Social Networks in The Boardroom*

Francis Kramarz† David Thesmar‡

November 22, 2006

Abstract

This paper provides empirical evidence consistent with the facts that (1) social networks strongly affect board composition and (2) social networks are detrimental to corporate governance. Our empirical investigation relies on a large dataset on executives and outside directors of corporations listed on the Paris stock exchange over the 1992-2003 period. This data source is a matched employer employee dataset providing both detailed information on directors/CEOs and information on the firm employing them.

We first find a very strong and robust correlation between the CEO's network and that of his directors. Networks of former high ranking civil servants are the most active in shaping board composition. Our identification strategy takes into account (1) firm and directors' fixed effects and (2) matching of firms and director along one observable and one unobservable characteristic. We then turn to real effects of such network activity. We find that firms where these networks are most active are less likely to change CEO when they underperform. This suggests that social networks in the board room impair corporate governance.

1 Introduction

That social networks affect market outcomes is a well-documented fact (see Granovetter, 1973 or Rees, 1966 for early references). The precise mechanisms through which networks operate are less well-known. To investigate such mechanisms, this paper focuses on the market for corporate directors, a market where network effects are likely to matter. First, hiring the right individual is potentially difficult: an outside director is both a part-time expert and a supervisor to the executive management. These are very specific and potentially

*For their decisive help in collecting the data we are most grateful to Denise François, Claude Jacquin and their colleagues at INSEE. We also thank Nicolas Depetris-Chauvin and Elsa Kramarz for their research assistance. Many of the improvements since the first draft owe to the valuable comments of Roland Bénabou, Mariasunta Gianetti, Ernst Maug and Augustin Landier, as well as seminar participants from Stockholm University, the COST conference at Uppsala, Amsterdam University, the CREST, and the NBER summer institute.

†CREST-INSEE, CEPR and IZA. Email: kramarz@ensae.fr

‡HEC and CEPR. Address: Dept Economics and Finance, 1 rue de la libération, 78351 Jouy-en-Josas Cedex, France. Email: thesmar@hec.fr

distinct skills and a proper and transparent market for such jobs may not exist. Hence, being directly or indirectly known to the management or the firm's main owners and shareholders is likely to be a strong comparative advantage to obtain a director seat. Social networks are therefore likely to *grease the wheels* of such a market with high frictions, by providing the management with information about the right candidates. Second, because the director has supervising tasks, the use of social networks may come at a cost. Relying on executives' networks to hire their own supervisor might conflict with directors' independence and quality, being therefore detrimental to corporate governance. Hence, the resulting impact of social networks on economic efficiency is unclear. On the one hand, social networks can be used by an entrenched CEO to find an obedient supervisor or an incompetent expert; while on the other hand, they can be used by a benevolent manager to facilitate her research of a competent expert or of a tough supervisor. In this particular setting, as in many others, the economic effect of social networks is ambiguous and can only be settled through an empirical investigation.

This paper examines this exact question in the case of France. It provides direct empirical evidence that (1) CEOs' social networks strongly affect board composition and (2) that social networks in the boardrooms reduce their efficiency: firms where these networks are active are less likely to change CEO when they underperform.

To look at social networks in the boardroom, we use a unique dataset on CEOs and non executive directors of all corporations listed on the Paris Stock Exchange over the 1992-2003 period. France is a particularly well-suited case when studying the prevalence of social networks in the business elites because its elites are highly concentrated and (at least some of) these networks are well-known, easily identified, and easily measured. The sociological literature indeed documents that among French business elites two broad and distinct networks coexist: engineers and former high-ranking civil-servants.[1] Members of these two networks are mostly recruited within graduates of two elite institutions: Ecole Polytechnique and Ecole Nationale d'Administration. Firms run by CEOs from these two networks account for 12% of all firms traded on the Paris Stock Exchange, and 65% in asset-weighted terms. Not only alumni of these two schools are over-represented among top executives but, most importantly, entering ENA or Polytechnique constitutes the virtually unique way of entering high-level jobs in the civil service and, even more so, the "Cabinets Ministeriels", the politically-connected civil service jobs.[2] Given these specific institutional

[1] For references in english, see Swartz [1985,1986], Kadushin [1995], Frank and Yasumoto [1998]. References in french include Bauer and Bertin-Mourot [1997], and Suleiman [1997a,b].

[2] As evidenced by Jacques Chirac, Valery Giscard d'Estaing, Lionel Jospin, Laurent Fabius, ..., and even the "new" Ségolène Royal, most French politicians are former énarques (the second being also a former Polytechnicien), starting their career in Cabinets Ministériels and turning to politics in the sequel. In fact,

features, data on social networks are relatively easy to collect, using the French issue of the Who's Who, together with alumni directories.

More precisely, we gather background data on directors/CEOs (education, career, socioeconomic background) and match them with accounting and financial information on their employing firms. In the first step of our analysis, we provide evidence of social networks in the labor market for non executive directors. To do this, we estimate, for each individual in our sample, a model of the probability of being hired in a given firm. The key regressor in this model is the interaction between the candidate's network and the network of the firm's CEO: if both are the same, the probability of hiring should be increased. This is our test of the prevalence of networks. Because we exploit the full variability and identification power provided by our matched employer-employee data, we are able to account for two important dimensions of unobserved heterogeneity, that are likely to (upward) bias our estimates of network effects. The first dimension is the inherent ability of each individual to become a director in general, as well as to be appointed in firms that have particular observable characteristics. For instance, top level bureaucrats may simply be more intelligent than others and therefore more apt to run and supervise large firms. Therefore, they would be present in the same firms both as CEOs and as directors. Our methodology allows to account for this. The second dimension is the firm level (unobservable) propensity to hire directors and CEOs with particular observable characteristics. For instance, firms with an autoritarian corporate culture may prefer to hire older directors and CEOs, and, say, civil servants may be over-represented in these generations. Or firms that are about to experience difficulties may be willing to hire politically connected CEOs and directors. We give a formal proof that the data deliver enough variability in the cross section to identify network effects, even in the cross section, while taking these two dimensions of unobserved heterogeneity into account. Although some limitations remain, the identifying power of our matched employer-employee data set is surprisingly large.

We follow the sociological litterature and define three main networks: (1) former civil-servants who graduated from ENA, (2) former civil-servants who graduated from Polytechnique and (3) Polytechnique graduates without any past in the civil service. We take all other CEOs (possibly belonging to other networks, or to none) as the reference. Using this breakdown, we find that the probability of being hired in a given firm is larger when the individual and the firm's CEO belong to the same network, *when this network is related to a past career in the civil service*. In addition, we find no evidence that Polytechnique graduates without civil-service experience tend to be employed in firms whose CEO has a similar background. We then look at hiring equations (flows), instead of employment (stock)

the French elite comprises an incredibly high fraction of former alumni of these two schools.

equations. This allows us to discriminate between the effect of the CEO's network and the effect of past board composition, on each individual's probability of employment. This reinforces our previous results: civil service related networks of CEOs still affect the recruitment policies of directors. The composition of the board has no significant impact on the identity of newly recruited directors. We interpret this as partial evidence that it is the CEO, not the directors, who "shapes the board". Our result that civil service related networks are particularly active hold in front of robustness checks designed to account for possible sorting of directors with firms along one observable and one unobservable dimension.

The second step in our analysis looks at governance in firms run by former high-ranking bureaucrats, as corporate governance is what the board of directors actually "produces". Following a large body of literature in corporate finance (see for instance Weisbach (1988), or more recently Dahya, Mc Connell and Travlos (2003)), we focus on CEO turnover to performance sensitivity. The literature documents that such sensitivity is in general higher in well governed firms, than it is in firms where the board is captured by the executive management. In the spirit of Weisbach (1988), we ask if this sensitivity is lower when the board has a larger number of insiders. While Weisbach - and most of this literature - classifies as insiders directors that are employees, former employees or suppliers of the firm, we classify as insiders directors that belong to the same social network as the CEO. We find that firms with many such directors are less likely to change CEO when performance declines. The effect is large and statistically significant for networks of former civil servants, consistently with the evidence on networks described above.

Beyond the French context, we believe this paper contributes to two strands of the economics and finance literature.[3] Clearly, the present contribution belongs to the emerging empirical economic literature on social networks in markets (see for example Bertrand, Luttmer and Mullainathan, 2000, Munshi, 2003, Bayer, Ross, and Topa, 2005). The first important difference between the existing papers and ours is the ability we have to observe networks at work in more direct or more precise fashion, because we are able to look *inside* the firm, in which we observe both the referee (the CEO) and the applicant (the director). Being able to look within the firm gives a lot of additional identifying power, which we

[3]To some extent, the present paper also contributes to the sociological literature in that it analyzes a much broader sample than elite scholars generally use (for instance, Kadushin(1995) studies 28 members of the French business elite. Frank and Yasumoto (1998) look at a "broader" sample of 125 people.). Hence, our description of the French "ruling class" goes in less details but is much more representative of the French reality. Our analysis of recent changes in the French business elites is another contribution of this article. Somewhat paradoxically, even though the State's retreated from economic life in the 1990s, former civil servants are more present among top executives in 2003 than ever before. We suggest that the very process of privatizations of the nineties has caused this persistence.

explore in detail.[4] In particular, we develop a new identification strategy and the ensuing (simple) estimation technique that should be useful to people interested in social networks. The second important difference between this paper and the existing economic literature on social networks is that we are in position to provide a preliminary assessment of the effect of networks on *organizational* performance, beyond their direct "labor" market effects. Most of the literature, in particular in relation to theories connecting job search and networks (Saloner, 1986; Montgomery, 1990), has considered networks to be a good thing for organizational performance: socially connected referees suggest new names to firms, and firms punish the referee if the newly hired is not as good as promised. Hence, in this theoretical literature, networks improve organizational performance. However, in the market for directors that we consider, the resulting outcome may well be lower organizational efficiency, as shareholders cannot always directly "punish" the referee (i.e. the CEO).

Our second contribution pertains to the literature on corporate governance, and in particular the debate on the role of "independent" directors (for a review, see Hermalin and Weisbach, 2002). Our results suggest that it is crucial to distinguish *formal*, from *real* independence. While a director may be formally independent (not a customer, not a supplier, nor an employee), she could well be tied with the CEO through a social network that prevents her from standing openly against his decisions, or prevents her from voting him out of office. Instead of raising the minimum fraction of independent directors, our research suggests that transparency and competition in the recruitement process of directors may be more useful than satisfying formal requirements of independence. While most academics now recognize that the existing formal measure of independence is far from satisfactory, very few studies have come up with alternative, possibly more relevant, measures of board independence.

On this last front, our paper is indeed very close to a recent study on French corporate boards and the business elite by Nguyen Dang (2006).[5] Nguyen Dang's paper focuses on corporate governance effects, while the present paper focuses more closely on social networks. Exactly like us, Nguyen Dang gives some evidence that firms run by former civil servants are less likely to change CEO in case of bad performance. He also shows - something we do not investigate here - that CEOs from these networks are more likely to seat on each other's boards (what the literature labels "interlocking directorships"). Our paper devotes much more attention, however, on presenting evidence that social networks exist and indeed shape board composition - at least in the French case. In particular, this explains the central role of our simple (and new) empirical framework that allows to identify the effects uncovered

[4] Abowd and Kramarz (1999) who cover related technical issues never mention the potential of matched employer-employee data for network analysis.

[5] This paper was unknown to us when writing the present paper.

in this paper. This strategy is widely applicable in many other contexts (social networks, matched employer-employee data)

The paper is organized as follows. Section 2 looks at the French elite from a historical and sociological perspective. This allows us to present how we gathered information on networks of outside directors and executives. Section 3 describes the dataset, providing additional descriptive information. Section 4 presents the statistical model and discusses identification. Then, Section 5 looks at the extent of networks and Section 6 at their economic costs. Section 7 concludes.

2 The French Business Elite

2.1 Historical Perspective on the French Elite

For both historical and sociological reasons, France's economic elites have two distinctive features (Bauer and Bertin-Mourot, 1997, Swartz, 1985): first, they tend to be drawn from a handful of Grandes Ecoles, which form separated networks. Second, a large part of the contemporaneous French business elite comes from the civil service, with relatively homogeneous and standardized careers. These two features are easy to observe and will guide our empirical strategy.

2.1.1 The Tyranny of the Diploma

Bauer and Bertin-Mourot (1997) distinguish two particular features of the French business elite. The first one is "the tyranny of diploma": college degrees, generally obtained before age 25, tend to over-determine career prospects. Those students fortunate enough to obtain the most difficult and competitive degrees have almost guaranteed access to top jobs in the administration and/or the private sector. The French post-secondary educational system splits into two parts (Suleiman, 1997): the first one is the usual university system, which is both free and whose access after high-school graduation is guaranteed by law. Most French universities have no right to select their incoming students; therefore, selection takes place along the way, inducing students to drop out after 2, 3, or 4 years. Suleiman notes that in the mid-1990s, this system comprised some 1.2 million students.

The second part of the educational system is much smaller (some 50,000 students), more elitist and consists of a myriad of different schools (Grandes Ecoles). In most of these schools, tuition fees are negligible, but entrance takes place after the successful completion of a nationwide examination with a numerus clausus. Preparation to these exams is carried out in special classes (classes préparatoires), and takes two to three years after high-school gradua-

tion. The bulk of these schools consists of engineering and business schools, though some of the most prestigious Grandes Ecoles do not fall into these categories. The French business elite is however mostly recruited within the two most prestigious Grandes Ecoles (Swartz, 1986): the Ecole Nationale d'Administration and Ecole Polytechnique. The Ecole Nationale d'Administration (henceforth ENA) was created after the second world war to supply the civil service with highly trained professionals. Ecole Polytechnique is an engineering school originally founded by Napoleon to recruit and train officers for the French military during the French Revolution, that gradually evolved into an engineering school. Nowadays, most of the class enter the private sector, but the best students during their years at Polytechnique (as measured by academic credentials, mostly in maths and physics) enter "en masse" the civil service. Other prestigious schools (Centrale, Les Mines, HEC etc.), less represented amongst top executives, have no tie with the civil service and all of their graduates join the private sector right after school.

Grandes Ecoles graduates retain some ties after college not only because they studied together and formed friendships there (see Kadushin, 1995, and Frank and Yasumoto, 1998), but also through alumni networks and events. The number of people involved is quite large so that the resulting networks are loose and uncoordinated (although some best selling books of the early 1970s went as far as calling them "mafias"). However, having studied in a Grande Ecole naturally endows a graduate with a host of weak ties within business people and, for ENA and Polytechnique graduates, within the high administration. Partly because of their ties with the civil service (more on this below), ENA and Polytechnique have historically been the most prestigious Grandes Ecoles, in spite of or perhaps because of, their small size. Together, they train some 500 new students a year. Firms appears to value their social connection (in particular with the administration, more on this below), their qualities, but also seem to rely on this elitist feature of the educational system to produce legitimacy in their organizations (see the case study in Bauer and Bertin-Mourot, 1997, and also Burt, Hogarth and Michaud, 2000). As a result, they hire top Grandes Ecoles graduates at the highest levels of the hierarchy instead of training and promoting employees over the long term. This tendency for firms to hire managers from Grandes Ecoles dates back to the XIXth century, though, at the time, most French firms were still family-owned, and family-run. As some firms became more successful and larger, professional managers were hired, and the top-level hierarchies started to fill up with engineers from Polytechnique and Ecole Centrale (see Cassis, 1997). In the mid-XXth century, firms started in addition to hire civil-servants, as we see now.

2.1.2 Civil Service and Business Elite

The second feature of the French economic system is that a large fraction of its business and political elite has spent its first years on the labor market within the civil service. This flow from top-level bureaucracy into business started after World War I. Until then, the State was small and held few levers over the economy. In those years, capitalists sought to influence regulation through directly lobbying or by bribing politicians elected to the Parliament or employed in the Government (Garrigues, 2002). During World War I, high-ranking civil-servants had progressively risen to power as the State budget grew larger. In the early 1920s, diplomats and employees of the Ministry of Colonies seemed to have been particularly sought after by firms willing to set up subsidiaries abroad. In the 1930s, the State started to intervene more heavily in the economy through nationalizations and regulation.[6] At this point, the knowledge of the internal workings of the bureaucracy and the associated connections started to be valued more strongly by private firms, in particular in the financial industry.

However, the big shift in the relationships between business and the administrative elites occured *after* WWII. First, in 1945 the Government, then run by the unlikely coalition of Gaullists and communists, two dirigist political forces highly involved in the Resistance, took control of most of the financial industry with the intent of channeling savings to priority industries under the tight supervision of the Treasury (Melitz, 1990). In addition, the Government took over most utilities and some large manufacturing firms (like EDF, the electricity monopoly, or Renault, a large car maker). The Treasury and the Ministry of Industry therefore became, during these reconstruction years, the real centers of power in finance and industry (Garrigues, 2002). Simultaneously, ENA was created, which dramatically increased the supply of high-ranking civil-servants certified by a prestigious and restrictive selection system explicitely based on education. The new prestige attached to civil service, along with the creation of this dedicated school, created a new elite, mostly based on scholarly achievement and sharing a meritocratic Republican ethos.

In a given class at ENA or Polytechnique, the best students have systematically joined one of the five most prestigious bureaucratic careers, or "Corps d'Etat" (Suleiman, 1997 and also Kadushin, 1995), training altogether some 50 people a year. The best Polytechnique graduates were entitled to join industry-related "Corps d'Etat", the famous corps des Mines or the corps des Ponts et Chaussées. These career paths were designed to train future experts

[6] Most French airlines were nationalized in 1933 and consolidated into what is now Air France. The national railways were created in a similar way in 1937. In 1936, a left wing coalition (Le Front Populaire) came into power, got a firmer hand on the Bank of France (then the private property of France's top financiers), enacted the "congés payés" (two weeks of paid vacations) and the 40 hours workweek (Asselain, 1984).

in the manufacturing industries, to serve both as political advisors and top-level managers. The best ENA graduates were entitled to enter the Inspection des Finances, the Conseil d'Etat or the Cour des Comptes (again "Corps d'Etat"). These careers paths were designed to produce experts in public finance and law (particularly important in a country where the State has its own jurisdiction). The typicall successful high-ranking civil-servant career in the postwar years involved a few years in the Treasury (for ENA graduates) or at the Ministry of Industry (for Polytechnique graduates who joined the civil service), then as a "cabinet" advisor to the minister of industry, finance, or the Prime Minister. With this experience, they could then join the top management of a large private or a State-owned company. To private firms, part of their value came from their "carnet d'adresses" (adress book), built during their years at the top levels of the State, a very valuable asset in a country where State presence pervaded all industries, be it through regulation, subsidies, finance or mere influence (for an example of direct government intervention in a purely private firm, see the example of the Schneider empire in Cohen, 1989).

By the early 1980s, ENA and Polytechnique graduates' involvement in the top management of French firms was pretty strong (see Swartz, 1986). It was even strengthened by the 1981 mass nationalizations undertaken by the then newly elected socialist Government. In 1986, a strong policy reversal was implemented by the center right coalition led by Jacques Chirac: most of the State assets were privatized, with a temporary halt during the 1988-1993 period. The State progressively lost its direct grip over manufacturing industries, the financial industry; it deregulated the goods and credit markets and reduced dramatically its subsidies (for a description of this financial liberalization episode, see Bertrand, Schoar and Thesmar, 2004).

In the past 15 years, the State's loss of power did not, apparently, change the way French business elites were recruited. Half of the firms listed on the French stockmarket have no controlling shareholder (Sraer and Thesmar, 2005). Top-ranking bureaucrats put in place in the 1980s could remain at the head of their companies. With a congruent board of directors, it was not be difficult for them to choose a successor with similar background and education in the 1990s. Furthermore, the Treasury set up a network of cross-shareholding and cross-directorships ("the noyaux durs", or hard cores) between private and privatized firms (Garrigues, 2002). The official goal of this network was to protect French champions from an hostile (i.e. foreign) takeover. All these factors, along with further privatizations in the 1990s, contributed to strengthen the grip of former civil-servants over the country's largest firms. This grip is still visible in 2006.

With these two features of the French elite in mind, we turn to a statistical analysis (next Sections), but first, we briefly review recent sociological work based on contemporaneous data

sources.

2.2 Contemporary Sociological Evidence

As evidenced above, personal and business relations between members of the French elite have naturally developped from the bonds created during their post-secondary education (see Burt, Hogarth and Michaud, 2001) and through common careers in the civil service (Swart, 1986; Kadushin, 1995). This sociological literature has shown that these relations have two prominent features. First, even though they most often resemble "weak ties" between fairly competitive people, these bonds can also be very tight and described by their members as true "friendship".[7] Second, the French elite can be broken down into different cohesive subgroups, within which friendship bonds prevail, but between which competition and weaker ties are the norm. These two aspects will provide us with a simple way of collecting hard information on social networks within the French business elite.

As it turns out, sharing common educational, social or occupational background is a good proxy for "friendship relations". Charles Kadushin (1995) studied the frienship relations among 28 members of the "inner circle" of the French financial elite (people whose influence was the largest among 125 most influent Frenchmen in business and economics). Consistently with the above discussion on the relation between bureaucratic and business elites, he shows that a past career in the French Treasury is highly correlated with being part of this "inner circle", other things being equal.[8] Moving on to friendship, he finds that two people of this circle are more likely to define themselves as "friends" when (1) both are ENA graduates and, most often (in his target sample), members of the Grands Corps, (2) both were connected to the same political party (often because they worked as advisers when the party was in government) and (3) when their past career included a few years at the Treasury. Also, within his target sample, Kadushin finds that friends were more likely to seat on the same board of directors. Hence, objective measures of elite cohesiveness so far used by sociologists interested in elites networks, such as similar education, similar professional experience, or board interlocks (on this literature see the review by Mizruchi, 1995) seem to be perfectly applicable in our French context. While not entirely surprising - especially to French insiders - this will serve our purpose well, given that our data does not provide direct information on

[7] Leslie Mitchell De Quillacq (1992), an american-born journalist, conducted in the early 1990s some 67 interviews among influential members of the business elite. In the words of one of them "Dinners, Luncheons, breakfasts, tête à tête... It's always the same who talk, always the same ones who are there. It doesn't stop. We meet all the time." (quoted from Kadushin, 1995, p 210).

[8] As it turns out, membership to very exclusive clubs like Le Siècle, AFEP, Entreprise et Cité,... is also strongly correlated with being a member of the business elite. We do not, however, have access to this (very) private information and this clearly is a limitation of our study.

the family or friendship relations between individuals, but only information on education, socioeconomic background and past career. To some extent, Kadushin's study legitimates our empirical strategy, which relies on assuming that people with share strong features and a common background within a restricted world will be either willing to reciprocate favors (accumulating social capital through "reciprocity transaction") or willing to maintain their reputation vis à vis the same network.

A second useful aspect of the French elite is that its members tend to cluster into different subgroups within which social cohesion is very high and between which there is some level of weak cooperation and competition (Frank and Yasumoto, 1998). Within subgroups (the "Corps d'Etat" for example), a high degree of cooperation is the norm, and members seek to accumulate social capital by building their reputation vis-à-vis the network as a whole, and not towards particular individuals (what Frank and Yasumoto call "enforceable trust"). With potentially competing subgroups, individuals tend to build ties based on interpersonal reciprocity ("reciprocity transactions") rather than construct a reputation with respect to the entire (alien) subgroup. Using a somewhat different methodology than Kadushin – but the same dataset – Frank and Yasumoto break the French elite into three groups: right-wing ENA graduates, left-wing ENA graduates and non-ENA graduates. Consistently with their hypothesis on between/within subgroup interaction, Frank and Yasumoto find that people are more likely to engage in hostile actions towards members of other subgroups than toward members of their own subgroups. In addition, they find that two people are more likely to engage in reciprocity transaction (help one another) when they do not belong to the same subgroup. These results are useful when constructing our empirical strategy in that they guarantee that various social networks actually do cluster the elite in several distinct and observable groups.

3 The Data

3.1 Data Sources

Our data set matches information on the employee – the CEO and the directors – with data on the employing firms. To construct it, we used three main data sources: (1) the DAFSA yearbook of French listed firms provides us with firm-level variables (including the names of the CEO and of the members of the board), (2) the French edition of the Who's Who gives us socioeconomic, career and educational information on CEOs and directors. The Who's Who is however not exhaustive, hence, (3) for ENA and Polytechnique graduates, Alumni Directories were used to obtain education and partial information on careers for those individuals not listed in the Who's Who.

All French firms listed on the stock market are required to issue an annual report including accounting information. Using the annual reports, the DAFSA yearbook compiles listed companies accounts in a yearly publication. Available yearbooks go back to the 1950s, but unfortunately, detailed balance sheet and profit account information is only available from the 1984 issue on. Given that French firm often take the form of business groups with myriads of subsidiaries, corporate account are always consolidated at the group-level – although the group leader is most often the only entity listed. We extracted this information from the 1988-1993 paper issues of the yearbook, and from its 1994-2003 electronic issues. We restricted ourselves to firms listed on the "premier marché" or on the "second marché", excluding those firms traded over the counter ("hors cote") or firms listed on the "nouveau marché" (a market for young, innovative firms which was created in 1995). The "premier marché" consists of all firms whose market capitalization and volume traded are large enough. The "second marché" is a market for smaller, in general fairly mature, firms who are listed but whose trading volume is too low to enter the premier marché. Both markets have on average some 300 firms listed each year.

Along with accounting information, the DAFSA yearbook provides us with the names of the CEO (directeur général or président du directoire), the chairman (président du conseil d'administration or président du conseil de surveillance) and the non-executive directors (administrateurs or membre du conseil de surveillance). Henceforth, we will use the words "non executive directors" and "directors" interchangeably, since their meanings are identical in the French context. As it turns out however, most CEOs (directeur général) also hold the title of chairman of the board (président du conseil d'administration). Only when the firm is a "société à directoire" (a special legal form imported from German law), is the CEO prevented from holding the chairman seat.

We retrieved personal information on the CEOs and the directors using two data sources. The first one is the Who's Who in France, a list of prominent people in politics, business and entertainment. For each individual, the available information is well standardized and includes self-reported measures of parent's occupation, place and date of birth, marital status, number of children, education, current occupation and past career (with positions in firms, firms' names, and dates of entry or accessions to the positions). Each individual listed in the DAFSA database was coded using his or her first and last names. The matching process has been done by hand for all CEOs, Chairmen and Outside Directors from 1992 until 2003, using the 1994 and 2000 issues of the Who's Who. On average, some 51% of all CEOs of all listed corporations were retrieved in the Who's Who. Given that we look at the 1994 and 2000 issues of the Who's Who, this percentage shows a steady decline over the period under study, from some 60% in the beginning to 45% in 2003. This figure is somewhat lower

for directors, with approximately 36% of them being listed in the Who's Who. Again, this percentage goes down from 40 to 27% over the period.

The second source of data on directors and CEOs are the directories of both Polytechnique and ENA graduates, which are exhaustive, in contrast to the Who's Who. These directories provide the obvious information about education, but no information about the socio-economic background and very little information about career (bureaucratic career - Corps d'Etat - if any). All CEO and director names present in the DAFSA database over the 1992 until 2003 were cross-checked using these directories. Given that we are looking at directories of graduates, almost 100% of ENA and Polytechnique graduates who were CEOs, chairmen, or board members of our listed firms can be assumed to have been included in our analysis file.[9]

Relying on the historical and sociological evidence reviewed above we identify three networks[10] in our sample: (1) ENA graduates, all former high ranking civil-servants, (2) Polytechnique graduates who had a career as "civil service" engineers and (3) Polytechnique graduates who spent their whole career in the private sector. We now turn to a descriptive investigation of our data to see how these three networks are prevalent among the directors and CEOs of large listed corporations.

3.2 The French Business Elite in the 1990s

A raw inspection of our data confirms and updates the findings of sociologists on a much larger sample. First, Polytechnique and ENA graduates dominate the French business elite, as do civil-servants. Second, this pattern has become even more pronounced over the recent period for which we have data (1992-2003).

[Insert Tables 1,2]

Indeed, the data are fully consistent with the sociological and historical evidence outlined above. Over the 1992-2003 period, (1) ENA and Polytechnique graduates run the lion's share of French firms, and (2) former civil-servants, in particular those actively involved in politics also run a large share of the firms. As can be seen from Table 1, ENA and Polytechnique graduates run, on average, some 20% of the firms; while this may appear small, their firms are on average very large, since they correspond to some 70% of all assets traded on the Stock Exchange (at book value). This pattern can still be found if we restrict our focus to civil-servants that were "cabinet" advisors, who run 6% of the firms, but 52% of the assets.

[9] Apart from ambiguity in a name and surname, as, for instance, when both are very common.

[10] In a previous version of this paper, available from the authors upon request, we used a finer breakdown, based on "Corps d'Etat" or political affiliation. Results were essentially similar to those presented here.

[Insert Figures 1,2]

Second, in spite of a vigourous process of privatization accompanied by the deregulation of many sectors of the economy during the nineties, civil-servants remain prevalent amongst top executives of French corporations as late as the early 2000s. Figure 1 shows the change in the asset-weighted share of CEOs from various backgrounds. During the 1990s, civil-servants with pure administrative background - ENA graduates - became more and more prevalent. In addition, Polytechnique "engineers", either from the civil service or from the private sector declined sharply after 1999. Last, this movement started with the resumption of privatizations under the right-wing government, elected in 1993. SOEs run by former civil-servants started to be sold to the public starting from that date on.

Figure 2 looks at the trend in board composition: it shows the change in the (asset-weighted) share of directorships held by ENA graduates, Polytechnique graduates with a career in the civil service and Polytechnique graduates with a pure private sector background. These shares are both very high and show a strong upward trend in the early 1990s, right when privatizations resume (1993). In asset weighted terms, between 40 and 50% of all director seats were filled with members of one of these three networks. Strikingly, without even mentioning this particular feature of French business elites, two reports on "best corporate governance practices", issued in 1995 and 1999 (Viénot I and II), focused on the appointment of "independent directors" to solve governance problems.

Figures 1 and 2 display similar evolutions: over the the 1990s ENA graduates became more and more prevalent both as directors and CEOs, while polytechnique graduates, in particular those linked with the civil service, lost ground. This, along with sociological evidence on French elites, suggests a relation between board composition and the CEO's identity: ENA graduate CEOs may be more likely to appoint ENA graduates as non executive directors.

A preliminary investigation indeed supports this claim: CEO's identity matters for shaping board composition. As Table 3 shows, the fraction of ENA graduates seating on the board of corporations run by ENA graduates is much higher than in other corporations. The same result holds for Polytechnique graduates when they have a civil service background but not for those "polytechniciens" with an entire career in the private sector.[11]

[Insert Table 3]

This first direct look at the data indeed suggests that social networks shape the composition of corporate boards. It is still unclear, though, which structural parameters is identified

[11] Similar tables, using various distinctions such as political affiliation, are also compelling. We omitted them to save space.

by this simple inspection of Table 3. Do we simply measure that ENA graduates are better directors, and hence more sought-after ? Do we simply measure the fact that some firms naturally attract ENA graduates as directors and CEOs - potentially because they operate in regulated industries, or because the business requires a good knowledge of the bureaucracy ? Or do we capture the fact that ENA CEOs run larger firms, that have larger boards and are thus more likely to appoint ENA directors ? To circumvent these difficulties, before looking at the networks *per se*, we briefly describe the empirical model we use in our exploration of the data, and then derive simple, easy to estimate reduced-form equations that will allow us to recover the parameters we want to identify. And, of course, this will help us interpret the results presented in Table 3.

4 Empirical Strategy

Appointment of a director depends on each potential applicant's skills, in particular her own social networks and whether it overlaps with that (those) of the CEOs. This simple statement generates a model which is difficult to estimate in general, even with the data at hand. However, this model can be transformed through various aggregations and elimination of nuisance parameters into relations that can be estimated. These transformations from the structural (economic) model to these aggregated and estimable forms are not straightforward. Therefore, this Section carefully spells out how the structural model translates into various estimable models.

4.1 The "Economic" Model

Consider the (matched employer - employee) panel where individuals are indexed by i, firms by j, and time by t. We assume the existence of several (possibly overlapping) networks, which we index by k. As in Munshi (2003), we try to identify whether belonging to the same network as that of the firm's CEOs increases the chance for individual i to be appointed at firm j's board. We thus start by formulating the following linear[12] probability employment model:

$$E_{ijt} = \alpha_i.Z_{jt} + \beta_j.X_{it} + Z'_{jt}.M.X_{it} + \sum_{k,l} \lambda_{kl}.\left(C^k_{jt}.A^l_i\right) + \varepsilon_{ijt} \tag{1}$$

where $E_{ijt} = 1$ if individual i works as a director of firm j at date t, and $E_{ijt} = 0$ otherwise. k is an index for the network. $A^k_i = 1$ when individual i belongs to network k, and zero otherwise. C^k_{jt} is equal to 1 when the CEO of firm j at t belongs to network k, and zero

[12]Given that the probability for a given - even if well connected - individual to be hired at a given firm's board are small, a linear probability model seems to be a correct approximation.

otherwise. Z_{jt} is a vector of firm level observables. X_{it} is a vector of individual level observables. α_i and β_j are vectors of individual and firm fixed effects.[13] M is a matrix of coefficients that stand for the various interaction terms between variables of X_{it} and variables of Z_{jt}.

In equation (1), we measure the strength of social networks by looking at the λ_{kl} coefficients. If network effects are really present, then we should observe that being appointed as a director in firm j occurs more frequently when the individual and the CEO share the same network. Hence,

$$\text{H}_0\text{: } \lambda_{kk} > \lambda_{kl} \text{ for all } l \neq k$$

corresponds to evidence of network effects in the patterns of nomination.

Obviously, finding directors and CEOs from the same network in the same company is *not* always evidence of networks. It could be the, say, former civil servants, tend to join larger firms, firms that operate in regulated industries, or firms that are dependent on procurement contracts. It could be, also, that former civil servants are more clever, and that large firms prefer to hire clever people both as CEOs and directors. This is why equation (1) adds three types of controls. First, the term $\alpha_i.Z_{jt}$ stands for the unobserved propensity of people α_i to serve as directors of companies with observables Z_{jt} - for instance, high IQ workers may obtain seats at the boards of large firms. Second, $\beta_j.X_{it}$ measures the unobserved firm propensity β_j to hire directors with observables X_{it} - for instance, firms with an authoritarian corporate culture may prefer to hire older directors. Taken together, these two terms control for the sorting of directors and firms along one dimension that is observable, and another that is not.

The third control $Z'_{jt}.M.X_{it}$ stands for matching of directors and firms along purely observable dimensions. For instance, former civil servants may tend to join the boards of former state owned entreprises, engineers may sort in more technology intensive industries, or educated directors may be more often found in larger firms. The elements of the M matrix measure the strength of sorting along observables in the data.

Model (1) cannot be estimated as such. Indeed, the original data, by construction, only includes observations for which $E_{ijt} = 1$. However, it is virtually impossible to generate all observations for which $E_{ijt} = 0$. For instance, we do not know who applied as a director to any given firm j and was not considered or even rejected. One solution could be to assume that all individuals applied to all firms. In particular, all individuals not included in the data are potential applicants. Another problem with this approach is computational as there are, a priori, some 600 firms and 5,000 directors every year. Over 10 years, the sample of all

[13] Because intercepts are always present in vectors X_{it} and Z_{jt}, model (1) always includes "pure" person and "pure" firm effects.

(i, j, t) would therefore feature some 30 millions observations ! Hence, in the next subsection we derive estimable models that *only require* the knowledge of the "$E_{ijt} = 1$" observations.

4.2 The Firm-Level Model

This section shows how model (1), expressed as a match between an individual and a firm, may be aggregated as a firm-level model and which parameters of (1) can be identified. Let us introduce a few more notations. First, let:

$$n_{jt}^k = \sum_i E_{ijt}.A_i^k$$

be the total number of directors sitting at firm j's board, who belong to network k. $n_{jt} > n_{jt}^k$ is the total number of directors of j. n_t^k is the total number of members of network k and finally n is the total labor force (total number of directors in the data source).

In the following derivation, we will assume for simplicity that $X_{it} = 1$, i.e. that directors do not differ according to observable characteristics. While this is admittedly a strong assumption, this is one that we will be able to dispense with in the following section (where we will derive the "individual level model"). The objective of this hypothesis is thus mostly for clarifying purposes (but detailed calculations, without this assumption, are reported in Appendix). After a few manipulations, which basically amount to computing n_{jt}^k and n_{jt} using model (1), we show in Appendix that:

$$\begin{aligned} Y_{jt}^k &= \left(\frac{n_{jt}^k}{n_t^k} - \frac{n_{jt}}{n_t}\right) = a_t^k.Z_{jt} + \sum_m b_t^{mk}.C_{jt}^m + u_{jt}^k \qquad (2) \\ \text{with } b_t^{mk} &= \lambda_{mk} - \sum_l \lambda_{ml}\frac{n_t^l}{n_t} \end{aligned}$$

where Y_{jt}^k is the proportion of members of network k ending at the board of j in excess of the natural population proportion of people ending at the board of j. The $a^k.Z_{jt}$ term in equation (2) allows to control for firm - director matching along firm observables and director unobserved characteristics. This control is performed by simply including the Z_{jt} firm level controls in the linear regression of Y_{jt}^k on the CEO's network C_{jt}^m. The b_t^{mk} coefficient measures the relation between a CEO's identity and the board composition, controlling for the above fixed effects. These coefficients are not exactly equal to the λ's, because any network can be present at a given firm's board, as the mere result of its size in the natural population. The expected fraction of m, even in the absence of network effects, would be n^m/n. As a result, the specific effect on k will be *underestimated* in the "firm level" specification if we do not correct for this bias.

Finally, testing for the presence of networks is fairly straightforward. By comparing b_t^{kk} and b_t^{kl}, we are able to restate hypothesis H_0 in terms of the estimated parameters from (2):

$$\text{H}_0\text{: } b_t^{kk} > b_t^{kl} \text{ for all } l \neq k$$

thus, by looking at the difference between the coefficients of C_{jt}^k in the regressions explaining (1) the proportion of members of k ending in j and (2) the proportion of members of l ending in j.

4.3 The Individual-Level Model

Obviously, because our data sources have two dimensions, firm and individual, an equivalent strategy can be derived using the individual dimension. The advantage of aggregating equation (1) at the individual level is that we can dispense with the assumption that directors are identical with respect to observables ($X_{it} = 1$). Symmetrically, it is convenient to assume that firms are identical ($Z_{jt} = 1$). Thus, because in the derivation of the individual and firm level models, we make different assumptions on the matching process of directors to firms, we view their results as complementary.

Let:

$$\mu_{it}^k = \sum_j E_{ijt} C_{jt}^k$$

be the number of firms in which, simultaneously, i is a director and the CEO belongs to network k. We denote μ_t^k, the sample number of members of network k, μ_{it}, the number of board seats held by individual i and μ_t the overall number of board seats in the sample.

We now assume that $Z_{jt} = 1$. Again, after straightforward manipulations described in Appendix, we can show that model (1) rewrites as the following equation, estimated with *individual* level data:

$$\begin{aligned} W_{it}^k &= \left(\frac{\mu_{it}^k}{\mu_t^k} - \frac{\mu_{it}}{\mu_t} \right) = c_t^k . X_{it} + \sum_m d_t^{km} . A_i^m + v_{it}^k \qquad (3) \\ \text{with } d_t^{km} &= \left(\lambda_{km} - \left(\sum_l \lambda_{lm} . \frac{\mu_t^l}{\mu_t} \right) \right) \end{aligned}$$

Therefore, equation (3) explains, given individual i's network, the excess share W_{it}^k of boards in which i is sitting and where the CEO belongs to network k. The coefficient d_t^{km} on the director's network A_i^m measures the extent to which a CEO from k tends to hire preferentially directors from k. This estimation strategy allows to control for the unobserved propensity of firms to match with directors of known characteristics by including individual observables as additional regressors.

4.4 Sources of Identification

Let us start with a simplified version of our equation (1):

$$E_{ij} = \alpha_i + \beta_j + \sum_{k,l} \lambda_{kl}.\left(C_j^k.A_i^l\right) + \varepsilon_{ij} \tag{4}$$

in which we eliminate all variables but the network affiliation of person i and of the CEO of firm j and in which the time dimension is also discarded. This new equation (4) contains the so-called pure person and firm effects. It is crucial to understand why our transformations, both the person-level and the firm-level models, are able to get rid of the pure person and firm effects, even in the cross-section. Take any person i. We know in which firms i is employed (a member of the board) and in which firms i is not employed. This stands in stark contrast with a wage model with pure person and firm effects (see Abowd and Kramarz (1999)) because the wage paid to i is only known in those firms where person i is employed. Hence, using the linear specification given above, all the "$E_{ij} = 0$" observations bring information on the person effect. Because there are many such observations, it is relatively easy to eliminate the pure person effect using the appropriate transformation, as described in the individual-level model subsection. Similarly, for any firm j, all those persons who do not belong to j's board bring information. Because there are many such observations, it is relatively easy to eliminate the pure firm effect using an appropriate transformation, as described in the firm-level model subsection.

Hence, our identification strategy is similar to the so-called "Within"transformation used in panel data analysis.

4.5 Possible Biases

There are multiple sources of estimation biases; this subsection makes it clear which ones our empirical strategy will be able to deal with. Obviously, measurement error – aside from hand-typing errors – does not appear to be an issue, because we directly measure the network each CEO belongs to. Of course, measurement error could arise if our categorization of the various networks was inappropriate. Yet, unbiased mistakes in measuring networks would a priori attenuate the magnitude and significance of our estimates.

Second, remember that we could not recover the socio-economic background of all directors and CEOs, but only for those who happened to be present in the Who's Who.[14] It could very well be that those individuals included in the Who's Who are also those with high "director" ability. Independently of being an ENA or a Polytechnique graduate, sheer

[14] Polytechnique and ENA graduates were all included, however, given that we had access to the directory of all former students of these two schools.

charisma, skills, or intensive networking are likely to be correlated with someone's probability of becoming a director. Our model includes a specific person effect α_i that controls for this tendency. And because our firm-level model, by aggregating and differencing, eliminate α_i, this technique controls for such potential biases.

Third, our model controls for observable tendencies of firms to hire directors from particular networks, i.e. for instance firms in regulated industries may have a propensity to hire former civil servants (the $Z'_{jt}.M.X_{it}$) term in equation (1). But our approach does not control for unobservable firm "tastes" for some networks, as for example, when some firms, because of their corporate culture, have a tradition of promoting and hiring engineers rather than top level bureaucrats. This limitation of our approach is easy to see in the individual level model (3) where we allowed director observables to vary ($X_{it} \neq 1$). Let us look at the propensity of firms to hire from particular networks; in the language of model (1), this means $X_{it} = (A_i^m)$ for some m. As appears from equation (3), a linear regression will not be able to identify this effect ($c_t^k.X_{it}$) separately from network effects ($d_t^{km}.A_i^m$). Theoretically, it would be possible to account for this by including a firm fixed effect in equation (2) - see the derivation in Appendix. Unfortunately, there is a very low turnover of ENA CEOs and, most often, when they leave, their replacement CEO turns out to be another former ENA graduate. Clearly, introduction of firm fixed effects would not generate any well-identified estimate in this situation. This fact therefore makes the practical identification of (1) a fixed tendency for a given firm to hire, say, ENA graduates separately from (2) the additional tendency due to the fact that currently the CEO is an ENA graduate, virtually impossible *using the firm-level* specification (again, not in theory but in practice).

Fourth, it is impossible to control for sorting along unobservable characteristics *on both sides* (pure unobservable matching). If directors with high IQ tend to join firms with high IQ CEOs, and IQ is correlated with Grandes Ecoles graduation, our estimates will be upward biased. This concern is difficult to address. Fortunately, our networks are not only related to elite school attendance, but also to a career in the civil service. Hence, our data will allow us to compare (1) former civil-servants from different top schools and (2) civil and non civil-servant that graduated from the exact same school.

5 Evidence of Networks

This section looks at network effects using model (1) discussed just above; we estimate the λ_{kl} parameters, which stand for the marginal probability, for a member of network l, to be a director in a firm run by a CEO belonging to network k.

5.1 Estimating the Probability of Employment

In a first step, let us assume away matching considerations and simply posit that $X_{it} = Z_{jt} = 1$, which means that some firms have in general a higher tendency to appoint, and some individual have a general tendency to be appointed. We will deviate from these assumptions in Section 5.3. We start by estimating the following, slightly modified, version of (2):

$$\frac{n_{jt}^k}{n_t^k} - \frac{n_{jt}^0}{n_t^0} = a_t^k + \sum_m \underbrace{(\lambda_{mk} - \lambda_{m0})}_{c_{km}} C_{jt}^m + u_{jt}^k \tag{5}$$

where j indexes the firm and t indexes time. k stands for the network under scrutiny (ENA, Polytechnique with civil service, Polytechnique without civil service). Equation (5) is obtained by substracting equation (2) for network k from equation (2) for network 0. Thus, the difference with the previous firm level equation is that we take one network as the reference. Now, the left-hand side variable is the fraction of members of network k that are employed in firm j *minus* the fraction of members of reference network that are employed in firm j. We define the reference category to be members of neither ENA nor Polytechnique networks. u_{jt}^k is an error term and the indicator C_{jt}^m is equal to 1 whenever firm's j CEO belongs to network k. We are interested in the coefficients of these indicator variables $(\lambda_{mk} - \lambda_{m0})$, which have a very simple structural interpretation, since they measure the probability for a member of a given network k to be a director of a firm run by a member of network m, *minus* the probability that a member of k is a director in a firm run by a CEO that does not belong to any of the networks.

[Insert Table 4]

Table 4 reports estimates of (5) for all three networks of interest (ENA, Polytechnique with civil service, Polytechnique without civil service). These regressions are jointly estimated using the SURE method, that permits error terms of the three equations to be correlated with each others for a given firm. Indeed, for example, if a given firm has many ENA directors, it is less likely that it has many Polytechnique graduates, so the two equations are not totally independent. We also allow the error terms to be correlated across observations of a same firm using the White correction method for standard errors. The bottom panel of table 4 provide tests of the null hypothesis of equality of coefficients on CEO across equations.

First, for civil servants, the coefficient on CEO's identity is always very strong and economically significant; the probability of being director in a firm is increased on average by some 0.5-1 percentage points when the CEO belongs to one of the two civil service related

networks (graduates from ENA or Polytechnique). This is sizeable, given that, with 600 firms, the probability of being employed in given specific firm is on average some 0.2%.

Second, these results do not necessarily constitute very strong evidence of network importance per se, since we are only comparing members of three networks to "mostly unconnected" directors. We thus test our H_0 hypotheses more directly by looking if, for a given director, the probability of being employed in a firm run by a CEO of the *same* network is significantly higher. In other words we ask in equation (5) whether $c_{kk} > c_{km}$, for all m. These tests are reported in the bottom rows of Table 4. Our results therefore show that the most important networks are former ENA graduates, former Polytechnique graduates with civil service career, but not Polytechnique graduates who went directly to the private sector. These results are strong evidence that the intuitions of Kadushin (1995) and Franck and Yasumoto (1998) were right: it is networks of former civil-servants, not networks of engineers, that matter the most.

To confirm the results obtained in Table 4, we used the individual-level model to run similar regressions, and report the results in supplemntary Table A1. Given our assumptions that $X_{it} = Z_{jt} = 1$, results should be identical to the firm level model (5), assuming model (1) is not misspecified. There, the dependent variable is the fraction of seats held by individual i (at date t) that correspond to firms run by CEOs of network k. The explanatory variables are describe the network of individual i. We run three regressions, one for each network, and allow residuals to be correlated across the three equations of each given individual using the SURE estimation technique. As it turns out, the same orders of magnitude and the same test statistics are obtained with this alternative way of collapsing the data. The only difference that emerges using this model is that ENA directors are as likely to sit on boards of firms run by ENA CEOs as they are to sit on boards of firms run by Polytechnique civil servants. This suggests that different civil service related networks have links with each other, a pattern that we will find again in subsequent analyses.

5.2 Estimating the Probability of Appointment

An important question raised by the previous regression results is whether CEO's identity matters, or whether it is simply a proxy for the board's identity. Imagine for instance that the CEO holds no real power in appointments, and that all the power in these matters rests with the board of directors. In this case, the board is going to appoint CEOs that are similar to the set of directors, implying that the causal relation is reversed. Though this is still evidence of social networks interfering with the labor market, the direction of the relation matters for corporate governance. Indeed, if the board turns out to be chosen by the firm's CEO - Shivdasani and Yermack (1999) suggest that this situation might very

well hold in the US -, the directors' ability to monitor the management on behalf of the shareholders might be severely impaired.[15]

To look at this issue, we do two things. First, we reestimate model (1), by looking at *appointments* rather than employment. Hence, $E_{ijt} = 1$ when i is appointed by firm j at date t. We use the firm level aggregation and thus correlate the CEO's identity with the firm's hiring policy, thus providing a more stringent test of social interactions.[16] We then ask whether the CEO's identity in these appointment regressions is a proxy for initial board composition by including in the regression the past number of directors in the board of either networks. This amounts to running the following modified version of (5):

$$\frac{n^k_{jt}}{n^k_t} - \frac{n^0_{jt}}{n^0_t} = a^k_t + b^k_{jt} + \sum_m c_{km}.C^m_{jt} + \sum_m c'_{km}\#A^m_{jt} + u^k_{jt}$$

where the left-hand side variable is now the share of newly hired members of network k hired by firm j minus the share of newly hired directors by j. $\#A^m_{jt}$ is now the fraction of members of network m *already* sitting on the board of firm j. Note that such a regression could *not* be estimated using employment instead of appointment - as in the specifications shown above - since faces the well-known reflection problem (Manski, 1993): if A and B are similar and sitting on the same board, then it is difficult to know whether A seats because of B or the reverse. By introducing some dynamics, this methodology makes some kind of "Granger causality" argument: it is A who matters if A was on the board *before* B.

[Insert Table 5]

The results of these firm-level regressions for our three selected networks are presented in Table 5. Estimation of all three equations is made jointly using the SURE methodology, and allowing for flexible correlation across observations of a same firm using the White correction. As above, industry and year indicators are included. To avoid spurious correlations, explanatory variables are lagged one year. In the Table, columns 1 to 3 look at the equivalent of (5), that is assuming $c'_{km} = 0$. Columns 4 to 6 add the past board composition controls.

The regression results from columns 1 to 3 confirm previous findings; education (ENA and Polytechnique vs the rest) and career (civil service vs private sector) networks affect the allocation of directors to firms, even when analyzing nominations. Results from columns

[15] Claude Bébéar, the former CEO of AXA, a large French insurance company, and a prominent figure in French business, argues that "board members are in general reluctant to fire the president. One general assembly after the other, a CEO has "his" men appointed on the board of directors. They owe him their seats. After a few years, the CEO seats with a board composed through personnal ties, various free masoneries, student friendship and so forth." (Bébéar, 2003).

[16] We also ran - results non reported - individual level regressions using appointments instead of employment, with pretty much the same estimates and success.

4 to 6 support the idea that CEO's identity, not board composition, explain the selective directors' appointments. First, even though inclusion of the board composition variables reduces slightly the difference between coefficients on CEO's identity (compare tests values for the first regression with those for the second), all c'_{km} coefficients for board composition are significant and strongly positive. All tests give results virtually identical to those presented in Table 4. In addition, we now have similar results for boards: boards dominated by former civil servants tend to recruit new directors from the networks (Polytechnique or ENA) they belong to.

5.3 When Directors and CEOs Sort on Other Dimensions

Last, we assess the biases arising from the fact that directors may sort with firms according to observable or unobservable characteristics. As suggested in section 4.5, we run firm level regressions including average individual characteristics and individual level regressions including firm level characteristics, and see if our results still hold.

[Insert Table 6]

We start by reestimating our firm-level regressions including observable firm characteristics, as in equation (2): a dummy equal to one for former SOEs, industry dummies as well as the firm's past profitability (as measured by ROA lagged by one year). This approach allows us to take into account the fact that these observables matter for directors endowed with particular, unobservable, characteristics that might be correlated with networks. This is done in the first three columns of table 6, for each of the three networks we focus on.

As it turns out, these controls do not affect our estimates very much. The only change is that now firms run by ENA graduates are as likely to hire former civil servants from ENA than from Polytechnique. This does not affect our general conclusion that civil-servants networks are active, while those related to a Grande Ecole (Polytechnique) without bureaucratic career are not. Accounting for other possible sorting processes, that could be overlapping with network effects, does not affect our results neither quantitatively nor qualitatively.

In supplementary Table A2, we use individual level regressions to control for director characteristics (age and years of education), instead of firm level characteristics. Results obtained are similar to what was reported in Table A1.

6 Real Effects of Social Networks

The above results suggest that networks of former high ranking civil-servants seem to be particularly active in shaping board composition. When the CEO is a former civil-servant

(whether a graduate from Ecole Polytechnique or ENA), the fraction of directors from the same background is larger.

The existing literature in labor economics suggests that such arrangements might be optimal: CEOs use their own social networks to "grease the wheels" to find more appropriate directors. One obvious cost here is nepotism, i.e. CEOs using their networks to hire friends rather than appropriate directors. The conflict of interest is particularly strong in the present case, as directors are supposed to monitor the CEO, and friends are obviously less likely to be "tough" supervisors. Theoretical models in labor economics assume that shareholders can design an optimal contract with the referee (here, the CEO). In this case, perverse effects such as nepotism, are dominated by beneficial effects in equilibrium. This assumption is, however, unlikely to hold in the context of large, publicly traded corporations such as the ones we study here.

As argued above, an important function of the board of directors in a corporation is to discipline the management in order to make it act in the firm's shareholders interests. In some extreme cases, when it becomes clear that a change in strategy is needed and cannot be implemented by the current management, this might force the CEO to resign. This is, however, likely to occur too late if some directors and the CEO belong to the same social network and are tied by social connections. Then, the CEO might be able to retaliate on any hostile action undertaken by his directors, even if he loses his job, or in contrast might be able to bribe - because of their common relations - his directors more efficiently.

Hence, we ask if well connected CEOs are less likely to be forced out when their firm performs badly. There is a long tradition in the corporate governance literature to investigate CEO turnover to performance sensitivity. In the spirit of this literature, we start with the following logistic regression:

$$T_{jt} = \alpha + \beta.PERF_{jt} + \delta.\text{controls}_{jt} + \varepsilon_{jt} \tag{6}$$

where T_{jt} is a dummy variable equal to 1 when the CEO loses her job over the next year (between t and $t+1$). $PERF_{jt}$ is an industry adjusted measure of corporate performance (we use here return on assets, i.e. EBIT over assets). Following Weisbach (1988), we ask if the number of directors that we label as "insiders" affects β. This leads us to estimate the following equation:

$$T_{jt} = \alpha + \left(\beta_0 + \beta_1.\text{insiders}_{jt} + \beta_2.\text{controls}_{jt}\right).PERF_{jt} + +\delta.\text{controls}_{jt} + \varepsilon_{jt} \tag{7}$$

where controls include board size (as measured by log(number of directors)), ownership concentration (as measured by the fraction of votes held by the largest block holder), a dummy equal to 1 when the CEO is *not* chairman of the board of directors (which is always

the case when the firm has a German style two tier board structure), and a dummy equal to 1 when the firm is or has been state controlled in the past. These controls enter both additively, but also as interactions with our performance. Indeed, the finance literature has shown that (1) large board may be less efficient monitors (Yermack (1996)) and thus should decrease turnover to performance sensitivity ($\beta_2 > 0$) and (2) large shareholders are more efficient monitors (Shleifer and Vishny (1997)) and thus should increase turnover to performance sensitivity ($\beta_2 < 0$). There also some suspicions that CEOs cannot reduce the odds of getting fired when they do not chair the board of directors ($\beta_2 > 0$). Finally, given that, as we saw above, social networks related to civil service are the most active, it is also natural to control for a potentially different behavior of firms who have either been recently privatized, or firms that are still partially owned by the government. One clear possibility is that these firms are, from a general standpoint, less well governed and therefore have lower turnover to performance sensitivity for reasons beyond the management's social networks ($\beta_2 > 0$).

The coefficient of interest here is β_1, which measures the extent to which a board with insiders may reduce the odds of firing the CEO in case of bad performance. In a cross section of US firms, Weisbach (1988) has shown that this is the case for firms whose board is dominated by former employees, current employees, or suppliers of the firm. The analysis conducted above suggests that, at least in the French context, a more relevant measure of inside directors rests on computing the number of directors that belong to the same social network as the CEO. We proceed by identifying social networks as in the above analysis: ENA graduates, Polytechnique graduates with a past career in the civil service, and Polytechnique graduates with a pure private sector background.

[Insert Table 7]

Logistic regression results are reported in Table 7. We restrict ourselves to the sample of CEOs aged less than 65, in order to reduce the chances that turnover be due to retirement.[17] First, column 1 reports the plain CEO turnover regressions without network effects (i.e. assuming $\beta_2 = 0$). As it turns out, the sensitivity of turnover to performance is large and statistically significant at 5%. Other things equal, a one standard deviation reduction in adjusted ROA (by about 6 percentage points) increases the probability of next year CEO turnover by 37 percentage points. This is not surprising since a simple cross tabulation shows that, for firms experiencing CEO turnover, average industry adjusted ROA is only 1.8 percentage lower than what it is for firms with stable CEOs. Column 1 also shows that other controls have little, if any, explanatory power on the sensitivity of turnover to performance.

[17] The distribution of CEO age at turnover date indeed has a spike around 65.

As it turns out, firms with a two tier board and firms with large shareholders tend to oust their CEOs less often when performance deteriorates. This is at odds with intuition but statistically insignificant. Less surprisingly, former SOEs do indeed seem to have a weaker governance, although the difference is, again, insignificant. This pattern is unchanged once we control for the presence of inside directors (columns 2 to 5).

We then look at the effect of inside directors on turnover to performance sensitivity. Column 2 takes as our measure of insiders a dummy equal to 1 if the board of directors has at least two ENA graduates, *when the CEO is also an ENA graduate*. As it turns out, the difference in sensitivity between firms with inside dierctors and firms without inside directors is large and statistically significant at 1%. Point estimates suggest that, in the absence of inside directors, a one standard deviation reduction in adjusted ROA leads to an increase by 33 percentage point in the probability of CEO turnover. In the presence of inside directors, the same performance reduction actually leads to a decrease of turnover probability which is not significantly different from zero.

Columns 3 and 4 look at networks of Polytechnique alumni. Column 3 focuses on Polytechnique graduates with a past in the civil service, a network that we have shown to be active in the above analysis. Thus defined, the presence of inside directors reduces the turnover to performance sensitivity of firms, albeit to a smaller extent than for networks of ENA graduates. Also, the difference is statistically insignificant. One possibility is that there simply to few of these CEOs and directors to identifiy networks effects properly. Alternatively, these networks may be blended into the more general network of former high ranking civil servants (we investigate this in column 5). In column 4, we just look at Polytechnique graduates with pure private sector background. The analysis above suggests that such networks do not appear to shape board of directors composition, as Polytechnique CEOs are as likely as other CEOs to hire polytechnique directors. Consistently with this finding, boards with CEOs from Polytechnique and Polytechnique directors do shake up the incumbent management as often as other firms when performance worsens.

In Column 5, we ask if the overall network of former civil servants from ENA or Polytechnique actually affect corporate governance. It is natural to put these networks together because Tables 4 and 6 have shown that ENA CEOs also tend to hire civil servants with a Polytechnique degree. This suggest that there exists a larger networks of former high ranking civil servants. We thus use a dummy equal to 1 when the board of directors has at least two members of either network and the CEO belongs to one of these networks. Consistently with the estimates reported in columns 2 and 3, civil servant networks appear strongly associated with reduced monitoring of management. The turnover to performance sensitivity of firms with such insiders is equal to zero, while it is strongly negative for the rest of the population.

The difference is statistically significant at 5%.

7 Conclusion: Social Networks and Corporate Performance

This paper has shown that social networks do indeed appear to shape board composition. We used French data because the history and sociology of the French business elite make it fairly easy to measure if a given CEO or director belongs to a given network. As it turns out, network of former bureaucrats are the most active in determining board composition, controlling for both directors and firm characteristics. This phenomenon seems to have real implications in terms of corporate governance, firms with directors and CEOs with a past career in the civil service are less likely to change CEO when performance is bad. This suggests that social networks may serve as a clean way to measure non executive director independence. This is interesting for France, where the Anglo-saxon notion of independence has little grip: the appointment of an employee on the board of non executive directors is not a common practice. This is also interesting beyond France because it suggests that there must ways (like social networks) to measure director independence more accurately than by using the traditional measure that the existing literature has documented.

Are there more tangible side effects of such bad governance ? When we look at performance, firms run by former civil-servants are systematically less profitable than average, although the effect is statistically significant only for those CEOs who were "cabinet" advisor at some point in their career (which roughly corresponds to 50% of them), i.e. who are politically-connected CEOs. We provide a description and an explanation for this result in a companion paper (Bertrand, Schoar, Kramarz and Thesmar, 2006): our contention there is that labor demand from these firms is more sensitive to the political cycle, as their politically-connected CEOs "lend" jobs to incumbent politicians. We also provide suggestive evidence that such job creation helps reelection, but hampers corporate profitability. The present paper provides an explanation as to why these CEOs remain in power, even though they do not make the most efficient use of the firm's assets: they, not the investors, are the ones who govern the company.

8 References

Abowd, John M., and Kramarz, F. (1999), "The Analysis of Labor Markets Using Matched Employer-Employee Data", in *Handbook of Labor Economics*, edited by O. Ashenfelter and D. Card, vol 3, pp 2629-2710

Asselain, Jean-Charles (1978), *Histoire économique de la France*, Folio, Paris

Bauer, Michel and Bertin-Mourot, B. (1997), "La tyrannie du diplôme initial et la circulation des élites: La stabilité du modèle français", in Mendras and Suleiman Eds. *Le recrutement des élites en Europe*, La Découverte, Paris

Bayer P., Ross S. L. and G. Topa (2005), "Place of Work and Place of Residence: Informal Hiring Networks and Labor Market Outcomes" NBER Working Paper, 11019

Bébéar, Claude (2003), "Ils vont tuer le capitalisme", Editions Plon, Paris

Bertrand, Marianne, Luttmer, E. and Mullainathan, S., (2000), "Network Effects and Welfare Culture", *Quarterly Journal of Economics*, vol CXV, pp 1019-1056

Bertrand, Marianne, and Mullainathan, S. (2001), "Are CEOs Rewarded for Luck? The Ones Without Principals Are" *Quarterly Journal of Economics*, Vol 116, N°3, pp. 901-32

Bertrand, Marianne, Schoar, A. and Thesmar, D. (2005), "Banking Deregulation and Industry Structure: Evidence From the French Banking Reforms of 1985", *forthcoming Journal of Finance*

Bertrand, Marianne, Kramarz, F., Schoar, A. and Thesmar, D. (2006), "Politically-Connected CEOs and Corporate Outcomes: Evidence from France", mimeo

Burt, Ronald, Hogarth, R. and Michaud, C. (2000), "The Social Capital of French and American Managers", *Organization Science*, March, 11, 2, pp 123-147.

Cassis, Youssef (1991), *Big Business in Europe*, Oxford University Press

Cohen, Elie (1988), *L'Etat brancardier*, Fayard, Paris

Coles, Jeffrey, and Hoi, C. (2003), "New Evidence on the Market for Directors: Board Membership and Pennsylvania State Bill 1310", *The Journal of Finance*, Vol LVIII, N°1, pp 197-230

Dahya, Jay, Mc Connel, J. and Travlos N. (2002), "The Cadbury Commitee, Corporate Performance and Top Management Turnover", *The Journal of Finance,* Vol LXVII, N°1, pp 461-480

De Quillacq, Leslie (1992), "The Power Brokers: An Insider's Guide to the French Financial Elite", Dublin: Lafferty Publications

Ferris, Stephen, Jannagathan M. and Pritchard, A. (2003), "Too Busy to Mind the Business ? Monitoring by Directors with Multiple Board Appointments", *The Journal of Finance,* Vol 58, 3, pp 1087-1112.

Fernandez, Roberto, Castilla, E., Moore P., (2000), "Social Capital at Work: Networks and Employment at a Phone Center", *The American Journal of Sociology*, Vol 105, N°5, pp 1288-1356

Frank, Kenneth, and Yasumoto, J. (1998), "Linking Action to Social Structure in the System: Social Capital Within and Between Subgroups", *American Journal of Sociology*, Vol 104, N°3, pp 642-686

Garrigues, Jean (2002), *Les patrons et la politique: De Schneider à Seillière*, Ed. Perrin, Paris

Granovetter, Mark (1973), "The Strength of Weak Ties," *American Journal of Sociology*, 78 (May), pp 1360-1380

Hermalin, Benjamin and Weisbach, M. (2001), "Boards of Directors As An Endogenously Determined Institution: A Survey of The Economic Literature", NBER WP N°8161

Kadushin, Charles (1995) , "Friendship Among the French Financial Elite", *American Sociological Review*, Vol 60, N°2, pp 202-221

Manski, Charles (1993), "Identification of Endogenous Social Effects: The Reflection Problem", *The Review of Economic Studies*, 60, pp 531-542

Melitz, Jacques, (1990), "Financial Deregulation in France," *European Economic Review*, vol 34, pp 394-402.

Mizruchi, Mark (1996), "What Do Interlocks Do ? An Analysis, Critique, and Assessment of Research on Interlocking Directors", *Annual Review of Sociology*, Vol 22, pp 271-298

Montgomery, James, (1991), "Social Networks and Labor Market Outcomes: Towards an Economic Analysis", *The American Economic Review*, Vol 81, N°5, pp 1408-1418

Munshi, Kaivan (2003), "Networks in the Modern Economy: Mexican Migrants in the US Labor Market", *Quarterly Journal of Economics*, pp 549-599

Nguyen-Dang, Bang, (2006), "Does The Rodolex Matter ? Corporate Elite's Small World and the Effectiveness of Boards of Directors", mimeo HEC

Rees, Albert (1966), "Information Networks in the Labor Market," *The American Economic Review*, Vol 56, N°1/2, pp 559-566

Saloner, Garth (1985), "Old Boys Networks as Screening Mechanisms", *Journal of Labor Economics*, Vol 3, N°3, pp 255-267

Shivdasani, Anil, and Yermack, D. (1999), "CEO Involvement in the Selection of New Board Members", *The Journal of Finance*, Vol 54, N°5, pp 1829-1853

Sraer, David and Thesmar, D. (2004), "Performance and Behavior of Family Firms: Evidence From the French Stockmarket", *forthcoming, Journal of the European Economic Association*

Suleiman, Ezra (1997a), "Les élites de l'administration et de la politique dans la France de la V° république: Homogénéité, Puissance, Permanence", in Mendras and Suleiman Eds. *Le recrutement des élites en Europe*, La Découverte, Paris

Suleiman, Ezra (1997b), *Les ressorts cachés de la réussite française*, Edition: Le Seuil, Paris.

Swartz, David (1985), "French Interlocking Directorships: Financial and Industrial Groups", in *Networks of Corporate Powers: A Comparative Analysis of Ten Countries*, Stokman, Ziegler and Scott Eds.

Swartz, David (1986), "French Corporate Leadership: A Class Based Technocracy", *Research in Political Sociology*, vol 2, pp 49-79

Weisbach, Michael (1988), "Outside Directors and CEO turnover", *Journal of Financial Economics*, Vol 20, pp 431-460

9 Appendix

9.1 Identifying Power of the Firm-Level Model

In terms of the above notations, these four sets of variable write:

$$n_{jt}^k = \sum_i A_i^k E_{ijt},\ n_{jt} = \sum_i E_{ijt},\ n_t^k = \sum_i A_i^k,\ n_t = \sum_i 1$$

hence by using model (1) to get an expression of E_{ijt}, we can compute n_{jt}^k explicitly:

$$\begin{aligned} n_{jt}^k &= \sum_i A_i^k . \left\{ \alpha_i . Z_{jt} + \beta_j . X_{it} + Z'_{jt} . M . X_{it} + \sum_{m,l} \lambda_{ml} . \left(C_{jt}^m . A_i^l \right) + \varepsilon_{ijt} \right\} \\ &= \left(\sum_i \alpha_i . A_i^k \right) . Z_{jt} + \beta_j . \left(\sum_i A_i^k . X_{it} \right) + Z_{jt} . M . \left(\sum_i A_i^k . X_{it} \right)' \\ &\quad + \sum_m \lambda_{mk} . \left(C_{jt}^m . A_i^k \right) + \sum_i A_i^k \varepsilon_{ijt} \end{aligned}$$

which leads to:

$$\frac{n_{jt}^k}{n_t^k} = \widehat{\alpha}_t^k . Z_{jt} + \beta_j . \widehat{X_t^k} + Z'_{jt} . M . \widehat{X_t^k} + \sum_m \lambda_{mk} . C_{jt}^m + \widehat{\varepsilon}_{jt}^k \tag{8}$$

where:

$$\begin{aligned} \widehat{\alpha}_t^k &= \frac{\sum_i \alpha_i . A_i^k}{\sum_i A_i^k},\ \widehat{\varepsilon}_{ijt}^k = \frac{\sum_i A_i^k . \varepsilon_{ijt}}{\sum_i A_i^k} \\ \widehat{X_t^k} &= \frac{\sum_i A_i^k . X_{it}}{\sum_i A_i^k} \end{aligned}$$

so that $\widehat{\alpha}_t^k$ is the average fixed effect (ability to find any kind of directorship) of all members of network k. $\widehat{X_t^k}$ is the average X_{it} for all individuals of network k.

We then compute board size n_{jt}:

$$\begin{aligned} n_{jt} &= \sum_i \left\{ \alpha_i . Z_{jt} + \beta_j . X_{it} + Z'_{jt} . M . X_{it} + \sum_{m,l} \lambda_{ml} . \left(C_{jt}^m . A_i^l \right) + \varepsilon_{ijt} \right\} \\ &= \left(\sum_i \alpha_i \right) . Z_{jt} + \beta_j . \left(\sum_i X_{it} \right) + Z_{jt} . M . \left(\sum_i X_{it} \right)' \\ &\quad + \sum_{m,l} \lambda_{ml} . C_{jt}^m . \left(\sum_i A_i^l \right) + \sum_i \varepsilon_{ijt} \end{aligned}$$

which rewrites:

$$\frac{n_{jt}}{n_t} = \widehat{\alpha}_t . Z_{jt} + \beta_j . \widehat{X_t} + Z'_{jt} . M . \widehat{X_t} + \sum_{m,l} \lambda_{ml} . C_{jt}^m . \frac{n_t^l}{n_t} + \widehat{\varepsilon}_{jt} \tag{9}$$

where:

$$\begin{aligned}\widehat{\alpha}_t^k &= \frac{\sum_i \alpha_i}{\sum_i 1}, \widehat{\varepsilon}_{ijt}^k = \frac{\sum_i \varepsilon_{ijt}}{\sum_i 1} \\ \widehat{X_t} &= \frac{\sum_i X_{it}}{\sum_i 1}\end{aligned}$$

so that $\widehat{\alpha}_t^k$ is the average fixed effect (ability to find any kind of directorship) of all the labor force.

We now substract (9) from (8) and get:

$$\begin{aligned}\frac{n_{jt}^k}{n_t^k} - \frac{n_{jt}}{n_t} &= \left(\widehat{\alpha}_t^k - \widehat{\alpha}_t\right).Z_{jt} + \beta_j.\left(\widehat{X_t^k} - \widehat{X_t}\right) + Z'_{jt}.M.\left(\widehat{X_t^k} - \widehat{X_t}\right) \\ &\quad + \underbrace{\sum_m \left(\lambda_{mk} - \sum_l \lambda_{ml}\frac{n_t^l}{n_t}\right) C_{jt}^m}_{\text{effect of networks}} + \left(\widehat{\varepsilon}_{jt}^k - \widehat{\varepsilon}_{jt}\right)\end{aligned}$$

which more compactly rewrites as:

$$Y_{jt}^k = a^k.Z_{jt} + \sum_m b_t^{mk}.C_{jt}^m + u_{jt}^k$$

when $X_{it} = 1$.

9.2 Identifying Power of the Individual Level Model

Let

$$\mu_{it}^k = \sum_j E_{ijt}C_{jt}^k$$

be the number of firm in which i is a director, whose CEO belongs to network k. Again, we use model (1) to compute this number:

$$\begin{aligned}\mu_{it}^k &= \sum_j C_{jt}^k.\left\{\alpha_i.Z_{jt} + \beta_j.X_{it} + Z'_{jt}.M.X_{it} + \sum_{m,l}\lambda_{ml}.\left(C_{jt}^m.A_i^l\right) + \varepsilon_{ijt}\right\} \\ &= \alpha_i.\left(\sum_j C_{jt}^k.Z_{jt}\right) + \left(\sum_j \beta_j.C_{jt}^k\right).X_{it} + \left(\sum_j C_{jt}^k.Z_{jt}\right)'.M.X_{it} \\ &\quad + \sum_l \lambda_{kl}.\left(\sum_j C_{jt}^k\right).A_i^l + \sum_j C_{jt}^k.\varepsilon_{ijt}\end{aligned}$$

let

$$\mu_t^k = \sum_j C_{jt}^k$$

be the overall number of firms headed by a CEO of network k:

$$\frac{\mu_{it}^k}{\mu_t^k} = \alpha_i.\widehat{Z_t^k} + \widehat{\beta_t^k}.X_{it} + \widehat{Z_t^k}.M.X_{it} + \sum_l \lambda_{kl}.A_i^l + \overline{\varepsilon}_{it}^k \tag{10}$$

where:

$$\begin{aligned}
\widehat{\beta_t^k} &= \frac{\sum_j \beta_i.C_{jt}^k}{\sum_j C_{jt}^k}, \overline{\varepsilon}_{it}^k = \frac{\sum_j C_{jt}^k.\varepsilon_{ijt}}{\sum_j C_{jt}^k} \\
\widehat{X_t^k} &= \frac{\sum_j Z_{jt}.C_{jt}^k}{\sum_j C_{jt}^k}
\end{aligned}$$

We now compute the number of directorship held by a single individual i a date t:

$$\begin{aligned}
\mu_{it} &= \sum_j \left\{ \alpha_i.Z_{jt} + \beta_j.X_{it} + Z'_{jt}.M.X_{it} + \sum_{m,l} \lambda_{ml}.\left(C_{jt}^m.A_i^l\right) + \varepsilon_{ijt} \right\} \\
&= \alpha_i.\left(\sum_j Z_{jt}\right) + \left(\sum_j \beta_j\right).X_{it} + \left(\sum_j Z_{jt}\right)'.M.X_{it} \\
&\quad + \sum_{m,l} \lambda_{ml}.\left(\sum_j C_{jt}^m\right).A_i^l + \sum_j \varepsilon_{ijt}
\end{aligned}$$

again, we divide by μ_t, the overall number of firms at date t:

$$\frac{\mu_{it}}{\mu_t} = \alpha_i.\widehat{Z}_t + \widehat{\beta}_t.X_{it} + \widehat{Z}_t{}'.M.X_{it} + \sum_l \lambda_{kl}.\left(\frac{\mu_t^l}{\mu_t}\right).A_i^l + \overline{\varepsilon}_{it}^k \tag{11}$$

We are now set to substract (11) from (10) and obtain in the process:

$$\begin{aligned}
\frac{\mu_{it}^k}{\mu_t^k} - \frac{\mu_{it}}{\mu_t} &= \alpha_i.\left(\widehat{Z_t^k} - \widehat{Z}_t\right) + \left(\widehat{\beta_t^k} - \widehat{\beta}_t\right).X_{it} + \left(\widehat{Z_t^k} - \widehat{Z}_t\right).M.X_{it} \\
&+ \sum_m \underbrace{\left(\lambda_{km} - \sum_l \lambda_{lm}.\frac{\mu_t^l}{\mu_t}\right)}_{d_t^{km},\text{ effect of networks}}.A_i^m + \left(\overline{\varepsilon}_{it}^k - \overline{\varepsilon}_{it}\right)
\end{aligned}$$

or, in a more compact form:

$$W_{it}^k = c_t^k.X_{it} + \sum_m d_t^{km}.A_i^m + v_{it}^k$$

when we assume $Z_{jt} = 1$.

10 Figures

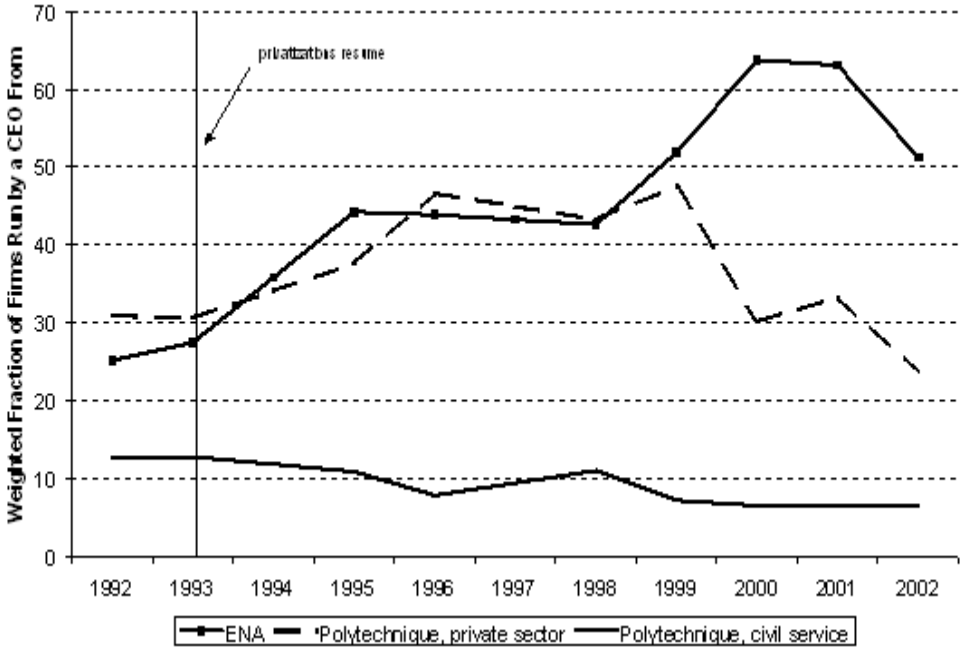

Figure 1: Characteristics of the CEOs of France's Listed Corporations : 1992-2003

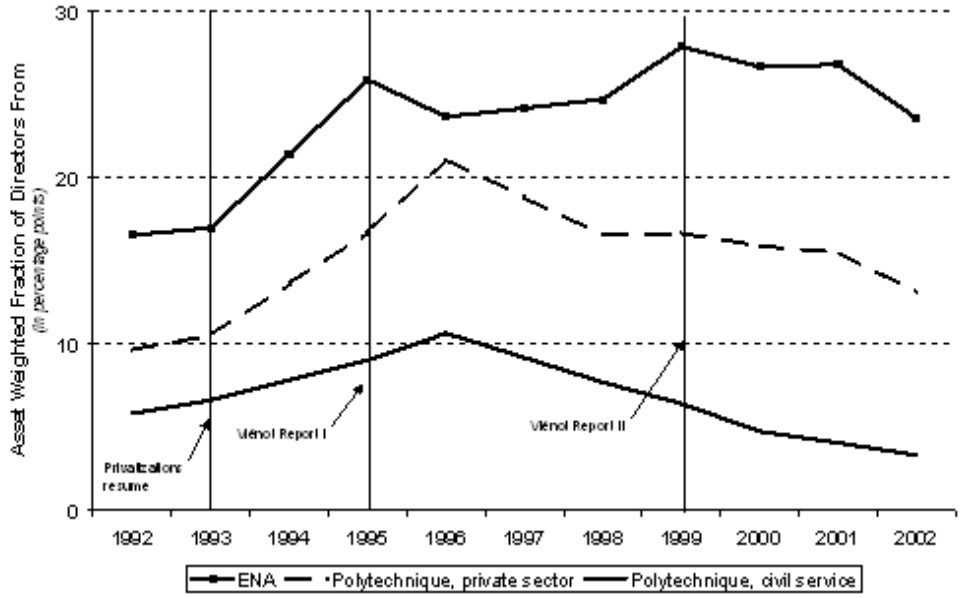

Figure 2: Board Composition of French Listed Corporations : 1992 - 2003

11 Tables

Table 1: Firm Level Summary Statistics

	Mean	Std Dev.	Min	Max	Asset Weighted Mean
CEO Background					
ENA graduate	0.07	0.26	0	1	0.54
Polytechnique, former civil servant	0.04	0.20	0	1	0.08
Polytechnique, always private sector	0.08	0.27	0	1	0.33
In Who's Who	0.51	0.50	0	1	0.88
Former civil servant	0.12	0.32	0	1	0.65
Former "cabinet" advisor	0.06	0.24	0	1	0.52
Outside Directors					
Total Number	6.9	3.8	1	26	-
At least one ENA	0.30	0.46	0	1	0.90
At least one polytechnique, CS	0.18	0.38	0	1	0.59
At least one polytechnique, PS	0.36	0.48	0	1	0.81
Firm Characteristics					
Former SOE	0.13	0.34	0	1	0.64
Currently SOE	0.04	0.20	0	1	0.13
Pct shares held by major block holder	50.8	25.1	0	100	27.0
Firm Performance					
Assets (bn Euros)	5.5	45,7			-
Return on Assets	0.06	0.06	-0.13	0.27	-
Return on Equity	0.16	0.19	-0.79	0.88	-
Tobin's Q	1.3	0.8	0.3	6.6	-
Age (years)	62	48	0	327	-

Note: French public firms over the 1994-2001 period. Source: DAFSA diary of public firms for the names of the directors. Who's Who and School Diaries

Table 2: Director Level Summary Statistics

	Mean	Std Dev.	Asset weighted mean
Positions			
# of CEO seats	0.1	0.4	0.3
# of director seats held	1.9	1.7	3.0
Past Career and Education			
ENA graduate	0.08	0.27	0.26
Polytechnique, once civil servant	0.04	0.19	0.07
Polytechnique, always private sector	0.10	0.30	0.17
Is in Who's Who	0.37	0.48	0.57
Former civil servant	0.12	0.32	0.33
Former "cabinet" advisor	0.06	0.24	0.20
Age	60	10	-

Note: French public firms over the 1994-2001 period. Source: DAFSA diary of public firms for the names of the directors. Who's Who and School Diaries

Table 3: Preliminary Evidence on Networks

Board Composition as a Function of the CEO's Background

		CEO Education/career			
	All	ENA	Poly., C.S.	Poly., P.S.	Other
Non weighted averages					
% of ENA graduates	0.06	0.16	0.13	0.08	0.05
% of Poly. graduates, civil servants	0.03	0.06	0.12	0.04	0.02
% of Poly. graduates, private sector	0.07	0.09	0.12	0.12	0.06
% of other	0.84	0.69	0.63	0.76	0.87
Asset weighted averages					
% of ENA graduates	0.25	0.31	0.23	0.22	0.11
% of Poly. graduates, civil servants	0.07	0.08	0.13	0.07	0.02
% of Poly. graduates, private sector	0.12	0.14	0.13	0.10	0.09
% of other	0.56	0.47	0.51	0.61	0.77

Note: French public firms over the 1992-2001 period. Source: DAFSA diary of public firms for the names of the directors. Who's Who and School Diaries

Table 4: Econometric Evidence on Networks

Effect of the CEO's Background on Director *Current Employment*

	Firm level model		
	Among currently employed directors, fraction of:		
	ENA	Poly, C.S.	Poly, P.S.
CEO is ENA	0.6***	0.3***	0.1***
	(0.1)	(0.1)	(0.0)
CEO is Polytechnique	0.5***	1.0***	0.3***
& former civil servant	(0.1)	(0.1)	(0.1)
CEO is Polytechnique	0.2***	0.1**	0.2***
& always private sector	(0.1)	(0.1)	(0.0)
Year dummies	yes	yes	yes
Observations		8,035	
Test ENA(1)=ENA(2)		0.00***	
Test ENA(1)=ENA(3)		0.00***	
Test Poly, CS(2)=Poly, CS(1)		0.00***	
Test Poly, CS(2)=Poly, CS(3)		0.00***	
Test Poly, PS(3)=Poly, PS(1)		0.50	
Test Poly, PS(3)=Poly, PS(2)		0.97	

Note: SURE estimates - Standard errors between brackets. Residual are allowed to be correlated across equations and observations of the same firm. All explanatory variables are lagged by one year. Source: DAFSA yearbook of listed companies for accounting variables and Who's Who in France (1994 and 2000 issues) for directors' education. Polytechnique and ENA graduates directories for CEOs.

Table 5: Econometric Evidence on Networks

Effect of the CEO's Background on Director *Appointment*

	Firm level regressions					
Among newly appointed directors, fraction of:	(1) ENA	(2) Poly, C.S.	(3) Poly, P.S.	(1) ENA	(2) Poly, C.S.	(3) Poly, P.S.
CEO is ENA	0.13***	0.06***	0.03***	0.09***	0.04**	0.02**
	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)	(0.01)
CEO is Polytechnique	0.10***	0.23***	0.03**	0.05***	0.18***	0.02
& former civil servant	(0.02)	(0.04)	(0.01)	(0.02)	(0.04)	(0.01)
CEO is Polytechnique	0.04***	0.05**	0.05***	0.02	0.03**	0.04***
& always private sector	(0.02)	(0.02)	(0.01)	(0.01)	(0.02)	(0.01)
% of ENA directors (-1)	-	-	-	0.35***	0.12***	0.10***
				(0.04)	(0.04)	(0.03)
% of Poly, former C.S.	-	-	-	0.17***	0.36***	0.02
directors (-1)				(0.05)	(0.11)	(0.03)
% of Poly., always P.S.	-	-	-	0.09***	0.03	0.07***
directors (-1)				(0.03)	(0.03)	(0.02)
Year dummies	yes	yes	yes	yes	yes	yes
Observations		6,759			6,757	
Test ENA(1)=ENA(2)		0.01***			0.00***	
Test ENA(1)=ENA(3)		0.01***			0.00***	
Test Poly, CS(2)=Poly, CS(1)		0.00***			0.00***	
Test Poly, CS(2)=Poly, CS(3)		0.00***			0.00***	
Test Poly, PS(3)=Poly, PS(1)		0.72			0.18	
Test Poly, PS(3)=Poly, PS(2)		0.99			0.87	

Note: SURE estimates - Standard errors between brackets. Residual are allowed to be correlated across equations and observations of the same firm. All explanatory variables are lagged by one year. Source: DAFSA yearbook of listed companies for accounting variables and Who's Who in France (1994 and 2000 issues) for directors' education. Polytechnique and ENA graduates directories for CEOs.

Table 6: Econometric Evidence on Networks
Robustness to Additional Sorting Variables

	Firm level model		
Among currently employed directors, fraction of:	(1) ENA	(2) Poly, C.S.	(3) Poly, P.S.
CEO is ENA	0.5***	0.4***	0.1*
	(0.1)	(0.1)	(0.1)
CEO is Polytechnique	0.4***	1.0***	0.2***
& former civil servant	(0.1)	(0.2)	(0.1)
CEO is Polytechnique	0.1*	0.1	0.2***
& always private sector	(0.1)	(0.1)	(0.0)
Former SOE dummy	yes	yes	yes
Past year firm ROA	yes	yes	yes
Industry dummies	yes	yes	yes
Observations		5,219	
Test ENA(1)=ENA(2)		0.35	
Test ENA(1)=ENA(3)		0.00***	
Test Poly, CS(2)=Poly, CS(1)		0.01***	
Test Poly, CS(2)=Poly, CS(3)		0.00***	
Test Poly, PS(3)=Poly, PS(1)		0.35	
Test Poly, PS(3)=Poly, PS(2)		0.36	

Note: SURE estimates - Standard errors between brackets. Residual are allowed to be correlated across equations and observations of the same firm. All explanatory variables are lagged by one year. Source: DAFSA yearbook of listed companies for accounting variables and Who's Who in France (1994 and 2000 issues) for directors' education. Polytechnique and ENA graduates directories for CEOs.

Table 7: CEO Turnover: Do Networks Matter ?

	Losing CEO Position in the Forthcoming Year				
CEO belongs to:	Base	ENA	Poly, CS	Poly, PS	ENA or poly CS
Industry Adj. ROA	-7.7**	-9.7***	-8.1**	-7.9***	-9.8**
	(3.9)	(3.9)	(4.0)	(3.9)	(4.2)
Industry Adj. ROA	-	14.6***	3.2	3.2	10.1**
× (# directors = CEO ⩾ 2)		(5.0)	(10.0)	(5.1)	(5.0)
(# directors = CEO ⩾ 2)	-	0.2	1.1***	0.4	0.5*
		(0.4)	(0.4)	(0.4)	(0.3)
Industry Adj. ROA	-5.5	-5.7	-6.0	-5.9	-6.1
× Former or current SOE	(3.4)	(4.4)	(4.5)	(4.4)	(4.5)
Industry Adj. ROA	2.6	4.7	3.4	2.8	5.2
× % largest blockholder	(5.8)	(5.9)	(5.9)	(5.8)	(6.2)
Industry Adj. ROA	2.8	3.7	2.7	2.8	3.4
× Two tier board	(4.4)	(4.3)	(4.5)	(4.5)	(4.4)
Former/current SOE	0.2	0.2	0.1	0.2	0.1
	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)
% largest blockholder	1.4***	1.4***	1.5***	1.4***	1.5***
	(0.4)	(0.4)	(0.4)	(0.4)	(0.4)
Two tier board	0.4*	0.4*	0.4	0.4*	0.4
	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)
log(board size)	0.3	0.3	0.3	0.2	0.2
	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)
Log(assets)	0.00	0.02	-0.01	-0.01	-0.01
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
Industry dummies	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes
Observations	1,629	1,629	1,629	1,629	1,629

Note: Logit estimates - Standard errors between brackets. Sample of all firms run by a CEO aged less than 65. Error terms are clustered at the firm level. In all regressions, the dependant variable is a dummy equal to 1 when the current CEO is not the CEO anymore next year. In column 1, we simply regress this departure dummy on industry adjusted firm Return on Assets and controls. We then interact this performance variable with a dummy equal to 1 when (1) the CEO belongs to a network and (2) at least two directors belong to the same network. In column 2, network is "ENA graduate". In column 3, network is "Polytechnique graduate, civil service career". In column 4, network is defined as "Polytechnique graduate, purely private sector career". Columns 5 encompasses columns 2 and 3: network is defined as "ENA graduate, or Polytechnique graduate with career in the civil service".

Table A1: Econometric Evidence on Networks

Evidence From Individual Level Regressions

	Individual level model		
	Among board seats held, fraction of firms run by a CEO from		
	ENA	Poly, C.S.	Poly, P.S.
Director is ENA	0.6***	0.5***	0.2***
	(0.1)	(0.1)	(0.0)
Director is Polytechnique	0.3***	1.0***	0.1**
& former civil servant	(0.1)	(0.1)	(0.1)
Director is Polytechnique	0.1***	0.2***	0.1***
& always private sector	(0.0)	(0.1)	(0.0)
Year dummies	yes	yes	yes
Observations		43,858	
Test ENA(1)=ENA(2)		0.43	
Test ENA(1)=ENA(3)		0.00***	
Test Poly, CS(2)=Poly, CS(1)		0.00***	
Test Poly, CS(2)=Poly, CS(3)		0.00***	
Test Poly, PS(3)=Poly, PS(1)		0.48	
Test Poly, PS(3)=Poly, PS(2)		0.25	

Note: SURE estimates - Standard errors between brackets. Residual are allowed to be correlated across equations and observations of the same individual. All explanatory variables are lagged by one year. Source: DAFSA yearbook of listed companies for accounting variables and Who's Who in France (1994 and 2000 issues) for directors' education. Polytechnique and ENA graduates directories for CEOs.

Table A2: Robustness to Additional Sorting Variables
Evidence From Individual Level Regressions

	Individual level model		
	Among board seats held, fraction of firms run by a CEO from:		
	ENA	Poly, C.S.	Poly, P.S.
Director is ENA	0.5***	0.4***	0.1**
	(0.1)	(0.1)	(0.1)
Director is Polytechnique	0.2***	1.1***	0.1
& former civil servant	(0.1)	(0.2)	(0.1)
Director is Polytechnique	0.1	0.4***	0.1**
& always private sector	(0.1)	(0.1)	(0.1)
Director's age	yes	yes	yes
Director's education	yes	yes	yes
Observations		12,232	
Test ENA(1)=ENA(2)		0.52	
Test ENA(1)=ENA(3)		0.00***	
Test Poly, CS(2)=Poly, CS(1)		0.01***	
Test Poly, CS(2)=Poly, CS(3)		0.00***	
Test Poly, PS(3)=Poly, PS(1)		0.67	
Test Poly, PS(3)=Poly, PS(2)		0.07*	

Note: SURE estimates - Standard errors between brackets. Residual are allowed to be correlated across observations and across equations for each given individual. All explanatory variables are lagged by one year. Source: DAFSA yearbook of listed companies for accounting variables and Who's Who in France (1994 and 2000 issues) for directors' education. Polytechnique and ENA graduates directories for CEOs.