Universities, knowledge exchange and policy: A comparative study of Ireland and the United Kingdom

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Abstract

This paper aims to provide one of the first cross-country empirical analyses of the intensity and diversity of knowledge exchange activities by academics. Focusing on the wide perspective of knowledge exchange, the results are based on two large scale surveys with academics in the UK and Ireland and compare them in terms of: modes of interactions, types of partners, motivations and impacts of interactions, constraints on interactions and mission of higher education perceived by academics. It is found that academics in the two countries are both involved in a wide range of activities, with intellectual property activities being the least frequently engaged type of interaction. However, academics working at Irish and UK universities show distinct patterns of interactions with private sector companies and public sector organisations. Our analysis calls for caution over one country seeking to borrow policies from another without understanding the specific context of the higher education sector.

Keywords: Engagement, Higher education, survey methods

JEL Code: I20, I28

1. Introduction

In 2016, Ireland is set to mark the centenary of the Easter Rising which took place 100 years ago in Dublin, with an extensive programme of events launched by the government. The Easter Rising, which began on Easter Monday 1916, is considered to be one of the defining moments of the struggle for Irish independence from the United Kingdom (UK). As a result of the Anglo-Irish Treaty, the Irish Free State was created in 1922, while Northern Ireland remained part of the UK. Under the constitution of 1937, the Irish Free State was named 'Ireland', and was officially declared a republic later in 1949. The relations between Ireland and the UK, however, have been influential and long-lasting. For centuries, Ireland and the UK have been connected politically, reaching a height in 1801 with the creation of the United Kingdom of Great Britain and Ireland. Overall, the two states have a lot in common: their proximate geographic location, common language, close cultural and personal links, as well as their common status as islands in the European Union (EU).

Given these cultural, geographical, and political relations, it is perhaps not surprising to find the higher education sector in Ireland and the UK similar in many ways. After all, the higher education system in Ireland has, from a historical perspective, been based largely on the British system. Founded in 1592 by Queen Elizabeth I, the University of Dublin, Trinity College – the oldest university in Ireland – was modelled on the University of Oxford and University of Cambridge in the form of a collegiate university, although no other college was ever established. University College Dublin, which is now Ireland's largest higher education institution (HEI), had its origins in Cardinal Newman's failed Catholic university of the mid-19th century. At the same time University College Dublin was established, the so-called Queen's Universities at Galway, Cork and Belfast were founded, of which the former two were to become part of the Queen's University of Ireland until the Irish Universities Act 1908 made them colleges of the National University of Ireland.

With ties dating back to centuries ago, the HEIs in the two countries have undergone different stages of development since the independence of Ireland, but there seems to have been a tendency for the Irish sector to emulate and borrow policies from the UK sector. From the late 20th century onwards, the two states, as well as their HEIs, have both been through a period of profound change and transformation of the shape of society and its underlying economic base, a period now widely known as the Knowledge Age. To be specific, the role that knowledge plays in economic growth has significantly been redefined based on the rise

of the endogenous growth model, in which knowledge, along with the traditional factors of physical capital and labour, is acknowledged as a key factor of production (Romer 1986; Lucas 1988). Although it has been argued that views on the prominence of knowledge for economic development remain contested (Lagendijk and Cornford 2000; MacKinnon et al. 2002), it has come to the fore of policies, in both Ireland and the UK, which call for building regional and national competitiveness through knowledge creation and diffusion (Lawton Smith 2003; Boschma 2004). In both states, policy makers expect their HEIs to act as important actors within systems of innovation, in particular by engaging themselves in various types of knowledge exchange activities to provide knowledge for business and the wider community (Cooke et al. 2004; Kitagawa 2004; Huggins et al. 2008).

In this paper, we contrast the outreach activities involved by academics based at HEIs in Ireland and the UK, and examine the similarities and differences between them. Our paper contributes in a number of ways to the extant literature. On the one hand, we focus on the wide perspective of knowledge exchange instead of the narrow perspective of knowledge transfer. The focus of early research on this issue has been knowledge transfer, e.g. patenting and licensing, between academics and private sector firms (Kline and Rosenberg 1986). More recently, research efforts have been directed toward the process of knowledge exchange in a broader perspective (Abreu et al. 2009; CBR 2009). In particular, the notion of knowledge transfer has been considered to be too specific (and narrow) to include the much wider channels of communication that academics are involved in (Klofsten and Jones-Evans 2000; Perkmann and Walsh 2007; D'Este and Perkmann 2011; Hughes 2011; Sigurdson et al. 2015). The term knowledge exchange, as argued, better captures the interactions between academics and their partners, in comparison to knowledge transfer (Schartinger et al. 2001; ESRC 2009). Furthermore, academics have also been found to work closely with government bodies, other public and third sector organisations, which implies that focusing narrowly on academic-business interactions underestimates the comprehensive role of universities (Jones-Evans et al. 2000; Abreu et al. 2008; Hewitt-Dundas 2012; Huggins et al. 2012).

On the other hand, we provide one of the first cross-country empirical analyses of the intensity and diversity of knowledge exchange activities by academics. Previous studies, when comparing the case of HEIs in different countries, have tended to focus on the performance of knowledge transfer activities, such as the number of patents granted to universities or the number of spin-out firms established by university staff. This is set within the context that many countries, inspired by the success of American universities since the 1980s, have also implemented policies to delegate to universities or individual researchers the

right of making decisions about the use of their inventions. In the case of spin-out activities, for instance, although studies have confirmed their prosperity across countries, Clarysee et al. (2001) observed that they are more prosperous in some countries than in others, owing to the effects government have. We thus argue that the extant literature has tended to examine the (financial) performance of knowledge transfer activities, with the structure of them not being touched upon extensively, a gap our findings seek to fill.

One of the main difficulties in comparing the structure of academic knowledge exchange networks across nations, it seems, lies in the fact that there is a lack of relevant evidence based on surveys covering various countries. Relatively, there has been much more evidence in measuring and comparing the performance of university knowledge transfer. To our best knowledge, one of the most comprehensive surveys in mapping academic engagements is a survey in the UK conducted in 2008 by the Centre for Business Research (CBR) at the University of Cambridge, as part of an ESRC (Economic and Social Research Council) funded project. Recently, the CBR team, together with some other organisations, released a report in which they updated the results of their academic survey. As part of an independent study which examines the economic and innovation impact of Irish HEIs on the economy, we constructed an adapted version of the CBR survey. The survey was sent through the Higher Education Authority (HEA) to all the 21 Irish HEIs, including universities and institutes of technology (IoTs). While the Irish study is independent from the UK study, they are based on a comparative framework, with the purpose of collecting comparable data in Ireland to that in the UK. Our analysis, in essence, is based upon the comparison of the results of the CBR academic survey in 2015 and the survey we adapted from that. In particular, the results compare Ireland and the UK in terms of: modes of interactions, types of partners, motivations and impacts of interactions, constraints on interactions and mission of higher education perceived by academics.

The structure of the paper is as follows. The next section briefly sets out the main theoretical ideas on knowledge exchange between academics and external organisations. It is followed by a comparison of the UK and Ireland in their recent developments in policies relevant to knowledge exchange. This paper then proceeds to outline the data used for the analysis before it presents the main findings. The final section provides policy discussions and concluding remarks.

2. Innovation system, universities and knowledge exchange

Our society is said to have shifted from a land-based, labour-based, and capital-based one to a knowledge-based one (Harloe and Perry 2004). For knowledge-based economies, their knowledge development capabilities are increasingly viewed to be associated with their systems of innovation, a system of interconnected institutions to create, store and transfer knowledge, skills and artefacts which define new technologies (Lundvall 1992; Nelson 1993; Freeman 1995; Cooke et al. 2004). In the mid-1980s, the debates over the industrial policy in Europe intrigued the emergence of the national innovation system (NIS) concept. Later on, the concept of innovation system was developed at regional level, which led to the rise of the regional innovation system (RIS) approach, as many studies have shown that innovation activities and collaborations tend to take place within the same region. In general, innovations in a system approach are carried out through a network of actors (Edquist 1997) and systems serve as interaction networks in which knowledge is created and shared (Kaufmann and Tödtling 2001). Policy makers now attach great importance to universities in building innovation systems, in particular through fostering knowledge networks, given that universities are the most important knowledge reservoirs in society (Datta and Saad 2011).

As already indicated, there has seen a shift of research focus from knowledge transfer of intellectual property (IP) to multifaceted channels and mechanisms of knowledge exchange (Meyer-Krahmer and Schmoch 1998; Agrawal 2001; Tiffin and Kunc 2011). Cohen et al. (2002), for instance, considered the following channels connecting firms and universities: patents, informal information exchange, publications and reports, public meeting and conferences, recently hired graduates, licenses, joint or co-operative research ventures, contract research, consulting, and temporary personnel exchanges. A total of 16 types of knowledge interaction were included in the study of Schartinger et al. (2002) and grouped into four categories, namely joint research, contract research, mobility and training. Abreu and Grinevich (2013), when investigating the nature of academic entrepreneurship in the UK, argued that the focus of the literature should be widened to include informal commercial and non-commercial activities as well as patent-based activities. In addition, the most notable feature of modern universities is, arguably, that they are engaged with various types of partners, in different modes of networks, at local, regional, national, and international levels. Although much of the focus has been on interactions between academics and firms, evidence from the UK seems to suggest that, academics are more closely engaged with the public and third sector organisations than with private firms (Abreu et al. 2009).

While universities have been viewed as an important source of competitiveness by regional authorities, it is necessary to point out that university knowledge networks are not always spatially bounded, but are both local and global (Andersson and Karlsson 2007). In their study of Tel Aviv, Belfast, and Cardiff, Cooke et al. (2002) found the evidence that universities have much stronger interactions with businesses at national and international levels than at regional level. It has also been claimed by many studies that knowledge sourced globally by firms may be superior to that from local sources (Davenport 2005; Johnson et al. 2006), which might help explain the rising levels of distant – national or international – partnerships involving academics and businesses. A possible situation in weaker regions, where the industrial base is dominant with a large number of small firms, is that universities and individual academics may have to find their partners elsewhere, as proximate firms lack absorptive capacity to commercialise the knowledge they can provide. Nevertheless, there is no simple answer to the question of how the geographical feature of networks impacts on the effectiveness of knowledge exchange.

Factors that influence academic engagement in knowledge exchange have been found and examined at various levels, ranging from individual, departmental and organisational, to institutional (see Perkmann et al. 2013, for a systematic review of the literature on university-industry relations). Studies have identified that individual characteristics, such as gender, age and seniority of academics, all play an important role in predicting their partnerships. When compared with their female colleagues, male academics are often more actively engaged with industry (Azagra-Caro 2007; Link et al. 2007). The impact of age on academic engagement is somehow ambiguous as the literature has yielded contrasting findings (D'Este and Patel 2007; Boardman and Ponomariov 2009; Giuliani et al. 2010; Haeusslet and Colyvas 2011). Senior researchers are more likely to have larger networks, as shown in many empirical studies, because they may be more reputable in research and have previous experience with industrial collaborators (Van Dierdonck et al. 1990; Landry et al. 2006; Bozeman and Gaughan 2007). For the same group of individuals, there might still exist regional or national differences when it comes to knowledge exchange, which could be explained by the influence of national contexts on academics. Indeed, individual academics' decisions to participate in knowledge exchange are the outcome of many factors combined, including their motivations, perceptions of opportunities, and barriers to collaboration (Abreu et al. 2009; Goldstein 2010; Villasana 2011). Extensive literature has analysed the role of departmental features in deciding academic engagement in knowledge exchange networks (Owen-Smith and Powell 2001; Martinelli et al. 2008). While it is widely accepted that patents and licenses are not a relevant

knowledge transfer channel for researchers in computer science, they are among the most important channels for academics in fields such as biomedical and chemical engineering (Bekkers and Bodas Freitas 2008). A general conclusion is that disciplinary affiliation is an important variable predicting academic engagement with industry (Lee and Bozeman 2005; Boardman 2008). Also, studies on academic collaboration have tended to distinguish between social sciences and applied fields of research, arguing that the importance and intensity of knowledge transfer channels may differ between the two groups (see Lee 1996; Boardman 2009). To include fields such as arts, humanities and social sciences in empirical studies is actually a recent trend, as the early literature did not generally consider academics in those disciplines as entrepreneurial or relevant to engagement (Olmos-Peñuela et al. 2014). In their survey in 2008, Abreu et al. (2009) argued that social scientists participate widely with business and the community, although in different ways to engineers and scientists. It is of interest to examine if there is any difference in knowledge exchange between universities with a diverse mix of discipline areas and universities that are more focused on a narrow range of disciplines.

On an organisational level, the research quality and income of the affiliate university are indicators commonly used when analysing academic engagement. Generally, it is argued that the most research intensive universities also possess greater networks with external organisations (Huggins et al. 2010). World excellent research in these institutions serves as a magnet for large global partners which pursue the best knowledge regardless of its location. The influence of the prestige and reputation of institutions on their external networking capability is rather relevant especially in the UK context, thanks to the hierarchical nature of the UK university system. In particular, UK universities are usually referred to as being established or new, depending on when they were granted university status. The distinction is also related to the overall quality of universities, with more established universities being more research focused and newer universities often being weaker in research output (Lambert 2003). In areas of spin-offs, patents, and licences, Lawton Smith (2003) found that the four UK universities with the highest research income and quality – the University of Oxford, the University of Cambridge, University College London and Imperial College London – are also the leading performers in technology transfer activities. This echoes the positive correlation between the institutional research performance and the individual participation in knowledge commercialisation identified in many other studies (Jones-Evans et al. 1999; Carlsson and Fridh 2002; Di Gregorio and Shane 2003; Markman et al. 2005; O'Shea et al. 2005; Phan and Siegel 2006). Nevertheless, while established universities may be more likely to be partners

for global firms, new universities still play important roles in providing various types of services to local companies. It is probably more appropriate to claim that both established and new universities are of importance to regional economic development, albeit in different areas and in different ways (MacKenzie and Zhang 2014).

There is little empirical evidence of the role of institutional contexts, e.g. national policies, in academic engagement, with a few exceptions. Wigren-Kristoferson et al. (2011), for example, analysed the changing nature of academic work related to knowledge production and diffusion, which was set within the changing research policy landscape in Sweden. In particular, unlike many other European countries, Sweden allows university researchers (not the universities as organisations) to retain full rights to their discoveries, which is called the university teacher's exemption. Focusing on the evolution of policies in the devolved regions in the UK, Huggins and Kitagawa (2012) conducted a policy-level analysis of university knowledge transfer activities and initiatives in Scotland and Wales, while Kitagawa and Lightowler (2012) compared policies, strategies, and funding incentives of technology transfer in England and Scotland. A relatively large body of literature has examined those institutional-level factors encouraging commercialisation activity, especially the introduction of policies like the Bayh-Dole Act in the U.S. (Sampat et al. 2003; Mowery and Sampat 2005; Powers and McDougall 2005). At least from these studies, it seems that participation in knowledge exchange is positively related to the level of competition that academics face (Goldfarb and Henrekson 2003). Understandably, intense competition for resources would motivate academics to become more active involved in searching for partners and securing extra research funding which would otherwise be unavailable.

3. The policy context for university knowledge exchange in Ireland and the UK

3.1. Ireland

From the late 1990s onwards, the Irish Government embarked on a strategy of significantly enhancing the scientific, technological and innovative capacity of the country, as part of its aim to develop a knowledge and innovation-based economy (OECD 1996; Forfás 2004). In a way, these endeavours were built on many years of support from the EU, mainly through its Structural Funds, and originated at a period when the so-called 'Celtic Tiger' growth spurt seemed to have slowed down, if not ended (Sweeney 1998; MacSharry and White 2000). Ireland has seen, since 2000, the release of a series of national policies and incentives targeting investment in science and technology (Harkin and Hazelkorn 2014).

In the *National Development Plan 2000-2006*, which sets out an overall development strategy for the country, one of the objectives is the consolidation and improvement of Ireland's international competitiveness (Stationery Office 1999). It has been argued that this stage saw a policy shift towards funding research in universities and other third level institutions, as a means of maintaining sustainable national economic growth. Following the implementation of the NDP, the Science Foundation Ireland (SFI) was founded in 2001 to undertake and support strategic research of world class status. As well as this, the Programme for Research in Third Level Institutions (PRTLI), initiated in 1998 and administered by the HEA, was further expanded, representing a significant commitment of state resources to research in higher education. Over its five cycles between 1999 and 2008, the PRTLI received over €1.22bn in exchequer and private funding (HEA 2011).

The importance of science, technology and innovation (STI) was emphasised again in the *Strategy for Science, Technology and Innovation 2006-2013*, which represents Ireland's first comprehensive strategic approach to developing STI on a whole of government basis (DJEI 2006). In general, the Strategy seemed to have proposed a wider perspective on STI than what was addressed in the NDP. The Strategy called for actions not only in delivering world class research but also in areas such as capturing, protecting and commercialising ideas, as well as strengthening research and development (R&D) for enterprise, innovation and growth. Launched in 2006, the HEA Strategic Innovation Fund (SIF) was aimed at enhancing collaboration between HEIs, improving teaching and learning and promoting access and lifelong learning.

In 2011, the Department of Education and Skills (DES) published the *National Strategy for Higher Education to 2030* – also known as the Hunt report after its chairperson, economist Colin Hunt – and mapped out a vision of the higher education sector in the decades ahead (DES 2011). In this report, there was a whole chapter dedicated to engagement between academics and external organisations, arguing that 'engagement with the wider community must become more firmly embedded in the mission of higher education institutions' (DES 2011, p. 79). More recently, in March 2012, the Research Prioritisation Steering Group launched the *Report of the Research Prioritisation Steering Group*. The idea of the Report was to build on the strengths that have emerged from considerable public and private investment in STI during the last decade, and to target the priority areas that will become the focus of future state investment in research and innovation (Forfás 2012).

Although it has received some attention, the idea of knowledge exchange is still in the early stages in Ireland, with no dedicated funding scheme to boost knowledge exchange

activities and to measure the performance of institutions. During the last decade, state investment in Ireland's HEIs has primarily been supporting and promoting capacity building of institutions themselves, although some funding has also been encouraging collaboration between HEIs. The creation of a series of regional clusters of institutions, which was initiated in 2013, aims to improve the quality of teaching and research through more effective collaborations between the institutions situated within the same region. Recently, the policy focus on universities has shifted towards engagement not only within the higher education sector but also between the sector and the wider society. The latest call from the Technology Transfer Strengthening Initiative (TTSI) – the flagship programme of the Irish Government in knowledge transfer since 2007 – was aimed at expanding the scope of the initiative beyond the traditional patenting and licensing approach to technology transfer. A direction which future policies could follow is to deliver, reward and incentivise knowledge exchange activities among Ireland's HEIs.

3.2. UK

In the UK, the mission of universities was redefined as a response to the major shifts in expectations that they should make an active contribution to the development of their regions (Chatterton and Goddard 2000). Whilst the introduction of the 1993 *Realising Our Potential Awards* demonstrated the UK Government's increased focus on the impact of university-business interactions (Abreu et al. 2008), the first major study into the impact of universities at a regional level did not appear until the *Dearing Report* (the National Committee of Inquiry into Higher Education 1997) which noted that UK universities should be seen as a significant force in regional economies and as a source of income and employment. This set off a series of reports over the next 15 years that began to emphasise the inter-relatedness of research and economic benefit.

The 1998 government White Paper – *Our Competitive Future* – argued that the crucial factor in building the knowledge-driven economy is about 'the more effective use and exploitation of all types of knowledge' (DTI 1998, p. 6), with the knowledge created by the university sector accounting for an important share of this resource. In a 2000 White Paper entitled *Excellence and Opportunity*, the government proposed a number of initiatives and programmes to create clusters of innovation that drew universities and businesses together and to ensure that excellence in science was turned into products and services (DTI 2000). The UK *Science and Innovation Investment Framework* for the period 2004-14 further

embedded the notion of translating the knowledge base more effectively into business and public service innovation (HM Treasury 2004).

Many more reports were generated which specifically examined how to maximise the impact of universities on knowledge exploitation and economic development. The *Lambert Review* concluded that government would have to do more to support business-university collaboration and that business would need to learn how to exploit the innovative ideas that are developed in the university sector (Lambert 2003). The *Sainsbury Review* called for the building of a national innovation ecosystem, to include a wide range of actors extending from universities to research institutes, government funders and regulators, business and investors, and specified the contributions that should be made by each party (Sainsbury 2007). Two more recent reports (Wilson 2012; Witty 2013) have continued this thinking suggesting that universities should make the facilitation of economic growth a core strategic goal. While the *Wilson Review* recommended that universities should firmly be at the heart of our economy if the potential of UK university-business collaboration is to be fulfilled, the *Witty Review* suggested that universities have extraordinary potential to enhance economic growth at the local level.

As a consequence of the impact of national policies and reports on universities and economic growth, the UK Government has launched a series of funding schemes to boost knowledge exchange activities, further, and maybe more directly, highlighting the significant of converting scientific progress into economic success. Indeed, funding for HEIs around the UK includes three main components: funding for teaching, funding for research and funding for knowledge exchange. While the amount of funding to support knowledge exchange is relatively small compared to funding for teaching and research, it has been increasing significantly over the last decade.

In 1999 the Higher Education Funding Council for England (HEFCE) established the Higher Education Reach-out to Business and the Community Fund (HEROBC) for the purpose of enhancing the contribution that universities make to the economy and society (HEFCE 2000). The Higher Education Innovation Fund (HEIF) succeeded this in 2001, and the current incarnation of the fund runs from 2011 to 2015 (HEFCE 2011; PACEC 2012). In 2004, the Higher Education Funding Council for Wales (HEFCW) founded its Third Mission (3M) Fund and later renamed it as the Innovation and Engagement Fund (I&E) (HEFCW 2011). Northern Ireland runs an adaptation of the HEIF in England, while Scotland offers its own Knowledge Transfer Grant (KTG) (SQW 2009; DELNI 2010).

4. Data and methodology

As explained, there are two sets of data collecting settings, with one independent from the other. In the UK, the academic survey was commissioned through the National Centre for Universities and Business (NCUB) and conducted as part of a large research project carried out by the CBR at the University of Cambridge as well as some other organisations in 2015. In essence, this survey updates the analysis of the same survey of UK academic engagement with external organisations, which was undertaken by the CBR during the autumn of 2008 and the early summer of 2009 and which covered the period between 2005/06 and 2007/08 (see Abreu et al. 2009). In 2015, the web-based survey was created and then sent to a specially constructed sampling frame of more than 130,000 individual academics in all disciplines in virtually all UK universities who were active in research and/or teaching in 2014/15. The survey asked academics to indicate their engagements in knowledge exchange networks between 2012/13 and 2014/15. It finally achieved a sample of 18,177 responses, representing a response rate of 14 per cent. The sampling frame, response rate and possible response biases had to be evaluated to make sure the data was statistically representative. Although the researchers had access to the data, there was no information about the process in which the survey was administrated. Hughes et al. (2016) however have explained these issues in full detail in their report of the survey results, which became the only source we could reference. Understandably, the reliance on external bodies in terms of data collection is a common issue for researchers who use large-scale secondary data. Therefore, the following analysis of the CBR academic survey has been elaborated based on the information provided by Hughes et al. (2016).

The CBR team manually compiled a list of all academics holding a university post and active in teaching and/or research in the sample period in all disciplines in all UK HEIs, which was the sampling frame. Using the Qualtrics survey software suite, the survey instrument was administered in a series of waves. The intention in doing so was to take into account the scale of the survey, which was to be sent to over 140,000 academics. In particular, the survey was sent out in batches of 10,000 emails each spread over two days, and after the initial email invitation, two prompts were emailed the first after 10 days and the second after a further seven days. In terms of response bias, the comparison between non-respondents and respondents was not possible; however, the CBR team compared those academics who replied without a reminder with those who replied after receiving one. In general, the quantitative differences were very small, although there were some statistically

significant differences between the two groups, the main reason for which was related to the large sample size the study contained. The sample was further compared with HESA (Higher Education Statistics Agency) by position, gender, discipline and age of respondents, and it seemed that the survey would lead to a somewhat higher likelihood of interaction with external organisations, which must be borne in mind when interpreting the results.

With inspiration from the CBR academic survey, an adapted, but shorter, version of it was constructed by the researchers to collect comparable data in Ireland. Same as the CBR academic survey, our own survey was targeted on the full range of academics disciplines. In the end of November 2014, the survey was sent through the HEA to the president offices of all the 21 Irish HEIs, which then circulated the invitation to their own staff respectively. It was hoped that in this way a better response rate could be achieved. Around two weeks later than the first email, a reminder was sent to a number of institutions when, either the original survey had not been circulated yet, or the response rate was significantly lower than the average of the whole sample. When the survey was closed in the end of January 2015, a total number of 1,710 responses were received from 19 Irish HEIs, of which 1,099 were complete responses, with an overall response rate of 5.1 per cent. As there were only six respondents from veterinary and agriculture, those responses were excluded from the results. In general, while the response rate seems low, it compares well against many other national studies of Ireland's higher education sector. For instance, around the same percentage of students responded to the Eurostudent Survey V, which reports on the social and living conditions of higher education students in Ireland in 2013 (Harmon and Foubert 2014).

In order to check if there is any response bias between the survey respondents and the whole sample, we compared the two groups in terms of activity, gender and age. Unfortunately, without comparable data from the HEA, the comparison was not available in terms of discipline. While our sample is representative of the HEA data in terms of gender, our respondents are different from the whole sample in the distribution of age groups. In particular, our sample has a lower proportion in the under 40 age group and a higher proportion aged over 40 than the HEA data. Presumably, older staff are more likely to hold senior positions and report higher levels of interaction. Overall, there might be an upward bias in our sample in the estimated level of interaction involving academics with external organisations, also similar to the CBR survey. Nevertheless, the implications for response bias are not straightforward to infer, neither in our own survey nor in the CBR survey.

It is essential to define knowledge exchange activities – the key concept of this paper – before presenting the findings. Knowledge exchange activities, a term this paper uses

equivalently to knowledge networks, refer to the channels through which academics interact with businesses and the community. In the view of the CBR academic survey, knowledge exchange takes place in a wide spectrum of activities, including not only IP channels but also research partnerships. The survey assesses the engagement of academics in the following four broad categories, namely people based, problem solving, community based and commercialisation, as listed in Table 1 below.

5. Results

5.1. Modes of interactions

Table 1 shows how intensively respondents in Ireland and the UK were engaged in a total of 27 types of knowledge exchange activities which were grouped into the four broad categories. In general, academics in the higher education sector in both countries were actively engaged in a wide range of external interaction activities with their partners. More importantly, knowledge transfer activities, i.e. patenting and licensing, were much less frequently engaged by academics in Ireland and the UK, in comparison to people based, problem solving and community based activities. Academics in the two countries were instead heavily involved in activities such as attending conferences, informal advice, participating in networks, giving invited lectures and joint research and publications. Focusing narrowly on knowledge transfer activities, therefore, would inevitably fail to draw the full picture of university-industry interaction, as it is clearly shown that university staff are actively involved in a diverse range of activities. Aside from the knowledge transfer channels, external secondment and community based sports were also on the lower end of the spectrum, reported by less than 10 per cent of respondents in both Ireland and the UK. Although we did not seek to directly compare the two national data sets in a statistical manner, due to the significant differences between Ireland and the UK in terms of the numbers and profiles of the HEIs, it was still considered to be insightful to juxtapose the results of the two surveys. After all, our survey and the CBR survey used the same survey questions and were based on the same systematic frameworks, which allow for potential comparison and discussion. Furthermore, as we intend to highlight the potential problems associated with policy borrowing in the higher education sector between these two countries, it is crucial for us to have a general acknowledgement of the differences between them in knowledge exchange. As Table 1 indicates, there were considerable differences between the two countries with regards to the intensity of academic knowledge exchange. Academics based at Irish HEIs, for instance, were more closely

engaged in knowledge exchange than their UK counterparts in 15 activities. By contrast, UK academics outperformed their Irish counterparts in a total of 12 activities. An interesting finding was that, in all of the four types of commercialisation activities, academics in Ireland were more intensively engaged than those based at the UK HEIs.

Table 1 about here

5.2. Types of partners

In Table 2, we compare how intensively academics in Ireland and the UK interacted with private sector companies and public sector organisations. All respondents taken into account, around 57 per cent of Irish academics stated that they were engaged with the private sector, while less than 52 per cent of the responding individuals reported interaction with the public sector. As also shown in Table 2, Ireland shows some different patterns from the UK. For instance, academics in British universities showed higher levels of interaction with their public sector partners than with private firms. In Ireland, however, academics were more closely engaged with private sector companies than with the public sector such as governmental organisations. The share of respondents employed by Irish HEIs who indicated involvements in knowledge exchange activities with private firms was also significantly higher than that of respondents working at UK universities. According to the CBR academic survey, less than 31 per cent of the UK respondents indicated that they were involved with private sector firms. Furthermore, academics in Ireland also showed higher levels of interaction with public sector organisations than their UK counterparts, with under 35 per cent of academics in the UK claiming that they were engaged with the public sector. In general, as Table 2 suggests, the higher education sector in Ireland shows close relationships with both the private sector and the public sector, even when compared with its international counterparts.

Table 2 about here

5.3. Motivations and impacts of interactions

In both surveys, academics were asked to indicate the motivations for interaction with external partners and the degree of importance of each motivation using a 1-to-5 rating scale, with 5 referring to ‘very important’ and 1 referring to ‘very unimportant’. Table 3 below shows the mean scores of the 12 motivations identified in the surveys. It is interesting that

academics based at Irish HEIs gave higher scores to all the 12 motivations than their UK counterparts, suggesting that each motivating factor had a stronger effect on academics in Ireland than in the UK. Among the 12 motivations, the most important ones – those with the highest mean scores – in both countries include gaining insights in the area of academics' research, keeping up to data with research in external organisations and testing the practical application of academics' research. Relatively less important motivations for Irish and UK academics to engage in knowledge exchange include looking for business opportunities linked to their own research and seeking personal income. In particular, the mean score of 'source of personal income' was 2.3 for UK academics and 2.4 for Irish academics respectively. It seems to imply that in both countries, academics did not view financial reward an important motivating factor of knowledge exchange interaction; rather, they were much more likely to engage themselves with external organisations when there was room to strengthen their own research capability.

Table 3 about here

Table 4 illustrates how respondents considered the impacts of external activities on their research performance and teaching. Overall, most academics in both countries suggested that their involvement with external organisations had at least some impact on their research, with less than 11 per cent of them indicating otherwise (8.7 per cent of Irish academics said knowledge exchange had very little or no impact on research). In both Ireland and the UK, more than half of the respondents agreed that new insights for work were provided by their engagement, while more than 40 per cent of them indicated that external activities had led to new contacts in the field or new research projects. Nevertheless, academics in the UK reported much stronger impacts of external interaction on their research than did their Irish counterparts, which is an interesting finding in need of further investigation. A possible reason for this difference could be related to the exact nature and content of knowledge exchange activities in which academics in these two countries were engaged. Possibly, it also has something to do with the fact that measuring the impact of academic activities in Ireland is, relative to the UK, in its infancy. In the UK, the Research Assessment Exercise (RAE) and its successor Research Excellence Framework (REF) have since the 1980s been assessing the research of British HEIs, with the impact of research receiving more attention. The nature of these research evaluation frameworks is that it may get researchers thinking about their work beyond established recognition structures and processes of the academic profession.

Relatively, it seems that knowledge exchange was more likely to have some impact on research than on teaching. Around 18 percent of Irish academics and 28 per cent of UK academics suggested that there was very little or no impact from external activities on their teaching. These numbers are much higher than the shares of respondents in the two countries indicating the same for research. Similar to the case of research, UK academics were more likely to report that their teaching was impacted by their external activities than their Irish counterparts. The areas where most academics in both countries tended to report impact on teaching include the changes of the way they present the material, the changes of curriculum and the strengthening of their reputation as a teacher. An increase in entrepreneurial skills among students was least frequently reported by academics in both Irish and UK HEIs as an influence by external activities, with less than 17 per cent of respondents indicating so in both countries.

Table 4 about here

5.4. Constraints on interactions

The constraints identified by the respondents when engaging in their knowledge exchange activities are shown in Table 5. In both countries, the most important constraints cited by academics include a lack of time to fulfil all university roles, insufficient resources devoted by the institutions, bureaucracy and inflexibility in the institution and insufficient rewards from interaction. By contrast, cultural differences between universities and firms were the least frequently cited constraint by academics, which seems to contradict the conventional wisdom that cultural barriers limit interaction between academics and firms (Lambert 2003). Overall, Irish academics were more likely to be influenced by the constraints than their counterparts in the UK. In eight of 13 cases, the share of Irish academics reporting a constraint was higher than that of UK academics. For instance, although more than 50 per cent of the respondents in both countries reported that they lacked time to engage with external organisations, academics based at Irish HEIs were much more likely to be constrained by this factor than UK academics were. In the UK, academics were more constrained than those based at Irish HEIs by unwillingness in the external organisation to meet the full cost, lack of resources in the external organisation to manage interaction, and lack of interest by external organisations. These are the areas where the policies in the UK could possibly seek to improve. Finally, when it comes to bureaucracy and inflexibility in their institutions, Irish academics were much more likely to be constrained than their UK

counterparts. It should also be highlighted that, although extensive research has identified substantial barriers to successful collaboration and knowledge exchange between universities and firms, few studies have attempted to investigate what may attenuate them. A notable exception is the work of Bruneel et al. (2010), who sought to explore the effects of collaboration experience, breadth of interaction, and inter-organisational trust on lowering different types of barriers. While greater levels of trust was found to be able to reduce both orientation-related and transaction-related barriers, prior experience of collaborative research only lowered the former type of barriers. Relevant questions on these issues could be integrated into the academic survey when it will be circulated again in the future.

Table 5 about here

5.5. Mission of higher education

Understandably, the intensity of academic engagement in knowledge exchange could, in part at least, be influenced by the perception of academics regarding such activities. Respondents in Ireland and the UK were asked in the surveys to indicate how they perceived the role of higher education in the economy. In particular, they were required to indicate to what extent they agreed with each of the six statements about relationships between universities and businesses as well as the wider society (Table 6). Again, a 1-to-5 rating scale was used to measure the differences, with 5 referring to 'agree strongly' and 1 referring to 'disagree strongly'. For academics in both countries, they were most likely to argue that academic freedom is of fundamental importance to the future wellbeing of society. To a large extent, academics in Ireland and the UK also stated that higher education has a key role to play in increasing the competitiveness of business, which might positively influence the interaction between academics and firms. Nevertheless, Irish and UK academics also tended to agree that, over the past few years, universities in their own country have gone too far in attempting to meet the needs of industry. In general, academics tended to disagree that the main purpose of university teaching should be to prepare students for the labour market. Comparing the mean scores of the six statements between the two countries, UK scores were higher than Ireland in four, while Ireland scored higher in one. In addition, academics based at Irish HEIs were more likely to agree that academia should focus on basic research and should not be concerned with its actual or potential application than those at British universities.

Table 6 about here

6. Discussions and conclusions

As universities have increasingly been portrayed as important actors in systems of innovation at both national and regional level, they are now actively engaged in various types of knowledge exchange activities with external organisations. Whereas there has been much evidence in the performance of university knowledge transfer activities, little is known about the intensity of knowledge exchange activities engaged by academics (Hewitt-Dundas 2012). In this paper, we have examined and compared the current state of academic knowledge exchange in Ireland and the UK, with the aim to understand the intensity and diversity of interaction between academics and business and the community in these two countries.

In both countries, academics were found to be involved in a wide range of knowledge exchange activities, with IP-related activities being the least frequently engaged type of interaction (Hughes 2011). Although Irish academics were more intensively involved in the majority of types of interaction than their UK counterparts, a more reasonable suggestion seems to be that academics across countries tended to engage in different types of activities. It remains unclear what might be the underlying reason for this difference, but it might be related to the policies adopted in each country which possibly advocate and promote certain activities. Future studies could examine the role of national policies in driving academic engagement with external organisations. As indicated, the idea of knowledge exchange is still in the early stage in Ireland, and there has been limited empirical evidence gathered to undertake this task at the moment. In contrast to the UK, where the knowledge exchange process is more advanced, the Irish context offers an interesting laboratory in which to investigate HEIs operating at the first stage of their development in knowledge exchange.

Staff working at Irish and UK HEIs showed distinct patterns of interaction with private sector companies and public sector organisations. While the Irish respondents were more closely engaged with the private sector than with the public sector, their UK counterparts showed reverse patterns. In particular, university-industry engagement in Ireland was in a relatively good position, at least when compared with that in the UK, since Irish academics worked more intensively with both private sector firms and public sector organisations than academics in the UK. Cautions should be taken when interpreting these results, though, because on the one hand there might be differences within the same higher education sector and on the other hand there are many more factors which could affect the effectiveness and

influence of such interactions, including size, research intensity and location of firms as well as the type of public sector organisations.

Academics were motivated by a number of factors to get involved in knowledge exchange, but were found to face many constraints too. Instead of using knowledge exchange as a means of seeking personal income, university staff in both Ireland and the UK were much more likely to be motivated by gaining insight in their research area. Therefore, regional policy makers who intend to incentivise academics to be more closely engaged in knowledge exchange might devise more effective programmes and instruments by taking into consideration the motivations of academics to interact with industry. While it was overwhelmingly suggested that knowledge exchange activities had some positive impacts on research and teaching undertaken by academics, they also claimed that the lack of time was the most important factor constraining their further interaction. In particular, more than 60 per cent of Irish academics claimed that there was a lack of time for them to fulfil all university roles. This finding has important policy implications, especially for some (economically) weaker regions where policy makers might have too high expectations of higher education institutions in driving regional development (Porter and Ketels 2003). In such regions, which tend to lack a dense system of institutions, including publicly funded research institutes and laboratories dedicated to applied research (Huggins and Johnston 2009), governments are likely to reinforce their expectations on universities by piling new functions and activities onto them, which however often leaves universities with a mission impossible (Jacob et al. 2003; Nedeva and Boden 2006). It could be the case that some academics already felt there were too many things for them to handle; thus to further add knowledge exchange activities on their agenda may turn out to be detrimental.

In general, university staff were positive about the role higher education should play in supporting business and regional development in both countries (Goddard et al. 2014), but they were, at the same time, concerned about the detriment to their core teaching and research roles as a result of too much focus being put on meeting the needs of industry. After all, academics in Ireland and the UK still held firmly that academic freedom is of fundamental importance. Our findings could be of relevance to policies in higher education, innovation and the knowledge-based economy. In Ireland, the policy focus, which used to be mainly on capacity building of HEIs and on collaborations between HEIs, has recently shifted towards knowledge exchange between the higher education sector and the wider society. What this paper has found could be used as a first step to build a more comprehensive understanding of knowledge exchange activities between Ireland's HEIs and their external partners.

An important lesson from our analysis is that, if any knowledge exchange policy instrument is to be really effective, the specific context of the higher education sector as well as its external stakeholders should be deeply understood, as there simply is not a one-size-fits-all solution. Although we did not conduct statistical comparisons between the results of the two surveys, it was still clear for one to notice considerable differences between Ireland and the UK in academic engagement in knowledge exchange activities. It raises a call for caution about one country seeking to imitate, emulate, or copy policies from another without specifying similarities and differences between each other and discussing their implications. This concern is of great relevance to the Irish higher education sector, which seems to have a tradition of looking at its UK counterpart for policies and practices. To begin with, the binary system of universities and IoTs in Ireland mirrored the structure of the UK higher education sector which included universities and polytechnics until 1992, when the Further and Higher Education Act 1992 ended the binary divide in the UK and accelerated the expansion pace of the sector by creating the so-called post-1992 universities (Taylor 2003). More recently, there was the idea of Technological Universities in Ireland, which was introduced as part of a framework for reform within the Irish higher education landscape, following publication of the *National Strategy for Higher Education* in 2011. A key aspect of the Technological Universities Bill is institutional merger – requiring a number of smaller institutions to merge into a large institution – which also follows the trend in the UK's higher education landscape, especially the Welsh model (Tight 2013). Since the late 2000s, the Welsh government has been pursuing an aggressive reform agenda, with the main aim of creating a critical mass of research capabilities. In addition, as a result of the economic crisis of 2008, the Irish government has implemented austerity policies to deal with its high level of debt, during which process the higher education sector was strongly impacted. In 2014, the Minister for Education and Skills established an expert group on future funding for higher education, whose main responsibility was to consider the issues relating to the long term sustainable funding and identify options for change. The final report of this group, released in the end of 2015, reviewed funding models in a number of countries, with a lengthy discussion about the English model. Interestingly, one of the main suggestions was to bring in an income contingent repayable loan system just like the one in England (Bekhradnia 2015).

Whilst it is widely accepted that policy borrowing is important for policymakers, as it provides what useful lessons might be learnt from other systems, Noah and Eckstein (1969) have clearly claimed that, "it was one thing to assert that the study of foreign education was a valuable enterprise; it was quite another to believe that foreign examples could be imported

and domesticated." In the case of Ireland, it is apparent that many policies and practices in the higher education sector have been borrowed, or adapted, from those in the UK, especially England. As stated, although the two countries share similarities in many ways, the specific context of the higher education sector has become rather different. Our comparative analysis of academic engagement in knowledge exchange activities in Ireland and the UK clearly demonstrates those differences, which need to be taken into account when policymakers seek to further foster those interactions. As one of the first studies to examine the intensity of academic knowledge exchange in various countries, our analysis provides a framework of comparison and allows for tailored policy making.

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Table 1. Academic knowledge exchange in the four broad categories (% of respondents)

		Ireland (n = 1,099)	UK (n = 18,177)
	People based activities		
1.	Attending conferences	77.0	**80.8**
2.	Participating in networks	51.1	**63.0**
3.	Giving invited lectures	49.9	**55.4**
4.	Student placements	**42.4**	31.1
5.	Curriculum development	**41.5**	21.8
6.	Sitting on advisory boards	32.6	**32.7**
7.	Employee training	**28.8**	27.2
8.	Enterprise education	**11.0**	7.0
9.	Standard setting forums	8.5	**24.9**
	Problem solving activities		
10.	Informal advice	**58.1**	47.4
11.	Joint research	**45.6**	44.5
12.	Joint publications	45.2	**48.1**
13.	Research consortia	**29.1**	29.0
14.	Hosting personnel	28.8	**29.3**
15.	Consultancy services	25.5	**31.5**
16.	Contract research	22.2	**26.8**
17.	Prototyping and testing	**13.7**	9.0
18.	Setting of physical facilities	**13.7**	9.7
19.	External secondment	5.7	**10.0**
	Community based activities		
20.	Lectures for the community	35.4	**41.4**
21.	School projects	24.1	**28.6**
22.	Public exhibitions	**22.2**	13.4
23.	Community based sports	**8.0**	3.0
	Commercialisation activities		
24.	Patenting	**8.4**	5.9
25.	Formed/run consultancy	**7.7**	7.4
26.	Licensed research	**5.5**	3.4
27.	Spun-out company	**3.3**	2.8

Notes: 1. For each category, activities were ranked in a descending order of the value for Ireland; 2. For each activity, the value was marked bold if it was bigger than that for the other country.

Table 2. Academic knowledge exchange with the two sectors (% of respondents)

	Ireland (n = 1,099)	UK (n = 18,177)
Private sector companies	**57.1**	30.8
Public sector organisations	**51.7**	34.9

Note: For each sector, the value was marked bold if it was bigger than that for the other country.

Table 3. Motivations for academic knowledge exchange (mean score)

	Ireland (n = 1,099)	UK (n = 18,177)
Gain insights in the area of my own research	**4.3**	3.9
Keep up to date with research in external organisations	**4.1**	3.5
Test the practical application of my research	**4.0**	3.5
Further my institution's outreach mission	**3.9**	3.6
Create student project and job placement opportunities	**3.8**	3.1
Gain knowledge about practical problems useful for teaching	**3.7**	3.2
Secure access to the expertise of the external organisation	**3.7**	3.2
Secure funding for research assistants and equipment	**3.6**	2.8
Secure access to specialist equipment, materials or data	**3.3**	3.2
Look for business opportunities linked to my own research	**2.9**	2.5
Source of personal income	**2.4**	2.3

Notes: 1. Motivations were ranked in a descending order of the value for Ireland; 2. For each motivation, the value was marked bold if it was bigger than that for the other country.

Table 4. Impacts of academic knowledge exchange on research and teaching (% of respondents)

	Ireland (*n* = 1,099)	UK (*n* = 18,177)
Research		
It has given me new insights for my work	53.2	**75.5**
It has led to new contacts in the field	48.9	**72.9**
It has led to new research projects	42.9	**59.7**
It has strengthened my reputation in the field	39.6	**60.9**
It has had very little or no impact	8.7	**10.3**
Teaching		
It has led to changes in the way I present the material	41.4	**52.9**
It has led me to make curriculum changes	33.6	**43.0**
It has strengthened my reputation as a teacher	25.6	**40.7**
It has led to an increase in the employability of my students	22.4	**31.8**
It has had very little or no impact on my teaching	18.0	**27.8**
It has led to an increase in entrepreneurial skills among my students	11.2	**16.7**

Notes: 1. For each category, impacts were ranked in a descending order of the value for Ireland; 2. For each impact, the value was marked bold if it was bigger than that for the other country.

Table 5. Constraints on academic knowledge exchange (% of respondents)

	Ireland (*n* = 1,099)	UK (*n* = 18,177)
Lack of time to fulfil all university roles	**61.6**	52.5
Insufficient resources devoted by your institution	**34.3**	21.3
Bureaucracy and inflexibility in your institution	**33.1**	23.3
Insufficient rewards from interaction	**28.3**	20.1
Unwillingness in the external organisation to meet the full cost	14.6	**17.7**
Difficulty in identifying partners	13.6	**16.9**
Differences in timescale	**13.1**	10.1
Poor marketing, technical or negotiation skills of your institution	12.4	**14.7**
Lack of experience in the external organisation to interact	**11.6**	10.3
Lack of resources in the external organisation to manage interaction	10.5	**14.7**
Lack of interest by external organisations	9.9	**11.8**
Difficulty in reaching agreement on terms of interaction	**9.6**	6.8
Cultural differences	**5.4**	3.3

Notes: 1. Constraints were ranked in a descending order of the value for Ireland; 2. For each constraint, the value was marked bold if it was bigger than that for the other country.

Table 6. Extent to which agree with statements about relationships with external organisations (mean score)

	Ireland (*n* = 1,099)	UK (*n* = 18,177)
Academic freedom is of fundamental importance to the future wellbeing of society	4.4	**4.6**
Higher education has a key role to play in increasing the competitiveness of business	3.9	**4.2**
Over the past few years, universities have gone too far in attempting to meet the needs of industry to the detriment of their core teaching and research roles	3.2	**3.3**
Business in the country does not have the capacity to use research effectively	3.0	**3.1**
The main purpose of university teaching should be to prepare students for the labour market	2.8	2.8
Academia should focus on basic research and should not be concerned with its actual or potential application	**2.4**	2.3

Notes: 1. Statements were ranked in a descending order of the value for Ireland; 2. For each statement, the value was marked bold if it was bigger than that for the other country.