

# THE ROLE OF INNOVATIVE SMEs TO THE GROWTH OF REGIONAL ECONOMY: THE CASE OF CZECH REPUBLIC

**Richard Gardiner**

University of Pardubice, Studentska 95, Pardubice 53210, Czech Republic  
*richardgardiner18@yahoo.com*

**Petr Hajek**

University of Pardubice, Studentska 95, Pardubice 53210, Czech Republic  
*petr.hajek@upce.cz*

## **ABSTRACT**

*Globally, we cannot deny the fact that SMEs form part of the fabric of the economic growth. This presupposes that they serve as a pivot for economic development as they unfold the contributions such promoting economic growth, creating innovation as well as enhancing prosperity. This paper examines the relationship between the small and medium-sized enterprises (SMEs) and economic growth of Czech regions. The paper is based on primary research data collected within the Community Innovation Survey in Czech Republic. This survey provides a unique source of data on various aspects of innovation development in SMEs, such as their objectives, cooperation, funding, etc. We show that the share of innovative SMEs has a strong positive impact on the economic accounts of NUTS 4 regions. We also show that this effect has origins in the structure of intellectual capital (both human and structural) of SMEs. We use the data from the Community Innovation Survey to develop the proxy variables of the components of regional SMEs' intellectual capital. We use structural equation models to demonstrate the statistical significancy of these effects and various direct and indirect effects of the share of innovative SMEs on the indicators of regional economic performance. The results show that new-to-firm innovative SMEs are critical for regional economies based on innovation adoption strategy. Human and structural capital represent important prerequisites for this strategy. This has important policy implications, supporting the role of regional embeddedness to sustain the role of SMEs. This can also provide some generalizations on the contribution of SMEs for national economies.*

**Keywords:** *small and medium-sized enterprises, innovation, regional economic growth*

Determinants of Innovativeness and Performance of SMEs

## **1 INTRODUCTION**

Generally, the role of Small and Medium Sizes Enterprises (SMEs) to the regional economy growth has been a thorny issue as a section of developing and transitional economies have different perception about their role towards the economic development. Apparently, SMEs are believed to be crucial for economic development (Wennekers and Thurik, 1999). Yet they have not much asserted the instrumental role (especially human capital development, innovation, and economics growth) played by SMEs. The advanced economies, on the other hand, regard SMEs as a backbone of the economics of high income countries. This assertion was supported by report from Organization of Economic Co-operation and Development (OECD) indicated that more than 95% of private institutions are SMEs in on the globe. At the same time it employs 60% of the labour force in the private sector as well as enhancing regional development and creating of social cohesion.

Consequently, existing literature review portrayed that SMEs promotes economic growth through myriad of ways that extend beyond mere creation of jobs. Its early contribution includes the creation of value chain, ensuring linkages with large firms, promoting economic dynamics via entrepreneurship, and ensuring financial market development. SMEs also promote social stability and assists other industries. According to Dalberg (2011), new SMEs enter the market every year and statically, represent 5% to 20% of the existing enterprises. They inject into the economic system some level of innovation, dynamism and comparably much of this experienced is from smaller firms rather than from large ones. Hence, they can be major sources of business ideas.

Our study was conducted in Czech regions, where the share of SMEs in the total number of enterprises is 99.86%, the share of total employees in the business sector is 59.43%. This shows that SMEs make tremendous contribution to Czech economy (Belas et al., 2015). Undoubtedly, SMEs sector is one of the pivots for increasing competition, productivity and, thus, promoting the growth of income and per capita GDP. This development encouraged structural transformation of the economy because healthy SMEs are linked up with innovation as well as technological advancement. In effect, such undertaking enhances regional and local development, reduces inequalities, in as much as there is rise in income of a wider segment of given population. In a similar way, SMEs induce greater demand for good governance.

The above mentioned facts raise the need for national and regional support of SMEs' innovativeness. The innovative activity of SMEs depends on two important determinants, namely internal sources related to R&D and external support. Regional level is particularly important because it provides stimulating milieu, supporting inter-firm communication, socio-cultural structures and institutional environment (Asheim and Isaksen, 2002). SMEs are territorially embedded in regional innovation systems, leading to collective learning and continuous innovation. Regional knowledge base is thus becoming increasingly important determinant of SMEs' innovativeness (Sternberg and Arndt, 2001; Lasch et al., 2013; Stuetzer et al., 2014). Regional knowledge base affects both SMEs' capacity to create and absorb new knowledge and their ability to exchange knowledge. These effects are rooted in regional human and structural capital (Nitkiewitz et al. 2014).

Regional human capital comprises the know-how characterizing the different actors operating within a region (Demartini and Del Baldo, 2015). It can be developed through formal training and education (Dakhli and de Clercq, 2004). According Belas et al. (2015), SMEs in Czech Republic are burdened with a decrease in domestic demand due to new technology has changed the trend of market demand. SMEs need to re-develop human capital and at same time should be more innovative in their activities to keep up with current demand. Regional structural capital provides SMEs with technological infrastructures, including information and communication technology (ICT), regional knowledge repositories such as universities and research centers and innovation infrastructure and support (Demartini and Del Baldo, 2015).

Most related studies to date have tended to focus of the determinants of SMEs' innovative activity. However, far too little attention has been paid to the role of innovative SMEs in regional setting, including its effect on regional economic growth. Hence this paper investigates: (1) the effect of innovative SMEs on regional economic growth, (2) the effect of current state of regional human and structural capital on the innovativeness of SMEs, and (3) the impact of these towards the growth of regional economy. Thus, we explore how intellectual capital can be transformed into innovation activity of SMEs and thus promote regional economic growth.

The remainder of this paper is structured as follows. Section 2 briefly reviews the determinants of SMEs' innovation activity. Section 3 introduces data selected for the analysis

and the research methodology based on structural equation models. In section 4, we present the results of the empirical experiments and section 5 concludes the paper.

## **2 DETERMINANTS OF SMEs INNOVATION PERFORMANCE**

Innovation is one of the topmost factors through which SMEs promote economic growth and it is perceived as driving force bringing up the rear business success. According to Radas et al. (2015) innovations are more vital to SMEs than for larger firms. Since almost all large firms are innovative due to substantial internal R&D capabilities, the factors that determine innovativeness of SMEs have attracted particular attention in recent literature.

The commonly reported determinant includes the size of the firm. Comparably, larger firms have easier access to resources needed for investment and adopt new technologies. Larger firms have also the sources to both acquisition and generation of innovations. For this reason they benefit from the economy of scale. Besides, they are capable of attracting the best human capital and use its knowledge to innovate their activities.

Secondly, the number of firm's skilled labour is also another determinant. A firm with ability to use new technology or cope with operation of complex technology saves the firm from incurring additional cost in training labour and save time, respectively. Also, SMEs which have well educated and technically qualified employees will definitely be fast in adapting to market innovations. Regional human capital plays a crucial role in providing skilled labour to SMEs. In addition, the perceived resource deficiency in knowledge-based resources constitutes a major perceptual barrier to SMEs' internationalization (Xie and Suh, 2014).

Moreover, the firm's ability to access information can serve as a determining factor. Firms which have the ability to access current or up-to-date information always stand the chance of adjusting and sustaining in the market because they can adopt strategies meeting these economic changes. This implies the utilization of information about consumer behavior/taste or preference, price fluctuations, emergence of new technology and material, financing market opportunities, government regulations on trade as well as taxes are very important to the firms as they could innovate the strategies and activities to meet any changes of this information. In addition, a firm's ICT infrastructure improves the access to knowledge (Hajek et al., 2014). For instance, firms use ICT to substitute their traditional means of communication, control business documents, and carry on their business activities together with business transactions. ICT create innovation by first stepping up of spreading information through closer links between firms and clients. Similarly, ICT increases the efficiency of communication. Again, regional infrastructure as an important component of regional structural capital plays a critical role in this context.

Another important determinant is the SMEs' access to finance (Prokop and Stejskal, 2015). Apparently, SMEs have internal financial sources. Yet flexible and easy access to external financial sources provides an alternative opportunity to innovate their activities. As a result, SMEs can purchase or perk up the existing or new machinery and equipment as well as capital goods to innovate their business activities. Apparently, the combination of internal R&D expenditure combined with regional (national) financial support represents the most effective mechanism promoting SMEs' innovation performance.

The SMEs' openness to foreign trade is another factor which contributes to innovation activity. The SMEs which are open to foreign trade are capable developing innovation as they are exposed to state-of-the-art knowledge and technology (Filalotchev et al., 2009). A study conducted by Benacek et al. (2000) for Central and Eastern Europe countries indicated that there emerge technology spillover from foreign direct investment in manufacturing sectors of the Czech Republic, Hungary, Slovakia and Poland. Overall, the manufacturing sector in the Czech Republic had the strongest ability to gain knowledge from the spillovers.

The determinants of SMEs' innovation activity with respect to regional dimension in the Czech Republic can be traced from the study conducted by Prokop and Stejskal (2015). They outlined the importance of public R&D expenditure as an indicator of regional innovation capital.

Following the arguments mentioned above, we hypothesize that:

*H1:* When combined with private R&D expenditure, regional human capital (HC) and structural capital (SC) promote the innovativeness of SMEs.

Most Czech regions profit from knowledge acquisition, rather than developing more radical innovations. Moreover, Czech regions were categorized as moderate innovators in regional innovation scoreboard (Hollanders et al., 2009; Hajek et al., 2014). We therefore hypothesize that:

*H2:* For the economic growth of Czech regions, new-to-firm innovations are more important than new-to-market innovations.

### **3 DATA AND METHODS**

To examine the role of innovative SMEs in the economic growth of Czech regions, we collected data from both the Community Innovation Survey (CIS) and the regional database of the Czech statistical office (CSO). The CIS 2010 was based on a harmonized questionnaire of EU Member States and it was carried out in the Czech Republic for the period 2008-2010 by combining sample (stratified random sampling) and exhaustive surveys taking into account the regional dimension of NUTS 4 (77 regions). In total, data on 4,447 SMEs were obtained with the reported response rate greater than 60 %. The CIS is regarded as a comprehensive and reliable source of innovation statistics in the EU.

The innovation activity of the SMEs in the region was estimated by calculating the share of SMEs that introduced a new product or process to the firm/market. New-to-firm innovations are less radical and rely on knowledge acquisition as they are already available from the competitors in the market. In our sample, 28.4 % of SMEs were innovative, introducing new-to-market innovation in 52.9 % and new-to-firm innovation in 79.0 % (note that many SMEs introduced both new-to-market and new-to-firm innovation in the monitored period). To transform the data into regional dimension, we calculated average values for the SMEs located in the region.

R&D expenditures are considered the most important determinant of innovation activity in the related literature. To measure this determinant, we used the regional average of total expenditures for all types of innovation activity, including in-house and external R&D, the acquisition of equipment and the acquisition of existing knowledge from other enterprises and organizations.

SMEs are important actors in regional innovation systems. Although SMEs mostly apply and exploit knowledge generated within the regional innovation system, SMEs are strongly connected to other actors via knowledge transfer component (Hajek et al., 2014). These actors, such as universities and other research organizations, generate and diffuse knowledge. To measure these determinants of SMEs' innovation activity, the concept of regional intellectual capital was utilized, consisting of two interconnected components – human and structural capital. Relying on previous literature on measuring regional intellectual capital, we used the proxies of the two components that were found significant in prior studies. To assess the level of regional human capital, we adopted the measure of educational attainment. To distinguish between general, academic and scientific knowledge and skills, we used the shares

of population with bachelor, master and doctoral degree. On average, the shares were 1.8 % for bachelor, 8.6 % for master, and 0.4 % for doctoral degree. Note, however, that significant differences existed between the regions. For example, Prague achieved the values more than twice the average ones.

To evaluate regional structural capital, we focused on the following components: (1) innovation capital (measured by regional government and university R&D expenditures and by the share of employees working in science and R&D), (2) process capital (measured by the share of households with internet access and the share of population participating in the last parliament elections), and (3) market capital (measured by GDP per capita in PPS with EU28=100). Similar as the proxy variables for human capital, the structural capital indicators were strongly correlated. To obtain unbiased results in regression models, we therefore first performed a confirmatory factor analysis with maximum likelihood estimates. The average weights (AW) for human and structural capital are presented in Table 1. Cronbach's alpha showed  $> .60$ , indicating the internal consistency of the models.

*Table 1: Results of confirmatory factor analysis*

Indicator of HC	Weight	Indicator of SC	Weight
bachelor degree	0.956	regional government and university R&D expenditures	0.909
master degree	0.993	employees working in science and R&D	0.914
doctoral degree	0.956	households with internet access	0.767
		population participating in the last parliament elections	0.731
		GDP per capita in PPS	0.915

To evaluate regional economic growth, we used two common economic measures of innovative activity, employment and sales' growth. Again, to obtain these indicators for NUTS 4 regions, we calculated average values for the SMEs located in the region (20.2 % sales growth on average, 10.8 % employment growth on average between years 2008-2010). As a result, we had a sample of 77 regions with corresponding input-output data.

To study the effects of innovative SMEs on regional economic growth, we constructed several structural equation models. In these models, innovative SMEs represent a mediator variable, causally located between the input variables (R&D expenditure, regional human and structural capital) and output (growth of employment and sales). In other words, we tested both the direct and indirect (via innovative SMEs) effect of the input variables on regional economic growth. The direct and indirect effects were then estimated from the following equations:

$$M = i_M + a_j \times X + e_M, \quad (1)$$

$$Y_k = i_Y + c'_j \times X + b_j \times M + e_Y, \quad (2)$$

where  $c'_j$  estimates the direct effect of the input variables on regional economic growth, and  $a_j \times b_j$  estimates the indirect effect via innovative SMEs. The total effect  $c_j$  can be then calculated as follows:

$$c_j = c'_j + a_j \times b_j. \quad (3)$$

In the models, the causal effect between regional human (and structural) capital and innovative SMEs is moderated through private expenditure on R&D, representing a moderator  $W_1$ . Then, the effect of  $X_j$  on  $Y_k$  may be expressed as follows (Hayes, 2013):

$$Y_k = i + (c_1 + c_2 \times W_m) \times X_j + c_3 W_m + e_Y, \tag{4}$$

where  $(c_1 + c_2 \times W_m)$  represents the conditional effect of  $X_j$  on  $Y_k$ .

**4 RESULTS**

In Fig. 1 to Fig. 4, we examined both the mediation role of innovative SMEs and the moderation role of private R&D expenditures on regional economic growth (growth of employment and sales). In these models, regional HC and SC influence the economic growth both directly (this is without the mediation role of innovative SMEs) and indirectly (we hypothesize that HC and SC promote the innovativeness of SMEs and thus support regional economic growth). We also expect that exploiting regional HC and SC can be effectively transformed into innovation only when combined with private R&D expenditures.

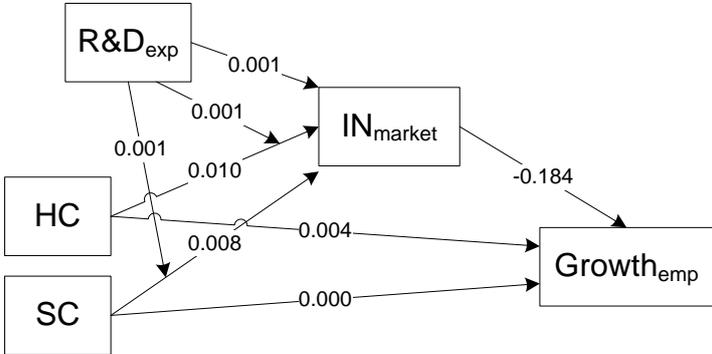


Figure 1: The mediating effect of new-to-market innovative SMEs on employment growth

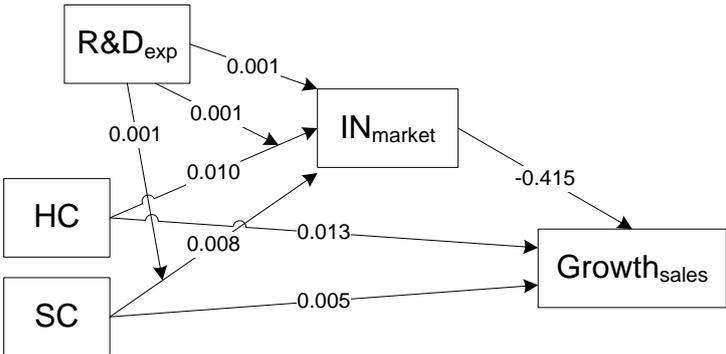


Figure 2: The mediating effect of new-to-market innovative SMEs on sales' growth

Fig. 1 and Fig. 2 show results for more radical new-to-market innovative SMEs (innovation leaders), whereas Fig. 3 and Fig. 4 represent structural models for new-to-firm SMEs (innovation followers).

The result of structural model in Fig. 1 explicitly shows that there is no positive effect from new-to-market innovative SMEs ( $IN_{market}$ ) on employment growth in Czech regions. The indirect effects from human capital (HC) and structural capital (SC) via innovative market

SMEs were also not significant for employment growth. Similarly, private research and development (R&D) expenditure, HC and SC did not show any significant effect on new-to-market innovative SMEs.

The structural model in Fig. 2 also showed no significant effect from new-to-market innovative SMEs on sales growth. The other direct effects from indicators HC and SC also showed insignificant effects. In addition, there was no significant effect from R&D expenditure, HC and SC on new-to-market innovative SMEs. Compared with regional employment growth, the effects were stronger but still insignificant.

The effect of new-to-firm innovation SMEs ( $IN_{firm}$ ) on regional employment growth was strong, whereas the direct effect from regional HC and SC was insignificant (see Fig. 3). However, regional HC and SC and R&D expenditure showed significant positive effect on new-to-firm innovative SMEs. Thus, HC, SC and R&D expenditure had a strong indirect effect on regional employment growth. Even stronger effects were observed for the structural model in Fig. 4. The directions of the effects on sales' growth were the same as for the employment growth.

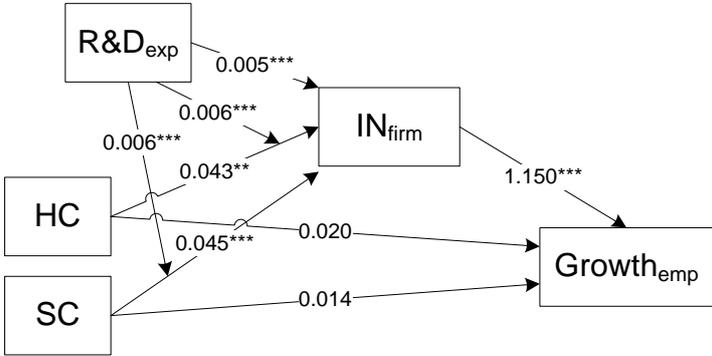


Figure 3: The mediating effect of new-to-firm innovative SMEs on employment growth

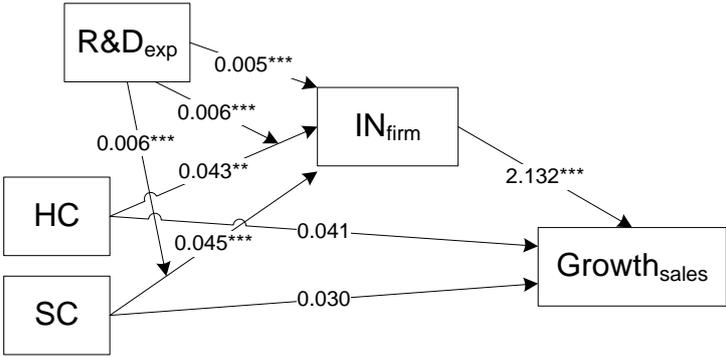


Figure 4: The mediating effect of new-to-firm innovative SMEs on sales' growth

**5 CONSLUSION**

The present study was designed to determine the effect of innovative SMEs on regional economic growth, and the effect of regional HC and SC on both the innovativeness of SMEs and regional economic growth. In this investigation, the aim was to assess the role of innovative SMEs in the relationship between regional knowledge base and economic growth. Returning to the hypotheses posed at the beginning of this study, it is now possible to state that private R&D expenditure is an important moderator for SMEs in utilizing regional

knowledge base, providing empirical support to hypothesis *H1*. Thus, we showed that regional HC and SC promote the innovativeness of SMEs. Moreover, regional support is more effective when combined with private R&D expenditure. This conclusion, however, holds only for new-to-firm innovative SMEs. This finding has important implications for developing regional innovation strategies in moderate innovative regions like Czech regions. Knowledge acquisition strategy is more effective for these regions and should be therefore supported by national and regional governments. This conclusion was further supported by confirming hypothesis *H2*, this is that new-to-firm innovations are more important than new-to-market innovations for the economic growth of Czech regions. One of the more significant findings to emerge from this study is that new-to-market innovative SMEs do not represent a significant driver of regional economy growth in moderate innovative regions.

However, more research on this topic needs to be undertaken before the association between regional knowledge base and innovative SMEs is more clearly understood. Future studies on the current topic are therefore recommended. The focus should be placed not only on moderate innovative regions, but also on innovation followers and leaders. Further studies are also recommended, taking into account additional variables such as foreign direct investment and regional knowledge networks.

## **ACKNOWLEDGEMENT**

This work was supported by a grant provided by the scientific research project of the Czech Sciences Foundation Grant No: 14-02836S and by the grant No. SGS\_2016\_023 of the Student Grant Competition.

## **5 BIBLIOGRAPHY**

1. Asheim, B. T., Isaksen, A. (2002). Regional innovation systems: the integration of local 'sticky' and global 'ubiquitous' knowledge. *The Journal of Technology Transfer* 27(1), 77-86.
2. Belas, J., Demjan, V., Habanik, J., Hudaková, M., Sipko, J. (2015). The business environment of small and medium-sized enterprises in selected regions of the Czech Republic and Slovakia. *E+M Ekonomie a Management* 1, 95-110.
3. Benacek, V., Gronicki, M., Holland, D., Sass, M. (2000). The determinants and impact of foreign direct investment in Central and Eastern Europe: A comparison of survey and econometric evidence. *Transnational Corporations, Journal of United Nations* 9(3), 163-212.
4. Dakhli, M., De Clercq, D. (2004). Human capital, social capital, and innovation: a multi-country study. *Entrepreneurship & Regional Development* 16(2), 107-128.
5. Dalberg, H. (2011). *Report on Support to SMEs in Developing Countries Through Financial Intermediaries*. SME Briefing Paper, EIB Draft version, Geneva: European Investment Bank.
6. Demartini, P., Del Baldo, M. (2015). Knowledge and social capital: drivers for sustainable local growth. *Chinese Business Review* 14(2), 106-117.
7. Filatotchev, I., Liu, X., Buck, T., Wright, M. (2009). The export orientation and export performance of high-technology SMEs in emerging markets: The effects of knowledge transfer by returnee entrepreneurs. *Journal of International Business Studies* 40(6), 1005-1021.
8. Hajek, P., Henriques, R., Hajkova, V. (2014). Visualising components of regional innovation systems using self-organizing maps - Evidence from European regions. *Technological Forecasting and Social Change* 84, 197-214.

9. Hajkova, V., Hajek, P. (2014). Efficiency of knowledge bases in urban population and economic growth—Evidence from European cities. *Cities* 40, 11-22.
10. Hayes, A. F. (2013). *Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach*. Guilford Press.
11. Hollanders, H., Tarantola, S., Loschky, A. (2009). *Regional Innovation Scoreboard (RIS) 2009*. PRO INNO EURO, INNO METRICS.
12. Lasch, F., Robert, F., Le Roy, F. (2013). Regional determinants of ICT new firm formation. *Small Business Economics* 40(3), 671-686.
13. Nitkiewicz, T., Pachura, P., Reid, N. (2014). An appraisal of regional intellectual capital performance using Data Envelopment Analysis. *Applied Geography* 53, 246-257.
14. Prokop, V., Stejskal, J. (2015). Determinants of machinery firms' innovation activity—case study from the Czech Republic. In *55th Congress of the European Regional Science Association: World Renaissance: Changing Roles for People and Places*.
15. Radas, S., Anic, I. D., Tafro, A., Wagner, V. (2015). The effects of public support schemes on small and medium enterprises. *Technovation* 38, 15-30.
16. Sternberg, R., Arndt, O. (2001). The firm or the region: what determines the innovation behavior of European firms?. *Economic Geography* 77(4), 364-382.
17. Stuetzer, M., Obschonka, M., Brixy, U., Sternberg, R., Cantner, U. (2014). Regional characteristics, opportunity perception and entrepreneurial activities. *Small Business Economics* 42(2), 221-244.
18. Wennekers, S., Thurik, R. (1999). Linking entrepreneurship and economic growth. *Small Business Economics* 13(1), 27-56.
19. Xie, Y. H., Suh, T. (2014). Perceived resource deficiency and internationalization of small-and medium-sized firms. *Journal of International Entrepreneurship* 12(3), 207-229.