



# A national systems view of university entrepreneurialism: Inferences from comparison of the German and US experience

Mark Lehrer<sup>a,\*</sup>, Phillip Nell<sup>b</sup>, Lisa Gärber<sup>b</sup>

<sup>a</sup> Sawyer School of Management, Suffolk University, 8 Ashburton Place, Boston, MA 02108-2770, USA

<sup>b</sup> Institute for International Marketing and Management, Wirtschaftsuniversität Wien, Augasse 2-6, A-1090 Vienna, Austria

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## ABSTRACT

Examining parallels in the long-term evolution of the German and US university systems, this paper formulates hypotheses about the rise and decline of university entrepreneurialism at the national level. Three macro-level antecedents of university entrepreneurialism are identified: (1) decentralized competition; (2) latitude in mission and revenue mix; (3) a nationwide, diversified bidding system for the funding of large-scale university-based research. Of these, the third is real lynchpin of university entrepreneurialism. Arguing for a multidimensional understanding of such entrepreneurialism (i.e. beyond just the commercialization of scientific discoveries), the paper identifies three developments within universities emanating from a favorable national environment: (1) organizational innovations for achieving economies of scope; (2) an institutionalized capacity for strategic selection of research foci; and (3) a capacity to contribute to the development of new industries. The analysis suggests that as national university systems grow and run into cost containment problems, political pressures for reform increase, leading to system homogenization; system homogenization weakens the contextual sources of entrepreneurialism and triggers a process of decline.

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## 1. Introduction

The modern university represents an evolutionary paradox. Observed up close, most universities appear to be paragons of inertia: bureaucratic, inefficient, and much less flexible organizations than private sector firms. Yet from an evolutionary perspective, universities demonstrate remarkable longevity, with histories often extending back to the medieval or Renaissance era. While it may appear tempting to ascribe this to a stable environment, the environment in which universities operate is actually quite dynamic. Not only do universities have to contend with rapidly expanding frontiers of knowledge (Ben-David, 1977; Clark, 1993), but they also engage in an expanding array of tasks beyond teaching and research, including cooperation with industry, technology transfer, and new firm creation. This has given rise to an extensive, albeit heterogeneous body of research on the “entrepreneurial” university (Etzkowitz, 1983; Clark, 1998; Siegel et al., 2003; Lockett et al., 2005; Rothaermel et al., 2007).

This contribution addresses the following question: What are some of the basic drivers and characteristics of entrepreneurialism within national university systems? Departing from the usual

focus on individual universities, we adopt a national perspective on the entrepreneurial roles that universities play (Casper and Kettler, 2001; Rosenberg, 2003; Gittelman, 2006). The analysis illuminates parallels between two national university systems – in Germany before 1914 and in the US after 1940 – that were particularly “entrepreneurial” not only in the narrow sense of seeking commercial exploitation of scientific discoveries but also in a broader dynamic sense: capable of self-development, adaptable to the changing nature of science, and an agent both in the performance of “open science” (Dasgupta and David, 1994) to expand the frontiers of basic scientific knowledge *as well as* in the transfer of this knowledge to industrial application. Germany and the US featured the world’s leading national university systems in these respective eras, and we believe that entrepreneurialism, as defined below, constitutes a useful category for understanding the ascendancy of national university systems – and their decline.

It might be objected that the German university system before 1914 and the US university system after 1940 reveal considerable dissimilarities. Yet this is precisely why study of the remaining parallels is an instructive exercise, facilitating a conceptualization of university entrepreneurialism that transcends specific and current incarnations of the phenomenon. Based both on historical evidence and on theoretical grounds, we posit three indispensable contextual factors for entrepreneurialism in national university systems,

\* Corresponding author. Tel.: +1 617 573 8000.

E-mail address: [marklehrer@gmail.com](mailto:marklehrer@gmail.com) (M. Lehrer).

of which the third is particularly crucial and difficult to implement effectively:

- (1) decentralized competition;
- (2) latitude in mission and revenue mix;
- (3) an institutionalized, diversified bidding system at the national level for public funding of large-scale research projects.

Erosion of these same factors can, according to the same logic, contribute to the decline of entrepreneurialism within a given national university system.

Discussion is organized as follows. Section 2 proposes a framework of entrepreneurialism in national university systems. Sections 3–5 provide a theory-based historical retrospective using this framework. Section 3 highlights key structural characteristics of the pre-1914 German university system, leading to ascendancy of this system. Section 4 reviews how broadly similar characteristics emerged in the ascendant US university system after 1940. Section 5 shows that within Germany many of these structural characteristics were eroded by well-intentioned reforms, leading to a loss of vigor in both basic science and in the commercialization of science. Rather than attributing this development to shortsighted policy-making, the analysis imputes the relative decline of the German university system to a life cycle effect which, as suggested in Section 6, could play itself out in broadly similar ways in the US and elsewhere.

## 2. A framework of national university system entrepreneurialism

In some treatments of university entrepreneurialism, “entrepreneurial” is largely synonymous with “dynamic” (Clark, 1998; Röpke, 1998; Etzkowitz, 2003). The antipode to an entrepreneurial university is a bureaucratic or otherwise static university that carries out a narrow purpose with little view to self-development or adaptation to changing circumstances. In other treatments of the topic, “entrepreneurial” is largely synonymous with “commercial”: the antipode to an entrepreneurial university in this sense is a university that engages in scientific discovery but fails to follow up on it by engaging in technology transfer, incubating new firms, or networking with industry (Siegel et al., 2003; Lockett et al., 2005).<sup>1</sup>

Our contribution builds squarely on the former and broader definition of the entrepreneurial university in order to flesh out the macro systemic conditions that facilitate adaptive self-development in universities. Nonetheless, commercial activities are one indicator of such self-development and, moreover, one that varies substantially among different national university systems (Nelson, 1993; Freeman, 2004). As an illustration, the EPO patenting statistics collected by Malik (2006) and excerpted in Table 1 reveal striking variation in university systems as they affect the vital scientific area of biotechnology, which requires deep capabilities in both basic and applied research (Rothaermel and Deeds, 2004).

While US and UK universities filed 5626 and 362 biotechnology patents respectively during the years 1994–2005, French universities filed five and German universities nine during this same period. Variation in country-level university entrepreneurialism in explaining these differences has been amply demonstrated (Casper

**Table 1**

EPO biotechnology patents (K-1, K-2, K-3) filed by universities, 1994–2005.

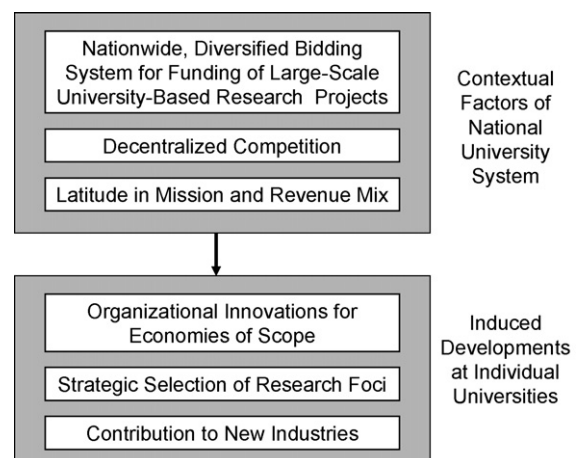
Country	Number of patents	Patents per million inhabitants
US	5626	18.9
UK	362	6.0
China	210	0.16
Israel	112	17.5
Germany	9	0.11
France	5	0.08

Source: Malik (2006).

and Kettler, 2001; Lehrer and Asakawa, 2004; Gittelman, 2006). But where does such entrepreneurialism come from? And how can one explain differences in the depth, breadth, and adaptability of activities among national university systems in the first place?

A framework of national university system entrepreneurialism is depicted in Fig. 1. While the framework does not purport to specify all of the factors that make one national university system more entrepreneurial than another, it provides a theoretical synopsis of the historical analysis that follows and serves as a point of departure for considering the broader factors affecting the ascendancy and decline of national university systems.

The framework postulates that the emergence of entrepreneurial universities depends on a structured interface between the invisible hand of market forces and the visible hand of public R&D funding. The interface consists of three contextual factors at the national level. The first of these, and the real lynchpin of university entrepreneurialism, judging by the systems considered here, involves a nationwide, diversified bidding system for public funding of large-scale university-based research projects. A well-funded “marketplace of scientific ideas” helps direct resources to the most innovative groups and individuals, ultimately increasing overall public-sector support for science (Ben-David and Zloczower, 1962; David, 2004). Like other markets, academic markets do not work well if they are entirely regulated or deregulated, but instead require the construction and maintenance of specific market institutions. The postulated bidding system is a market and diversified in the sense of not only a diversity of possible recipients, but also a diversity of public funding sources (as opposed to a monopsonistic one); this is consistent with the findings of national comparisons of public science systems highlighting the adverse consequences of concentrating public R&D funding in a single agency (Whitley, 2007; Whitley and Gläser, 2007). As suggested below, the construction of an effective and efficient national bidding system for funding of university research is a non-trivial challenge.



**Fig. 1.** National university system entrepreneurialism.

<sup>1</sup> The growing dominance of the latter conception is indicated by a recent review by Rothaermel et al. (2007), who found that technology transfer offices, new firm creation, and networks of innovation (plus other aspects of the larger environment) constitute three of the four major categories of work on the entrepreneurial university.

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