

Academic entrepreneurship and traditional academic duties: synergy or rivalry?

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This study investigates the influence of academic entrepreneurship on traditional academic duties carried out in a resource-constrained environment, particularly focusing on whether there is synergy or rivalry between these two activities.

Using qualitative evidence, we discover that there are funding, resource, knowledge and skill and networking synergies between academic entrepreneurship and traditional academic duties. These synergies are found to be extremely important in overcoming resource barriers to conduct teaching and research. Academic entrepreneurs manage their engagement in multiple activities through symbiotic relationships with other academics. While academic entrepreneurs are the initiators who secure entrepreneurial opportunities, other academics support them as they capitalise on these opportunities. The importance of encouraging academic entrepreneurship as a strategy to overcome resource barriers to traditional academic duties is emphasised. Implications and future research avenues are highlighted.

Keywords: academic entrepreneurship; traditional academic duties; synergy; resource-constrained environment; rivalry; Sri Lanka

Introduction

Universities are key institutions in any innovation ecosystem. The engagement of universities in entrepreneurial activities, in addition to their traditional roles of teaching and research, has received mixed responses; while some view this engagement as a positive change with myriad benefits for universities, businesses and the wider economy

(Phan and Siegel 2006; Wright et al. 2006; Etzkowitz 1998; Louis et al. 2001; Zucker and Darby 2001), others have argued that it might have negative impacts on traditional university roles (Van Dierdonck and Debackere 1988; Bercovitz and Feldman 2003).

These negative effects are bound to be mainly due to the use of limited physical (Van Dierdonck and Debackere 1988) and human resources (Bercovitz and Feldman 2003) in universities for academic entrepreneurship (Dasgupta and David 1994; Rosenberg and Nelson 1994). Since university resources are strong predictors of the outcomes of traditional academic duties (i.e. teaching and research) and academic entrepreneurship (Powers and McDougall 2005), resource conflicts may result in suboptimal performance in both of these tasks (Bercovitz and Feldman 2003). This resource-based criticism might be more critical for universities operating in resource-constrained environments than those in relatively resource-rich environments. These resource-constrained environments are generally characterised by significant resource scarcity that involves shortages of skills (Alexander and Andenas 2008; Griffith-Jones, Bhattacharya, and Antoniou 2003), finance (United Nations Human Settlements Programme 2005), infrastructure, technology (World Bank 2010) and institutions (Claude and Weston 2006).

Although there is a wealth of research on this topic carried out in developed, relatively resource-rich nations (Phan and Siegel 2006; Wright et al 2006; Etzkowitz 1998; Louis et al 2001; Zucker and Darby 2001), there is a lack of research investigating the impacts of entrepreneurial engagement on traditional academic duties in developing, resource-constrained environments. Hence, this study aims to fill this gap in our knowledge by investigating how academic entrepreneurship affects traditional

academic duties carried out in a resource-constrained environment. It uses a dedicated survey of academics in Sri Lanka to address this research gap, and particularly, aims at answering whether there is synergy or rivalry between academic entrepreneurship and traditional academic duties. The following sections of the paper discuss the theoretical background underpinning this study, and the methodology adopted. The findings and their implications are then presented.

Theoretical context

Definition of an academic entrepreneur

The term ‘academic entrepreneur’ has mostly been used to differentiate academics who have engaged in forming companies from those who have not (Radosevich 1995; Samson and Gurdon 1993; Daniels and Hofer 1993). However, some recent studies have used this term to represent academics who have carried out a much broader spectrum of knowledge-transfer/exchange activities (Jones-Evans and Klofsten 2000; D’Este and Perkmann 2011). Academics who have formed companies may also simultaneously carry out multiple types of other knowledge-transfer/exchange activities, engagement in which is defined in recent studies as ‘plural activity’ (De Silva, Uyerra, and Oakey 2012).

For the purpose of this study, we used the concept of ‘plural activity’. Whilst we define academic entrepreneurs as those who have formed at least one company, their engagement in a wide array of other entrepreneurial activities is taken into account when researching impacts on traditional academic duties. Since different entrepreneurial activities are interrelated (Jones-Evans and Klofsten 2000; D’Este and Perkmann 2011), this strategy allows us to investigate the influence of the full spectrum of entrepreneurial

engagement on traditional academic duties. Also, this approach makes our findings comparable with the majority of past studies, which define academic entrepreneurs as those who have formed companies. Three types of entrepreneurial activity, highlighted in Table 1, were used as a framework in this study to investigate entrepreneurial engagement, which was then used to analyse their impacts on traditional academic duties: these were teaching-related academic entrepreneurial activities, research-related academic entrepreneurial activities and company creation.

Insert Table 1 about Here

Entrepreneurial activities and traditional academic duties

There is no consensus in the literature in relation to the impacts of academic entrepreneurship on traditional academic duties. The following sections initially discuss contradictory arguments put forward by past studies that have mainly focused on relatively resource-rich, developed nations. Subsequently, by drawing on these studies, we develop specific research questions to investigate how academic entrepreneurship may influence traditional academic duties carried out in a resource-constrained environment.

Some studies have argued that academic entrepreneurship has negative impacts on traditional academic duties (Dasgupta and David 1994; Rosenberg and Nelson 1994). First, this is due to resource conflicts that may arise when limited facilities available in universities are used for multiple activities (Van Dierdonck and Debackere 1988). Second, it is as a result of difficulties faced by academics in balancing traditional academic duties and entrepreneurial endeavours, since entrepreneurial engagement

demands substantial efforts and time commitments. These multiple engagements could result in academics not performing either task successfully (Bercovitz and Feldman 2003).

However, recent research has provided evidence of positive influences of academic entrepreneurship on both research and teaching. For instance, the number of research publications and the extent of academic engagement in entrepreneurial endeavour have been found to be positively correlated (Calvert and Patel 2003; Van Looy, Callaert, and Debackere 2006; Lowe and Gonzalez-Brambila 2007; Brooks and Randazzese 1999). It has also been shown that academic experience in interacting with businesses contributes to producing graduates who are suitable for industry (Baldini, Grimaldi, and Sobrero 2006). As a result, academic entrepreneurs have been found to be more productive in terms of teaching and research than academics without entrepreneurial engagement (Louis et al. 2001; Siegel et al. 2004). Also, 'star' scientists have been found to engage in more entrepreneurial activities than others (Zucker and Darby 2001; Erdis and Varga 2009).

These contradictory arguments raise the question as to whether there are any underlying conditions that may explain the synergies and rivalries between academic entrepreneurship and traditional academic duties. By referring to the literature, we have identified four potential underlying conditions, namely funding, resources, knowledge and skills and networks. The following sections briefly illustrate how we develop four specific research questions on the basis of these underlying conditions.

Wright et al. (2004) have found that academic entrepreneurship generates additional income streams for universities, which is a potent way of compensating for the

scarce direct government funds available (Phan and Siegel 2006; Wright et al. 2006). However, entrepreneurship may on the other hand result in funding rivalry if it utilises the limited funding available to deliver traditional academic duties. Furthermore, if the change of focus from basic to applied science damages the quality of teaching and research (Van Dierdonck and Debackere 1988), the funding status of universities may further be negatively affected. In a resource-constrained environment, while funding synergies may enable universities to overcome resource scarcities, funding rivalry may negatively impact on university teaching and research. Our first research question is developed around the issue of funding synergy and rivalry:

RQ1: Is there funding synergy or rivalry between academic entrepreneurship and traditional academic duties?

Previous research has argued that academic entrepreneurship may enable universities to access facilities/resources in industry (Siegel et al. 2004). Also, establishing joint research labs with industry can increase universities' resource status (Andersen, De Silva and Levy 2013). While these resource synergies may allow universities in resource-constrained environments to overcome resource barriers, if entrepreneurship creates extra demand for already limited physical and human resources, it will be detrimental to traditional academic duties (Bercovitz and Feldman 2003). Our second research question, which is based on this contradictory resource-related argument, is:

RQ2: Is there resource synergy or rivalry between academic entrepreneurship and traditional academic duties?

By 'resources', we mean both physical and human resources available in universities.

The literature has also shown that academics use the knowledge, skills and contacts developed through entrepreneurial engagement to improve traditional academic duties (Etzkowitz 1998; Louis et al. 2001; Zucker and Darby 2001; Erdis and Varga 2009). For instance, they capitalise on industry-related knowledge and skills (D'Este, Mahdi, and Neely 2010) and professional networks (Siegel, Veugelers, and Wright 2007) developed through entrepreneurial involvement to produce graduates who are suitable for industry and to carry out research activities. However, the question is whether the synergies mentioned above are traded off against time and resource conflicts between entrepreneurial engagement and traditional academic duties. The extent to which knowledge, skills and networks developed through entrepreneurial engagement are useful to deliver traditional academic duties is questionable. Perhaps academics might be able to deliver more value to teaching and research using the networks, knowledge and skills developed through their involvement in traditional academic duties than those developed through entrepreneurship (Van Dierdonck and Debackere 1988; Bercovitz and Feldman 2003). These contradictory arguments led to the third and fourth research questions:

RQ3: Is there knowledge and skill synergy or rivalry between academic entrepreneurship and traditional academic duties?

RQ4: Is there networking synergy or rivalry between academic entrepreneurship and traditional academic duties?

On the basis of the theoretical background discussed above, we aim to make an original contribution by investigating the influence of academic entrepreneurship on traditional academic duties carried out in a resource-constrained environment – a rather underexplored context. Further originality is added by our approach, which studies the impacts of a wide array of entrepreneurial engagements (i.e. teaching- and research-related entrepreneurial activities and company creation) on traditional academic duties by focusing on four underlying conditions, namely funding, resources, knowledge and skills and networking synergy and rivalry.

Material and methods

Sri Lanka was chosen to represent a resource-constrained environment. According to the World Bank classification, Sri Lanka is a lower middle income country with GDP per capita of 2375 (current US \$) in 2010 (The World Bank 2011). In terms of World Bank indicators, Sri Lanka is placed in the 50th, 16th, 26th, and 55th (higher ranks indicate stronger resource status) percentile ranks with respect to financial, infrastructural, technological, and institutional resources respectively. Furthermore, Sri Lanka has a very low level of support mechanisms and institutional frameworks for promoting university–industry interactions (University Grant Commission of Sri Lanka 2011). Sri Lanka has no private universities and only thirteen publicly funded universities. These public universities provide free undergraduate education. Government expenditure on universities as a percentage of GDP in 2012 was only 0.27%, which is remarkably low when compared with developed (e.g. OECD average 1.2%) and some emerging economies (e.g. India - 0.67%) (OECD 2010). These facts illustrate Sri Lanka’s suitability to represent a resource-constrained environment.

In this study, mixed methods were adopted in a sequential manner (Fleiss and Zubin 1969). Initially, an online survey was conducted, which was subsequently followed by an in-depth face-to-face interview phase. The main purpose of the online survey was to gather data on the entrepreneurial engagement of academics, which were then used to identify academics who have engaged in company formation. In-depth interviews were conducted to collect detailed qualitative data on the impacts of entrepreneurial engagement on traditional academic duties.

The population for this study are academics in thirteen universities in Sri Lanka (employing a total of 4215 academics as of January 1st, 2011: University Grant Commission of Sri Lanka 2011). Given that there is no list of elements in the population, and that it was not possible to cover all the universities during the in-depth interview phase, a cluster sampling technique was used for this study. In order to reduce potential sampling errors, we selected a representative sample of universities (Arber 2001) in terms of their age (Franklin, Wright, and Lockett 2001), location and size (Friedman and Silberman 2003; Agrawal and Henderson 2002). Accordingly, academics in six out of the thirteen universities were selected as the sample (N=1182).

The online survey was carried out April–May 2012. In the online survey, academics were asked to state whether they had engaged in company formation during the last five years (i.e. 2012–2007). Academics who said ‘yes’ were requested to state whether they had carried out other types of teaching and research-related entrepreneurial activities, listed in Table 1, during the last five years.

The response rate for the online survey was 30% (358 responses in total). Of these respondents, 122 had engaged in company formation and were thus considered to be ‘academic entrepreneurs’ for the purpose of this research¹. Of these 122 academic entrepreneurs, a sample of 35, which was representative of the demographic characteristics (i.e. university, age, gender, and academic discipline), was selected for in-depth interviews.

During in-depth interviews, academics were asked to state how academic entrepreneurship impacted on their traditional academic duties, including how they balance their entrepreneurial engagement with their traditional academic duties. The four types of synergies and rivalries (i.e. funding, resources, knowledge and skills and networks) highlighted in the theoretical context were used to guide the interviews. Whether and how each type of entrepreneurial activity (i.e. teaching- and research-related entrepreneurial activities and company creation) generates different synergies and rivalries with traditional academic duties was investigated. NVivo was used to assist this analysis. Additionally, 23 students were interviewed to obtain general viewpoints and opinions about the teaching quality of a few selected academics, which were triangulated against the relevant findings from the in-depth interviews with academics.

¹A non-response bias test revealed that respondents do not differ significantly from non-respondents with respect to their universities $X^2(5, 1182) = 2.976$ $p=.704 > 0.05$, gender $X^2(1, 1182) = 3.674$ $p=.06 > .05$, academic discipline $X^2(7, 1182) = 10.410$ $p=.167 > 0.05$, and position $X^2(2, 1182) = 1.015$ $p=.602 > .05$.

Results and discussion

All academic entrepreneurs in our sample have carried out at least one activity that can be categorised as teaching-related entrepreneurial activities, research-related entrepreneurial activities or company formation. On the basis of their engagement, the analysis of qualitative evidence on the impacts of academic entrepreneurship on traditional academic duties was conducted separately for these three types of academic entrepreneurial activity.

The impacts of teaching-related academic entrepreneurship on traditional academic duties

Teaching-related academic entrepreneurial activities considered in this study were external teaching, initiating the development of new external degree programmes, and conducting seminars and training sessions for industry personnel. All respondents who had formed companies (i.e. academic entrepreneurs) were carrying out at least one of these three teaching-related entrepreneurial activities.

The majority of respondents mentioned that carrying out teaching-related entrepreneurial activities enabled them to develop a better understanding of new trends in industry and a professional network of contacts, which we consider in this study as knowledge and skill and networking synergies. They made use of these to revise curricula, to gain access to companies for traditional academic duties (e.g. company data for research and access to companies for student visits), to secure training placements for students, and to invite industry personnel to give visiting lectures. For example, one entrepreneur stated:

“When conducting training and seminars for industry personnel, we get opportunities to interact with them informally. These informal discussions enabled me to understand new trends in the industry, which I incorporated into curriculum revisions.”

Another academic entrepreneur who specialised in Animal Science stated:

“I often have to arrange field visits..... Students and alumni [of external teaching he conducts], who are employees of various companies, provide access to their companies for such visits. Sometimes, they arrange short training programmes for my university students.....there were a few instances where I got access to data available in industry through these contacts which was helpful for my research activities.”

The above results on networking and knowledge and skill synergies are in line with the findings of other similar studies carried out in developed countries, which revealed that knowledge and skills (D'Este et al., 2010) and professional networks (Siegel et al., 2007) developed through entrepreneurship were used to improve the quality of traditional academic duties (Shane, 2004). Rivalry between teaching-related academic entrepreneurial activities and traditional academic duties was not reported in any form. Also, apart from income generated by universities through external teaching being a source of university funding, no other funding or resource synergies were found in relation to teaching-related entrepreneurial activities.

The impacts of research-related academic entrepreneurial activities on traditional academic duties

Academic entrepreneurs had also engaged in at least one of the five activities categorised as research-related entrepreneurial activities, namely research-based industry placements, carrying out research-based consultancy for industry via their universities or privately (but without forming a company), developing products or services with potential for commercialization, collaborating with industry through joint research projects, and providing research-related assistance to small business owners.

Research-related academic entrepreneurial activities were reported to generate positive impacts on university teaching and research in the forms of funding, resources, knowledge and skills and networking synergies. These synergies enabled academics to improve teaching quality, overcome research funding constraints and increase the usefulness of academic research outputs.

One academic, an expert in construction engineering, explained how she used knowledge and skills and contacts developed through entrepreneurial engagement for curriculum revisions, for case-based teaching, and to develop teaching aids:

“Carrying out joint research projects with industry enabled me to develop strong links with them. As a result, I was able to receive feedback on how our graduates [those who are employed by these companies] perform, which was useful to improve my teaching].....

Often, I use my experience in carrying out consultancy and joint research projects with industry to develop case studies to make students aware of practical aspects. I also make use of these to explain the applications of some theoretical aspects.....The photographs I took [e.g. defects in machinery, processes, and plants] while working in industry were also used for teaching.”

Funding secured through research-related entrepreneurial activities was reported to generate positive impacts on participants’ traditional research activities. For example, one academic stated:

“From this joint research project with industry [a research project in veterinary science], I was able to provide three bursaries to PhD students. They work as research assistants in the research project.....the income gained from consultancy was also used to improve lab facilities.....

When he was asked why he used consultancy income to improve labs, he answered:

The University does not have enough funds to upgrade labs, so I had no alternative..... Without improving the labs, we wouldn’t have been able to conduct the research.”

The above quotation exemplifies funding and resource synergies between research-related entrepreneurial activities and traditional academic duties. Since universities were resource-constrained, without these synergies, it was found to be very

difficult to achieve excellence in research. Hence, academic entrepreneurial engagement was essential to improve academics' research profiles:

“Research funding is extremely constrained in Sri Lanka. Therefore, I often apply for joint research funding with industry and non-governmental organizations. From one of the recent project funds, I funded four PhD students and improved the university floriculture lab..... We published four papers. Without these involvements, it is not possible to develop our research careers.”

It is also evident that academic entrepreneurs value the usefulness of their joint research with industry to society and the economy. They acknowledge that even though the main driver for participating in joint research projects is to overcome funding constraints, they appreciate the fact that such joint research projects generate direct socio-economic benefits when compared with some basic research conducted out of personal interest, which may take a long time to generate benefits:

“[when an academic was asked whether joint research with industry damages research quality] That depends on how you define ‘quality’. To me, ‘quality’ means how useful my research is to society and the economy. It’s true that I approached industry because my university did not have funds for research. Companies won’t fund research projects unless they have the potential to generate direct benefits.”

This confirms that the entrepreneurial engagement enables academics to generate economic impacts through their research, which is increasingly used as a measure of gauging research quality. These findings on knowledge and skills,

networking, resource and funding synergies between research-related entrepreneurial activities and traditional academic duties largely corroborate the studies carried out in developed nations, which have highlighted that entrepreneurial engagement improves the quality of research carried out in universities (Siegel et al. 2004; Calvert and Patel 2003; Van Looy et al. 2006; Lowe and Gonzalez-Brambila 2007; Brooks and Randazzese 1999). However, apart from this similarity, our findings also suggest that in the Sri Lankan context, funding generated through entrepreneurial engagement is essential to overcome severe resource scarcity, and without such engagement it would have been significantly more difficult to achieve excellence in teaching and research. Hence, one of the originalities of this study is the fact that it highlights how research-related entrepreneurial activities carried out in a resource-constrained environment have become an essential means to gain success in traditional academic duties.

The impacts of company creation on traditional academic duties

In addition to teaching- and research-related academic entrepreneurial activities, academic entrepreneurs have also carried out at least one type of company formation – such as joint ventures with industry, university commercialisation centres, science parks and incubators, and privately owned companies. It was evident that companies formed by academics generated several benefits for teaching and research activities. All four types of synergy – resource, funding, networking and knowledge and skills – were found between company creation and traditional academic duties.

In-depth interviews revealed that companies formed by academics provided employment opportunities for graduates, training placements for students, access to

professional networks, resources to carry out university teaching and research and funding to improve the facilities of university departments. One academic stated:

“I formed three companies with two staff members from my department [the Department of Computer Engineering]...we hire graduates, provide training placements to students...we also formed a department fund, into which a portion of the profit earned by these companies goes. We use this fund to improve the infrastructure facilities of our department....we also have a network of researchers working in our companies. We can access them whenever we need assistance to carry out teaching and research.....it is very difficult to find funds and resources for university research, but since we have resources in our companies, we successfully carry out research activities.”

Academics mentioned that given the resource-constrained environment, it would have been more difficult to strive for excellence in traditional academic duties without these companies. Similar benefits were received through joint research labs with industry:

“In our university, we have three joint research labs [attached to the Electronics, Telecommunications, and Chemical Engineering departments]. In addition to carrying out joint research activities [with industry], labs are also used to conduct university teaching and research. For example, students are given opportunities to carry out their ‘practicals’, we use lab facilities for university research.....The university cannot afford to buy expensive equipment. Therefore, these labs are very

useful.....We also fund postgraduate students. They work in our labs....Experience in working in these labs has improved the employability of our students.”

Respondents also mentioned that because their universities did not have sufficient funds to build university-owned labs, joint research labs significantly improved their resource status. Furthermore, they stated that working with industry personnel in these labs promoted the exchange of tacit knowledge, which positively influenced the quality of academic teaching and research.

Additionally, it was also evident that the networks of contacts developed with industry through companies formed by academics were used to receive feedback on the university curricula and to promote university degree programmes, which in turn improved the quality of teaching and the employability of their graduates. One of the mechanisms adopted for this purpose was to hold monthly meetings with the partner or networking organisations of academic companies in order to explore opportunities to collaborate with industry and to receive feedback on university teaching and research activities. As a result, they were able to streamline academic programmes to produce graduates who met industry requirements and to design research programmes to generate outputs that capitalised on gaps in industry.

These positive impacts generated by academic companies support the findings of studies carried out in relatively resource-rich developed nations (D'Este et al 2010; Wright et al 2004, 2007; Siegel et al 2004). The original contribution of our findings is the illustration of how these benefits enable academics to overcome resource barriers. These funding, resource, knowledge and skill and networking synergies are extremely important to successfully deliver traditional academic duties in a resource-constrained

environment. Hence, academic entrepreneurship seems to be a key element without which the delivery of teaching and research in such environments is significantly more difficult.

The above analysis suggests that academic entrepreneurship is essential to conduct teaching and research in a resource-constrained environment. As illustrated in Figure 1, company creation and research-related academic entrepreneurial activities generated all four types of synergistic effects, while teaching-related entrepreneurial activities generated three of the four types.

Insert Figure 1 about Here

Triangulating findings

Since the above analysis was based solely on interviews carried out with academics, a degree of bias is possible. In order to avoid potential result bias, informal discussions were conducted with students to obtain general viewpoints and opinions about the teaching and research quality of a few selected academic entrepreneurs, other academics who work closely with them and those who have not engaged in any entrepreneurial activities. Interestingly, all the discussions with students suggested that academic entrepreneurs and other academics who were collaborating closely with them were better teachers and researchers than academics who did not engage in entrepreneurial activities.

Symbiotic relationship between academic entrepreneurs and other academics

Since no rivalry between academic entrepreneurship and traditional academic duties was reported, we investigated how academics balanced their engagement in multiple activities.

It was revealed that while academic entrepreneurs were the initiators and leaders of entrepreneurial activities, they were supported by other academics to capitalise on these entrepreneurial opportunities. For example, academic entrepreneurs have established new institutes for external teaching, established joint research labs, secured consultancy projects and acted as the principal investigators of international and industrial funding applications. Other academics (who have not formed companies) have taught on these external degree programmes, helped to run companies and carried out research projects secured by academic entrepreneurs. There was a symbiotic relationship between academic entrepreneurs and other academics in those teams. Other academics were dependent on the opportunities perceived by academic entrepreneurs, since the environment lacks opportunities and resources. On the other hand, academic entrepreneurs were reliant on other academics to capitalise on these opportunities, without which they would not be able to manage their multiple engagements.

These findings on the different but complementary roles played by academic entrepreneurs and other academics are, to a certain degree, in line with those of Jones (2008), which illustrate how different tasks performed by team members in knowledge-based organisations enable them to recognise and respond to opportunities, which ultimately ensures high growth. Nevertheless, the original contribution of our study is

that it highlights how these teams enable the balancing of traditional academic duties and entrepreneurial engagement performed in a resource-constrained environment.

However, it is worth noting that this paper only presents the academic entrepreneurs' side of the symbiotic relationship: hence, the views may be biased, since the perspective of other academics is not considered. Since the findings regarding symbiotic relationships only emerged during the data analysis stage, we were not in a position to collect data from other academics. We acknowledge that this is a limitation of our study and encourage future research to investigate the relationship between entrepreneurial academics and other academics by focusing on both perspectives.

Conclusions

We make an original contribution to the academic entrepreneurship literature by highlighting how academic entrepreneurship influences traditional academic duties carried out in a resource-constrained environment. This paper initially discussed the contradictory arguments in past studies, which were carried out mainly in developed, relatively resource-rich countries. While some authors have argued that academic entrepreneurship has a negative effect on traditional academic duties (Van Dierdonck and Debackere 1988; Bercovitz and Feldman 2003), others have shown that entrepreneurial engagement improves the quality of teaching and research (D'Este et al 2010; Siegel et al 2007; Etzkowitz 1998 Louis et al 2001; Zucker and Darby 2001). Our findings support the latter: we found that academics capitalise on resources, funding, industry-related knowledge and skills and professional networks acquired through entrepreneurial engagement to carry out their teaching and research.

In addition to validating past studies, we have made an original contribution by highlighting how academic entrepreneurship has become an important means to overcome resource barriers to engage in traditional teaching and research activities in a resource-constrained environment. Without academic entrepreneurship, it is significantly more difficult to achieve excellence in teaching and research activities. Hence, academic entrepreneurship is a strategic pathway that allows academics to achieve career progress in a resource-constrained environment.

Our finding that academic entrepreneurs are better teachers and researchers than academics who have not engaged in entrepreneurial activities supports previous studies that have found that 'star' scientists engage in more entrepreneurial activities than others (Zucker and Darby 2001; Erdis and Varga 2009). The originality of our work is that it illustrates how the contribution of other academics who work closely with them enables academic entrepreneurs to successfully carry out multiple activities. Whilst academic entrepreneurs are the initiators or leaders who secure entrepreneurial opportunities, other academics support them to capitalise on these opportunities. It is the lack of opportunities in this resource-constrained environment that has created this symbiotic interdependency between academic entrepreneurs and other academics. This finding answers the counterargument which had highlighted that academic entrepreneurship could result in academics not performing any of their tasks successfully (Bercovitz and Feldman 2003) due to the difficulties faced in balancing traditional academic duties and entrepreneurial activities (Wright et al 2004). The differential but interdependent and complementary roles played by academics in a university enable academic entrepreneurs to manage their workload and universities to generate best value.

In addition to the theoretical contributions highlighted above, this paper also provides some practical implications for academics, universities, and policy makers, particularly for those operating in resource-constrained environments. The findings on synergies between academic entrepreneurship and traditional academic duties highlight the need for university managers to encourage entrepreneurial engagement as a strategy to overcome resource barriers. Also, the interdependence between academic entrepreneurship and traditional academic duties emphasises the importance of science, technology and innovation policies – in similar developing, resource-constrained environments – being designed to reflect on these synergies. This is essential to overcome resource barriers for innovation and growth in environments where resources are scarce.

The symbiotic relationship between entrepreneurial academics and other academics underpins the importance of having a heterogeneous group of academics within universities who play complementary roles. This should be reflected in university recruitment, training and promotion schemes by enabling different career tracks rather than encouraging a homogeneous group of academics through the use of narrow key performance indicators. Also, the ‘people-driven’ approach of academic entrepreneurship underpins the importance of science, technology and innovation policies in similar environments, focusing on empowering and rewarding individual academics (Lockett, Kerr, and Robinson 2008), which is a step forward from the traditional ‘institutional’ focus. Since this research was performed in a resource-constrained context, there are obvious limitations associated with its external validity. Therefore, its replication in other contexts will allow more robust theory development

via wider empirical comparison. Also, future research is required to further understand the relationship between academic entrepreneurs and other academics, particularly by investigating the perspective of other academics, which this study has not captured.

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