period are presented in Appendix 2A and 2B. The variables are not cointegrated. Thus there is no long run stable relationships between them.

When the *numerus clausus* is taken into account, our analyses of all students show a positive causal relationship between the *numerus clausus* and the number of students enrolled in medicine (Appendix 2C). So logically, when the *numerus clausus* increases/decreases, the number of medical students also knows an increase/decrease. Variations in the number of medical students are 15% dependent on variations in the *numerus clausus* (Appendix 2D). This dependence is illustrated by the simulation of shocks: following a positive shock to the *numerus clausus* (the latter is relaxed), the number of medical students is positively impacted for around 7-8 years (Appendix 2D). Although only 4% of the variance in the number of law students depends on variations in the *numerus clausus*, the shock analysis shows that a positive shock to the NC has a negative impact on the number of law students, thereby helping to regulate the entire university system.

Analysis by gender shows 1 causal relationship for male students and 3 causal relationships for female students.

For male students, we observe the same relationships than on the whole students: the *numerus clausus* positively causes the number of male students in medicine. The dependence is around 12% and the impact of relaxing the *numerus clausus* is less long-lasting than for all students (Appendix 2F). For female students, the 3 causal relationships can be summarised as follows:

NC	→	Medicine	→	Law	→	NC
	+		+		-	

The variance in the number of female law students is 6% dependent on variations in the number of female medical students, which in turn is 11% dependent on variations in the *numerus clausus*. The latter is 10% influenced by variations in the number of law students.

Even if the phenomenon of substitution between prestigious courses is not observed among female students, the *numerus clausus* still plays a regulating role. In fact, a relaxing in the *numerus clausus* leads to an increase in the number of female medical students, which in turn leads to an increase in the number of female law students through the development of higher education for women. However, if there is too large an influx of female students, this needs to be regulated, leading to a tightening of the *numerus clausus* (negative causal relationship between the number of female law students and the *numerus clausus*). This will then have an impact on the number of female medical students, which will fall.

Conclusion

In extension to previous work on glutting and gendered study choices, this article addressed the question of gender distribution of students in French law and medicine faculties. Using an unpublished database spanning more than a century, the aim was threefold. Firstly, to see whether social prestige associated with a profession had the same influence on women and men in their choice of studies. Secondly, to study the presence or absence of any substitution phenomenon between prestigious branches, i.e. law and medicine. Finally, we aimed to see whether the regulatory role of the medical sphere operated in the same way for men and women.

Over the entire period, we observed a substitution phenomenon among men, but not among women. For men, there is an a-cyclical trend in the number of students in the two most prestigious faculties in the French higher education system, while for women, medical studies seem to play an accelerating role in the overall development of women's higher education. The more recent period, taking into account the *numerus clausus*, confirms these results and highlights the regulating role of the *numerus clausus* both on medical studies and on the higher education system as a whole. While the *numerus clausus* plays a direct regulatory role in the male higher education system, it also plays an indirect role in regulating the female higher education system, by slowing down its development.

One question remains nevertheless unsolved: what impact does the *numerus clausus* have on maintaining educational inequalities between men and women? This will be the subject of our future investigations.

References

Atwater L.E., Brett J.F., Waldman D., DiMare L., Hayden M.V. (2004). "Men's and women's perceptions of the gender typing of management subroles", *Sex Roles*, 50, pp. 191–199.

Baszanger, I. (1986). Recension de l'ouvrage de GEISON, G. (1984). Professions and the French State 1700-1900, Philadelphia, University of Pennsylvania Press, 319p, *Revue Française de Sociologie*, Vol. 27, 1, p. 156 – 158.

Becker G.S. (1964). *Human Capital. A Theoretical and Empirical Analysis with Special Reference to Education*, New York: Columbia University Press.

Bian L., Leslie S.-J., Cimpian A. (2017). "Gender stereotypes about intellectual ability emerge early and influence children's interests", *Science*, 355, pp. 389-391,

Blau P., Duncan O. D. (1967). *The American occupational structure*, New York, Wiley.

Bouhmadi R., Lemistre Ph. (2007). "Devenir cadre : une affaire de famille, de genre ou d'éducation ?", *Revue d'Economie Appliquée*, 2, pp. 123-156.

Bordalo P., Coffman K., Gennaioli N., Shleifer A. (2019). "Beliefs about Gender", *American Economic Review*, 109(3). pp. 739–773.

Botelho A., Costa-Pinto L. (2004). "Students' expectations of the economic returns to college education: results of a controlled experiment", *Economics of Education Review*, 23.6, pp. 645-653.

Boudon R. (1973). *L'inégalité des chances*, Paris, Armand Colin.

Box G.E.P., Jenkins G.M. (l976). *Time Series Analysis, Forecasting and Control*, Holden Day, San Francisco.

Bruijn, M. J. (1950). *Note sur la situation des Pays-Bas*, Conférence d'experts sur les systèmes d'enseignement et la technique moderne, Paris, 26-30 juin.

Bruneau C. (1996). "Analyse économétrique de la causalité : un bilan de la littérature", *Revue d'économie politique*, 106, pp. 323-353.

Bugeja-Bloch F., & Couto, M.-P. (2018). "Le Parcoursup des filles. Classe et genre à l'université ", *La Vie des idées*.

Buser, T., Peter, N. & Wolter, S.C. (2022). "Willingness to compete, gender and career choices along the whole ability distribution", *Experimental Economics*, 25, pp. 1299–1326.

Cattaneo M., Horta H., Malighetti P., Meoli M. and Paleari S. (2017). "Effects of the Financial Crisis on University Choice by Gender", *Higher Education*, 74(5). pp. 775–798.

Chambaz, C., Maurin, E., Torelli, C. (1998). "L'évaluation sociale des professions en France. Construction et analyse d'une échelle des professions", *Revue française de sociologie*, 39-1, p. 177-226.

Coffman K.B., Flikkema C.B., Shurchkov O., (2021). "Gender stereotypes in deliberation and team decisions", *Games and Economic Behavior*, 129, pp. 329–349.

Court M., Bertrand J., Bois G., Henri-Panabière G. et Vanhée O. (2013)."L'orientation scolaire et professionnelle des filles : des choix de compromis ? Une enquête auprès de jeunes femmes issues de familles nombreuses", *Revue française de pédagogie*, 184, pp. 29-40.

Demeulemeester, J.-L. (1994). "Une évaluation empirique de la rationalité des étudiants et étudiantes belges (1954-1987)", *Économie et Prévision*, *116*, 137-151.

Demeulemeester J.-L. & Rochat D. (2001). "Rational Choice under Unequal Constraints: the Example of Belgian Higher Education", *Economics of Education Review*, 20, pp. 15-26.

Dherbécourt C., Flamand J. (2023)."Inégalité des chances : ce qui compte le plus", Note d'analyse, *France Stratégie*, 120.
Dickey, D.A., Fuller, W.A. (1979). "Distribution of the Estimators for Autoregressive Time Series with a Unit Root", *Journal of the American Statistical Association*, 74, pp. 427-431.
Diebolt, C. (1994). *L'évolution de longue période du système éducatif allemand :* Vol. 1 : *Education, croissance et cycles longs,* Vol. 2 : *L'histoire quantitative de l'éducation,* Thèse de doctorat en Sciences économiques, Université Montpellier 1, 15 février 1994, 1042 p.
Diebolt, C. (1997). "L'évolution de longue période du système éducatif allemand XIXème et XXème siècle", *Economies et Sociétés, Série AF*, 23, p. 1-370.
Diebolt, C. (2001). "La théorie de l'engorgement", *Economie Appliquée,* 54, (4), pp. 7-31.
Diebolt, C. & El Murr, B. (2004a). "A Cobweb Model of Higher Education and Labour Market Dynamics", *Brussels Economic Review*, vol. 47, 3-4, pp. 409-429.
Diebolt, C. & El Murr, B. (2004b). "Educational Development and Labour Markets. The Case of Higher Education in Germany, 1820-1941", *Quality and Quantity,* 34, (2), pp. 127-145.
Diebolt, C. & Demeulemeester, J.-L. (2011). "New Institutional History of the Adaptive Efficiency of Higher Education Systems. Lessons from the Prussian Engineering Education : 1806-1914", *Economies et Sociétés, Série AF*, 43, p. 33-63.
Diebolt, C. & Guironnet, J. P. (2012). "Vers une théorie économique de la suréducation ?", *Economies et sociétés*, *Série "Histoire économique quantitative"*, n°45, pp. 1453-1468.
Diebolt, C. & Jaoul-Grammare, M. (2007). "Pourquoi devenir médecin, juriste etc ? Les leçons de l'histoire", *Sociétal*, 55, pp. 9-13.
Duru-Bellat, M. (2004). École de garçons et école de filles. *Diversité Ville Ecole Intégration*, *138*, 65-72.
Easterlin R. A. (1995). "Preferences and Prices in Choice of Career: the switch to business, 1972-1987", *Journal of Economics Behaviour and Organisation*, 27, pp. 1-34.
Eckel, C. C., & Grossman, P. J. (2008). "Men, women and risk aversion: Experimental evidence". *Handbook of Experimental Economics*, *113*(1). 1061-1073.
Eckstein Z., T. P. Schultz, K. Wolpin (1984). "Short-run fluctuations in fertility and mortality in pre-industrial Sweden", *European Economic Review*, 26, 3, pp. 295-317.
Engle, R., Granger, C. (Eds.). (1991). *Long-Run Economic Relationships: Readings in Cointegration*, Oxford University Press.
Engle, R.F., Granger, C.W.J. (1987). "Co-Integration and Error Correction: Representation, Estimation, and Testing", *Econometrica*, 55, pp. 251.-276.
Elliott, G., Rothenberg, T.J., Stock, J.H. (1996). "Efficient Tests for an Autoregressive Unit Root", *Econometrica* 64, pp. 813-836.
Eulenburg F. (1904). *Die Frequenz der deutschen Universitäten von ihrer Gründung bis zur Gegenwart*, B.G. Teubner, Leipzig.
Felouzis G. & Perroton J. (2009)."Grandir entre pairs à l'école Ségrégation ethnique et reproduction sociale dans le système éducatif français", *Actes de la Recherche en Sciences Sociales*, 180, 5, pp. 92-100.
Fershtman, C. & Weiss, Y. (1993). "Social Status, Culture and Economic Performance", *The Economic Journal*, 103 (July). p. 946-959.
Fershtman, C. & Weiss, Y. (1998). "Social Status and Economic Performance: a survey", *European Economic Review*, 42, pp. 801-820.

Freeman, R. (1971). *The Market for College-Trained Manpower. A Study in the Economics of Career Choice*, Cambridge: Harvard University Press.

Freeman, R. B. (1976). *The Overeducated American*, Academic Press, New-York.

Frome PM., Eccles JS. (1998). "Parents' influence on children's achievement-related perceptions", *Journal of Personality and Social Psychology*, 74(2). pp. 435-452.

Furnham A., Gasson L. (1998). "Sex differences in parental estimates of their children's intelligence", *Sex Roles*, 38, pp. 151–162.

Furnham A., Reeves E., Budhani S. (2002). "Parents think their sons are brighter than their daughters: sex differences in parental self-estimations and estimations of their children's multiple intelligences", *Journal of Genetic Psychology*, 163(1). pp. 24-39.

Gabay-Egozi L., Shavit Y., Yaish M. (2015)."Gender Differences in Fields of Study: The Role of Significant Others and Rational Choice Motivations", *European Sociological Review,* 31, 3, pp. 284–297

Ganzeboom, H. B. G., Treiman D. J. (1996)."Internationally comparable measures of occupational status for the 1988 international standard classification of occupations", *Social science research*, 25, p. 201-39.

Gispen K. (1989). *New Profession, Old Order. Engineers and German society, 1815-1914*, Cambridge, Cambridge University Press.

Gneezy, U., Niederle, M., & Rustichini, A. (2003)."Performance in Competitive Environments: Gender Differences", *Quarterly Journal of Economics*, *118*(3). 1049-1074.

Granger, C.W.J. (1969)."Investigating Causal Relations by Econometric Models and Cross-spectral Methods", *Econometrica* 37, 424-439.

Halek, M., & Eisenhauer, J. G. (2001). "Demography of Risk Aversion", *Journal of Risk and Insurance*, *68*(1), pp. 1-24.

Haupt, H. G. (1993). *Histoire sociale de la France depuis 1789*, Les Editions de la MSH, 302p.

Hendry, D.F., Mizon, G.E. (1993)."Evaluating Dynamic Models by Encompassing the VAR", in: Phillips, P.C.B. (Ed.). *Models, Methods, and Applications of Econometrics*. Oxford: Basil Blackwell, pp. 272–300.

Hodge R. W., Treiman D. J., Rossi P. (1966). "A comparative study of occupational prestige", in: Bendix, R., Lipset, S.M., (eds). *Class, status and power*, New York, Free Press of Glencoe.

Holland J. L. (1966). *The psychology of vocational choice*. Waltham MA: Blasidell.

Hoxby, C. (2003). *Economics of School Choice*, University of Chicago Press

Jaoul, M. (2004a)."Enseignement supérieur et marchés du travail : analyse économétrique de la théorie de l'engorgement", *Economie et Prévision*, 166, pp. 39-57.

Jaoul, M. (2004b). *Economie de l'enseignement supérieur en France: une analyse cliométrique*, Thèse de doctorat en sciences économiques, Université Montpellier I, 19 novembre, 346 pages.

Jaoul-Grammare, M. (2013)."L'évolution des inégalités dans l'enseignement supérieur universitaire français. L'influence des réformes institutionnelles et des ruptures économiques", *Économies et Sociétés. Série AF*, 46, 7, pp. 1105-1130.

Jaoul-Grammare, M. (2014). Prestige social des professions et substituabilité des filières universitaires en France au XXème siècle. *Economies et Sociétés - Série AF - Histoire Economique Quantitative*, *49*, pp. 1309-1333.

Jaoul-Grammare, M. (2018). "L'évolution des inégalités de genre dans l'enseignement supérieur entre 1998 et 2010. Une analyse de l'(in)efficacité des réformes politiques", *Education et Formations*, 96, pp. 113-131.

Jaoul-Grammare, M. (2022)."Reforms and Inequalities in Selective Fields of French Higher Education: Measuring the Impacts through a Dual Approach", *European Journal of Education*, 57, 2, 255-272.

Jaoul-Grammare M. (2023). "Gendered professions, prestigious professions. When stereotypes condition career choices", *European Journal of Education*, 59, 2, pp. 1-26.

Jaoul-Grammare M. (2024)."Déclassement et immobilisme : évolution des compromis des diplômées du supérieur (1997-2015)", *Formation-Emploi*, n°167, à paraître.

Jaoul-Grammare M., Lemistre Ph. (2018)."Réussite en début de carrière : un lien au diplôme à relativiser selon la mesure du déclassement et la satisfaction professionnelle", in Dupray A. et Quenson E. (Eds). *Sept ans de vie professionnelle des jeunes : entre opportunités et contraintes*, Octarès Éditions.

Johansen, S. (1988). "Statistical analysis of co-integration vectors", *Journal of Economic Dynamics and Control*, 12, pp. 231-254.

Johnston, J., Dinardo, J., 1999. *Méthodes économétriques*. Economica, Paris.

Kane T.J. (1995). "Rising Public College Tuition and College Entry: How Well Do Public Subsidies Promote Access to College?", *NBER Working Paper* 5164.

Klinowski D. (2019). "Selection into self-improvement and competition pay: gender, stereotypes, and earnings volatility", *Journal of Economic Behavior & Organization*, 158, pp. 128.

Lainé F. (2010)."La mobilité professionnelle : facteurs structurels et spécificités de l'Île-de-France", *Économie et statistique*, 431-432, pp. 37-56

Lemaire S. (2005)."Les premières bachelières du panel : aspirations, image de soi et choix d'orientation", *Education et Formation*, 72, pp. 155-167.

Lucas, R. E. (1988). "On the Mechanics of Economic Development", *Journal of Monetary Economics*, 22, pp. 3-42.

Manzo G. (2007)."Le modèle du choix éducatif interdépendant. Des mécanismes théoriques aux données empiriques françaises et italiennes", *Archives Européennes de Sociologie*, 48, 1, pp. 3-53

Manzo G. (2009). *La spirale des inégalités. Choix scolaires en France et en Italie au 20e siècle*, Paris, Presses Universitaires de Paris Sorbonne, 336 p.

Marshall, A. (1890). *Principles of Economics*, Macmillan, London, Reprinted, 1962.

Monfort, A., Rabemananjara, R. (1990). "From a var model to a structural model, with an application to the wage–price spiral", *Journal of Applied Econometrics*, 5, pp. 203–227.

Montmarquette C. Mourji F. & Mahseredjian S. (1998)."Les choix de filières universitaires par les lycéens marocains : préférences et contraintes", *Revue d'Analyse Économique*, 74, 3, pp. 485-522.

Müller-Benedict, V. (1991). *Akademikerprognosen und die Dynamik des Hochschulsystems. Eine statistisch-historische Untersuchung*, Campus Verlag, Frankfurt am Main.

Müller-Benedict, V. (2000). "Confirming Long Waves in Times Series of German Student Populations 1830-1990 Using Filter Techniques and Spectral Analysis", *Historical Social Research*, 25 (3/4), pp. 36-56.

Nelson, R. R., & Phelps, E. S. (1966). "Investment in Humans, Technological Diffusion, and Economic Growth", *American Economic Review*, 56, pp. 69-75.

Niederle M., Vesterlund L. (2011). "Gender and competition", *Annual Review of Economy*, 3, pp. 601-630.

Nisihira, S. (1968)."Le prestige social des différentes professions. L'évaluation populaire au Japon", *Revue Française de Sociologie*, IX, pp. 548-557.

OCDE, (2011). *Report on Gender Initiative: Gender inequality in Education, Employment and Entrepreneurship, 78p.*

Page, L., Levy-Garboua, L., & Montmarquette, C. (2007)."Aspiration Levels and Educational Choice. An Experimental Study", *Economics of Education Review*, *26*(6), pp. 747-757.

Peugny C. (2009). Le déclassement, Paris, Grasset.

Perugini C., Vladisavljević M. (2019). "Gender inequality and the gender-job satisfaction paradox in Europe", *Labour Economics*, 60, pp. 129-147.

Petrides K. V., Furnham A. & Martin G. (2004). "Estimates of Emotional and Psychometric Intelligence: Evidence for Gender-Based Stereotypes", *Journal of Social Psychology*, 144:2, pp. 149-162.

Razafindranovona T. (2017)."Malgré la progression de l'emploi qualifié, un quart des personnes se sentent socialement déclassées par rapport à leur père", *INSEE Premières*, n° 1659.

Romer, P. M. (1986). "Increasing Returns and Long-Run Growth", *Journal of Political Economy*, 94, pp.1002-1037.

Romer, P. M. (1990). "Endogenous Technological Change", *Journal of Political Economy*, 98, pp. 71-102.

Rouse C.E. (1998). "Do two-year Colleges Increase Overall Educational Attainment? Evidence from the States", *Journal of Policy Analysis and Management*, 17, 4, pp. 595-620.

Salanié, B. (1999). "Guide pratique des séries non-stationnaires", *Économie & prévision*, 137, pp. 119–141.

Schein V.E. (2001). "A global look at psychological barriers to women's progress in management", *Journal of Social Issues*, 57(4). pp. 675-688.

Schultz, T. W. (1963). *The Economic Value of Education*, New York, Columbia University Press

Sims, C.A. (1980). "Macroeconomics and Reality", *Econometrica*, 48, pp. 1-48.

Siow A. (1984)."Occupational Choice under Uncertainty", *Econometrica*, 52 (3) pp. 631-45.

Smith, A. (1776). *The Wealth of Nations*, Modern Library, New York, Reprinted 1932.

Stallmann, J., Johnston, T.G., Mwachofi, A. & Flora, J.L. (1993)."Labour Market Incentives to Stay in School", *Journal of Agricultural and Applied Economics*, 25, 2, pp. 82-94.

Stevanovic B. & Mosconi N. (2007)."Les représentations des métiers des adolescent(e-s) scolarisé(e-s) dans l'enseignement secondaire", *Revue Française de Pédagogie*, 161, pp. 53-68.

Treiman D. J. (1977). *Occupational prestige in comparative perspective*, New York, Academic Press.

Titze, H. [1990], *Der Akademikerzyklus. Historische Untersuchungen über die Wiederkehr von Überfüllung und Mangel in akademischen Karrieren*, Vandenhoeck & Ruprecht, Göttingen.

Uzawa, H. (1965). "Optimum Technical Change in an Aggregate Model of Economic Growth", *International Economic Review*, 6, pp. 18-31.

Van Zanten A. (2001). *L'école de la périphérie*, Paris, Presses Universitaires de France.

Van Zanten A. (2009)."Le choix des autres. Jugements, stratégies et ségrégations scolaires", *Actes de la Recherche en Sciences Sociales*, 180, 5, pp. 24-34.

Weber, M. (1922). *Economy and Society*. Translated And Reprinted, University Of Califormia Press, Berkeley, 1978.

Windolf, P. (1990). *Die Expansion der Universitäten 1870-1985. Ein internationaler Vergleich*, F. Enke, Stuttgart.

Windolf, P., Haas, J. (1993). "Higher Education and the Business Cycle 1870-1990. A Cross-National Comparison", *International Journal of Comparative Sociology*, 34 (3/4), pp. 167-191.

Zarkin, G. A. (1983)."Cobweb Versus Rational Expectations Models: Lessons from the Market for Public School Teachers", *Economics Letters*, 13, pp. 87-95.

Zarkin, G.A. (1985)."Occupational Choice: An application to the Market for Public School Teachers", *Quarterly Journal of Economics*, 100, pp. 409 - 446.

Appendix 1: 1899-2022

A) Unit root Tests

Tested variable	Null hypothesis	Included variables	ERS-Statistics	Decision
LAW	Unit root	Trend + intercept	-1,33	Unit root
DLAW	Unit root	Intercept	-9,68	Stationnary
MED	Unit root	Trend + intercept	-1,56	Unit root
DMED	Unit root	Intercept	-8,69	Stationnary
LAWF	Unit root	Trend + intercept	-0,69	Unit root
DLAWF	Unit root	Intercept	-3,39	Stationnary
MEDF	Unit root	Trend + intercept	-0,94	Unit root
DMEDF	Unit root	Intercept	-10,37	Stationnary
LAWM	Unit root	Trend + intercept	-2,40	Unit root
DLAWM	Unit root	Intercept	-10,20	Stationnary
MEDM	Unit root	Trend + intercept	-1,45	Unit root
DMEDM	Unit root	Intercept	-8,97	Stationnary

B) Johansen Cointegration test

Tested variables	Optimal lag p	Hypothesized No. of CE[s]	Eigenvalue	Trace Statistic	Critical Value [5%]	Prob.
MED and LAW	3	None	0,09	17,5	25,87	0,38
		At most 1	0,05	5,59	12,52	0,51
MEDF and LAWF	3	None	0,13	24,92	25,87	0,06
		At most 1	0,06	7,94	12,52	0,26
MEDM and LAWM	3	None	0,10	15,39	25,87	0,54
		At most 1	0,02	2,63	12,52	0,92

C) Granger causality tests (P=3)

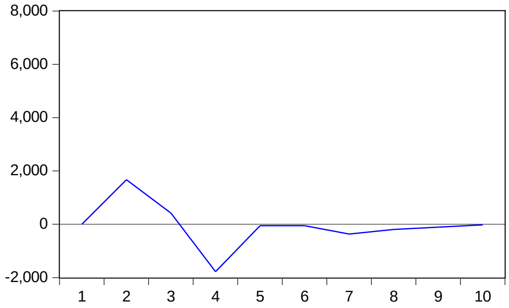
Null hypothesis	F-Statistic	Sign
DMED does not Granger Cause DLAW	5.19***	-
DLAW does not Granger Cause DMED	0.81	
DMEDF does not Granger Cause DLAWF	0,40	
DLAWF does not Granger Cause DMEDF	5,17***	+
DMEDM does not Granger Cause DLAWM	2,91**	-
DLAWM does not Granger Cause DMEDM	5,49***	+

***, ** : significance at 1%, 5%

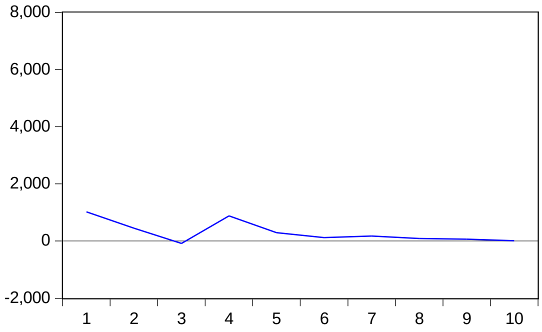
D) Variance decomposition and shock analysis for all students

Variance Decomposition of DLAW:			
Period	S.E.	DLAW	DMED
1	6377.646	100.0000	0.000000
5	6909.145	87.17315	12.82685
10	6925.767	86.85130	13.14870
Variance Decomposition of DMED:			
Period	S.E.	DLAW	DMED
1	6298.603	2.626384	97.37362
5	6629.348	4.802271	95.19773
10	6647.137	4.903124	95.09688

Response of DLAW to a positive shock on DMED



Response of DMED to a positive shock on DLAW

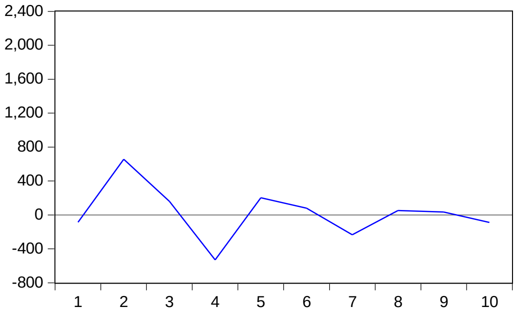


E) Variance decomposition and shock analysis for female students

Variance Decomposition of DMEDF:			
Period	S.E.	DMEDF	DLAWF
1	3950.256	100.0000	0.000000
5	4049.020	99.02546	0.974537
10	4061.375	98.84895	1.151050

Variance Decomposition of DLAWF:			
Period	S.E.	DMEDF	DLAWF
1	2343.874	0.133850	99.86615
5	2646.746	11.16672	88.83328
10	2679.967	11.90719	88.09281

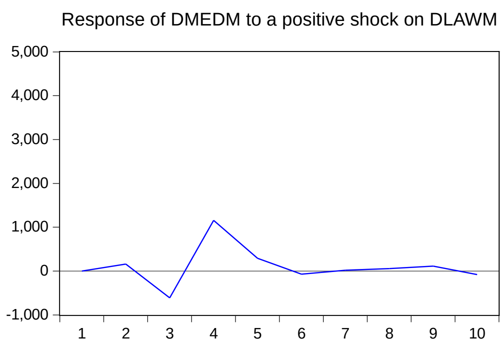
Response of DLAWF to a positive shock on DMEDF

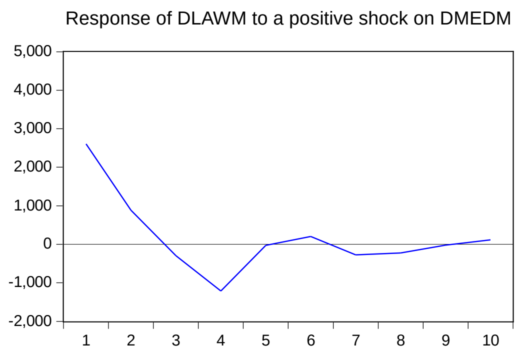


F) Variance decomposition and shock analysis for male students

Variance Decomposition of DLAWM:			
Period	S.E.	DLAWM	DMEDM
1	5165.064	74.55332	25.44668
5	5445.424	69.20490	30.79510
10	5482.735	69.02168	30.97832

Variance Decomposition of DMEDM			
Period	S.E.	DLAWM	DMEDM
1	4003.008	0.000000	100.0000
5	4396.675	9.431878	90.56812
10	4415.359	9.495353	90.50465





Appendix 2 – Period 1971-2019

A) Unit root Tests

	Null hypothesis	Included variables	ERS-Statistics	Decision
LAW	Unit root	Trend + intercept	-1,71***	Unit root
DLAW	Unit root	Intercept	-3,70***	Stationnary
MED	Unit root	Trend + intercept	-1,76***	Unit root
DMED	Unit root	Intercept	-2,65***	Stationnary
LAWF	Unit root	Trend + intercept	-1,52***	Unit root
DLAWF	Unit root	Intercept	-4,50***	Stationnary
MEDF	Unit root	Trend + intercept	-2,34***	Unit root
DMEDF	Unit root	Intercept	-6,04***	Stationnary
LAWM	Unit root	Intercept	-1,98**	Stationnary
MEDM	Unit root	Trend + intercept	-1,83***	Unit root
DMEDM	Unit root	Intercept	-7,94***	Stationnary
NUMERUS	Unit root	Intercept	-1,32***	Unit root
DNUMERUS	Unit root	Trend + intercept	-4,63***	Trend
TDNUMERUS	Unit root	Intercept	-2,77***	Stationnary

, * : significance at 5% , 1%

B) Johansen Cointegration test

	Optimal lag p	Hypothesized No. of CE[s]	Eigenvalue	Trace Statistic	Critical Value [5%]	Prob.
MED, LAW	1	None	0,17	11,50	25,87	0,85
		At most 1	0,05	2,34	12,51	0,94
MEDF, LAWF	1	None	0,27	17,3	25,87	0,39
		At most 1	0,04	2,14	12,51	0,96

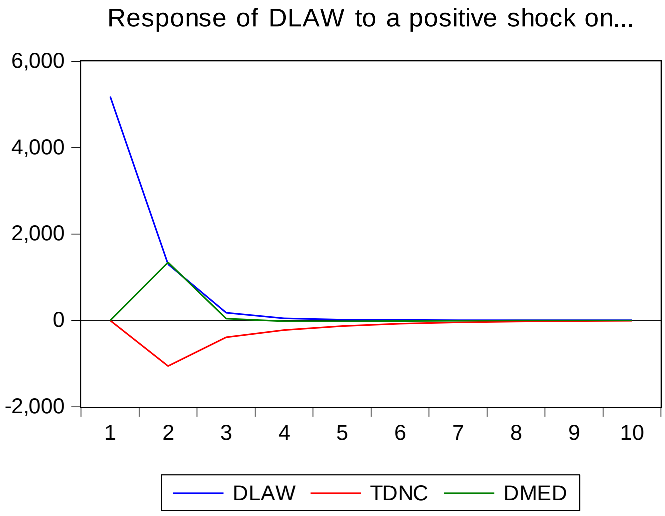
C) Granger causality tests (P=1)

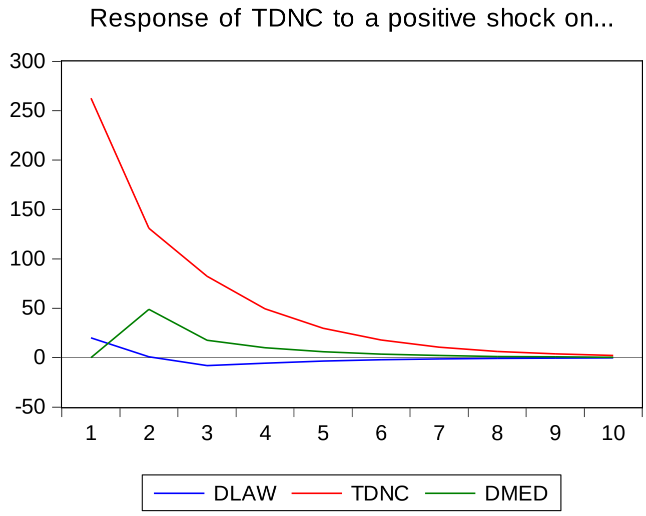
Null Hypothesis:	F-Statistic	Prob.	Sign
DMED does not Granger Cause DLAW	1.68	0.20	
DLAW does not Granger Cause DMED	0.54	0.47	
TDNC does not Granger Cause DLAW	1.2	0.28	
DLAW does not Granger Cause TDNC	0.11	0.74	
DMED does not Granger Cause TDNC	1.62	0.21	
TDNC does not Granger Cause DMED	5.83**	0.02	+
DLAWF does not Granger Cause DMEDF	0.74	0.39	
DMEDF does not Granger Cause DLAWF	2.72*	0.10	+
TDNC does not Granger Cause DMEDF	2.74*	0.10	+
DMEDF does not Granger Cause TDNC	1.67	0.20	
TDNC does not Granger Cause DLAWF	0.06	0.81	
DLAWF does not Granger Cause TDNC	5.99**	0.02	-
DMEDM does not Granger Cause TDNC	1.00	0.32	
TDNC does not Granger Cause DMEDM	4.66**	0.04	+
LAW_M does not Granger Cause TDNC	0.20	0.65	
TDNC does not Granger Cause LAW_M	0.52	0.48	
LAW_M does not Granger Cause DMEDM	0.20	0.66	
DMEDM does not Granger Cause LAW_M	1.74	0.19	

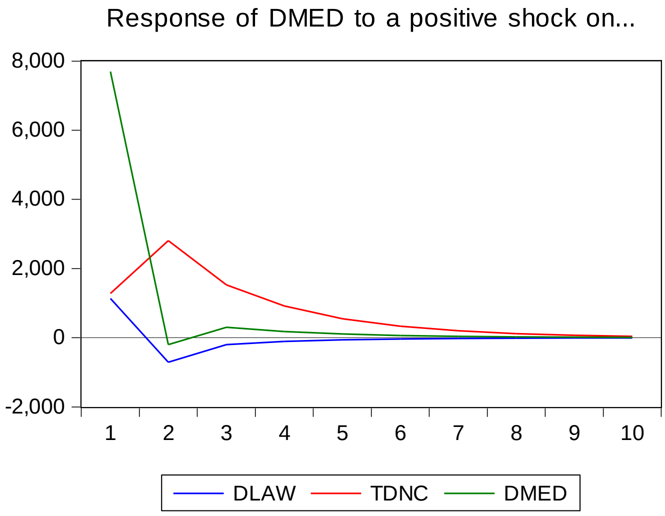
**, * : significance at 5%, 10%

D) Variance decomposition and shock analysis for all students

Variance Decomposition of DLAW:				
Period	S.E.	DLAW	DMED	TDNC
1	5183.892	100.0000	0.000000	0.000000
5	5633.813	90.09458	4.180897	5.724521
10	5634.729	90.06574	4.183443	5.750817
Variance Decomposition of DMED:				
Period	S.E.	DLAW	DMED	TDNC
1	7884.537	2.069614	97.93039	0.000000
5	8618.769	2.479670	82.64984	14.87049
10	8629.073	2.476797	82.48168	15.04152
Variance Decomposition of TDNC:				
Period	S.E.	DLAW	DMED	TDNC
1	263.2821	0.582311	2.666757	96.75093
5	315.4284	0.511714	8.120355	91.36793
10	316.2441	0.515616	8.141467	91.34292

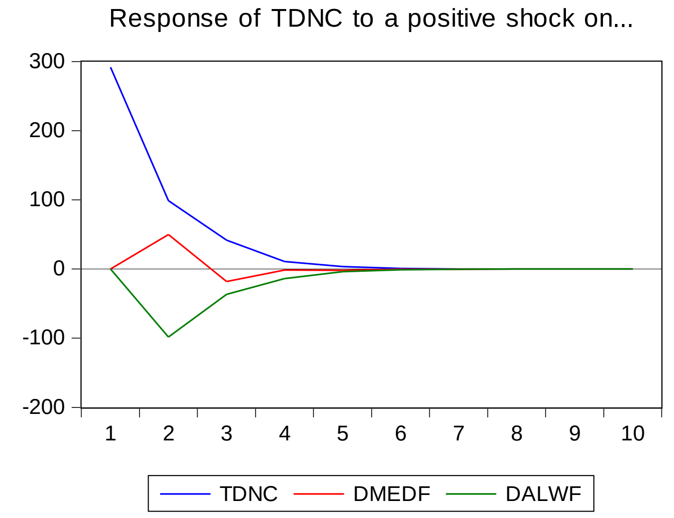

Response of DLAW to a positive shock on...
6,000
4,000
2,000
0
-2,000
1
2
3
4
5
6
7
8
9
10
DLAW
TDNC
DMED

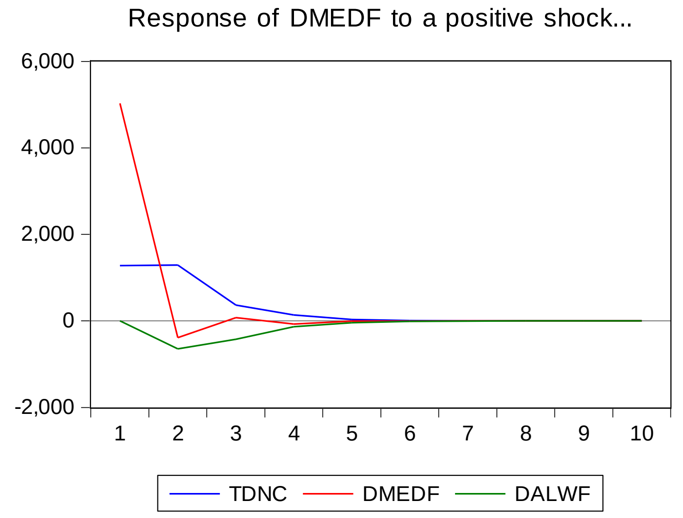

Response of TDNC to a positive shock on...
300
250
200
150
100
50
0
-50
1
2
3
4
5
6
7
8
9
10
DLAW
TDNC
DMED

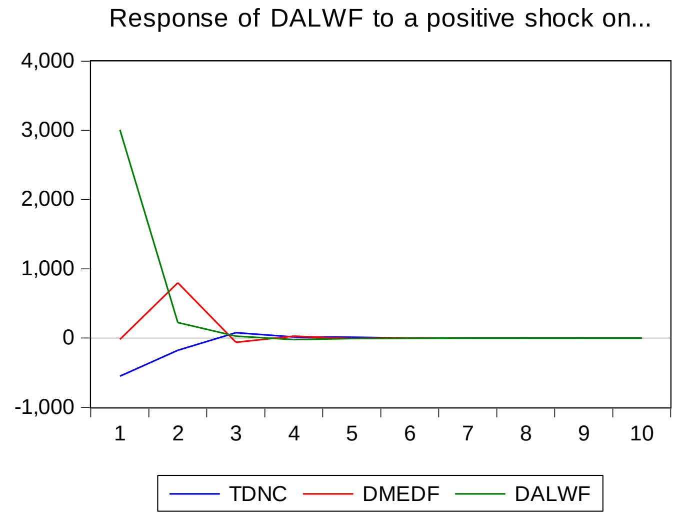

Response of DMED to a positive shock on...
8,000
6,000
4,000
2,000
0
-2,000
1
2
3
4
5
6
7
8
9
10
DLAW
TDNC
DMED

E) Variance decomposition and shock analysis for female students

Variance Decomposition of TDNC:				
Period	S.E.	TDNC	DMEDF	DLAWF
1	291.5358	100.0000	0.000000	0.000000
5	332.7226	87.30672	2.543994	10.14929
10	332.7257	87.30570	2.544049	10.15026
Variance Decomposition of DMEDF:				
Period	S.E.	TDNC	DMEDF	DLAWF
1	5188.597	6.066875	93.93312	0.000000
5	5432.607	11.67931	86.23755	2.083139
10	5432.633	11.67954	86.23686	2.083602
Variance Decomposition of DLAWF:				
Period	S.E.	TDNC	DMEDF	DLAWF
1	3055.799	3.239343	0.003652	96.75701
5	3172.714	3.374819	6.358514	90.26667
10	3172.717	3.374866	6.358512	90.26662


Response of TDNC to a positive shock on...
300
200
100
0
-100
-200
1
2
3
4
5
6
7
8
9
10
TDNC
DMEDF
DALWF

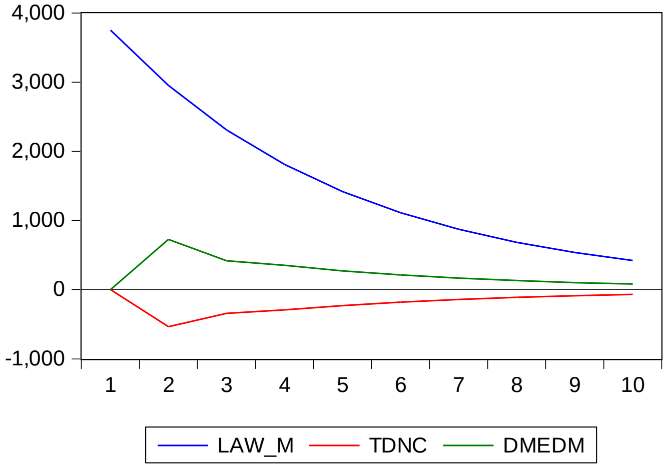

Response of DMEDF to a positive shock...
6,000
4,000
2,000
0
-2,000
1
2
3
4
5
6
7
8
9
10
TDNC
DMEDF
DALWF


Response of DALWF to a positive shock on...
4,000
3,000
2,000
1,000
0
-1,000
1
2
3
4
5
6
7
8
9
10
TDNC
DMEDF
DALWF

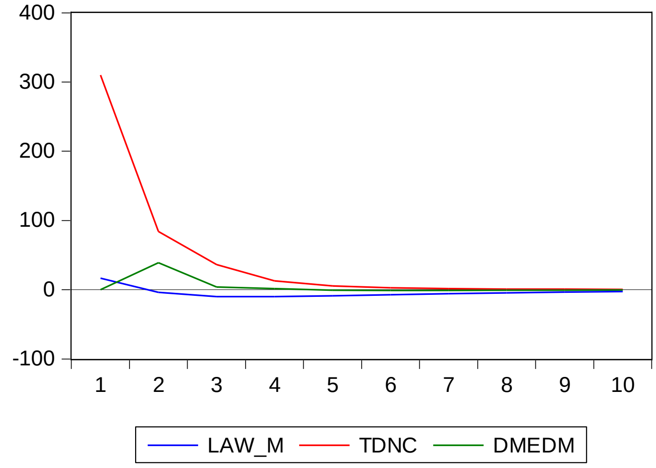
F) Variance decomposition and shock analysis for male students

Variance Decomposition of LAW_M:				
Period	S.E.	LAW_M	TDNC	DMEDM
1	3750.666	100.0000	0.000000	0.000000
5	5901.838	95.86481	1.556313	2.578878
10	6160.338	95.71576	1.633496	2.650742
Variance Decomposition of TDNC:				
Period	S.E.	LAW_M	TDNC	DMEDM
1	310.6121	0.285556	99.71444	0.000000
5	327.0057	0.529507	98.02525	1.445243
10	327.2150	0.644145	97.90947	1.446382
Variance Decomposition of DMEDM:				
Period	S.E.	LAW_M	TDNC	DMEDM
1	4083.296	2.623810	2.823669	94.55252
5	4336.087	2.797327	12.56321	84.63947
10	4336.535	2.815749	12.56114	84.62311

Response of LAW_M to a positive shock on...



Response of TDNC to a positive shock on...



Response of DMEDM to a positive shock on...