Ecology of National Rule Birth: A Longitudinal Study of Dutch Higher Education Law, 1960–2004

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ABSTRACT

To date, quantitative assessments of the evolution of national rules have only rarely been conducted, leaving many questions ill-understood and unaddressed, particularly as to the features of rule stock evolution patterns. Can such patterns be traced, and if so, can the underlying causal mechanisms be identified? This article will address these questions. The premise is that forces endogenous to the rule system, inherent to any population of national rules, together with the demographic characteristics of rule makers, and the institutional features of the rule-making bodies jointly determine the birth rates of national rules. Given this key assumption, we offer a three-fold contribution. First, we develop a theoretical framework that integrates ecological with demographic and institutional theories of the evolution of law. Second, we describe longitudinal quantitative data concerning rule (birth) events within the domain of postwar Dutch higher education legislation. Third, we apply negative binomial regression techniques in order to estimate a comprehensive theory-driven model specification of the underlying drivers of national rule birth.

INTRODUCTION

Conventional wisdom concerning national rules in modern Western societies proclaims that there are too many rules and that their number is growing exponentially. In combination with the foundation of supranational institutions, such as the European Union, this implies the creation of ever-growing bureaucratic rule-producing systems that impose unnecessary and abundant costs on citizens and organizations. But conventional wisdom may be misguided. A key assumption in this argument is that the stock of rules is growing to begin with. This would imply that the birth rate of rules is higher than the death rate: that is, more new rules are created than old rules suspended. To explore this basic issue of the evolution of stocks of rules, quantitative assessments of the evolution of national rules are badly needed. Otherwise,

many questions will remain ill-understood or unaddressed. What is actually the size of the stock of national rules? How many new rules are created on an annual basis, on average? What is the frequency of change in existing rules? At what rate are rules suspended? Are there international evolution pattern differences across different rule systems and rule areas? And, most fundamentally, is the evolution of the stock of national rules characterized by any systematic pattern that may, indeed, produce a steady increase in complexity?

This article adds to the literature on these issues by analyzing the underlying causal processes that have determined the birth of national rules in the domain of postwar higher education in the Netherlands (1960–2004). The annual variations in the stock of national rules are calculated as the accumulated difference between rule births and rule repeals per year. In the domain of Dutch higher education, national rules are not often suspended, and although the rules are frequently changed, this does not have a large impact on the size of the national stock of rules (cf., van Witteloostuijn and de Jong 2008). We argue that a thorough comprehension of the underlying forces that foster or dampen national rule birth processes is crucially important to enhance our understanding of the evolution of the degree of "red tape." Of course, we focus on a specific case: Dutch higher education law in 1960–2004. However, we believe our logic is more widely applicable.

In the current article, we focus on national rules codified in formal law and hence recorded in written form (cf., March, Schulz, and Zhou 2000). Other examples of national legislation in written form are statutes, orders in council, and decree orders. Written rules are important because much contemporary life is organized around written rules. They are important instruments designed and applied by governments to coordinate and control national institutions, such as those in higher education. In doing so, we relate to the literatures in political science and public administration on the legislative process. Our contribution to this literature is that we expand the so-called ecological approach to national rule evolution by offering an integration with demographic and institutional perspectives.

The perspective of rule-based behavior that is central to the ecological approach proposed here is part of a well-established research tradition. Conceiving institutions as collections of rules is at the heart of many institutional perspectives on human behavior in political science (March and Olson 1984), sociology (Zucker 1987), economics (North 1990), governance (Williamson 1985), and law (Eggertsson 1990). In this literature, both qualitative and quantitative perspectives have been developed. On the one hand, much work in this research tradition is characterized by a focus on theory development or qualitative empirical work, implying a relative paucity of quantitative empirical studies. This extant literature predominantly examines the way in which the content of a particular rule is adapted in response to new issues arising within an institutional law context or in reaction to the stakeholders' voiced demand for new rules. On the other hand, a series of quantitative studies in the 1990s and 2000s started to estimate the determinants of processes of rule making. In political science and public administration, this work relates to issues of national legislation (e.g., Mayhew 1991; Tsebelis 1999). In organization studies and organizational sociology, a parallel tradition focuses on the evolution of organizational rules (e.g., March, Schulz, and Zhou 2000; Schulz 1998, 2003). Following in the footsteps of this quantitative work on rule making, rather than seeking to explain why a particular rule came into existence to begin with (that is, comparative static analysis), we aim at understanding the underlying processes that determine the births of national rules over an extended period of time (that is, intertemporal dynamic analysis).

An important premise here is that these underlying causal processes are manifest in observable regularities that drive the evolution of stocks of rules. The ecological approach focuses precisely on this—the intrinsic dynamics reflected in observable evolutionary regularities. In line with other ecological theories, we assume that histories of stocks of national written rules have general statistical properties, implying that they develop in systematic ways. In the social sciences, insights from bioecology have been translated such that they can be applied to the evolution of populations of social entities, rather than of species as in bioecology (cf., Hannan and Freeman 1977, 1984). The focus is on the drivers of the so-called vital rates of the birth, change and death of such social entities, and the implications of these combined vital rates for the macro structure of the population in terms of, for example, concentration, density, and diversity (cf., van Witteloostuijn and Boone 2006). This ecological logic has been applied in empirical studies into the evolution of a wide variety of organizational populations, including industrial firms and interest groups, as well as national and organizational rules (see below for a brief review). Particularly, we share this ecological focus with a series of studies into the evolution of interest groups in political science (cf., Gray and Lowery 1988, 1996, 2001a, 2001b; Lowery and Gray 1993, 1995, 1997, 1998). We take this ecological approach as our starting point to subsequently merge in insights from demographic and institutional perspectives.

So, we argue that ecological theory is particularly powerful as a steppingstone for theory development as to the evolution of national rule stocks by integrating relevant insights from other perspectives into the ecological core of the theory. One obvious candidate for cross-pollination is institutional theory. Research in public administration, too, acknowledges the importance of institutional theories (e.g., Bozeman and DeHart-Davis 1999; Chackerian 1996; Frumkin and Galaskiewicz 2004; Peter and Hogwood 1991). Not only are rules themselves often seen as institutions, as indicated above, but also are rules produced by institutions. Key drivers of rule production are reflected in characteristics of the institutional context, such as features of the democratic procedures and the coalition in power (e.g., Maltzman and Shipan 2008). Another clear candidate for cross-fertilization is the demographic theory of rule makers. In the end, rules are created by people. Some people are more productive or successful rule makers than others, which can partly be explained by demographic features such as their age and experience (e.g., Martin and Vanberg 2005).

So, following van Witteloostuijn (2003), the interdisciplinary foundation of our study combines ecology with insights from such demographic and institutional theories. In essence, we develop a demographic institutional ecology of national rule births. The argument is that the introduction of new national rules is determined both by its own history and rule stock characteristics (the ecological angle), as well as by the demographic features of national rule makers (the demographic angle) and rule-making institutions within the institutional context of the rule-making process (the institutional angle). National rules are populations of entities which, like any other population such as those comprising of organizations, human beings, or animals, are subject to ecological forces. Furthermore, a society's rule-producing machinery is composed of rule-making bodies (cabinets and parliament) and their rule-making members (ministers and civil servants) that/who operate within a particular institutional context. We hypothesize that both mechanisms separately and jointly dampen or foster the introduction of new national rules.

To summarize, the key aim of our study is to test hypotheses that derive from a demographic institutional ecology of national rules. By doing so, we intend to empirically

identify and explain underlying causal mechanisms that determine the rate of national rule births. The interdisciplinary theoretical perspective and quantitative estimation methodology are the core innovative elements in this study. Our study shares both innovative elements with van Witteloostuijn and de Jong (2007, 2008). We move beyond van Witteloostuijn and de Jong (2007) by developing and estimating a comprehensive model of rule birth. Their study was largely descriptive, with a small explorative model including only three variables (national rule density, civil servant density, and minister experience) for a limited time period (1986–2004). We add to van Witteloostuijn and de Jong (2008) by focusing on the more essential ecological event of rule birth (rather than rule change, as they do) and by estimating a comprehensive model including all three categories of rule birth determinants jointly (rather than their three smaller separate models).

The outline of the article is as follows. We will first offer a brief literature review. Subsequently, we will explain in detail the theoretical logic, formulating three illustrative pairs of hypotheses as to the ecological, demographic, and institutional determinants of national rule birth. Given that our study is one of the first of its kind, we focus on a subset of the drivers of national rule birth that we believe will illustrate succinctly what our novel approach entails. In future work, this subset may be expanded, of course. Next, we will introduce this article's research methodology, addressing issues related to our counts of national rules and measures of the variables. Following that, we will present our empirical evidence. Finally, we will conclude with an appraisal, offering a reflection on opportunities for future research.

LITERATURE REVIEW

There already are, of course, quite a few powerful theories concerning the rise and fall of national law. By and large, such theories tend to emphasize the rationality of law from the perspective of individuals, groups, or societies at large (Friedman 2002; Masters and Grutter 1992; Watson 1985). Lobbying and rent-seeking theories, for example, argue that much regulation is introduced or removed in order to serve the self-interests of special interest groups. Economic theories suggest that much regulation is installed or demolished to facilitate efficient economic and social processes across societies. Within law, too, there is an ongoing debate about whether—and if so, how—national rules evolve in response to changes in the institutional context and to the relative importance of the rule-maker bodies. Our interdisciplinary framework does not deny the importance of these "rational" explanations. However, we provide a complementary perspective by emphasizing the rather mechanistic endogeneity of many of the processes that underlie national rule-making legislation.

Indeed, in political science and public administration, an impressive quantitative research tradition focuses on issues related to such law-making processes. A seminal contribution is Mayhew (1991), dealing with legislative and executive effectiveness. Inspired by Mayhew's work, subsequent studies sought to deepen our understanding of the driving forces behind such outcome variables as legislative change, gridlock, prioritization, and significance. A discussion of a few prominent examples must suffice here, by way of illustration. First, Edwards, Barrett, and Peake (1997) offer a test of the impact of divided government on legislative gridlock, finding that the likelihood that important legislation fails to pass in the United States is considerably larger under divided government. Second, Binder (1999) argues that intrabranch friction contributes to policy stalemate more than interbranch conflict, again in the US context. Third, Martin (2004) estimates the impact

of issue divisiveness and saliency on legislative prioritization in Belgium, Germany, Luxembourg, and the Netherlands, indicating that issues characterized by both features are introduced earlier on the agenda. Fourth, Martin and Vanberg (2005) report that changes made to a ministerial bill draft in the course of parliamentary review in Germany and the Netherlands are significantly influenced by government issue divisiveness (positively), a junior minister from a partner party (negatively), the number of committee referrals (positively), the number of articles in the draft bill (positively), and the expiration of the bill before the plenary vote (positively). Fifth, Maltzman and Shipan (2008) estimate the forces behind legislative longevity in the United States, finding that significant amendments in major legislation are more likely if, for example, the government is divided and the House and Senate disagree at the time of enactment. Sixth, Lapinski (2008) introduces a new policy-coding scheme needed to study the effect of policy substance on the legislative process and applies this novel scheme in a study of legislative performance in the United States.

In the context of the current study, work on law production is particularly interesting. Tsebelis (1999) studies the role of the number of veto players and ideological distance in determining the ability to produce significant laws, focusing on the introduction of significant labor laws in 15 countries in Western Europe in the 1981–91 period. His results suggest that, indeed, the number of veto players and the coalition's ideological range negatively affect law production, with the control variables agenda control, corporatism, and left ideology being insignificant. In the Appendix of her legislative gridlock article, Binder (1999) reports a test of Mayhew's (1991) original argument. She indicates that the production of landmark laws between 1947 and 1986 in the United States, using a measure based on *New York Times* editorials, is positively affected by the percentage of moderates and a budget surplus, with a divided government, ideological heterogeneity, time out of majority, bicameral distance, filibuster threat, and public mood being insignificant. Ringquist, Worsham, and Eisner (2003) estimate the impact of public salience and technical complexity on legislation production aimed at directing the behavior of four federal agencies in the United States from 1949 to 1996. Their dependent variables are based on counts of the number of bills. They find, by and large, that both public saliency and technical complexity positively affect legislation production.

In organization science, a large bureaucracy literature developed in the aftermath of Weber's (1921) classic study. From our perspective, the project on organizational rule production at Stanford University is particularly relevant (March, Schulz, and Zhou 2000). The core logic is nicely reflected in Schulz (1998). Given our ambition to develop an ecological theory of law production, a detailed discussion of this logic is warranted. Basically, Schulz' (1998) study confronts Weberian bureaucracy theory with insights from the organizational learning literature. On the one hand, Weberian bureaucracy theory argues that, for a variety of reasons, "bureaucracies frantically breed rules, and frequently . . . rule breeding intensifies as bureaucratization proceeds" (Schulz 1998, 845). Borrowing terminology from organizational ecology (see below), this logic suggests a positive density dependence effect: the rate of rule birth is expected to increase with rule density. On the other hand, organizational learning theory suggests an opposite prediction: the rate of rule birth is likely to decline with rule density. Schulz (1998) discusses three mechanisms that may explain this negative density dependence effect.

First, if rule density increases, the "problems cease to be available for further rule production" (Schulz 1998, 853). This is the preemption effect. Second, bureaucracies tend

to extend the range of applicability of established rules, implying the "habitual application of old rules to new problems," which "eliminate[s] the perceived need to create new rules" (Schulz 1998, 853). This is the codification trap effect. Third, a temporal order effect implies that in the early history of a bureaucracy, rule production is high as "the low hanging fruit" is dealt with first. That is, "[i]t takes longer and longer for this process to arrive at the next problem because the next problem is rarer than the preceding one (ceteris paribus)" (Schulz 1998, 854). This is the sorting effect. In a birth rate study for Stanford University for administrative rules (1961–87) and academic rules (1891–1987), evidence for a negative density dependence effect is provided, by and large.

At the interface of organization and political science, the study of Deveraux Jennings et al. (2005) focuses on explaining the rate of legal rule births and revisions of sections of US regional water law over a 90-year period in the 20th century. Now, the organizational ecology angle that is central in the Stanford University organizational rule production study is replaced with a traditional political science perspective. The independent variables are the standard ecological events of birth and revision (of sections of a state's regional water act). The independent variables are the number of recent higher court cites of the water act, conservative versus progressive party control of the state, times of political transition, regional economic output, and wartime. The number of higher court cites of the water act, progressive party control of the state, political stability, low regional economic output, and wartime all positively affect the rate of rule birth and revision. So, in this study, the issue of density dependence is not considered.

In contrast, van Witteloostuijn and de Jong (2007, 2008) start from applying organizational ecology logic to national legislation evolution. Given the largely descriptive nature of the 2007 study, we here focus our discussion on van Witteloostuijn and de Jong (2008). In this study, the logic from the (small) ecology of organizational rules literature is applied to the issue of national law change, adding insights from the political science and managerial demography traditions. Different from Schulz (1998), however, a nonmonotonic hill-shaped rule density dependence relationship is suggested. Moreover, similar to the legislation production literature, a series of political arguments are added to the basic ecological story (cabinet tenure, power and turnover), and novel demography variables are included (the minister's age, tenure, experience and religion), following the managerial demography literature. In a series of tentative empirical analyses for Dutch higher education law in 1960–2004, they report evidence for a hill-shaped density dependence relationship, as well as for a number of significant minister and cabinet demography effects. In the current article, we further develop the logic in van Witteloostuijn and de Jong (2008) in the context of national law birth, rather than change. In doing so, we contribute to the established national law evolution literature by adding insights from the organizational ecology and managerial demography literatures.

THEORY AND HYPOTHESES

This study explores how organizational ecology (Carroll and Hannan 2000) and the ecology of organizational rules (March, Schulz, and Zhou 2000) can be applied and adapted in order to understand the evolution of national rules along the lines suggested by van Witteloostuijn (2003), specifically focusing on national rule birth. van Witteloostuijn (2003) suggests to merge insights from both ecological approaches with institutional theories and, especially, with the demographic literature in management (Finkelstein and Hambrick 1996). In what

follows, we present a theoretical argument as to the impact of ecological processes, demographic characteristics of ministers, and institutional features of cabinets on national rule births. It goes without saying that we could speculate about many interactive effects between the different rule birth determinants or that we could add other potential determinants of the (national) rule birth process. However, because of sample size limitations, and given that this article provides a first empirical test of a demographic institutional ecology of national rule births, we limit complexity by focusing on main effects only, leaving more complicated and extended interaction-based theory for future work. So, we will only consider the direct effects of each individual independent variable on our central dependent variable—national rule births—separately.

Ecological Processes

The ecological approach to the evolution of social entities is our key point of departure. Here, the main argument is that populations of national rules are determined by population-specific ecological processes and by the path-dependent dynamic of these processes. Based on theoretical and empirical work over the past 30 years, organizational ecology offers a wealth of explanations for the birth, growth, change, decline, and death of organizations at the population level (Baum 2002; Carroll and Hannan 2000; Hannan and Carroll 1992). The key theoretical logic of organizational ecology is built on two pillars: the ecological processes of competition and the institutional processes of legitimation. Additionally, organizational ecology has assimilated a wide variety of alternative determinants of such vital rates, from the influence of political turbulence (Carroll 1987) and social capital (Pennings, Lee, and van Witteloostuijn 1998) to strategic groups (Carroll and Swaminathan 1992) and technological change (Podolny and Stuart 1995).

Essential are ecological and institutional processes. In this context, the density dependence theory on the effect of population density, which is the number of organizations active in the population, on all vital rates is one of the leading theoretical perspectives in organizational ecology (Baum 2002; Hannan and Freeman 1989). Dozens of studies have predicted and provided empirical support for (inverse) U-shaped relationships between population density and (mortality) founding rates of organizations. These nonmonotonic relationships are determined by processes of competition and legitimation, as reflected in two ceteris paribus hypotheses that combine into the prediction of a reversed U-shaped density dependence effect on rule birth. The first hypothesis relates to competition and vital rates, predicting negative density dependence for birth rates. This is a well-established argument in economics: a larger number of organizations depress entry rates, as large-number competition reduces profit opportunities and survival rates. The second hypothesis involves legitimation and vital rates, suggesting positive density dependence for birth rates. This reflects well-known institutional sociology, which argues that the societal taken-for-grantedness of an organizational form increases with the frequency with which this form is observed. Together, the processes of competition and legitimation produce an inverse U-shaped density dependence hypothesis for birth rates.

These hypotheses have been applied to the evolution of formal organizational rules in the case of Stanford University (March, Schulz, and Zhou 2000; Schulz 1998). In other work, this line of logic has been adapted in order to explain the birth rate of national rules (cf., van Witteloostuijn 2003; van Witteloostuijn and de Jong 2007, 2008). The core argument is that similar density-dependent processes can explain the birth rate of national

rules. In this context, two alternative theories can be applied, as summarized in the literature review above. On the one hand, Weberian and post-Weberian bureaucracy theory argue that "rules breed rules." The application and production of national rules provide legitimation to public administration. Old regulations and laws are seldom or never repealed. At most, they are amended, while new rules are continuously being introduced. Often, societies and law domains evolve along a path of increasing complexity. In parallel, there is a growing need for new rules that target new complexities. New rules try to solve voiced problems but often introduce new issues. Therefore, new rules induce the need for yet another set of new rules. In a way, this is a reflection of economics' Law of Say in the rule arena. By introducing a rule, demand for additional rules is boosted as the audience is triggered to ask for more, being made aware of the potential to regulate. As a consequence, the growth in the number of rules increases as the volume of rules goes up, implying that the rule stock expands almost "of its own accord."

On the other hand, learning theory suggests that rule-making bodies learn all the time, being associated with four mechanisms that dampen rule production. First, the preemption effect implies that problem availability reduces over time. Second, the codification trap means that the range of application of existing rules is expanded over time. Third, the sorting effect is associated with selecting in rules that work well and selecting out those that do not. In doing so, rules that are ineffective are abolished along the way. Fourth, over time, broader rules may be created by combining existing more specific and separate rules into new more general and integrative rules. This may be called the generalizing effect.[1] In all, learning produces a set of rules that are able to absorb new issues, while reducing the need for the creation of new rules. The larger the density of rules, the higher the likelihood that an existing rule can deal with emerging issues, either by stretching the interpretation of an established rule or by changing an existing rule by adding another provision. Hence, the density dependence effect is negative.

In principle, combining both forces may generate different hypotheses (cf., Schulz 1998). For one, either the negative or the positive density dependence effect may dominate in the context of a specific body of rules. This would generate two alternative hypotheses, predicting a process of linearly negative or positive density dependence. When these opposite effects are taken together, we arrive at nonlinear density dependence hypotheses. On the one hand, we might assume that the negative density dependence forces only dampen the positive effect without triggering a sign switch. This implies a hypothesis of a positive but decreasing density dependence effect. On the other hand, following traditional organizational ecology, we may argue that, after a certain density threshold, the negative effect of density will take over, generating a sign switch. This gives the nonmonotonic density dependence hypothesis that we take as our benchmark. This gives

H$_1$ (rule density)   There is a reversed U-shaped relationship between national rule density and national rule birth.

Apart from rule density, rule-maker density may imply a population-internal ecological dynamic. Over the years, the size of public administration in many Western societies has grown significantly. As a result, a rule-producing and controlling bureaucracy has become the primary institutional characteristic of highly complex nation states. This also applies to the Netherlands, where public administration is dominated by large hierarchical

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1   This fourth mechanism was suggested by an anonymous referee. The other three are discussed by Schulz (1998).

ministries, often with many decentralized branches throughout the country. The Dutch Ministry of Education is a well-known example of this. This ministry was founded in 1918—prior to 1918, educational regulation was taken care of by the Ministry of Internal Affairs. Especially after the Second World War, the size of the ministry greatly increased. This was associated with intensified legislative activities.

In the first years of our observation period, there was a strong need to establish the legitimacy of the ministry—something which was being challenged by many politicians and "competing" ministries. As a result, there was a forceful inclination to produce new rules associated with a new body of law that would serve as "trophies." Over the years, after the legitimacy of the ministry had been established, the continuous production of new rules served to offer legitimacy to the growing number of civil servants employed by the ministry. The production of new rules is the basis of bureaucratization; it reflects the core competence of a skilled and specialized civil servant. Due to processes of learning, socialization, and specialization, rule makers will continuously produce new rules. That is, the growth in rule production is reinforced by a growing population of rule makers that have precisely that as their job: rule production. The result is an increase in a nation-state's red tape: the national rule birth will be positively associated with the number of rule-making and rule-monitoring officials. This relates to ecological logic, too: "rule-makers breed rules." Hence, we have

> H_2 (rule-maker density) The density of national rule makers is positively associated with national rule birth.

Demographic Characteristics

A stream of relatively recent studies of organizations focus on the analysis of the role of the demography of managers (Finkelstein and Hambrick 1996) and management teams (Boone, de Brabander, and van Witteloostuijn 1996), in order to explain interorganizational differences in behavior and performance. Managers and management teams have or include different experiences, capabilities and personalities, and reflect different degrees of awareness and ambition. These differences affect their organizations' behavior and performance differently. For example, Chief Executive Officers (CEOs) with a background in finance are more likely to engage in cost-cutting strategies, and commercial enterprises headed by a CEO with an internal locus-of-control trait tend to outcompete their counterparts with "external" CEOs (Boone, de Brabander, and van Witteloostuijn 1996; Wijbenga and van Witteloostuijn 2007). Indeed, a large number of empirical studies provide significant support for the explanatory power of a variety of the demographic characteristics of managers and teams (see Boone, van Olffen, and van Witteloostuijn 2005, for an overview). In line with this argument, we hypothesize that for the production of new national rules the background features of rule makers and rule-making groups do matter as well.

In what follows, by way of steppingstone, we focus on the impact of a few of the minister's demographic characteristics on the rule-production process, particularly the experience of the minister to the rule-making domain and his or her age. The first characteristic reflects the minister's prior experience with the educational domain. The hypothesis that relates the experiential history or functional background of agents to their decision-making behavior is well established in the organizational behavior literature (e.g., Boeker 1997; Finkelstein and Hambrick 1996). Executives will selectively perceive (observe, evaluate, and interpret) strategic stimuli in line with their experiential history and functional

background and act accordingly. In line with this, we expect that the experience of a minister with the rule-making domain she/he is in charge of will determine the number of newly introduced rules. That is, an education minister with much education-related experience is more likely to introduce new rules than her or his counterpart without such related experience. The underlying logic relates to capabilities and routines. For one, knowledge of the domain is likely to be associated with a sharp eye for what is believed to be imperfect. Moreover, experience comes with routines as to how things should be done. Therefore, we suggest

> H_3 (rule maker's experience)   A national rule maker's (i.e., minister's) extent of experience in the relevant rule domain is positively associated with national rule birth.

This positive effect may be linear or nonlinear. The latter could imply that the positive effect of experience is smaller the larger the degree of experience. In theory, the relationship may switch sign as well, if we assume that very experienced rule makers start to believe that creating new rules is counterproductive. As we do not have any a priori theoretical reason to predict either shape, we simply explore this in the empirical analyses by adding the squared experience variable as well.

Our second demographic characteristic of a minister is age or "tenure in life" (Hambrick and Fukutomi 1991). Earlier work has revealed that this is one of the most salient human features, providing an intragenerational link between individuals (Lawrence 1988).[2] Age is an important attribute because it determines a person's background and experience outside the employing organization (Wiersema and Bird 1993). These background experiences influence attitudes and beliefs. Furthermore, age has, according to human capital theorists, a concave relationship to an individual's productivity (Bates 1990). The productivity of young workers is low but rises rapidly as their human capital increases and stabilizes as they cease to invest in training at older age. Middle-aged workers are believed to be most productive, whereas older workers may become less productive due to the depreciation of their skills or the reduction in their efforts. In line with this logic, we expect to find a nonmonotonic relationship between the age of a minister and national rule birth. So, we formulate

> H_4 (rule maker's age)   There is an ∩-shaped relationship between the age of the national rule maker (i.e., minister) and national rule birth.

Institutional Features

Finally, we will consider the role of the cabinet in the rule-making process, concentrating on the institutional position of this central rule-producing body. We focus on the power position and the political composition of the cabinet as key institutional features of the governing body in the legislative process (cf., Edwards, Barrett, and Peake 1997; Maltzman and Shipan 2008; Tsebelis 1999).[3] Strategic decisions are often unstructured and

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2   Because age and tenure are often correlated and, therefore, have much common variance, we decided to include the first of this pair of demographic characteristics in this study of national rule birth.

3   Admittedly, this implies a focus on only a specific aspect of the wider institutional setting. In future work, we hope to collect cross-country data. Then, the variety in the broader institutional context offers opportunities to study the effect of different institutional rules guiding the legislative process. In the single-country context of the current empirical study, we lack this type of variation, which is why we decided to focus on what may be called institutional features of the cabinet.

ambiguous and therefore invite the use of power by different agents who try to push their preferred choices (Eisenhardt and Bourgeois 1988). The essence of power is the ability to cause someone to do something that she/he would not have done otherwise (Gaski 1984). Recent demographic studies emphasize the role of power of an organization's top management as a team, rather than the power of the individual top manager (Boone, van Olffen, and van Witteloostuijn 2005; Finkelstein 1992). Of course, power takes center stage in the political arena. For instance, in political science, much theoretical and empirical work has been done on bargaining in parliamentary systems (Huber and McCarty 2001; Pech 2004), government formation processes (Martin and Stevenson 2001; Mershon 2002; Müller and Strøm 2000), and portfolio allocation and political appointments (Bertelli and Feldmann 2006; Druckman and Roberts 2005; Schofield and Laver 1985).

A key proposition is that cabinets have a legislative right to exert influence due to election results, which is reflected in their (relative) power position in the parliament (Lijphart 1999; McLean et al. 2005). In the British system, for instance, any party with 50% plus one of the seats in the House of Commons has all the power it needs to pass legislation (Taylor 2007). The more seats a cabinet has, the more it can achieve in the rule-making process. The parliamentary members of cabinet parties are not anonymous individuals, operating in silent isolation. Rather, they know one another well, they are bound by tacit agreements, and they tend to follow their leaders. This is not different in the Netherlands (Andeweg 2006). New national rules must be approved in a lengthy parliamentary decision-making process. In the Dutch system, it is almost impossible for any one party to obtain a parliamentary majority (Timmermans and Moury 2006). Hence, Dutch cabinets always reflect a coalition of different political parties. If a cabinet is supported by a large majority in the parliament and, thus, has a strong legislative power position, new rules are more likely to pass smoothly through the decision-making process. This gives

H_5 (rule-making team's power position)   A national rule-making team's (i.e., cabinet's) power position is positively associated with national rule birth.

Next, we consider the composition of the cabinet in terms of the (dis)similarity of the participating political parties. A key argument in the top management team demography literature is that a team's compositional characteristics influence the dynamics within the top management team, which in turn impact upon the team's behavior and performance (Boone and van Witteloostuijn 1995; Boone, van Olffen, and van Witteloostuijn 2005). The so-called facilitation perspective argues that team homogeneity—that is, demographic similarity among team members—enhances group cohesion and social integration, which in turn facilitates communication frequency and decision effectiveness. The cabinet is a dominant factor in the policy-making process, in particular with respect to the introduction of new national rules (Andeweg and Nijzink 1995; Martin 2004; Martin and Vanberg 2005). The cabinet sets the agenda and primarily takes the initiative for new laws. Because of the proportional nature of the Dutch electoral system, it rarely—if ever—happens that any single party can benefit from the majority of legislative votes necessary to enact policies on its own accord. Then, government by coalition formation is unavoidable. A coalition will bring together parties with preferences that diverge on specific issues, implying that pursuing a common policy requires compromises.

As a result, parties that participate in a coalition are engaged in a "mixed-motive game" (Huber and Shipan 2002; Strøm and Müller 2000). On the one hand, they have reason to cooperate with their coalition partners to pursue common policies successfully.

On the other hand, each party faces incentives to move policy in the direction that will appeal to their party members and voters. Thus, the ideological diversity within a cabinet's coalition matters (Budge 2001; Huber and Inglehart 1995) not only to explain such issues as the duration of the cabinet formation process (Carmignani 2001) or a premature termination (Warwick 1992) but also the birth rate of new national rules. If cabinet heterogeneity is not managed properly, this may in turn slow down decision processes. Political heterogeneity within the coalition is likely to increase the number and intensity of conflicts. Due to power struggles, cabinets loose precious time. They not only have more difficulty to decide on the nature of new legislation but also tend to need more time to introduce new rules. So, we formulate

> H_6 (rule-making team's homogeneity) A national rule-making team's homogeneity
> (i.e., cabinet parties' political similarity) is positively associated with national rule
> birth.

Again, as with minister experience, this positive effect may be linear or nonlinear. The latter could imply that the positive effect of homogeneity is smaller the larger the degree of homogeneity. Similarly, the psychological literature on team heterogeneity suggests that the relationship might be reversed U-shaped (Boone, van Olffen, and van Witteloostuijn 2005). On the one hand, team homogeneity reduces functional conflict and increases decision-making efficiency, which would boost a cabinet's rule production. On the other hand, team heterogeneity is associated with creativity, which is likely to trigger rule making, too. Together, both counterforces might generate a reversed hill-shaped effect of cabinet homogeneity on national rule birth. As we do not have any a priori theoretical reason to predict whatever shape, we simply explore this in the empirical analyses by adding the squared homogeneity variable as well.

METHODS

Critical Unit of Measurement and Sources of Information

Regulations can be categorized according to their legal status, which is connected with the body establishing them.[4] For national regulations, we are able to distinguish between laws in the formal sense (as laid down by parliament), orders in council and royal decrees (as determined by the cabinet), and ministerial guidelines and circulars (as established by a specific ministry). Laws in the formal sense have the highest status; they are laid down by parliament and, hence, pass through the entire—time-consuming—institutional legislative process. For this reason, we have opted to examine the dynamics of formal laws, particularly legislation relating to higher education. An act is a collection of national regulations that are created during the institutional process (Postma 1995). A formal law has a particular structure, with the text being divided into titles, sections, articles and subarticles, paragraphs, clauses, and subclauses. Each section of a law deals with a part of the domain in question. The literal text of a law—that is, the lowest level within the structure of the act—codifies the national regulations, and so the outcome of the national institutional decision-making process, for a specific domain. Our focus is the lowest level of text in

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4   This and the next three subsections are largely based upon van Witteloostuijn and de Jong (2008).

a formal law (frequently a clause or subclause, but often a paragraph) as the critical unit of study.

In doing so, we can chart the dynamics of national regulation at its most detailed level, which maximizes the flexibility of the resulting database. Moreover, because entire acts, sections, or parts are only seldom amended, this level of analysis is critical to empirical studies of the underlying dynamics of national regulation. The results of the institutional dynamic law-making processes are usually expressed at the most detailed level of legislation, namely the text. If we would record amendments at too high a level of aggregation, we run a greater risk of missing the underlying dynamic. We should add that not all laws are structured in the same way. What is more, even within the same domain—such as higher education—the law's structure often changes over time. Consistency can only be guaranteed at the most detailed level of regulation as each law contains text at that level.

The source of national regulations—in our case, higher education acts—is the many editions of the *Staatsblad*, which publishes all formal laws, together with all accompanying changes. Many Dutch university libraries have a complete archive of *Staatsblad* editions. We prefer these hard copy archives to the existing digital databases (available on http://overheid.nl or http://wetten.nl), which are managed by Staatsuitgeverij, the government publisher, but which are not historically complete. The digital databases go back to about 1995, which is insufficient for a study of the long-term evolutionary dynamics of regulation. Moreover, searching for information in the digital archives requires the design of algorithms based on core words. There is a high risk that an incomplete algorithm will lead to an equally incomplete overview of acts (and particularly of amendment acts). Finally, all digital texts still need to be converted to a word-processing program before the mother file can be used for empirical and statistical processing.

Rule Domain

The very first Dutch national rule in 1801 was the one declaring education to be a concern of the nation-state (Boekholt et al. 2002). Research on the Dutch higher education system makes a distinction between the pre-World War II and post-World War II period (Dodde 2000). Although the foundation of the Dutch higher education rule system can be traced back to the prewar period—the first national law for higher education was introduced in 1876 and amended in 1905 and 1920—much of higher education's content and organization were developed in the postwar period, with the 1960 law on higher education as an important point of departure (Zoontjens 1999). From that point on, the differences between primary, secondary, adult, vocational, special, and higher education have been firmly established. For this reason, our window of observation concerns the 1960–2004 period. The current higher education system is based on a three-cycle degree arrangement, consisting of bachelor, master, and PhD programs and degrees. Higher education is offered by two types of institutions: research universities (*universiteiten*), and universities of professional education (*hogescholen*). In terms of employment and government expenditure, higher education nowadays is one of the most important sectors in the Netherlands (Eurydice 2005).

The total number of educational rules is unknown even at the Ministry of Education (cf., Donker van Heel, van Zutphen, and Zoon 2004), which clearly distinguishes rules relating to higher education from those related to other educational domains (e.g., primary, secondary or vocational education). So, the domain of higher education law is clearly demarcated in the body of national legislation. The first step in data collection involved

compiling a list of all amendments to postwar acts. The main sources were the acts themselves, as published in the *Staatsblad*. Each time an amendment is made, however minor, the act begins with a detailed summary of all previous amendments, along with reference to the editions of the *Staatsblad* in which they appeared. Each amendment act has a specific publication date. We code this date as the time when the act and its amendment took effect. Although occasionally the act itself provides additional regulations and data in relation to its entry into force, this is less important for our purposes because publication in the *Staatsblad* completes the institutional process.[5] Each amendment act gives the specific location of the amendment (a section, article or subarticle, paragraph or subparagraph, clause or subclause, or sentence) and details the substance of the amendment in question. We verified our list by consulting several other sources, in particular the Schuurmans and Jordens educational editions (which are the most important sources of information on educational acts), coupled with the information on educational legislation from educational specialists in Vermeulen (1999), Postma (1995), and Zoontjens (1999).

Event Measures

We measured the dependent variable, ''Rule birth,'' on an annual basis. It is constructed as a combination of the occurrence of the event and the size of the event: that is, our rule birth count is the number of sentences involved with the creation of new rules. There are roughly two ways of determining the size of a national regulation: by the space it takes up (in square centimeters) or by the number of sentences. As the correlation between these two measures is probably very high, it should generally make little difference which one is used. Although both methods are laborious, it is somewhat easier to count national regulations in terms of sentences than to measure them in terms of the space they take up. During the data collection process, we monitored the layout of the *Staatsblad*. Although differences in terms of typeface, size, margins, and line spacing appeared, this only marginally affected the average number of characters on one page.

On the basis of the relevant amendment act, each amendment was classified into one of three main groups: (a) the creation of a new rule, (b) a change of an existing rule, or (c) a repeal of an existing rule. In almost all instances, the amendment can be explicitly classified in one of these ways. For the second group, we introduced a further classification, depending on the ultimate implications in terms of the size of the change. A replacement can have three outcomes: no size implications (e.g., an entire sentence is replaced by a new full sentence of the same size), an increase in size (e.g., an entire article containing five sentences is replaced by a new article of ten sentences), or a reduction in size (e.g., a subclause containing five sentences is replaced by a new subclause of two sentences). We used this information in order to measure the density of national rules (see below).

Independent Variables

We measure ''Rule density'' in each year as the cumulative net size result of changes to regulations. The annual net change is the balance of new regulation births plus the ''positive'' amendments and minus the number of repeals and ''negative'' amendments, all

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5   Additionally, as we will explain below, this fits better with the lag structure we use in the empirical analyses, as publication in the *Staatsblad* is the first easily observable sign of the rule-creation event.

measured in terms of the number of sentences. The neutral amendments can be omitted as they do not affect the size of rule density. Our first year of observation is 1960. Because we have no count of rule density in 1959, the net rule size change in 1960 is our baseline to or from which we cumulatively add or subtract net rule size changes in subsequent years. So, strictly speaking, we are measuring cumulative changes in density rather than absolute density. However, knowing the starting rule stock size in 1959—say, x—would simply have added this value x to our annual rule density, linearly lifting the time series up without any effect on the sign and significance of the estimates reported below. To check for the hypothesized nonlinear effect, we added "Rule density squared."

For the Dutch Ministry of Education, we counted the number of civil servants in the observation period, coined "Civil servant density." For this, we used different sources of information: Knippenberg and van der Ham (1994), the annual financial reports from the Ministry of Education published by the Second Chamber (*Tweede Kamer*), and recent estimates of the number of civil servants by the Dutch Ministry of Internal Affairs. Since only a very few of these years have no data, we were able to interpolate missing values from the surrounding years.

The demographic characteristics of ministers as to industry experience and age were derived from the curricula vitae of all postwar Dutch ministers of Education. These curricula vitae are all stored and maintained in the Dutch National Parliamentary Archive Institute. Additionally, many of these ministers have bibliographies that describe their personal and professional life in great detail. We have measured "Minister experience" as a percentage that expresses the amount of experience in education over the entire career that a minister had accumulated prior to becoming minister. As many of the ministers are recruited from the field, most of them already have experience in higher education—for example, due to a board position at a university. In a few instances, a minister did not have any relevant experience. In such a case, we assume that experience grows from zero in the first year to full experience in the third year. The rationale is that a minister is usually highly educated and, therefore, will quickly learn about the specific domain at the ministry. To explore the potential nonlinear effect of minister experience, we also add "Minister experience squared."

We measured the age of the minister at the start and at the end of the period and calculated "Minister age" as the mean value for each year. To test our hypothesis, we added "Minister age squared." In our observation period, due to elections and turnover of cabinets, sixteen different ministers headed the Ministry of Education. These ministers usually changed positions during the calendar year. To obtain an annual estimate for a "representative" minister in a given year with a change of ministers, we calculated the tenure in terms of the number of days (including a caretaker period) and used this as a weight for the experience and age measures of ministers.

"Cabinet power" was proxied by the surplus amount of seats the coalition had in the Second Chamber. There are 150 seats available. Obviously, a cabinet will need at least a minimum majority position (that is, 75 seats plus 1). Often, the coalition holds more seats that this bare minimum, thus commanding a more powerful position. The cabinet's power position is measured as the number of seats above that of the minimum majority position of 76.

We measured "Cabinet homogeneity" as one minus the squared Euclidean distance of cabinet parties in the political spectrum, weighed by the number of seats in the Second Chamber (cf., Boone et al. 2004). To explore the potential nonlinear effect of cabinet

homogeneity, we also added ''Cabinet homogeneity squared.'' We agreed upon the location of all political parties along a ''left-right'' dimension, after producing two independently made rankings, which generated a list that was double-checked against historical evidence. A numerical example may illustrate our measure. Assume a three-party coalition with liberal democrats (D66), Christian democrats (CDA), and liberal conservatives (VVD), with a seat distribution in the Second Chamber of 6, 44, and 28, respectively. Suppose that these parties score 4 (D66), 5 (CDA), and 7 (VVD) on our left-right dimension. A plot can be constructed with seats on the x-axis and left-right scores on the y-axis. In the quadrant, we can measure all pairwise Euclidean distances, which are then summed up and divided by the number of coalition partners (three, in our example). In our observation period, we observed 18 different cabinets. Usually, cabinet change emerged during the course of a year. To obtain an annual estimate for a representative cabinet in a given year with a change of cabinets, we calculated the tenure in terms of the number of days (including a caretaker period) and used this as a weight for constructing our cabinet power and homogeneity measures.

Control Variables

We include one control variable in our regression model: a dummy variable for 1985 (coded as 1 in 1985 and 0 otherwise). In our observation period, the number of events in terms of rule births, changes, and repeals fluctuates. In 1985, however, there was an absolute peak in the births of new rules due to the mass introduction of substantive new laws during the course of this year. The dummy variable 1985 controls for this unique peak. Of course, many other control variables could have been added. For one, we constructed different measures that account for the size of the demand for higher education—for example, number of students and the gross national expenditure on higher education (in current and constant prices). Additionally, we constructed different clocks that account for the age of the ministry, for important laws that reformed the educational system, and for different educational institutions (that are involved in the rule-making process as well). In the end, all these additional measures correlated almost perfectly either with each other or with the independent variables that we included in the present analysis. For this reason, they were omitted from the regression models.

Negative binomial regression

We apply negative binomial regression techniques to estimate the significance or nonsignificance of the hypothesized determinants of the birth of national rules (Allison 1984; Blossfeld and Rohwer 1995; Carroll 1983; Tuma and Hannan 1984). These techniques induce statistical entry rate regularities from time series. Similar techniques, focusing on estimating the determinants of events (here, entry), are common in political science. Examples are studies in international relations (Box-Steffensmeier, Reiter, and Zorn 2003; Box-Steffensmeier and Zorn 2003), decision making in the European Union (Golub 2002; König 2007), cabinet survival (Alt and King 1994; Warwick 1995), and parliament dissolution (Carmignani 2002; Strøm and Swindle 2002). To test our theoretical model, we analyzed rule birth in Dutch higher education for the period 1960–2004. We chose ''year'' as the time interval, which resulted in 45 observations.

    The dependent variable is a discrete counting measure. Hence, we start from the assumption that rule births follow a Poisson distribution. In doing so, we would estimate the

number of events (rule births) that occur in a specified time interval (in our case, a year). The Poisson model, however, imposes the restriction that the conditional mean of the dependent variable is equal to its variance. The negative binomial regression model generalizes the Poisson model by introducing an individual unobserved effect into the conditional mean, thus allowing for overdispersion in the data (i.e., variance exceeding the mean). Extensive experimentation using both approaches revealed that the Poisson process was not suitable for our data set. Hence, we will only report and discuss the results from the negative binomial model. We used the robust quasi-maximum likelihood (ML) estimation procedure implemented in E-views since this produces more consistent estimates of the parameters of a correctly specified conditional mean than the ML estimation procedure does, even if the distribution is incorrectly specified (cf., Santos Silva and Tenreyo 2006). Note that we ran our analyses with the ML estimator, too, by way of robustness check (available upon request). Indeed, the pattern of results is similar to what we report below. However, due to the nonnormal nature of the distribution of our dependent variable, the ML regression models' overall goodness-of-fit statistics are problematic.

A final remark relates to the lag structure. A priori theoretical and empirical arguments as to whether or not, and if so, when delayed effects emerge are generally missing. For rule-making processes, though, conventional wisdom suggests that our demographic and institutional measures will have delayed effects on national rule changes, because the rule-production process initiated by a cabinet and the minister goes through a series of time-consuming constitutional steps. This is why we decided to lag all demographic and institutional covariates in our regression models with 1 year. That is, our dependent variable is measured at year t, as are the constant, 1985 dummy and rule density variables, and all demographic (minister) and institutional (cabinet) covariates are from year $t - 1$. Indeed, the results reported below disappear altogether or are much weaker in the contemporaneous-throughout specification (available upon request).

EMPIRICAL RESULTS

The data show that all rule events took place. In the observation period, we used 178 amendment laws to identify the different rule events. Overall, we counted 1,815 rule birth events with a total size of 22,086 sentences (12.17 average size per new rule), 959 'neutral' rule changes, 123 'positive' changes with a total size of 955 sentences (7.76 average size per 'positive' change), 76 'negative' changes with a total size of 671 sentences (8.83 average size per 'negative' change), and 383 repeals with a total size of 2,734 sentences (7.14 average per repeal). As a result, the (net) stock of national rules for Dutch higher education increased by more than 800% in the postwar period (taking 1960 as our benchmark year, as explained above). The descriptive statistics and Pearson correlations are reported in table 1. The hierarchical regression results are provided in table 2, step-by-step adding ecological (Model 2), demographic (Model 3), and institutional (Model 4) variables to the baseline specification (Model 1).

Table 1 shows that all values of the correlation coefficients are below 0.80, which is the common threshold value for multicollinearity. The squared terms are the exception to this rule, by their very construction. However, our theory implies that they must be included. Further inspection of our data, using the comprehensive Model 4 from table 2, revealed that neither autocorrelation nor heteroscedasticity is an issue. Autocorrelation is problematic if the residuals are serially correlated. The Durbin-Watson statistic is

Table 1
Descriptive Statistics and Pearson Correlations[a]

Variable	Mean	SD	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1. Rule birth	957.709	409.571	1.000											
2. Rule density	224.386	397.839	0.104	1.000										
3. Rule density squared	205.025	745.764	−0.171	0.921	1.000									
4. Civil servant density	2,419.844	809.611	0.115	0.102	0.068	1.000								
5. Minister experience	92.075	16.526	0.097	0.065	0.075	0.211	1.000							
6. Minister experience squared	87.447	24.350	−0.105	0.067	0.082	0.173	0.989	1.000						
7. Minister age	46.339	4.422	−0.285	−0.084	−0.168	0.072	−0.442	−0.455	1.000					
8. Minister age squared	21.664	4.012	0.278	−0.085	−0.169	0.082	−0.456	−0.468	0.999	1.000				
9. Cabinet power	90.236	8.249	0.210	0.211	0.196	0.014	−0.089	−0.093	−0.162	−0.163	1.000			
10. Cabinet homogeneity	16.961	18.377	0.244	0.150	0.158	0.564	0.230	0.226	0.163	0.152	0.158	1.000		
11. Cabinet homogeneity squared	425.031	424.741	−0.138	−0.135	−0.520	−0.145	−0.133	−0.133	−0.306	−0.152	0.158	0.964	1.000	
12. Dummy 1985	0.023	0.151	0.097	−0.083	−0.042	0.082	0.074	0.080	−0.247	−0.240	0.173	0.193	−0.147	1.000

[a]The figures for the squared terms have been divided by 100 (for Minister age squared and Minister experience squared) and 1,000 (for Rule density squared) for presentation purposes only.

Table 2
National Rule Birth in Dutch Higher Education (1960–2004)[a]

	Model 1	Model 2	Model 3	Model 4
Constant	10.516*** (0.151)	3.218*** (0.767)	87.404*** (22.046)	71.869*** (25.369)
Rule density		0.005*** (0.001)	0.006*** (0.001)	0.008*** (0.001)
Rule density squared		−0.001* (0.006)	−0.002*** (0.006)	−0.003*** (0.006)
Civil servant density $(t-1)$		0.002*** (0.000)	0.002*** (0.000)	0.001*** (0.000)
Minister experience $(t-1)$			0.031 (0.179)	0.325*** (0.118)
Minister experience squared $(t-1)$			−0.007 (0.001)	−0.002** (0.001)
Minister age $(t-1)$			−3.786*** (1.012)	−3.438*** (1.131)
Minister age squared $(t-1)$			0.041*** (0.011)	0.039*** (0.012)
Cabinet power $(t-1)$				0.121*** (0.039)
Cabinet homogeneity $(t-1)$				0.291** (0.113)
Cabinet homogeneity squared $(t-1)$				−0.005* (0.003)
Dummy 1985	4.287*** (1.011)	5.732*** (1.019)	5.399*** (1.052)	4.176*** (1.121)
Log-likelihood	−522.52	−443.39	−431.47	−415.80
LR statistic	77.23***	203.53***	227.36***	258.71***
Degrees of freedom	1	4	8	11
LR index (pseudo R^2)	0.07	0.19	0.21	0.23

[a]SEs in brackets. The estimates for the path coefficients divided by the SEs result in z-values. The accompanying p values result from the standard z-distribution table.
*$p < .05$, **$p < .01$, ***$p < .001$.

2.17. This is above the critical upper bound value for the Durbin-Watson test at the significance level of 5% (1.86). Hence, the null hypothesis of no autocorrelation is accepted. Heteroskedasticity is problematic if the residuals do not all have the same variance, which may result in incorrect standard errors. The White heteroskedasticity test fails to reject the null hypothesis of no heteroskedasticity at the significance level of 1% because the p value of the F statistic is .26.

We estimated a set of hierarchical regression models examining first the (linear) relationship between rule birth and our control variables (Model 1). We then entered our main effects variables regarding ecological processes (Model 2), ministers' demography (Model 3), and cabinet features (Model 4), respectively. The various fit parameters show that our model increasingly fits the data better. For example, the likelihood ratio (LR) index improves from 7% in Model 1 to 23% in Model 4. Also, the estimates remain robust in terms of signs and significance levels, by and large. For that reason, we mainly focus our discussion on the results with reference to Model 4.

The empirical results provide strong support for our explanation of national rule births. The LR chi-square statistic of the final model was satisfactory (258.71 with $p < .000$), which ensured the improvement of the fit of our model over a model that included only the intercept. The estimated parameters for rule density ($\beta = 0.008$ with $p < .001$) and rule density squared ($\beta = -0.003$ with $p < .001$) have the expected opposite signs, and both are highly significant. Indeed, the density peak of 1,352,000 is within our observation range, which has a maximum of 29,000,000. Hypothesis H1 is, therefore, confirmed. Note that, as the net entry rate is positive throughout all years in our time window, a negative density

dependence effect is still associated to the rule stock growth (van Witteloostuijn and de Jong 2007, 2008). The estimated parameter for civil servant density is positive, as expected, and clearly significant in Models 2 and 3 ($\beta = 0.002$ with $p < .001$) but not so in Model 4, implying moderate support for Hypothesis H2.

Hypothesis H3 is partly supported: the experience of the minister with the domain of higher education significantly increases rule births in higher education law ($\beta = 0.325$ with $p < .001$ for the linear effect and $\beta = -0.002$ with $p < .01$ for the squared term). However, the effect is nonmonotonic, revealing a reversed U-shape, as the maximum of 89.312 is clearly inside our observation range of [0,100.000]. Moreover, the power position of the cabinet in the Second Chamber does indeed facilitate the introduction of new national rules for higher education ($\beta = 0.121$ with $p < .001$), implying that Hypothesis H5 is accepted. Cabinet homogeneity is nonlinearly associated with the introduction of new national rules ($\beta = 0.291$ with $p < .01$ for the linear term, and $\beta = -0.005$ with $p < .05$ for the squared term). Hence, Hypothesis H6 is partly confirmed. The effect is nonmonotonic, revealing a reversed U-shape, as the maximum of 27.320 is clearly inside our observation range of [0,38.080]. The parameter estimate for the 1985 dummy variable is positive and highly significant, which confirmed our expectation as to the unique situation in that year ($\beta = 4.176$ and $p < .001$).

The empirical results in table 2, however, do not support Hypothesis H4. Rather than the expected reversed U-shaped relationship between minister age and rule births, we find a U-shaped relationship. The estimated path coefficients for minister age ($\beta = -3.438$ and $p < .001$) and minister age squared ($\beta = 0.039$ and $p < .001$) have significant opposite signs but indicate a convex rather than a concave relationship to rule births. Indeed, the inflexion point of 44.257 is within our observation range, which has a maximum of 53.840. This implies that the productivity of young ministers decreases before, after a certain age, to increases again. We performed different additional analyses to verify the robustness of this result. We first estimated our model in terms of tenure of the minister rather than minister age. This, however, again confirmed a significant convex relationship. Hence, minister age and tenure go together in the explanation of national rule births. Subsequently, we removed the squared term for age in order to test the hypothesis that a negatively linear relationship might well exist between the age of a minister and her or his productivity in terms of the introduction of new rules. We found a positive but insignificant relationship in this regard.

Our interpretation of this unexpected result is three-fold. First, the risk-averse incentive structure, which is a crucial assumption underlying Hypothesis H4, may not hold for ministers in government cabinets, as opposed to managers in for-profit organizations. Young ministers might feel the ambitious and energetic pressure of the young to prove themselves. Hence, initially, they are extremely productive rule makers, in an attempt to show that they can do the legislative job. This may explain the initial high-end starting point of the age-dependent rule-making curve. Second, the risk of a breakdown in terms of career failure for younger ministers is relatively high. This is particularly an issue for ministers of moderate age, with a career and family at stake. As a result, their rule-making behavior will be more moderate, reflecting their more risk-averse attitude. This would imply the downward slope after the high end of the age-dependent rule-making curve. Third, older ministers have less to lose and have a greater incentive to collect their 'trophies' in order to leave their stamp on history. Indeed, new rules of considerable size often receive the name of the minister who introduced these rules. The temporary position of a minister

may further amplify this. Also, older ministers usually are financially independent—or, given their wealth of expertise and personal network, have greater opportunities for other civil careers. Prestige is a well-known driver for ministerial behavior at this point of their career. Moreover, the introduction of new rules requires a considerable amount of expertise, which takes a great deal of time to accumulate. In addition to this, the decision-making process at a ministry is extremely complex. Older ministers generally have more experience, managerial capabilities, and natural authority over civil servants, both in the department and in the field. Together, these competences might result in greater productivity in terms of the introduction of more and new national rules for higher education at older age. This will generate the upward-sloping part of the rule-production curve.

CONCLUSION

This article intends to empirically unravel the underlying causal mechanisms that determine the rate of national rule births. In the evolution of national law, rule birth is one of the most important events, particularly when birth rates exceed repeal rates. This is often the case because national rules tend to be rarely suspended. A careful inspection of our sample with respect to Dutch postwar higher education shows that more and more regulations are indeed being added to the existing stock at an ever-increasing rate. Today, the doubling rate for the national rule stock in Dutch higher education is less than 10 years. To a certain extent, these results confirm the widespread perception in the field of Dutch universities. Our study is one of the first to have empirically tested this general common wisdom. We developed a method of rule counting which—in line with our definition of a national rule—has allowed the construction of time series for rule births, changes, and repeals. By doing so, we have resolved some of the complexities that have, to date, hampered a quantitative analysis of the evolution of national legislation. On the basis of this data, we have estimated models that predict linear and nonlinear relationships between different covariates and rule birth.

Our findings reveal that ecological, demographic, and institutional processes can indeed explain the birth rate of national rules. The stock of rules expands due to a powerful internal dynamic: that is, rules breed rules, following a reversed U-shaped density dependence pattern. For the 'stock' of rule-producing civil servants, we find moderate support for the hypothesis that rule makers breed rules. In addition, the minister's experience in the educational domain throughout the entire career prior to becoming a minister is important: ministers are more 'productive' in proportion to their affinity with the substance of higher education up to a point, after which their rule production starts to decline. Moreover, a stronger power position of the cabinet in the Second Chamber facilitates the introduction of new rules, whereas the effect of cabinet homogeneity reveals a reversed U-shape. All this is as expected, by and large. A somewhat surprising result concerned the effect of the age of the ministers. Following the demographic literature, we predicted a concave relationship with rule birth. Instead, we found a convex relationship. Ministers apparently face age and government-specific risk and career incentives that result in reversed U-shaped age-productivity curve. Overall, our study aligns well with the suggestion that ecological and institutional theories must be merged to develop a better understanding of complex population-level dynamics (Amburgey and Rao 1996; Baum and Oliver 1992, 1996; Baum and Powell 1995).

We envision at least three opportunities for future research, which may help to overcome some of the inevitable limitations of our study. First, because of the size of our sample (that is, 45 observations), we could only include a limited number of variables in our

empirical models. Although these variables reflect key theoretical perspectives and, there-fore, offer a primary foundation for a demographic institutional ecology of national rules, many more potential drivers of the evolution of law can and need to be considered, such as tenure, political, and religious background of ministers, similarity of demographic char-acteristics with the state secretary (who in the Netherlands is very important in the new legislation process) and team composition features of cabinets (such as mean and spread of age, tenure, and educational background). Additionally, in future work, we hope to in-clude proxies for rule-making pressures from the demand side, such as the density of lob-bying groups. Of course, the more comprehensive models that follow from this can be estimated not only for rule births but also for rule changes and suspensions. Comparing the underlying causal mechanisms would allow for the identification of similarities or dif-ferences in the explanatory mechanisms for these three key events.

Second, to be able to estimate larger models, larger data sets must be compiled. The collection of new data from other countries or from other domains of law would enable to verify the generalizability. For one, particularly Europe offers a natural laboratory for em-pirical research in the demographic institutional ecology of national rule evolution since different European countries have produced different evolutionary trajectories in different institutional settings. These differences are associated with differences in the process, or-ganization, and 'culture' of national law systems. Moreover, the collection of new data from other domains of law offers opportunities to test for cross-population dynamics. For exam-ple, it might be that the population of Dutch rules for higher education is a reaction to the dynamics of European legislation created in Brussels. Similarly, various other domains of national rules, such as company or media law, are interesting alternative settings.

Third, in this article, we estimated models with main effects only. In future work, re-search may move forward by including interaction effects between, for example, ecological variables and demographic and institutional features. Evidence scattered throughout the ecological literature suggests that—alongside the endogenously driven ecological processes within populations—it is the interaction between institutional settings and the evolution of rules that matters. For example, the evolution of the Dutch auditing industry has been heavily influenced by formal law-setting events that regulate the demand for auditing services (Maijoor and van Witteloostuijn 1996; Pennings, Lee, and van Witteloostuijn 1998).

A final remark relates to the potential applicability of our perspective to broader issues of bureaucracy and rule making. We believe that the ecological perspective as proposed here offers a promising platform to further develop a general theory of bureaucracy and rule making. As such, ecology is associated with a well-established and rich toolkit for the study of evolutionary processes in communities of social entities. This is not only clear from the ecological study of a wide variety of organizational populations in sociology (e.g., Carroll and Hannan 2000) but also from the ecological approach to the evolution of interest groups in political science (e.g., Gray and Lowery 2001a, 2001b) and of bureaucratic rules in or-ganization studies (e.g., Schulz 1998). Indeed, insights from demographic and institutional theories from the group psychology literature (e.g., Finkelstein and Hambrick 1996) and bureaucracy and legislative theories in public administration (e.g., Ringquist, Worsham, and Eisner 2003) can be easily integrated into such an ecological perspective on the law-making processes, as we hoped to have demonstrated above. In doing so, the three essential building blocks of a theory of the evolution of law (or rules, more generally) are in place: the intrinsic ecological dynamics of any population of social entities, the

institutional rules of the game within which the ecological processes evolve, and the key demographic features of the agents and their bodies that, ultimately, have to decide on making, changing, or suspending rules.

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