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SHORT ARTICLE

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# Human capital and university–business interactions: an example from the wine industry

Pedro Marques 

## ABSTRACT

Research on university–business interactions has thrived in recent years, influenced by some very successful examples where they have led to the emergence of world-class clusters. However, this paper will argue that in less developed regions the most important contribution that universities can make to their regional economies is the supply of skilled human capital. Through the case study of the wine industry in Portugal, it will argue that this supply of human capital can have a significant impact on the absorptive capacity of firms, particularly SMEs. It will therefore seek to make an important contribution to academic research in this area, by outlining a relatively neglected research area. It is also relevant for policy-makers and practitioners, as it argues that innovation and regional development policies should pay more attention to the need to match skills provision by higher education institutions to business needs among SMEs.

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## INTRODUCTION

Research on university–business links has mostly focused on knowledge exchange and collaboration. This is due to previous case studies of successful regional economies where this type of interaction has been shown to be a catalyst for business growth and continuous innovation (Vallance, 2016). What is sometimes not addressed in this literature is that such interactions tend to be supported by a thick and/or well-connected institutional infrastructure which is difficult to replicate (Trippel, Asheim, & Miorner, 2015). They are, therefore, less likely to function as catalysts for innovation in regions where this is not present.

The main contribution of this paper will be to show that the training and supply of human capital is a very relevant, yet relatively neglected, dimension of university–business interactions that can have a positive impact on innovation and growth in less-developed regions (LDRs) (Camagni & Capello, 2013). On an individual level, the acquisition of human capital allows professionals to access knowledge produced in more advanced regions and transfer it to firms located in LDRs (Pill, Bristow, Davies, & Drinkwater, 2011). At the organizational level, this

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supply of human capital allows firms to increase absorptive capacity, defined as ‘the ability of a firm to recognise the value of new, external information, assimilate it, and apply it to commercial ends’ (Cohen & Levinthal, 1990, p. 128).

Empirically, this paper will use a case study of the Portuguese wine industry, which has seen significant changes in terms of technological upgrading and product quality over the last three decades. Despite the small size of this nation, its ‘wine regions’ have followed different paths in their investment in technology and improved product quality. It will be argued here that these differences are partly explained by the extent to which firms in these regions have drawn on the contribution of a new wave of university-trained oenologists. This is because these oenologists are regarded as one of the most important elements in the overall increase in the quality of Portuguese wine over the past three decades (Rebelo & Caldas, 2013).

The paper is structured as follows. The next section discusses the relevant literature and is followed by a section on methodology. The following two sections then discuss the main results. The paper ends with some brief conclusions.

## UNIVERSITIES AND HUMAN CAPITAL

The literature on the interaction between universities (or research centres) and businesses has mostly focused on topics such as research collaboration, scientific entrepreneurialism and formal networks (Vallance, 2016). It has also tended to privilege the analysis of analytical or synthetic knowledge by measuring the impact of R&D, patenting and other types of applied research on innovation and growth. Often drawing on examples from a few regions that have been very successful in developing high-tech sectors, and informed by concepts such as the triple helix, some of this literature then seeks to explore how firms and other organizations in less developed territories can draw on the presence of knowledge producing institutions to become more innovative (Sánchez-Barrioluengo, 2014).

In this paper the main argument is that far less attention has been paid to the impact that universities can have on innovation through their supply of human capital to local firms (Holden & Jameson, 2002). This impact can be observed at the individual and organizational levels. At the individual level, the acquisition of specialized knowledge allows individuals to develop cognitive proximity with firms or research organizations even if they are physically distant. According to Boschma (2005), the cognitive base of actors should be close enough to whatever knowledge they seek to access for them to be capable of communicating, understanding it and processing it successfully. Although this also includes a tacit component, sharing a common technical base is a crucial starting point that can be complemented by work experience and learning by doing.

In turn, the integration of these skilled workers into small and medium-sized enterprises (SMEs) in lagging regions, as workers or consultants, allows firms to access physically distant knowledge and to increase their absorptive capacity (Holden & Jameson, 2002). The increase in absorptive capacity is achieved through the acquisition of new technical knowledge, but also because university graduates often understand the importance of management and marketing issues (Rebelo & Caldas, 2013). They can therefore help deliver both better strategic thinking and improved organizational structures (Cohen & Levinthal, 1990).

In the case of the wine industry, there has been a significant amount of research on the technological and scientific advances that the sector has experienced over the past three decades (Giuliani, Morrison, & Rabellotti, 2011). As with other research on innovation, most of the debate has centred on how firms have partnered with universities and research centres to adopt a scientific approach to production, particularly in countries without a tradition of winemaking (especially the United States and Australia). In countries without the same level of knowledge production (such as Chile or South Africa), the emphasis has been on how networks built around

key individuals (sometimes also called ‘star oenologists’) helped firms to catch-up technologically (Cusmano, Morrison, & Rabellotti, 2010).

The Portuguese wine industry has also undergone a significant transformation over the past three decades. Wine exported from Portugal between 2008 and 2011 had the third highest unit value in the world, behind France and New Zealand (FAOSTAT, 2015). In terms of absolute value, wine exports rose from €550 million in 2010 to €728 million in 2014, and accounted for 20% of agricultural exports and 1.5% of total goods exported (INE, 2015; IVV, 2016). However, Portuguese winemaking firms generally lacked the scale to hire ‘star oenologists’ (with a few exceptions) and did not have strong relationships with universities or research centres. This was therefore a case of bottom-up transformation, driven to a significant extent by the emergence of a new generation of oenologists. Other specialists, such as agricultural engineers, have also played a central role, but the focus here is on oenologists due to their specific training in winemaking.

## CASE STUDY AND METHODOLOGY

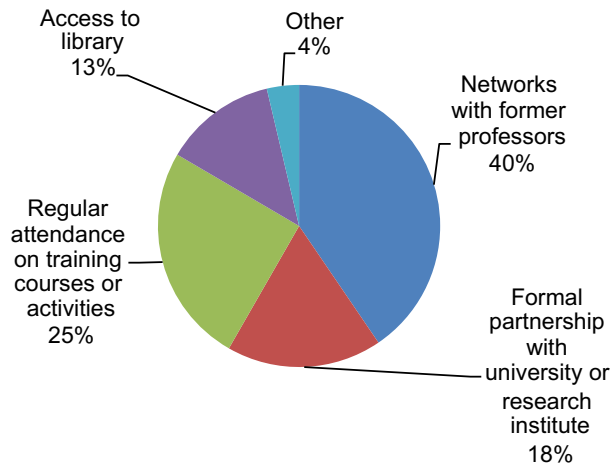
Empirical evidence was collected for this research project in two ways: firstly, a case study analysis of the three main wine-producing regions in Portugal (Alentejo, Douro and Lisbon). These cases studies included a total of 57 semi-structured interviews with firms (18 in Alentejo, nine in Lisbon and 21 in Douro) and stakeholders at the regional and national levels. This included representatives from regional certification authorities, national organizations regulating and promoting the wine industry, the Association of Portuguese Oenologists and an association representing wine cooperatives. Secondly, a national survey of 131 oenologists working in Portugal that asked questions about their educational and professional background. Two approaches were used to reach the survey’s target audience: first, the Association of Portuguese Oenologists sent a link to its 400 members asking them to participate. In addition, contacts in a database gathered for the case study, plus additional contacts for producers located in other Portuguese winemaking regions, were approached directly. If they were oenologists, they were asked to participate, otherwise they were asked to invite oenologists with whom they worked to fill in the questionnaire.

## OENOLOGISTS AND PORTUGUESE SMALL AND MEDIUM-SIZED ENTERPRISES

The four most represented regions in the survey of Portuguese oenologists are Douro (27 replies), Alentejo (24), Lisbon (18) and Tejo (12), which is not surprising as the first three are the largest producers of wine. The majority of those who responded work in an organization as full-time oenologists (70 replies), followed by consultant oenologists (27) and, finally, those who own their own winery (17). Of the 131 individuals who replied, 120 reported having a tertiary degree.

One of the most important consequences of the predominance of tertiary degrees is that it has allowed individuals to build knowledge-exchange networks with higher education institutions. Around 66% of respondents claim to maintain regular contact with universities or research centres, though only 18% have formal relationships (Figure 1). This is a high level of contact in a country that traditionally has very low levels of university–business engagement (OECD, 2006). It helps to compensate for the fact that only one firm interviewed during the case study stage reported having formal engagement with universities or research centres.

Potentially even more important is the fact that tertiary degrees create opportunities for international work experience. A total of 30% of survey respondents have worked for the wine sector in foreign countries, with the United States, Australia and France being the main destinations. That value rises to almost 40% among under 40-year-olds. This circulation of human capital is



**Figure 1.** Type of relationships maintained with higher education institutions or research centres (%). Source: Survey of Portuguese oenologists.

**Table 1.** Importance of different routes for acquiring new knowledge.

|  | <i>N</i> | Average* | SD   |
|--|----------|----------|------|
| Scientific articles published in international science journals  | 123      | 5.54     | 1.24 |
| Networks with former co-workers in Portugal                      | 127      | 5.30     | 1.37 |
| Networks with former degree colleagues                           | 128      | 5.18     | 1.47 |
| Scientific articles published elsewhere                          | 115      | 5.10     | 1.38 |
| Seminars organized by other entities                             | 123      | 5.09     | 1.25 |
| Scientific articles published in Portuguese science journals     | 123      | 5.07     | 1.52 |
| Articles in specialized press                                    | 123      | 5.02     | 1.27 |
| Seminars organized by the Association for Portuguese Oenologists | 117      | 4.69     | 1.64 |
| Networks with former co-workers in other countries               | 110      | 4.55     | 1.81 |

\*Respondents were asked to value on a scale of 1 (not important at all) to 7 (very important) the importance of each route for the acquisition of new knowledge. This is the average value.  
Source: Survey of Portuguese oenologists.

facilitated by the sharing of a common technical base with winemakers in other parts of the world, which can then be further developed through work experience and the acquisition of tacit knowledge. The value of their internationalization is illustrated by the following quotation:

Nowadays a significant number of younger oenologists do their degree in Portugal [...] and then they go abroad for work experience, usually to new world countries, because they think it's interesting and it is indeed a different perspective on winemaking [...] and also sometimes to the old world countries, such as France. That gives them a very interesting know-how. We have a new generation of oenologists doing excellent work [because of that].

(interview with a representative from the Association of Portuguese Oenologists, Almeirim, 9 January 2014)  
Their eventual return to work in Portuguese firms leads to a transfer of knowledge that would otherwise only be possible through formal engagement with research centres or producers in other countries. Additionally, it facilitates learning from foreign sources such as international science journals which, as shown in Table 1, is the most highly valued source in the survey. This is not to say that only those who work abroad read these journals, but merely to emphasize how crucial is the engagement with foreign knowledge sources. This is even more important due to the

relatively unimportant role respondents perceive for national research institutions, as illustrated by the following quotation:

We still don't have an institution coordinating research and development for the wine sector. There are fragmented research efforts but it is not internationally competitive research. Structures are created but then there is no continuity.

(interview with a representative from Alentejo's wine certification authority, Evora, 25 January 2012)

However, the educational trajectories of individuals do not fully explain the evolution of this sector in Portugal. Considering that this is a sector overwhelmingly dominated by SMEs, which traditionally struggle to attract and retain skilled personnel (Holden & Jameson, 2002), it is important to take into account some organizational characteristics that allowed firms to invest in human resources with high level skills. The first region in Portugal to invest in new technologies, new production techniques, advanced oenological knowledge and better marketing tools was Alentejo towards the end of the 1980s. Here the local cooperatives, and a few large private producers, had a particularly positive influence. This was by no means inevitable, since most cooperatives in other Portuguese regions remain focused on producing high-volume, low-quality wine. It had a positive impact on their sales, with the Alentejo region currently accounting for 40% of the quality wine market in Portugal.

This process was helped by Alentejo's traditional use of intensive agricultural techniques and its larger than average land plots compared with other Portuguese regions (INE, 2015). Coupled with the existence of financial incentives from the European Union, this encouraged economic agents to make significant investments in modern winemaking technologies and the plantation of new vines. It also encouraged them to invest in human capital, particularly in hiring oenologists and other specialists, and to promote the dissemination of modern agricultural techniques across the region. Of particular relevance was the creation of ATEVA, a unique association in the Portuguese context, which employs agricultural engineers to provide support to farmers. Together these decisions helped create positive knowledge externalities and a culture of quality in all stages of the production process.

In a region such as Douro, with a combination of strong brand recognition, a small number of large firms (producers of high value-added port wine) – which occasionally rely on international star oenologists – and land fragmentation, the creation of absorptive capacity among SMEs happened through a different mechanism. It also happened at a later stage, towards the end of the 1990s. Here it was primarily about generational change in family-owned business, with the new cohort including mostly highly educated individuals who attended university before taking over the family business. The fact that the region benefits from strong brand recognition makes small businesses more viable, as they can charge a premium to consumers. Additionally, the port wine market continues to represent an important source of revenue for smaller producers, allowing them to invest in the creation of own brands as a parallel product. The result is a growing share of the Portuguese quality wine market and increasing recognition in international markets (*Wine Spectator*, 2015).

## CONCLUSIONS: HUMAN CAPITAL AND ABSORPTIVE CAPACITY

As discussed above, the process of change in the Portuguese wine sector is explained by a variety of factors. At its core is the increase in the supply of human capital from Portuguese universities, which allowed firms to create absorptive capacity and in turn manage the absorption and exploitation of (mostly) foreign technology. As demonstrated in this paper, this process has at least two important dimensions. On an individual level, the acquisition of specialized knowledge

creates the conditions for acquiring work experience and tacit knowledge in a variety of contexts, which can then be transferred as embodied knowledge to firms with limited formal links to knowledge-producing institutions. This is termed ‘cognitive proximity’ as it relates to the capacity of individuals to engage with people who are physically distant by sharing a common knowledge base (Boschma 2005).

At the firm level, such human capital functions as a bridge to outside knowledge, which is particularly important when other sources are not available (Holden & Jameson, 2002). Additionally, the fact that at least some of these individuals combine tertiary degrees with work experience in advanced countries facilitates the use of technology which was developed in those countries. This is because technological development always incorporates important dimensions of tacit knowledge, even after a technology reaches the later stages of maturity (Dosi & Nelson, 2013).

This is a relevant issue for research on university–business interactions but also for policy-makers, since it implies a change in direction for innovation policy. There are several reasons that explain why so much emphasis is put on formal modes of engagement, particularly in recent years, when universities are increasingly expected to be more active in commercializing their intellectual property (Christopherson, Gertler, & Gray, 2014). Nonetheless, there could be a much greater effort to align skills provision with local business structures, particularly in LDRs, and to encourage the incorporation of graduates into SMEs.

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