



Institutionalizing the triple helix: research funding and norms in the academic system

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Abstract

What are the institutional mechanisms that enable or hinder the development of new forms of knowledge production? This issue has been slightly neglected in the discussion of the “triple helix”. To redress this shortcoming, the authors suggest an institutionalist complement to the triple helix model. The article analyzes the institutional regulation of academic research, with a special emphasis on how norms in the academic system are constituted via research funding. It is argued that funding is a key mechanism of change in the norm system since its reward structure influences the performance and evaluation of research. The empirical analysis is based on the public financing of technical research in Sweden, with comparisons made with other countries. The structure of research funding has been reformed in all the countries studied. In addition to continuing recognition for scientific merit, the reforms have had the effect of emphasizing the commercial potential and the societal relevance of the research supported. The two dominant models of research funding, an intra-academic model and a top-down interventionist model, seem to be replaced partly with a catalytic one. However, there are counteracting tendencies. Some agencies still reproduce a model of reputational control and a collegial orientation among researchers. It is concluded, therefore, that the forces of change and continuity are engaged in a process of negotiation about the normative regulation of academic research. © 2000 Elsevier Science B.V. All rights reserved.

Keywords: Triple helix; Research funding; Academic system

1. The regulation of academic research

Since the late 19th century, and especially since World War II, university research has been regulated by a norms system emphasizing disciplinary knowledge production and the importance of collegial recognition. Through this normative convergence,

universities in different national, political, and organizational settings have come to share the same tasks, routines, and norms (Clark, 1983). Thus, the university sector has emerged as a distinct “organizational field” in society (cf. Scott, 1995). One important element in the development of this self-regulation has been the establishment of research funding agencies controlled by the researchers themselves. Historically, the dominant institutional order within the academic system has been the system of collegially based norms, emphasizing quality assessment. The increase in public spending on academic

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research after World War II was central in this process of normative integration. The research councils were the main instruments of the increase in research funding, and the councils were controlled by researchers, evaluating research on the basis of its scientific merit.

It has, however, been suggested that the performance and regulation of university research is undergoing a change that will erode the organizational and normative boundaries of the university system. The concept of the triple helix, developed by Etzkowitz and Leydesdorff (e.g., Leydesdorff and Etzkowitz, 1996; Etzkowitz, in press), refers to this process. Industrial and political interests have been integrated into the evaluation, organization and performance of university research, challenging the collegial control of research. In connection with this, it has been claimed that a new “organizational field”, broader than the traditional university field, has emerged: the knowledge-based economy, consisting of industry, the state, and the academic system. The development of the new field is accompanied by an institutional order based on the integration of political, industrial, and academic interests in the conduct and regulation of research, politics, and economic activities. The actions and strategies of some university researchers play a central part in the evolution of the knowledge-based economy, with entrepreneurial scientists bridging the gap between academia and the market (Etzkowitz, in press). Furthermore, the role of public institutions in redirecting academic work towards commercial applications and industry–university collaboration is central. Thus, all three spheres of the triple helix (the political, industrial and academic) have merged within the new organizational field (“knowledge-based economy”) guided by a norm system stressing the importance of techno-economic renewal and market-determined success.

While we see this as a valid picture of research organization in contemporary societies, we believe that it lacks a more specified model of the interplay between actors, organizations and institutions in this transition. It is our conviction that the triple helix model could gain from an integration of concepts from the tradition of neo-institutional theory. From a neo-institutionalist perspective, an organizational field develops through a process of “organizational isomorphism”: the procedural routines of one orga-

nization are spread to other organizations (DiMaggio and Powell, 1991). This dissemination of routines, structures, and norms of organizations is the result of coercive, normative, and mimetic processes (Scott, 1995). For the university system, the criteria for resource allocation to universities and research groups, and public regulation of the performance of research, represent coercive forces compelling particular forms of conduct. The normative processes refer to the norms and values that regulate conduct within organizations. The collegial orientation of scientists is fostered by normative structures and procedures such as peer review. The mimetic processes are expressed in the copying, by one organization, of the daily routines of another organization. This is exemplified by the way in which researchers, research groups and universities cope with the pressure from outside sources. They often do this by imitating the means by which successful counterparts manage problematic aspects of their organizational environment, such as research-funding agencies, political structures, and industrial interests.

When an organizational field emerges, it centers on an *institutional order*. In the formation of an organizational field, routinized patterns of conduct which have mobilized support from the environment are established and internalized by the organizational actors in the field. An institutional order becomes broadly accepted and sustained by all actors involved, creating stability for the organizational routines (Douglas, 1986). The procedures of academic research are standardized in this way, with the result that the structure of university research is reproduced over a period of time.

How, then, can changes in institutional orders and restructurizations of organizational fields — like the one postulated in the triple helix model, be explained? In this article, we concentrate on the role of research sponsors. Funding agencies operate on all three levels of influence (coercive, normative and cognitive): their operational routines and administrative structures form the basis for the researchers’ applications. Their criteria for evaluation can, to a large extent, be expected to influence the normative orientation among researchers. Finally, their decisions indicate for research groups the types of research performance and organization that are rewarded.

On this basis, we assume that funding agencies contribute to constructing, reproducing, and changing the institutional order of academic research. They do so by influencing the evaluation of research and the mechanisms of reputational control (Elzinga, 1985, p. 209). The first issue refers to the standards by which research is evaluated, the second to the constitution of a reference group for researchers. For instance, a traditional academic research council is controlled by academic researchers, and tends to emphasize an orientation toward fundamental issues within a discipline. A mission-oriented agency can instead be expected to stress problem-oriented research with utility as an important criterion. The research that it funds is meant to be evaluated within a broader social community, consisting of practitioners, interest groups, etc., and disseminated in a “user-friendly” manner. Thus, these two ideal-typical models of funding agencies structure norms in academia in two different directions: the former emphasizing issues and perspectives accepted within the “scientific community”, the latter encouraging researchers to focus on matters of relevance to social practice.

The organization of funding, the criteria that funding agencies apply in the selection of grants, and the standards by which the results of research are evaluated thus influence the institutional order of the academic system. By structuring their research support into categories of different kinds (disciplines, problem areas, social or industrial sectors, etc.), research sponsors steer the attention of potential applicants in a specific direction. With their criteria for evaluation, whether developed by peers or by officials and practitioners, and with their evaluation criteria, research sponsors influence the expectations and orientations of the applicants. Thus, research sponsors influence the framework for research performance and the networks which form part of the research environment.

1.1. The role of research funding

What is the role of funding agencies in the re-structuralization of organizational fields? We have argued that organizational fields emanate partly as a result of mimetic processes. Organizations cope with uncertainty by imitating successful counterparts,

leading to a convergence of norms and routines among organizations performing similar tasks. The research sponsors shape the environment in which the mimetic processes operate. “Successful” organizations within the academic field are those which can attract funding, recognition, and prestige (Sandström, unpublished). When a researcher or research group receives a grant, it is an indication of recognition. That recognition, of course, enables the reproduction of the research organization. Thus, we argue that grant-giving agencies function as societal agents structuring research performance and the institutional norms of academic research. As a result, the actions taking place within the academic system are dependent on and structured by the funding agencies.

To illustrate how funding agencies influence the constitution of organizational fields, we will use the model of the triple helix. From this perspective, the organizational field and institutional order for academic research are changing. After the first “academic revolution” (when the universities incorporated research into their organizational activities), industry, university, and policy were separate organizational fields with separate institutional orders. The academic system focused on fundamental research, organized along disciplinary boundaries, and had only limited and mediated contacts with politics and industry. Research councils, although acting on behalf of the state, maintained the boundaries between the academic system and the rest of society, and directed the attention of academic researchers toward collegial recognition.

Now, with the “second academic revolution”, a new organizational field and institutional order are emerging. The field, the “knowledge-based economy”, incorporates industrial, academic, and political actors, placing “the university in a new alignment with the productive sector” (Leydesdorff and Etzkowitz, 1996, p. 3). The institutional order of the “knowledge-based economy” transcends the boundaries of the first academic revolution. Academic research is pursued with openness towards practical applications and commercial exploitation of academic research. Thus, for the transition to the “knowledge-based economy” to be completed, research sponsors must be reformed. They play a vital role in the process of redirecting the normative orien-

tation and actions of individual researchers within the new organizational field. They can also, however, reproduce existing routines, halting or hindering the transformation of the institutional order and organizational field.

As a consequence of the emphasis on institutional factors for changes in knowledge production, our discussion will focus on two issues related to the institutionalization of a triple helix. First, we analyze the role of research sponsors in the future regulation of university research, and second, the impact of the sponsors' strategies for the constitution of an organizational field for academic research. The first issue refers to how the agencies influence the criteria for performing research — in collaboration or isolation, in disciplinary or transdisciplinary structures, with a target of academic excellence or applicability, etc. The second issue refers to the formation of networks that are steered by actors both outside and inside the academic system. The following questions arise: To what extent are such networks established by the research sponsors? By whom and by what criteria are proposals evaluated? To which agencies are the networks related? These issues focus on how academic research is internally organized and externally connected.

Our assumption is that institutional structures play a significant role in the emergence of new cognitive and organizational models within the academic system. The institutionalization of a triple helix model of knowledge production is critically dependent upon new forms of research funding. Section 2.2 examines the development of research funding in Sweden and a number of other countries in order to illustrate the interaction between norms and organizational fields, on one hand, and forms of research funding on the other.

2. The funding of technical research — change and continuity

We have argued that the organization and normative regulation of technical research is an area in which forms of research funding play a crucial role. Changes in research performance and interaction between research and various forms of social practice must be related to the strategies of research sponsors. To illustrate the strength and scope of this argument,

we will now provide an account of the strategies of the dominant technical research funding agencies in Sweden. This includes an assessment of their influence on the institutional order of academic research and the structuralization of an organizational field for technical researchers.

The interpretation of the Swedish case is based on official documents, fieldwork including some 50 interviews conducted with academic researchers and research officials of the funding agencies between 1995 and 1997, and previous studies by the authors (Benner and Sandström, 1996; Sandström, 1997, Sandström, unpublished; Sandström et al., 1997). The generalizability of these findings will be illustrated by comparing the Swedish pattern of development with those of other Western countries.

2.1. *The funding landscape for technical research in Sweden*

In Sweden, a considerable proportion of funding for academic research is allocated through sectorial bodies reporting to other ministries than the Ministry of Education and Science. The university sector is the main recipient of money for applied research and development, since the research institutes are few and of little importance in Sweden. R&D in Sweden focuses heavily on certain key industries. Together, the five biggest R&D areas account for more than 80% of all research and development spending in industry. And these resources are concentrated among a few companies. Pharmaceuticals is the most R&D-intensive industry and it is closely followed by telecommunications (NUTEK, 1998).

Governmental funding of R&D in natural science, engineering science and medicine is channeled through three different institutional mechanisms:

- Faculty appropriations directly from the Ministry of Education and Science.
- Peer-reviewed funding from the research councils.
- Projects funded by various governmental agencies.

There are also a number of old and new foundations that fund academic research (12% of current cost of university R&D in 1997, Statistics Sweden, 1999). Faculty appropriations are relatively low in Sweden in comparison with other countries. The share was 36% for engineering sciences and around

50% for natural science and medicine in 1997 (Statistics Sweden, 1999). This highlights the importance of studying patterns of research funding in the Swedish case.

There are three dominant actors in the funding landscape for technical research in Sweden: the mission-oriented sectorial agency NUTEK, TFR which is a traditional research council, and SSF which is oriented at “strategic research”. Below, we will discuss their considerations and the effects that these will have on the organizational field and institutional order for academic technical research in Sweden. What needs to be stressed is the substantive shift in research priorities with the increasing importance of “strategic research” funding during the late 1990s and relatively large cuts for research councils and sectorial agencies. This shift has important implications for the regulation of academic research. The diversity of funding will, however, also create ambiguities in the organizational field and institutional order.

2.1.1. The Swedish National Board for Industrial and Technical Development (NUTEK)

The largest technical funding agency in Sweden, with an R&D budget of almost US\$100 million (SKr700 million), is NUTEK. The dominant part of NUTEK’s support to technical R&D is channelled to the academic system. NUTEK and its research officials have tried to use this “constraint” as a way of steering university research into lines that are relevant to industrial R&D. Thus, NUTEK aims to connect and integrate academic research with the dominant part of Swedish industry (engineering, forestry, machinery, etc.). NUTEK views itself as the “voice of industry” within the academic system, acting as a bridge between academic and industrial interests.

NUTEK has developed a system of steering committees connected to its support programs. The committees are dominated by industrial representatives but include academics as well. The committees do not act as micro-regulators of research contracts. That function is concentrated in the hands of research officials (Sandström, 1997). The committees focus on strategic issues for research funding, and, arguably, on strengthening the dialogue between NUTEK and industry.

The organizational structures and routines of NUTEK have developed according to two dominant principles: relevance and efficiency. Research support is structured according to industrial sectors and technologies, such as information technology and transportation. Research programs, where academic and industrial researchers sometimes cooperate, are also oriented towards strengthening the technological foundation of industry (Marklund, 1994). From NUTEK’s perspective, this means that it is necessary to delegate decision-making to competent and well-connected officials. The criteria for evaluation also reflect a balance of concerns for quality and relevance. The research officials are crucial for the evaluation of incoming project proposals, while a more traditional collegial evaluation is set up to assess the scientific quality and, in some cases, also the relevance of the proposals (NUTEK, 1996).

NUTEK intends to act as a “network entrepreneur”, fostering coalitions between industry and academic researchers in the development and dissemination of new technologies. Academic researchers have, from NUTEK’s perspective, a tendency to neglect issues and areas of relevance to industry. Industry can enhance its long-term R&D planning through contacts with academic research. These contacts are made, for instance, through mobility of researchers, research cooperation, technology transfer, etc. (NUTEK, 1998). The starting-point and reference for NUTEK’s support to academic research is therefore the technological competence of the existing industrial structure. NUTEK has been far less successful in establishing new areas of industrial and technological development (Sandström and Tisell, 1998).

2.1.2. The Swedish Research Council for Engineering Sciences (TFR)

TFR is another large public funding agency with an R&D budget of about US\$40 million (SKr300 million). TFR is a research council in the classical sense, with a collegial rather than a managerial leadership. Significantly, TFR was established in 1991 as a political counter-reaction to the massive development of mission-oriented agencies during the 1970s. The Council is oriented toward securing the latitude for basic research within the technical universities in Sweden. It also acts as a counterweight to

NUTEK's orientation toward industrial interests in the more narrow sense (TFR, 1994).

The objective of TFR has been to shelter researchers from short-term pressures for industrial relevance. Instead, it tries to induce the researchers to formulate long-term issues and to identify themselves as members of an international community of scholars. TFR should, therefore, in the same way as councils for medical and natural science research in Sweden, foster an international outlook among the applicants for research grants (Sandström et al., 1997). As a reflection of this orientation, TFR has only a very small secretariat. Furthermore, the council as such does not place itself at the centre of different networks. That role is instead played by the researchers who are supported by TFR.

The organizational structure and routines of TFR is modeled on those of traditional research councils. A number of technical research areas (technical chemistry, computer science, electronics, etc.) are the basis for the organizational matrix. A secretariat aids the work of program committees, which are dominated by national researchers and supplemented by international reviewers. Arguably, the committees form the core of the council, with the board and the secretariat supplementing and supporting the committees. TFR thus represents a collegial self-organization of technical research, where the founding principle is that scientific quality — evaluated by peers — should guide resource allocations.

The size of the projects funded by TFR is relatively limited, even though it has larger grants than other Swedish councils. TFR thus concentrates on funding as many projects as possible, rather than emphasizing large-scale research programs. This is also in line with the aim of establishing broad legitimacy among the researchers (Sandström et al., 1997).

The criteria for evaluations of applications (*ex ante*) and research performance (*ex post*) reflect the orientation towards collegial recognition and international orientation. Scientific excellence and the novelty of the project design are the primary criteria. The role of international reviewers is established to avoid intellectual insularity in problem formulation and nepotism in project selection. The criterion of industrial relevance is more or less absent in the selection process, although the council maintains a well-developed network with industry. For some ar-

eas — such as materials and technical mechanics — the role of international reviewers is less emphasized, as is the demand for scientific excellence. In such areas, TFR tries to encourage the development of research communities.

In terms of an organizational field for technical R&D, TFR tries to establish and sustain a national scientific community with international academic linkages. Swedish technical researchers should thereby orient themselves to a broad community of technical scholars, where their work will be evaluated. TFR aims at supporting research and the training of researchers, and reinforcing the international orientation of technical researchers. Industry is expected to gain indirectly on the basis of a strong, independent and internationally renowned academic sector. Industry and academia represent two different systems with their own logic of action, norms systems, etc. TFR should maintain the separation of the two with the expectation that both industry and academia will benefit from this.

2.1.3. The foundation for strategic research

A new research sponsor, representing a new organizational form of supporting research, is the Strategic Research Foundation (SSF). The foundation is formally private, but was founded in 1993 with government support, including a huge donation (US\$2 billion or SKr15 billion). According to its mandate, the foundation shall direct its support to academic research marked by international recognition for scientific excellence as well as good prospects for industrial applications. Research funding should also be long-term and focused: only very large programs with a budget of about US\$2 million per year, lasting for at least 5 years should be supported. Academic and industrial actors jointly design research programs (SSF, 1998).

The foundation has established itself as a major player in research funding, awarding research support of about US\$100 million (SKr700 million) per year. Support to technical research areas includes programs in microelectronics, personal computing, engineering design, and combustion science. The programs, headed by academic researchers, also have steering committees composed of both academic researchers and industrialists. The programs are primarily oriented toward support for postgraduate re-

search and for interdisciplinary and cooperative research.

SSF tries to establish a transinstitutional network. The goal is to foster common interest among academic and corporate researchers. SSF attempts to build alliances between industry and the university system through the mobility of researchers and through the joint organization of the research programs. When the programs are being organized, relevant researchers and industrial interests are identified. In structuring research support, industry's need for qualified researchers is a central target, whereas the programs are implemented within the academic system. Thus, both industry and academia are the targets of the foundation's programs. Industry's competitiveness should be enhanced through increased supply of PhDs, while the academic system should integrate industry's knowledge interests — such as the demand for highly qualified researchers with a broad and industrially relevant competence profile — in its organizational routines.

The routines of the foundation reflect the attempt to integrate industrial and academic interests. Programs of industrial interest are developed within the academic system to satisfy academic standards. The programs are thus not developed by the foundation. It acts primarily as a catalyst and as an “incubator” of new organizational forms within the academic system, with the ultimate intention of raising the competence level of industry. The dual target — academic reform to enhance corporate competitiveness — is reflected in the evaluation process. Proposals are evaluated on the basis of their international scientific level and their relevance to industry (as measured in the number of PhDs employed by industry). The foundation thus encourages a new form of knowledge production and organization, emphasizing industrial connections, heterogeneous organizational structure, and managerial leadership.

The organizational field that SSF has created is transinstitutional. The main targets of the foundation's programs is to match industrial and academic organizational forms by controlling the structure, volume and output of university graduate education. As a result, university graduate education should become more receptive to the qualitative and quantitative needs of Swedish industry for qualified personnel. The supply of qualified personnel, in this

case scientists and engineers with research training, is seen as a critical factor behind economic growth and the creative utilization of the economy's resources. On the other hand, the emphasis on initiatives taken within the academic system (and the stress on quality control) should mean that the university system retains most elements of its traditional autonomy, but with a greater openness to industry's interests. The ultimate intention is to foster a self-regulating system, where industry and academia interact in the development of programs for knowledge production and graduate education. Thus, SSF supports large-scale programs in areas with both academic and industrial potential, a function which neither the research councils nor the mission-oriented agencies have hitherto been able to fulfill in the Swedish system (Stankiewicz, 1997).

2.1.4. Funding from the European Union (EU)

Funding from the EU is becoming increasingly important in the Swedish academic system. During the Third Framework Programme (1990–1994), Swedish participation — at the time regulated by the EEA treaty, since Sweden joined the EU in 1995 — amounted to about US\$40 million (SKr250 million) yearly, of which universities represented about 40% (SOU/1996: 29). Although an evaluation of participation in the Fourth Framework Programme has not yet been done, Swedish participation has been projected to reach over US\$200 million (SKr900 million) yearly during the Fourth Framework Programme (*ibid.*). We will not deal with the organizational structure of the EU programs in detail. It seems sufficient to point out that the EU programs operate to increase the share of funding for academic research that is evaluated on the basis of its relevance for industrial interests and its connection to actors and research interests outside the academic system.

2.2. Empirical generalizations

The Swedish case thus indicates a trend towards an extended organizational field for academic research. It also includes the emergence of an institutional order emphasizing applicability to at least the same extent as scientific quality. The proportion of research funding in which the evaluation of proposals and research results are non-collegial have in-

creased. The presence of SSF and the growing reliance upon EU funding are the main vehicles for this transition (Table 1). The picture is blurred, however, by the institutionalization of the Technical Research Council (TFR) in the 1990s. The intra-academic mechanisms (an intra-university organizational field with an institutional order emphasizing collegial recognition) have been supported by the expansion of the TFR.

Funding of technical research in Sweden does not follow a unidirectional path towards a new regulatory model. Instead, different and to some extent contrary developments exist in parallel. This development is also causing a lot of turbulence among Swedish academics. The growing importance of the SSF and of EU funding for academic research has caused a great deal of friction between the state and the academic scientists, since this has been accompanied by a cut of over a third of the research councils' budgets. Evidence of the discord appeared in the form of two public letters, the first signed by 90 professors, the second by some 300 professors. These letters expressing discontent from researchers concerning the allocation of resources were published in the leading Swedish daily. Somewhat unexpectedly, this critique has since been translated into the pro-

posals of a public commission on research organization (SOU/1998:128). In the commission's report, it is suggested that all public research funding should be allocated through four research councils, with the academic control of allocation and priorities unchanged. This proposal has, in its turn, met with resistance both from parts of the academic system and from the mission-oriented agencies. The issue is not yet (1999) resolved, and a final decision on the organization of public R&D funding has been postponed until the year 2000. Thus, the organization of research funding and the role of new sorts of research money remain highly controversial issues in Swedish research policy. The research councils are still popular among academic scientists, even though many researchers claim that the research councils are unable to make necessary priorities (Sandström, unpublished; Sandström et al., 1997). Thus, there is a dialectic process of negotiation between the "old" system of funding, led by the research councils and dominant parts of the academic world, and a new transdisciplinary system, based upon the mission-oriented agencies, European R&D funding and an increasing number of academic scientists.

We will now briefly discuss the evolution of research funding in other countries to illustrate

Table 1

Financiers of R&D performed by universities (in medicine, natural science and technology) in Sweden in 1994/1995 compared to 1998 (current prices)

Sources: Sandström (1997), pp. 133–137; SOU/1996, 29; Govt. reports 1995/1996 and 1998; Eliasson (1998), p. 10.

	Research councils	Sectoral agencies	New foundations
Selection	Peer review	Project managers	Ad hoc
Objective	Scientific quality	Technical development	Technoscience and Networks
Political steering	Budgets	Direct	Indirect
Logic	Autonomy	Heteronomy	Mixed
FY 1994–1995 US\$/year	Natural (NFR), 124 Medical (MFR), 50 Technical (TFR), 42 Agriculture (SJFR), 23 Space (Rymd), 32 Sum, 270	NUTEK, 100 Others, 110 Sum, 210	– Sum, 0
1998 US\$/year	Natural (NFR), 88 Medical (MFR), 43 Technical (TFR), 31 Agriculture (SJFR), 18 Space (Rymd), 15 Sum, 195	NUTEK, 84 Others, 78 Sum, 162	Strategic, 97 Environmental, 39 Competence, 10 Medicine and Care, 10 Sum, 156

whether the tendencies in Sweden are idiosyncratic or a more general feature of institutional rigidities and ambiguities in research funding.

In the British system, the research council system has been retained as the center of research funding, but its structure has been reformed into a mixture of a traditional council model and a mission-oriented agency. More precisely, the research councils have been given additional tasks outside the traditional role of funding and evaluating research according to its scientific merit (HMSO, 1993). In determining funding priorities, the research councils now use instruments such as “business planning cycles”, wherein economic competitiveness and potential for technology transfer are as important as research quality. The evaluation of research support has also been extended from *ex ante* evaluation to process and application evaluation. The research councils have developed a number of organizational innovations to cope with their responsibility of contributing to national competitiveness and serving the needs of their “customers” in industry and government. These innovations include new bodies such as Technical Opportunities and User Panels. The administrative superstructure of British science policy has also expanded. An array of different bodies (such as the Office of Science and Technology, The Council for Science and Technology, and The Technology Foresight Steering Group) are oriented toward institutionalizing the new and broader role for academic research. The rhetoric is unambiguous: the research councils are part of the broad field of industrial and growth policy and academic research is validated in its practical as well as its academic context. Clearly, the reform of the research council system seems to facilitate a change toward a broader organizational field with a new institutional order.

In Norway, research councils have been reformed to play a broader role in society and to change the organization and normative structure of academic research. Here, a reform process has been underway since the early 1990s, when a unified research council was formed with the explicit task of integrating application- and discovery-oriented research (NOU/1991:24). The organizational structure that has evolved includes a new organizational matrix (disciplines combined with societal sectors). New support mechanisms have been established, in the

form of targeted programs with long-term planning horizons and new managerial structure, including a more pronounced role for industrial interests.

Canadian and US research policy has also stressed the importance of the intertwining of commercial and academic work through public support of new transinstitutional research centers (such as Engineering Research Centers in the US and University–Industry Research Centers in Canada). Australia is a typical example of a restructuralization of research support, where public bloc funding has been replaced with new funding principles, linking resource supply to academic–industry partnerships (Slaughter and Leslie, 1997).

Hence, the reforms of research funding in Sweden and elsewhere include both continuities and discontinuities. Important parts of research funding in these countries is controlled by the academic system (through the research councils), with research quality and collegial recognition as dominant allocation principles. The disciplinary structure of the research councils is more or less intact, as is the collegial evaluation process and the evaluation criteria. Utility and demands from “customers” have, however, been added to the old organizational structure. The attempted reforms seem, according to empirical studies of research funding in the UK, Canada and Norway, to have had the effect of preserving the core orientation of the research councils, the collegial control and evaluation of research, in an era of pronounced political and industrial demand for organizational reform (Balmer and Sharp, 1994; Dalpé and Andersson, 1995; Mathiesen, 1996).

It does, however, seem likely that there will be evolutionary learning effects when new tasks and structures are added to the traditional ones. This interpretation is well in line with the triple helix model of knowledge production, which state that there will be a rearrangement and integration of the different helices. We conclude that there will be a gradual transformation and negotiation between different models of research performance and evaluation, which in a long perspective could lead to the emergence of a new organizational field with a coherent and stable institutional order. This is evident in countries with reformed research councils, but also in Sweden, where the SSF, with a managerial structure has been incepted, but where a strong,

traditional academic research council also exists. Nevertheless, the combination of different roles within one agency or among various, co-existing agencies with differences in their strategies seems to be an important obstacle to a full-fledged development of an extended organizational field for academic research (a “knowledge-based economy”). We would, on the basis of this evaluation of research funding practices, instead suggest that the organizational field that is emerging will be a hybrid between the intra-academic and the “knowledge-based economy”. Collegial recognition will remain an important normative element for academic researchers, together with entrepreneurialism and societal accountability.

3. Conclusion: a new organizational field for academic research?

The issue addressed in this article is whether or not an organizational field of the “knowledge-based economy” — and a new institutional order — is emerging and what role the research sponsors play in that process. The more general and theoretical aim has been to highlight some of the institutional mechanisms behind changes in knowledge production. In order to emphasize the perspective that the regulation of research organization and performance is evolving into a new model, we have emphasized the many different regulatory strategies that currently exist among and also within research funding agencies. These differences pertain to at least three aspects: the criteria for evaluations of research (the norms for research performance), the networks established, and, finally, the organizational field that is developed.

The interventionist model, with a mission-oriented agency at its center (such as NUTEK in Sweden), tries to adjust academic research to industry’s knowledge interests. The intention is to reorient academic research, so that industry’s changing demands for competence and complementary resources in R&D are internalized within the university system. Thus, the intention is to include the academic researchers in the process of adapting the structure of industry, with the funding agency acting as a proactive entrepreneur.

The autonomy model is exemplified by the pure form of the research councils (such as TFR in Sweden). Councils, by virtue of their design, aim at emphasizing scientific quality, an international orientation, and academic initiatives as the dominant principles of research organization. Thus, the intended effect on the norm system is to reinforce a collegial reputational control and an orientation toward basic research. The networks and organizational fields that research councils establish are primarily academic.

The transinstitutional model, an organizational innovation dating back to the 1980s, combines elements of the two aforementioned models. It represents the organizational form for research funding which is most related to the triple helix. In the Swedish case, SSF is one example. The reformed funding agencies in Britain, Norway, Canada, the US and Australia also have a transinstitutional orientation. The model is based upon academic autonomy and initiatives taken by university researchers, but tries to direct academic researchers to modes of operation that fit industry’s needs. The strategies emphasize organizational complexity, managerial control of research performance, and transinstitutional and transepistemic knowledge production. Thus, the intention is to reorient the routines of the university system — its organization, the forms of research performance, its external contacts — to internalize the interests of science-based industrial sectors. The main difference from the interventionist model is the catalytic rather than regulating role of the funding agency. The intention is to develop transinstitutional norms for knowledge production, which evolve within a wide socio-economic network, involving academic and industrial interests in the regulation of research programs.

An organizational field like the “knowledge-based economy” is linked to an institutional order based on entrepreneurialism, transinstitutional research organization and transepistemic quality control. There are, as we have argued, signs of the emergence of a new organizational field with a new institutional order for academic technical research, but there are also ambiguities. In the Swedish case, one model of research funding with self-organized interaction between industry and academia exists in parallel with a model of top-down control of academic–industrial interaction, and a traditional model of research steer-

ing and performance, where intra-academic autonomy is central. In the other countries discussed, funding agencies include both transinstitutional and intra-academic models in their organizational routines. As we have argued, organizational ambiguities arise when traditional research councils are transformed into transinstitutional agencies. Their organizational structures may be transinstitutional, and new funding mechanisms may be developed, but the legacy of the intra-academic model remains strong.

The tensions between different models of research funding — fostering different organizational field and institutional orders — are common in most public research systems. Indeed, it might be an unavoidable aspect of the reorganization of academic research. Large and powerful interests are invested in the different models of research regulation, and these interests will struggle to maintain their organizational basis, even within the reformed research councils. The path to the “knowledge-based economy” and a new norms system for academic research will, as a result, be protracted. This comes as no surprise from an institutionalist perspective, whereby the emergence of an organizational field with a distinct institutional order is seen as a complex process. Existing institutional structures tend to hinder the evolution of new organizational routines. Research funding is a battleground for different agents with different strategies, and its structure will be a crucial element in the development of new forms of knowledge production.

Acknowledgements

The paper is based on research funded by the Bank of Sweden Tercentenary Foundation (grant no. 97-5085). The authors thank Henry Etzkowitz, Loet Leydesdorff, Leif Hommen and an anonymous reviewer for comments on earlier drafts.

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