Article

Exploring the Intensity of Relationships with Vocational Education Centres: A Typology of Spanish SMEs

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Abstract: Even though the availability of skilled labour and technological know-how is critical to the sustainability of small and medium-sized enterprises (SMEs), the relationships between industry and the vocational education system have received little attention in the recent literature regarding social aspects of innovation. The objective of this paper is to analyse the intensity of relationships between industrial SMEs and vocational education and training (VET) centres from the firms' perspective. The study is based on a survey carried out with a sample of 1388 Spanish industrial SMEs with vocational education graduates among their employees. Multivariate hierarchical segmentation techniques were used in order to identify the main explanatory variables. As a result, we obtained a typology ("tree") of eight organizational profiles associated to different intensity levels (from higher to lower) of relationships between firms and schools. The results show that most industrial SMEs maintain relations with vocational education centres, reflecting the importance of the latter for the companies. The organisational type having the highest level of relations refers to SMEs with experience in external cooperation (cooperation with other actors in innovation projects) which have vocational education employees (graduates) in technical areas and which are bigger in size. Likewise, the results suggest that fruitful collaboration between SMEs and vocational education centres depends on the existence of an established culture of innovation among the smaller firms. This work sheds light on economic and social sustainability. Its results and discussion are linked to the objectives of United Nations sustainable development goals and the recent communication from the European Commission to the European Parliament entitled "European skills agenda for sustainable competitiveness, social fairness, and resilience".

Keywords: SME; vocational education and training; VET; relationship; collaboration; innovation; Spain

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1. Introduction

Small and medium-sized enterprises (SMEs) are a critical part of social and economic development in Europe. According to the European Commission [1], there are 22.6 million SMEs in the European Union (EU-27)—the vast majority being micro-sized firms—employing almost 84 million people (65% of the total employment). Their contribution to the added value is about 53% and about half of these firms claim to be engaged in innovation activities.

Among the main factors upon which the sustainability of SMEs are dependent are access to qualified personnel and technological knowledge that enable the development and adoption of innovations [2]. SMEs are characterised by the lack of resources and capabilities that allow them to develop this function, thus they need to collaborate with other organisations.

Studies have been carried out about the cooperation for innovation between SMEs and other actors, highlighting the role played by technology centres, universities, and

public research organisations, as well as by customers and suppliers [3–9]. However, little attention has been dedicated to the role of vocational training centres in relation to SMEs, which is an important and under-researched area. This is especially so regarding studies which look at the firms' view of vocational education and training (VET). Vocational education institutes provide skilled labour for the industrial sector and business in general (through their more "traditional" and basic missions), but could also fulfil other functions which affect regional development, such as continued training and technical aid for SMEs.

The study of the economic functions of vocational education and training (VET) institutes goes back to research carried out mainly in the US in the late 1990s [10–14]. In a seminal paper, Rosenfeld [11] indicated that VET institutes are in a better (closer) position than universities to offer services to firms (human resource provision, continuous training, technical services) and, in many industrial sectors, there is a lack of intermediate, skilled technicians and workers, and not so much of engineers. Likewise, other papers have pointed at the possible function of VET institutes in regional development [15–18], but little empirical research has been carried out regarding these issues.

In the Spanish case, several studies have shown that the compulsory workplace internships introduced by the LOGSE Act reform of vocational education in the 1990s are a basic element in the relationship between firms and VET institutes and that firms rate such internships positively [19–23]. According to studies carried out in different regions of the country, student internships in companies seem to be a basic mechanism whereby business and education agents can get to know each other and develop trust-based relationships [24–27]. Supervisors from VET centres visit the companies where they gather first-hand information about their business, their training and personnel needs, and the extent to which the formal education curriculum matches the companies' needs. In more dynamic institutes, teaching and the curriculum are being adapted to the companies' requirements and further training services are being offered to them.

Thus, student internship is the main type of relationship between firms and VET institutes, along with (and related to) the hiring of skilled workers from the institutes' graduate pools. Based on this type of relationship, new forms of relationships emerge, such as continuing education and technical services. In his original papers, Rosenfeld [11,12] indicated that continued training programmes funded by public sources were a fundamental element in the relationships between VET schools and business environments, as the adoption of new technologies by the latter (often composed of SMEs) entailed a parallel investment in workers' training. Other studies have pointed to the positive synergies between the academic base of institutes and their worker training programmes [13,28–30]. Recently, Fletcher [31] (p. 373) claimed that US community colleges "became a primary tool for economic and workforce development". According to several sources, VET colleges are key players in continued training for workers in several US states [10,32,33].

Overall, the effects of continued, adult training for VET institutes seem to be positive, although some authors have warned about the risk of diverting attention from certain aspects of the core mission of VET schools (e.g., a wider, humanistic concept of education, and attention to undergraduates with special needs) [13,14]. The international literature has also pointed out difficulties faced by VET institutes in offering continued training services and in integrating the formal and continued training branches [28,30].

Furthermore, in addition to adult continued education, it has been found that the most advanced and territorially embedded VET institutes can offer technical services to companies, mostly SMEs [11]. VET institutes can be important innovation partners for SMEs which have limited possibilities of both performing research and development (R&D) activities and establishing cooperative relations with external knowledge structures such as technology centres and universities.

As Woolgar et al. [34] indicated, the main sources of knowledge for SMEs are market-chain sources (clients and suppliers) and other agents such as business and technical consulting and VET schools. The role of VET institutes as agents facilitating the diffusion and adaptation of new technologies (and providing technical services to firms, including

organisational improvement services) has been pointed out by several authors [15,18,35–38]. In the last years, countries such as Canada have started to fund the “applied research” mission of VET institutes [39]. However, as several sources recognise (e.g., [38]), technical services are still a rather small part of most VET schools’ activities.

The objective of this paper is to analyse the types of relationships between SMEs and vocational education and training (VET) institutes and, specifically, the variables which result in a higher intensity of such relationships. We start from the assumption that a high intensity of relationships between industrial SMEs and VET institutes can be seen as an important (and often neglected) element of dynamic production and innovation systems.

The paper seeks to answer the following questions: What types and levels of relationships exist between industrial SMEs and vocational education institutes from their environment? Which are the specific variables that influence the intensity of relationships between industrial SMEs and VET institutes?

The paper produces new evidence about a field which has received little attention, focusing on the importance of the relations between industrial companies and vocational education and training (VET) institutes in Spain. The analysis is based on the firms’ perspective, as we draw on data from a survey on a large sample of Spanish industrial SMEs.

The paper is organised as follows. The next section offers a description of the methodological details of the study: characteristics of the survey carried out, elaboration of main variables, and a description of the statistical technique used. Then the results obtained are presented in Section 3. Finally, a discussion of the results is developed in Section 4 and some final reflections are stated in Section 5.

2. Materials and Methods

2.1. Data Collection and Sample Design

The study is based on a telephone survey conducted among 1388 industrial SMEs (sectors 05–39 of the 2009 Spanish Standard Industrial Classification, CNAE) with between 10 and 250 employees in five regions in northern Spain (Asturias, Basque Country, Navarre, Aragon, and Catalonia). It comprises an aggregate sample of representative samples from each region. Each regional sample is a random proportional sample stratified by size (five strata), so that, for the aggregate sample, at a 95% confidence level and under the most unfavourable assumption ($p = q$), it assumes a margin of error of 2.5%.

Data collection was conducted from December 2013 to January 2014. The sample was taken from a real population of 113,121 companies listed in the SABI database of Spanish firms elaborated and updated in October 2013 by the Bureau Van Dijk company (<https://sabi.bvdinfo.com/>) (accessed on 2 November 2013). This database was used as a sampling frame for simple random selection. The individuals surveyed were managing directors or heads of human resource management and/or training areas. The survey was specifically designed by the research team. The data were processed using SPSS v.22. Henceforth, all data presented in this paper refer to that survey.

The basic profile of the firms surveyed is that of a small SME, from the metal-mechanic sector or belonging to lower medium R&D intensity sector. The sample contained a predominance of small companies (47% had under 25 employees), while 29.3% had between 25 and 49 employees, and only 23.7% had 50 or more. As for the technological sector (R&D intensity, based on OECD classification), 41% of the SMEs surveyed were from low-tech sectors, and the majority (65.8%) were from medium-low and low-tech sectors. Of these, 31% performed medium-high technology activities, and 3.2% performed high technology activities. Regarding industry sector, 48% of the firms performed metal-machining activities (CNAE2009 codes 24, 25, 28, 29, 30, and 33) and the remaining ones were distributed among other industrial activities.

The companies were also found to have an important number of workers with vocational education qualifications: in nearly a third of the companies surveyed, over half

of the staff was made up of these profiles and, in two thirds of the companies, at least a quarter of the staff had completed these studies.

2.2. The Dependent Variable: Relationships between SMEs and Vocational Institutes

SMEs were asked about the different types of relationships with vocational institutes, most often situated in their local environment. Six types of relationships were studied: student internships, hiring graduates from the institutes' labour pools, continued training (offered within the institute), demand-based continuous training, and technical services, as well as firms' provision of machinery or software (to the education centres).

Therefore, the types of relationships covered range from the more conventional (or basic) "traditional" missions to ones more strictly related to innovation (the survey aimed at analysing innovation-related issues and vocational education workers' participation in innovation).

The great majority (63%) of the surveyed companies said that they had some form of relationship with VET centres. The most frequent forms of relation are the basic ones (receiving students in internships and hiring graduates from the centres' labour pools) but, as can be seen in Table 1, relevant levels of less traditional types of relationships were found.

Table 1. Types of relation established with vocational institutes.

Types of Relation Established with Vocational Education Schools	%
Some form of relationship	63.0
Students in internship	49.6
Labour pools	33.4
Continuing education (supply-based)	20.0
Continuing education (demand-based)	18.7
Technical and innovation services	12.2
Provision of machinery to the school	7.1

It was observed that relationships between firms and vocational education institutes were cumulative. Firms which had only one or two types of relationships very often restricted their contacts to the traditional ones. On the other hand, firms which had other, more infrequent types of relationships had also relationships of a basic type.

Therefore, we have measured the different types of collaboration ("relationships" variable, numerical, 0–6) declared by firms, taking into account both intensity and width. The most frequent situation is that of firms which do not have any type of relationship with vocational institutes (37%). Among firms which do have relationships, the most frequent situation is to have one (21%) or two (21%) types of relationships. This is reflected in the average of relationships (1.41).

2.3. Explanatory Variables

A wide variety of variables were considered with a view to analysing characteristics of firms which can potentially affect the existence and intensity of relationships with vocational education institutes. We looked for firm profiles related to higher and lower levels of relationship intensity. After exploring bivariate associations, a selection of nine independent variables was obtained (see Table 2).

The selected explanatory variables refer to different kinds of SME characteristics. On the one hand, structural aspects of firms such as technological level, size, or industrial activity sector were taken into account. On the other, variables related to firms' innovation capacity were included. The study belongs to a wider research project about VET-level workers' participation in innovation, which was conceptualized as interactive learning processes involving social relationships both internal and external to the firm. Specific indicators referring to the existence of external cooperation in innovation projects and to firms' self-perception of their innovative capacity were used. We also looked at middle-

level worker participation in technical innovation as a potential independent factor. Finally, several variables describing types of VET staff were included, such as presence in technical areas and percentage of high-level VET workers in the firms' workforce.

Table 2. Variables, definitions, and indicators used.

Variable	Definition	Indicator
Size	Number of employees	50 or smaller vs. over 50
Technological level	R&D intensity (high, medium-high, medium-low, low)	High and medium-high vs. medium-low and low
Activity	Industrial classification (CNAE-09)	Metal-machining activities (CNAE-09 codes 24, 25, 28, 29, 30, 33) vs. others
Type of VET workforce	Combination of presence (higher or lower than 50%) and education level (higher level VET higher or lower than 50%)	Low presence and low level of higher VET; low presence and higher level of higher VET; high presence and low level of higher VET; high presence and high level of higher VET
VET in technical areas	Presence of vocational education employees in: technical office, R&D, process and/or product engineering	Yes/No
High-level VET workers	Presence of high-level VET workers in workforce (%)	50% or lower/more than 50%
Innovative capacity	Self perception of the company's innovation capacity as related to direct competitors (lower/equal/higher)	Higher capacity/lower capacity (equal or lower capacity)
VET participation in innovation	Level of participation by employees with vocational education in six innovation activities (product innovation, process innovation, product improvement, process improvement, new work-organisation systems, and commercial innovation)	none/low vs. quite high/high
Co-operates in innovation	Has cooperated with actors external to the organisation in projects of/for innovation in the last four years (clients, suppliers, technological centres, universities, etc.)	Yes/No

As most independent variables are categorical, firstly bivariate analysis was carried out using cross tables. In this way several variables were identified which referred to firms' characteristics such as the presence of VET employees in their workforce and, specially, the involvement of these employees in innovation-related activities. Among the variables selected, those referring to basic characteristics such as firm size, industry sector (metal-machining vs. other), and technological level (higher or lower R&D intensity) have showed some explanatory influence, separately or in a combined fashion. Other variables more related to the "demography"—so to speak—of VET personnel (i.e., presence of workers with intermediate skills; proportion of employees having higher level vocational education degrees) and to the "innovation culture" of the companies (experience in external co-operation; use of advanced organisational practices) have also been shown to provoke significant differences.

2.4. Data Analysis

In order to explain in more detail the data without losing variety, the intensity of relationships has been selected as the dependent variable and CHAID segmentation techniques have been applied to the SME sample with a view to checking which one of the potentially explanatory variables has a discriminant effect upon the intensity of relationships. The

final goal was to try to develop a typology of SMEs based on a combination of these characteristics.

CHAID is a sequential, “automatic interaction detector” [40]. In the version for numeric dependent variables, CHAID analysis splits the sample into two or more categories using F tests on each step. Using a set of independent categorical variables (predictors), the technique cycles through the predictors to determine which pair of categories is least significantly different with respect to the dependent variable. As a result, CHAID builds a predictive tree by splitting the sample until the algorithm does not find any significantly discriminating predictor variables any more. This technique is useful in the detection of multiple interactions among variables (looking for patterns) and results in a final typology of cases in relation to the dependent variable. It is also a convenient way of summarising the data as the relationships can be easily visualised.

3. Results

After applying SPSS exhaustive CHAID a segmentation tree was obtained (see Figure 1 below) which has three levels and eight final nodes and includes interactions among six of the nine variables considered in Table 2.

Figure 1. Segmentation tree.

The primary result obtained is that the main variable in predicting the intensity of SME relationships with vocational education institutes is not a structural, “objective” (so to speak) variable, but a “softer”, more cultural variable related to the strength of innovation activities within the firm, i.e., cooperation with external agents in innovation projects. There is a significant difference between firms which have and those which do not have such cooperation practices, with the former having a significantly higher (wider) level of relationships with vocational education schools.

In the second step, the sample was again split according to the differences marked by two different independent variables. Companies that do not cooperate (the first group obtained at the first level) were differentiated according to the sector of activity and those that do cooperate (the second group at the first level) were divided according to the presence of graduates in their technical areas. Thus, the tree shows that among firms which do not have external cooperation practices (branch 1 on the left side), metal-machining sector companies have a higher intensity of relationships with vocational education institutes. In the other branch (firms which do cooperate with external agents in innovation activities), having technical area staff with VET backgrounds is associated with the higher frequency and width of relationships.

At the third level of segmentation three variables related to SMEs characteristics can be found. Among “descriptive” variables, two subgroups are split up according to size (they come from different tree branches). Controlling for the rest of the interactions, the effect of size always comes in the same direction, i.e., the relationship average is always higher for bigger firms as compared to smaller ones. This type of effect is stronger for firms not belonging to the metal-machining sector (branch 2) than for firms which have VET graduates in technical areas (branch 1).

Among firms which do cooperate but do not have VET personnel in technical areas, a second characteristic of final segmentation is the presence of higher level vocational education graduates in the workforce.

Finally, another important variable which contributes to the explanation and to the emergence of a typology of firms is VET personnel participation (higher vs. lower) in innovation activities.

The final results obtained from the analysis provide a typology of eight groups of SMEs according to their level of relationships with vocational education institutes. Four of those groups have a higher than average intensity of relationships and four groups have a lower one. Table 3 below summarises the typology obtained from the segmentation tree.

Table 3. Typology obtained from the segmentation tree (using exhaustive CHAID).

Typology	Type	No. of Rel.(*)	Node	N	%
Cooperate, VET in technical areas, bigger size	1	2.59	14	128	9.2
Cooperate, VET in technical areas, smaller size	2	1.80	13	284	20.5
No cooperation, metal-machining, VET participation in innovation (more)	3	1.73	10	89	6.4
Cooperate, no VET in technical areas, high-level VET workers (more)	4	1.60	12	97	7.0
No cooperation, other sectors, bigger size	5	1.24	8	76	5.5
No cooperation, metal-machining, VET participation in innovation (less)	6	1.14	9	251	18.1
Cooperate, no VET in technical areas, high-level VET workers (less)	7	1.12	11	165	11.9
No cooperation, other sectors, smaller size	8	0.81	7	298	21.5

(*) Reflects the average number of relations with VET centres (between 0 and 6 types. See Table 1).

The main results obtained can be summarised as follows:

The type having the highest intensity of relationships (type 1) is far ahead of the rest (average of two to three different types of relationships) but makes up only a small minority (9%) of the SMEs. A combination of external cooperation for innovation and the presence of VET employees in technical areas forms the strong branch for this type.

The same is true for type 2 (20.5%), which reflects a high intensity of relationships but, in this case, among smaller SMEs. In our view, the identification of this set of firms

is especially important due to both the percentage of companies involved (representing the second biggest group) and their composition (small, but innovative SMEs, having VET graduates in their technical departments).

The type having the lowest intensity (type 8) is clearly identified: these are SMEs which do not have relationships with vocational education institutes. They are the biggest group. This group is defined by the main discrimination (they have no experience in cooperation) and is further characterised by an interaction of sector (non-metal) and size (smaller firms).

Intermediate combinations with close-to-average intensity (types 3 and 4) provide a complex picture of interactions with vocational education institutes. In the first case (type 3), coming from the first branch (SMEs that do not cooperate), the combination of metal sector and worker participation in innovation produces a higher than average level of relationships with VET institutes. In the second case (SMEs that do cooperate) having a higher level of VET employees (although not in technical areas) is associated to a considerable level of relationships with vocational education schools.

The groups showing a low level of relationship (types 5, 6, and 7) have different sizes. Type 6 (18%) is defined by the lower involvement of VET employees in innovation activities. These are SMEs which do not have cooperation experience and belong to the metal sector.

4. Discussion

Studies carried out by Rosenfeld and other early pioneers pointed at the economic importance of the different types of SME–VET institute relationships, such as continuous training and technical services, as well as student internships and hiring of graduates. Other, more recent authors have developed that idea, as reviewed in the introduction of our paper.

VET institutes can play a role as knowledge infrastructures for SMEs' competitiveness and sustainability, affecting their "absorptive capacity" [41,42] for acquiring new knowledge, but so far little empirical research has been carried out about those relationships. In this paper, we claim to have taken some steps in that direction, showing how intensity of SME–VET relationships is linked to the firms' "mode of innovation" (external cooperation, VET worker functions and participation).

Therefore, it is interesting to highlight the importance of what we could call a stronger innovation culture. As pointed out by Fernández-Esquinas et al. [43], cultural elements are viewed as strategic assets because of their capacity to enhance small firms' action and to provide opportunities to compete in the knowledge economy.

The results of our research suggest the existence of a greater probability of a relationship between SMEs and VET centres among those companies that already cooperate with other innovation agents (technology centres, public research organisations, universities, etc.). This finding provides empirical evidence that VET centres are integrated into the pool of relationships that make up the "openness" [44] of the innovation strategies of SMEs, diversifying the external sources of knowledge used by companies and deepening the intensity of the relationships that they maintain with each of their agents in order to improve their innovative performance.

VET institutes could serve the training and innovation needs of small enterprises better than more "official" or formal knowledge agents such as technology centres and universities, or at least complement those agents. This could be the case especially in so-called "low technology" sectors, which are a very important part of the EU economy in themselves and also act as adaptors and developers of new technologies emerging from the higher technology sectors [45,46]. This result is consistent with a recent study [47] showing that vocational training centres are indeed relevant agents in the articulation, knowledge exchange, and dissemination of a local innovation system.

In this line, it is interesting to point out that for those firms which have a stronger innovation culture (i.e., firms which cooperate with external partners in innovation projects), the second variable having a discriminant effect is related to higher level human resource

development (having VET personnel in technical areas). In addition, as can be seen in Figure 1, when there is no presence of such personnel in technical areas, the existence of more employees with higher VET degrees in the firm is related to a more intense relationship with VET institutes. In other words, those firms with more “specialised” VET personnel have wider and more intense relationships with vocational institutes.

This fact is in accordance with the results of the study by Otero et al. [48], which highlights a higher penetration of workers with vocational training profiles among smaller companies in the Basque Country, both at the technical levels of operation and at the intermediate and even managerial positions in the companies surveyed. This fact highlights the importance of the social and trust networks that are generated at the regional and district level, facilitating cooperation between the actors of the regional innovation system.

It is relevant that the process of detection of influencing variables ends up with yet another characteristic referring to the way in which firms innovate and which is linked to the role of vocational education graduates. Even though this effect has only been measured for SMEs from metal-machining sectors which do not have a tradition of external cooperation in innovation and which therefore can be seen as more “conventional” organisations, it is interesting that VET worker participation in innovation has a strong discriminant influence with respect to intensity of relationships with vocational institutes (higher for firms showing high worker participation and lower otherwise). Employees who participate in innovation processes, in order to develop their capacity to absorb knowledge, have to act as interfaces with their environment [2]. They have to identify, interpret, assimilate, and transfer knowledge within the organization. The personal relationships established with VET teachers during their studies, the participation in continuous training offered by the VET institutions, or the joint participation in innovation projects developed with VET institutes facilitate the relationship between companies and training agents.

In 2015, the United Nations approved the so-called “2030 Agenda for Sustainable Development” with the intention of comprehensively addressing the challenges facing humanity at the global level, where 17 goals are set out, among which the following should be highlighted for the purposes of this paper: education and training (goal 4), economic growth based on decent work (goal 8), and sustainable industrialisation and innovation (goal 9). In line with this movement, and integrating the aforementioned objectives, the European Commission, in its communication to the European Parliament entitled “European skills agenda for sustainable competitiveness, social fairness and resilience” [49], emphasizes that training and lifelong learning are essential for sustainable and long-term growth, productivity, and innovation, and are therefore a factor in the competitiveness of enterprises, particularly SMEs.

This research sheds light on the business characteristics that favour cooperation between industry and education and is closely related to the achievement of the aforementioned objectives. Considering the results obtained, by way of implication, it should be noted that the authorities should favour with their policies (educational, fiscal, and industrial) the reception by companies of vocational education trainees. They should also devote resources to promoting specialised continuing education offered by VET centres in their fields of specialisation. In addition, it would be convenient to encourage the exchange of knowledge between companies and VET institutes through meetings and formal working groups, and the joint execution of technical work and/or innovation projects.

Countries like Spain, which have a school-based vocational education system, are likely to remain so, but at the same time they can increase firms’ participation in such a system, e.g., by increasing the length of student internships and thus taking some steps toward a “dual” system [50,51]. Within the context of the 2030 Sustainability Agenda, Spain has urgent challenges related to VET, such as the low level of worker population education, low student participation in initial vocational education (as compared to European standards), and a lack of integration between the initial education and continuous training subsystems [52]. In this respect, the study reported in our paper shows the impor-

tance which vocational education centres can have in continuous training and innovation systems, especially for SMEs.

The main practical implication of this research work at the company level is that companies need to change their innovation culture. Overcoming the existing barriers to external cooperation and worker participation in technical activities [53–55] can be key to the competitiveness of European SMEs.

5. Conclusions

The aim of this research was to answer questions regarding the existence and width of relationships between SMEs and vocational education institutes. Firms have been shown to have a high level of relationship with such educational institutions (63% of them have some kind of relationship). Interestingly, a significant presence of less traditional missions has been found, referring specially to continuous training services (28% of firms). This fact is undoubtedly a sign of the importance of the VET institutes for SMEs' sustainability.

The analysis carried out has also illustrated the complexity of the interactions among firms' characteristics, as segmentation has used different variables in almost all levels of disaggregation. The tree segmentation technique has shown that the explanatory force of some structural variables (size, sector, type of personnel) has an effect on firms' relationships with vocational education institutes. However, such an effect is not direct, but mediated by other, more powerful predictors (such as experience in external cooperation for innovation, personnel with VET qualifications and their participation in innovation processes) which shape the final influence of the above mentioned variables upon the intensity of relationship between firms and educational institutes.

However, even though we have been able to offer an answer to the main question set out in the beginning of the paper (i.e., that of the variables affecting the relationships between firms and vocational education institutes), the study has several limitations. Due to the existence of differences between regional education-industry systems, the aggregated sample is more complex than the independent subsamples. Therefore, replication of the analysis at the regional level could strengthen the stability of the conclusions. Another possibility for further developing the analysis carried out in this paper would be to use the resulting typology as an independent variable in future studies, with a view to studying differences in SMEs' perceptions of more qualitative aspects of their relationships with vocational education institutes, such as the level of trust and reciprocity of the relationships, the implication of each partner in them, the flexibility of the schools in serving the firms' needs, and the influence of the firms' organisational culture on the relationships that they develop with education institutes.

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