

# The two forms of social capital. Relational structure of PhD committees and recruitment in French political science

Olivier Godechot, Nicolas Mariot

## Abstract

Research on social networks has shown two patterns of relations between individuals that may work as a capital: opened, diverse and porous relational forms on the one hand, dense, closed and stable relational forms on the other hand. The efficiency of these two forms, far from being contradictory, meets two forms of competition: one is the individual quest of personal advantages within the group, the other is the setting-up and mobilization of the group in its competition with other groups. The possible coexistence of the two effects appears in our case study about PhD committees in Political Sciences as we show the impact of networks of invitations to these committees on doctors' employment. We argue that on a short term and personal scale, having an heterogeneous committee, that is members lightly interconnected with the PhD supervisor, adds value to the PhD itself within the discipline and helps the doctor in finding a job. Conversely, on a long term and collective level, the constitution of a dense and cohesive network based on institutions, whether universities or sub-disciplines, enhances the defense, reproduction or extension of the group in its competition with other groups.

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The success of the concept of *social capital*, first in economic sociology (Steiner, 1999), then in social sciences, general sociology, management, political science (Putnam, 1993), and even more recently in economics (Sobel, 2002) – even within the most orthodox international institutions (OECD, 2001) – is not, paradoxically, based on a stabilized definition. In sociology, social capital generally expresses the fact that *the expenditure of time, effort, money and other goods in relational activities is not simply a final consumption or a particular form of leisure, but that it is also an investment that participates in production and that can be a source of profit – in money or in other forms.* Beyond a first *modus vivendi* around the volumetric dimension of social capital – capital as an increasing function of the number of relationships – (Granovetter, 2000 [1973]; Bourdieu, 1980; Héran, 1988; Coleman, 1988; Putnam, 1993), the various research studies do not agree on a uniform and univocal characterization of the mechanisms and relational forms that make networks profitable. The differences have less to do with differences in the basis of action (rejection or adoption of the rational action paradigm) than with differences in the conceptualization of profitable relationships. To simplify, we can oppose two conceptions of social capital: one that, in the wake of Burt (1993), makes capital an individual good, valued in diversified and porous relational structures, and the other, following Coleman – and to some extent Bourdieu<sup>1</sup> – that makes it a collective good, supported by cohesive and dense relational structures.



Figure 1

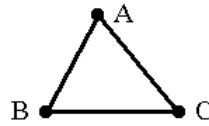


Figure 2

To better understand this divergence, let us examine the elementary relational structure, the triad. Which relational form is more likely to function as capital? If we follow the individualist conception, figure 1 is a richer social capital structure – at least for individual *A*. This is because *A* acts as a bridge between two actors who would otherwise not be connected. *A* therefore possesses significant social capital for two reasons. The first reason is informational (Granovetter, 2000 [1973]): *A* benefits from non-redundant information from *B* and *C*. The second reason is more strategic. *A* can benefit from the profits of intermediation. *A* has a “structural hole” in her network (Burt, 1995): she serves as a bridge between *B* and *C*, and *B* and *C* must therefore go through *A* to benefit from each other’s goods and services; in the state of the

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<sup>1</sup> Despite their paradigmatic differences, Bourdieu’s and Coleman’s conceptions of social capital are similar. They both insist on group cohesion: Bourdieu stresses the groups’ surveillance of its limits and Coleman the role of relational closure. However, Bourdieu is more individualistic than Coleman insofar as he points to the mobilization of the group’s capital by the one who has power over the group, while Coleman speaks of public good and neglects the differentials of internal power.

structure, they cannot bypass her. Burt thus explains that *A* enjoys a position of *tertius gaudens* and that she can, to her advantage, put *B* and *C* in competition.

On the contrary, if we follow the collective conception of social capital, Figure 2 constitutes a more capital-intensive relational structure than Figure 1. The relational structure of Figure 2, a clique structure, is more resilient to the test of time than that of Figure 1. James Coleman (1988) thus argues that relational “closure” is conducive to the development of norms and the creation of a high degree of interpersonal trust. As Baker shows in his study of auction markets (1984), in a cohesive relational structure, group members more easily agree on the value of goods or people. Ultimately, a dense and cohesive relational structure supports a group, which adds its own group power to the power of each of its members (Bourdieu, 1980). This type of dense, cohesive relational structure, generating a sense of belonging and solidarity, is, if we follow Bourdieu, characteristic of “all *institutions that aim to favor legitimate exchanges and exclude illegitimate ones*”<sup>2</sup>.

Are these two conceptions of social capital contradictory? What do we know about the possible co-presence of these forms of activation of relational structures? The opposition between these two conceptions of social capital has been highlighted and commented on in numerous works (Podolny, Baron, 1997; Baker, Obstfeld, 1999; Lin, 2001; Burt, 2001) and has given rise to empirical evaluations and attempts at articulation. Several strategies can be distinguished.

Some authors have sought to rank or analyze the optimal distribution of the two forms of social capital. Burt (2001) has thus tried to establish empirically the superiority of one conception over the other: based on a large number of surveys on corporate networks and noting that “performance” is always positively correlated with his indicator of diversification of the individual’s network, he concludes that the theory of “structural holes” is superior to that of “relational closure”. On the contrary, Granovetter (2003 [1995]) argues, after a review of the ethnographic literature on ethnic entrepreneurship, that there is an optimal level on the diversification-cohesion scale.

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<sup>2</sup> With the exception of the introductory article devoted to it in 1980, social capital is a concept that is little used in Bourdieu’s theory. Although it is often mentioned (in association with symbolic capital), it is rarely objectified. In most of the correspondence analyses carried out, no indicator of social capital is used (see *Homo Academicus*, for example). Even if Bourdieu, to our knowledge, has not explained such an asymmetry, we can try to find theoretical reasons for such a relegation. Social capital is seen as a multiplier of other capitals (economic and cultural). It is secondary to these forms of capital that it multiplies. It would thus appear redundant in statistical analyses, especially with techniques such as correspondence analysis, which is more synthetic than analytical. Another reason can also be advanced: social capital in Bourdieu’s view is, like symbolic capital, a meta-capital. It has no content of its own. Just as any capital can function as symbolic capital, any capital can be multiplied by the relational structure. The proximity is even stronger if we consider that the two capitals, symbolic and social, are both rooted in relational structures, the relation of *credit* for the first and of *support* for the second. The elaboration of symbolic capital, which thus dominates Bourdieu’s work, might have contributed to obscure the notion of social capital, for which only a few “provisional notes” have remained.

Other works that tackle this opposition explore the possibilities of articulating these two forms of capital. Some dissociate the fields in which one or the other form is an asset: in companies organized around narrowly defined hierarchical and functional positions, strong and cohesive ties are more important than weak ties (Podolny, Baron, 1997); similarly, in research and development teams, dense ties allow for a higher level of innovation, whereas in teams that use already existing expertise, dense and redundant relationships generate a loss of time and efficiency (Hansen, Podolny, Pfeffer, 2001). Others, more numerous, detail in the same field the plurality of relational mechanisms underlying a synthetic social capital concept and examine the benefits they enable and the relational structures that make them effective. Relationships between people can be the result of either cohesive or divisive strategies (Baker, Obstfeld, 1999). Cohesive relationships, according to Franck and Yasumoto (1998), make it possible, within French high finance, to guarantee trust (*enforceable trust*) and to proscribe hostile actions in a welded group; outwardly diversified relationships, on the other hand, produce reciprocity obligations (*reciprocity transaction*). In some works, these research paths lead to the development of “contingency models” (Brooke, 2001), i.e. to empirically specify the mechanisms and circumstances in which relationships serve as resources. In other work, social capital is seen as the product of multiplex networks, for example in the collegial firms of business lawyers, as a combination of work and friendship relationships, whose cohesion has distinct effects on “performance”, strong in the case of work, weak in the case of friendship (Lazega 1999a).

We propose a slightly different articulation of the opposition between the relative effectiveness of dense and porous structures. This opposition may have less to do with the different nature of the relationships or the variety of contexts in which they are mobilized, than with the differences in the individual or collective level of their activation. The opposition may be more related to what economists analyze as a problem of aggregation, a problem that is all the more complex in the case of social relations because the externalities are multiple and multiform (Sobel, 2002; Gleiser, Laibson, Sacerdote, 2000)<sup>3</sup>. At an individual level, relationships can be seen as a system of resource mobilization, in the context of a multiplicity of dyadic exchanges. But at a more aggregate level, relationships can also be the support of cooperative behavior. Thus, we will consider here that “individual” social capital is the benefit that an individual derives from her place in the structure of relationships, whereas collective social capital is the capital of the group, a collective good that the group shares and reinforces through the establishment of a strong cohesion<sup>4</sup>. Both forms

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<sup>3</sup> The notion of aggregation, however, remains rooted in an individualistic conception of the social bond, which may be inappropriate in the case of social networks. Group relations pre-exist individual investment in relations. The passage between the two levels is as much a movement of aggregation as of singularization.

<sup>4</sup> Coleman (1990) is best known for emphasizing the role of relational closure in the constitution of social capital. However, his concept of power as the control of resources within a

can be read as modalities for managing competition. In competition for scarce goods, individuals can either individually mobilize the effective supports for obtaining these goods, or they can come to an agreement with certain competitors, try to limit the competition, form a group, and set this group in motion for the monopolization of these scarce goods (Weber, 1995 [1922]).

Of course, it is difficult to base the closure of the group on purely instrumental reasons. Because the constitution of the group as a monopoly is a collective advantage, the relational investment by rational actors in this structure of relation always risks being suboptimal because of the risk of free riders (Coleman, 1988). The group will only truly play the role of an appropriation group if its foundation is based on non-instrumental factors, institutional foundation (Bourdieu, 1980), affective relations, social affinities, frequency of unsought contacts (such as professional sociability), union around shared norms and values, etc. Even if it is possible to set up relatively sophisticated systems of interests, pledges and sanctions to perpetuate strictly instrumental relationships, a community based on instrumental interests alone is fragile.

Thus, two forms of social capital, with different temporalities, can coexist: individual social capital, which the individual can mobilize in competition with her peers, and a collective form, collective social capital, which is based on a dense relational structure that does not belong to the individual so much as to the group of connected people. However, it should be noted that, even if they are not contradictory in theory and if they can coexist and produce their effects jointly, these two forms of capital, from a dynamic point of view, remain potentially antithetical. Indeed, the strategic development of individual social capital leads the individual to suppress or disinvest in redundant contacts, more constraining in Burt's sense and less profitable, and to develop structural holes in her network. This kind of strategy can weaken the unity and cohesion of the group. On the contrary, building collective social capital, developing cohesion within the group, can also have the consequence of limiting relational singularization within the group and competition within it.

Can we highlight, *on the same data*, the two forms of capital and analyze their dialectical relations? This is the project that this article sets out to address, based on the analysis of links within organizations whose collegial form seems particularly fertile for the study of social capital (Lazega, 1999b): the world of political science in the 1990s<sup>5</sup>.

### **Relationships in academic life**

In the academic world, it seems that “relationships” do indeed matter, at least in the minimal form of peer knowledge. A simple examination of the

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system (p. 132) corresponds relatively well, in the case of networks (pp. 314-315), to our concept of “individual social capital”. Relational closure is seen as a means of limiting power differentials, of administering competition, and of transforming relationships from an individual good into a “public good”.

<sup>5</sup> This research is part of an ongoing survey, entitled *Itinéraire des docteurs en science politique* (IDSP), launched under the auspices of the French Political Science Association.

academic power structure shows the central importance of fully or partially collegial institutions on the academic careers of political scientists. At the national level, the National Council of Universities (24 members in political science section (04) of the CNU, two-thirds of whom are elected) grant “qualitification” (*i.e.* the right to apply locally) to applicants for teaching and research positions, the committee of the *agrégation du supérieur* (generally seven people) recruits the majority of university professors<sup>6</sup>, and the unit councils of the FNSP and section 40 of the CNRS (21 members) recruit researchers. At the local level<sup>7</sup>, the Commissions of Specialists (disciplinary recruitment committee of ten to twenty members in each university), select “qualified” assistant professors and full professors for competitive examinations<sup>8</sup>.

Thus, such important steps in the material life of a scholar as recruitment and promotion are decided by a vote. The latter must therefore gather the support of a majority of voices expressing themselves in her favor, and, contrary to hierarchical bureaucratic structures where only the individual opinion of the superior counts, she must be *valued by the greatest number*.

The academic world generally fears that its reproduction will escape it and be delegated to bureaucratic bodies, bodies of inspectors, ministries, university presidents, etc. However, it is not complacent about the self-reproduction it organizes. To listen to the critics, scientific excellence, the legitimate (but difficult to determine) criterion in which they all say they share, is not, far from it, the academic criterion that they see implemented in practice. The relational character of decisions is often vigorously denounced: “mafias”, “cronyism”, “networks”, “scheming”, “nepotism”, “settling of scores” are terms that recur under the pen of the critics. Thus, competitions for the recruitment of assistant professors are generally criticized for being false competitions, and for being less the selection of the best candidate on the basis of her teaching and research skills than a procedure for endorsing a decision taken upstream on the basis of personal affinities between certain members of the committee and the elected candidate (Collectif de sociologues candidats à l’Université, 1996, Lazar, 2001). One of the main biases of university recruitment is thus *academic inbreeding* (Fréville, 2001), the preferential allocation of the position by the specialist committee to candidates from its own university. The commissions could find it difficult to gloss over the personal relationships established between the doctor and the host team during the PhD<sup>9</sup>. Networks are thus

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<sup>6</sup> Specificity shared by law, management sciences and economics.

<sup>7</sup> The respective order of the national phase (CNU) and the local phase (CS) in the recruitment procedure has varied four times from 1979 to 1992. After a period when the national phase ended the recruitment process, the decree of n°92-71 of January 16, 1992 fixes the national phase before the local phase. This order has not changed since. (Fréville, 2001)

<sup>8</sup> The editorial boards of the major journals in the discipline are also collegial organizations with an indirect impact on academic careers.

<sup>9</sup> According to Senator Fréville’s survey, 53% of the 768 respondents were recruited at the university where they defended their PhD.

invoked as an illegitimate form of bypassing the competition and the evaluation of merit.

Nevertheless, the role of networks in academic careers – not the obscure and ghostly ones of the denunciatory discourse, but the objectified ones of sociology – is sometimes invoked (Musselin, 1996; Goode, 2000; Perrot, Linnemer, 2004) but paradoxically little studied: Cameron and Blackburn (1981) report that the scholars interviewed often state that relational supports play a role, especially when entering the career; similarly, several works have shown that the scientific prestige of the supervisor or the institution of origin matters more than the productivity of the doctor in obtaining a position (Hargens, Hagstrom, 1967; Long, Allison, McGinnis, 1979). But the reticular mediations of these findings are missing. Indeed, although network analysis has long been concerned with the scientific and academic world and is still flourishing, its problems are inspired more by the sociology of science than by economic sociology. Thus, it tackles the different facets of scientific life: disciplinary cohesion and the genesis of scientific prestige (Han, 2003; Friedkin, 1978; Hargens, 1969), the conditions of scientific production, the structural conditions of the emergence of intellectual figures (Collins, 1998), the hybrid networks combining people and objects (CSI, 1992), etc. The study of the future of PhDs is certainly classic and often carried out in the social sciences with the conceptual tools of the discipline concerned, if only to find out about its morale (cf. in economics Siegfried, Stock, 1999). But, in general, this study uses mainly individual data. In France, the sociology of academic life has been strongly influenced by the work of Bourdieu and his collaborators (Bourdieu, 1984; Lebaron, 2000; Soulié, Mauger, 2001). While the conceptual tool of the field asserts the relational dimension, in statistical analyses this is often reduced to differences in status or in degree of possession (degree of possession of capital, etc.)<sup>10</sup>.

### **Invitation to PhD committees as a relational atom**

In this research, we collected the composition of political science PhD committees from 1990 to 2001. We believe that these relationships of invitation to committees are an indicator of the relational structure of a discipline and allow us to explore the concept of social capital.

By crossing two sources, the 936 theses of political science listed in the CD-Rom Doc-thèses<sup>11</sup>, and the 1032 theses of the files sent by the universities and IEP (*i.e.* Political Study Institutes such as Sciences Po Paris), we have thus gathered a total of 1163 doctorates, for which we know systematically the

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<sup>10</sup> Thus, even though the *opening* of the chapter “Species of capital and forms of power” begins with a quotation from Proust relating a game of recommendations for election to the academy, these games are little described and analyzed (except on p.115-116), perhaps partly because of the absence of objective data.

<sup>11</sup> Soulié and Mauger (2001) also use this source to study the social and disciplinary variations of the relationship to the object.

name of the doctor, the supervisor, the year of defense and the title of the PhD<sup>12</sup>. Among the files delivered directly by the institution of defense, we also have the detailed composition of the committee for 741 theses.

The sample structure here is based on information provided by the universities. We can claim neither exhaustiveness nor even the absence of representativeness bias. On the temporal level, the distortion does not seem too damaging: we know 80% of the PhD committees of the last two years, about 60% of the committees of the years 1993-1999, and 50% of the theses of the years 1990-1992. On the other hand, the bias of the committee composition by institution is more obvious. Some universities did not answer our call, and among them, some universities that are big producers of theses like Paris 8, Montpellier, Rennes, Aix-Marseille. Other universities provided unfortunately incomplete data. We know only 12% of the committees of Paris 2 and 50% of the committees of Bordeaux<sup>13</sup>. We know that we are underestimating the proportion of “endogamous” committees, which constitute “isolates” in the discipline, compared to the multi-invited PhD committee members in different places, whose existence and relative weight in the total number of committee members is known, even if they may also have participated in unknown committees.

These 741 PhD committees total 2864 relations of invitation of committee members by the supervisors, of which 2271 relations are distinct<sup>14</sup>. To complete the table, information concerning the doctors and the committee members has been collected. The titles of the PhD subjects were coded according to three variables: the sub-disciplinary affiliation, the cultural area of the subject and the scientific field of the PhD<sup>15</sup>. The gender of the doctor was coded on the basis of the first name, the nationality on the basis of both the last name and the first name when the information is not provided by the university. By using administrative data, information on recruitments on various university or research center websites (such as the very complete CNRS directory), reports of competitions in *Système D* (bulletin of the Associa-

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<sup>12</sup> The delimitation of this set is therefore based on the doctor’s registration of her PhD in political science. We have therefore taken into account political science theses defended under the direction of professors outside the discipline and we have excluded theses defended in another discipline under the direction of a political science professor.

<sup>13</sup> It is not impossible to exclude a bias in the composition of the sample linked to the position of one of us within the discipline (Parisian political sociology). In order to limit the scope of this bias, we have only included PhD committee compositions based on information given by the university for all of its theses and not on the basis of our personal knowledge of members of the discipline. It is true that we have sometimes solicited the help of close intermediaries to obtain files from the institutions. But this was often not necessary, and other times it was not sufficient. At first glance, the ability of higher education institutions to provide us with data seems to reflect their internal organization (availability of staff, accessibility of archives, etc.) rather than our proximity to these institutions. However, the latter cannot be ruled out.

<sup>14</sup> We differentiate the relation A invites B from the relation B invites A. By confusing these two cases, we obtain 2133 distinct invitation relations. (cf. Godechot, Mariot, 2003a).

<sup>15</sup> Despite our vigilance, these codings are undoubtedly tainted by biases linked to our own positions in the universe under consideration.

tion des Candidats aux Métiers de la Science Politique), etc, we were able to identify 246 PhDs who had obtained a position in political science or in other disciplines (sociology, STAPS – Sport Science –, information and communications, history, American civilization, public law, etc.), in higher education (universities, IEP) or in public or parapublic research in France (CNRS, FNSP, EDF, France Telecom, INRETS, etc.). As an indicator of educational capital, we coded whether or not they had attended the IEP in Paris or an IEP in the provinces. For the most important committee members (159 committee members having participated in more than 5 committees), we found the main professional location during the period, and we coded, on the basis of our knowledge of the discipline and of the supervised theses, the sub-disciplinary specialty and the specialization in a cultural area.

As an indicator of relational structure, we have chosen to rely on the relationships of invitation to PhD committees in political science. The use of such a database to establish the relational structure of the discipline has several advantages. These are fairly homogeneous relationships that are easy to collect, to quantify and to orientate, covering the discipline very broadly, well beyond the central networks of membership in the CNU or in editorial boards. Unlike, for example, conversation relationships, our relational structure, if not complete, is at least well circumscribed. The PhD committee is an interesting object for analysis in terms of networks, not only because of its technical properties, but also because, in a Durkheimian logic, its institutional roots give it a greater degree of social reality than many other reticular phenomena. The constitution of the PhD committee is not a trivial decision. It is always an intentional operation, even if intentionality, which is plural, is not easily deciphered. It responds to a certain number of rules, rules which in law institute the legitimacy of those called to judge and give validity to their verdict, rules which nevertheless leave, in practice, a great deal of latitude to the PhD supervisor to compose the committee<sup>16</sup>. Its solemn and “artificial” dimension, far from being an obstacle to analysis as it would be for those who are looking for “authentic” networks of relations, makes the committee an excellent support for sociological objectivation.

However, let's not hide the ambiguities and ambivalences of the invitation relationship. First question, who invites? According to the regulations, it is the “head of the establishment”. However, it seems that this decision is, in the

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<sup>16</sup> For most of the period studied, the PhD committee was governed by the rules defined by the decree of March 30, 1992: it is designated by the head of the institution on the advice of the head of the doctoral school; it includes at least three members, at least one third of committee members from outside the institution chosen for their scientific competence, and at least half of them professors or equivalent (in the discipline, this rule is interpreted extensively, since very few assistant professors have ever sat on a PhD committee). The decree of 25 April 2002 on doctoral studies only slightly modifies these rules. It specifies that the PhD supervisor cannot be the president. Before the publication of the decree of February 13, 1992, according to the decree of July 5, 1984, only one external personality was required. Moreover, it is common for institutions to impose as a local rule that there must be at least two members of the university within the PhD committee.

social sciences, essentially an endorsement of the composition of the committee by the PhD supervisor. It is more difficult, however, to know who makes up the PhD committee. Is it the PhD supervisor or the doctoral student? The share of one and the other probably varies according to the difference in scientific capital between the doctor and the supervisor and the supervisor's style of management (mandarin or collegial). Doctoral students with a high level of scientific, cultural and social capital (doctoral students from the *Grandes Écoles*, who have already published before the defense and who know the academic world well) can undoubtedly propose committee members, but even then, they cannot really impose someone who would not fit in with the supervisor. We thus consider that it is always the supervisor, *in fine*, who invites her colleagues to judge one of her students and not the doctoral student who composes the committee herself.

For the supervisor, the composition of the committee most often responds primarily to a desire to certify and make her doctor visible – and secondarily for career purposes. For the guests, the invitation relationship has a double meaning: it is both a *working* relationship and an *honorary* relationship. Judging a PhD is an important task: reading, possible writing of reports (“pre-report” or defense report), preparation of a public intervention also subject to peer review, travel, the defense itself, in short several days of work. Some scholars talk with moderate enthusiasm about participating in PhD committees. One of them told us that “agreeing to ‘help out a colleague’ to complete the committee for an average PhD assumes that this colleague will return the favor one day. However, to see the invitational relationship only as an invitation to work leads to a misunderstanding of its honorific nature. And like all honorific relationships, it is essentially ambiguous. If young scholars (e.g., assistant professors), elevated to the dignity of committee member, are honored by an invitation, prestigious scholars may honor the committee more than the other way around when they are invited by a little-known supervisor. Because it is honorary and because an assertive refusal could be seen as an affront, it seems that refusing to participate in a committee is relatively rare, especially on the part of scholars at the beginning of their career or on the part of colleagues working at the institution.

Thus, the invitation relationship, a solemn relationship of exchange of service, work and honor, decided in the framework of plural strategies, has interesting technical and social properties to make it the element of a network structure. It could even represent a satisfactory approximation of the main relationships linking the members of the discipline<sup>17</sup>.

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<sup>17</sup> This type of relational structure, centered on the supervisors, tends however to neglect the networks of the youngest actors, assistant professors, research fellows and especially, in the perspective of recruitment, the PhDs themselves. Some of them thus take several years to obtain a position and, sometimes, have spent time, as a doctoral student and as a post-doctoral student, personally building their “reputation” partly outside the networks of their own supervisor.

## Network structure

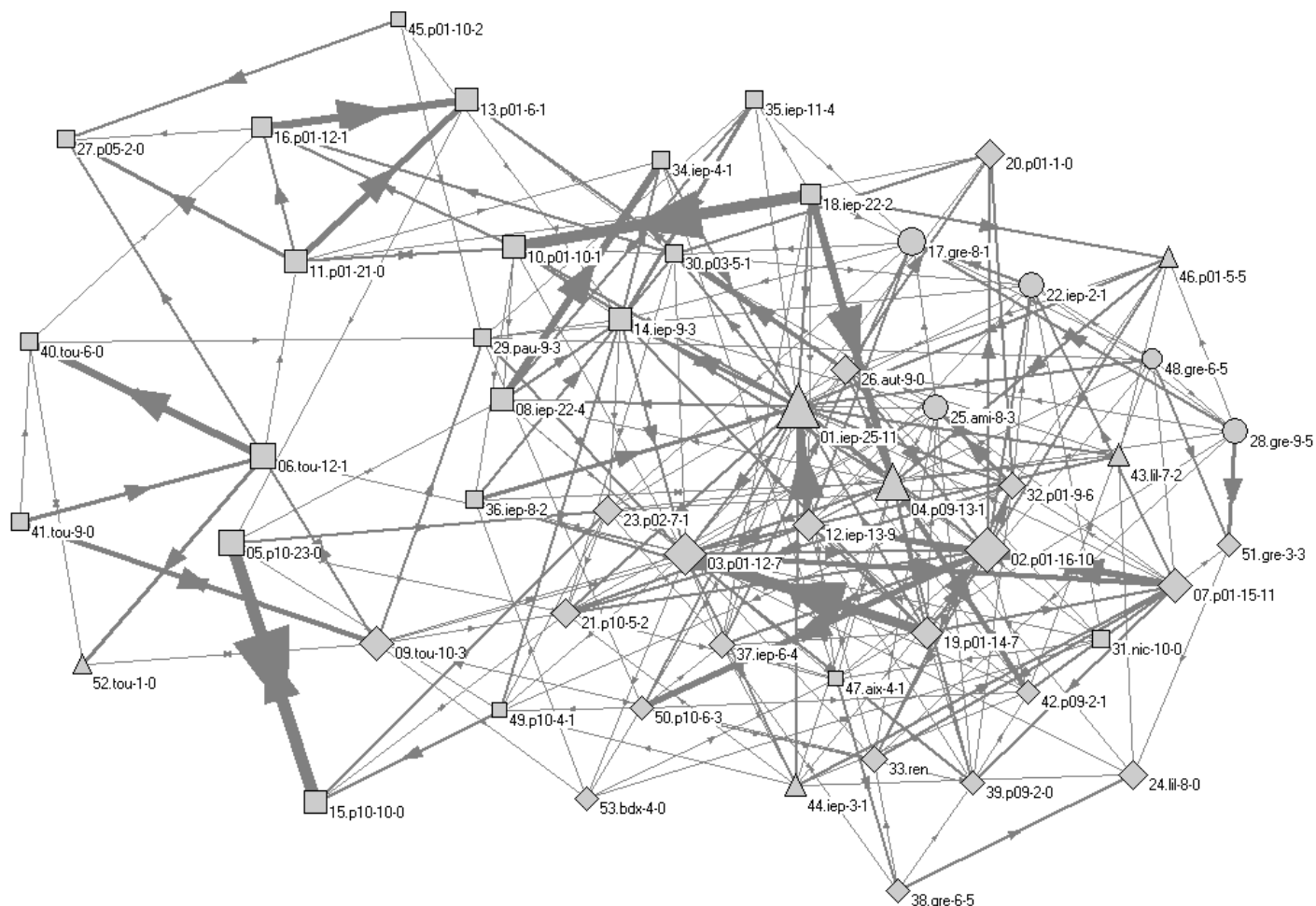
Figure 3 is a representation of the invitational relationships among the 53 committee members most present on political science PhD committees, who participated in 15 or more committees<sup>18</sup>. The sample, considering the 1180 committee members in our file, may seem narrow. However, these 53 committee members account for 39% of the total number of available seats (1361 out of 3501) in the 741 known committees, and the Figure represents 589 invitation relations (i.e. 26% of all invitation relations). While remaining readable, this Figure represents the essential invitation relations of political science PhD committees.

In the middle of the Figure, a dense central node emerges, at the heart of which are committee members, generally Parisian, who often sit on the bench, direct numerous theses and, for many of them, have PhDs who obtain positions. Not far from the most central person in the network, *committee member 01*, there is a handful of professors from Paris 1, rather specialists in political sociology, who strongly invite each other and whose PhDs get positions. They are also strongly connected with other specialists in political sociology from the capital's institutions: IEP, Paris 9 and Paris 10. In the eastern suburbs of this core, there are professors from provincial institutions, often with an IEP (Amiens, Grenoble, Lille, Rennes), specialized in political sociology or public policy, often younger, who, while having developed links between themselves on the basis of geographical proximity, remain well connected with the center as a whole. In the northwestern suburbs, one can distinguish networks of professors or researchers specializing in international relations, often members of CERI or IEP Paris, with repeated and selective relationships. If they are connected to the center, it is more through the intermediary of one or two contacts than through broad coverage. Further west on the Figure, three "cliques" emerge, groups of two to five people, strongly interconnected and weakly connected to the rest of the network: the international relations of Paris 1 in the North-West, the Toulousans in the West, and the international relations of Paris 10 in the South-West. In some cases, the invitation relationships are very intense: *Committee member 05* invited *Committee member 15* 13 times, who in turn invited him 8 times. The doctor of one of them thus had two chances out of three to find the other on her committee. For these three isolated "cliques", obtaining positions for their doctors seems more difficult. Thus, this graphical representation suggests, on a first limited sample, that the relational structure is not without impact on the probability of obtaining rare goods. A more detailed statistical examination will allow us to specify how.

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<sup>18</sup> The graphs were drawn with the *Pajek* software by Batagelj and Mrvar (downloadable from <http://vlado.fmf.uni-lj.si/pub/networks/pajek/>).

**Figure 3.** Political science committee members' network. Committee members who participated in 15 or more committees between 1990 and 2001.



**Note:** Each dot represents a scholar, each line an (at least) inviting relationship.

**Shape of the point:** Disciplinary specialty of the scholar. Solid diamond = Political science - political sociology. Solid square = Political science - international relations. Solid triangle = Political science - political theory. Solid circle = Political science - public policy. Empty square = Other political science. Empty triangle = Law. Empty diamond = Sociology. Empty circle = Other disciplines.

**Area of the point:** Proportional to the number of presences in all the known committees.

**Item title:** The first two characters are an identifier; the next three, the abbreviation of the main institution of attachment during the period (cf. appendix 1 for the list of abbreviations); the first number, the number of supervised PhDs; the second, the number of supervised PhDs who have found a position.

45.p01-10-2 = Committee member n°45, practicing in Paris 1, ten directed doctors, two of whom have found a teaching-research position.

**Direction of the arrow:**  $A \rightarrow B$  = A invites B.

**Line thickness:** Proportional to the number of invitations.

### Individual social capital

Even if the committee is not necessarily composed with the utilitarian and exclusive concern of maximizing the chances of obtaining the position, it is quite likely that the doctor and the supervisor have the concern of obtaining

with this composition a positive enhancement of their common product. However, the composition remains a strategy under constraints: it is difficult to invite to the PhD committees people that the doctor or the supervisor have never met, people whose agreement or reaction to the PhD cannot be anticipated. Perhaps this is sometimes the case of the foreign scientific personality, but the invitation of a committee member known only through her writings is rather rare. Most often, members of the social network of the supervisor or the doctor are invited, either whom they know “personally”, or to whom they have had prior access on various occasions (work, seminars, colloquia, defenses of other doctors, etc.) informing on their ability to sit. The relations of the supervisor, as well as those of the doctor, are thus a support point for the development of the PhD. First of all, they make it possible to influence the formal verdict. Secondly, they allow the circulation of the judgment. Finally, they allow to obtain direct support during the recruitment process.

Even if there are strategies of distancing oneself from the PhD (as well as strategies of appropriation), the PhD supervisor exposes herself at the same time as she exposes one of her products. She is thus partly bound to the fate of her doctoral student, if only for the time of the defense. It is thus likely that she will try to compose her committee with committee members who are not too hostile towards her and her student. A committee composed of close friends will perhaps be a little more lenient<sup>19</sup> and will sometimes allow borderline PhDs to obtain “congratulations”, where a larger committee would have been more severe, heavily burdening the doctor in the competition for positions by refusing the highest grade. For a fraction of doctorates on the line, relationships, here rather cohesive – committee members close to the supervisor – help to ensure a good grade.

But the mention is however a very imperfect signal and not very discriminating of the value of the doctor (69% of the candidates obtain the congratulations). The differentiation between two “highest honors with congratulations” theses is then made by the differentiation of the informal speeches made about them. Within a discipline, it is not uncommon to hear verdicts circulating about a PhD – sometimes formulated in an aesthetic register – between people who have not read the work: “It is a [very/fairly] good PhD”; “It is an average PhD”. Even if we were in hard science, the evaluation would not be limited to the sole objective verification of the validity of the result. In the verdict circulates a synthetic summary of the whole PhD, – value of the object, value of the problematic, value of the results, value of the theory, originality, value of the person – which cannot be deduced from a simple “objective” calculation.

The composition of the committee thus has a strong influence on the presentation and circulation of the value of the PhD. The PhD is a voluminous

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<sup>19</sup> Note also that a supervisor, who considers her doctor’s PhD mediocre, can compose a close PhD committee – soliciting work colleagues to whom she will be able to render the same service –, not so much to improve the doctor’s grade as to avoid disturbing distant committee members.

object that is not widely read, but one can be pretty sure that the members of the committee have read it. The written traces of the defense, starting with the grade, or the ten or so pages of the different committee reports, are not always able to establish the value and to carry away the adhesion. On the contrary, the real-life readers, honored by the invitation, whose sympathy the doctor may have won, are always more likely to explain to their network of relations what makes the PhD interesting. The value (“it’s a nice PhD”), by word of mouth, then begins to circulate. Even if the circulating verdict is not dithyrambic (“not a bad PhD”), the PhD gains in any case the privilege of the known over the unknown<sup>20</sup>.

If the supervisor has invited committee members who have many contacts and who gravitate to very different backgrounds, the dissemination of the verdict will be great. These people will be able to convey and circulate the value, to convince their colleagues of the value of what they have read, and to support the doctor, if necessary, orally, before the key committees for recruitment: CNU, CNRS sections, specialist commissions, editorial committees of journals. However, this practice of open committees entails a risk: weak links will more easily allow themselves to issue a negative verdict, a verdict that is all the more disabling if it is widely circulated. Finally, this practice is not available to everyone: it is more costly and complex, and it assumes that sufficient ties have been established beforehand to allow this type of invitation. On the other hand, if you invite people who are close to you, people who are more easily accessible and whose reaction you can anticipate, you limit the cost of the invitation and the risk of hostile actions (depreciation of quality). But people who are close to each other also know each other and invite each other: they risk being equivalent from a structural point of view. Therefore the value judgment on the PhD goes round in circles in the closed network without getting any brighter.

To test our hypotheses that individual social capital, the investment in diversified and non-redundant relationships, allows one to obtain rare goods (academic positions for PhDs), we perform a logistic regression where we evaluate the impact of the position in the relational structure on the probability of having a position. Our partly longitudinal data allow us to study the impact of the network structure in the past on obtaining positions in the future, which reinforces the causal nature of the correlation relationship. Thus, to build the network, we sum the invitation relationships between committee members in the year of the defense and the two years prior to it. As our network starts in 1990 and taking into account this two-year delay, we estimate the probability of obtaining a position for the doctors who defended from 1992 onwards, and for whom we know the committee, i.e. 667 doctors. We used as explanatory variables classical individual characteristics: gender, nationality, university, degree, sub-discipline, grade, and year of defense. We added variables related to the position in the network: the number of distinct persons in invitational

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<sup>20</sup> A very negative verdict, on the other hand, can become a serious handicap.

relationships with the PhD supervisor (whatever the direction of the relationship), the supervisor's "structural constraint", the average for the invited committee members of the number of distinct persons in invitational relationships with each of them, and the average of the invited committee members' "structural constraint". We also estimate a variant (Model II) where the volume dimensions of the network are omitted.

At first glance, gender<sup>21</sup> does not seem to influence the probability of obtaining a position since the two rates of obtaining positions (27% for men and 25% for women) are comparable. However, men are numerous among foreign PhDs (78% men) and among French PhDs the difference between the sexes is more noticeable (43% of men obtain a position against 31% of women). Also, when controlling for other variables, in particular nationality, gender becomes very discriminating, which may reflect a mobility differential between the two genders. Even more than gender, nationality is a highly significant variable. Its measurement is admittedly problematic: we only know the nationality with certainty for 55% of the sample and, for the rest, we have coded it primarily on the basis of the first name and marginally on the basis of the surname. With such an approximation, we obtain a population of "foreign" doctors of 37%. Unlike "French" PhDs, they are much less likely to obtain a position in France (4% as opposed to 37% of national PhDs, the regression confirming the importance of the difference). This difference is due in part to the fact that some of them do not seek a position in France after their doctorate and in part to the fact that it is more difficult for a foreigner to obtain a position than for a French person (lesser insertion, lesser conformity of their PhD to the value criteria of the discipline, possible discrimination, etc.).

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<sup>21</sup> Remember that gender was coded on the basis of the first name (and our knowledge of the candidates). The "undetermined sex" cases are generally foreign individuals or individuals of foreign origin for whom we were unable to deduce the sex simply by reading the first name. To estimate the regression, we assigned them a probability of 0.7 of being male and 0.3 of being female based on the sex ratio.

**Table 1:** Probability of  $x$  having a job. (Logistic regression)

| Independent variables                                                       |                                               | Descriptive statistics |                    | Raw correlation |                    | Model I                         |          | Model II                       |
|-----------------------------------------------------------------------------|-----------------------------------------------|------------------------|--------------------|-----------------|--------------------|---------------------------------|----------|--------------------------------|
| Qualitative variables and modalities <sup>1</sup>                           |                                               | Workforce              | Distribution       | Placement rates | Rate of non-placed | Parameter2 (Standard deviation) | Chi2     | Parameter (Standard deviation) |
| All /intercept                                                              |                                               | 667                    | 100%               | 25%             | 75%                | -2,026 ***<br>(0,182)           | 23,6 *** | -2,031 ***<br>(0,183)          |
| Gender                                                                      | Male                                          | 429                    | 64%                | 27%             | 73%                | 0,236 **<br>(0,082)             | 8,3 **   | 0,236 **<br>(0,082)            |
|                                                                             | Undetermined                                  | 22                     | 3%                 | 0%              | 100%               | -0,472 **<br>(0,164)            |          | -0,472 **<br>(0,163)           |
|                                                                             | Woman                                         | 216                    | 32%                | 25%             | 75%                |                                 |          |                                |
| Nationality                                                                 | French                                        | 213                    | 32%                | 40%             | 60%                | 0,715 ***<br>(0,145)            | 24,3 *** | 0,706 ***<br>(0,145)           |
|                                                                             | French first name                             | 204                    | 31%                | 35%             | 65%                |                                 |          |                                |
|                                                                             | Foreign name                                  | 92                     | 14%                | 9%              | 91%                | -1,192 ***<br>(0,242)           |          | -1,177 ***<br>(0,241)          |
|                                                                             | Foreigner                                     | 158                    | 24%                | 2%              | 98%                |                                 |          |                                |
| Educational capital                                                         | Graduate of IEP Paris or ENS                  | 89                     | 13%                | 52%             | 48%                | 0,813 **<br>(0,272)             | 11,4 **  | 0,826 **<br>(0,271)            |
|                                                                             | Graduate of another IEP                       | 123                    | 18%                | 42%             | 58%                | 0,315<br>(0,274)                |          | 0,302<br>(0,273)               |
|                                                                             | Not an IEP graduate                           | 455                    | 68%                | 15%             | 85%                | -0,244 **<br>(0,085)            |          | -0,243 **<br>(0,085)           |
| Universities                                                                | Other                                         | 147                    | 22%                | 20%             | 80%                | 0,148<br>(0,24)                 | 3,7      | 0,081<br>(0,232)               |
|                                                                             | Grenoble                                      | 56                     | 8%                 | 50%             | 50%                | 0,519<br>(0,398)                |          | 0,446<br>(0,392)               |
|                                                                             | IEP Paris                                     | 170                    | 25%                | 33%             | 67%                | -0,015<br>(0,232)               |          | 0,049<br>(0,224)               |
|                                                                             | Paris 1                                       | 167                    | 25%                | 26%             | 74%                | 0,034<br>(0,218)                |          | 0,047<br>(0,217)               |
|                                                                             | Paris 10                                      | 65                     | 10%                | 11%             | 89%                | -0,085<br>(0,454)               |          | -0,086<br>(0,454)              |
|                                                                             | Toulouse                                      | 62                     | 9%                 | 8%              | 92%                | -0,779<br>(0,555)               |          | -0,766<br>(0,553)              |
| Sub-discipline                                                              | Political sociology                           | 181                    | 27%                | 40%             | 60%                | 0,391 *<br>(0,192)              | 8,6 *    | 0,389 *<br>(0,191)             |
|                                                                             | International Relations                       | 334                    | 50%                | 11%             | 89%                | -0,365 **<br>(0,139)            |          | -0,38 **<br>(0,138)            |
|                                                                             | Political theory                              | 42                     | 6%                 | 31%             | 69%                | -0,157<br>(0,414)               |          | -0,092<br>(0,408)              |
|                                                                             | Public Policy                                 | 110                    | 16%                | 41%             | 59%                | 0,524 *<br>(0,247)              |          | 0,55 *<br>(0,245)              |
| Grade                                                                       | Honors or highest honors                      | 195                    | 29%                | 5%              | 95%                | -1,345 ***<br>(0,277)           | 23,6 *** | -1,359 ***<br>(0,278)          |
|                                                                             | Unknown                                       | 38                     | 6%                 | 32%             | 68%                |                                 |          |                                |
|                                                                             | Highest honors with congratulations           | 315                    | 47%                | 30%             | 70%                | 0,604 ***<br>(0,125)            |          | 0,611 ***<br>(0,125)           |
|                                                                             | Highest honors with unanimous congratulations | 119                    | 18%                | 43%             | 57%                |                                 |          |                                |
| Quantitative variables <sup>3</sup>                                         |                                               | Average                | Standard deviation | Average placed  | Average non-placed | Parameter (Standard deviation)  | Chi2     | Parameter (Standard deviation) |
| Year                                                                        |                                               | 1997,13                | 2,85               | 1996,37         | 1997,39            | -0,870 ***<br>(0,136)           | 40,9 *** | -0,856 ***<br>(0,135)          |
| Network <sup>4</sup> of the supervisor $i$ of $x$                           | Number of contacts of the PhD supervisor      | 14,26                  | 9,80               | 16,10           | 13,65              | 0,117<br>(0,171)                | 9,0 *    | .                              |
|                                                                             | Supervisor's structural constraint            | 0,15                   | 0,09               | 0,13            | 0,16               | -0,343<br>(0,221)               |          | -0,435 **<br>(0,155)           |
| Network <sup>4</sup> of committee members $j$ invited to the defense of $x$ | Average number of guest contacts              | 5,27                   | 3,69               | 6,14            | 4,39               | 0,150<br>(0,167)                | 22,2 *** | .                              |
|                                                                             | Average structural constraint of guests       | 0,60                   | 0,21               | 0,52            | 0,63               | -0,506 **<br>(0,176)            |          | -0,606 ***<br>(0,131)          |

<sup>1</sup> Parameters and standard deviations of qualitative modalities were recalculated to compare to the score of the population as a whole (not to a reference modality).

<sup>2</sup> \* indicates significant at the 10% level; \*\*, significant at the 1% level; \*\*\*, significant at the 1‰ level.

<sup>3</sup> Quantitative variables were standardized in both regressions to facilitate comparison of parameters. The parameter is the effect of a one standard deviation from the mean of the quantitative variable.

<sup>4</sup> The network is made up of relationships accumulated over a period of three years: the year of the defense and the two years preceding it.

**Note for the reader:** There are 89 graduates of the IEP Paris or the ENS (13% of the total). 52% of this population obtained a job (48% did not). The logistic regression of the model allows us to estimate a positive parameter of 0.813 and a standard deviation of 0.272. This effect is significant at the 1% level. The chi-square for all the terms of the educational capital variable is 11.4. The probability of nullity of the coefficients of all the modalities of the variable is less than 1%.

Because of the importance of the IEP in the discipline (30% of the PhDs and 60% of the PhDs in post), the coding of the passage through an IEP (Paris or Province) makes it possible to obtain a satisfactory approximation of both the academic skills at the beginning of the PhD and the degree of insertion in academic life. The effect of educational capital, which is classic in an estimate of this kind, is clearly apparent. Graduates of the IEP Paris have a one in two chance of obtaining a position, as opposed to a one in six chance for PhDs who did not go through an IEP. In view of the gross percentages of PhDs who have a job, the university seems to be an important determinant in obtaining a job. Doctors from Grenoble would be more favored (50% of them get a job) than Parisians. Doctors from Paris 10 (11% have a position) and even more so from Toulouse (8%) are clearly disadvantaged. However, this difference in performance between institutions is due less to the difference in the properties of the scholars than to differences in the composition of the population of PhDs. In the Parisian institutions, particularly Paris 1, the population of PhDs is quite heterogeneous: it includes both a high proportion of graduates from the IEP de Paris and a high proportion of foreign PhDs. On the contrary, in Grenoble, the population is much more homogeneous: very few foreigners and many IEP graduates. This composition effect is filtered out by the estimation of the regression parameters. The effect of the institution itself is therefore ultimately limited, especially when we take into account the grade and network variables. “All other things being equal, there is little difference between the universities. The only significant difference is between the two extremes, Grenoble, whose PhDs easily obtain positions, and Toulouse, whose PhDs find it much more difficult to obtain them.

Sub-disciplinary affiliation has a significant gross effect and a net effect that remains strong. Doing a dissertation in political sociology and public policy seems to be more likely to lead to a job: 40% of PhDs in this case succeed. Conversely, only 11% of PhDs who prepared a PhD coded as international relations are in this case. The composition is certainly a factor: 60% of PhDs in this sub-discipline are foreigners. But the regression shows that, even taking into account this composition effect, international relations lead less frequently to a position. We will come back to this phenomenon later.

The grade allows us to obtain an approximation of the value judgement made on the PhD by the members of the discipline. This is certainly biased for two reasons: on the one hand, the grade is not always reported in the same way from one institution to another<sup>22</sup>; on the other hand, the committee may be

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<sup>22</sup> The decree of March 30, 1992 concerning postgraduate studies and its various modified versions stipulate that “Admission results in the awarding of one of the following honors: Honors, Highest Honors, Highest Honors with congratulations,” replacing the three honors of “Fair, Honors and Highest Honors”. “Unanimous congratulations” is not a grade but a description of the modalities for awarding congratulations. Some juries and some institutions (such as Grenoble) seem to award congratulations only unanimously and do not explicitly include this precision, while others routinely make the distinction. For the estimation of the regression parameters, we have therefore grouped together “congratulations” and “unanimous congratulations”. Similarly, to deal more easily with the few unknown grades, we assigned

composed of people close to the supervisor or the doctor, who are more inclined to be benevolent. No doctor with an “honorable” grade finds a position. The “very honorable” grade without congratulations is a handicap: 5% of its holders find a job. Congratulations (29% of them have a position) and even more so unanimous congratulations (43% of them have a position) are an indispensable asset for obtaining a position at the university. The variable is one of the most significant in the regression. But let us note that the grade serves more to exclude a minority from the race for positions than to select an elite: 62% of the PhDs obtain congratulations, that is to say three congratulations for one position to be filled. We will see that within the relational structure, an opinion on the value of the candidates circulates and is formed, which plays as important a role as official certification.

The probability of obtaining a position varies greatly according to the year of defense for reasons that are difficult to disentangle. Recent years seem to be unfavorable. On the one hand, the time left for doctors to find a position is much greater for doctors at the beginning of the period (eleven years) than for the last doctors (two years), a bias which, in the absence of precise information on the date of recruitment, we cannot correct. On the other hand, the supply and demand of doctors varies during the period: during the second half of the period, the number of doctors increases while the number of positions open to competition seems to decrease<sup>23</sup>. In the end, the year is mainly used as a control variable to adjust the other variables.

The introduction of indicators on the position in the network of the PhD supervisor and the members of the committee allows the examination of proposals on the impact of the form of the links on the probability of appropriating a rare good, here the position. We try to distinguish in model I, the respective impact of the volume dimension – the number of invitation relationships of the supervisor on the one hand and of the committee members on the other hand – and of the form of the relationships. To calculate indicators of the latter, we used Burt’s indices (Burt, 1995, Degenne and Forsé, 1994). Burt calls “structural constraint” an indicator that measures the absence of structural holes between the contacts of individuals. In short, the more directly an individual’s contacts are connected to each other without her intermediary, the more redundant they are and the more “constrained” the individual is<sup>24</sup>. She cannot play her contacts against each other, and she will get redundant information and services from them. Thus, the more the PhD supervisor and her guests are “constrained” by their place in the relational structure, the more difficult it would be for them to promote the doctor and help her get a posi-

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them, on the basis of the distribution of the variable, the probability 0.69 of having congratulations and 0.31 of not having them.

<sup>23</sup> Finally, it should be noted that the representation of universities is not uniform throughout the period. The temporal bias is perhaps selective and could also lead to over-representation at the beginning of the period of the PhDs who are less likely to be forgotten: those who have obtained a position.

<sup>24</sup> For the calculation see annex 3.

tion. Here we measure the impact of two categories of structural holes: with the structural constraint of the supervisor, the primary structural holes, and with the average of the structural constraint of the committee guests, the supervisor's "secondary structural holes" (Burt, 1992).

The volume-form decomposition is made delicate by the fact that the structural constraint and the number of contacts are quite strongly correlated (correlation coefficients of the order of  $-0.7$  – cf. Appendix 3)<sup>25</sup>. Burt (1995) recognizes moreover that his indicator condenses several dimensions: the size, the density and the hierarchy of an individual's network – understood as the concentration of relations in the hand of one. This correlation is related, on the one hand, to the increased probability of having members of one's network who are not directly connected when the number of contacts increases, and, on the other hand, to the convention of treating people with only one contact – for whom the measure of the direct interconnection of contacts has no meaning. Burt's formula rightly leads to assigning a maximum constraint to these network terminals (see Appendix 2).

The volumetric dimension of social capital, which is highly significant when the raw correlation is measured (on average 16.1 contacts for the supervisor and 6.1 contacts for the members of the committee of the PhDs who obtain a position against 13.7 and 4.4 respectively for those who do not), disappears when the structural constraint is introduced<sup>26</sup>.

The shape of the relationships, on the contrary, has a strong impact. The structural constraint of the supervisor is indeed slightly higher than the significance level, but this is probably due to a slight collinearity effect with the volume<sup>27</sup>. In model II, the impact of an unconstrained supervisor is thus more visible. The average structural constraint of the committee members invited to the defense is particularly significant, at the 1% threshold in Model I, at the 1‰ threshold in Model II. To make the doctor visible, to find intellectual and material support for her, the diversification of the relations of the supervisor's guests thus matters more than the diversification of the supervisor's direct relations. The guests, who are both close to the doctor they have agreed to judge but whose judgment passes for being more independent than that of the supervisor, can play, if they have a large and non-redundant network, a crucial role as an amplifying relay within the academic field.

Difficulties in interpreting the regression emerge, however, when we consider that the grade obtained depends in part on the composition of the committee and that the composition of the committee also depends on the

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<sup>25</sup> The commonly used indicators, *Variance Inflation Factor* and Belsey, Kuh, and Welsh criterion, for detecting multi-collinearity (Erkel-Rousse, 1994) do not report any in Model I. The comparison between Model I and Model II suggests that the correlation tends to overestimate the standard deviations of the supervisor's structural constraint somewhat.

<sup>26</sup> The Chi-square statistic associated with the simultaneous null hypothesis of the two volume parameters is 1.3, while it amounts to 10.9 for the two structural constraint parameters, respectively.

<sup>27</sup> Structural constraint and volume of its contacts are in the model I not significant separately but very significant together, significance which owes more to the shape than to the volume.

level of the PhD – as anticipated by the doctoral student-supervisor pair. Does the parameter of the grade mainly measure the quality of the PhD or the diversification of the committee? Similarly, does the parameter associated with the diversification of the committee measure more the quality of the PhD or the volume of the social capital of the doctor-supervisor couple? To most of the work on the impact of networks, it is possible to ask the question: is social capital the cause of “performance” or its consequence<sup>28</sup>?

Can we thus respond to an alternative interpretation according to which the diversification of the committee would essentially be an indicator of the quality of the PhD and not a support for making the PhD visible and obtaining support? It is possible to overcome this problem by using the instrumental variables technique (Robin, 1999). The method consists in finding instruments, *i.e.* exogenous variables, in this case social capital for the grade and the quality of the PhD for the diversification of the committee, likely to make them vary respectively. The replacement of these two misidentified variables with a prediction based on exogenous instruments makes it possible to correct the identification problem.

However, it is difficult to find variables approximating the “scientific value” of the PhD that are totally independent of the network. If we take the publications as a proxy for the value of the candidates (information that is difficult to collect exhaustively), we would also capture the networks of access to the publication (themselves correlated to the networks of invitation to the committees). The belief in a “scientific value”, totally independent of social contingencies (the network), is itself a bit naive<sup>29</sup>. On the other hand, it is easier to find indicators of social capital that are independent of the value of the PhD than the opposite. The diversification of the PhD committees of the supervisor’s other PhDs provides a good candidate for the instrumentation of network variables. Instrumented committee diversification, in other words the prediction of committee diversification based on an indicator of the supervisor’s social capital exogenous to PhD value, has a highly significant effect and of the same order as those estimated in Model I and II (see Appendix 4)<sup>30</sup>.

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<sup>28</sup> Even if “performance” temporally follows the constitution of the network, this could also be the consequence of a leading indicator of “performance” (the value of the PhD as a leading indicator of recruitment).

<sup>29</sup> Following Collins (1998), intellectual thought, insofar as it is a dialogue at a distance with others, is also the product of relational activity. He thus shows that philosophers who are connected to numerous and diverse thinkers, whether inspirers or opponents, are in a position to elaborate a philosophical discourse that is more constructed and more likely to be historically remembered.

<sup>30</sup> But, one may say, are the levels of each of the PhDs of the same supervisor not correlated? Isn’t there a match between PhDs of a certain level and a PhD supervisor with a certain network? The phenomenon cannot be denied. However, by controlling in the regression by the IEP diploma, *i.e.* the level at the beginning of the PhD, we limit the scope of this objection. The only assumption we make is that within each of the delimited degree levels (IEP Paris or ENS, IEP de province, other IEP), such matches are negligible. The frequent testimonies of PhDs about mistakes in the choice of a PhD supervisor may support this hypothesis.

This estimate confirms the clear importance of social capital for obtaining a position, and the modalities of its activation: it is the relationships with influential people with multiple, diversified and non-redundant contacts that allow, during the PhD and the defense, to collect institutional support and above all to put the value of the PhD into circulation, in short to make the doctor visible in the academic field and ultimately to allow her to find a position. In the academic field of political science, the actors competing for positions, apprehended at an individual level, thus benefit from the diversification and non-redundancy of their relationships.

### **The “collective social capital**

While with the above regression we have shown how, at an individual level, individuals in competition could take advantage of the diversification of their relations, an advantage that is both strategic and relational, to obtain rare goods, we have not shown how the group as a group, by establishing a network of dense and homogeneous relations within it, could encourage the emergence of shared norms and values, a regulation of competition likely to favor itself in its competition with other groups. The effect of cohesion must therefore be measured not at the level of the individual, as proposed by Burt (1995), but at the level of a collective. In order to analyze the effect of the variation in the internal cohesion of a group on its capacity to regulate internal competition and to face external competition, we distinguish as groups, the sub-disciplines of political science on the one hand, and the recruiting universities on the other hand, groups that have an institutional base (Bourdieu, 1984) and are likely to manage common issues<sup>31</sup>. However, the number of groups characterized is limited and the evidence is not of the same nature as in the first part.

#### Sub-disciplines

As we saw from the results in Table 1, the different sub-disciplines have very unequal probabilities of obtaining teaching and research positions. The differential remains strong, even when controlled for other variables such as composition by nationality, degree, or by the interconnectedness of the panel members. Examination of Figure 3 showed that, among the main committee members, those who appeared relatively isolated, repeatedly inviting a few relatives, often belonged to the international relations sub-discipline. Doesn't this suggest that the difference in terms of reproduction refers to different degrees of constitution and mobilization of the sub-discipline?

While it does not constitute statistical evidence of the same order as that developed in Table 1 regarding “individual social capital,” a first test suggests that, in addition to diversification at the individual level within the group, the cohesion of the group as a whole is also a factor favorable to obtaining a

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<sup>31</sup> A completely inductive reconstruction of groups on the basis of invitation relationships would risk delineating groups between which the variation in cohesion would be lower and within which the issues would be less clearly defined.

position. We thus replaced the sub-discipline variable with the density<sup>32</sup> of the sub-discipline in each year (measuring the invitation networks over three years as explained above). This variable is then significant at the 1% threshold and its chi-square of 7 is close to that provided by the sub-discipline variable (8.6). In other words, the difference in recruitment between sub-disciplines seems to be more related to the difference in cohesion and mobilization than to the difference in content. Let's continue this intuition suggested by this correlation by comparing the two most important sub-disciplines, political sociology and international relations.

Graphs 2 and 3 represent the invitation relationships between the main members of the committees of the theses coded in political sociology and international relations respectively. While the size of the network is equivalent (61 and 60 individuals), the structure of the invitational relationships is strongly differentiated. In political sociology, there are 251 distinct invitational relationships compared to 220 in international relations. The density of political sociology is 10% higher than that of international relations<sup>33</sup>: 0.069 in political sociology versus 0.062 in international relations.

In political sociology, the relationships gravitate on Figure 4 around a concentrated center of a few highly interconnected professors from Paris I, large producers of theses that often lead to a position. They become diluted as they move away from this central focus without losing cohesion, especially towards the east of the Figure. Beyond the second circle of scholars from IEP Paris, Paris 10 or Paris 9, we find mainly professors from Grenoble and Lille, specialists in political sociology or public policy, often younger and possibly waiting to return to Paris, who, even if they have developed local relationships in their universities, have maintained contact with the Parisian core. This concentric structure is, however, less regular in the other directions. Thus, in the West of the Figure, we find the isolation of the Toulouse scholars and, in the North, we notice that certain scholars from Paris 1, well connected among themselves and with scholars from Paris 2, are not very well connected to the central core, which perhaps suggests the existence of a cleavage between scholars within this institution.

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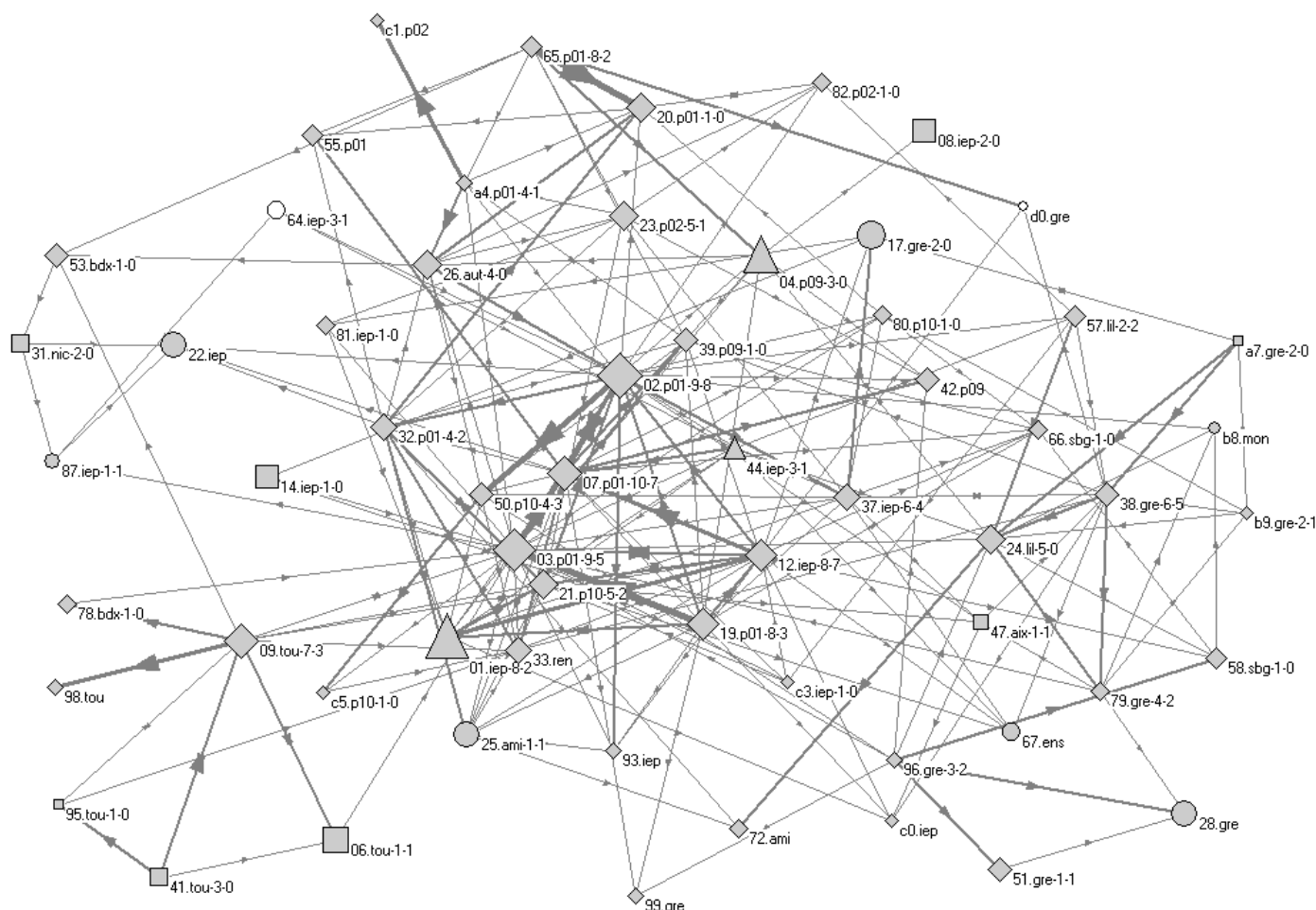
<sup>32</sup> To approach more correctly the idea of density, i.e. the ratio between the number of links observed and the number of possible links, while taking into account the specificity of the invitation to a PhD committee, we used, instead of the classical indicator, the following

formula,  $\sum_{i,j} I_{ij} / (7 * T)$  where T is the number of theses (in the sub-discipline and the period

considered) and  $I_{ij}$  an indicator variable which is worth 1 if  $i$  has invited  $j$  at least once. We thus consider that the maximum possible linkage is that each committee member invites 7 different people to each PhD committee.

<sup>33</sup> Measured here by the classical formula:  $\sum_{i,j} I_{ij} / (N^2 - N)$ .

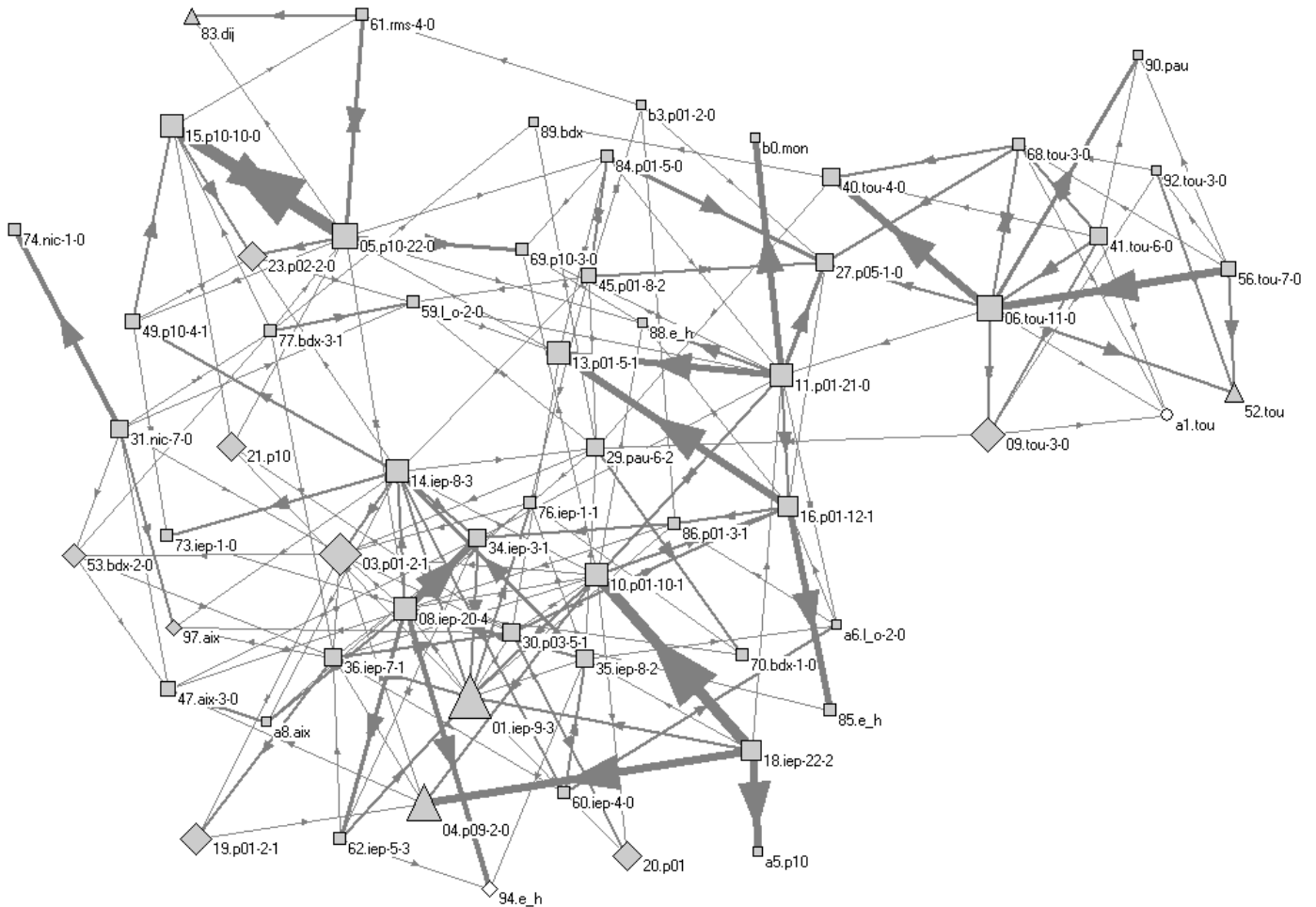
**Figure 4.** Committee members who participated in at least four dissertation committees coded in political sociology (n=61)



The legend of graphs 2 and 3 is identical to that of Figure 3, except for the wording of the points. The last two figures refer respectively to the number of supervised PhDs and the number of the PhDs finally recruited, which did a PhD in the sub-discipline in question.

In contrast, the Figure representing international relations scholars has the splintered structure of its object. The Figure has no easy center to characterize, although the core of dense relationships between IEP scholars (often CERI members) could serve as a candidate. The relational structure, on the other hand, presents numerous “cliques”, networks of very dense relationships between groups of two, three or four people, but these cliques are poorly connected. From left to right, at the top, we see three cliques, the international relations of Paris 10, those of Paris 1, and then those of Toulouse. Going down to the bottom of the Figure, it is possible to disentangle, on the one hand, a dense and coherent sub-network, open to the outside world since some of the scholars of political sociology are invited there, and a very closed clique centered around *Committee member 18*, made up of specialists in a particular field, studies on the former USSR and the countries of the East. Except in the latter case, the formation of cliques seems to be more the product of institu-

**Figure 5.** Committee members who participated in at least six committees of theses coded in international relations (n=60)



tional proximity than of a logic of scientific specialization in a given cultural area.

This relational cohesion of political sociology around a central core can be seen as the product of the history of this sub-discipline over the last twenty years. Its central circle of professors currently at Paris 1 has played an essential role in redefining political science along the lines of the social sciences in general and sociology in particular. Political science, far from being a speculative and normative science like law or philosophy, must, according to them, also have a field and empirical methods: interviews, statistics, archives, direct observation, etc. The “political” object, then, cannot be limited to the sole exegesis of the systems and forms of “political life” (elections, parties, governments...). It is considerably enlarged to the point that its definition becomes problematic (Favre, 1980 and 1995). This redefinition of the objects and methods of the discipline (considerably influencing the implicit criteria for

defining what a doctorate should look like) was reinforced in the mid-1980s by the rapprochement of some of its protagonists with Bourdieu, his concepts or his school. The introduction of the *Agrégation du supérieur* in 1972 was an important instrument in this process, since it allowed them to quickly gain access to positions of power (professors) and the production of PhDs. Around this militant and refounding core, the following generations of PhDs and *agrégés du supérieur* joined, sharing a certain number of conceptions as to what political science should be, and even more rejections: the refusal of a political science that was too generalist and journalistic, providing itself with an object that was too large for the conduct of a true investigation. This configuration produced both in the nineties diversified but also centralized relations, a cohesive and dense structure, better able to share the same scale of value, to disseminate the names of people of value and to mobilize to obtain a position and ensure its reproduction and extension. On the contrary, international relations seem to be balkanized, divided into a multitude of small areas – universities, cultural areas studied – which do not really communicate with each other. They cannot, therefore, truly share a scale of values or a sense of solidarity and are particularly vulnerable to the offensive of political sociology.

### Universities

Even more than sub-disciplines, universities are collective units that can administer competition. Indeed, they largely control the composition of the committee of specialists, and thus the recruitment and reproduction of the group. For various reasons, universities can thus favor the recruitment of close individuals, especially local PhDs, over distant ones<sup>34</sup>. When university members, especially local PhD supervisors, are connected by dense and repeated ties, when they have developed a significant collective social capital, they are likely to adopt a cooperative behavior and to manage internal competition and globally favor local PhDs. On the contrary, looser relationships and even more dissension, in short, the absence of shared values within the group, would open up the game in favor of external candidates. We can therefore hypothesize a link between “academic inbreeding” (*localisme*) and local cohesion of relations.

Testing this hypothesis requires a delicate evaluation of academic inbreeding in political science (Godechot, Mariot, 2003b). The difficulty of the exercise lies in the fact that we rarely know the date on which the positions were obtained, and also in the fact that it is a statistical evaluation based on small numbers. However, we can establish some enlightening approximations based on the information available to us. Since 1992, the recruitment procedure for

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<sup>34</sup> Among the reasons often mentioned: to stabilize the precarious position of a quasi-colleague, to choose someone living locally who is capable of integrating quickly into the pedagogical team, to find an outlet for the school of thought and the product of the PhD supervisor, to defend oneself against competition deemed unfair from other institutions that also recruit locally, or from dominant institutions, such as the IEP, which massively exports doctors but do not recruit juniors, to pursue scientific collaborations already begun, etc. In the rest of the text, we are careful not to make a normative assessment of “academic inbreeding” and we only seek to establish a correlation between this phenomenon and local cohesion.

assistant professor positions has remained unchanged<sup>35</sup>. The CNU first makes a first selection at the national level, the *qualification*, and then the local specialist commissions recruit the assistant professors among the qualified PhDs. The qualification lists constitute a first information on the competing population<sup>36</sup>. To evaluate the intensity of the bias in favor of local candidates over the whole period, we must first evaluate the importance of local competitors – the number of qualified local doctors – and – a more delicate exercise – the number of external competitors over the whole period<sup>37</sup>. These hypotheses allow us to draw up a more precise list of potential competitors and to estimate the weight of local preference at the global and local levels.

Thus, out of the twenty universities that have produced doctors who are able to compete (qualified) and have participated in the recruitment of assistant professors in section 04 of the CNU, there are 32 local recruitments and 38 external recruitments, *i.e.* a local recruitment rate of about 44%. In the absence of local preference, we should have found 5 local recruitments, that is a rate of 7% of local preference. In these 20 universities, there are on average<sup>38</sup> 13.2 local competitors and 162.66 potential external competitors for 5.2 positions, which are divided into 2.20 positions for local candidates and 2.6 for external candidates. Local candidates thus have an *odds* ratio 11 times higher than that of an external candidate. Academic inbreeding, often denounced, is therefore a massive and significant phenomenon. Through the study of a few universities, for which we know the PhD committees and where the number of recruitments has been significant, we would like to show that the degree of local preference varies according to the local cohesion of the academic world.

Table 2 presents the estimated local and external competitors and the recruitment results between 1991 and 2001 in Toulouse, Lille, Paris 1, Grenoble, Amiens, Strasbourg<sup>39</sup>. The hierarchy of local preference is not easy to define. Toulouse recruited 3 locals and 3 outsiders, while Paris 1 recruited 5 locals and 3 outsiders (doctors from IEP Paris...). Does this mean that local preference is less strong in Toulouse than in Paris 1? No, because we must take into account

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<sup>35</sup> It is therefore relevant to the 1991 PhDs.

<sup>36</sup> Unfortunately, we are missing the years 93, 96 and 97.

<sup>37</sup> The main problem is to reconstruct the positions to which PhDs who obtained a job at the end of the period could have applied. In order to make a reasonable breakdown of PhDs, we make the following assumptions: a) not all PhDs appointed as professors, at the CNRS or at the FNSP, compete for assistant professor positions; b) candidates always prefer to have a position in political science than in another discipline; c) candidates prefer to have a position in the university where they did their PhD than in another university; d) in the absence of a local position, the university closest (distance by kilometer) to Paris I is the one preferred (*i.e.* a PhD from Grenoble taken in Amiens is considered as a potential candidate for Paris X but someone who does not apply in Pau). The order of priority of the local preference (c) over the Parisian preference (d) is open to discussion. However, its inversion leads to a variation of a dozen or so external candidates at the most and does not really modify the results.

<sup>38</sup> Averages are weighted by the number of positions offered.

<sup>39</sup> In the provincial cities, no distinction is made between the various universities (Lille I, II, III) and the universities and IEPs (IEP Lille). The proximity between universities and between universities and IEPs is much stronger there than in Paris, which justifies this rapprochement.

the number of local competitors. At Paris 1, over the period, 5 local candidates were chosen out of 54, whereas at Toulouse, 3 out of 7 were chosen. The chosen solution consists in comparing the significance of the bias in favor of local candidates<sup>40</sup>. The probability of non-significance of local preference is 1‰ in Toulouse, 4‰ in Lille, 2‰ in Paris 1, 4‰ in Grenoble, 16‰ in Amiens, and 100‰ in Strasbourg, a city with a clear preference for the outside. This indicator, admittedly fragile because of the fragility of the assumptions<sup>41</sup>, provides a satisfactory scale of local preference when small samples must be compared.

**Table 2: Competition for positions and probability of non-significance of local preference at six universities.**

| 1991-2000  | Doctors | Estimated qualification rate | Estimated local competitors | Estimated external competitors | Inbred recruits | Outside recruits | Probability of no local preference |
|------------|---------|------------------------------|-----------------------------|--------------------------------|-----------------|------------------|------------------------------------|
| Toulouse   | 68      | 12%                          | 7                           | 146                            | 3               | 3                | 0,11%                              |
| Lille      | 20      | 40%                          | 8                           | 171                            | 3               | 6                | 0,44%                              |
| Paris 1    | 177     | 38%                          | 54                          | 178                            | 5               | 3                | 1,82%                              |
| Grenoble   | 65      | 60%                          | 23                          | 133                            | 3               | 3                | 4,19%                              |
| Amiens     | 12      | 83%                          | 8                           | 175                            | 1               | 3                | 16,50%                             |
| Strasbourg | 10      | 30%                          | 3                           | 156                            | 0               | 6                | 100,00%                            |

Thus, Toulouse, a university that is very disconnected from the rest of the discipline, which has difficulty in obtaining the qualification of its doctors (12% of its doctors are qualified while 30% are qualified on average), seems to have a strategy of defending its local doctors when they are qualified. On the other hand, the people of Strasbourg do not seem to be concerned about defending their local products.

Table 3 suggests that these differences in strategy originate in a different relational density. In Toulouse, the PhD supervisors are few in number compared to the number of theses. They invite few distinct people. On the other hand, they invite each other a lot. The distinct invitation relations between the 14 supervisors constitute more than a quarter of the distinct invitation relations. These are generally reciprocal invitation relationships and are repeated, 42% of the total invitation relationships are invitation relationships between PhD supervisors. On the contrary, in Strasbourg – a much smaller place of production – the share of relations between PhD supervisors on the total relations is much lower. Globally the hierarchy of the local preference calculated above follows the hierarchy of the two indicators of cohesion.

<sup>40</sup> The hypergeometric distribution is used to calculate the probability that a random draw without replacement would lead to a local preference rate equivalent to or higher than the one observed in this type of population. For small numbers, this method is more robust than *chi-square* or *odds-ratio* comparisons.

<sup>41</sup> One of the sources of fragility comes from the lack of dating of competitions and recruitments. It is quite possible that in a certain number of cases, in particular in universities producing few qualified PhDs, positions were put up for competition even before the PhDs had finished their PhD.

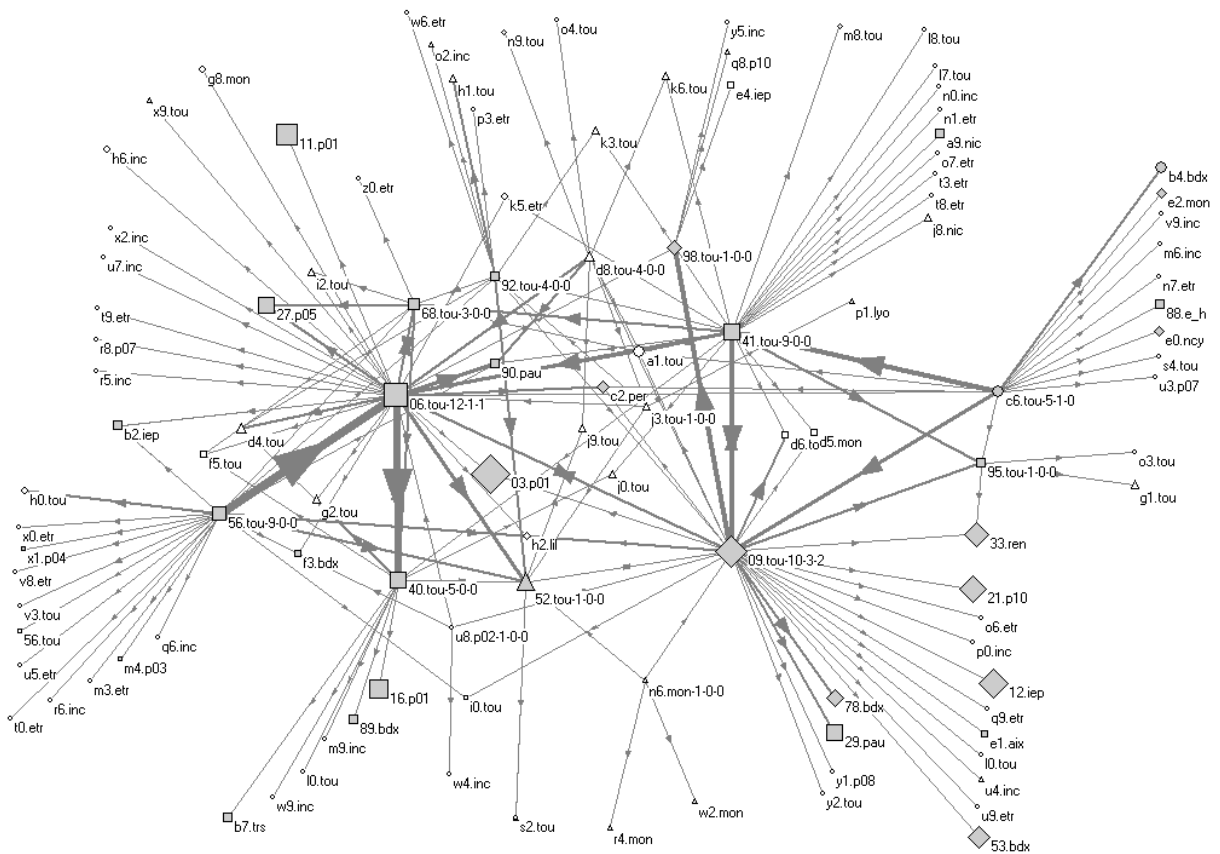
Only Lille, certainly a small production unit, seems to obtain a strong bias in favor of the locals by limiting the weight of the relations between its PhD supervisors.

**Table 3: Cohesion indicators at the six universities.**

| 1990-2000  | Known committees | Number of PhD supervisors | Number of distinct people in the committees | Share of relationships between local managers out of all relationships |                     |
|------------|------------------|---------------------------|---------------------------------------------|------------------------------------------------------------------------|---------------------|
|            |                  |                           |                                             | Distinct relationships                                                 | Total relationships |
| Toulouse   | 67               | 14                        | 116                                         | 27%                                                                    | 42%                 |
| Lille      | 20               | 6                         | 59                                          | 20%                                                                    | 22%                 |
| Paris 1    | 197              | 45                        | 351                                         | 28%                                                                    | 35%                 |
| Grenoble   | 62               | 20                        | 173                                         | 25%                                                                    | 31%                 |
| Amiens     | 13               | 5                         | 38                                          | 19%                                                                    | 22%                 |
| Strasbourg | 10               | 7                         | 33                                          | 15%                                                                    | 17%                 |

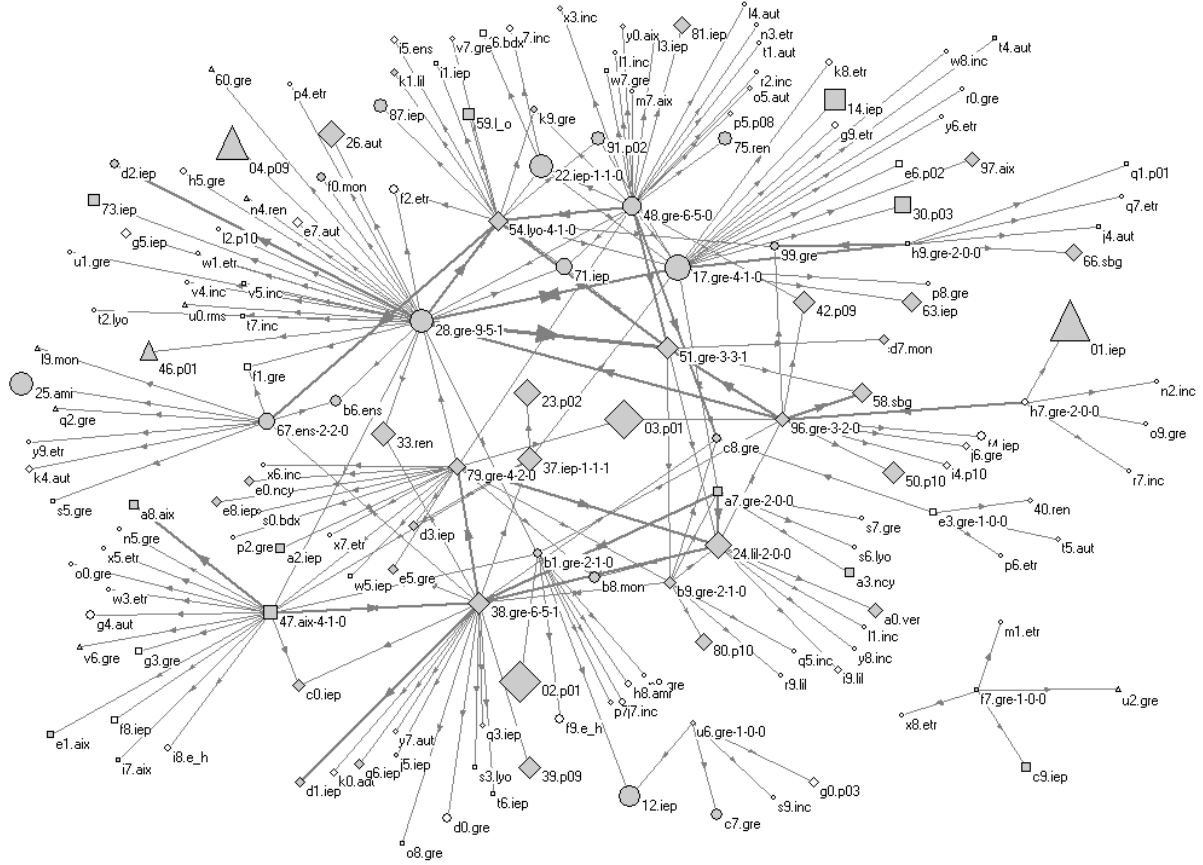
The examination of some invitation graphs by faculty confirms the reading of Table 3. In Toulouse, the invitation relationships between PhD supervisors

**Figure 6. Committee members who participated in the PhD committees in Toulouse.**



**Reading note for graphs 4 to 6:** The legend is identical to that of Figure 1, except for the title. The last three figures are, in the university considered, the numbers of these directed, of doctors “placed” and of doctors placed locally as assistant professors in section 04. In Figure 4, “09.tou-10-3-2” = scholar 09, from Toulouse, having directed 10 theses in Toulouse, 3 doctors “placed”, of which two locally.

**Figure 7.** Committee members who participated in the PhD committees in Grenoble.



are particularly dense and strong (Figure 6). Each of the 6 large supervisors is linked to most of the 5 others, and often by reciprocal invitation links accumulating 5 to 10 invitation relationships. The supervisors whose PhDs obtain positions locally (*committee member 09* and *committee member 06*) are supervisors who, while investing massively in their colleagues, thus constituting a group spirit favorable to the defense of the group's reproduction, have taken care, particularly for the first, to diversify usefully by inviting heavyweights of the discipline: *committee member 03*, a member of Paris 1, of the CNU of 1996 and an important figure in French political sociology, *committee member 12* of the IEP Paris, and *committee member 21* of Paris 10. This diversification has undoubtedly allowed a certain number of doctors to pass the qualification hurdle, which is particularly difficult for doctors from Toulouse, and to finally find a place "at home" where the tight-knit group is ready to defend them against external competition.

While the number of theses in Grenoble is of the same order as in Toulouse, the relational structure is much more complex (Figure 7). The number of PhD supervisors on one side and the number of distinct persons in the committees are higher than 40%. The main supervisors are distributed around

a central circle. On the periphery of this circle some supervisors seem to be very poorly connected to the others. There is one supervisor whose committee is completely cut off from the network, another who is only connected by a common guest, and two supervisors who are only connected to the network by another PhD supervisor. However, these are “small producers”. We distinguish two sub-networks of PhD supervisors, in the north, the specialists in public policy, and among them three or four supervisors have repeated relations (3 invitations in each direction between *Committee member 28* and *Committee member 17*). In the south, specialists in political sociology are grouped together, and their relationships are dense but not very repeated. The two subgroups have roughly equal placement and recruitment power. This division into two equal, and perhaps potentially rival, groups eventually limited the extent of “academic inbreeding” in Grenoble. But the strategy of defending local candidates is all the less urgent because the export scores are good, whether to other universities or to the CNRS. Indeed, whether they are from the northern or southern group, the supervisors seem to take care to diversify their relations with outsiders, in particular by inviting well-known and recognized professors and researchers from Paris 1, the IEP in Paris (or the FNSP), Paris 9, or Paris 10.

Strasbourg, finally, is a university that has a clear preference for external candidates. Admittedly, the number of qualified local candidates (3) is not very large. But while many positions were offered during the period (6), the PhD supervisors did not try to defend even one of their own. An examination of the relationship sheds light on this extraversion (Figure 8). PhD supervisors, sometimes not very well established in Strasbourg, are only linked to each other by a single contact, either by a common contact or by a direct invitation. These invitation relationships are very rarely repeated and reciprocal. One of them (*Committee member 58*) acts as a bridge between the other supervisors, probably because of his privileged institutional position within the Strasbourg IEP. Without this unifying core, the network would be split into four islands.



of juxtaposition of social capital for an individual and for a collective. Knowing whether it is a necessary juxtaposition, a stable conjunction or an unstable combination, would make it possible to specify the role of social relations in everyday life.

**Olivier GODECHOT**

**Nicolas MARIOT**

## APPENDIX

### 1. Abbreviations of the main institutions of affiliation of the supervisors during the period

|     |                          |     |                          |
|-----|--------------------------|-----|--------------------------|
| aix | Aix-Marseille            | p02 | Paris 2                  |
| ami | Amiens                   | p03 | Paris 3                  |
| aut | Other                    | p04 | Paris 4                  |
| bdx | Bordeaux                 | p05 | Paris 5                  |
| dij | Dijon                    | p07 | Paris 7                  |
| e_h | EHESS                    | p08 | Paris 8                  |
| ens | École Normale Supérieure | p09 | Paris 9                  |
| etr | Foreign institution      | p10 | Paris 10                 |
| gre | Grenoble                 | p11 | Paris 11                 |
| iep | IEP-Paris (Sciences Po)  | p12 | Paris 12                 |
| inc | Unknown institution      | p13 | Paris 13                 |
| l_o | Oriental Languages       | pau | Pau                      |
| lil | Lille                    | per | Perpignan                |
| lyo | Lyon                     | ren | Rennes                   |
| mon | Montpellier              | rms | Reims                    |
| nan | Nantes                   | sbj | Strasbourg               |
| ncy | Nancy                    | tou | Toulouse                 |
| nic | Nice                     | trs | Tours                    |
| p01 | Paris 1                  | ver | Versailles Saint-Quentin |

### 2. Calculation of Burt's "structural constraint"

Let  $z_{ij}$  be the number of times  $i$  invites  $j$ . Burt begins by measuring the proportion  $p_{iq}$  of  $i$ 's relations invested in contact  $q$ :

$$p_{iq} = (z_{iq} + z_{qi}) / \sum_{j \neq i} (z_{ij} + z_{ji})$$

He then calculates the "constraint" of  $j$  on  $i$ , roughly a sum of  $i$ 's direct and indirect contacts:

$$c_{ij} = \left( p_{iq} + \sum_{q \neq i, j} p_{iq} p_{qj} \right)^2$$

The global "constraint" on  $i$  is then the sum of the "constraints" coming from each of its contacts:

$$C_i = \sum_j c_{ij}$$

$C_i$  is equal to 1 when  $i$  has only one contact in the network and tends to 0 when its contacts are very numerous and not connected to each other.

### 3. Table of correlation coefficients between network variables

|                                         | Number of contacts of the supervisor | Supervisor's structural constraint | Average number of guest contacts | Average structural constraint of guests |
|-----------------------------------------|--------------------------------------|------------------------------------|----------------------------------|-----------------------------------------|
| Number of contacts of the supervisor    | 1                                    | -0,70                              | -0,04                            | 0,09                                    |
| Supervisor's structural constraint      | -0,70                                | 1                                  | 0,11                             | -0,10                                   |
| Average number of guest contacts        | -0,04                                | 0,11                               | 1                                | -0,73                                   |
| Average structural constraint of guests | 0,09                                 | -0,10                              | -0,73                            | 1                                       |

The other correlation coefficients between explanatory variables do not exceed 0.2 in absolute value.

### 4. Correction of the identification problem with the instrumental variable technique

The identification problem can be written as follows:

$$Y_x = \alpha \cdot M_x (D_x^i, Q_x) + \beta \cdot D_x^i (Q_x, K_x^i) + X_x \cdot \gamma + u_x$$

With  $Y_x$ : having a job.  
 $D_x^i$ : diversification of the committee of  $x$  by the supervisor  $i$ .  
 $M_x$ : grade of the PhD of  $x$ .  
 $Q_x$ : quality of the PhD of  $x$ .  
 $K_x^i$ : social capital mobilized by supervisor  $i$  and doctor  $x$ .  
 $X_x$ : other explanatory variables.

Because of the impossibility of correcting the measurement error concerning the quality of the PhD, we choose to voluntarily omit the grade variable which approximates it. We first estimate by a first step regression, the diversification of the predicted committee according to the diversification indicators  $D_x^i$  used by the supervisor for her other committees:

$$D_x^i = \delta \cdot D_{-x}^i + X_x \cdot \eta + e_x$$

This prediction  $\check{D}_x^i$  of this variable based on the first step equation is then exogenous to the PhD quality  $Q_x$ .

$$Y_x = \lambda \cdot \check{D}_x^i + X_x \cdot \mu + v_x$$

In Model I and II, the variable *structural constraint of the supervisor* is not the most suspect of misidentification because it is constructed from the network of all the supervisor's contacts over three years and the composition of  $x$ 's dissertation committee ultimately plays only a limited role in the indicator. On the other hand, the *mean of the structural constraint of the guests* reflects more directly the strategy of committee composition and is the most misidentified variable. Since it is the most significant and our reasoning relies on its significance, we will focus on this one for instrumentation. We instrument it with the mean of the same variable for the supervisor's committees during the four surrounding years. In order to use the instrumental variables estimator (two-stage least squares), we use a linear probability model in the second stage, whose approximation to a logistic model is not troublesome as long as we limit

ourselves to the interpretation of the parameters and refrain from trying to predict probabilities.

| Explanatory variables                                      |                                                                                                          | Single OLS of $Y_x$   | First stage regression of $D_{xi}$ | Second stage regression of $Y_x$ |
|------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|-----------------------|------------------------------------|----------------------------------|
| Year                                                       |                                                                                                          | ***                   | **                                 | ***                              |
| Gender                                                     |                                                                                                          | **                    | <i>ns</i>                          | *                                |
| Nationality                                                |                                                                                                          | ***                   | *                                  | ***                              |
| Educational capital                                        |                                                                                                          | ***                   | <i>ns</i>                          | **                               |
| Institution                                                |                                                                                                          | *                     | *                                  | *                                |
| Sub-discipline                                             |                                                                                                          | ***                   | <i>ns</i>                          | **                               |
| <i>Misidentified variable (<math>D_{xi}</math>)</i>        | Average structural constraint of invited committee members on the doctoral panel $x$                     | -0,078 ***<br>(0,017) | .                                  | .                                |
| <i>Instruments (<math>D_{xi}</math>)</i>                   | Average structural constraint of committee members invited to other supervisor's committees $i$          | .                     | 0,325 ***<br>(0,043)               | .                                |
| <i>Instrumented variable (<math>\check{D}_{xi}</math>)</i> | Prediction of the average structural constraint of the committee members invited to the committee of $x$ | .                     | .                                  | -0,145 **<br>(0,055)             |
| Observations                                               |                                                                                                          | 513                   | 513                                | 513                              |
| R2                                                         |                                                                                                          | 0,33                  | 0,22                               | 0,31                             |

Reading: Significance of variables or groups of control variables, \* at the 10% threshold, \*\* at the 1% threshold, \*\*\* at the 1‰ threshold. The number of doctors is reduced to 513 because some supervisors do not have theses defended during the four years surrounding the year of the defense of  $x$ .

The parameter of the instrumented variable remains very significant and its absolute value is even higher than that obtained in the simple regression.

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