IAAEG

Institut für Arbeitsrecht und Arbeitsbeziehungen in der Europäischen Gemeinschaft

Discussion Paper Series No. 01/2010

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Abstract

In many European countries efforts are undertaken to improve doctoral education. In the context of new public governance in the Higher Education sector, less state, more competition, less academic self-governance, more internal hierarchy and more influence by external stakeholders under the common roof of New Public Management (NPM) are considered most promising for successful PhD education.

Therefore according to a steering model of American research universities many initiatives are undertaken to introduce more managerial elements in European university departments. Based on an explorative analysis of qualitative and quantitative data of 26 continental European, English and American economics departments, we investigate the steering effects of the five above mentioned governance dimensions in the years 2001 to 2002 on subsequent placement success of PhD graduates. To control the impact of resources on PhD education, next to governance regimes we added four different resource conditions to the analysis: financial resources, publication record of the department, total number of professors in a department and annual number of PhD graduates in a department,

Using fuzzy-set QCA to analyze the data, our results deliver strong support for local best ways of steering configurations and no superiority of one system over the other. Introducing market elements though seems to be important in any governance system but only in combination with different co-conditions. In respect to our control conditions only financial resources contribute considerably to the understanding of steering PhD education.

Our results strengthen the strong impact of competition as an effective governance instrument and take into account the relevance of financial resources.

Key words: New Public Governance, competition, higher education, PhD education, fsQCA

1 Introduction

The idea of a structured education of future researchers has been established in the USA long before any European countries have initiated attempts in this direction in the early nineties. The apparent success of American research universities in placing their PhD graduates in top research institutions highlights the success of their educational system. Yet on the other hand side several European universities also manage to educate PhD students on an academic level which easily meets the standards of top research.

Picking up the current –European- debate about how to organize higher education in order to meet high level standards of research we are going to analyze the organizational preconditions to deliver high class researchers. Since in European countries like Germany research in economics highly depends on novel work by PhD students we particularly focus on economics as the field of reference and claim that any improvement in this area may lead to improved research success. We further assume that success and failure will depend on the organizational setting these university departments are facing. We therefore compare the effects of external incentive systems as well as internal steering mechanisms by comparing different traditions in the governance of PhD education. In our study we assume that the interaction of external forces with internal organizational structures best explains the production of academically relevant PhD education.

We focus on governance regimes with different levels of competition through external incentives, like different state funding models or department rankings in league tables as exogenous forces and on the centralization of decision making processes as endogenous characteristics of the organization. Both mechanisms are closely connected (Schneider & Sadowski 2009): competition for financial resources is vital for successful PhD education but only under the condition that they meet favorable organizational preconditions. Particularly in the current debate about successful New Public Management (NPM) initiatives we can scrutinize which configuration of governance dimensions will be effective given a certain organizational frame (Clark & Ma 2005; Frackmann 2005; Gumport 2005; Harley, Müller-Camen & Collin 2004; Orr 2005).

In order to realize different governance configurations we distinguish three governance regimes which demonstrate reasonable differences between the respective governance systems and at the same time allow for wide variation (and success) inside the governance regimes: continental Europe, Great Britain and the US.

Different pictures emerge for the effects of governance: On the one hand side the highly competitive system at American research universities seems quite successful for their research success at first glance but the recent debate also indicates a mixed picture for PhD education (Altbach 2004; Moes 2003; The Economist 2005). On the other hand side politically initiated

external forces are successful in changing the organizational landscape in universities as the effects of the Research Assessment Exercise (RAE) in Great Britain indicate (Hammen 2005). Additionally the identification of excellent research in Europe by the European Commission: "Mapping of Excellence in Economics" (European Commission 2004) or recent research grant allocations by the European Research Council (2008) demonstrate success for countries who have early focused on mimicking the US American system like The Netherlands or Great Britain. Additionally continental European countries like Germany with the "Initiative for Excellence" (BMBF 2007), France (LRU 2007) or Austria (Lanzendorf 2006) initiated attempts to introduce certain elements of or the American model in order to improve their Higher Education with different political emphasis and success (de Boer, Enders & Schimank 2007).

We do not neglect the impact of resource levels on PhD education. Recent findings by Schneider, Thaller and Sadowski (forthcoming) for example have highlighted the effect of financial funding on successful PhD education. Their results indicated though, that this resource variable is only effective in interaction with additional crucial conditions like joint efforts by the faculty for PhD education or high determination to top research.

2 Governance structures of higher education in continental Europe, Great Britain and USA

It can be claimed that until the mid 1980s the common governance model of most continental European universities was a combination of academic self-governance and high levels of state regulation and control. Since then new public management initiatives aimed for less state regulations and more "quasi-market" elements (Kehm & Lanzendorf 2006b). It is further claimed that universities who will exert more autonomy over internal affairs through managerial hierarchies will face these new challenges more efficiently.

Early analysis of higher education systems is based on the macro level to explain differences in the governance between countries. Clark (1983) for example proposed that governance can be distinguished according to three different dimensions of coordination which were market, state and academic oligarchy[1]. Accordingly van Vught (1997) classified governance in a two-dimensional model of state control and state supervision. The macro level approach alone has been deemed not to explain governance systems accurately, though. McDaniel (1996) suggests that the governing structure of higher institutions cannot be limited to country differences but has to be extended to the levels and instruments under scrutiny. Recently de Boer, Enders and Schimank (2007) have offered a more refined categorization of new public governance styles of higher education which

[1] He later extended the framework to 'hierarchy' as a fourth dimension (Clark 1998).

comprises five basic mechanisms: **competition, academic self-governance, stakeholder guidance, state regulation and managerial self-governance**.

By contrasting governance regimes based on traditional steering and NPM and referring to a crude dichotomous characteristic of each governance dimension as either a "low" or a "high" value, Schimank (2007) distinguishes two ideal types of governance in universities: the "perfect" new governance of universities combines high competition, low academic self governance, high stakeholder guidance, low state regulation, and high managerial self-governance. A "perfect" traditional governance model shows the exact opposite characteristic in each of these five governance dimensions.

But even policy regimes in Europe with the longest experience in implementing these NPM instruments like Great Britain (Leisyte et al. 2006) or The Netherlands (de Boer et al. 2006) have by far not yet reached "perfect" NPM governance. Latecomer countries like Germany (Kehm and Lanzendorf 2006a) or Austria (Lanzendorf 2006) have only implemented some NPM instruments (de Boer et al. 2007). German universities and departments experience steering attempts by many political actors with, at least under a new public governance perspective, inconsistent directions. While the federal government for example introduced more competition with the 'initiative for excellence', a form of indirect or distant steering (BMBF 2005), states impose direct regulations, e.g., as to the particular design of PhD education (ENB 2008). Schimank (2008) convincingly suggested, however, that not only extreme realizations, but mixed configurations could be effective.

2.1 Governance of PhD education

It can be witnessed, that higher education institutions demonstrate different paces in changing the governance structure of their higher education institutions on different levels, resulting in heterogeneous patterns of higher education governance between and within countries (de Boer et al. 2007).

In the governance of PhD education, neither Great Britain nor The Netherlands come anywhere close to ideal NPM models (Metcalfe Thomson and Green 2002; Park 2005; and de Weert 2004 respectively). While hardly any NPM instruments have reached PhD education in Italy (Moscati 2004), some other European countries are experimenting with to date unclear results: France (Lemerle 2004; Dahan 2007), Switzerland (Groneberg 2007: 19-21) or Germany (Hüfner 2004).

2.2 Governance Dimensions

2.2.1 Competition

One of the main governance mechanisms in NPM is the implementation of (quasi-) markets (Kehm and Lanzendorf 2006b) which explain the success of departments in American universities

(Backes-Gellner 1992, 2001; Aghion, Dewatripont, Hoxby, Mas-Colell & Sapir 2009). Participants in the market for PhD students compete for scarce financial resources to pay scholarships or reimburse travel expenses in order to attract excellent PhD students (DFG 2000: 15-16; DFG 2003: 30). Many European countries, such as The Netherlands or Great Britain, have implemented radical but transparent funding models to distribute research budgets according to academic performance criteria (European Commission 2004; Hammen 2005) whereas other continental European countries like Germany, France or Italy still stick to traditional budgeting rules with few exceptions.[2]

2.2.1.1 Additional funding based on locally competitive performance

This form of funding includes two different funding schemes. The first is characterized through low threshold criteria where public authorities or universities determine relevant academic indicators like number of undergraduate teaching, time to degree or gender equality and reward results exceeding that threshold with a certain amount of money (Leszczensky and Orr 2004). For PhD education this usually comprises achievements like total number of graduating PhD students, female/male-ratio or total number of post doc positions (Leszczensky and Orr 2004). The second funding scheme has more, though limited competitive elements. Political actors tender competition for research projects that only address departments of a certain region often with political expectations in mind.

2.2.1.2 Additional funding based on nationally competitive performance

Additional funding based on highly competitive performance is a very strict version of administered competition, often on a national basis. It is usually based on decisions following a peer review process. Whereas individuals can apply for individual research grants, funding of coordinated programmes of departments or department networks (in Germany for example through "Research Training Groups" or "Collaborative Research Centres") is more influential because it possibly provides large scale funding for PhD education and at the same time integrates the students into a scientific community.

2.2.2 State regulation

Academic behaviour of departments and individuals can also be steered by regulations of public policy actors requiring, for instance, a certain ratio of foreign PhD students in a program (ENB 2008) or the fixing of the financial assistance or the legal status of PhD students (de Weert 2004).

2.2.3 External stakeholders

Control can be exercised by external interest groups or bodies beyond and more powerful than what governments, the state or the institutions are able to exercise. The ranking in league tables, the

[2] A majority of German states for example established a regime of quasi-competitive elements where they first have forced university departments to cut their basic resources with the perspective to establish a kind of research foundation which will redistribute these savings according to a prospective reward system (Leszczensky & Orr 2004).

relative position or the rise or descend in these ranking is of vital interest in many departments and universities. It may allow for more changes in faculty behaviour than laws and direct regulations may do.

2.2.4 Managerial self-governance/ hierarchy

Regulations for PhD education can be imposed by university management on departments with regard to the selection procedures, the scale, and the maximum length of studies or international collaboration (noch mehr Info).

2.2.4.1 Transparency over academic achievements

Although widely criticized (e.g. Frey 2007), transparency over academic achievements has become a popular tool transparency over academic achievements university management may demand transparency of the academic output of departments and faculty members through evaluations to assess the academic activities of their institutions and members. Transparency through evaluations may end up in accreditations or audits (Stensaker and Harvey 2006) which follow different perspectives.

University management may demand that departments face accreditations where external evaluators focus on a limited and established number of input and output criteria for an institution or programme to arrive at a final dichotomous decision: accredited or not (Harvey 2004). Their decision signals a quality standard in the domains under examination to the outside world. Usually accreditations are rather seldom[3], but university managers will gain from a positive evaluation by raising tuition fees, attracting better students and recruiting top faculty. In particular the refusal can have a drastic impact for student and professorial applications, funding, and tuition fees. The interest of faculty attracting high quality discussion partners through positive accreditations is articulated in Harvey (2004).

Transparency in the context of audits follow a different approach. Audits focus on performance criteria, which need not be guided by established standards as in accreditations, and they do not result in cut-off judgements. Evaluators in quality audits compare the achievements of an institution and its programme for instance to the average or to some benchmark institution (Stensaker 2000). Favourable as well as unfavourable decisions are informative and they may serve to help organizational development or to internally (re-)negotiate resources.

2.2.4.2 Target agreements

Although Schimank (2006) portrays a pessimistic picture of the effects of target agreements as means of governing universities and departments, they are nowadays one of the popular governance instruments in higher education (Jaeger et al. 2005; Weichselbaumer 2007). Their efficacy has been demonstrated for judges who, like professors, are faced with a complex task and

[3] Accreditation in the English Research Assessment Exercise took place in 2001 and 2008 for example.

various performance criteria (Schneider 2007). The same should apply to the academic world where however performance criteria are even more diversified and where performance levels may show a considerable time lag (Schneider and Sadowski 2004: 395). The main difference to regulatory interventions lies in their negotiated character which allows for taking individual or organizational characteristics into account.

2.2.5 Academic self governance

Academic self-governance reflects the degree by which faculty in the department is autonomous over their decisions. Every interviewee indicated that university management either consults faculty board or that faculty has a big saying in the decision making of a department. In general the autonomy of faculty is greater for academic than for organizational decisions.

Insert table 1 about here

As Schimank (2007) and de Boer et al. (2007) have demonstrated, configurations of pure traditional models as well as pure NPM models hardly exist. High academic quality also occurs among "mixed" governance regimes[4] – at least according to NPM standards. They presume that the effectiveness of governance regimes depends upon the intended results and that a certain combination of governance elements might be favorable for one academic performance indicator (e.g. PhD placement in the general labour market), while another governance regime might be conducive to another performance indicator (e.g. publication record of PhD students). We share these assumptions and claim that it might be the interplay of several governance mechanisms that either leads to or prevents an intended result (similarly Braun and Merrien 1999: 19). Our empirical study wants to answer this very question:

Which governance dimensions or combinations thereof lead to successful PhD education?

3 Empirical Design

We focus on the producers of PhD education, university departments and their faculty. We assess how faculty perceives and experiences governance and how they enable successful PhD education. By focusing on the field of economics which is highly comparable internationally we expect that variations in the organizational setting rather than country differences are accountable for successful PhD education. Nonetheless our selection of departments was driven by country

[4] According to Combes and Linnemers (2003) weighted ranking of publications, the economics department in Toulouse (France), which would operate under a suboptimal governance regime, is ranked 1st and the London School of Economics (Great Britain), operating in a governance regime very close to "perfect" NPM criteria, is ranked 2nd for publications in Europe.

differences in order to distinguish the wide variety of governance environments and to retrieve different levels of market forces.

We focus on departments in Great Britain to capture exogenously generated competition through the Research Assessment Exercise (RAE). We presume that new market forces produce new institutional stratifications with a new, more effective and/or efficient organization of PhD education (Hammen 2005; Harley, Müller-Camen & Collin 2004, Orr 2005). According to a "theoretical sampling" we choose two departments which have benefitted from the new system and three departments which have not changed their position in the RAE although they improved in international research rankings.

Also we expand the empirical sample for economics departments in US research universities where the differentiation of universities is much more advanced and established. Competition between private and state universities has a long tradition and is taken for granted (Frackmann 2005; Lombardi, Capaldi, Reeves & Gater 2004; Graham & Diamond 1997). It should have led to individual organizational settings, including PhD education which meet these challenges best (Graham/Diamond 1997: 174). Private universities usually lead the rankings of top departments (Goldberger, Maher & Ebert Flattau 1995; Thursby 2000) and it seems plausible that they also organize PhD education most effectively and/or efficiently.

Departments from continental Europe finally reflect a wide variety of different governance systems with scattered patterns of governance elements with strong market elements and strong state regulation at the same time.

Therefore we deliberately refrain from the widely used comparisons of national governance to assess diversity in governance regimes. Instead of considering country level governance regimes as a sole input factor, we selected departments according to the governance regime, the organization of their PhD education and thirdly according to their research record (measured by quality weighted publications according to Combes and Linnemer (2003). Organization of PhD education and research record both serve as proxies for organizational and behavioral reactions to governance regimes. We argue with Mayntz (2004), that departments operate in a unique (local) governance regime or "system of rules" which offers a set of incentives and consequences which lead to a particular form of PhD production and publication output as 'corps d'esprit'.

For the analysis we construct a set of input conditions[5] (the five above mentioned governance dimensions) as described in table 1 and relate them to academically successful PhD education which in our perspective means: generating top level young researchers for the academic market.

In a case study design, the information is retrieved through in-depth interviews combined with document analyses. Interviewees were asked whether they perceive an influence of either one of the instruments under consideration, either personally or for the department's PhD education. We decided to ask several interviewees in each department to control for reliability in the statements.

3.1 Sample

We include 26 economics departments in our sample. The departments are selected according to their (presumed) differences in the governance of the departments. Table 2a describes the sample. The departments are indicated D1 to D26. In total 13 departments are form continental Europe (nine departments are from Germany, one department each from Switzerland, Italy, France and The Netherlands), five departments are from Great Britain and eight departments are from the United States.

Insert table 2a about here

The overall number of faculty in the departments varies from 6 professors to 79 professors. The overall median of faculty is 23.5 professors and the overall mean number of faculty is 28.0 professors, with a standard deviation (SD) of 21.0 professors. In our sample the number of professors in continental Europe varies between 6 and 58. The mean number is 14.7 (SD = 13.9) and a median of 10 professors. The number of professors in Great Britain spans from 26 to 48 with a mean of 29.6 (SD = 13.5) and a median of 32 professors. Finally the number of professors in the US sample varies between 18 and 79 professors with a mean of 47.0 (SD = 21.0) and a median of 47.5 professors. Table 2b describes the sample.

Insert table 2b about here

We could retrieve the average annual number of PhD students from their web pages and from information by the program administrators. Only for one department we relied on the information by the interviewees in the department. The average number of PhD graduates varies from 2.0 graduates to 24.8 graduates annually with a mean of 8.4 PhD graduates (SD = 5.9) and a median of 5.6 PhD graduates. In continental Europe the graduates vary from 3.8 to 16 students. The mean

[5] In order not to confuse the basic assumptions of statistical methods with qualitative comparative analysis (QCA) we use the term "condition" instead of "independent variable."

number of PhD graduates in our continental European sample is 9.1 (SD=8.1) with a median of 5.8 PhD graduates. For the Great British sample the numbers span from 3.8 to 16 graduates annually. They have a mean of 10.5 graduates (SD=6.5) and a median of 14.4 PhD graduates annually. Finally the American sample graduates between 2.0 and 16.7 PhD students annually. Their mean is 6.7 graduates (SD=4.9) and their median is 4.6.

Insert table 2c about here

Between May 2005 and March 2008 we conducted semi-structured in-depth interviews with 81 academic and administrative key persons at the respective departments. In our questions we asked about the steering of a variety of their daily academic activities like administration, teaching, research in general and PhD education in particular for the years 2001-2002. In order not to get biased answers we left the interviewees unaware of our definition of a successful department. To remember the governance styles of interest we had our interviewees compare the governance styles in 2001 and 2002 to the ones predominant when the interviews took place. We were interested in their perception of individual and departmental effects. The characteristics of each governance dimension were scrutinized for each case and then related to the outcome, academic placements for the years 2002-2006.

3.2 Analysis

In order to analyze the interview statements we use “fuzzy set Qualitative Comparative Analysis” (fsQCA) by Ragin (2008) and the QCA software by Ragin, Drass and Davey (2006).

In our case fsQCA is the method of choice for our research question. In contrast to classical statistical models (e.g. regression analysis) which deliver “unifinal” results that are represented in one single regression equation, fsQCA allows “equifinal” results, meaning that different conditions may lead to the same outcome.

3.3 Conditions

3.3.1 Outcome: academically relevant PhD placements

The criteria for performance measurement of PhD education is manifold (Colander 2008). While several approaches focus on qualitative aspects like the publication record of PhD graduates (Hilmer & Hilmer 2007) or professors (Rauber & Ursprung 2006) or the reputation of a graduate school (Ehrenberg 2004; Burris 2004), quantitative criteria like the total number of graduates (Leszczensky & Orr 2004) or time to degree (RAE) are also considered indicators for success.

The present study takes a quality approach and assesses the impact of PhD education for the academic market. We avoid watered down data due to long time lags in publications by PhD

graduates early in their career and use a composite qualitative measure based on PhD placements (Schneider & Sadowksi 2009). PhD education is considered to be academically relevant when the department manages to place PhD graduates in universities at the approximate level of a post-doc or assistant professor. Except for a few countries, where PhD students are considered as labor force to maintain daily routines at a department, educating PhDs to become future researchers is the main goal for departments and success will be reflected through publications or placements in well established departments (Schneider, Thaller & Sadowski 2009).

For them improving the academic level of their PhD students in order to place them in an economics department or in an academic position in the public sector is central to their education.

> As one of our interviewees illustrates it: "*PhD program… to train the next leaders of academia ... and basically I think the way you do that is to bring quality to the programs: students, faculty and the research " … "few - not many [PhD graduates] go to corporations … the business schools, they have many people in corporations, we tend not to . "* (dean; US university)

For the present study we claim that PhD education has the highest academic impact when departments manage to place graduates in top university departments and the least impact when PhD students are not placed in academic position. Between these two points departments display varying degrees of placements. To obtain placements a dataset was created where we identified the names of all PhD graduates of the sample departments[6] for the years 2002 to 2006 and pursued each individual career[7].

We did not simply count the number of placements because this would not reflect the different departmental goals in PhD education. While German departments for example employ PhD students predominately to maintain the daily routines of a department, PhD students in a British or US department are educated for the academic market which will end up in different placement ratios. For this reason we introduce a quality element in the data by distinguishing placements according to the ranking of the hiring departments assuming that the quality of education will be reflected by the hiring department. The better the hiring department, the more emphasis they put on the academic perspective of the candidate. In our definition qualitative placement takes place when graduates are placed in a department that belongs to the top 150 research departments or centers in the world according to the study by Combes and Linnemer (2003). Following this rational we are

[6] We were not able to obtain the names only in one department. There we relied on the statements of our interviewees about placements

[7] Amir and Knauff (2006) point to the high correlation between placement success of PhD graduates and the academic level of the departments they graduated from.

able to arrange departments according to two criteria: the ratio of placements in general and the ratio of placement in top departments as qualitative element.

In the sample departments the placement ratio varies between 0.03 (3% of PhD graduates find a position as postdocs in the academic sector) to 0.76 (76% of PhD graduates find a position as postdocs in the academic sector). The mean value for placements is 0.41 and the median 0.42.

As demonstrated above these figures cannot be compared directly due to different demands for PhD students in the departments so we assessed the qualitative element[8]. The placement ratio in top departments varies between 0 (no PhD graduate was placed in a top department) to 0.43 (43% of PhD graduates are placed in a top department), the mean value is 0.13 and the median 0.11.

For the fuzzy set we clustered the departments in a six-value fuzzy set (table 3a) with two intermediate levels (mostly but not fully in = 0.8; more or less in = 0.6) between the breakpoint (0.5) and fully in (1) and with two intermediate levels (more or less out = 0.4; mostly but not fully out = 0.2) between the breakpoint (0.5) and fully out (0) (Ragin 2008:31). Department are considered 'fully in' when they display high levels of general and qualitative placements. Department D11 for example has a continuous average general and qualitative placement of more than 50% which qualifies for a membership score of 1. Department D9 as an example for a membership score of 0.8 (mostly but not fully in) displays a continuous general placement score of more than 50% and a discontinuous qualitative score of 25%. A membership score of 0.6 (more or less in) is assigned to departments like D23 which has a general placement score of 40% and a qualitative but discontinuous placement score of 20%. Department D4 as an example for a membership score of 0.4[9] (more or less out) displays a general placement of 70% but has no qualitative placement. A membership score of 0.2 (mostly but not fully out) is assigned to departments like D16 which has a general placement of 0.42 and a sporadic qualitative placement of 5%. Finally departments like D26 which provides a general discontinuous placement of 23% and no qualitative placements are considered to be 'fully out'.

Insert table 3a about here

3.3.2 Input conditions: governance dimensions

All five governance dimensions with their respective indicators as illustrated in table 1 serve as input conditions. The coding varies between four and six fuzzy scores. The configurations of all conditions for each case are shown in the fuzzy data table (table 3b). There is a great variety in the

[8] General placement and qualitative placement correlate with r=.47 (p=0.5); N=25 (one case missing).
[9] Data for one department was missing. We assigned them a membership score of 0.4, based on the statements of our interviewees.

governance of departments, demonstrating that we realized a dataset with great variance in the governance regime.

3.3.2.1 Input condition: Competition

Departments face competition on many different levels. According to the statements of our interviewees we distinguish degree of membership to competition through a six-value fuzzy set.

Departments are located between the point of maximum ambiguity (0.5) and full membership (1.0) when they regularly compete for nationally competitive funding since national competitive funding is a strict version of competition and usually follows a peer review process. Departments are always located between the point of maximum ambiguity (0.5) and full non-membership (0.0) when the do not compete for national competitive funding.

They are assigned full membership (1.0) when they regularly apply for national third party funding, when they regularly apply for local funding and when they actively compete for the best PhD students worldwide. Departments are assigned strong membership in the fuzzy set (0.8) when they regularly apply for national funding and when they regularly apply for local funding or the best PhD students internationally. When departments apply for national competitive funding they are assigned to be more or less in (0.6).

They are assigned to be more or less out (0.4) when they compete for good PhD students on their academic level and regular local competitive funding. They are assigned weak membership (0.2) when they limit themselves to occasional local competitive funding and report rather little academic expectations for their PhD students. When departments join hardly any academic competition they are assigned a full non-membership (0.0).

3.3.2.2 Input condition: hierarchy

Departments face different degrees of hierarchy. We distinguish a six-value fuzzy set to assess hierarchy in a department.

We assign full membership to the fuzzy set (1.0) when a dean is a professional manager and can define the strategy within a department where he has the right to decide upon new hires. Additionally they can demand certain academic achievements from their faculty and impose sanctions on faculty. Departments are assigned strong membership (0.8) when the university or the department has established strong organizational regulations for PhD education, may impose sanctions on faculty but does not determine a strategy by itself. We assign departments to be more or less in than out (0.6) when deans manage the organization of a department and have certain degrees of flexibility in their behaviour like negotiating work load models. They are either professional managers or they can renew their turn as dean again and again.

Departments are assigned to be more or less out (0.4) when deans are elected from the faculty and have a small margin to decide important decisions. Weak membership (0.2) is assigned when faculty is autonomous in their daily activities but where a dean is elected to negotiate the interest of the faculty with the university management. Departments are assigned full non-membership (0.0), when faculty is autonomous in their individual decisions of how to organize research and teaching and does not care about the dean.

3.3.2.3 Input condition: state regulation

In order to reflect the degrees of state regulation we decide to distinguish a four-value fuzzy set.

Departments are assigned full membership (1.0) when states directly interfere in the autonomy of PhD supervisors like the remuneration of students or the number of foreign students or the status of PhD students. We consider departments to be more in than out (0.66) when states indirectly influence the education through the regulation of PhD teaching for example.

When the state demands a certain frame for the education of PhD students so that departments care eligible for benefits like scholarships we consider departments to be more out than in (0.33). Full non-membership (0.0) is assigned when the state has no influence over any parts of the design of PhD education.

Insert table 3b about here

4 Results

4.1 Academic placement of PhD graduates

The fsQCA delivers two most parsimonious solutions of NPM instruments to explain success in PhD education (outcome=1). Each solution consists of two configurations of instruments and their characteristics for achieving successful PhD education. The first configuration of each solution is always alike, while the second configuration of each solution disposes of different instruments. Yet the first instrument of the second configuration also remains the same in both solutions. Altogether the most parsimonious solutions consist of four NPM instruments with different combinations as summarized in table 4a.

4.1.1 Analysis of necessary conditions

A test for necessary conditions indicated a high consistency score (consistency= 0.914) and a high coverage score (0.828) for the presence of competition. These high scores deem the condition competition to be necessary for the output to occur. The other four conditions reveal consistency

scores lower than 0.782 and coverage scores lower than 0.764, indicating that the other conditions are no necessary conditions for the outcome to occur.

Insert table 4a about here

4.1.2 Analysis of sufficient conditions (complex solution)

As for the test for necessary conditions we included all 26 cases for the analysis of sufficient conditions. We chose a frequency cutoff of 1 and determined a consistency cutoff of 0.80[10]. This left us with 13 cases with outcome 1. Logical Remainders were excluded and prime implicants are chosen by hand. Two configurations arise when choosing prime implicants by hand. We opted for the configuration with higher consistency score (0.895) as can be seen in configuration 4a in table 4b.

Insert table 4b about here

The results demonstrate that departments which realize academically relevant PhD education are characterized through four (three) clear governance regimes.

One subset of departments (configuration 1 in table 4b) faces a governance pattern in which high levels of competition, low managerial self-governance and high academic self-governance are sufficient for successful PhD education. It can be considered a successful continental European cluster.

The second subset of departments (configuration 2 in table 4b) realizes successful PhD education in a governance regime with high levels of managerial self-governance, low state regulation high focus on external stakeholder and low levels of academic self-governance. It can be claimed that this configuration of governance dimensions represents a successful US cluster.

Subset three (configuration 3 in table 4b) consists out of very similar sufficient conditions and departments for successful PhD education to occur. Yet in this subset, departments are more concerned with competitive elements in their academic life than in the configuration before.

As just mentioned we chose in the fuzzy set procedure to select prime implicants by hand, so we ended up with two configurations of additional prime implicants. We decided to choose the following configuration because it has a higher consistency score which we consider more compelling for the results. The last subset of departments (configuration 4 in table 4b) therefore displays a configuration of sufficient governance dimensions that consist out of high levels of

[10] We chose 0.8 as valid consistency score since our data revealed a consistency gap between 0.80 and 0.74 between cases 13 and 14.

competition, low state regulation, strong focus on external stakeholders and high levels of academic self-governance. This pattern represents a cluster of successful English departments and scattered departments from continental Europe and the US.

The results demonstrate that a configuration of governance dimensions as they are present in successful US and English departments support academic performance. Departments from different governance environments (as is the case in many countries of continental Europe) which manage to create and operate in a governance regime that comes close to the reference models of successful US and English departments also realize successful academic work as can be shown in the results of the cases in configurations 2, 3 and 4. Nonetheless the results of configuration 1 in table 4b clearly point to an additional fact. That is that alternative governance regimes (as they are present in many countries of continental Europe) may also be successful in realizing academic success even though they do not display the same governance elements as the US and Great Britain do.

As the test for necessary conditions demonstrates though, one element is necessary in almost all successful departments. Only when faculty accepts competition and include it in their daily academic work, it can successfully realize academic performance.

4.2 Unsuccessful PhD education

Although we focus on governance dimension with academically relevant PhD education we are also interested in governance dimensions underlying departments with less academic relevance. We therefore conduct fsQCA with the opposite outcome: low academic placements.

4.2.1 Analysis of necessary conditions

A test for necessary conditions shows no clear picture. The absence of competition is the condition with the highest consistency (0.847) and coverage (0.924) scores but the consistency score is too low to assume a necessary condition.

4.2.2 Analysis of sufficient conditions (complex solution)

The cases reveal high consistency scores for less successful PhD education. Again we included all 26 cases for the analysis and chose a frequency cutoff of 1 and determined a consistency cutoff of 0.93[11].

This left us with the remaining 13 cases with the outcome 0. In the first step logical remainders were excluded (including or excluding prime implicants in the analysis does not change the

[11] By doing so we drop one case from the analysis although it has a high empirical consistency score of 0.926 and the empirical gap is actually between 0.926 and 0.845. On the other hand side this case was already used to explain the outcome 1. From a theoretical perspective we assume that the same case should not be used to explain on e outcome and the opposite outcome at the same time. So we decided to neglect it for this analysis and to set the consistency score at 0.93.

solutions). Two configurations arise a solution consistency of 0.961 and a solution coverage of 0.688 table 4c.

Insert table 4c about here

The results of table 4c demonstrate that departments which are less successful in placing their PhD graduates are characterized by two but actually only one unique configuration of conditions. This configuration (configuration 1 in table 4c) consists out of low levels of competition in addition with low levels of managerial self governance, high state regulation and little focus on external stakeholders. This configuration is present in twelve out of the thirteen departments in our sample with less successful PhD placement. The additional pattern (configuration 2 in table 4c) represents one less successful department with an almost opposite pattern than the one before.

The cases of configuration 1 consist out of less successful departments from all governance regimes from our sample, be it from continental Europe, Great Britain or the US.

In contrast to the wide variety of governance configurations for successful departments, our findings indicate that less successful departments are characterized by one simple pattern of detrimental conditions. No condition itself is necessary for low placement, it is the typical constellation that underlies less successful departments.

The data table (table 3b) indicates that the degree of each governance dimension (US, GB, continental EU) varies in different governance regimes but it may have a positive or negative effect on the outcome only when it crosses a certain threshold. We can see for example that there is a slight difference in the degree of academic self-governance between US and German departments for less successful departments. But only when this difference passes a threshold and is realized in combination with another governance dimension we find successful departments.

4.2.3 Robustnesschecks

4.2.3.1 Financial resources

Financial resources are considered crucial for running graduate programs effectively. We therefore. attempt to take financial resource levels into account. Unfortunately data about financial budgets are not publically available. In order receive a good estimation for financial resources we therefore rely on published research budgets and third party funding[12] as a rough proxy for financial budgets. We decided to rely on the overall departmental budget and didn't break it down to individual funding for each professor.

[12] All budgets were converted into Euro

The departments are clustered in a six-value fuzzy set with two intermediate levels (mostly but not fully in = 0.8; more or less in = 0.6) between the breakpoint (0.5) and fully in (1) and with two intermediate levels (more or less out = 0.4; mostly but not fully out = 0.2) between the breakpoint (0.5) and fully out (0). Department are considered 'fully in' when their research budget exceeds 1.2 million Euro annually in the years 2001 to 2003. They are assigned a membership score of 0.8 (mostly but not fully in) when their annual research budget lays between1.2 million and 900.000 Euro. A membership score of 0.6 (more or less in) is assigned when the budget lays between 900.000 and 500.000 Euro. A membership score of 0.4 (more or less out) indicates a research budget between 500.000 and 250.000 Euro. A membership score of 0.2 (mostly but not fully out) is assigned to departments with a research budget between 250.000 and 1 Euro and finally, departments which do not indicate any research funding are considered to be 'fully out'.

By adding financial resources as additional condition to the fsQCA no changes appear in the test for necessary conditions. Competition remains the sole necessary condition for the outcome variable as indicated in 4.1.1. As for the test for necessary conditions we included all 26 cases for the analysis of sufficient conditions. We chose a frequency cutoff of 1 and determined a consistency cutoff of 0.88 due to large gaps between the consistency scores. This left us with 11 cases with outcome 1. Logical Remainders were excluded.

The direct comparison to the original fuzzy analysis with the configuration of the moderating condition 'financial resources' indicates, that the consideration of financial resources in addition to the five governance conditions improves the overall fit (consistency score: 0.88) of the entire model and an equal or even better fit of the individual configurations of departments than only regarding the five governance variables in the model. The allocation of departments to the respective configurations does not change the underlying pattern of the influence of governance dimensions much. This is also demonstrated by the data from the 'raw coverage'. The values between the original and the new analysis are not widely spread, this patterns along with an analysis of the departments represented through the coverage scores indicate, that the configurations more or less consist of the same departments.

The analysis was carried out with eleven cases due to the strict application of a consistency score of 0.88. In the original analysis we had 13 departments so we assumed that the results could have only occurred based on the neglect of two cases. To scrutinize whether it was only the stricter consistency criteria that let us realize these results we loosened the consistency criteria to a consistency score of 0.78 and include 13 departments as in the original analysis and ran an additional analysis. These results left us with about the same overall fit as in the original analysis (consistency score: 0.859) but again still better individual consistency scores than the original analysis. In this second check for 'financial resources' as in the first robustness analysis the general

clusters of departments do not change, although the fit of the model improves by adding 'financial resources' as an additional condition to governance dimensions.

4.2.3.2 Previous publication record of the departments

Schneider, Thaller and Sadowski (forthcoming) hint to importance of publication records of PhD supervisors for placement success. We therefore take this finding into account and create a new condition in addition to the governance dimension. We rely on the ranking of Combes and Linnemer (2003) to assess internationally comparable publication records for the departments.

The departments are subdivided into four clusters:

Departments are assigned full membership (1.0) when they are ranked between rank one and 35 in the ranking by Combes and Linnemer. We consider departments to be more in than out (0.66) when they are ranked between rank 36 and 100. When they are above rank 100 departments are considered to be more out than in (0.33). And finally full non-membership (0.0) is assigned when departments are not ranked at all according to Combes and Linnemer.

By adding the previous publication record of the departments as an additional resource condition to the fsQCA no changes appear in the test for necessary conditions. Competition remains the sole necessary condition for the outcome variable as indicated in 4.1.1. As for the test for necessary conditions we included all 26 cases for the analysis of sufficient conditions. We chose a frequency cutoff of 1 and determined a consistency cutoff of 0.78 to make the sample comparable to the original analysis. This left us with 13 cases with outcome 1. Logical Remainders were excluded and one of two prime implicants, the one with the higher consistency score was chosen by hand. This new analysis left us with a very fragmented picture. Although we improve the overall as well as most of the individual consistency scores these figures are not improving the analysis of the data. First, each configuration displays at least five underlying conditions leading to idiosyncratic explanation without sensible clusters. Second by adding three new configurations the patterns do not lead to a more parsimonious solution, leaving us with arbitrary results. Third, in-depth analysis of the distribution of the departments to the configurations leads to new clusters.

It can be claimed that for many departments in our sample, publication record is not a sufficient condition to explain placement success, our output condition.

4.2.3.3 Total number of professors and teaching personnel of the departments

As Hilmer and Hilmer (2007) or Osterwalder (2007) indicate, the number of supervisors in a PhD graduate program influences educational success. We decided to take this condition into account and ran a cluster analysis to group the departments according to total number of professors and teaching personnel.

A six-value fuzzy set reflects the structure of our sample best. Departments are considered 'fully in' when their teaching staff exceeds 50 people. They are assigned a membership score of 0.8 (mostly but not fully in) when their teaching staff lays between 50 and 41 people. A membership score of 0.6 (more or less in) is assigned when their teaching staff lies between 40 and 24 people. A membership score of 0.4 (more or less out) indicates a teaching staff between 23 and 13 people. A membership score of 0.2 (mostly but not fully out) is assigned to departments with a staff between 12 and 9 people and finally, departments which consist out of less than 9 people are considered to be 'fully out'.

By adding the total number of professors and teaching personnel of the departments as an additional resource condition to the fsQCA no changes appear in the test for necessary conditions. Competition remains the sole necessary condition for the outcome variable as indicated in 4.1.1.

As for the test for necessary conditions we included all 26 cases for the analysis of sufficient conditions. We chose a frequency cutoff of 1 and determined a consistency cutoff of 0.81 to compare both, the original and the new analysis. This left us with 13 cases with outcome 1. Logical Remainders were excluded. The results demonstrate only a slight increase in overall (new consistency score: 0.853) as well as individual consistency scores. In contrast to the original solution, the overall fit of the model decreases a little by adding total number of professors as a resource condition due to an additional configuration to the new solution. The new analysis also indicates that success is also possible in departments with few professors.

4.2.3.4 Total annual number of PhD graduates of the departments

We finally took the total number of PhD students as an additional condition into account. We retrieved the annual number of graduates from the webpages of the departments and checked the numbers during the interviews. According to the data we subdivided the departments into four clusters:

Departments are assigned full membership (1.0) when they graduate more than 13 PhD students annually. We coded departments to be more in than out (0.66) when they graduate between 13 and 6 PhD students annually. When they graduate less than 6 but more than 4 PhD students annually are considered to be more out than in (0.33). And finally full non-membership (0.0) is assigned when departments graduate less than 4 PhD students annually.

By adding the total annual number of PhD graduates of the departments as an additional resource condition to the fsQCA no changes appear in the test for necessary conditions. Competition remains the sole necessary condition for the outcome variable as indicated in 4.1.1. As for the test for necessary conditions we included all 26 cases for the analysis of sufficient conditions. We

chose a frequency cutoff of 1 and determined a consistency cutoff of 0.80. This left us with 13 cases with outcome 1. Logical Remainders were excluded.

These results left us with about the same overall fit as in the original analysis (consistency score: 0.862) and more or less the same individual consistency scores as in the original analysis. As can be seen from this new analysis the assumption that a high number of PhD students is a sufficient condition for the successful outcome cannot be maintained. The analysis demonstrates that a high number of PhD students is sufficient for three configurations but that it is also sufficient in one configuration and is not present in another cluster of departments.

5 Discussion

Our results gives additional evidence to the assumption that competition is a necessary precondition for departments to engage in successful PhD education: competition for resources, for good PhD candidates, for publication success and reputation in the academic system. We claim that there are several best governance systems that are able to facilitate good PhD education and that is not necessary for departments –at least in economics- to mimic the governing structure of top American research universities although they are with no doubt the most successful departments.

Our data points out, that resource levels of departments have less systematic effects on successful education of future academics than the personal factors among the members of a department, elicited through external governance forces.

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7 Appendix

Table 1: The five governance dimensions with corresponding instruments

Competition

- additional funding based on locally competitive performance
- additional funding based on nationally competitive performance
- for excellent PhD students

Managerial self-governance / hierarchy

- transparency over academic achievements
- university regulations for departments
- target agreements

State regulations

- direct interference in PhD education
- legal regulations for departments

External Stakeholders

- Departmental rankings in league tables
- University board

Academic Self-governance

- Faculty influence in strategic decision making

Note:

Table 2a: Sample according to governance system form and publication record.

		Publication record	
		High	Low
Governance system	Market	D15, D17, D26	D16, D18, D19, D20, D21
	„Transition“	D11, D12, D23, D24, D25,	D22
	Mixtures	D1, D5, D9, D10, D13, D14	D2, D3, D4, D6, D7, D8

Note: Market: departments face high market pressures; transition: departments are in a transition from state regulation to more markets; mixtures: departments face more state regulations than market forces; High: publication output of the department is among the top 150 departments; Low: publication output of the department is *not* among the top 150 departments; D1 to D26: departments in our sample.

Table 2b: description of the composition of professors in the departments according to the governance regime

Regime	**span**	**mean**	**SD**	**median**
Overall	6 to 79	28.0	21.0	23.5
Continental Europe	6 to 58	14.7	13.9	10
Great Britain	26 to 48	29.6	13.5	32
US	18 to 79	47.0	21.0	47.5

Note: regime: governance regime; span: lowest to highest number of faculty members in the departments; mean: mean value; SD: standard deviation; median: median value of professors in the departments.

Table 2c: description of the composition of PhD students in the departments according to the governance regime

Regime	**span**	**mean**	**SD**	**median**
Overall	2.0 to 24.8	8.4	5.9	5.6
Continental Europe	2.6 to 24.8	9.1	8.1	5.8
Great Britain	3.8 to 16	10.5	6.5	14.4
US	2.0 to 16.7	6.7	4.9	4.6

Note: regime: governance regime; span: lowest to highest number of PhD students in the departments; mean: mean value of PhD graduates/year; SD: standard deviation; median: median value of PhD graduates in the departments.

Table 3a: fuzzy scores the for outcome condition

Membership score	1	0.8	0.6	0.4	0.2	0
Verbal specification	Fully in	mostly but not fully in	more or less in	more or less out	mostly but not fully out	fully out

Table 3b: Fuzzy data table of governance dimensions and their output for 26 departments

Competition	Hierarchy	State regulation	External stakeholders	Academic self-governance	outcome	Depart-ment
0,8	0,2	0,66	0,66	0,8	0,8	D1
0,2	0,2	0,66	0,33	0,8	0	D2
0,2	0,2	1	0,33	0,6	0	D3
0,4	0,2	0,66	0,33	0,8	0,2	D4
0,6	0,2	0,66	0,33	0,8	0,6	D5
0	0	0,66	0	1	0	D6
0	0	0,66	0,33	1	0	D7
0	0	0,66	0	1	0	D8
0,8	0,4	0,66	0,66	0,6	0,8	D9
0,8	0,2	0,33	0,33	1	0,6	D10
1	1	0	1	0,6	1	D11
0,8	0,6	1	0,66	0,2	1	D12
0,4	0,8	1	0,33	0	0,6	D13
0,8	0	0	0,66	1	0,8	D14
1	1	0	1	0,4	0,6	D15
0,2	0,4	1	0	0	0,2	D16
1	1	0	0,66	0,4	1	D17
0,2	0,4	0,66	0,33	0,2	0,4	D18
0,2	0,4	0,66	0,33	0,2	0,4	D19
0,4	0,4	0,66	0,33	0,2	0,6	D20
0,4	0,6	0,33	0,66	0,4	0,4	D21
0	0,4	0,66	0	0,2	0	D22
1	0,8	0	1	0,6	0,6	D23
0,6	0,6	0,33	0,66	0,6	0,4	D24
0,6	0,6	0,33	0,66	0,6	0,6	D25
0,4	0,4	0,66	0,33	0,2	0	D26

Note: each value in each cell indicates the fuzzy value of the input (governance dimensions) and output (placement) condition of each case (department); D1 to D26: departments in the sample.

Table 4a: necessary condition

	Consistency	Coverage
COMPETITION	0.913793	0.828125

Table 4b: Configurations for academically successful PhD education, logical remainders excluded

	Configuration	Raw coverage	Unique coverage	consistency
1	C • h • A	0.500	0.224	0.853
2	H • s • E • a	0.442	0.022	0.875
3	C • H • E • a	0.505	0.063	0.889
Configuration for additional prime implicants				
4	C • s • E • A	0.524	0.052	0.895
solution coverage: 0.803448				
solution consistency: 0.858986				

Note: c=competition; h=hierarchy; s=state regulation; e=external stakeholders; a=academic self-governance. CAPITAL letters indicate presence of condition, lowercase letters indicate absence of condition; • = logical AND. Solution coverage/ consistency scores include prime implicants.

Table 4c: Configurations for academically less successful PhD education, logical remainders excluded

	Configuration	Raw coverage	Unique coverage	consistency
1	c • h • S • e	0.660	0.430	0.960
2	c • H • s • E • a	0.258	0.028	1
solution coverage: 0.688194				
solution consistency: 0.961203				

Note: c=competition; h=hierarchy; s=state regulation; e=external stakeholders; a=academic self-governance. CAPITAL letters indicate presence of condition, lowercase letters indicate absence of condition; • = logical AND. Solution coverage/ consistency scores include prime implicants.

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