Third mission policy goals and incentives from performance-based funding: are they aligned?

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Abstract

In competitive knowledge-based economies, policymakers recognise the importance of universities' engagement in third mission activities. This paper investigates how a specific policy approach to encourage third mission engagement – the use of performance-based funding to reward universities' success in this domain – aligns with the broader goals of third mission policy. Considering the case of the United Kingdom (UK), the first country to have implemented a system of this kind, we analyse how the system has come into being and how it has evolved, and we discuss whether its implementation is likely to encourage universities to behave in ways that are aligned with the goals of third mission policy, as outlined in government documents. We argue that the system encourages universities to focus on a narrow range of income-producing third mission activities, and this is not well aligned with the policy goal to support a complex innovation ecosystem comprising universities with different third mission objectives and strategies. The paper concludes by proposing possible avenues for achieving greater alignment between incentives and policy goals.

Keywords: Performance-based funding, higher education, third mission, knowledge exchange, Higher Education Business and Community Interaction Survey, Higher Education Innovation Fund.

1. Introduction

In order to create value for the economy and for society at large, universities are expected to actively engage with stakeholders from the private, public and third sectors (Grady and Pratt 2000). The often-repeated argument that, by accelerating the rate of creation and distribution of knowledge, universities' engagement with external stakeholders can bring about greater economic prosperity (Howlett 2010; Vorley and Lawton-Smith 2007), has underpinned what has been described as the 'second academic revolution' (Etzkowitz 2003): universities have acquired a 'third mission' (Nelles and Vorley 2010) that consists of the 'generation, use, application and exploitation of knowledge and other university capabilities outside the academic environment' (Molas-Gallart et al. 2002, p.2). This mission, now considered as important as teaching and research, can be pursued through various activities that include, but are not limited to, commercialising scientific research, collaborating with public and private organisations, providing education to audiences beyond traditional students, contributing to public debates and to cultural activities, and engaging in social and community regeneration processes (Bekkers and Bodas Freitas 2008; Hewitt-Dundas 2012; Laursen and Salter 2004; Lawton-Smith 2007; Perkmann and Walsh 2007).

The third mission has been increasingly institutionalised within universities (Lockett, Wright and Wild 2014; Pinheiro, Langa and Pausits 2015) through actions like top-down strategic planning, changes in leadership and implementation of supporting organisational structures (Fumasoli, Pinheiro, and Stensaker 2014; Pinheiro and Stensaker 2014). Policy pressures have been important drivers of institutionalisation (Sanchez-Barrioluengo 2014; Pinheiro, Langa and Pausits 2015): since the late 1990s, policymakers in most countries have sought to encourage universities' engagement in

some third mission activities, particularly the commercialisation of university research through patents and spinoff companies (Mowery and Sampat 2005; Geuna and Rossi 2011), and research collaborations between university and industry (Bozeman 2000; Perkmann, Neely and Walsh 2011). Key decisions for third mission policy involve the choice of which activities should be encouraged, and what incentives should be established to accomplish this. Incentives can be defined explicitly: for example, additional funds can be assigned to reward universities that perform certain activities particularly well. Incentives can also arise implicitly from the way in which performance is measured (Rossi and Rosli 2015), for example through the choice of indicators used to construct rankings (Montesinos et al. 2008; Marhl and Pausits 2011). Devising third mission support initiatives that, in promoting some channels of university engagement, do not hamper other productive efforts, poses an important challenge to policymakers.

This paper explores how a particular approach to incentivising universities' engagement in third mission activities – the introduction of performance-based funding – aligns with the broader goals of third mission policy. We consider the case of the United Kingdom (UK), which is the first country to have implemented a comprehensive performance-based funding system for universities' third mission engagement: we analyse how the system has come into being and how it has evolved, and we discuss whether such system is likely to encourage universities to behave in ways that are aligned with the goals of third mission policy, as outlined in government documents. So far, few studies have attempted to empirically explore the implications of this funding system in terms of, among other things, how funds are distributed over time (does the system lead to funding being progressively concentrated in a few institution? Is the performance ranking stable?), and how it influences universities'

strategies of engagement in different third mission activities and in the other two missions of teaching and research[1]. Complementing existing empirical studies, this paper develops a critical discussion of the incentives that the performance-based funding system is likely to generate, in light of the general goals of third mission policy. Analysing this issue is important, not just to identify potential weaknesses in the system that is being studied, but also to derive lessons that may be useful to policymakers elsewhere who are considering implementing similar approaches.

The paper is structured as follows. Section 2 reviews the literature on the design and implementation of third mission policy, focusing on the debate about the use and implications of performance indicators and performance reward systems. Section 3 reconstructs the main steps in the evolution of the policy discourse around universities' third mission agenda, based on an analysis of selected policy documents published by the UK government between 1993 and 2015. We examine the overarching policy goals outlined in these documents. Section 4 describes how a performance-based funding system for third mission engagement has been introduced in the UK, and how its implementation has evolved over time. Section 5 presents a critical discussion of the incentives that this system is likely to generate for universities, and of their alignment with the goals of third mission policy. Possible avenues for achieving greater alignment between policy incentives and policy goals are discussed in the final section.

[1] Day and Fernandez (2015) explored the patterns of income growth from third mission activities in UK universities, highlighting a concentration trend; Rosli and Rossi (2015) and Rossi and Rosli (2015) analysed the limitations of current indicators in reflecting universities' actual third mission performance.

2. The implementation of performance indicators and funding systems in third mission policy

The implementation of the third mission agenda in universities has not occurred without controversy. Critics have highlighted potential conflicts with the other missions of the university, suggesting that the pursuit of this agenda may not only be detrimental to the university's search for research excellence (Florida 1999; Philpott et al. 2011), but also to its mission to effectively produce qualified human capital through teaching (Sanchez-Barrioluengo 2014). The distortions introduced by commercial incentives to the fundamental principles underpinning the scientific enterprise (Blumenthal et al. 1996; Murray and Stern 2007) might threaten universities' ability to fulfil all these roles simultaneously and to achieve some balance among their missions (European Commission 2011; Sanchez-Barrioluengo 2014). Furthermore, the multiple rationales that underpin third mission activities – from the pursuit of immediate economic gain, to broader community and regional development and the attainment of social goals – may lead to conflicting institutional strategies, and even conflicting policy goals and policy instruments (Flanagan et al. 2011; Mok 2005).

In view of the increasing institutionalisation and permanence of third mission activities (Gulbrandsen and Rasmussen 2012) criticisms to third mission policy have also focused on pragmatic aspects of design and implementation, building on the argument that it is difficult to determine what constitutes successful performance in third mission activities, and what activities should policies target. Four main challenges in relation to third mission policy implementation can be identified from a review of the literature.

(i) Difficulty in identifying which third mission activities should be incentivised. The range of activities that fall within the realm of third mission is very broad (Perkmann et al. 2013), and the choice of which ones should be incentivised is a politically contested issue (Docherty et al. 2012), since different stakeholders might be invested in different activities. Lockett, Wright and Wild (2014) show that, in the UK, different associations representing different groups of university institutions had remarkably different views about what third mission entailed, and they actively sought to shape the discourse about the nature of third mission and the indicators used to measure engagement and success[2].

(ii) Difficulty in evaluating successful performance. It is unclear what 'success' means with respect to third mission. Success should be evaluated on the basis of the outcomes of third mission activities, particularly the impacts that they produce on the economy and on society. However, this is problematic, because it is difficult to identify all the possible impacts to be measured, to decide the temporal interval after which impact should be assessed, and to ascertain the extent to which impact is directly due to the university's actions, as opposed to serendipity, luck and other factors beyond the university's control (Molas-Gallart et al. 2002; Meagher, Lyall and Nutley 2008). For this reason, success is often evaluated on the basis of engagement measures rather than impact (Molas-Gallart et al. 2002; Robichau and Lynn 2009).

(iii) Policy goals expressed in terms of indicators rather than of underlying outcomes. Indicators have tended to take on a central role in policy implementation (Grupp and Mogee 2004; Sorlin 2007), often leading policymakers to express their goals in terms

[2] Following Gulbrandsen and Rasmussen (2012) we use the term 'measure' as a broader concept that also includes qualitative data, whereas the term 'indicator' refers to a specific quantitative unit. Thus, one measure may consist of several indicators. Measures and indicators may deal with inputs, outputs or outcomes (the latter are sometimes referred to as impacts) (Langford et al. 2006).

of achievement of indicators, rather than of the outcomes they are intended to proxy (Langford et al. 2006). Molas-Gallart and Castro-Martinez (2007) suggest that indicators – besides being simple to handle (Sorensen and Chambers 2008) – have the advantage of allowing stakeholders to avoid potential gridlocks due to conflicting policy goals: in a context characterised by high ambiguity and high conflict (Matland 1995), it is easier for stakeholders to agree on symbolic measures of performance (DiMaggio and Powell 1983) which appear objective and uncontroversial, rather than on the more ambiguous and conflicting policy goals that they are pursuing.

(iv) Performative effects of indicators on institutional behaviour. The focus on indicators often has a performative effect (Rafols et al. 2012; Texteira and Koryakina 2013): institutions are incentivised to strategically adapt their behaviour in order to achieve good scores in the indicators. This can stimulate undesirable changes in institutional policies and practices (Dougherty and Reddy 2013). For example, organizations may end up engaging too intensively in activities that are not very commercially productive but are measured, instead of focusing on activities that are not measured but more productive (Gulbrandsen and Rasmussen 2012).

These criticisms have become even more relevant in light of the increasing reliance on performance-based funding as a way to promote efficiency in universities (Geuna and Martin 2001; Hewitt-Dundas 2012). Based on theories of action (Argyris and Schon 1996), the rationale for the use of performance-based funding is that institutional performance can be improved through material incentives that mimic the profit motive for business (Dougherty and Hong 2006), thus inducing organizational compliance with a set of intended policy goals (Etzioni, as cited in Matland 1995, p. 161). Such material incentives, typically taking the form of financial rewards, are

'effector' tools that allow the policymaker to translate goals into actions (Hood and Margetts 2007).

Performance-based approaches have been used to distribute research funding (e.g. UK, Holland, Italy, Spain, Canada), and since the mid-2000s the UK has implemented a similar approach for third mission activities. Since this approach assigns a central role to performance measurement, its implementation is likely to raise the four problems outlined earlier. As indicators are seen as signifiers of policy goals (Lascoumes and Le Gales 2007), they can have performative effects leading institutions to narrowly focus on activities that are financially rewarded (Dougherty and Reddy 2013). This can cause a misalignment between the incentives created by the system and the overarching goals of third mission policy.

3. Third mission policy in the United Kingdom: evolution in policy goals

The UK's science, research and higher education policy is the responsibility of the Department of Business Innovation and Skills (BIS). However, funding allocation is devolved to the governments of the four countries of England, Northern Ireland, Scotland and Wales, each of which has appointed an authority in charge of higher education policy (the Higher Education Funding Council for England, HEFCE; the Department for Employment and Learning Northern Ireland, DELNI; the Scottish Funding Council, SFC; and the Higher Education Funding Council for Wales, HEFCW). Each authority is responsible for distributing funding for universities' teaching and research activities, and for implementing policy instruments in support of third mission engagement in its country. Further research funds to universities are distributed competitively by seven funding councils that operate nationally. The distribution of universities across the four countries is unequal, with the greatest share

(81%) localised in England. This reflects the importance of policies implemented in England and their influence on the whole system.

In order to illustrate the evolution of policy goals in relation to third mission, we analysed the main documents produced by the UK government since the mid 1990s, which we identified through a systematic publications search of the government's national archives and of the Higher Education Funding Council for England (HEFCE) websites. Through qualitative analysis of these documents' focus and contents, in line with our research objectives (Lee 2009), we tracked change and discontinuities in policymakers' goals and recommendations (Bowen 2009), leading to temporal bracketing (Lamothe and Langley 2001; Mills, Durepos and Wiebe 2010). Temporal bracketing helps to decompose the data and identify specific theoretical mechanism recurring over time (Langley 1999; Langley et al. 2013).

We identified 25 key policy documents that are particularly relevant to understand the evolution of the government's policy goals in relation to university third mission[3]. These documents have been published between 1993 and 2015 by the departments that, over time, have been in charge of higher education policy[4] and by the devolved higher education authorities. For each of these 25 documents, we identified the general policy goal to be addressed, the specific goal identified in relation to third mission, and the key recommendations made in order to achieve such third mission

[3] Based on secondary literature, this analysis does not explore what were the social, political, cultural factors that underpinned the changes in the way in which third mission has been conceptualized in policy documents. However, our main objective here was to reconstruct and map these changes, rather than identify their driving factors, and the documents provided a convincing illustration of this.

[4] These departments were: the Department for Trade and Industry (DTI, 1970-2007), the Office of Science and Technology (OST, 1992-2007), the Department for Education and Skills (DFES, 2001-2007), the Department for Innovation, Universities and Skills (DIUS, 2007-2009), the Department for Business, Enterprise and Regulatory Reform (BERR, 2007-2009), the Department for Business Innovation and Skills (BIS, since 2009).

policy goals. A table summarizing these is presented as a supplementary file. Temporal bracketing has led us to identify three key overlapping periods in the evolution of third mission policy goals.

3.1. Early 1990s – early 2000s: Third mission engagement as technology transfer

The UK government's concern with supporting university-industry technology transfer began in the 1970s, when a widespread debate on the UK's presumed failure to exploit research emerged (Grady and Pratt 2000). Initial interventions to answer the problem were fragmented, the government's aspirations were unclear, and synergies among government, university and industry were lacking. In, 1993 the white paper 'Realising our potential' (OST 1993) purported to highlight a gap between the UK's excellence in science and technology and its relative weakness in exploiting them to economic advantage. For the first time, universities were explicitly identified as the central focus for economic development, and the importance of partnerships between industry, government and the science base was emphasised. This white paper led to a re-configuration of government support for science and technology. The move of the Office of Science and Technology (OST) from the Cabinet Office to the Department for Trade and Industry (DTI) in 1995 provided an avenue for more coordinated national policy on university third mission. With the election of the Labour government in 1997, greater concern for improved economic competitiveness and social welfare led to more attention being paid to supporting universities' engagement with business and the community, reflected in an increasing number of government white papers and policy reviews on this issue.

The Dearing Report (National Committee of Enquiry Into Higher Education 1997) stressed the importance of universities' responsiveness towards industry engagement,

encouraging them to commercialise scientific results through patents and spinoff companies. The white paper 'Our Competitive Future: Building a Knowledge Driven Economy' (DTI 1998) drew attention to the government's ability to promote enterprise and stimulate innovation by rewarding universities for strategies and activities to enhance interaction with business. The white paper 'Excellence and Opportunity' (DTI 2000) highlighted the government's crucial role in encouraging the exploitation of knowledge in order to improve UK's competitive position; it suggested that the commercialisation of scientific research and invention should be encouraged, particularly through the use of intellectual property rights.

The model of university third mission engagement that prevailed until the early 2000s borrowed heavily from the sciences and engineering (Kitagawa and Lightowler 2012): innovation was viewed as an essentially linear process whereby universities would transfer technology to business, either by selling patents and licenses, by performing contract research (National Committee of Enquiry Into Higher Education 1997; DTI 1998) or by setting up spinoff companies (Lockett, Wright and Wild 2014).

3.2. Early 2000s- 2010s: Third mission engagement as knowledge transfer

During the 2000s, policy documents began to reflect a more nuanced view of third mission engagement, supported by growing empirical evidence highlighting the diversity of engagement channels (Jones and Craven 2001; Wright et al. 2008; Meagher, Lyall and Nutley 2008). It was recognised, particularly on the basis of evidence from the US (Chakrabarti and Santoro 2004; Mowery and Sampat 2005), that the commercialisation of patents and licenses and the sale of shares in spinoffs did not generate much revenue for most universities (Lockett, Wright and Wild 2014)

and that emphasizing intellectual property rights could hamper knowledge-sharing and collaborative work (David and Metcalfe 2007).

The Lambert Review (HM Treasury 2003) explicitly took a holistic view of universities' third mission activities, recognising the limitations and possible drawbacks of focusing too much on patenting and on the pursuit of narrow financial returns. This was reiterated in later documents such as the Gowers Review (HM Treasury 2006) and the Saraga report (DIUS 2007), which argued that universities' emphasis on intellectual property negotiations might not be beneficial to the wider economy. The more recent Hargreaves Review (BIS 2011) highlighted that universities should realise the potential of their intellectual property beyond their patent portfolio, focusing on other areas such as copyright.

In this period, the term 'knowledge transfer' began to be used widely (e.g. DES 2003; HM Treasury 2003). While universities were still seen as transfer agents (Bozeman 2000) involved in a somewhat linear innovation process, the term 'knowledge transfer' suggested that they could transfer more than just technology, by engaging in people-based and problem-solving activities (Hughes and Martin 2012). These activities included, among others, professional development, consulting for the public and private sectors, provision of testing, prototyping, clinical, legal, logistic and other knowledge-intensive services (Bekkers and Bodas Freitas 2008; D'Este and Patel 2007).

The focus broadened from science and engineering to the entire spectrum of academic disciplines, including the social sciences and the arts and humanities, and to different types of universities (DIUS 2008a, 2008b). The white paper 'Opportunity for all in a world of change' (DTI/DFES 2005) claimed that different universities had different contributions to make (some as world class centres of research excellence and players

in global markets, and others primarily as collaborators engaging with local businesses, communities and policymakers), and that institutions must choose the role which best suits their strengths. It argued that public funding should encourage such choice, by providing incentives for institutions to become more entrepreneurial, build closer links with business and the community, and have proper arrangements for exploiting the results of their work. Acknowledging that different universities engage in different types of activities, the Sainsbury Review (HM Treasury 2007) recommended that third mission funding should be spread more widely across the sector.

During the 2000s, particular attention was paid to the regional dimension of universities' third mission (Potts 2002). The 'Future of Higher Education' white paper (DES 2003) proposed a more regional focus for universities to support economic development. In 2000 the government had created a new Regional Innovation Fund worth £50 million a year to enable Regional Development Agencies (RDAs) to support clusters, incubators and networking among scientists, entrepreneurs, managers and financiers. The Lambert Review (HM Treasury 2003) emphasised that RDAs should be given targets to promote links between business and university. The Fifth Parliamentary Report by the Select Committee on Science and Technology (2003) recommended that HEFCE should develop measures to assess the effectiveness of third mission engagement, with particular focus on their regional dimension, to complement national quality measures for teaching and research. The report suggested the implementation of an appropriate measurement system, to ensure 'sustained commitment by HEIs [Higher Education Institutions] to supporting business so that they develop the motivation, capacity, capability and commitment to interact professionally and effectively with regional development in all its breadth'

(Select Committee on Science and Technology 2003, 5.2). Interestingly, policy debates in Europe in the same period showcased similar developments, calling for universities to contribute to society not only by generating research and consultancy income but also by driving the development of regional innovation systems (European Commission 2011, 2015).

3.3. Early 2010s onwards: Third mission engagement as knowledge exchange

Since the 2010s, the government's aspirations have broadened further. Universities are expected to be part of ecosystems of innovation characterised by collaboration and exchange among a variety of stakeholders, aimed at addressing complex social and economic challenges (Andersen, Brinkley and Hutton 2011; BIS 2015). The term 'knowledge exchange', which emphasises the two-way, collaborative nature of the interactions between universities and businesses (or other stakeholders) began to gain ground (DIUS 2008; BIS 2012, 2013a, 2015).

The 'Innovation Nation' white paper (DIUS 2008b) argued for the importance of approaching innovation systemically by building a supporting environment that involved the Research Councils, the government, the RDAs, universities and businesses. Emphasis was placed on creating collaborative relations and two-way exchange of knowledge as opposed to one-way transfer. The Wilson Review (BIS 2012) suggested that the impact of university-industry collaboration should not be measured purely on the basis of economic gain but also consider policy development. The Dowling review (BIS, 2015) recommended universities to expand the numbers of long-term strategic partnerships with businesses across all areas, disciplines and sectors, while the 'Growing your business' review by Lord Young (BIS 2013a) encouraged businesses to be more pro-active in engaging with universities. Emphasis

was placed on creating a conducive environment for university-industry collaboration, by setting up appropriate structures and incentives (BIS Committee 2013; BIS 2014a), and on the development of interdisciplinary and concerted action on a large scale to bring about radical change (BIS 2010a; BIS 2013b). In response to these concerns, the government introduced the Catapults, clusters and hubs to encourage collaborative work and free flow of ideas through co-location of university and industry staff. The Hauser review (BIS 2014) encouraged the government to increase the number of Catapults to twenty by 2020 and thirty by 2030.

After 2010, however, the regional focus has been abandoned. Cochrane and Williams (2013, p. 47) noted that 'it would be hard to find any explicit reference to local or regional economies in statements emerging from the Department of Business, Innovation and Skills or the Higher Education Funding Council for England since May 2010'. This is in line with the broader trend towards regional policy disengagement level occurring in England[5]: following the publication of the white paper 'Local Growth: Realising Every Place's Potential' (BIS, 2010b), and in parallel with the change to a Conservative-Liberal Democrats coalition government, all RDAs were closed down (31 March 2012) and new business-led Local Enterprise Partnerships (LEPs) between local authorities and businesses were established. By April 2014, 39 LEPs covered all areas of England (BIS Committee, 2014). The Witty Review (BIS, 2013b) and the Heseltine Review (BIS 2013c) highlighted the importance of the LEP as a pathway to national economic growth: they argued that

[5] Interestingly, the progressive abandonment of a regional policy focus within England has been accompanied by the ongoing devolution of policy powers across the countries of Northern Ireland, Scotland and Wales. Devolution has allowed these governments to implement independent science and innovation policy initiatives. See Huggins and Kitagawa (2012) for a comparative analysis of initiatives in support of university knowledge transfer in Scotland and Wales.

funding allocation should support LEPs partnering with local universities, which would enhance the locality's competitive advantages and leverage their co-location to generate growth (BIS 2013c, 2014b, 2015). However, how policies in support and innovation and knowledge transfer can be implemented in the LEP context remains unclear. This might have had the consequence of discouraging universities to pursue an agenda of contributing to regional development as a key form of engagement, and rather focus on different objectives. Little empirical evidence exists at the moment to argue whether this has been the case.

Table 1 summarises the key policy goals, closely related to different conceptualisations of the nature and focus of third mission activities, in each of these three periods.

Table 1. The evolution of third mission policy goals in the UK

Period	Early 1990s - early 2000s	Early 2000s - 2010s	Early 2010s onwards
Conceptualisation of third mission engagement	Technology transfer	Knowledge transfer	Knowledge exchange
Model of innovation	Linear model: universities seen as transfer agents	"Enhanced" linear model: universities still seen as transfer agents, but it is acknowledged that many types of knowledge can be transferred and that interactions are crucial for transfer to occur	Systemic approach: emphasis on joint actions between universities and other stakeholders and on positive feedback processes for all involved
Subject-related focus	Science and engineering primarily	All academic subjects, including not only science and engineering but also the arts and humanities and the social sciences	All academic subjects, with interdisciplinarity as a key theme
Institutional focus	Research-intensive universities	All types of universities: potential contribution of universities with diverse institutional missions is acknowledged	All types of universities: importance of coordinating resources and scale up responses to complex challenges in all fields
Spatial focus	Not mentioned explicitly: focus is on disembodied	Regional focus: importance of co-localisation to promote	Flexible focus (local, national or global) depending on the

	knowledge which can be transmitted easily	interactions	challenges to be addressed
Key policy goals	Increase universities' ability to respond to industry needs	Increase universities' ability to build ongoing relationships with stakeholders in business, policy, communities, broader society	Help universities to work with other partners to build effective ecosystems of innovation able to tackle complex challenges

4. Third mission policy in the United Kingdom: implementation of a performance-based funding system

Since the mid-1990s, in parallel with the setting out of policy goals in government documents, several policy instruments were launched with the objective to encourage and support universities' third mission engagement. While performance-based funding systems have been implemented in all four UK countries, the particular sets of instruments and the details of their implementation differ (Huggins and Kitagawa 2012). Our analysis focuses on England, which hosts the majority of university institutions in the UK, and where the switch to performance-based funding has been more marked. We track the consolidation of different instruments into a single funding stream, whose allocation has progressively changed from competitive to performance-based, and the evolution in the formula used for the allocation.

4.1. The implementation of a performance-based funding system for third mission engagement

While several stand-alone initiatives supporting university-industry collaborations around research and training had been implemented in the UK since the mid-1970s,[6]

[6] These included the Teaching Company Scheme, launched in 1975, which involved employing graduates in companies on projects jointly supervised by academics and company staff (Senker and

the Knowledge Exploitation Programme launched in 1999 was the first package of measures explicitly designed to support universities' third mission engagement in a comprehensive way. The package included three instruments:

(i) The Higher Education Reach-out to Business and the Community (HEROBAC) Fund: sponsored by Department for Education and Skills (DFES) and Department of Trade and Industry (DTI) and allocated by HEFCE, the HEROBAC fund initially was set at £60m over four years (HEFCE 1999). From the start, the intention was to turn it into a permanent third stream of funding, aimed at developing the capability of universities to engage with business and the wider community, by setting up appropriate organisational and structural arrangements.

(ii) The Science Enterprise Challenge (SEC) supported entrepreneurially-oriented education and training through networks of universities. It aimed to foster the development of an innovation culture in universities and encourage them to more closely align their practices and objectives to those of business. Allocated through competition and managed directly by OST, £45 million was made available over the period 1999-2004.

(iii) The University Challenge Seed Fund provided access to seed funds to exploit science and engineering research outcomes and support the creation of university spinoffs. The scheme was funded by the Wellcome Trust, the Gatsby Charitable Foundation and the UK Government. Universities receiving the fund had to provide

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Senker 1994); the LINK scheme, launched in 1986, which supported collaborative research partnerships between industry and the research base (Grimaldi and Von Tunzelmann 2002); the Faraday Partnerships, introduced in 1997, which provided grants for consortia (universities, trade associations and businesses), to promote research, technology transfer and the commercial exploitation of science and technology (Abramovski, Harrison and Simpson 2004); and the University for Industry (Ufi) initiative, launched in 1998, a promotional, brokerage and commissioning agency that aimed to stimulate demand for lifelong learning programmes on the part of industry (Grady and Pratt 2000).

25% of the total fund from their own resources. £45 million was allocated in the first round of the competition in 1999, and £15 million more in 2001.

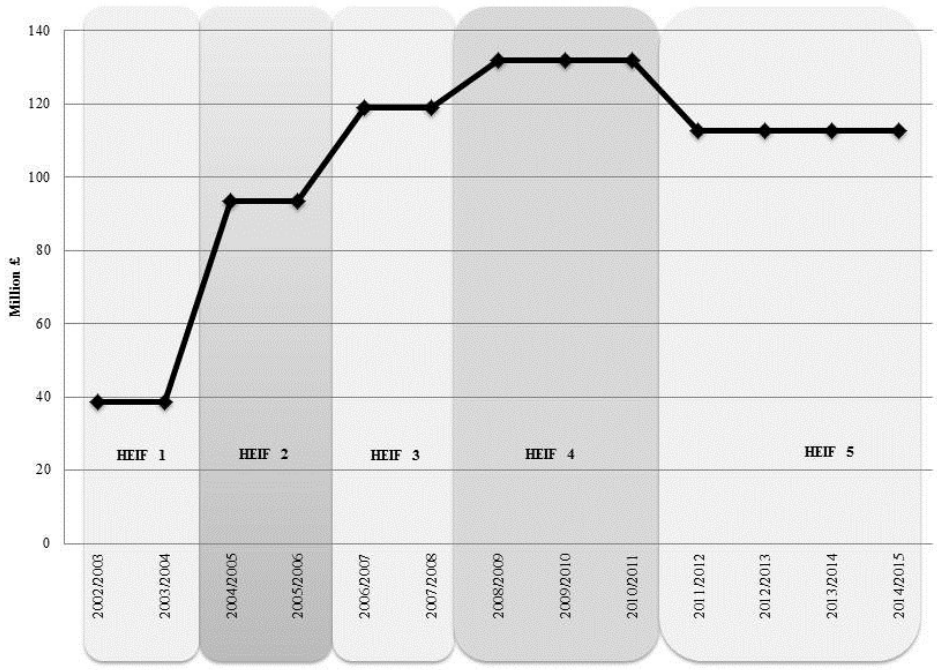
Both the SEC and the University Challenge Seed Fund were aligned with the focus on spinoffs as key channels of technology transfer, which prevailed at that time. Following the Government's 2000 Spending Review, in 2001/2 a new stream of funding to support universities' third mission engagement was announced as a partnership between HEFCE, DTI and DFES, in order to continue and develop the work of the HEROBAC initiative: the Higher Education Innovation Fund (HEIF), to sit alongside the core funding to university institutions for research and teaching[7]. Since the remit of HEIF included the activities originally funded by the HEROBAC, Science Enterprise Challenge and University Challenge Seed Fund, HEIF streamlined the various initiatives under a single fund. The fund was supposed to facilitate a more strategic approach to third mission, whereby some universities attributed more importance to supporting local industry and to other focus areas, than to basic research (Select Committee on Science and Technology, 2003).

Figure 1 shows the evolution of the yearly amount of funding allocated to the HEIF in England since its inception in 2001. After a marked increase between 2004 and 2008, the fund has later stabilised on an amount of just under £120 million per year, which is almost three times as much as in 2001. The fund has become, over time, a very important source of support for third mission activities, also as a consequence of the progressive drying up of other sources of funding. A recent report (Coates Ulrichsen

7 Similar funds have been launched in the other UK countries: the Innovation and Engagement Fund in Wales, the Knowledge Transfer grant in Scotland, and the Higher Education Innovation Fund in Northern Ireland.

2014) suggests that about 34% of universities' third mission income resulted from activities realised using HEIF funding.

Figure 1: The evolution of HEIF funding allocation



Source: Authors' elaboration based on data from HEIF reports, available from http://www.hefce.ac.uk/kess/heif/ (last accessed August 2015).

Besides the consolidation of various funds into a single stream, the decade following the introduction of HEIF has also seen a change in the allocation process. Initially, funds were allocated competitively, on the basis of the project proposals; but since 2006 funds have been allocated to universities according to their third mission performance.

This has been justified in terms of a change in the fund's objectives. The funds allocated competitively in the first period of the HEIF (HEIF1 and HEIF2) were supposed to help institutions build their third mission capability, by setting up

appropriate infrastructures and developing competences (Grady and Pratt 2000). The rationale for performance-based funding was to reward and encourage excellence in third mission activities alongside research and teaching (HEFCE 2011). This switch was progressive: while HEIF3 and HEIF4 introduced formula-based funding, this constituted only part of the overall allocation with the remaining part still being allocated competitively. Since HEIF5, the allocation is entirely formula-based. The evolution of the allocation mechanism is shown in Table 2.

Table 2: Evolution of HEIF allocation mechanism

		Components			
Year	**Fund**	**Competitive Bidding**	**Formula Potential & capacity building**	**Formula Activities not best measured by income**	**Formula External income**
2001-2004	HEIF 1	100%			
2004-2006	HEIF 2	100%			
2006-2008	HEIF 3	25%	34%	7%	34%
2008-2011	HEIF 4		40%		60%
2011-2015	HEIF 5				100%
2015-2016					100%

Source: Authors' elaboration based on data from HEIF reports, available from http://www.hefce.ac.uk/kess/heif/ (last accessed January 2016).

4.2. Characteristics of the implementation of performance-based funding

Once the performance-based funding system was established in 2006, its implementation involved the decision to link it to a formula based on quantitative indicators of performance, rather than, for example, some form of qualitative assessment. The formula also changed over time, with increasing weight assigned to income from third mission activities.

In HEIF3, the formula (which was used to allocate 75% of the HEIF funding) was based on a set of 12 indicators derived from several sources (Kitagawa and Lightowler 2012; Molas-Gallart and Castro-Martinez 2007). These indicators included income from intellectual property exploitation, regeneration and development, and non-credit bearing courses, as well as data on student placements, engagement with noncommercial organizations, staff dedicated to third mission activities, and overall number of staff of the university (Molas-Gallart and Castro-Martinez 2007). In HEIF4, 100% of funds were allocated via formula, and the formula was based on a combination of number of staff and income from a set of third mission activities. Income from small and medium-sized enterprises (SMEs) was double-weighted (Kitagawa and Lightowler 2012). In HEIF5, all funds were allocated via formula, and the formula was entirely based on the income that universities accrued from third mission activities[8]. Again, income from SMEs was double weighted.

Moreover, a more stringent approach to funds allocation was adopted, from granting the funds lump sum (HEIF1-HEIF3) to administering the allocation yearly (HEIF4, HEIF5). This required universities to adopt a more strategic approach to planning for their third mission activities within the specific HEIF period. There was also a move towards greater concentration of funds, with an increase in the maximum award received by each university (£2.85 million for HEIF5) and the introduction of a threshold, whereby only universities earning more than £250,000 were eligible to receive HEIF funds. While the presence of a cap on the maximum and minimum changes in funding allocations allowed year-on-year should have tempered the

[8] The 100% formula allocation only applies to English universities; the shares of funds allocated through formula are 80% in Northern Ireland, 75% in Wales and 92% in Scotland.

process of funding concentration (allocations could increase by 50% at most, and could not drop by more than 50%), evidence suggests that the latest HEIF rounds have increased funding concentration (Coates Ulrichsen 2014; Day and Fernandez 2015). Since the transition to 100% formula funding in HEIF4, growth rates in third mission incomes have increased more in those institutions that already had higher income, reversing a previously established trend whereby smaller institutions used to have higher third mission income growth (Day and Fernandez 2015). Moreover, HEIF5 (2011-2015) allocated around £26 million additional funding to top performers, which further increased concentration. HEIF funding for 2015-2016 followed the methods used from 2011 to 2015 for the main HEIF allocations (£150 million) and included additional awards for the top performing institutions (£10 million) (HEFCE 2015). [9] Details of the evolution of HEIF allocation mechanisms are summarised in Table 3.

Table 3: Evolution of the HEIF funding allocation mechanisms

	HEIF 1	***HEIF 2***	***HEIF 3***	***HEIF 4***	***HEIF 5***
Year	2001-2004	2004-2006	2006-2008	2008-2011	2011-2015
Total allocation	£77 million	£187 million	£238 million	£396 million	£450 million
Notes:			Up to an additional £20 million to fund a third and fourth year of the 22 Centres for Knowledge Exchange, provided they show satisfactory performance	A fifth and final allocation of £8 million made available for existing Centres for Knowledge Exchange for the academic year 2008-09	
Minimum allocation	£250,000 overall	£200,000 overall	£200,000 overall	£100,000 per year	No minimum allocation, but move to an external income threshold allocation.
Maximum allocation		£2,400,000	£3,000,000	250% of the previous allocation	£2,850,000

[9] In 2012-13, 12 top performers received in total of £6 million additional funding and in 2013-2014 and 2014-2015, 27 top performers received in total of £20 million additional funding across the two years.

Other constraints			No institution will receive less than 75% of its previous allocation under HEIF 2	Each institution is guaranteed 80% of their previous allocation	Maximum allocation constrained to 50% increase No institution sees its allocation drop by more than 50%
Threshold for participation in the HEIF funding scheme	None	None	None	None	£250,000 minimum third mission income

Source: Authors' elaboration based on data from HEIF reports, available from http://www.hefce.ac.uk/kess/heif/ (last accessed August 2015).

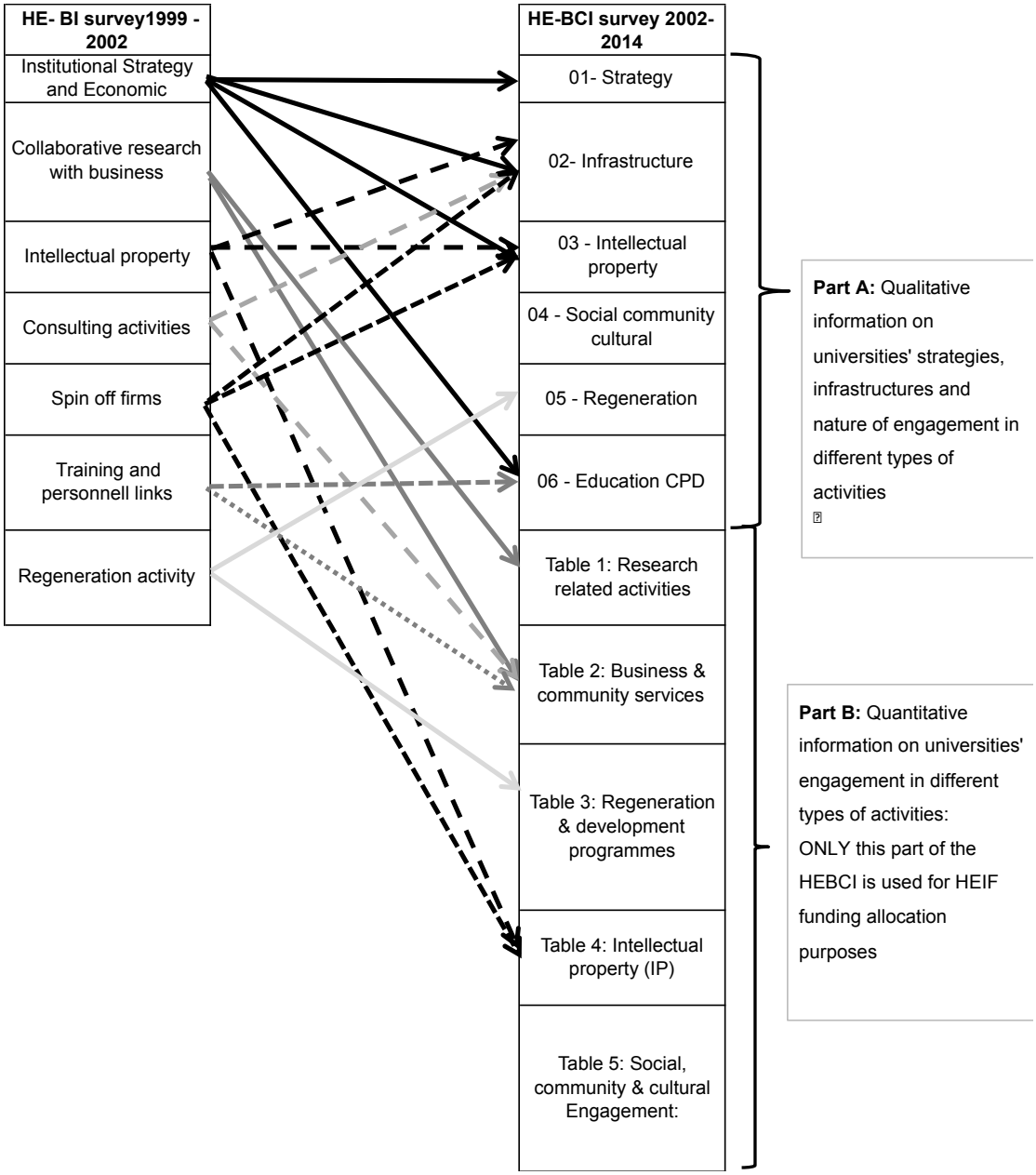
The introduction of a formula based on quantitative indicators required the availability of such indicators in the first place. While the first step towards the development of a performance-based funding system should be the creation of an appropriate system to measure performance (Molas-Gallart et al. 2002), in practice, the formulas used for the allocations of HEIF relied upon already existing indicators that had been collected for other purposes. In particular, most of them (all of them in HEIF5) were derived from a survey (Higher Education Business and Community Interaction, HEBCI) that had been implemented by HEFCE in 2000 as a monitoring system to collect information about universities' third mission activities.

The HEBCI was developed starting from some early surveys commissioned in the mid to late 1990s (Howells, Nedeva and Georghiou 1998), whose scope was limited to relatively few universities. These surveys placed a strong emphasis on qualitative information and had a strong focus on measuring regional interactions. In order to systematise data collection, HEFCE was put in charge of carrying out a more comprehensive survey covering all universities in the UK. The first edition of the survey, called Higher Education and Business Interaction (HEBI) was launched in 2001, referring to the period 1999-2000. It was commissioned by HEFCE to the

Centre for Urban and Regional Development Studies, University of Newcastle upon Tyne (Charles and Conway 2001).

Starting from the third edition (carried out in 2003 and referring to 2001/2002) the survey has been carried out every year, but it has undergone several changes both in its overall structure and in the activities measured, which influence the kind of indicators that it is possible to build from the data. In particular, the structure of the survey (now called Higher Education Business and Community Interaction, HEBCI) changed drastically in 2002, when it was split into two parts, one dedicated to the collection of qualitative information about universities' knowledge exchange infrastructures and strategies (part A), and one dedicated to the collection of quantitative information on their third mission activities (part B). Figure 2 shows how the themes present in the first two editions of the survey (1999-2002) were reallocated into these two main sections (the arrows in the figure point to the sections of the HE-BCI survey in which the themes included in the HE-BI survey were reallocated). Although the information collected after 2002 was initially not too dissimilar from that collected in previous editions of the survey, in practice collating all the quantitative information in a separate section made it easier to detach it from qualitative information about the context in which it was generated, and it can be argued that this facilitated the transition toward a system in which the only part that mattered for policy implementation was the quantitative one.

Figure 2: Main changes in the structure of the HEBCI



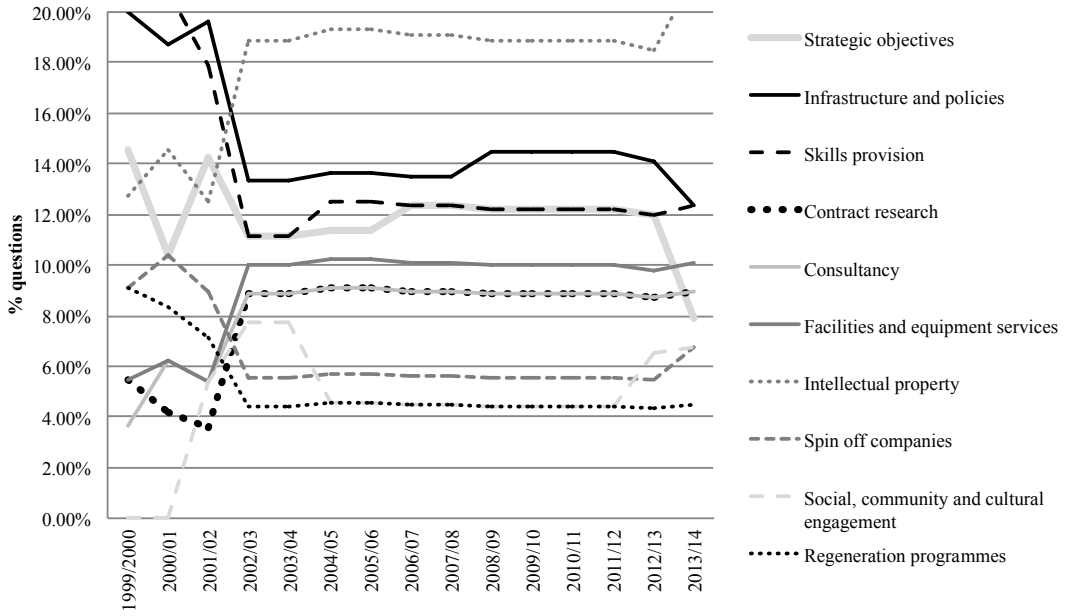
Source: Authors' own elaboration based on HE-BI and HEBCI questionnaires, available from http://www.hefce.ac.uk/data/ (until 2011; last accessed August 2015) and https://hesa.ac.uk/pubs/hebci (last accessed August 2015).

Since 2008, the survey has been managed by the Higher Education Statistics Agency (HESA). In 2012 HESA launched a consultation for a review of the survey, resulting in some changes to the 2013/14 edition. Although some universities proposed to reintroduce an integration between quantitative and qualitative information, in order for the qualitative responses to contextualise and help to explain the quantitative data,

HESA decided to leave the two-part split (HESA 2012). Moreover, the number of qualitative questions in part A was markedly reduced, while only small changes were made to the quantitative information collected in part B, such as removing the request to provide income figures by RDA (following the abolition of RDAs, this request was no longer meaningful), clarifying some definitions around intellectual property, and including information about social enterprises.

Over time, there has also been a progressive change in the importance of the different thematic areas included in the survey. Figure 3 shows the relative importance of different themes, measured on the basis of their share of questions. Four main themes gained ground: intellectual property, provision of facilities and equipment services, and contract research and consultancy. Other themes declined in importance, albeit slightly: strategic objectives, spinoff companies, and regeneration programmes. A couple of themes appeared to lose considerable ground: infrastructure and policy, and skills provision. The theme 'social, community and cultural engagement', was introduced in 2001/2002 and, after a period in which it gained increasing importance, its prominence in the survey stabilised.

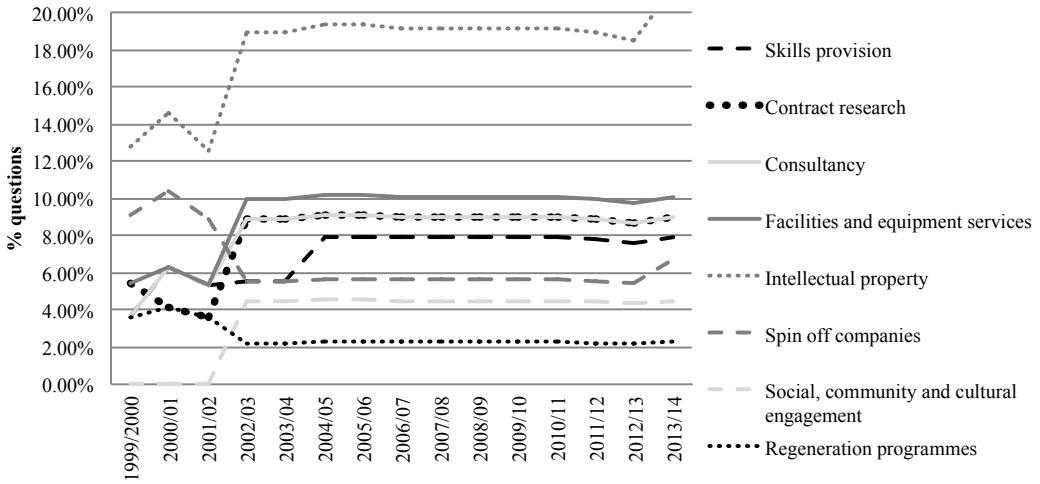
Figure 3: Parts A and B: The relative importance of various thematic areas in the survey, over time



Source: Authors' own elaboration based on HE-BI and HEBCI questionnaires, available from http://www.hefce.ac.uk/data/ and https://hesa.ac.uk/pubs/hebci (last accessed August 2015).

Analysing the quantitative part of the survey, Figure 4 shows that the relative importance of various thematic areas has changed, consistently with the overall changes introduced in the survey: rising importance of intellectual property, provision of facilities and equipment services, consultancy and contract research, and, again, progressive loss of importance of spinoff companies and regeneration programmes.

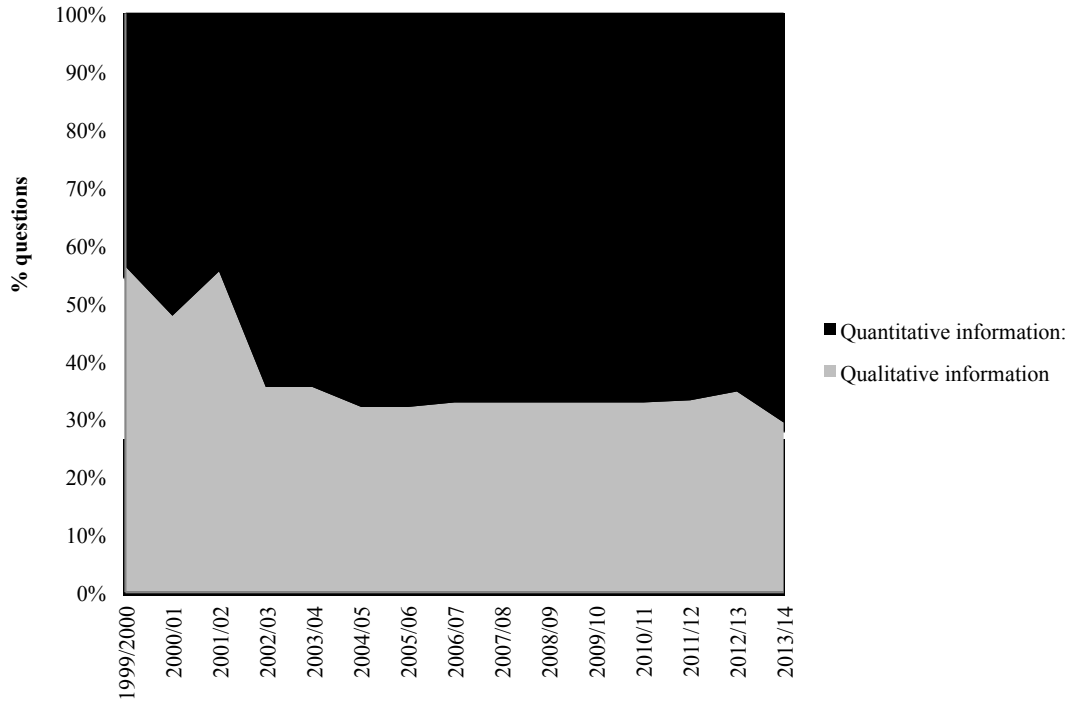
Figure 4: Only Part B: The relative importance of various thematic areas in the survey, over time



Source: Authors' own elaboration based on HE-BI and HEBCI questionnaires, available from http://www.hefce.ac.uk/data/ and https://hesa.ac.uk/pubs/hebci (last accessed August 2015).

Figure 5 shows that over time, and in particular since 2002, the share of questions collecting quantitative information has increased markedly: quantitative information counted for about 40% of the survey questions in 1999/2000, but constituted 70% of the survey questions in 2013/14.

Figure 6: The growing importance of quantitative indicators



Source: Authors' own elaboration based on HE-BI and HEBCI questionnaires, available from http://www.hefce.ac.uk/data/ and https://hesa.ac.uk/pubs/hebci (last accessed August 2015).

Therefore, even though third mission policy increasingly encouraged a focus on a broad set of third mission activities, arising from a variety of academic disciplines, in practice the survey attributed progressively greater importance to a few activities likely to generate income to the university, many of which are also associated with technological and scientific subjects. The loss of importance of regeneration programmes, spinoff companies and skills provision themes reflected a shift away from the regional dimension of knowledge exchange, with progressively greater importance attributed to the achievement of excellence on a national scale rather than to the involvement in interactions with local stakeholders. The reduced focus on strategies and policies also suggests a shift away from more intangible aspects of engagement and towards more tangible, quantifiable outputs.

5. Implications: are the incentives created by performance-based funding aligned with policy goals?

The goals of third mission policy in the UK have evolved from a narrower focus on supporting technology transfer from university to industry, to a broader focus on promoting the development of innovation ecosystems where universities engage with many stakeholders, through different channels and activities, in order to address complex social and economic challenges.

Can a performance-based funding system support the pursuit of such complex policy goals for third mission policy? In theory, this might be possible as long as this system provides incentives for universities to develop third mission strategies that best exploit their relative strengths and competitive advantages (Sánchez-Barrioluengo 2014) and, within those strategies, encourages them to focus on the activities that generate the greatest positive socioeconomic impacts.

However, the four arguments that we presented earlier suggest that in practice it is a challenge to devise a performance-based funding system that supports these complex goals, and we argue that these challenges are present in the system implemented in the UK.

(i) Difficulty in identifying which third mission activities should be incentivised. Policy documents have acknowledged that different universities may adopt different models of engagement while equally fulfilling their third mission remit (BIS 2012). However, some forms of engagement are more amenable to performance measurement: for example, activities that produce returns that can be quantified in monetary terms, rather than activities whose returns are more intangible. Therefore, performance measure systems are more likely to focus on the former. In the UK, the amount and quality of information collected about the university's third mission

strategies, policies and infrastructure has been reduced, while greater importance has been assigned to activities that can be measured by quantitative indicators, in particular income. Moreover, the set of quantitative indicators have progressively focused on a narrower range of activities (Rosli and Rossi 2015), moving away from skills provision, entrepreneurship and local regeneration, and focusing more on research contracts, consultancies and especially intellectual property. This seems to increasingly privilege the collection of quantitative information about the 'technology transfer' model of third mission engagement, which has instead been progressively abandoned by policy thinking.

(ii) Difficulty in evaluating successful performance. Policy should encourage universities to focus on third mission activities that are more impactful, rather than simply to engage in a lot of activities with limited impact. Nevertheless, measuring the impact of third mission activities is difficult (Molas-Gallart et al. 2002) and this often leads to a focus on measuring engagement. But measuring third mission engagement and assessing impact are different things, and it cannot be assumed that certain activities are always impactful and should therefore be promoted (Perkmann et al. 2013) for all types of universities (Sánchez-Barrioluengo 2014).

In the UK, the formula used to allocate funds has relied on a progressively narrow range of indicators of engagement, most recently including only income. It has been observed that higher income does not always mean greater impact (Coates Ulrichsen 2014; Rossi and Rosli 2015), as it can be connected with reputation or with the higher cost of engaging with stakeholders in particular subjects, while lower income, rather than denote lack of impact, may be due to engagement with particular types of beneficiaries, such as disadvantaged socioeconomic groups (Hatakenaka 2005), or to engagement in particularly risky and uncertain activities (Rossi and Rosli 2015).

Although these objections do not completely undermine the usefulness of using income as a guide for tracking impact[10], nonetheless the exclusive use of income as a guide for distributing funding contains an implicit incentive to move away from activities that are not income-producing (which are poorly measured in the survey, on the one hand, and do not form the basis for reward, on the other) and, among income producing activities, to focus on those whose returns are less risky and which are more highly remunerated.

(iii) Policy goals expressed in terms of quantitative indicators rather than of underlying outcomes, and *(iv) performative effects of indicators on institutional behaviour*. Because the system rewards institutions whose model of third mission engagement leads them to generate higher income from a certain set of activities, it could induce some universities to change their strategy of engagement to fit this model, even when it is not suited to their specific strengths, and when engagement in other non income-producing activities may be more socially beneficial (Rossi and Rosli 2015; Lockett, Wright and Wild 2014; Dougherty and Reddy 2013). In particular, it might encourage universities to see their interactions with businesses within a context of short-term revenue generation, rather than for longer-term economic and public benefit (Guldbrandsen and Rasmussen 2012).

The formula used particularly rewards larger institutions (University Alliance 2011; Coates Ulrichsen 2014), since it is based on income levels rather than on income per capita or income growth (Rossi and Rosli 2015). Moreover, compared to the more forward-looking competitive approach, the formula is entirely based on past

[10] HEFCE (2011) justified the use of income-based formula allocation as a means to 'incentivise and support those HEIs that can make the greatest contribution to the economy and society' as 'income remains the best proxy we have for the impact of KE [knowledge exchange] activities on the economy and society' (HEFCE, 2011).

performance and rewards institutions that have been successful in the past (Coates Ulrichsen 2014). Making policy choices based upon past accomplishment (Kay 2006) not only reinforces the status quo, but also stifles variety in the system by hindering experimentation.

Because of these issues, the funding system is not well aligned with the objective to support a complex innovation ecosystem in which universities with different objectives and approaches to their third mission engagement coexist. Policy documents have recommended the use of sophisticated assessment methods focusing on long term evaluations, subjective assessment and metrics that are not strictly economic in nature (Select Committee on Science and Technology 2003; BIS 2012), which would spread funds more widely across the university sector (HM Treasury 2007). These approaches however imply a greater degree of complexity and possibly an increase in the cost of implementation.

While, to our knowledge, no studies have so far attempted to empirically assess whether UK universities' third mission strategies have actually changed in response to the incentives generated by the performance-based funding system, and while the amount of funds distributed through this system is small relative to their overall public funds allocations (although it is instrumental in producing about a third of universities' third mission income, Coates Ulrichsen 2014), it is nonetheless important to be aware of the incentives that this system is likely to create and of the potential misalignment with broader policy goals so that similar approaches are not adopted uncritically elsewhere.

Interestingly, some third mission programmes that used performance-based funding have moved back to competitive allocation. Guldbrandsen and Rasmussen (2012) describe the case of the FORNY programme in Norway, where the use of a formula to

reward performance created incentives for technology transfer offices to strategically change their behaviour in undesirable ways. This led to many changes in the formula and to its eventual abandonment for purposes of fund allocation. In Scotland, the SFC claimed that formula-based funding allocations 'have not resulted in a strong, strategic focus on Scotland's biggest challenges or opportunities' (THE 19 June 2010, cited in Kitagawa and Lightowler 2012, p.9), recognizing their failure to fulfil broader policy goals.

6. Conclusions and avenues for further research

To be successful in supporting policy goals, instruments and their implementation need to be clearly linked to the goals they intend to facilitate. This is particularly important for a designated third-stream fund such as HEIF, which plays a unique role in the landscape of third mission policy instruments in the UK: while academics can access many sources of funds to support their engagement with business and other stakeholders, HEIF is one of the few instruments that universities can use strategically at central level to specifically strengthen their third mission activities. For this reason, and also because of its relatively small size, an instrument such as HEIF should not just reinforce what universities are already capable of doing with recourse to other funds, but it probably would be more effective in sustaining the complex innovation ecosystem envisaged by policymakers, if it allowed universities to experiment with the third mission strategies that are best suited to their evolving sources of competitive advantage. Greater experimentation could be allowed by implementing performance-based funding in a less restrictive way, for example by broadening the range of indicators used for performance measurement, including the evaluation of qualitative information about the impact of third mission activities, and/or by

allowing the use of different indicators for different institutions or different departments, acknowledging that the mode of third mission engagement tends to vary across subject areas. Another approach could be to mix different instruments through a 'policy-mix' approach (Nauwelaers et al. 2009). In complex, unpredictable contexts, flexibility in achieving a goal is better supported by the concept of equifinality (Gresov and Drazin 1997; Kapsali 2011), by having different possible trajectories– paths to reach the goal. The 'policy-mix' approach would imply returning to a mix of different instruments supporting specific types of third mission activities and/or supporting them in different ways, possibly with greater coordination with the instruments made available by other funding agencies (research councils, funding trusts, local governments etc.). This would require interaction between funding agencies to clarify the characteristics and objectives of the planned instruments (Dolfsma and Seo 2013) and to coordinate the degree of differentiation between the instruments, and how they may be coupled with the structure of the policy objectives (Bach, Matt and Wolff 2014).

While the objective of this work was to showcase the difficulty in aligning the incentives created by performance-based funding with the complex goals of third mission policy, the patterns that have emerged from it could be further explored by investigating the implications of performance based-funding on universities' strategic behaviour through empirical analyses exploiting available data on universities' strategic priorities, income and engagement in different activities.

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