



Innovation, learning and performance in a resource-rich emerging economy



Authors:

Gregory J. Scott^{1,2} 
Ian Chaston^{1,2,3} 

Affiliations:

¹CENTRUM Católica, Graduate Business School, Peru

²Pontificia Universidad Católica del Peru, Peru

³Department of Management and International Business, The University of Auckland Business School, New Zealand

Corresponding author:

Gregory Scott,
gscott@puccp.pe

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Background: This article compares the performance of firms in resource-rich sectors of the Peruvian economy with that of businesses operating in service sectors.

Objectives: In so doing, the research seeks to examine whether innovation is managed differently by firms operating in different sectors of a developing-country economy and whether the performance of firms in an emerging economy may be influenced by innovation and learning practices at the sectoral level.

Method: Data were acquired through a survey of overwhelmingly middle managers working in Peru.

Results: According to the survey findings, the performance of firms in the resource-rich sectors appeared to be uninfluenced by innovation or involvement in organisational learning. In contrast, firms in the service sectors not only exhibited an innovation orientation and involvement in learning but also reported higher sales growth.

Conclusion: The study concludes that firms operating in the resource-rich sectors of Peru's economy do not appear to benefit from engaging in innovation or learning at this point in time, whereas such activities are advantageous for service sector businesses. Therefore, the relationship between innovation, learning and performance may be influenced not just by the type of economy but also by the sector in which the firms are operating.

Introduction

Drucker (1985) posits that post-war business survival rates were likely to be the highest among firms that engaged in innovation. Trott (1998) concludes that innovation in the face of a major change in market conditions will assist firms to emerge from an economic downturn in a much stronger position than their less innovative competitors. In relation to exploiting innovation, Slater and Narver (1995) posit that this involves organisational learning to acquire and exploit appropriate new knowledge from both within and outside the organisation. Senge (1990) proposes that a clear relationship exists between the failure of organisations and their inability to learn from experience. Hamel and Prahalad (1994) concluded that the learning process must be translated into the acquisition of new knowledge that can be used to upgrade core competences.

The vast majority of studies on organisational learning and innovation management is based on research carried out on firms located in industrialised economies such as the United Kingdom or the United States. Hence, the question arises whether theories concerning the relationship between performance, learning and innovation derived from such studies are also applicable for organisations doing business in emerging economies. The purpose of this study is to examine this question in the context of companies operating in different sectors of the Peruvian economy.

Innovation and learning

Schumpeter (1934) argues that innovation provides an effective response to economic uncertainty during a major economic downturn. His view was validated in the context of post-war economies by studies of firms in the United States which survived a recession through reliance upon innovation (Ghemawat 1993; Gilbert 1990). The importance of innovation has recently been endorsed by a survey of over 1000 CEOs (IBM 2008). In the face of the worst recession since the 1930s, they contended that survival and growth are dependent on sustaining innovation and embedding an entrepreneurial culture across their organisations.

Many of the emerging economies in South America have been less impacted by the recent global downturn than most Western industrialised nations. These commodity and mineral-rich

countries have continued to benefit from strong demand for their products in the world's two fastest growing emerging economies, India and China. However, the long-term prospects for sustained growth in some of these same commodity-exporting countries remain uncertain because of the volatility of demand for primary products (*The Sunday Times* [London] 2011). Hence for countries such as Peru seeking a steadier and sustained economic development, movement towards placing greater emphasis on the exploitation of innovation would appear to be a beneficial.

Argyris and Schön (1996) propose that the performance of firms can be weakened by solving problems merely by relying on past experience and accumulated knowledge. They refer to this approach as 'single-loop' or a lower-level learning style. In their view, successful organisations are those which engage in 'double-loop' learning. This involves the acquisition and utilisation of new knowledge which, when linked with existing understanding, can be used to generate more effective solutions. The adoption of this latter style of learning offers the benefits of permitting organisation to be more versatile, flexible and adaptive. Chaston (2004) posits that firms utilising double-loop learning tend to achieve superior organisational performance. Huang et al. (2010) argue that open innovation leads to business growth by permitting organisations to leverage more ideas from a variety of external sources.

Innovation is a creative process that involves individuals engaging in some form of generative learning involving the acquisition of new knowledge (Popper & Lipshitz 1998). New knowledge when linked with existing understanding and business experience, results in the generation of new ideas that often run counter to prevailing conventions within an industry. Kuratko et al. (1993) propose that the role of learning in successful innovation involves acquiring new knowledge about facts, principles and capability. Kenworthy (1995) and Lundvall and Nielsen (2003) conclude that national and corporate culture may influence the willingness of organisations to engage in innovation. Palacios, Gil and Garrigos (2009) conclude that knowledge management and learning are critical factors influencing the level of entrepreneurial behaviour in the biotechnology and telecommunications industries. Mohannak (2007) and Moensted (2010) believe that high-technology firms, which focus heavily on exploiting innovation to achieve a competitive advantage, have a greater need for involvement in organisational learning than firms operating in low-technology sectors.

The process whereby new knowledge is acquired is known as 'organisational learning'. Day (1994) proposes that in market-driven firms, this process involves (1) open-minded inquiry, (2) widespread information distribution inside the organisation, (3) mutually informed mental models guiding market interpretation and (4) accessibility for all staff to what has been learned. Senge (1990) posits that organisations can only begin to develop and implement growth strategies when the process is based upon a 'systems thinking' approach.

To facilitate learning for all members of staff, Pedlar, Burgoyne and Boydell (1991) posit that firms need to create a 'learning organisation'. The benefits of a learning organisation include (1) the acquisition of new knowledge, (2) the more effective utilisation of existing knowledge and (3) a much clearer understanding of both internal and external environments. The participation of all staff promotes effective information interchange. This is often enhanced by involving individuals and entities external to the organisation. Key outcomes are the promotion of systemic thinking, creation of an organisational memory and, where necessary, redefinition of individual and corporate mental models. Pedlar et al. (1991) conclude that creating a learning organisation is a lengthy and resource-demanding activity which can take several years. Slater and Narver (1995) posit that the existence of a strong market orientation is a key cultural foundation upon which a learning organisation is based.

Learning in emerging economies

Although there is a wealth of evidence in the literature concerning the benefits of innovation and learning in industrialised countries, this topic has received only limited coverage in emerging economies. Furthermore, the bulk of this emerging economy research has focused on how the acquisition of new knowledge can enhance the performance of firms in Asia.

Lundvall and Nielsen (2003), for example, propose that China's success can be attributed to the country moving towards becoming a 'learning economy'. Huang and Chu (2010) note that links that Asian firms make with their customers in Western markets can catalyse learning and result in more innovation. The influence of overseas customers generates interactive learning among organisations. It also internalises learning among supplier organisations. Liu and Vince (1999) note that such learning from overseas customers involves a two-step process. Suppliers must first understand that differences exist between the cultures of their respective organisations. Then, they must seek to manage these differences when creating effective systems inside their own organisations.

Child (1994) identifies three levels of learning in his analysis of Asian firms. The first level is technical. It involves the acquisition and implementation of basic managerial processes. The second level is the introduction of new operating systems and procedures. In the final level, the Asian firms acquire capabilities in the area of strategic management. Child concludes that until learning moved towards higher or double-loop learning, there can be few expectations that the firms in an emerging economy will achieve any improvement in overall business performance.

Ordóñez de Pablos (2006) proposes that another source of learning is the arrival of large multinationals in an emerging economy. Their entry can prompt local firms to recognise the need to acquire new knowledge in order to remain competitive. Welsh, Alon and Falbe (2006) conclude that firms in emerging

economies often only act to enhance performance when confronted by competition from Western companies. A common response is to become more innovative by introducing new technology and investing in upgrading workforce capabilities.

Notwithstanding, Welsh et al. (2006) also note that the pressure for change among domestic service sector firms such as banks and retailers in an emerging economy, is somewhat different from that confronting firms engaged in exporting primary commodities. This is because the latter's orientation towards learning and innovation is strongly influenced by the nature of demand and the attitudes exhibited by their largest overseas customers. In contrast, the behaviour of domestic service sector firms is usually determined by local consumer attitudes, which have often been altered as the result of market entry by new, more innovative service providers from Europe and the United States. Poolthong (2009) confirms this perspective in the context of the impact of major international banks entering Asian markets. Their arrival prompted local banks to invest in innovation in order to develop new services and to upgrade service quality.

Maharajh and Heitmeyer (2005) echo these findings by observing that many studies on innovation in firms in emerging economies have focused on the business practices of local companies in the Far East. They point out that far fewer studies of this nature are available on firms operating in South America where increasing national wealth has been generated through the extraction and export of natural resources. Maharajh and Heitmeyer also examine the impact of the entry of large American and European retail chains such as Wal-Mart and Carrefour in domestic markets in South America. The arrival of these multinationals prompted established domestic retailers to acquire new knowledge in an effort to remain competitive. In the case of Chile, however, research has shown that the impact of overseas entrants was less pronounced as major local chains had already begun modernising their operations and upgrading customer service levels prior to their arrival (Bianchi & Mena 2004).

These various observations gleaned from the literature on the activities of service sector firms provide the basis for the following null hypotheses:

H1: An innovative orientation has no influence on the performance of firms operating within the banking and retail sectors of an emerging economy.

H2: Double-loop learning has no influence on the performance of firms operating the banking and retail sectors of an emerging economy.

H3: Organisational learning has no influence on the performance of firms operating within the banking and retail sectors of an emerging economy.

The resource curse and innovation

Ever since Adam Smith, economists have been interested in the pace of economic growth in different countries. Hence, they have sought to identify which pathways can most effectively contribute to increasing the wealth of nations. Some analysts of some resource-rich emerging economies heavily dependent on natural resources have found that over the last 50 years, these nations tended to grow more slowly than those countries with fewer resources and that instead needed to generate exports through the creation of manufacturing industries (Sachs 1997). This observed outcome of lower economic growth in spite of abundant natural resource endowments has become known as the 'resource curse'.

Various attempts have been made to determine whether a particular set of factors can explain this phenomenon (Auty 1993). One theory is that rapid growth in a natural resource sector generates very high revenues. Consequently, there is little interest, hence attempt to stimulate growth in other sectors of a nation's economy.

Lederman and Maloney (2007) reject the theory that economies with abundant natural resources are typically associated with a less-skilled labour force, limited physical capital accumulation and poor productivity. Rather, they support Dunning's (2005) conclusion that a contingency approach should be utilised when seeking to determine whether the resource curse exists in a given country. In effect, variations in the availability of natural resources and their impact on the growth of each nation's wealth reflect and thus are contingent upon differences in political history. Further support for a contingency approach for determining the presence of a resource curse, has been provided by studies on the political climate in different emerging nations. This body of research suggests that in non-democratic nations, there is a tendency for wealth to be retained by the political elite and not invested in promoting more broad-based economic development (Haber & Mendalo 2011; Karl 1997; Ross 1999).

Although the issue of a resource curse has fostered considerable effort by different researchers, much less attention has been given to whether an abundance of natural resources has any impact on the level of innovation *within those firms* involved in exploiting those resources. Ballard and Banks (2003) and Eugenio and Calfucura (2010) suggest that in resource-rich industries such as mining in emerging economies, the low-technology and long-established operational processes will result in firms exhibiting relatively low levels of innovation. Muscio, Nardone and Dottore (2010) conclude that in the extractive industries, innovation only tends to emerge in response to factors such as rising labour cost. Thus, for example, high labour cost in the Australian coal mining industry led to the introduction of new technology, whereas similar technology has not yet been widely adopted in developing countries with abundant supplies of cheap labour such as India or China (Bowden 2004). Lower levels of

innovation are also found to occur in markets where there is minimal customer pressure for the introduction of more technologically advanced products or production processes (Malerba & Orsenigo 1997; Van den Ende & Dolfsma 2005).

Another dimension to the issue of innovation in firms engaged in the extraction of natural resources involves the increasing pressure they face from key stakeholders to exhibit greater environmental responsibility in their operations in emerging economies (Amaeshi & Amao 2009; Jones 1995). Mining is an industry which can be hugely damaging to local environments. As a result, in recent years, there has been increasing pressure on large Western multinationals to exhibit higher levels of environmental responsibility (Dashwood 2007). Many multinational mining companies are attempting to improve the environmental footprint of their operations. One apparent disincentive, however, to greater environmentally friendly innovation in emerging economies by multinational firms is that it can create a cost differential relative to locally owned mining operations that often remain less concerned about protecting the environment (Guadamillas-Gómez & Donate-Manzanares 2011; Hillestad, Xie & Haugland 2010). Schmidheiny (2006) concludes that local companies in emerging economies do tend to be less concerned about the impact of their operations on the environment. Newbold (2003) contends that many governments in these countries are less inclined to demand that the operations of domestic firms be accompanied by major efforts to minimise the adverse impact on local communities. Others have noted that officials in emerging economies may not always have the knowledge, training or experience to do so (Gil 2009; Velásquez 2006). An added complication many multinationals face is that the largest customer for many of the world's minerals is China, a country which appears to be relatively less concerned about suppliers exhibiting greater environmental responsibility (Xu & Yang 2010).

Weyzig (2006) suggests that a number of factors such as culture, per capita income and the stage of industrialisation will determine the degree to which innovations intended to protect the environment or assume broader social responsibility, are accepted in emerging economies. Possibly one of the most critical issues at the level of the individual firm is whether there exists a perception among senior managers that the learning and innovation required to change current business practices will result in improved organisational performance. Ho, Vermeer and Zhao (2006) conclude that the degree of emphasis placed upon environmental and community-related initiatives by firms in an emerging economy, is also determined by the level of concern with these issues exhibited by domestic consumers.

These various observations provide the basis for the following null hypotheses:

H4: An innovative orientation has no influence on the performance of firms operating within resource-rich sectors of an emerging economy.

H5: Double-loop learning has no influence on the performance of firms operating within resource-rich sectors of an emerging economy.

H6: Organisational learning has no influence on the performance of firms operating within resource-rich sectors of an emerging economy.

Innovation and learning in Peru

A decade of political stability, macro-economic caution and free trade has enabled Peru to emerge as one of the strongest economies in Latin America (de Althaus 2007; Scott 2011; Tello & Tavera 2010). The primary wealth generation components of Peru's economy are agriculture, fish meal and mining. An abundant supply of mineral resources has been the most important factor in sustaining a strong export performance over the last decade. The mining industry, and most especially the copper producers, has significantly benefitted in recent years from China's ever-increasing demand for metals and other primary commodities (de Althaus 2007; Economist Intelligence Unit 2008). Given the boom in commodity prices, firms operating in Peru's resource-rich industries have faced few pressures to invest in innovation to enhance productivity because labour costs have remained relatively low. In addition, until fairly recently there has been relatively limited government pressure to reduce the adverse environmental impact of their operations (Gil 2009; *The Economist* 2009). Instead, public policy focused on encouraging foreign direct investment to revive the economy from its virtual collapse in the late 1980s (Murakami 2007).

Peru's economy grew by 9% in 2008, driven in part by higher world prices for minerals and metals (González Vigil 2009; Oxford Economics 2009; Tello & Tavera 2010). In 2009, Peru was one of the few countries that avoided a period of negative economic growth (IMD 2010). However, to partly offset the adverse effects of the global slump in commodity markets, the government increased public sector spending. By 2010, a recovery in global demand for minerals led to increased exports, and in 2011, Peru again enjoyed strong economic growth (Dube 2011).

Over the last 10 years, improving economic and political stability, plus rising per capita incomes, led to a number of major American and European service providers – especially in the banking and retailing sectors – to expand their operations in Peru (Blind & Jungmittag 2004). In the banking sector, major overseas banks such as Santander, HSBC and Citibank entered the market (*LatinFinance* 2010). Within the retail sector, established supermarket chains such as Wong and *Supermercados Peruanos* have been forced to defend their market position following the arrival of food retailers such as Tottus and Makro. As a consequence, and similar to other South American countries, domestic service providers in Peru are needed to place greater emphasis on the exploitation of learning and innovation to expand their service portfolios,

upgrade internal processes and enhance service quality (Nepomuceno & Porto 2010; Valenzuela 2010).

Research aims and methodology

Much of the literature on learning and innovation is based on studies of firms located in industrialised economies. Hence, the question arises of whether theories concerning the importance of learning are as equally applicable in firms based in a resource-rich emerging economy. This study examines the role of learning and innovation in relation to the performance of firms in Peru. In that context, the analysis focuses on companies engaged in (1) the extraction of natural resources, and (2) the provision of banking or other retail services.

The limited availability of commercial databases in Peru led to the decision to survey overwhelmingly middle and a few senior managers currently enrolled in the Catholic University of Lima's postgraduate programmes in business administration. These individuals were chosen because they were considered more likely to be familiar with the day-to-day activities of the firm and thereby the organisation's approach to innovation, than the CEO or CFO; more likely to report frankly about firm operations than those at the very top of the organisational hierarchy and therefore more image conscious; offered the possibility of conducting the surveys not only in Lima but also in three provincial cities to capture a broad cross-section of managers working in different sectors, in different parts of the country. All the surveys were completed in the classroom and anonymously to foster both completeness and candour by the individuals involved.

To assess organisational performance, the study utilised the same technique as Chaston and Mangles (1997), namely measuring average sales growth over the last 3 years on a five-point scale ranging from 'sales declined by more than 10%' to 'sales increased by more than 10%'. To determine the level of innovation exhibited by respondents' firms, the multi-attribute entrepreneurial orientation scale developed by Covin and Slevin (1988) was utilised. The scale is not intended to measure absolute values. Instead, the degree of involvement in innovation is assessed in relation to the mean score for the entire sample.

To determine the degree to which firms are utilising single-versus double-loop learning, the research utilised the scale developed by Sadler-Smith and Badger (1998). At one end of the scale, respondents are engaged in single-loop learning. At the other extreme, the bias is towards double-loop learning. In terms of measuring involvement in organisational learning, Dibrella, Down and Bull (1996) use a grounded theory approach to observe the learning process within American and European corporations. Chaston, Badger and Sadler-Smith (1999) utilise their framework to develop a multi-attribute scale to provide the basis for generating an empirical value for involvement in organisational learning. The degree of involvement in organisational learning is also assumed to exist on a continuum.

Results

Usable responses were received from 70 individuals employed in the resource-rich sectors of agriculture, fishing and mining and 114 individuals employed in either consumer banking or retailing. A visual inspection of the data indicated some degree of variation between respondents working in different resource-rich sectors, but an ANOVA to assess variation was not statistically significant at $p < 0.05$. Hence, data from all firms in the resource-rich sector were combined together in subsequent data analysis activities. A similar outcome was noted in relation to firms operating in consumer banking and retailing.

Cronbach alphas were calculated to test the reliability of the multiple measurement variables associated with assessing entrepreneurial orientation, learning style and organisational learning. All values for all three scales were greater than 0.70. Hence, all variables could be used to calculate the overall means utilised in subsequent regression analyses (Hair et al. 1998). The respective mean scores for entrepreneurial orientation, learning style and organisational learning for firms operating in the resource-rich sectors are summarised in Table 1.

Linear regression analysis was used to examine the relationship between business performance and entrepreneurial orientation using the SPSS statistical package. In the case of firms operating in resource-rich sectors, the regression was not statistically significant at $p < 0.05$. A similar result was found for a linear regression analysis aimed at testing the relationship between business performance, learning style and involvement in organisational learning (Table 2). In contrast, a regression analysis of business performance in relation to entrepreneurial orientation, learning style and involvement in organisational learning among service sector firms was significant at $p < 0.05$ or better (Table 2).

Discussion and conclusions

The regression analysis of business performance in relation to innovation among Peruvian consumer banking and retail operations was statistically significant at $p < 0.05$ or better. Hence, this research does not support the null hypotheses H1, that innovation has no influence on the performance of firms operating the banking and retail sectors of an emerging economy. This conclusion is supportive of the limited number of studies undertaken on service sector firms in South American emerging economies, namely involvement in innovation assists local firms to respond to increasing competitive pressures generated by new market entrants from abroad (Bianchi 2009; Nepomuceno & Porto 2010; Valenzuela 2010).

TABLE 1: Mean values by organisational sectors.

Area of analysis	Mean of firms operating in resource-rich sectors	Mean of firms operating in service sectors
Entrepreneurial orientation	4.56	4.21
Learning style	2.55	2.61
Organisational learning	3.14	3.10

TABLE 2: Regression analysis of sector performance.

Regression analysis	Adjusted R^2	Mean square	F	p	t
Resource-rich firms' performance in relation to entrepreneurial orientation	0.014	0.093	0.073	0.79	9.27
Resource-rich firms' performance in relation to learning style	0.015	0.67	0.058	0.82	8.95
Resource-rich firms' performance in relation to organisational learning	0.013	0.186	0.16	0.72	9.47
Service sector firms' performance in relation to entrepreneurial orientation	0.49	11.94	9.72	0.002***	10.89
Service sector firms' performance in relation to learning style	0.25	6.83	5.43	0.021**	15.10
Service sector firms' performance in relation to organisational learning	0.23	6.38	4.93	0.03**	8.13

F , where the F value is the ratio of the mean regression sum of squares divided by the mean error sum of squares; p , where the p values ** and *** indicate statistical significance at the 95% and 99% levels respectively; t , where the "t" statistic is computed by dividing the estimated value of the parameter by its standard error.

The regression analyses of business performance in relation to learning style and involvement in organisational learning among Peruvian consumer banking and retail operations were both statistically significant at $p < 0.05$. Hence, it seems reasonable to conclude that this study cannot support the null hypothesis H2 that double-loop learning has no influence on the performance of firms operating in the banking and retail sectors of an emerging economy, or H3 that organisational learning has no influence on the performance of firms operating in the banking and retail sectors of an emerging economy. This outcome is supportive of the view expressed by Maharajh and Heitmeyer (2005) that domestic service providers need to engage in the acquisition and exploitation of new knowledge in order to defend themselves against the large, often industrial-nation, multinationals that are increasingly seeking to expand their operations in South America.

The regression analysis of business performance in relation to entrepreneurial orientation, learning style and involvement in organisational learning in relation to firms based in Peru's resource-rich sectors of the economy was not statistically significant at $p < 0.05$. On the basis of this result, it seems reasonable to conclude that this research supports the null hypotheses H4 that an innovative orientation has no influence on the performance of firms operating within resource-rich sectors of an emerging economy, also H5 that double-loop learning has no influence on the performance of firms operating within resource-rich sectors of an emerging economy and H6 that organisational learning has no influence on the performance of firms operating within resource-rich sectors of an emerging economy. These conclusions are supportive of Ballard and Banks' (2003) and Eugenio and Calfucura's (2010) view that in resource-rich sectors such as mining in emerging economies, participant firms can be expected to exhibit a relatively low level of involvement in innovation and the exploitation of new knowledge to further enhance business performance. This apparent low level of innovation and learning can probably be explained by Muscio et al.'s (2010) perspective that initiatives to upgrade productivity or develop improved products are perceived as unimportant in firms involved in the exporting of commodities in countries such as Peru.

Management implications

The results of this study suggest that established theories concerning the benefits of innovation and learning to achieve higher business growth may not always be valid in the context of firms operating in the resource-rich sectors within

an emerging economy. Industrialisation and rising consumer incomes in countries like China and India will probably ensure strong demand for minerals and agricultural products from producer nations in sub-Saharan Africa and South America. Hence when recommending the most appropriate management practices relevant to firms based in the resource-rich sectors of an emerging economy seeking to sustain business performance, equal emphasis might well be given to the benefits of exploiting conventional technologies and existing managerial capabilities to improve, if not optimise, organisational performance.

In conclusion, some qualifying comments are in order. First of all, these results are for one country, two sets of sectors, for a particular point in time, and based on the perceptions of a particular group of informants. Our findings suggest that it would be extremely useful to see the results for several emerging economies, across and within multiple sectors, over a considerable number of years to get a more definitive assessment of the relation between performance, innovation and learning, and the implications for management in developing countries.

Going forward, the pressure to innovate is likely to increase, perhaps, more intensely in certain sectors than in others. Aside from actual or potential competitors, firms will have to deal with changing perceptions of various stakeholders that influence and are affected by their performance (Amofa 2004). For that reason, firms may need to adopt a stronger commitment to innovation and learning in order to improve their future capability to protect the natural environment (Amofa 2004; Borger & Kruglianskas 2006) and to reconcile with the fact that, as Pedlar et al. (1991) note, a move towards becoming an effective learning organisation can take several years to fully implement. In the case of Peru, firms engaged in exploiting natural resources have become increasingly aware over the last few years that the country's own inhabitants are beginning to expect firms to exhibit a much higher level of environmental responsibility (Rénique 2009). Hence, firms in the country's resource-rich industries can expect tighter controls over their activities within the foreseeable future.

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Competing interests

The authors declare that they have no financial or personal relationships which may have inappropriately influenced them in writing this article.

Authors' contributions

G.J.S. translated the questionnaire into Spanish, then tested and administered the questionnaire, coded and checked the data, wrote the parts on the Peruvian economy that served as the context for the study and helped to write up the interpretation of the data analysis. After the original submission, G.J.S. served as corresponding author, addressed all the reviewers' comments and did all the final edits required to produce the article ready for publication. I.C. developed the original questionnaire in English, performed data analysis, drafted the literature review sections of the manuscript, formulated the hypotheses to be tested and drafted the interpretation of the results.

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