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*Published in:*

Journal of Public Administration Research and Theory

**IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.**

*Document Version*

Publisher's PDF, also known as Version of record

*Publication date:*

2010

[Link to publication in University of Groningen/UMCG research database](#)

*Citation for published version (APA):*

Schalk, J., Torenvlied, R., & Allen, J. P. (2010). Network embeddedness and organizational performance. The strength of strong ties in Dutch higher education. *Journal of Public Administration Research and Theory*, 20(3), 629-653.

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## **Network Embeddedness and Organizational Performance: The strength of strong ties in Dutch Higher Education**

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Panel track 15. Public Management Research Association. Panel 2: Public Management and Organizational Performance

### **Abstract**

With only few exceptions, current research in public management on the effects of inter-organizational networks on organizational performance focuses either on network activity or on the inter-organizational network structure. The present paper theoretically links both approaches and tests two different types of network effects—‘network centrality’ and ‘cohesive subgroup membership’. The paper develops a model, which integrates organizational performance at the level of the organization and at the level of the individual client. To test hypotheses, data on the inter-organizational network of all Dutch colleges for the training of primary education teachers ( $n = 28$ ) was combined with college-level performance data for 2002-2005, and the evaluations of graduates of the colleges in a large sample of graduates for the same period ( $n = 7,119$ ). Multilevel logistic regression analyses show that embeddedness in cohesive subgroups rather than network activity significantly contributes to positive evaluations by individual graduates.

Paper prepared for presentation at the XII Annual Conference of the International Research Society for Public Management, panel 15 on public management and organizational performance organized by the Public Management Research Association, Brisbane, 26-28 March 2008. We are grateful to Vincent Buskens and Richard Zijdeman for their advice. Torenvlied acknowledges financial support from the Polarization and Conflict Project CIT-2-CT-2004-50604, funded by the European Commission DG Research Sixth Framework Programme and the project on Successful Implementation of Innovations in Organizations, funded by the ‘high potentials’ program of Utrecht University.

## 1. Introduction

Recent research in public management has shown that the characteristics of inter-organizational networks are important determinants of the performance of public agencies and public policies (O'Toole 1997; Bardach 1998; Agranoff and McGuire, 2003). Public agencies are organizations or organizational units involved in implementing a governmental policy. The observation that these agencies are embedded in networks of formal and informal relations with other public agencies, government institutions, private organizations and interest groups is not new (cf. Laumann and Knoke 1987; Heinz et al. 1993). Indeed, different traditions on 'policy networks' have developed from the 1980s onwards, varying from formal modeling approaches (König 1998) to metaphoric descriptions of public sectors (Marsh and Rhodes 1992). The main discussion is whether one conceives of policy networks as distinct forms of 'governance' (Powell 1990) or as special cases of a larger set of possible network relations (Podolny and Page 1998). The main hypothesis is that non-hierarchical network relations develop among interdependent organizations because these organizations are collectively accountable for social problem solving (Scharpf 1997; Börzel 1998). Hence, collaboration rather than competition is expected between public agencies in these networks (Nutt 2005).

Research in the field of inter-organizational networks shifted from conceptual and descriptive questions to explanatory questions, in particular to the explanation of collective outcomes of these networks. Studies in the field of sociology explain the outcomes of collective decision-making on the basis of inter-organizational network structures (cf. Stokman, Thomson and Torenvlied 2000; Torenvlied 2000; Thomson et al. 2007). Studies in the field of public administration explain the performance of inter-organizational networks in terms of policy effectiveness (Provan and Milward 1995; Provan and Kenis 2007) or accountability and legitimacy (Rhodes 1997; Klijn and Koppenjan 2000). Because performance is studied at the collective level, effects of network management are studied in terms of network design and compared with the effects of hierarchical structures on effectiveness, accountability, and legitimacy.

Only few studies systematically analyze the effects of inter-organizational network structure and network management on the performance of single public agencies (cf. Rethemeyer, 2007). Available studies show that the network management of public agencies explains the performance of these agencies on various indicators (Nicholson-Crotty and O'Toole, 2004; O'Toole and Meier 2004; Andrews, Boyne, Meier, O'Toole and Walker 2005). An analysis of the performance of Texas public schools reveals significant effects of both managerial networking by heads of Texas school districts and more structural network characteristics, such as diversity of funding (O'Toole and Meier 2004). These studies consistently report that 'ties are beautiful': agencies headed by more actively networking managers perform better. The hypothesis is that managerial networking enables organizations to cope with uncertainty and thus to absorb shocks in the environment.

The first innovation of the present paper is that we study the effect of network embeddedness of public organizations on their performance. We build on recent advances in organizational sociology (Borgatti and Foster 2003; Brass, Galaskiewicz, Greve and Tsai 2004). Studies on inter-organizational networks in this field replicate the 'ties are beautiful' observation: ties in the inter-organizational network increase survival rates, economic output and innovativeness of firms because such ties transfer new information (Zaheer, McEvily and Perrone 1998; Smith-Doerr and Powell 2005). However, organization sociology also shows that performance of organizations is strongly related to the *structural position* of an organization in the total network. These network effects are indirect, since their strength depends upon the

number and structure of ties of an organization as well as the number and structure of ties of other organizations. Such network effects are subtle, since they define different roles. For example, network brokers, central actors and organizations that possess arm's-length or weak ties generally perform better (Granovetter 1985; Burt 1992; Uzzi 1996). Hite, Williams and Baugh (2005) studied a complete network of 36 public school administrators and argued—though failed to convincingly demonstrate—that that the network position an administrator affects her school's effectiveness and performance.

The present paper argues that—rather than analyzing ego-networks of managers or organizations—we must take the complete inter-organizational network as the point of departure for an effective assessment of the effect of network management on public agency performance. We must focus on the structural position of public agencies in the inter-organizational network and not only on the frequency of network ties. Hence, we need complete network data, which has the advantage that not only the direct access to information and resources via dyadic relations can be assessed, but in addition the indirect access to information and resources through 'third parties'. Thus, the *ties of alters* to the focal public agency could be more important for predicting performance than characteristics of the alters themselves.

The second innovation of the present paper is that we analyze performance simultaneously at the level of the public agency as well as at the level of the client population. Public performance measures are very diverse (Boyne and O'Toole 2006), which is due to difficulties in measuring performance in public settings. For business firms, standard indicators are organizational profit and survival (Brüderl and Preisendörfer 1998), or innovativeness (Stuart and Podolny 1999). However, indicators for public agency performance are much harder to define. Most performance indicators are to be found at the organizational level—often developed for regular, quantified monitoring and control of agency behavior. Examples include the number of criminals arrested as a performance measure for police departments, or dropout rates as a performance measure for schools (Propper and Wilson, 2005).

Public agencies, however, deliver their services at the *individual level*, where they have to satisfy the needs and demands of clients. It therefore seems natural to use the evaluations of the clients as performance measures for these agencies. But, when doing so, we should not just compare the mean evaluation of each agency, but also incorporate variation at the individual level. Without simultaneously analyzing organizational and client level variation, it is impossible to assess the relative impact of explanatory mechanisms at the agency and client levels. An additional advantage of the analysis of variation in performance at the client level is that it allows us to control for selection effects, that is initial distributional characteristics of individual clients—for example in the case of schools the prior school achievements of students—that may account for some of the differences in performance at the organizational level. At the same time, simple characteristics of the organization may explain some of the variation in client evaluations—for example in the case of schools the size of the school. The appropriate statistical design to address such questions is a multilevel analysis. However, due to the fact that nested data must be available at different levels with a relatively large  $n$ , scholars tend to focus on single performance measures at the organizational level (Brewer and Seldon, 2000).

For the present study, we compiled a dataset which provides enough statistical power to apply a multilevel statistical design to the study of network effects on performance measures at the organizational and client levels. We collected data in the field of Dutch higher education, more in particular with respect to the inter-organizational network of 28 Dutch primary education teacher training colleges. We selected this sector because the student population is

relatively large, and the training program is largely standardized for all institutions for higher education. Thus, the substantive content of the educational programs offered is held more or less constant. We test whether the structural position of colleges in their sectoral network affects their performance. For the years 2002 through 2005 we used data available for a range of organizational performance indicators, and data collected in a nation-wide monitor among graduates of higher education.

The present study is exploratory, as we analyze only one network of 28 colleges and refrain from a comparative analysis of multiple inter-organizational networks. We do not aim to fully explain the performance of colleges, but rather test whether we find effects of networks structure and network management on performance—even when measured at the individual level of graduates. Indeed, many mechanisms at the level of the colleges and at the level of graduates could potentially explain college performance. Thus, the paper is a first step in an elaborate design, and subsequent steps in this design should for example include the role of internal and external management of colleges, the motivation of teachers, and substantive changes in educational programs.

## **2. The sector of Dutch primary education teacher training**

The object of study in the present paper is the network of 28 primary education teacher training colleges (in Dutch: *Pedagogische Academie Basisonderwijs* or PABO) in The Netherlands. These colleges form part of the Dutch system of higher professional education (HBO), which offers more applied studies as compared to the research-oriented system of Dutch universities.<sup>1</sup> PABOs typically prepare students for a bachelors degree—although recently two inter-college masters programs have been established. Within the system of higher professional education, these colleges offer a specific, four-year bachelor program to train teachers in primary education. They are the largest higher professional education colleges in the Netherlands (in 2006 total enrollment amounted to 35,000 students). A PABO can be either part of a larger multisectoral general college for professional higher education, or constitute a single monosectoral college by itself. There are 20 multisectoral and eight monosectoral colleges in the Netherlands. In contrast to the large general multisectoral colleges (in 2006 enrollment ranged between 1,500 to 40,000), the monosectoral colleges are relatively small (in 2006 enrollment ranged between 500 and 1,500 students). Differences in size between the PABOs themselves are less pronounced. Due to the particular history of Dutch education, colleges can be either public, catholic, or protestant, and this still plays a role in the identity of the college and its training program.

Because the average PABO is dependent on central government funding for about 65% of its funding, the most important external partner for these organizations is the Ministry of Education, Science and Culture. Funding is based primarily on total student enrollment, but also includes a ‘dynamic demand factor’ which incorporates performance measures such as dropout rates in the previous year, and enrollment in the present year (Kaiser, Vossensteyn and Koelman 2001). Thus, these colleges have to compete for students and resources. However, the colleges also have common interests. For example, the reputation of the whole

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<sup>1</sup> Whereas the Dutch system of higher education in general is believed to have shifted from bureaucratic control to a networked system (De Boer et al. 2007), the specific sector of primary education teacher training still is subjected to strong, regulatory control by parliament, ministers, and the Department of Education. Currently, major reforms are being implemented in Dutch higher education. These reforms are the result of the Bologna Declaration of 1999, promoting Europe-wide student mobility, access to higher education, and comparability of degrees. The Bologna Declaration led to the introduction of bachelors, masters, and doctorate degrees in Dutch higher education. The colleges for professional education seized the opportunity to develop masters programs in addition to their four-year bachelors programs.

sector was damaged when heated political debate and media attention focused on the poor math and language skills of PABO-students. The minister of Education, Science and Culture personally intervened in their programs. The PABOs are not only embedded in their sector, but also in local networks. These networks include the local authority, (boards of) local primary schools, and local regulatory agencies.

The inter-organizational network of the colleges for primary school teachers training is characterized by: (1) their participation in a number of formal institutions, and (2) informal, bilateral relationships between their directors and managers. The focus of the present paper is on the first aspect. The most important formal institution is the Higher Professional Education Council or *HBO-raad*. This council could be described as a network administrative organization (Provan and Kenis 2005) because it coordinates activities between colleges of professional education and is the primary lobby institution for the sector. The *HBO-raad* has one central board of directors and two different advisory boards: a general advisory board for all colleges of professional education, and a specific advisory board for the PABOs. Participation of colleges in the general advisory board comprises *direct participation* by directors of monosectoral colleges and *representation* of PABOs within general multisectoral colleges by a college board member. The *HBO-raad* is also responsible for special committees, which monitor the implementation of government regulations into the training programs, and in which some of the colleges are involved. In addition to the *HBO-raad*, other formal institutions have developed in the past. For example, all college managers meet in a consultation platform to discuss operational matters. This platform has grown into a lobby network alternative to the PABO-board of the *HBO-raad*. Within the sector, two cooperation networks of smaller colleges emerged. In addition, two inter-college master programs have been developed in which a subset of the colleges collaborate.

### 3. Theory

#### 3.1 Network activity

Current network research in the field of public management stresses the positive effects of active network management on organizational performance. The basic idea is that organizational networks buffer instabilities in political, economic, and technical demands, and compensate for informational uncertainties in the environment. Meier and O'Toole (2003) apply an autoregressive model with interaction terms for management and environmental forces to explain performance. Indeed, they find a positive effect of managerial networking on performance, conditional upon a certain degree of homogeneity of resources, and environmental stability (O'Toole and Meier 2004). In these studies, managerial networking is defined as the frequency in contacting different types of actors, where the frequencies are highly correlated for these different types (Meier and O'Toole 2003: 692; O'Toole and Meier 2004: 479).

Studies in sociology show that network activity has two main effects: a *learning* and a *coordination* effect. Learning effects occur because access to information increases the awareness of new innovations (Brass, Galaskiewicz, Greve and Tsai 2004; Mizruchi 1994). In the case of colleges for primary teacher training, examples are: successful teaching methods, computer technologies, or internships. Coordination effects occur because organizations pool their resources to arrive at common policies or lobby activities. In the case of colleges for primary teacher training, examples are: collaboration in joint centers of expertise, joint masters programs, or the cooperation networks of smaller colleges.

In terms of social network analysis, network activities are reflected by the *degree centrality* of organizations. For the colleges for primary teacher training, degree centrality can be either the frequency of relations of each college in its discrete, ‘ego-centered’ network (cf. O’Toole and Meier 2004), or the relations of a college within an inter-organizational network (cf. Provan and Milward 1995: 14-5). In addition to degree centrality as an indicator for network activity, more advanced measures for centrality have been developed (Wasserman and Faust 1994). One such measure is the *betweenness centrality* of organizations, which indicates the extent to which an actor is able to control information flows within the network. In general, we formulate the following (baseline) hypothesis:

**Hypothesis 1:** *College network activity.* The centrality of a college for primary teacher training in the inter-organizational college network positively affects its performance.

### 3.2 Network embeddedness

A different perspective on the relation between inter-organizational networks and organizational performance follows from the study of ‘whole’ networks (Knoke 1990; Provan, Fish and Sydow 2007). Studies of whole networks analyze the structural *network position* of organizations to explain performance (Mizruchi 1987; Galaskiewicz 1985; Burt 1992). The basic idea is that indirect relations and sub-networks within the inter-organizational network matter much: they affect the effective utilization of information and resources by individual organizations in the network. Ties with highly constrained organizations yield less profit than ties with autonomously operating organizations. For example, Burt (1992) shows that ‘structural holes’ in the network of an organization reflects a brokerage role of that organization in terms of resources and information, which can be utilized to advance organizational goals. The embeddedness of social interactions or transactions in specific network structures promotes the building of trust and cooperation and hence performance (Granovetter 1985; Raub and Weesie 1990; Buskens and Raub, 2002).

PABOs are embedded in their inter-organizational network. For the present study, this network is defined by the number of mutual affiliations in which directors of the PABOs meet (Mizruchi 1987; Wasserman and Faust 1994). This could be an indicator of simple contact frequency, or an indicator of the strength of institutional ties between two colleges. We assume that each college advances its organizational goals, and make the bold assumption that these goals are captured by performance indicators, such as dropout rates, or student and graduate evaluations. Good performance track records are important for the image and position of each college in the student market. Hence, pressures of competition for students may induce colleges to engage in opportunistic behavior, for example by withholding information or even providing misleading information. In addition, cooperation problems could occur: some colleges may spend valuable resources on lobbying activities without this being reciprocated by efforts by other colleges. Opportunistic behavior could diminish returns to investments in a relationship, or even make them negative.

In his seminal paper, Granovetter (1985) argued that a stronger embeddedness of economic transactions in broader patterns of social relations between organizations inhibits the opportunistic behavior of organizations (see also Swedberg 2005). A social relationship between two actors is embedded in a network when a ‘third party’ exists who has a relationship with both. This is called a ‘closed triad’ (Coleman 1990). More generally, networks that contain many such embedded relationships are ‘dense’ (Wasserman and Faust 1994). To capture the network embeddedness of organizations, we must look at the

relationships that all the alters of the focal organization have with each other, or the density in the focal organization's 'ego-neighborhood' (Wasserman and Faust 1994).

Opportunistic behavior of one organization towards another organization has reputation effects that work through 'third parties', who may become reluctant to share information, cooperate or exchange resources. The literature extends the effects of 'closed triads' to the density of all relations of a focal organization (Buskens and Raub 2002). Two network embeddedness effects are distinguished. The first, *learning* effect has consequences for the trustworthiness of the focal organization. The second, *control* effect has consequences for the relative costs of alternative course of action and the risk of being sanctioned by third parties. Thus, a PABO would benefit more from cooperation, the more mutual relations exist between the colleges in its network. We can extend the argument on embeddedness through 'closed triads' and 'network closure' to more complex, dense sub-network structures. Such sub-networks are dubbed *cohesive subgroups*, and learning and cooperation within these subgroups would positively affect trust and cooperation among their members. Assuming a relation between cooperation, trust and performance, we formulate the following hypothesis:

***Hypothesis 2: Cohesive college subgroups.*** Colleges for primary teacher training that form cohesive subgroups within the inter-organizational college network perform better than weakly integrated colleges, or isolated colleges.

### 3.3 Contextual effects

Networks and social structures do not develop independently (Mizruchi 1994), and thus a major challenge is to control for confounding contextual effects on network effects. Indeed, Peng and Luo (2000) analyze such confounding effects for market firms and report effects of managerial networking on returns on assets and market shares, in addition to sector effects, such as industrial growth rate and firm sizes. O'Toole and Meier (2004) identify and model contextual effects on the performance of Texas high school districts. Contextual factors include variables at the level of the colleges (for example funding), as well as variables at the level of students (for example motivation).

With respect to the sector network of colleges for training primary school teachers, the most important aspect of the environment is the embeddedness in the larger *fiscal structures*. It is obvious that colleges with limited access to financial means are expected to perform worse, controlling for size of the student population. Although state funding of colleges for professional education in the Netherlands is equally distributed (Boezerooy, 2003), some of the parameters that determine funding are subject to fluctuations in student enrollment or dropout rates. Some colleges also raise additional resources through contract activities.

With respect to the colleges themselves, factors at the level of the college determine performance. O'Toole and Meier (2004) mention stability in personnel, mission or program stability, production process, and procedures. For the present study of colleges for training primary school teachers we take into account the variability in a number of college characteristics for the period 2002-2005. If managerial networking is induced by variability in organizational variables—such as student enrollment—the effects of network embeddedness should decrease when controlling for these variables. Because wages are not under direct managerial control and wage changes affect all colleges in a similar way, we do not include them as contextual variables at the level of the colleges.

The composition of the student population also affects the performance of colleges. Most importantly, students will differ in their capabilities and motivation due to selection effects. Hence, the expected network effects could simply be due to the fact that networking colleges

attract the most intelligent and diligent students in the population. Controlling for individual student characteristics is important for another reason. We analyze the performance of colleges both at the level of the college itself, but more importantly also at the level of judgments of graduates. Indeed, client judgments have been an understudied perspective in research on public performance (Provan and Milward 1995). If we take seriously incorporating individual client judgments, we should control for variables at the level of the graduate.

#### 4. Research design and data

To test the hypotheses, we focused our attention on the performance of colleges for the training of primary education teachers in the period between 2002 and 2005. The motivation for this selection is twofold. In the first place, the student population is relatively large, and thus we can expect that the sample sizes for college-year combinations is large enough to allow for statistical testing. In the second place, the training program is largely standardized for all PABOs. Thus, because the substantive content of the educational programs offered is held more or less constant, it is less likely that differences found between PABO-graduates are due to substantive differences in the educational program. The selection of years was motivated by the availability of comparable data.

We constructed one, large dataset from three different sources. The first data source is a number of qualitative interviews and document analyses, which—combined with some of the tools of social network analysis—enabled us to make a reconstruction of the *inter-organizational PABO-network* over the last years. The second data-source is the management information system of the colleges for professional education, which is publicly accessible ([www.hbo-raad.nl](http://www.hbo-raad.nl)) and provides, among others, all available facts and figures on *PABO-characteristics*. The third data source is the ‘HBO-monitor’, coordinated by the Research Centre for Education and the Labour Market. This monitor is a yearly survey among a large sample of all graduates of colleges for higher professional education in the Netherlands. We selected the sub-set of all graduates in the sample who graduated at a PABO between 2002 and 2005. The HBO-monitor contains several questions about a *graduate’s evaluation* of PABO performance. The years reflect separate groups of evaluations by individual graduates, who are also nested in the PABOs. Changes over time thus refer to differences between cohorts, not changes within individuals.

In this way, we created a multilevel dataset, in which graduates are nested in years (of graduation) and PABOs. In total are available 28 cases at the highest, PABO-level.<sup>2</sup> At the PABO by year level 90 cases are available to control for the effects of PABO-characteristics at some point in time, or to control for (past) performance.<sup>3</sup> At the level of individual graduates there are 9,146 cases, of which 7,119 have no missing values on the variables used in our analyses. These 7,119 cases are used to test for effects of all variables at the different levels on graduates’ evaluations of PABO-performance. Obviously, our research design does not permit to generalize beyond the sector of PABOs, since this would require a comparative study of many more inter-organizational networks in a similar fashion.<sup>4</sup> The data also do not

<sup>2</sup> In total, there are 28 PABOs in The Netherlands. The dataset contains 24 PABOs, of which two have multiple locations (four and two). In the analyses, these locations are included as separate colleges.

<sup>3</sup> Potentially,  $28 \times 4 = 112$  cases are available, but the sample of graduates is empty for some PABO-year combinations.

<sup>4</sup> It is the ambition of the authors to make a comparative study of a large number of inter-organizational networks using a similar multilevel approach. The present paper is a first step in that direction.

permit the use of lagged variables at the individual level (autocorrelation models), but we do introduce some controls for past performance at the level of the PABOs.

#### 4.1 The inter-organizational PABO-network

There are many different ways to define relations in a 'total', or 'whole' inter-organizational network. Examples are interlocks between managers, information exchange networks, task-dependency relations, trust relations, or authority relations. For the present study, we studied the network which develops from multiple 'affiliations' of (representatives of) organizations. Organizations are affiliated with more or less formal institutions, cooperative networks, joint-programs, and so forth. Data on these affiliations of PABOs were collected using structured interviews with five key-informants (Torenvlied and Van Schuur 1994; Marsden 2005) as well as an analysis of documents and reports. We cross-validated the information to rule out potential (retrospective) biases (Torenvlied 2000). It appears that in the Netherlands, the sector of colleges for training primary education teachers is organized around eight affiliations. These include three formal institutions (three sub-councils of the HBO-Raad), a platform for smaller colleges, two cooperative networks of smaller PABOs, and two inter-PABO master programs. We assigned a PABO to an affiliation only if it is *directly* represented in the affiliation by a director or board member of the PABO.

Under the assumption that organizations have stronger (cooperative) relations if their representatives meet more often, we collapsed the  $N \times A$  affiliation matrix into an  $N \times N$  network matrix, with the number of mutual affiliations as entries. We used UCINET (Borgatti, Everett and Freeman 1999) to perform these operations. The inter-organizational network relations are valued, indicating the strength of the tie in the affiliation network (that is, the number of mutual affiliations as a proxy for contact frequency). From the network, we computed two centrality measures that indicate network activity. We define *degree centrality* of a focal PABO as the total number of other PABOs in the network of the focal PABO. We define *betweenness centrality* of a focal PABO as the sum of all probabilities that paths between other PABOs are linked through the focal PABO (Wasserman and Faust 1994: 190-1). We define *cohesive subgroups* as cliques of actors tied together with relations of comparable strength, so below or above specific threshold values (Wasserman and Faust 1994: 278-8).

#### 4.2 Context variables and other PABO-characteristics

Theoretically, we assume that network embeddedness complements the effects of context variables on organizational performance. In addition, we add a number of control variables that could provide alternative explanations for network effects on organizational performance. We distinguish between two types of context variables: environmental variables, and organizational variables. With respect to environmental context variables, we follow O'Toole and Meier (2004) who distinguish between: (a) dependence upon state funding, and (b) diversity of funding. We define *dependence on state funding* as the percentage of a PABO's total budget funded by government. We define *diversity of funding* as a fractionalization measure of four sources of funding: (1) government funding, (2) tuition fees, (3) contract activities, and (4) other funds. We computed an inverse Hirschman-Herfindahl concentration index, that is:  $1 - \sum_{s=1}^S x_s^2$ , where  $s$  denotes the source of funding,  $S$  denotes the total number of sources, and  $x_s$  denotes the fraction of the PABO-budget funded by the source.

With respect to organizational context variables, we distinguish between: (a) organizational stability, and (b) the availability of resources. We include two measures for organizational stability. The first measure is the *fluctuation in student enrolment*, defined as the mean change in student enrolment over the past five years (which is a mean difference score). The second measure is the *fluctuation in personnel costs*, defined as mean change in total costs for one fte. per student over the last five years. We also include two variables for the availability of resources. The first measure is the *student-personnel ratio*, defined as total student enrollment divided by the total fte for staff in one year. The second measure is the *solvency* of the college. Personnel costs, student-personnel ratio, and solvency are measured for the college for professional education as a whole. In the case of multisectoral colleges, we assume that these measures are distributed equally across different programs. Finally, we added the important control variable *size of the college* for professional education, of which the PABO is part. This variable provides information about the flexibility to deal with personnel issues, such as employee illness. At the same time, graduates generally evaluate smaller colleges more positively than larger ones. Size is defined as the total student enrolment for the given year of graduation.

#### 4.3 PABO-level performance measures

At the level of the PABOs, we use two different performance measures: (a) the diploma rate and (b) the student dropout rate for PABOs. The *diploma rate* is defined as the number of graduates in a given year divided by the mean of yearly total enrolment in the PABO over the period 1996-2005. We take the number of graduates relative to the mean enrolment for a long period to rule out short-term fluctuations in enrolment. Although an increase in freshmen enrolment could be interpreted as an indicator for good performance, it also causes diploma rates to go down, and is highly confounded with size of the college. The student *dropout rate* is defined as the number of freshmen dropouts as a proportion of the total freshmen student enrolment for a given year. High dropout rates are indicators for bad performance because colleges are assumed to motivate their students.<sup>6</sup> The PABO-level performance measures are lagged for one year and introduced in the multilevel analysis of graduate evaluations, since the data at the level of the graduates do not allow to introduce lagged performance data.

#### 4.4 Graduate-level performance measures

At the level of the graduates, we make use of the data provided by the ‘HBO-monitor’. Over 85 percent of the colleges participate in the survey. Although the core of the HBO-monitor studies the transition from school to the labor market, items are included that measure graduates’ perception of the educational program in which they were enrolled. Data are collected one to one and a half years after graduation, and the average response rates are about 40-45 percent for PABO-graduates (and a similar response rate for all college graduates). Data for the period between 2002 and 2005 indicate that 90 percent of the graduates found a job within one year: 85 percent as a primary school teacher and 5 percent as a teacher in a different field.

We measured performance at the graduate level using an item that confronted graduates with the question whether they would choose the same program *at the same institution* again. This

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<sup>6</sup> Some colleges may apply binding recommendations regarding the continuation of studies in the first year. This could be an alternative explanation for high drop-out rates.

dummy variable could capture many things, varying from satisfaction with teachers to the evaluation of facilities, or traineeships. However, the measure is a simple and attractive indicator for the evaluation of PABO-performance by graduates. Indeed, of all 8,050 PABO-graduates in the dataset who answered this question, 6,089 responded positively—which is about 75 percent. We also included control variables at the level of the graduates because some groups are simply harder to be satisfied. We include *gender* and *age* as standard control variables. Gender is heavily skewed: in the dataset, 90 percent are female. Age ranges from 18 to 63, with a mean of 29. In addition, we included a control for *level of capabilities*: the mean examination score the graduate obtained in the final central exams of her secondary education, prior to enrolment in the PABO.

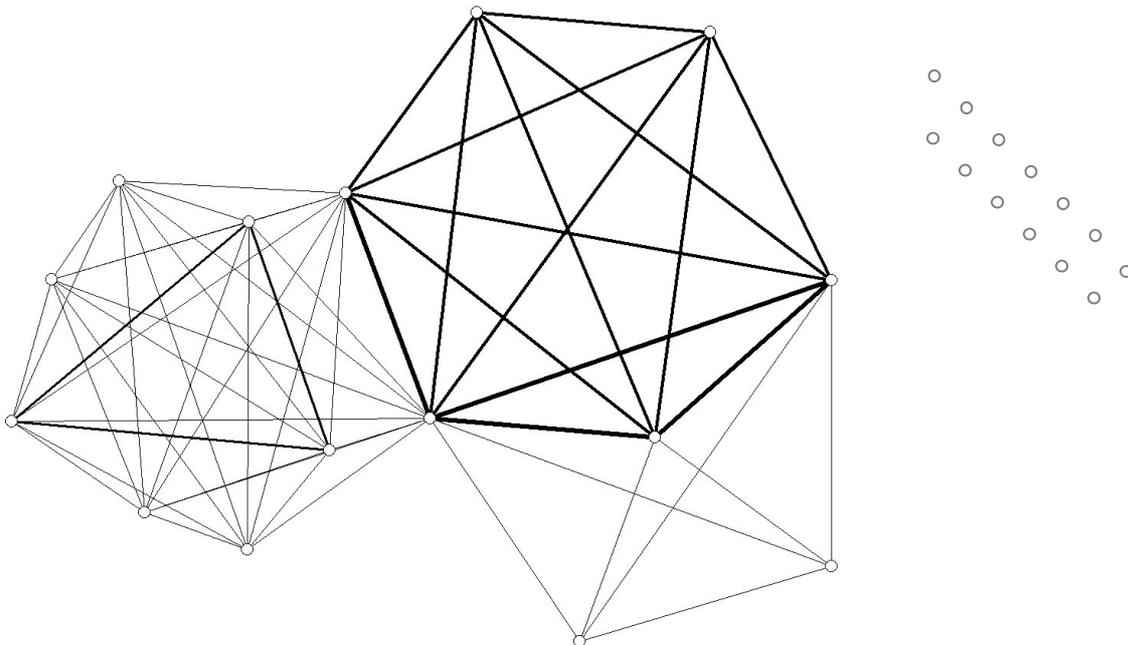
## 5. Results

### 5.1 The inter-organizational network structure

The network of affiliation relations between the 28 PABOs is presented in Figure 1 as a valued graph. Each node in the graph represents a college and each line represents the existence of at least one overlapping affiliation. We did not insert labels since we guaranteed that results would not be traceable to specific (groups of) colleges. The graph is valued, that is: the thickness of the lines indicates the number of overlapping affiliations. Of the 28 PABOs, 13 are isolates. Their director or board member is not directly involved in any of the affiliations. For the 15 PABOs with relations in the inter-organizational network, degree centrality varies between four contacts and 14 contacts. We observe two distinct sub-graphs: one located at the left of the graph and one at the right, connected by two PABOs.

**Figure 1**

The inter-organizational PABO-network

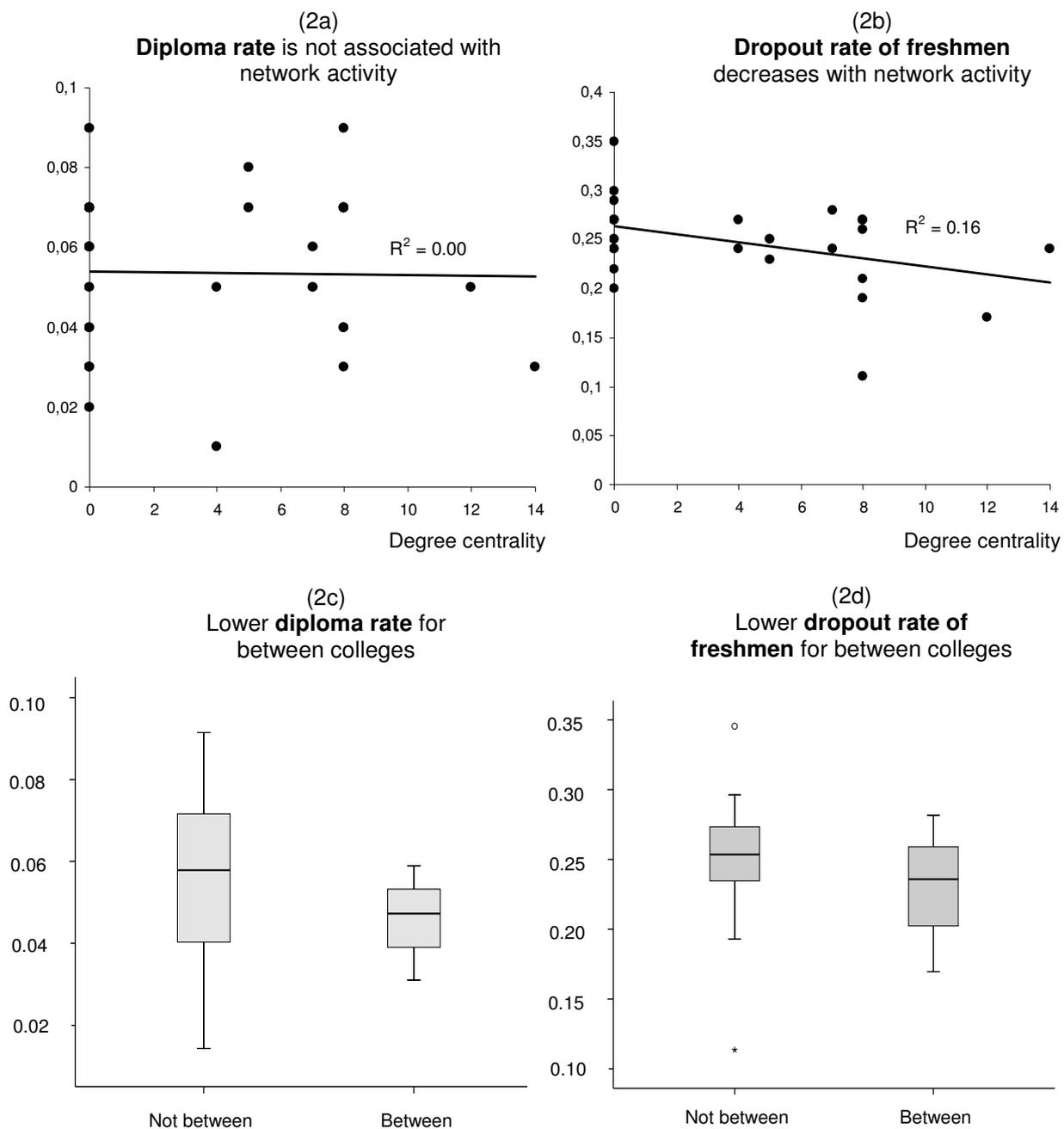


When we increase a threshold value for strength of relations, two cohesive subgroups emerge. The first, *cohesive subgroup* emerges at strength  $> 1$ , and is clearly visible within the left sub-graph of the inter-organizational network. It is a clique of three PABOs, which are embedded

in a broader cohesive network of weak relations. The second, *highly cohesive subgroup* remains at strength  $> 2$ , and dominates the right sub-graph. It is a clique of six PABOs, not well-embedded in the total inter-organizational network. Two PABOs within the highly cohesive sub-group are ‘bridges’, connecting the different sub-networks within the inter-organizational network. These are the PABOs that score highest on betweenness centrality. In addition to the two cohesive subgroups we observe a subgroup of *networking colleges*. Most colleges have weak relations within the left sub-graph, but some colleges have weak relations with three colleges in the highly cohesive subgroup. Finally, the 15 *isolated colleges* form a distinct, non-cohesive subgroup within the inter-organizational network. In figure 1, these colleges are represented by unconnected dots.

**Figure 2**

Bivariate plots of three measures for average PABO-performance (2002-2006) with degree centrality



### 5.2 Test of hypotheses for performance at the PABO-level

We expected that the centrality of a college for the training of primary teachers within the inter-organizational network positively affects its performance (hypothesis 1). For *degree centrality* and *betweenness centrality* we explored whether this hypothesis holds for two performance measures at the PABO-level. We computed average performance scores for *diploma rates* and for *dropout rates of freshmen* over the period 2002-2005.<sup>7</sup> There are only 28 cases, and we restrict our analysis to a visual inspection of bivariate relations. Figure 2 shows the results. Figure 2a shows that there is no association between diploma rates and degree centrality. However, for dropout rates of freshmen (figure 2b) we observe a significant negative correlation ( $\rho = -0.40, p < .05$ ). Hence, colleges that are more active in the inter-organizational network perform better: these are the colleges with lower dropout rates. With respect to betweenness centrality, we do not find significant differences in performance between colleges that have a betweenness score of zero, and a higher betweenness score. Figures 2c and 2d show that diploma rates and dropout rates are slightly smaller for colleges that have some value for betweenness centrality. Thus, we cannot corroborate or reject hypothesis 1 for performance at the PABO-level.

In hypothesis 2 we predicted that cohesive subgroups of colleges within the inter-organizational network perform better than weakly integrated colleges or isolates. Before testing this hypothesis for the same two performance measures at the PABO-level, we must first inspect whether the two centrality measures are associated with the subgroups in the inter-organizational network. If such an association exists, both network variables basically measure the same phenomenon—which is a common problem in analyses of smaller networks. Table 1 shows mean values of centrality for the four different subgroups of the network. Indeed, the second and third columns of table 1 show that significant differences exist between the groups. However, the mean values make clear that it is the group of isolated colleges that drives these results for degree centrality, and that it is the highly cohesive subgroup that drives these results for betweenness centrality. Thus, we conclude that network activity is an empirically different phenomenon than network cohesion.

**Table 1**

Differences between subgroups of PABOs in the inter-organizational network in: (a) network centrality and (b) two measures of average PABO-performance (2002-2005)

	Mean network centrality		Mean performance		N
	Degree	Betweenness	Diploma rate	Dropout rate	
Highly cohesive subgroup	8	8	0.06	0.23	6
Cohesive subgroup	8	0	0.07	0.17	3
Networking colleges	7	0	0.05	0.27	6
Isolated colleges	0	0	0.05	0.26	13
One-way ANOVA $F_{3,24}$	3.40	3.35	0.78	6.69	
	$p < .05$	$p < .05$	<i>n.s.</i>	$p < .05$	

<sup>7</sup> Although there exist changes in these performance measures within PABOs over the years, these changes do not differ markedly between PABOs with different centralities.

Table 1 shows that PABO-embeddedness in a cohesive subgroup indeed positively affects performance at the PABO-level. Both the cohesive and highly cohesive subgroups have lower dropout rates than the networking colleges and isolates. The results of a one-way ANOVA show that we cannot reject hypothesis 2 for the performance indicator of dropout rates at the PABO-level.

### 5.3 Test of hypotheses for performance at the level of the graduates

In order to test the effect of network centrality of PABOs (hypothesis 1) and their embeddedness in cohesive subgroups (hypothesis 2) on the individual evaluations of their graduates, we estimated a series of multilevel generalized linear models (Bryk and Raudenbusch 1992; Goldstein 1995; Hox 2002). The dependent variable (the performance measure) indicates whether or not a graduate would in retrospect choose the same PABO if given the chance to choose again. Since this variable is dichotomous, we apply a logit function, and link the linear multilevel predictions to probabilities. The nested models contain three levels of analysis: graduates (level-1) are nested in years (level-2), which are nested in PABOs (level-3). The statistical multilevel approach allows us to incorporate explicitly the dependencies between graduates that result from being enrolled in a particular PABO in a particular year. Thus, we are able to partition the variation in graduate satisfaction between the three levels (a PABO-component, a year-component, and a graduate component).

The three-level logistic model has the following form. Assume we have a number of explanatory variables ( $X_p, \dots, X_P$ ) at the *graduate level* (level-1), a number of explanatory variables ( $Z_q, \dots, Z_Q$ ) at the *year level* (level-2), and a number of explanatory variables ( $G_r, \dots, G_R$ ) at the *PABO-level* (level-3). The probability that graduate  $i$ , who graduated in year  $j$  at PABO  $k$  would choose for the same PABO again is given by  $\pi_{ijk}$ . Now, the prediction model can be written as follows:

$$\log it(\pi_{ijk}) = \beta_{0jk} + \beta_{p00} X_{ijk} \quad [1]$$

where:

$$\beta_{0jk} = \delta_{00k} + \beta_{0q0} Z_{0jk} + u_{0jk} \quad [2]$$

$$\delta_{00k} = \gamma_{000} + \beta_{00r} G_{00k} + v_{00k} \quad [3]$$

This is a random intercept model for a binary response variable. The error distribution  $\text{var}(e_{ijk})$  is fixed at  $\frac{1}{3}\pi^2$ , and hence no error term is specified at the graduate level (because it is already part of this specification of the error distribution, see Snijders and Bosker 1999). The intercept  $\beta_{0jk}$  is assumed to vary across years and across PABOs. This effectively implies that we expect the average graduate satisfaction score to vary across both levels. Variation in  $\beta_{0jk}$  is explained by year variables  $Z_{0q0}$  and PABO variables  $G_{00k}$ . The terms  $u_{0j}$  and  $v_{0k}$  are the year-level and PABO-level variance terms respectively. Thus, we focus on the estimation of effects of network variables  $G_{00k}$  – those that vary only between PABOs – on average graduate satisfaction, controlling for contextual factors that may vary both at the year and PABO-level, as well as control variables that vary at the graduate level.

A few cautionary remarks must be made with respect to the estimation of the model. Firstly, the statistical power for parametric tests of effects of variables at the PABO-level is limited, since we only have 28 cases in the dataset. Therefore, we cannot test for cross-level interactions, such as the moderating effects of network characteristics (for example that

network activity affects most the evaluations of motivated students). The limited statistical power at the PABO-level implies that we introduce only few control variables in one model. Therefore, we fit separate models of graduate satisfaction for each hypothesis. To test hypothesis 1, on the effect of network activity on performance, we include two variables of network activity: *degree centrality* and *betweenness centrality*. To test the second hypothesis, we included three dummy variables to capture the different subgroups.

**Table 2a**Network activity: Multilevel logistic regression of PABO graduate satisfaction 2002-2005 ( $N = 7,119$ )

	Empty model	Network model	Performance model	Environment model	Stability Model	Resources Model
<i>Network activity</i>						
Degree centrality		0.043 (0.030) *	0.037 (0.030)	0.042 (0.030)	0.009 (0.025)	0.038 (0.030)
Betweenness centrality		-0.010 (0.023)	-0.008 (0.023)	-0.008 (0.023)	-0.011 (0.019)	-0.008 (0.023)
<i>PABO—year level</i>						
Diploma rate (t-1)			0.104 (1.567)			
Dropout rate (t-1)			-1.438 (1.494)			
Diversity of funding				0.132 (0.126)		
Dependence state funding				-0.008 (0.009)		
Change in personnel costs					0.874 (0.439)**	
Change in enrolment					0.002 (0.002)	
Enrolment whole college					-0.034 (0.011)***	
Student / personnel ratio						-0.012 (0.055)
Solvency						1.107 (0.60)**
<i>Graduate level</i>						
Female		0.299 (0.001)***	0.299 (0.001)***	0.288 (0.001)***	0.023 (0.001)***	0.232 (0.001)***
Age		0.026 (0.000)***	0.026 (0.000)***	0.026 (0.000)***	0.026 (0.000)***	0.026 (0.000)***
Exam score (secondary ed.)		0.160 (0.000)***	0.160 (0.000)***	0.159 (0.000)***	0.161 (0.000)***	0.162 (0.000)***
<i>Intercept</i>	1.109 (0.103)###	-0.605 (0.147)###	-0.255 (0.571)	-0.699 (0.934)	-0.480 (0.240)##	-0.828 (0.792)
<i>Variance components</i>						
$\sigma_e^2$ (scale factor)	3.29	3.29	3.29	3.29	3.29	3.29
$\sigma_{u0}^2$ (year)	0.181 (0.032)###	0.168 (0.030)###	0.164 (0.029)###	0.162 (0.029)###	0.167 (0.030)###	0.175 (0.031)###
$\sigma_{v0}^2$ (pabo)	0.233 (0.080)###	0.237 (0.080)###	0.231 (0.078)###	0.232 (0.078)###	0.127 (0.050)###	0.234 (0.080)###

Note. \*  $p < .10$  (one-tailed); \*\*  $p < .05$  (one-tailed); \*\*\*  $p < .01$  (one-tailed); #  $p < .10$  (two-tailed); ##  $p < .05$  (two-tailed); ###  $p < .01$  (two-tailed).

We first fit an ‘empty model’ to find out how much variance in graduate evaluations is to be found at the different levels of analysis. Subsequently, we fit five different models for each hypothesis. The *network model* includes only the independent network variables at the PABO-level. The other four models also include these network variables, and control successively for four different groups of variables at the PABO-year level. The *performance model* includes the PABO ‘diploma rate’ and ‘dropout rate’ for the year preceding the year of graduation of a student. The *environment model* includes the environmental factors diversity of funding and dependence on state funding. The *stability model* includes the organizational stability factors ‘change in personnel costs’, ‘enrolment’, and the additional control variable ‘size of the whole college’. Finally, the *resources model* includes the effect of ‘student-personnel ratio’ and ‘PABO- solvency’. The second models tests whether network effects remain when controlling for past performance, and the last three models when controlling for contextual factors. In addition, we include age, gender and final central exam scores of secondary education as controls in all five models at the graduate level.

Table 2a shows the results of the multilevel analyses with *network activity* as the independent network variable at the PABO-level. The first model, the ‘empty model’ informs us about how much of the total variance in graduate evaluations can be attributed to the graduate level, the year level, and the PABO-level. The proportion of variance in graduate evaluations attributed to a specific level is computed by dividing the variance at the specific level by the sum of the three different variance components. In general, the explained variance in any logistic regression is considerably lower than the standard  $R^2$  for continuous dependents. The PABO-level explains 6.00 percent of the variation in graduate evaluations, and the year-level explains 4.66 percent of the variation. These numbers are considerable, taking into account the many factors that could play a role at the individual level.

The results of the analyses for all five models clearly show that graduates of the actively networking PABOs are not significantly more likely to be positive about their past education at the college. The second column of table 2a shows a significant effect of PABO degree centrality at  $p < 0.10$  in the expected direction (more network activity leads to more positive evaluations). However, when controlling for past performance or contextual factors, this effect disappears. Hence, we must reject hypothesis 1 for performance at the level of the individual graduates.

We do not find effects of past performance at the PABO-year level on the evaluation of graduates’. Hence, how well a PABO performed in the year preceding graduation does not affect graduates’ evaluations. Although it is reasonable to assume that the last year has the greatest impact on graduates, there may exist a *primacy* rather than a recency effect of past performance: students’ attitudes formed at the start of the curriculum could be hard to change afterwards. The environmental variables ‘diversity of funding’ and ‘dependency on state aid’, do not affect graduates’ evaluation. Thus, it appears that the broader institutional context in which a PABO operates is not directly related to graduates’ evaluation.

In particular, the variables in the stability model at the PABO-year level explain graduates’ evaluations and explain away the effect of network activity at the PABO-level. Remarkably, we find a positive effect of change in personnel costs on graduates’ satisfaction: variability in personnel costs reduces graduates’ likelihood of being positive about the college. pattern increases rather than decreases positive graduate evaluations. Total enrolment of students in the whole college of professional education has a significant, negative effect on graduates’ evaluations. Small scale colleges perform better at the individual level than larger colleges. Apparently size factors, such as anonymity and bureaucracy, negatively affect graduates’

satisfaction with their past education. College solvability—in the resources model—positively and significantly affects graduates' evaluations, as expected.

**Table 2b**

Cohesive groups: Multilevel logistic regression of PABO graduate satisfaction 2002-2005 ( $N = 7,119$ )

	Network model	Performance model	Environment model	Stability Model	Resources Model
<i>Cohesive groups</i> <sup>†</sup>					
Networkers	-0.219 (0.217)	-0.228 (0.218)	-0.222 (0.212)	-0.207 (0.204)	-0.250 (0.216)
Cohesive Subgroup	0.706 (0.277) <sup>***</sup>	0.643 (0.301) <sup>**</sup>	0.680 (0.271) <sup>***</sup>	0.341 (0.285)	0.659 (0.284) <sup>**</sup>
Highly Cohesive Subgroup	0.751 (0.227) <sup>***</sup>	0.732 (0.229) <sup>***</sup>	0.878 (0.240) <sup>***</sup>	0.513 (0.242) <sup>**</sup>	0.714 (0.235) <sup>***</sup>
<i>PABO—year level</i>					
Diploma rate (t-1)		-0.023 (1.529)			
Dropout rate (t-1)		-0.799 (1.471)			
Diversity of funding			0.220 (0.120) <sup>**</sup>		
Dependence state funding			0.001 (0.007)		
Change in personnel costs				0.881 (0.436) <sup>**</sup>	
Change in enrolment				0.002 (0.002)	
Enrolment whole college				-0.018 (0.011) <sup>*</sup>	
Student / personnel ratio					0.032 (0.049)
Solvability					0.925 (0.528) <sup>*</sup>
<i>Graduate level</i>					
Female	0.233 (0.001) <sup>***</sup>	0.233 (0.001) <sup>***</sup>	0.233 (0.001) <sup>***</sup>	0.233 (0.001) <sup>***</sup>	0.233 (0.001) <sup>***</sup>
Age	0.026 (0.000) <sup>***</sup>	0.026 (0.000) <sup>***</sup>	0.026 (0.000) <sup>***</sup>	0.026 (0.000) <sup>***</sup>	0.026 (0.000) <sup>***</sup>
Exam score (secondary ed.)	0.162 (0.000) <sup>***</sup>	0.162 (0.000) <sup>***</sup>	0.162 (0.000) <sup>***</sup>	0.162 (0.000) <sup>***</sup>	0.163 (0.000) <sup>***</sup>
<i>Intercept</i>	-0.618 (0.122) <sup>###</sup>	-0.404 (0.554)	-1.817 (0.855) <sup>##</sup>	-0.713 (0.231) <sup>###</sup>	-1.365 (0.704) <sup>#</sup>
<i>Variance components</i>					
$\sigma^2_e$ (scale factor)	3.29	3.29	3.29	3.29	3.29
$\sigma^2_{u0}$ (year)	0.164 (0.029) <sup>###</sup>	0.161 (0.029) <sup>###</sup>	0.160 (0.029) <sup>###</sup>	0.160 (0.028) <sup>###</sup>	0.168 (0.030) <sup>###</sup>
$\sigma^2_{v0}$ (pabo)	0.139 (0.053) <sup>###</sup>	0.141 (0.053) <sup>###</sup>	0.131 (0.051) <sup>###</sup>	0.101 (0.042) <sup>###</sup>	0.135 (0.053) <sup>###</sup>

Note. <sup>†</sup> Reference category = isolated PABOs; \* p<.10 (one-tailed); \*\* p<.05 (one-tailed); \*\*\* p<.01 (one-tailed); # p<.10 (two-tailed); ## p<.05 (two-tailed); ### p<.01 (two-tailed).

Hypothesis 2 stated that cohesive subgroups within the inter-organizational network perform better than weakly integrated colleges, or isolated colleges. We introduced three dummy variables identifying these different subgroups, with the subgroup of isolated PABOs as a reference category. Table 2b shows the results of the multilevel analyses with (*cohesive*) *subgroups* as the independent network variable at the PABO-level. All models show that—in contrast with network activity—subgroup cohesion and tie strength at the PABO-level have strong and robust effects on individual graduates' satisfaction. Table 2 shows that the assignment of PABOs to the different subgroups significantly explains variation in graduates' evaluation of their PABO.

With respect to the direction of the effects, table 2b clearly shows that the graduates of both the cohesive and highly cohesive subgroups have a significantly higher likelihood of being positive about their past education. Interestingly, PABOs that have only weak ties in the inter-organizational network do not perform better than isolates at the level of graduates' evaluations. Their average graduate evaluation is even lower than that of the reference group, although this difference is not statistically significant. The effect of the two cohesive subgroups on performance remains in all models, controlling for past performance and for different contextual variables. There is one important exception: the stability model, which explains away the effect of the cohesive subgroup (although not the effect of the highly cohesive subgroup). Hence, the analyses on graduates' evaluations firmly corroborate hypothesis 2.

The direction of the effects of the independent variables at the PABO-year level (past performance and contextual variables) are comparable with those in the previous analyses (with network activity), with two exceptions. First, the positive effect of 'diversity of funding' now turns significant at the  $p < .05$  level. Second, the size of the effect of 'student enrolment' decreases, indicating that the division in subgroups—at least partly—groups together colleges with comparable enrolment.

We add a final analysis to our test of the different multilevel models. The interpretation of estimates becomes quite complex in a multilevel analysis with a binary outcome variable and independent variables at three different levels. To explore effect sizes, we concentrate on the *network model* from table 2b and conducted an analysis of explained variance for each of the four subgroups in the inter-organizational network. The explained variance is computed by dividing the explained variance of the linear predictor by the total variance (Snijders and Bosker 1999). We did so for the two cohesive subgroups that had a significant effect on graduates' evaluations. In addition, for all four subgroups we computed the mean and range of the predicted probabilities that a graduate would positively evaluate the past education. Table 3 shows the results. The percentage variance explained is the additive variance to all the other variables in the network model, which contains all PABO-dummies and the graduate-level controls. This gives an idea of the variation in mean graduate satisfaction between the different subgroups of PABOs in the inter-organizational network.

Table 3 shows that the PABO-dummies only explain a small portion (one to two percent) of the total variation in graduates' evaluation at the individual level. However, each of the dummy variables explains around 20 percent of the variation in graduates' evaluations at the PABO-level. In addition, we observe a marked difference in predicted probabilities between the two cohesive subgroups on the one hand, and the networking colleges and isolated colleges at the other hand. For the cohesive subgroups, the mean predicted probability of graduates to be positive about their past education is about 85 percent. For the other colleges, this percentage is 10 percent points less. The range in predicted probabilities is even more revealing, because it shows that graduates from PABOs in the cohesive subgroups are much

more homogeneous than graduates from the other PABOs. Moreover, not one individual has a predicted probability lower than 0.62.

**Table 3**

Network model. Differences between subgroups of PABOs in the inter-organizational network in: (a) percentages variance explained of graduates' evaluations, and (b) predicted probabilities of graduates to positively evaluate their past study

	% Variance explained		Predicted probabilities		
	PABO-level	Total	Mean	Range	N
Highly cohesive subgroup	21.46	1.89	0.85	0.62 – 0.96	972
Cohesive subgroup	17.17	1.35	0.84	0.68 – 0.95	671
Networking colleges	n.s.	n.s.	0.73	0.24 – 0.93	2,842
Isolated colleges <sup>†</sup>	n.s.	n.s.	0.74	0.24 – 0.95	2,634

*Note.* <sup>†</sup> Reference category in the network model

## 6. Conclusion

This paper systematically examined the effects of network activity and network embeddedness of 28 Dutch colleges for the training of primary education teachers on their performance. Two innovations to existing research were made. The first innovation is a test of the effect of embeddedness of colleges in cohesive subgroups of the inter-organizational network, as a more subtle and indirect effect of networks as compared with network activity. Organizations tied in cohesive networks are expected to benefit from the building of trust and cooperation, and thus are expected to perform better Granovetter 1985; Burt 1992; Buskens. This network effect is different from network activity, as reflected by centrality, which focuses on information advantages that buffer the organization against environmental dependency and organizational instability (Meier and O'Toole 2003; O'Toole and Meier 2004). Indeed, our analysis of the inter-organizational network shows that members of the cohesive subgroups are not exclusively more active in the network: many more colleges are very active in the inter-organizational network, although not embedded in a cohesive subgroup.

The second innovation of the present paper is that, within one model of analysis, we integrated organizational performance data with performance indicators at the individual level of the client population. Although client evaluations are a crucial aspect of public service performance, they are seldom integrated as individual cases in one explanatory analysis (e.g. Provan and Milward 1995; Boyne et al. 2006). Forbes and Lynn (2005: 569) report that only two percent of studies on public management and government performance take into account stakeholder assessments as a dependent variable. For the colleges for the training of primary education teachers, the appropriate performance measure available at this level of analysis was the evaluation of graduates whether they would choose the same college and education. This item provides a 'litmus test' for graduate satisfaction with the education offered.

A multilevel statistical design was applied to take into account the complex nesting structure of graduates in years (cohorts), and in colleges. In the analyses, we controlled for past performance at the level of the college-year (diploma rate and drop out rate), for the environment (dependency on state funding and diversity of funding), and for a number of organizational context variables, such as size, stability, and resources of the colleges. A series

of logistic regression analyses showed that it is not so much network activity of the colleges that matters for graduates' evaluation, but rather the embeddedness of these colleges in cohesive subgroups. Network structure matters for the colleges under study more than network activity, and the direction of the effects found suggests that strong ties improve performance.

A further important result is that the multilevel analyses by themselves are able to reveal significant effects of network embeddedness of colleges on the evaluations of their graduates. Despite the 'noisy' variation at the individual level, evaluations provided by clients are indeed valuable judgments to be explained by higher-level characteristics of public agencies and their inter-organizational network. Thus, a multilevel design has the potential to improve the quality of analyses of public service performance. The main obstacle, probably, is the availability of high-quality data.

Of course, the analysis has not laid bare any causal relations between network embeddedness or network management and public agency (client level) performance. So many intermediary causal processes could play a role, that any specification or deeper 'explanation' of performance remains a black box. However, explaining performance at the client-level was not the aim of the present paper. Rather, we have demonstrated that significant effects exist that justify further investigation. Hence, there are many different routes for further research. For example, our multilevel analysis shows that much of the variation in graduates' evaluations is attributable to mechanisms at the client level. Thus, we must ultimately include the interaction between the behavior of 'street-level' officers with clients into the analysis. One level up, we should include the behavior of managers in translating both demands from the environment, as well as constraints and opportunities within the organization, into work routines and motivation. The present paper is the starting point for a series of comprehensive, in-depth analyses of managerial strategies and officer-client interactions within public service organizations within the framework of a large research project.

Given the relatively small number of cases at the level of colleges for the training of primary teachers ( $n = 28$ ), and the fact that effects of network embeddedness remained while controlling for important environmental and organizational context variables, the effects found could be considered to be an underestimation. Hence, a second route for further research is the extension of the present sector of colleges to many different sectors within Dutch higher education. This offers the possibility to employ both a comparative network study, and increase the power of the test—while still including evaluations of graduates as performance measures at the client level. Such research will shed more light on the complex, multilevel relations between 'whole' networks on the one hand, and client evaluations on the other hand that span the new frontiers of public management as an object for rigorous, analytical research (Lynn 2008).

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