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STRATEGIC KNOWLEDGE MANAGEMENT WITHIN SUBSIDISED ENTREPRENEURIAL UNIVERSITY-INDUSTRY PARTNERSHIPS

Maribel Guerrero

Newcastle Business School, Northumbria University, UK

maribel.guerrero@northumbria.ac.uk

Fernando Herrera

Engineering and Science Department, Tecnológico de Monterrey, Campus León, México

fernando.herrera@itesm.mx

David Urbano

Department of Business, Universitat Autònoma of Barcelona, Spain

david.urbano@uab.cat

ACKKNOWLEGDEMENT

The authors acknowledge the support from the interviewed enterprise-university partnerships. The authors also would like to thank to the anonymous reviewers for their insightful comments that contributed substantially to the development of our manuscripts. Fernando Herrera acknowledges financial support for PhD studies from Tecnológico de Monterrey. David Urbano acknowledges the financial support from the Spanish Ministry of Economy & Competitiveness [project ECO2017-87885-P], the Economy & Knowledge Department—Catalan Government [project 2017-SGR-1056] and ICREA under the ICREA Academia Programme.

Abstract

Purpose

This paper analyses how collaborative/opportunistic behaviours subsidised university-industry partnerships are influencing the design/implementation of strategic knowledge management practices in emerging economies.

Design/methodology/approach

The proposed conceptual model was analysed with a retrospective multiple case study approach integrated by four subsidised entrepreneurial universities-industry partnerships of the Incentive Programme for Innovation from 2009 to 2014 in Mexico.

Findings

Entrepreneurial universities and industrial organisations confirm insights about dual collaborative-opportunistic behaviour within subsidised partnerships. The main effects of behaviours represent an increment in the knowledge management costs during the monitoring stages. The ex-ante collaboration agreement anticipated and protected intellectual capabilities.

Research limitations/implications

This research contributes to the ongoing discussion about public administrations' opportunistic behaviours in emerging economies (Tripsas et al., 1995), the effectiveness of the innovation and entrepreneurial programmes (Guerrero and Urbano, 2019b), and the link between dual behaviours (collaborative and opportunistic) and knowledge management practices (de Wit-de Vries *et al.*, 2018).

Practical limitations/implications

New questions emerged about the effectiveness of subsidies as new modes of knowledge generation among entrepreneurial universities and industrial organisations, as well as the need for implementing strategic knowledge management practices in the public administration.

Social limitations/implications

For policymakers, the study presents insights about the effectiveness of public resources. Policymakers should understand challenges and re-define/re-incentivize the productive value chain as well as implement mechanisms to control opportunistic behaviours on potential subsidized firms.

Originality

The paper contributes to the academic debate about how entrepreneurial universities and industrial organisations are strategically managing their knowledge when participating in subsidised partnerships in emerging economies.

Keywords

Entrepreneurial Universities; University-Industry Partnership; Collaborative Behaviours; Opportunistic Behaviours; Strategic Knowledge Management; Emerging Economies

STRATEGIC KNOWLEDGE MANAGEMENT WITHIN SUBSIDISED ENTREPRENEURIAL UNIVERSITY-INDUSTRY PARTNERSHIPS

1. Introduction

Research about determinants, outcomes, and core activities (i.e., teaching, research, technology transfer, and entrepreneurship) of entrepreneurial universities has increased significantly since the publication of Clarks' book in 1998 (Guerrero and Urbano, 2019a). Previous studies have confirmed the significant contributions of entrepreneurial universities on society through the generation human capital, the generation of transferable and marketable knowledge, and the generation of graduate/academic entrepreneurs (Guerrero and Urbano, 2012; Guerrero *et al.*, 2016; Secundo *et al.*, 2017). In the current socio-economic landscape, entrepreneurial universities have been legitimised, such as bridges that connect their core activities with social challenges. Consequently, the entrepreneurial universities' community (students, academics, teachers, and staff) is actively participating in the generation, the dissemination, and the commercialisation of knowledge that strengthening societal, economic and technological development (Guerrero *et al.*, 2015). This phenomenon has also represented a revolutionary process in the modes of knowledge production (Carayannis and Campbell, 2011). Although more than two decades of insights about entrepreneurial universities, research about how these universities are managing their knowledge capabilities is very limited (Numprasertchai and Igel, 2005; Acworth, 2008; Tian *et al.*, 2009; Anand and Singh, 2011; Klosften *et al.*, 2019), especially, in emerging economies (Guerrero *et al.*, 2019).

In the context of emerging economies, organisations tend to be influenced by institutional voids that should be filled by specific conditions to reduce the high levels of uncertainty/risks in the venture and knowledge creation inherent in that context (Puffer *et al.*, 2010). Therefore, in these scenarios, entrepreneurial universities are oriented to foster entrepreneurship and

innovation as well as to mitigate the effects of institutional voids through their core activities (Guerrero and Urbano 2017). Following the institutional voids and market failures reasoning, extant studies have justified the implementation of subsidies to promote innovation and to incentivise private ventures to invest in research and development in emerging economies (Nelson, 1959; Arrow, 1962; García-Quevedo, 2004; Clarysse *et al.*, 2009; Edler and James, 2015; Dimos and Pugh, 2016; Kochenkova *et al.*, 2016). Consequently, subsidised university-industry programmes have gained relevance in the competitiveness agenda of multilateral organizations such as the Inter-American Development Bank (IDB), the World Bank (WB), and the Organization of American States (OAS) (Hall and Maffioli, 2008). Subsidies based on compulsory university-industry partnerships try to stimulate research collaboration, innovation, technological advances, and impacts on society (Cohen *et al.*, 2002; Takalo and Tanayama, 2010; Colombelli and Quatraro, 2018). Influenced by this type of government intervention, entrepreneurial universities have, directly or indirectly, assumed the responsibility for reducing institutional voids by enhancing the quality/quantity of research endeavours (Marozau *et al.*, 2016). It explains why subsidised programmes that promote university-industry partnerships have become the most popular mechanism for knowledge transfer in emerging economies (Mahmood and Rufin, 2005; van de Vrande *et al.*, 2009; Guo and Guo, 2011; Guerrero and Urbano, 2016).

Furthermore, the role of capabilities and behaviours are key factors in collaboration and innovation, meaning that strategic knowledge management practices should support organisations to become more effective collaborators/innovators (Salter *et al.*, 2014), thereby developing the absorption capacity within subsidised partnership. Nevertheless, the influence of behaviours on the configuration of entrepreneurial university-industry partnerships that participate on subsidised research programmes (Zeng *et al.*, 2010; Perkmann *et al.*, 2013; Kovacs *et al.*, 2015; Gianiodis *et al.*, 2016), as well as, the mechanism implemented by the

universities and industries for managing the knowledge generated as outcomes of subsidised collaborations (Guerrero et al., 2016; de Wit-de Vries *et al.*, 2018) are part of a black box that requires theoretical foundations and evidence. To contribute to this academic debate, this paper analyses how collaborative/opportunistic behaviours within subsidised university-industry partnerships are influencing the design/implementation of strategic knowledge management practices in emerging economies. Our proposed conceptual model was analysed with four Mexican cases of subsidised entrepreneurial universities-industry partnerships. Research was set in Mexico by two reasons: (a) during the last three government administrations have been established several subsidies to reinforce innovation and knowledge transfer via enterprise-university partnerships (OECD, 2013); and (b) Mexican enterprises and universities have implemented several open innovation practices to exchange resources/knowledge (Guerrero and Urbano, 2016).

The remained sections of this paper are organized as follows: Section 2 develops the conceptual framework for understanding strategic knowledge management in subsidised entrepreneurial universities-industry projects in emerging economies. Section 3 explains the methodological design applied in this paper. Section 4 describes the obtained results about the influence of behaviours/motivations on the outcomes of subsidies university-industry projects and entrepreneurial university mechanisms for knowledge management. Section 5 includes the discussion of our results in the light of previous studies. Then, Section 6 presents the main conclusions of the study, the implications for decision makers, and future lines of research.

2. Conceptual framework

Subsidies allow turning an unprofitable project into a profitable one or complete an existent project. Entrepreneurial university-industry partnerships could view public funds such a relatively cheap way to finance innovative/technological projects, especially when the

application costs are lower and the probability of selection is higher compared to alternative financing sources (Aschhoff, 2009; Aschhoff and Sofka, 2009). In this line, subsidies reduce the fixed costs of current/future research projects as well as increase the probability of being completed or undertaken (Benavente *et al.*, 2007). A recent meta-regression analysis of R&D subsidies has evidenced how knowledge inputs/outcomes could be measured in terms of additionality or/and crowding out effects (Dimos and Pugh, 2016, pp. 798-800). These effects are intrinsically evidencing the influence of positive or negative motivations/behaviours among subsidised organizations. Therefore, in this section, it is discussed how subsidised projects may endorse both collaborative and opportunistic behaviours among entrepreneurial university-industry partnerships.

2.1 Collaborative behaviours, subsidised partnerships, and knowledge management

Collaborative behaviour is founded by synergies, shared expectations, and long-term trust relationships. In this sense, this behaviour promotes open innovation practices among industries, entrepreneurial universities, and scientific centres where the partners' contributions and expected outcomes are clearly expressed and shared (Chesbrough, 2003; Nieto and Santamaría, 2007; Kovacs *et al.*, 2015). Therefore, in subsidised projects, collaborative behaviours allow the flow of resources, sharing risks as well as understanding subsidies just as additional resources that ensure the knowledge transfer, the generation of novel technologies, and the achievement of goals (Carayannis *et al.*, 2000; Whitley, 2002; Zeng *et al.*, 2010). Based on the additionality effect, subsidies provide additional support instead of substitute private or collaborative investments (Autio *et al.*, 2008; Clarysse *et al.*, 2009; Dimos and Pugh, 2016). This additionality also produces a signalling effect regarding the quality of the project/team, reduces asymmetries of information, and increases the access to additional funds (Lerner, 1999).

Any knowledge strategies requires a well-founded common ground with the harmony of interests, values, goals and obligations among partners (Nieto and Santamaría, 2007; Li and Kozhikode, 2009). The additionally effect produces that the R&D subsidy triggers a higher level of R&D output than the counterfactual state of not support (Dimos and Pugh, 2016). Therefore, collaborative behaviours produce a sharing effect affecting positively on the performance of the partnership (Belderbos *et al.*, 2004) and also generate benefits for society with the results of the project (Hill, 1990; Bogers, 2011; Salmi, 2012). As a consequence, collaborative partners prefer to reduce any uncertainty by implementing collaboration agreements, ethics protocols, and knowledge protection at the beginning. The rigid degree in the execution of these control will depend on the level of trust among partners, the project objectives, the contributions (sharing human capital, funds, labs or technologies), as well as the way that the tacit or not tacit knowledge is absorbed, protected, and commercialised by the partnerships (Miller *et al.*, 2016; 2018). In this vein, a collaborative behaviour (a) simplifies knowledge management practices during the transference, the acquisition, the learning process, and the outcomes' property (knowledge, technologies, and innovations) among entrepreneurial universities and industrial organisations (Darroch et al., 2003; Numprasertchai and Igel, 2005); and (b) enables informal mechanisms for monitoring the advances across the stages of the research project (Dust and Runar Edvardsson, 2012; Venkitachalam and Willmott, 2017).

In this regard, our first research question is ¿how are collaborative behaviors within subsidised entrepreneurial university-industry partnerships strategically influencing knowledge management practices in emerging economies?

2.2 Opportunistic behaviours, subsidised partnerships, and knowledge management

Assuming that the government does not have the mechanism to identify behaviours within subsidised projects, opportunistic behaviour could appear when subsidies are perceived as the perfect substitute of the financial contribution that one or more partners should provide within a research project (Wallsten, 2000; Baldwin and Robert-Nicoud, 2007). Previous studies have associated this effect to crowding-out effects that allows stopping to spend funds during the subsidised years of a project because subsidies are enough to continue ongoing the planned R&D activities (Dimos and Pugh, 2016). In this sense, crowding out effect may come from innovation strategies based on using external funds for developing R&D activities (Fölster, 1995; Irwin and Klenow, 1996; Chen *et al.*, 2002). These practices encompass moral hazard problems when one partner attempts to be more competitive appropriating its partners' resources/capabilities for its benefit (Conner and Prahalad, 1996; Sutz, 2000; Klerkx and Aarts, 2013; Bäck and Kohtamäki, 2015; Frishammar *et al.*, 2015). At the same time, opportunistic partners take advantages of market failures, weakness institutions, and asymmetries of information for obtaining resources/funds from several public programmes and external partners (Conner and Prahalad, 1996).

Based on above arguments, opportunist behaviours happen when partners tend to reduce failure/risks substituting private investment by public/external funds across time/scale of R&D projects or take more individual advantages rather than the subsidised partnership. At the beginning of any subsidised partnership, it is recommended that any partner contributes on the definition of formal controls (rules, procedures, policies, and rewards) that ensured the coding, monitoring and safeguard of the knowledge (Das and Teng, 2001, p.259), as well as, plus informal controls (norms, culture, value) that could be applied at different stages of the entrepreneurial university-industry partnership (Bijlsma-Frankema and Costa, 2005). Consequently, when opportunist behaviours are detected, the partnership should implement the formal and informal controls until the end or dissolution of the subsidised project

(Alexander *et al.*, 2018; de Wit-de Vries *et al.*, 2018). It will increase the cost of knowledge management and constitute a major cause of partnership instability (Williamson, 1987). For instance, opportunistic behaviour produces an appropriation effect affecting the R&D outcomes (Hottenrott and Lopes-Bento, 2016). This effect is temporal just if the company was not able to learn during the strategic knowledge management process (Söderblom and Samuelsson, 2013; Söderblom *et al.*, 2015)

In this regard, our second research question is ¿how are opportunistic behaviors within subsidised entrepreneurial university-industry partnerships strategically influencing knowledge management practices in emerging economies?

3. Methodology

3.1 Research setting and contextualisation

Research is setting in Mexico with particular emphasis on entrepreneurial universities-industries partnerships promoted by public programmes to incentive innovation. Since 2002, the Mexican Science and Technology Law has been implemented by the National Council for Science and Technology (CONACYT) in collaboration with the Ministries of Education and Economy (Diario Oficial, 2014). During 2009-2016, the Mexican administration implemented the called “Incentive Programme for Innovation” with an investment of 2932 millions of dollars (Guerrero *et al.*, 2017). The purpose of this programme was encouraging growth, competitiveness, university-industry collaborations, innovations (new products/services, process) with value added to strategic sectors, and the creation/protection of intellectual property. This programme included three modalities: (a) INNOVAPYME (Technological Innovation for Micro, Small and Medium Enterprises) that supported individual or collaborative projects submitted by SMEs; (b) INNOVATEC (Technological Innovation for Large Enterprises) that supported individual or collaborative projects submitted by large

enterprises; and (c) PROINNOVA (Projects Innovation-Oriented Network) that supported collaborative projects submitted by least two universities or research centres.

3.2 Qualitative methodological design

Given the nature of the phenomenon, we design a quantitative analysis with multiple cases studies (Yin, 1984; Eisenhardt, 1989). In particular, we apply the retrospective case study that is a type of longitudinal multiple case study design in which all data are collected when the analysed events have already occurred, and the outcomes are known (Street and Ward, 2010). The criterion of selection were: (i) entrepreneurial universities-industry partnerships should be subsidised by the Incentive Programme for Innovation during 2009-2014; (ii) industry partners should be involved in collaboration practices with other entrepreneurial universities; (iii) the universities should be classified as entrepreneurial universities based on the criteria proposed by Guerrero and Urbano (2012); and (iv) the universities-industry partnerships should develop a project associated to the priority industries for the Mexican innovation strategy (Automotive Industry and Footwear Industry). To answer our research questions, the four entrepreneurial universities-industry partnerships were analysed in this study. By confidential agreements, we use anonym names of the participants from the Automotive Industry (AutoIn1 and AutoIn2), the Leather and Footwear Industry (LeFoIn1 and LeFoIn2), as well as the entrepreneurial universities (EU1, EU2, EU3, EU4, EU5, EU6, and EU7). During September-December 2016, two managers from the Automotive Industry (AutoIn1 and AutoIn2), and two managers from the Leather and Footwear Industry (LeFoIn1 and LeFoIn2) were interviewed for 90 minutes. Furthermore, the seven entrepreneurial universities (EU1, EU2, EU3, EU4, EU5, EU6, and EU7) that participated with the four industrial organisations were identified and analysed using secondary sources of data provided by their university websites, official documents associated with the subsidised

project, and one interview with at least one academic enrolled in the subsidised project (Appendix 1). Table 1 shows an overview of the selected cases with a description of the main characteristics.

--- Insert Table 1 here ----

The research protocol covered: the background of the interviewee and organisational characteristics (age, size, financial results, growth aspirations), their innovation processes (knowledge exploration/exploitation/retention, resources/capabilities), the R&D subsidies (types, number of projects, modality, % private/public investment), their innovation practices (types, purposes, obtained results, positive/negative experiences, continuity), the innovation outcomes (financial, intellectual and social), and their perception of collaborative/opportunistic behaviours in subsidised projects. With regard to the data analysis, the information was coded and analysed according to the patterns identified in the literature. The analysis of the encoded and triangulated data involved the search for common patterns among interviews (Yin, 1984; Eisenhardt 1989) to identify findings that were framed in the previous literature, thereby strengthening the internal validity of the research (Appendix 2). Concerning the validity (Eisenhardt, 1989), this research attempts to achieve “literal replication” (predict similar findings) and “theoretical replication” (predict contrasting results but for predictable reasons).

4. Results

4.1 Description of the selected priority industries

The Automotive industry is one of the most relevant and representative industry for the Mexican economy. According to the INEGI¹ (2016), this industry produced products valued in approximately 614,621 million of pesos in 2014; representing the 47% of total national

¹ Instituto Nacional de Estadística y Geografía (INEGI)

production, 3.2% of Mexican GDP and 18.3% of manufacturing GDP. In terms of Foreign Direct Investment (FDI), this industry received around 39,319 million dollars represented 9.7% of total Mexican FDI in 2015 (HSBC, 2015). According to the Mexican Automotive Industry Association (AMIA), Mexico's automotive industry will see its consolidation as one of the top countries in vehicle production and export. Concerning the main characteristics of the selected industrial organisations, AutoIn1 was founded in the first decade of the twentieth century and operated in the New York Stock Exchange. It is a multi-brand enterprise with a strong influence in the global market with more of 70 plants around the world. For instance, it is covering market segments in North America, South America, Europe, Middle East, Africa, and the Asia Pacific. The core business includes designing, manufacturing, marketing, financing and servicing of different vehicles (e.g., cars, trucks, sports, electrified and luxury). For instance, the enterprise sells more than 6.6 million units (around 140.6 million dollars) during 2015. Regarding AutoIn2, this organisation was founded in the nineteenth century and operated in the Frankfurt Stock Exchange. It is a multinational company with strong representativeness in more than 50 countries around the world and with the main headquarters in Europe. Since 1998, when was acquired by an important Mexican business group, this enterprise manufactures brake systems, systems and components for powertrains and chassis, instrumentation, infotainment solutions, vehicle electronics, tires and technical elastomers in several plants located in Mexico. For instance, the enterprise sells more than 39.2 billion euros and evidenced an innovation expenditure of around 2.4 billion euros during 2015.

The Leather and Footwear industry is integrated by around 80 large enterprises which produce 85% of the total economic value of the industry and generated 46% of employment of the sector too. According to the INEGI (2016), this industry produced products valued in approximately 51,074 million of pesos in 2014. In this sense, the manufacture of Mexican footwear is an important commercial activity in the national economy, which generates a

highly competitive supply chain. For instance, the Footwear industry is the key actor in the leather-footwear-leather goods chain that is integrated by 7,400 establishments representing 68.4% of the entire production chain (Secretaría de Economía, 2015). For this reason, the Mexican government has implemented several strategies to promote the productivity and the competitiveness of this industry. According to the Mexican Footwear Association, Mexico has the 9th place in the world rank of footwear manufacturers. Concerning the main characteristics of the selected enterprises in this industry, LeFoIn1 is a Mexican enterprise with a strong experience during the last 30 years in the tanned sector offering leather and skin leather both in the domestic and in the international market. In the 70s, the enterprises faced several strategic problems that gave the possibility to innovate and to entry to several markets introducing new materials, textures, designs and colours. With an innovation ideology, this enterprise has invested in the creation of the development department, training of the personnel, and investing in technology. Based on this orientation and experience, the enterprises focusing on identify necessities across industries and adapted its products to those necessities becoming a key supplier of sectors such as automotive, aerospace, among others. On the other hand, LeFoIn2 is a Mexican and family enterprise founded in 1994. Currently, it is managed by the 3rd and 4th generation with a strong experience in the tannery business. The enterprise has obtained several recognitions such as the best tannery in Latin America by World Leather Magazine as well as it celebrated a collaboration agreement with Timberland in 2016. The business core is the production of world-class footwear and supplier of automotive industries

4.2 Strategic knowledge management influenced by collaborative behaviours within subsidised entrepreneurial university-industry partnerships in Mexico

The four interviewed managers highlighted a collaborative behaviour within their entrepreneurial university-industry partners in the development of subsidised projects (AutoIn1, AutoIn2, LeFoIn1 and LeFoIn2). The mode of knowledge varied according to the technological intensity, dimension, and project. For multinational companies (AutoIn1 and AutoIn2), given their medium high-tech intensity and dimension, the mode of knowledge/technology is within their R&D departments and with specific collaboration with strategic alliances with suppliers or agents enrolled in their value chain (AutoIn1), as well as with international universities or research centres (AutoIn1 and AutoIn2). Subsidised partnerships with entrepreneurial universities (EU1, EU2, EU3 and EU4) represented a reduction of costs and new modes of knowledge generation motivated by the improvement of the production process and testing new products. Concretely, AutoIn1's CEO explained

“.... our sector is very competitive, any movement is a highest risk. Therefore, we should be strategically oriented to collaborate with national and international partners to be technological updated. In our experiences, trust and sharing visions have been the key to our success or failure. We prefer to collaborate with commercial and scientific partners that understand the nature of company, our products, and our value chain. Subsidies represent for us an opportunity to improve processes, tools, equipment or introduce incremental innovations in our products. Any partnership is the best way to co-creation of value to capture clients' satisfaction, economic profits, and positioning of our brand, our products in the domestic market...”

For SMEs (LeFoIn1 and LeFoIn2), the perception of the subsidised partnership was associated with the idea of creating win-win conditions in the development of incremental innovation sharing risks/profits. The collaborative environment contributed on the achievement of the expectations, and long-term performance. After the subsidised partnership, LeFoIn1 started a disruptive innovation in a high-tech sector (Aerospace) with higher distance

to its low-tech core sector (Leather and Footwear). In this case, the mode of generating knowledge was collaborating with the same entrepreneurial universities (EU1, EU4, EU5, and EU6) and two research centres that complemented Aerospace capabilities. This insight legitimises the role of entrepreneurial universities in the generation of innovations, spillover effects and reduction of intuitional voids in emerging economies. LeFoIn1's CEO argued

“....collaborations and subsidies allowed us to achieve our technological and performance expectations. Moreover, the development of new capabilities and the acquisition of new knowledge opened new windows of opportunities in our sector as well as new initiatives into different sectors/industries...”

Regarding knowledge management within the entrepreneurial universities and industrial collaborations (Table 2), ex-ante, all partnerships defined the mechanisms (patents and licences) to protect knowledge and intellectual outcomes in initial agreement. Ex-post, the mechanisms varied for minor inventions were protected with property rights (AutoIn1), utility models between three and five years (AutoIn1, LeFoIn1, and LeFoIn2), and major discoveries within the production process or designs were protected with patents between 14 and 20 years (AutoIn1, AutoIn2 and LeFoIn1). In a few cases, the cost of knowledge management was higher influenced by the lack of understanding among six partners regarding the objectives of disruptive innovations (AutoIn2 faced a negative experience based on motivations).

--- Insert Table 2 here ----

4.3 Strategic knowledge management influenced by opportunistic behaviours within subsidised entrepreneurial university-industry partnerships in Mexico

Almost all interviewed managers recognised opportunistic behaviour when applied for subsidies with entrepreneurial universities. CEOs recognised that their initial motivation of subsidised university-enterprise partnerships were decrease costs. However, CEOs also

acknowledged the returns to the society generated by the outcomes of subsidised partnerships. AutoIn2's CEO mentioned that

“...Directly or indirectly, we had opportunist behaviour when we decided to participate in collaborative or individual subsidies. Intrinsically, subsidies represented the best alternative to reduce the costs in a very competitive market. Our affordable lost was the amount that we received from subsidies. In our logic, in case of failure, we are assuming that the maximum amount of money that could lose the company is the amount of the subsidy. Usually, the government monitored the achievement or failure of the initial expected outcomes/impacts. However, they did not do a follow up in the creation of knowledge/technologies with public resources...”

For instance, given the size, ownership and sector of AutoIn1 and AutoIn2, their private R&D investment is two times higher than the public R&D investment. Therefore, their costs decreased, innovations increased, intellectual capital (patents, utility models, property rights) increased, and growth impacts were less than 10% in job creation and sales. Concretely, AutoIn2's CEO explained

“... Our subsidised projects with entrepreneurial universities generated several returns to partnership and society. The most important return to society was the generation of new employment with the incorporation of students into the company for developing their practices (it is temporary employment) and attracted talent students (long term employment). Another return was connecting our knowledge outcomes with the improvement of the quality of life in our society. Unfortunately, the legitimisation of our returns exists for us. Society still has the stigma that subsidised multinational firms are opportunistic for using public funds without understanding the other side of the coin... “

If we consider that AutoIn1 and AutoIn2 are multinational companies located in Mexico, the impacts derived from Mexican subsidies will be accounted for their headquarters located in foreign country (North America). It could be an indicator of opportunistic behaviours promoted by the government that incentive foreign companies thinking on attracting a foreign investment or improving competitiveness indicators without evaluating the quality/temporality of results. At university level, findings also show the participation of two entrepreneurial universities (EU1 and EU4) in multiple subsidised projects with different industrial organisations. Both entrepreneurial universities are multi-campus universities with a reputation in research.

6. Discussions and implications

The first insight about knowledge management is that collaboration is the mode of knowledge generation stimulated by the public administration in emerging economies. Neither theoretically nor empirically, there is no consensus about the effectiveness of incentives (Clarysse et al. 2009; Greco et al., 2016; Hall et al., 2016). The proponents consider that subsidies enhance innovation and reinforce economic growth (García-Quevedo, 2004; Dimos and Pugh, 2016). The opponents argue that subsidies are not diverted to the best organisations because the selection could influence by pressure groups (Hall et al., 2016), as asymmetries of information (Callahan et al., 2012), or institutional voids (Guerrero and Urbano, 2017). In this research, the Mexican government provided a higher percentage of the public funds to subsidise no collaborative projects of multinational organisations with the intention to incentive foreign investments in innovation. Adopting the public choice theory, the government may adopt an opportunistic behaviour to gain reputation about the effectiveness of programmes and to achieve competitiveness rates in their strategic sectors (Tripsas et al., 1995; Zeng et al., 2010). The available public information does not allow estimate societal, technological, and

economic impacts of subsidised multinational organisations. In this vein, this research contributes to the ongoing discussion about public administrations' opportunistic behaviours in emerging economies (Tripsas et al., 1995), the effectiveness of the innovation and entrepreneurial programmes (Guerrero and Urbano, 2019b), and the need of strategic knowledge management practices in the public administration.

The second insight is dual behaviours (collaborative and opportunistic) among subsidised organisations. On the one hand, the paper contributes to the literature about the positive effect on knowledge production. It enhance the debate regarding collaborative behaviours among universities-industry partnerships stimulated by public R&D programmes (Zeng et al., 2010; Hall et al., 2016; Perkmann et al., 2013; Gianiodis et al., 2016; Colombelli and Quatraro, 2018) in emerging economies. On the other hand, the paper also contributes to the literature with evidence about mechanisms to identify opportunistic behaviours among subsidised partnerships. This enables the debate metrics to capture opportunism that previously were evidenced by additionally/crowding-out effects (Dimos and Pugh, 2016). The behavioural effect on knowledge management practices is moderated by the characteristics of subsidised firms (Wanzenböck et al., 2013) and entrepreneurial universities (Guerrero *et al.*, 2016). However, dual behaviours could be prevented or controlled by the implementation of formal/informal knowledge management mechanisms (de Wit-de Vries *et al.*, 2018). The success of these controls are observed on the quality of innovation (products, services, and process), a better innovation performance (sales, exports, and revenues), production of intellectual capital (utility models, copyrights, and patents), and good returns to the society (employment and spillovers). It opened an agenda for understanding the role of dual behaviours through metrics.

Several implications for the main actors involved in the Mexican innovation system emerge from our study such as policy makers, enterprise managers and university managers.

For policymakers, the study presents insights about the effectiveness of public resources. The bright side, it allows evaluating the cost-benefit of this government intervention and the effects on priority industries to maintain or adjust their actions. The dark side, as a part of a competitiveness and protectionist strategy, the North American administration imposed border taxes for those American companies (most of them enrolled in Automotive Industry) that making investments or operations in Mexico (most of them received subsidies). Policy makers should understand challenges and re-define/re-incentivize the productive value chain (Dussel et al., 2018), implement mechanisms to control opportunistic behaviors on potential subsidised multinationals (Takalo and Tanayama, 2010), and knowledge management practices within public administrations. For example, ex-post funding that provides a strong incentive to produce measurable output therefore subsidised organizations are closely monitored in terms of their production as well as ex-ante mechanisms that allow funders to control what (research projects) and/or who (researchers) is to be supported. *For enterprise managers*, this study offers insights about experiences, mechanisms and practices of subsidise organisations. The bright side of collaboration evidences impacts on performance with social returns. The dark side is linked with t appropriation behaviors of partners. For capturing value in long-term collaborations, is the implementation of knowledge management strategies (Söderblom and Samuelsson, 2013). *For university community*, the entrepreneurial university model is a good example of how modes of knowledge production are transformed. An example is collaboration practices with diverse agents involved in the entrepreneurial and innovative ecosystem to reinforce innovation activities (Guerrero and Urbano, 2016). In fact, the outcomes of those innovation practices are also relevant to legitimise the role of entrepreneurial universities in society as well as contribution to decrease the effect of institutional voids in emerging economies.

7. Conclusions and future research

The paper aimed to analyse how behaviours within subsidised entrepreneurial university-industry partnerships are influencing knowledge management strategies in emerging economies. Setting our research in Mexico, we conclude that knowledge management helps to collaboration partnerships to moderate the effect of dual behaviours (collaborative and opportunistic) on the expected intellectual outcomes. This research presents some limitations that provide new research opportunities. The first limitation is that this qualitative study did not include a control group (non-subsisted entrepreneurial university-industry partnerships) as a mechanism to contrasting the results obtained within our focus group (subsidised entrepreneurial university-industry partnerships). The second limitation was the definition of objective measures to approximate the collaborative and opportunistic behaviors. We need to recognise that opportunism is a negative stigma in the emerging economies and individuals avoid providing information. Future research should explore alternatives to evaluate the influenced of mixed degrees of collaborative/opportunistic behaviours in the effectiveness of public subsidies and innovation efficiency (Greco et al. 2016 and 2017), as well as propose new metrics to understand the role of behaviours on strategic knowledge management within entrepreneurial universities, industrial organisations, and public administration. In this sense, multiple theoretical approaches (i.e., resource based view, opportunity cost, institutional theory, knowledge spillover, open innovation, etc.) and methodological approaches (i.e., qualitative and quantitative) could help in-depth exploration about behaviors, outcomes and impacts (Kafouros *et al.*, 2018). The third limitation is regarding the knowledge management practices influenced by institutional voids or negative externalities as corruption (Guerrero and Urbano, 2016). The interviewed organisations are located in cities with higher levels of corruption that could condition the application/selection process of subsidies. It requires an in-depth analysis across regions to understand the effectiveness of university-industry

cooperation (Marzucchi et al., 2015), through all stages from the submission to the justification of final outcomes. Similarly, a detailed analysis of industries by priorities requires more exploitation (Audretsch and Lehmann, 2005; Acs *et al.*, 2009). As was identified in the automotive industry, the Mexican government has incentivized several multinational organisations for attracting foreign investment and it is relevant to analyse the socio-economic returns of R&D incentives; particularly, considering that the majority of headquarters of those organisations are located in North America.

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Table 1: Characteristics of subsidised partnerships

Modality	Industrial organisation	Main characteristics of the industrial organisation that promoted the application				Subsidies 2009-2015			Non-subsidised projects (number of collaborations with)			Subsidised Projects' Outcomes (in average)			
		Age (years)	Size (employees)	Location	% ownership	Private (%)	Public (%)	Subsidised projects	Commercial organisations	Scientific organisations	Mixed	Innovation performance (annual grow)	Intellectual property (outcomes)	Social impacts	
INNOVATEC	AutoIn1	31	> 500	Centre & North	100% Foreign 95% sales from foreign	71%	29%	Eleven individual & six in collaboration with EU1	One provider & One alliance with another enterprise	One with an international entrepreneurial university	-	3% in sales 6% in employees (35% of sales from innovations)	2 patents, 3 utility models, 1 property rights & 1 thesis	22 new employees	
	AutoIn2	12	> 500	Centre	100% Foreign 88% sales from foreign	70%	30%	Eight in collaboration with EU2, EU3, EU4	-	One with EU2 & 1 with a research centre	-	3% in sales 5% in employees (30% of sales from innovations)	2 patents	55 new employees	
INNOVAPYME	LeFoIn1	33	230-240	Centre	100% National 0% sales from foreign	62%	38%	One individual & six in collaboration with EU1, EU4, EU5, EU6	-	Two with EU1, EU4, EU5 and EU6 & with two research centres	-	20% in sales 15% in employees (80% of sales from innovations)	2 patents, 3 utility models, 1 thesis & introduction in other sector**	23 new employees	
	LeFoIn2	22	200	Centre	100% National 50% sales from foreign	51%	49%	One in collaboration with EU7	-	One with EU7 & 3 research centres	-	10% in sales 16% in employees (25% of sales from innovations)	1 utility models	25 new employees	

Note: ** Aerospace industry also with the support from PROINNOVA in collaboration with five scientific organizations

Source: Interviews

Table 2: Knowledge management within subsidised entrepreneurial university-industry partnerships

Partners' behaviours:	Strategic Knowledge Management					
	Models of knowledge / innovation	Measures of performance	Measure of protection	Measures of control		Costs
> Opportunism	A higher number of individual subsidies (multinational) and with mixed collaborations for capturing external funds and with lower level of commitment	The performance is highly captured by the opportunist panthers	Rigid protection of the inventions once the behaviour is identified (patents, copyrights, intellectual property)	Rigid implementation of initial collaboration agreements: incentives, duties, period, ending clauses, penalties, etc.	Rigid and constant monitoring of behaviours Social reputation and social norms of penalisation	Highest costs that depend of type and duration of monitoring from the identification until the end or dissolution of the contract agreement, project or partnership
	Mixed collaboration with commercial and scientific agents to share risks, capabilities, etc.	Outcomes are shared according to the initial collaboration agreement Learning process and absorptive capabilities	Shared property - thesis - utility models (<5 years) - patents (<20 years)	Flexible implementation of the initial collaboration agreements: incentives, duties, period, ending clauses, penalties, etc.	Shared values, trust, culture, social reputation, legitimisation, etc.	Lower costs of monitoring that are shared among the partners

Source: Authors

Appendix 1: Entrepreneurial Universities

ID	Main characteristics			Formal Factors			Informal factors		Resources			Strong Capabilities		
	Age (years)	Size (students)	Type	Research orientation	Knowledge transfer normative	Support measures for innovation	Reward system for inventors	Positive attitudes and culture towards entrepreneurship	Role models	Specialised human capital	Physical: TTO, Incubators	Commercial: Intellectual property	Techno-logical	Status and prestige
EU1	76	> 10,000	Private	Applied and Basic	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Top 20 in the Higher education Ranking in Mexico
EU2	204	> 150,000	Public	Applied and Basic	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
EU3	50	> 30,000	Private	Basic	Yes	Yes	Yes	n.a	Yes	Yes	Yes	Yes	Yes	
EU4	> 50	> 10,000	Public	Basic	Yes	Yes	Yes	n.a	Yes	Yes	n.a	Yes	Yes	
EU5	83	> 150,000	Public	Applied and Basic	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
EU6	280	> 24,000	Public	Basic	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	International, National and Local
EU7	> 50	> 10,000	Public	Basic	Yes	Yes	Yes	n.a	Yes	Yes	Yes	Yes	Yes	

n.a. = not available information

Source: Authors based on secondary sources and interviews

Appendix 2: Dataset

Sector	Industrial organisation	Type	Subsidised projects	Period	Category of the Incentive Programme for Innovation	Subsidised modality	Ext-ante Motives for participating in subsidised entrepreneurial university-industry partnerships			Ext-ante Expected outcomes from subsidised entrepreneurial university-industry partnerships		
							Motives	Opportunist?	Perception of subsidies	Innovation purpose	Intellectual capital	Capturing external knowledge
Auto	AutoIn1	Multinational	4	2009-2012	INNOVATEC	Collaborative	reduction of costs, gain competitive advantages	yes - represents our affordable lost	very appropriated but with a bureaucracy cost	quality in process	patents	suppliers & entrepreneurial universities
		Multinational	10	2009-2012		Individual						
		Multinational	2	2013-2015		Collaborative						
		Multinational	1	2013-2015		Individual						
	AutoIn2	Multinational	5	2009-2012	INNOVATEC	Collaborative	sharing risks, resources and lower costs	yes - it is like banks that using our deposits without affecting us	very positive but should be regulated and do a follow up after finishing the programmes	disruptive innovations	licences	suppliers & entrepreneurial universities
		Multinational	3	2013-2015		Collaborative						
		SMEs	1	2009-2012		Collaborative						
		SMEs	1	2009-2012		Individual						
LeFon	LeFoln1	SMEs	3	2009-2012	INNOVAPYME	Collaborative	minimize risks and increase profits	yes - it's an alternative for capturing funds with a few requirement and without interest rates	positive but with a lot of requirements	productivity, incremental and disruptive innovations	licences	entrepreneurial universities
		SMEs	2	2013-2015		Collaborative						
		SMEs	1	2009-2012	PROINNOVA	Collaborative						
		SMEs	2	2013-2015		Collaborative						
	LeFoln2	SMEs	1	2009-2012	INNOVAPYME	Collaborative	increase the economic impact	yes - is capturing value with non-owned money	good programmes	incremental	licences	entrepreneurial universities
		SMEs	1	2009-2012		Collaborative						

Appendix 2: Dataset (continue)

Industrial organisation	During the subsidised entrepreneurial university-industry partnerships								Ex-post Evaluating the subsidised entrepreneurial university-industry partnerships				Ext-post Value captured from subsidised entrepreneurial university-industry partnerships	
	Vision	internal initiatives	Risk level	Proactivity level	Absorptive capacity	Costs of knowledge management	Initial expectation	Positive side	Negative side	Final result	organization	Region		
AutoIn1	new plants, alliances, new business lines	autonomy and strategic projects	moderated	conservative	adoption de technologies that are applicate in other sectors (leather, plastics)	lower	development of new technology and improve process	introduce new technological advances	time	product development, acquisition of knowledge and skills	decrease of costs, increment in the efficient, achievement of all indicators	employment, education, wellbeing, corporate citizens		
AutoIn2	new plants	innovation programmes with incentives	moderated	rapid adopter	based on benchmarking	higher	improve products and process	acquisition of new knowledge and technology	not aligned interests	improvement s in process and products	improve the relationship between sales of innovations and economic profits	employment, social responsible, attracting foreign investment and improving the capabilities of local suppliers		
LeFoIn1	new sectors	new innovations are welcome	higher risk	pioneers	adoption of good practices in the sector	lower	development of new technology	more talent	time	Competitiveness	saving money and increase clients' satisfaction with quality	more clients, open new markets, employment, improving the quality of life		
LeFoIn2	new markets, new products	product development	lower risk	moderated leader	adoption of good practices in the sector	lower	improve quality	applied knowledge	time	quality	increment of sales	sustained competitive advantage, productivity, improvements in the value chain, attracting talent/investments		