Research Article

The Moderating Role of Firm's Level of Participation in a Cluster in the Relation between Absorptive Capacity and Sustainability Practices

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ABSTRACT

Objective: this study aimed to analyze the moderating role of the firm's participation level in a cluster in the relation between absorptive capacity and economic, social, and environmental sustainability practices. **Methods:** data were collected through a survey applied to 417 small and medium-sized firms participating in clusters. **Results:** results indicate that the absorptive capacity influences positively and directly the adoption of economic, social, and environmental sustainability practices. Such relations are moderated by the firm's level of participation in a cluster. **Conclusions:** we conclude that it is vital for the firm to seek external information and use it in line with the information and resources it already has to generate economic, social, and environmental sustainability practices. In addition, firms with a higher level of participation in a cluster are more likely to grow, establish partnerships, carry out innovation, and increase productivity.

Keywords: sustainability practices; level of participation in a cluster; absorptive capacity; structural equation modeling; multi-group analysis.

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INTRODUCTION

Studies have focused on investigating sustainability issues in large companies, mainly in multinationals, requiring more research that addresses smaller firms (Sarango-Lalangui et al., 2018). Small and medium-sized firms are increasingly showing interest in developing actions that show their commitment to issues related to sustainability (Sarango-Lalangui et al., 2018). The search for incorporating sustainability into business points to signs of transformation in the competitive scenario and firms are developing new ways of thinking about products, technologies, and processes (Nidumolu et al., 2009).

Studies carried out with small and medium-sized firms have highlighted essential issues related to sustainability, such as knowledge sharing, social capital (Meflinda et al., 2018), integration of knowledge (Hájek & Stejskal, 2018), obtaining information, resources, and performance (Li et al., 2017), and absorptive capacity (ACAP) (Aboelmaged & Hashem, 2019). ACAP is the firm's ability to recognize the value of new external information, assimilate it and apply it for commercial purposes (Cohen & Levinthal, 1990). The adoption of practices aimed at sustainability can be influenced by the absorptive capacity (Langenus & Dooms, 2018; Riikkinen et al., 2017).

Small and medium-sized firms face greater challenges compared to large ones, mainly due to the scarcity of resources, capacity, knowledge, and experience (Heras et al., 2020; Lubatkin et al., 2006; Voss & Voss, 2013). Recognizing, assimilating, and applying new information is a determining factor for firms' survival and permanence in a world that presents constant changes (Lane et al., 2006), becoming increasingly dynamic and turbulent (Teece et al., 1997).

This study seeks to respond to the call made by Annunziata et al. (2018) to analyze the role of firms' specific capabilities in adopting sustainability-oriented practices. Amui et al. (2017) and Salim et al. (2019) point out that studies are carried out to identify types of dynamic capacities, which in this study is the absorptive capacity (Wang & Ahmed, 2007), capable of developing sustainability. In addition, Gelhard and Delft (2016) argue that it is necessary to deepen the understanding of organizational capabilities and their relation with sustainability.

It is noteworthy that studies that address ACAP and sustainability tend to focus on individual firms and end up neglecting the geographic context, such as acting in clusters. Galdeano-Gómez et al. (2008) argue that the moderating role of the environment in which firms operate needs to be analyzed with a moderating function. Business networks and industrial agglomeration are important moderators to consider (Galdeano-Gómez et al., 2008). Research such as that of Li et al. (2019) used agglomerations of firms as a moderating variable between ACAP and performance.

Studies have focused on analyzing the role of clusters (Zeng et al., 2019), since the interactions established within the cluster (Larentis et al., 2013) can help firms identify, assimilate, transform, and use external information (Zhang et al., 2015) to generate sustainability practices (McLennan et al., 2016). When developing activities within a cluster, firms form a network (Rocha & Sternberg, 2005), each having a participation level (Gulati et al., 2000; Lima et al., 2009).

It is necessary to investigate whether the firm's greater involvement in the cluster generates any effect on the relation between ACAP and sustainability practices, contributing to the field theory's advancement. Although it is understood that in the cluster environment there is a greater exchange of knowledge impacting the generation of sustainability practices (Friedman & Miles, 2001; Lis & Rozkwitalska, 2020; Revell & Rutherfoord, 2003; Segarra-Oña et al., 2016), it is still insufficient to deepen the role that clusters play as environments enable knowledge and knowledge generation of new practices by firms (Lis & Rozkwitalska, 2020). Thus, this study seeks to answer the following research question: What is the role of the firm's participation level in a cluster in the relation between absorptive capacity and sustainability practices?

This study aims to analyze the moderating role of the firm's participation level in a cluster in the relation between absorptive capacity and practices of economic, social, and environmental sustainability in small and medium-sized firms. Original data were collected through a survey, structured on a Likert-type scale of seven points to test the hypotheses. The sample consists of 417 small and medium-sized firms that are part of a cluster in Santa Catarina, Brazil. The results indicate that the absorptive capacity positively and directly influences the adoption of economic, social, and environmental sustainability practices. These relations are moderated by the firm's level of participation in a cluster.

This study presents two main theoretical contributions: (a) broadens the understanding of the effect of ACAP on economic, social, and environmental sustainability practices in small and medium-sized firms, which participate in a cluster; (b) adds to the literature of the field an understanding of the moderating effect of the level of participation in the cluster on the relation between ACAP and sustainability practices. It also presents two managerial contributions: (a) it is necessary to constantly develop managers and employees so that they remain attentive to external information and knowledge to acquire, assimilate, transform, and use them in the generation of new practices, among them, those of sustainability; (b) by actively participating in a cluster, small and medium-sized firms now can establish partnerships, exchange knowledge, and access resources, which are not possible if the performance is isolated.

LITERATURE REVIEW AND HYPOTHESES

This section includes questions regarding the relation between absorptive capacity and sustainability practices, especially about the former's effect on the latter. It also addresses the role of the firm's participation level in a cluster as a moderating variable.

Absorptive capacity and sustainability practices

The increasingly dynamic, competitive, and rapidly changing environment (Teece et al., 1997) requires firms to learn to build new practices. When developing its absorptive capacity (Zahra & George, 2002), the firm has more significant possibilities to acquire external information, assimilate it, transform it, and use it (Behnam et al., 2018) by applying it in its processes. In addition to improving their operations, firms that use external knowledge can develop skills and

practices (Zhang et al., 2015). Such improvement occurs because the knowledge base influences how the firm recognizes and uses new knowledge (Zahra & George, 2002).

Although the use of absorptive capacity to understand sustainability practices is relatively recent (Garay et al., 2017), studies indicate that ACAP facilitates the adoption of successful sustainability strategies (Liu et al., 2019) because firms need to combine information from various sources, usually external to them (Ferro et al., 2019). It is observed that the adoption of sustainability practices is affected, in some way, by access to external knowledge (Liu et al., 2019). In this sense, keeping in touch with engaging internet channels, magazines, and even newspapers dealing with sustainability can help acquire relevant information (Garay et al., 2017).

ACAP can assist firms in adopting sustainability practices (Dzhengiz & Niesten, 2020), and new learning and practices aimed at sustainability can act as facilitators to generate competitive advantage and achieve better performance (Aboelmaged & Hashem, 2019). Thus, it is challenging to imitate ACAP and sustainability initiatives since they are related to complex processes and tacit knowledge. Therefore, the competitive advantage generated by such factors will be difficult to be copied by competitors (Garay et al., 2017).

Small and medium-sized firms can, based on ACAP, boost their sustainable innovation practices, needing to continually improve their technological and organizational capabilities (Brasil et al., 2016; Widya-Hasuti et al., 2018). Firms are challenged to consider economic, social, and environmental sustainability, also based on the success achieved in sustainable innovation, which, in turn, is significantly influenced by ACAP (Widya-Hasuti et al., 2018). In this sense, sustainability itself has been considered a form of innovation (Hjalager, 1997), and using several external sources of information is relevant for firms to innovate (Chen et al., 2015).

Firms must develop and improve their ability to acquire, assimilate, transform, and use external knowledge (Zahra & George, 2002), as this ability impacts the development of their operations and practices (Delmas et al., 2011). Those with high ACAP, when adopting economic, social, and environmental sustainability practices, tend to attract advantages, such as cost reduction (Garay et al., 2017).

The economic, social, and environmental sustainability dimensions are still not fully considered, providing the possibility of deepening sustainability practices in these dimensions, based on knowledge, as one of the most critical resources for the firm (Segarra-Oña et al., 2016). The adoption of environmental (Delmas et al., 2011) economic and social strategies (Pinkse et al., 2010) will be facilitated the more the firm develops its ability to identify, assimilate, transform, and use specific environmental information (Riikkinen et al., 2017). Firms that seek to develop eco-efficient operations have, in the absorptive capacity, assistance to identify that knowledge that is most important (Effiong & Singhal, 2014).

The development of new practices that pay attention to sustainability aspects is related to the generation of ideas and innovative ways of carrying out organizational tasks. Knowing what the internal needs are, and keeping an eye on the external environment (Dzhengiz & Niesten, 2020) to identify important information, assimilating them to integrate with internal knowledge, allows

the firm to generate sustainable operations (Albort-Morant, Leal-Rodríguez et al., 2018). The motivation of managers of small and medium-sized firms to adopt sustainability practices is linked to channels and information sources about sustainability, and the perceived usefulness of the information acquired (Garay et al., 2017).

TBL has become the most widely used theoretical understanding to explain sustainability in the business world (Milne & Gray, 2013), and researchers are using the concept of ACAP to explain sustainability strategies in firms (Liu et al., 2019). What still needs to be tested is the effect of ACAP on economic, social, and environmental sustainability practices. It is still necessary to analyze and deepen sustainability practices (Garay et al., 2017) to explain the influence of absorptive capacity on its adoption (Dzhengiz & Niesten, 2020).

Turning attention to economic sustainability practices, Garay et al. (2017) indicate that ACAP can be considered a predecessor, acting as a mechanism to explain practices aimed at economic sustainability. ACAP allows firms to reduce costs (Delmas et al., 2011) and obtain better results than their competitors (Garay et al., 2017). Thus, the first research hypothesis was formulated:

H1: Absorptive capacity positively and directly influences economic sustainability practices.

Compared to environmental and economic sustainability practices, social sustainability has been little researched (Engert et al., 2016), perhaps because it is less tangible (Branco & Rodrigues, 2006). It appears that ACAP can generate social sustainability practices (Riikkinen et al., 2017). The absorptive capacity helps the firm turn its gaze and attention to issues involving society (Shahzad et al., 2020), enabling the implementation of practices aimed at this audience (Ling, 2013). In knowledge-intensive organizations, managers understand the role of ACAP in influencing social sustainability actions (Crilly & Sloan, 2012). Therefore, the second hypothesis is presented:

H2: Absorptive capacity positively and directly influences social sustainability practices.

Consumers' increasing attention to environmental issues is leading firms to integrate environmental practices into their operations (Borland et al., 2016). Considering environmental practices as a matter of competitive advantage, firms are investing in the identification and development of capabilities focused on the area (Hesselbarth & Shaltegger, 2014). There are indications that the absorptive capacity generates environmental sustainability (Dzhengiz & Niesten, 2020). Firms that seek to develop sustainability practices focused on environmental issues can benefit from ACAP to identify the most important and useful knowledge (Delmas et al., 2011; Effiong & Singhal, 2014; Riikkinen et al., 2017). Thus, the third research hypothesis is:

H3: Absorptive capacity positively and directly influences environmental sustainability practices.

Level of firm participation in a cluster as moderator

Small and medium-sized firms face challenges in adopting sustainability practices (Bruijn & Lulofs, 2000; Revell & Rutherfoord, 2003), and partnerships with other firms in a cluster can help overcome these barriers (Hunt, 2000; Revell & Rutherfoord, 2003). In addition, participation in some clusters is an incentive for organizational learning in small and medium-sized firms (Simpson et al., 2004), for the search for knowledge (Segarra-Oña et al., 2016), and participation in programs aimed at sustainability (Friedman & Miles, 2001).

When looking for sustainability concepts, the firm may have doubts about how to adopt the practices, what their scope is, and the relation with the cost, since the profit will not come only because the firm is doing good (Eccles & Serafeim, 2013). Knowing the sustainability practices that other firms adopt help develop sustainability strategically (Garlet et al., 2017). Participating more actively in a cluster or a network can strengthen the relation between absorptive capacity and firms' adoption of practices (Tsai, 2001). It is noteworthy that different levels of participation in the cluster generate different results regarding access to knowledge, resources, development of ACAP, and the adoption of technological practices (Grimstad & Burgess, 2014; Lis & Rozkwitalska, 2020).

A firm that participates in a cluster and has a high ACAP will seek new knowledge/information, allowing interconnections between firms (Chandrashekar & Hillemane, 2018). The authors indicate that participating in a cluster makes it possible to move resources and establish partnerships. When considering the global economy, it can be understood that elements such as knowledge, motivations, and relations established in a geographic space or region make it possible to generate sustainable competitive advantages.

Clustering allows firms to train workers and suppliers and reduce business costs — the firms participating in a cluster share worldviews, resources, and knowledge (Di-Serio, 2007). The interactions between the firms' internal resources and the locality resources allow them to be heterogeneous, given the contextual aspects of the resources and capacities (Hervas-Oliver & Albors-Garrigos, 2009) — understanding that the firms that make up a cluster form a network (Berg et al., 2001). The level of participation in the cluster will reflect their strength of competition and cooperation. In addition, it will impact their learning and the establishment of their practices.

Sustainability practices appear to be different when the analysis is carried out in the cultural cluster that comprises more than one country than when it is carried out only at the level of the same country (Miska et al., 2018). Thus, the relations established in the clusters seem to have greater importance than being located in a given country. In clusters, firms, because a collaboration network links them, explore new business opportunities, seeking to increase their economic performance, minimize environmental impacts, and create benefits for the local community (Bellantuono et al., 2017). The cluster is inserted in the place where its performance encompasses economic, social, and environmental issues, with challenges for managers to develop practices focused on these three issues (Larentis et al., 2013).

Economic, social, and environmental practices in the cluster context have been little investigated in the literature, reinforcing the need to measure how much the cluster environment contributes to the firm's learning in generating sustainability (Garay et al., 2017; McLennan et al., 2016). A firm's participation in the cluster is based on the business carried out, the strategies outlined, and the relations maintained with other firms in the cluster (Wilkinson & Young, 2002).

Firms that participate in a cluster can share experiences, processes, learning, and practices (Eisingerich et al., 2010) since clusters are like repositories of knowledge that can originate from external sources (McLennan et al., 2016). The network of firms established within the cluster enables sharing ideas, technologies, and knowledge, based on the interaction established between the participants (Eisingerich et al., 2010), facilitating the learning process (Young, 2010).

Firms, small and medium-sized ones, are interested in participating in a cluster, as they see a greater possibility of obtaining an advantage, such as economies of scale (Gardiner & Scott, 2014). Participating in a cluster can lead small and medium-sized firms to access external knowledge and information (Granek & Hassanali, 2006). Clustering can be a more straightforward path to achieving sustainability (McLennan et al., 2016) and having a greater possibility of developing sustainability practices.

In general, putting economic, social, and environmental sustainability into practice is still a challenge for firms. However, the cluster environment, which makes it possible to learn from other firms, can facilitate sustainability practices. There is a possibility to learn from the experiences and relations established through partnerships (Giuliani & Bell, 2005). The environment where the firm is installed, and the relations established can enhance the learning processes to generate sustainability practices. Therefore, the H4 hypothesis arises:

> H4: *The level of firm participation in a cluster moderates the relation between ACAP and sustainability practices. Higher levels of participation in the cluster will have a more significant effect of ACAP on economic, social, and environmental sustainability practices than lower levels of participation.*

METHOD

Procedures, data, and sample

The primary data were collected between January and March 2020, in small and medium-sized firms participating in any of the 11 clusters in the state of Santa Catarina, Brazil (Begnini & Carvalho, 2021). The clusters are spread across the territory of the state of Santa Catarina and refer to the following economic activities and municipalities: textile products (Blumenau — 1 and Brusque — 2); wood products (Caçador); food products (Chapecó); electrical machines, appliances, and materials (Jaraguá do Sul); metallurgy and manufacture of machinery and equipment (Joinville); manufacturing of transport equipment, except motor vehicles (Navegantes); leather, travel items, and footwear (São João Batista); computer equipment, electronic and optical products (São José); and non-metallic, mobile mineral products (Criciúma).

Data were collected using a questionnaire with Likert-type scales with a seven-point scale. The elaboration of the research instrument questions sought to meet the criteria established by Fink (2003) considering that after each analysis the indicated improvements were made. After being prepared, the questions were sent for analysis by students in the area. Subsequently, the instrument was sent to specialists in the area and, afterward, presented and discussed in the research group and at the ANPAD Annual Meeting (EnANPAD).

The next step was to apply the questionnaire to six entrepreneurs followed by an informal conversation. The survey instrument was then inserted into the Survey Monkey platform and a pre-test was carried out with 41 responses from managers of firms participating in the Chapecó food cluster. With these data in hand, some statistical tests were carried out and, given the results, the data collection was carried out. The questions that make up the questionnaire are presented in Annex 1.

Eleven questionnaires were built, one for each cluster, and the link of each questionnaire was forwarded to the managers of the firms. The firms' contacts came from two sources: (a) from a database formed by the researcher; and (b) from a firm specialized in databases that, based on the National Classification of Economic Activities (Classificação Nacional de Atividades Econômicas – CNAE), extracts the contacts of firms from each of the eleven municipalities, according to the main activity of each cluster. Contact was made with 5,718 small and medium-sized firms participating in any of the indicated clusters. In total, 456 responses were received, of which 417 proved to be valid and formed the sample.

Preparation and adequacy of data for analysis

Altogether, 456 firms sent the answered instrument. When analyzing missing data, five responses were excluded because they were incomplete. Univariate outliers were sought through data standardization and identification of cases with scores greater than 3 (Field, 2011; Hair et al., 2009) and multivariate outliers by calculating the Mahalanobis distance divided by degrees of freedom, considering those with a value greater than 3.5 (Field, 2011; Hair et al., 2009), 16 observations being excluded. The reliability test was performed using Cronbach's alpha (AC) and inter-item and item-total correlations.

In these cases, the AC was always greater than 0.7, and no variable was excluded (Field, 2011; Hair et al., 2005). Observations were found to be independent (Hair, Black et al., 2014). It was observed that the variables are linear because the covariance values were different from zero (Cooper & Schindler, 2016; Hair, Black et al., 2014). As for normality, it was noted that the values of asymmetry and kurtosis did not exceed 2 and 7, respectively (Finney & DiStefano, 2013). Although it is possible to notice that there is multicollinearity in some variables, the values of the variance inflation factor (VIF) remained below 10, which is acceptable (Field, 2011; Hair et al., 2009; Kline, 2015). Eighteen observations were also excluded because large firms answered them. In the end, the sample was composed of 417 firms.

Constructs

There are three endogenous constructs: economic sustainability practices, social sustainability practices, and environmental sustainability practices. It refers to the adoption of sustainability practices by small and medium-sized firms that participate in a cluster. The statements used to measure each of the three constructs were prepared based on the field's literature. The constructs identified as reflective were measured by five statements each. Sustainability practices have been used as endogenous constructs in some studies (Fairfield et al., 2011; Padilha et al., 2020; Riikkinen et al., 2017).

Absorptive capacity was the exogenous reflexive construct. It used the ACAP formed by four dimensions (Zahra & George, 2002), the construct being measured by an assertion by dimension. ACAP has been used as an exogenous construct in some studies (Aboelmaged & Hashem, 2019; Albort-Morant, Leal-Rodríguez et al., 2018; Riikkinen et al., 2017).

The level of firm's participation in a cluster was the reflective moderator construct. The four statements used to measure it were elaborated based on the existing literature. Moderation was carried out through multi-group analysis. First, a new variable was formed with the observations' averages and then the average of the new variable. Of the total, 205 firms remained with values above the average. They were classified with a high level of participation in the cluster. Two hundred and twelve firms remained with the value below the average, classified with a low level of participation in the cluster. Cluster participation was used as a moderating variable (Frazão, 2018).

Control variables

As control variables, firm size and age were used. These are variables widely used as controls (Zou et al., 2018). The control variables, size, and age were tested to identify whether they influenced endogenous constructs. It is possible to affirm, with 95% confidence, that neither the age group nor the firms' size influences the adoption of economic, social, and environmental sustainability practices.

RESULTS

Direct relations

The collected data were tabulated in Microsoft Excel spreadsheets and treated with SPSS and AMOS software. Of the 417 firms that made up the sample, 32.85% were between 10 and 19 years old, 27.09 between 20 and 29 years old, 20.62% over 30 years old, and 19.44% up to nine years old. Most of the answers originated from the clusters in the municipalities of Chapecó, Joinville, and Blumenau with 98 (food products), 93 (metallurgy and manufacture of machines and equipment), and 93 (textile products) answers respectively. Subsequently, São José (43 — computer equipment, electronic and optical products), Brusque (24 — textile), Jaraguá do Sul (20

— electrical machinery, equipment, and materials), Criciúma (16 — non-metallic mineral products), Caçador (12 — wood products), São Bento do Sul (10 — furniture), São João Batista (7 — leather, travel items, and footwear), and Navegantes (1 — transport equipment, except motor vehicles).

After addressing issues related to missing data, outliers, reliability, independence of observations, linearity, normality, and absence of multicollinearity, the next step was to organize the analysis model employing SEM, using AMOS (Awang, 2012). Usually, the initial model needs to be changed to arrive at an acceptable and reliable adjustment (Hair, Black et al., 2014). To assess the model, the use of X^2 associated with degrees of freedom, the CFI, and the RMSEA (Hair et al., 2005) is sufficient. In addition to these, it was decided to include the GFI. Table 1 shows the values for the initial and final models, after the necessary adjustments, and the reference values.

Table 1

Adjustment index, initial and final model values, and reference value

Index	Initial model value	Final model value	Reference value
X^2/df	5.01	3.29	<= 3: good fit; <= 5: acceptable; > 5: bad (Awang, 2012; Awang et al., 2017)
GFI	0.83	0.90	> 0.90 (Hair et al., 2009; Malhotra, 2019)
CFI	0.85	0.93	>= 0.90 (Malhotra, 2019); > 0.90 (Hair et al., 2009)
RMSEA	0.09	0.07	< 0.08 (Hair et al., 2009); <= 0.08 (Malhotra, 2019); acceptable < 0.1 (Awang, 2012)

Note. X^2 = 375.58; df = 114; p = 0.000.

In comparison with the initial model, the end has undergone some changes:

(a) The variable PSECO3 was excluded;
(b) The PSAMB1 variable was excluded;
(c) Covariance between the error terms of PSSOC1 and PSSOC2 was introduced;
(d) Covariance between the error terms of PSSOC2 e PSSOC3 was inserted.

The exclusions occurred because the factorial loads presented were below 0.50 and 0.60. Covariance was included because when analyzing the research instrument's assertions, it was noticed that they maintain a relation with each other. For convergent validity, calculations were performed for extracted average variance (AVE), whose values must be greater than 0.50, of composite reliability (CC), which must be greater than 0.70. AVE and CC's values were not calculated for the cluster's constructive level (NPC). They were used as moderator multi-groups and did not participate in the model (Awang, 2012; Hair et al., 2009). Cronbach's alpha (AC) was also calculated, whose values must be greater than 0.70. These are expressed in Table 2.

As for the discriminant validity, the correlation loads between the constructs were used. Diagonally, the correlation loads were replaced by the values of the AVE root. Such values need to be greater than the correlation values between the constructs (Malhotra, 2019). Table 3 shows the results.

Table 2

Convergent validity

Construct	ACAP	PSECO	PSSOC	PSAMB	NPC
AVE	0.54	0.57	0.66	0.55	
CC	0.83	0.84	0.89	0.86	
AC	0.83	0.81	0.87	0.87	0.95

Table 3

Discriminant validity

	ACAP	PSECO	PSSOC	PSAMB
ACAP	**0.737**			
PSECO	0.621	**0.755**		
PSSOC	0.495	0.307	**0.815**	
PSAMB	0.550	0.342	0.272	**0.741**

It can be seen that the model presented adjustment, reliability, and validity. It was observed that all the factor loads between the construct and the latent variables were more significant than 0.60, meeting the expectations (Hair, Hult et al., 2014; Kline, 2015; Malhotra, 2019). Table 4 shows the hypothesis test, where the relations between the exogenous construct and the endogenous constructs were tested.

Table 4

Hypothesis test

H	Relation	Estimate standard	Estimate unstand.	SE	CR	p-value	Result
H1	PSECO <--- ACAP	0.550	0.545	0.059	9.317	***	Supported
H2	PSAMB <--- ACAP	0.495	0.648	0.073	8.900	***	Supported
H3	PSSOC <--- ACAP	0.621	0.817	0.074	11.057	***	Supported

Such results support the hypotheses H1, H2, and H3, indicating that absorptive capacity generates economic, social, and environmental sustainability practices. Figure 1 shows the path coefficients' values and the factor loads between the observed variables and the constructs.
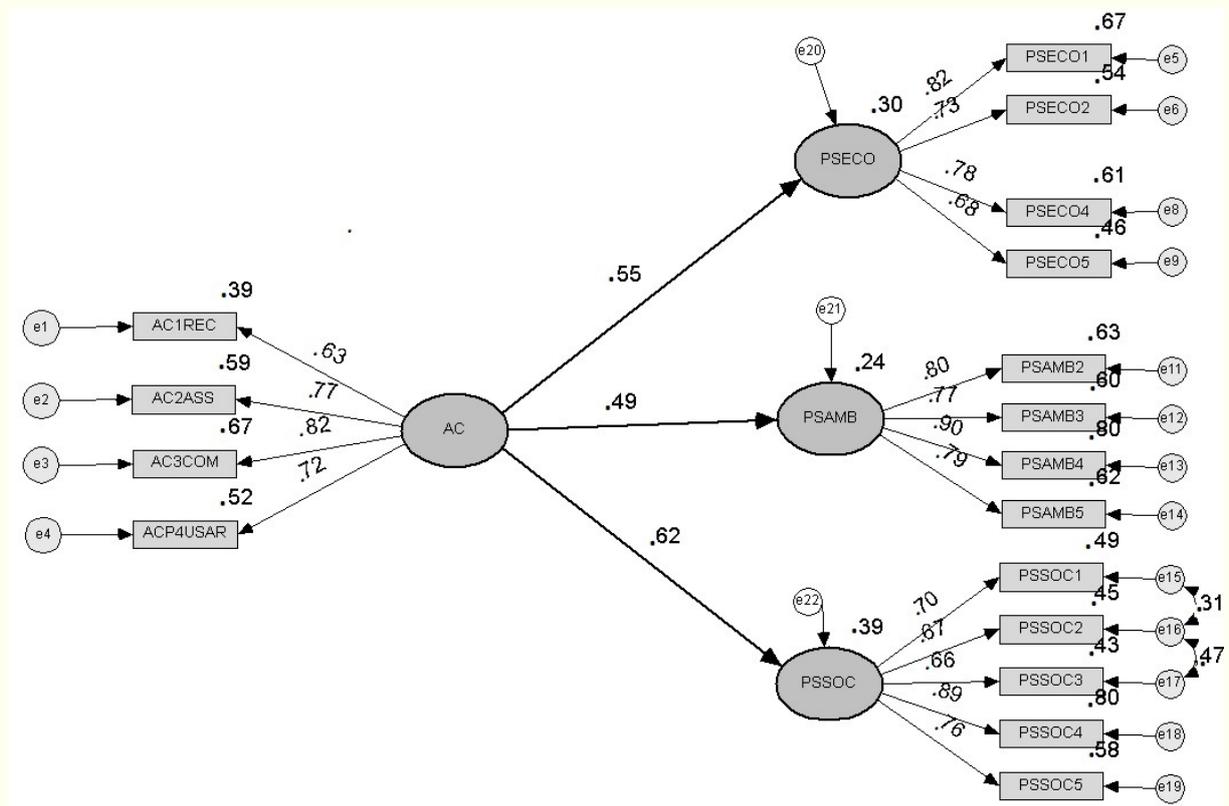
Figure 1 — Complete path diagram, with standardized estimates.

It appears ACAP explains about 30% of the data variance in PSECO, 24% of the variance in PSAMB, and 39% of the variance in PSSOC. The greater the effect size, the greater the degree to which the phenomenon under study is manifested (Hair, Black et al., 2014). Following the parameters of Cohen (1998) considering the r^2, the effect size was large (0.30) in the ACAP-PSECO ratio, medium (0.24) in the ACAP-PSAMB ratio, and large (0.39) in the ACAP ratio — PSSOC

Moderating effect

Moderation is an effect that occurs when there is the inclusion of a third variable that influences the relation between the endogenous and exogenous constructs (Awang, 2012; Hair et al., 2005). The moderating effect can be verified by a metric or categorical variable, which divides the sample into two or more subgroups (Hair, Black et al., 2014; Vieira, 2009). In this case, the objective is to verify how the structural model fits into different groups (Vieira, 2009). Before considering the moderating variable, the exogenous construct's effect must exist and be significant on the endogenous (Awang, 2012). It is then necessary to test whether the exogenous construct's effect on the endogenous changes according to the condition of the moderator (Hair, Black et al., 2014).

After forming a new variable, which is the average of the four variables of participation in the cluster ((CL1CRESC + CL2PARCE + CL3INOVA + CL4 PR OD) / 4), its average was

established, which was 4.57. Below the average, the level 1 (low) group was constituted with 212 observations, and above the average, the level 2 (high) group was formed with 205 firms.

The free structural model was estimated with the level 1 group, which presented an X^2 of 276.574, with 114 degrees of freedom. The restricted model had an X^2 of 302.997, with 117 degrees of freedom. The low level of participation showed an X^2 variation of 26.423 and a variation of degrees of freedom of 3; Using the chi-square distribution formula with 'n' degrees of freedom, the significance of the difference between group level 1 and 'n' [level 2] was calculated, which was p-value 0.000. As a result, the presented p-value < 0.005 shows that the models are different and moderation occurs (Hair, Black et al., 2014).

Afterward, the free and restricted structural model for the level 2 (high) group was estimated. The X^2 variation was 22.050, and the degrees of freedom were 3. While in the free model, the value of X^2 was 274.740, with 114 degrees of freedom, in the restricted model, it was 296.790, with 117 degrees of freedom. When calculating the significance of the difference between the models, the value was p-value 0.000. With a p-value < 0.005, it can be said that there is a significant difference between the models, and moderation occurs (Hair, Black et al., 2014), as shown in Table 5.

Table 5

Free and restricted model for low level and high level of moderation

	Low level group (1)				High level group (2)			
	Free model	Restricted model	Variation	p-value	Free model	Restricted model	Variation	p-value
X^2	276.574	302.997	26.423	0.000	274.74	296.79	22.05	0.000
df	114	117	3	0.000	114	117	3	0.000

The adjustment indexes, in this case, X^2/df, CFI, GFI, and RMSEA, were compared between the free model and the restricted model. If the restricted model has adjustments as reasonable as those of the free model, then moderation cannot be sustained (Hair et al., 2009). If the free model presents better adjustments than the restricted model, then moderation is sustained (Awang, 2021; Hair et al., 2009).

For group 1 — low level of participation —, the free model presented the results 2.426 (X^2/df), 0.869 (GFI), 0.912 (CFI), and 0.082 (RMSEA). The restricted model had 2.590 for X^2/df, 0.855 for GFI, 0.899 for CFI, and 0.087 for RMSEA. For the high level of participation, the free model's adjustment indexes were 2.410 for X^2/df, 0.857 for GFI, 0.920 for CFI, and 0.083 for RMSEA. Moreover, the restricted model presented 2.537 for X^2/df, 0.846 for GFI, 0.911 for CFI, and 0.087 for RMSEA.

It is noticed that both at the low and at the high level, the restricted model presented adjustment results not as good as the free model, supporting the existence of moderation (Hair et al., 2009). As the results indicate moderation, we started to explore how the effect varies between groups, analyzing the β values in each relation. The values are shown in Table 6.

Table 6

Values of β coefficients of multi-group analysis

Constructs and relation		Level	β standardized	β unstandardized	p-value
ACAP ⟶	PSECO	low	0.46	0.48	0.000
		high	**0.62**	**0.58**	0.000
ACAP ⟶	PSAMB	low	0.38	0.49	0.000
		high	**0.57**	**0.75**	0.000
ACAP ⟶	PSSOC	low	0.49	0.71	0.000
		high	**0.73**	**0.89**	0.000

It was decided to present both the standardized beta and the non-standardized beta (Vieira, 2009), and that the analysis would be on the non-standardized (Kline, 2015). In the relation between ACAP and PSECO, the path coefficient was 0.62 for high level and 0.46 for low level. In the relation between ACAP and PSAMB, the high level showed a beta of 0.57 and the low level a beta of 0.38. In the third relation between ACAP and PSSOC, the beta for the low level was 0.49, and for the high level it was 0.73. The high level of participation in the cluster allows ACAP to significantly affect economic, social, and environmental sustainability practices, supporting H4, as shown in Table 7.

Table 7

Result of hypothesis H4

Hypothesis	Description	Result
H4	The level of firm participation in a cluster moderates the relation between ACAP and sustainability practices. Higher levels of participation in the cluster will have a more significant effect of ACAP on economic, social, and environmental sustainability practices than lower levels of participation.	Supported

DISCUSSION

The results indicate that small and medium-sized firms participating in a cluster adopt economic, social, and environmental sustainability practices. This discovery points out the lack of clarity on how to best implement sustainability practices. However, a challenge for firms (Maletič et al., 2018), especially for small and medium-sized ones, is being overcome. When adopting sustainability practices, these firms become more valued in the market (Lourenço et al., 2014) and see opportunities to achieve competitive advantage (Babu et al., 2018; Gurtu et al., 2017). In addition, the impact of sustainability practices on these firms' performance is positive (Govindan et al., 2020), making it possible to achieve superior performance (Singh et al., 2019).

It was also found that the average adoption of economic sustainability practices was higher than the average of environmental and social practices and that the difference in the mean was statistically significant. This discovery is directly related to the fact that firms need to obtain financial results to remain active in the market, prioritizing economic practices (Høgevold et al., 2015). This fact indicates that, when developing economic sustainability practices, the firm can

efficiently use its resources (Miska et al., 2018), guaranteeing a positive result and becoming more competitive (Elkington, 2012). It is also necessary to consider that there is no single way to adopt sustainability practices (Maletič et al., 2018) and that the implementation requires time to make the necessary changes (Liu et al., 2019), in addition to the manager's attention to coordinate the processes (Zhu et al., 2012).

The support of the first three hypotheses confirmed that absorptive capacity generates economic, social, and environmental sustainability practices. The literature also indicates the research results that have also identified ACAP as a generator of sustainability practices (Aboelmaged & Hashem, 2019; Padilha et al., 2020). It is understood that through routines and processes, the firm can analyze, interpret, and understand the recognized external information, combining it with the already existing internal knowledge, which can trigger the adoption of new practices (Zhang et al., 2015). The integration of external, complex, and interdisciplinary knowledge impacts the adoption of practices (Dzhengiz & Niesten, 2020; Liu et al., 2019).

Having access to external knowledge enables firms to learn, leading to the establishment of necessary changes to adopt new practices aimed at sustainability (Albort-Morant, Henseler et al., 2018). Firms need to develop internal capacities to recognize and absorb new knowledge to facilitate new practices (Hashim et al., 2015). Capacity development by the firm makes it possible to change routines and activities to achieve actions aimed at sustainability (Dzhengiz & Niesten, 2020).

According to the capacity to absorb, assimilate and transform external information into internal knowledge (Padilha et al., 2020), the dimension 'transformation' of ACAP requires the company to unlearn existing unsustainable practices and build and adopt other methods that are sustainable (Dzhengiz & Niesten, 2020). ACAP influences the development of firm practices that participate in a cluster toward sustainability, as such actions return in some benefit (Aboelmaged & Hashem, 2019). Contributing to these arguments is the fact that a firm, by developing its ACAP, improves its mode of operation and the adoption of sustainability practices (Riikkinen et al., 2017). Evidence has shown that sustainability is considered a form of innovation that encourages competitiveness, based on the acquisition of environmental information and knowledge creation (Delmas et al., 2011; Garay et al., 2017).

Firms that participate in a cluster have actions aimed at adopting sustainability practices based on ACAP. It is argued that adopting real and sustainable practices is a decisive factor for the firm's permanence in the market and an essential competitive advantage generator. When treating sustainability issues as an objective of the present, pioneers will develop skills that rivals will have difficulties matching (Nidumolu et al., 2009).

ACAP generates sustainability practices, and, based on this process, improvements can be seen (Padilha et al., 2020). In the economic dimension, practices make it possible to improve performance as innovations, especially eco-innovations, are incorporated into the production process, triggering positive results such as, for example, cost reduction (Brasil et al., 2016; Delmas et al., 2011; Garay et al., 2017). In the social dimension, the practices adopted result in a better image of the firm before consumers and in improvements in relations with suppliers, employees,

and other stakeholders (Horbach et al., 2012; Klassen & Whybark, 1999). In the environmental dimension, firms' practices can reduce water and electricity consumption, increase the separation and recycling of waste, and encourage customers and suppliers to be environmentally friendly (Font et al., 2016).

The fourth hypothesis' support indicates that the higher level of participation in the cluster increases the effect of ACAP on the practices of economic, social, and environmental sustainability concerning the lower level of participation. The empirical findings of this study are in line with the theoretical predictions presented that the firms participating in a cluster show different levels of growth (Porter, 1998; Villar & Walter, 2017), partnerships (Albuquerque, 2016; Porter, 1998), innovations (Albuquerque, 2016; Porter, 1998), and productivity (Di-Serio, 2007). Because it participates in a cluster, geographic proximity to other firms allows access to knowledge and resources, impacting the firm's performance (Porter, 1990). However, participation levels tend to be different, even if the cluster firms' participants share knowledge and worldviews (Di-Serio, 2007).

The establishment of partnerships between the firms in the cluster enables the exchange of knowledge to reduce the uncertainties present in the market, promoting increased social interaction (Albuquerque, 2016; Cortés et al., 2020; Gray, 2006). For the firm to access that information relevant to its business, at the right time, aiming to adopt economic, social, and environmental sustainability practices, the establishment of partnerships with other firms is essential (Hunt, 2000), especially for generating confidence (Porter, 1998). In the cluster, the firm can still operate in a network with other firms, access new knowledge, improve economic performance, minimize environmental impacts, and create benefits to society, making it possible to explore new business opportunities (Bellantuono et al., 2017). In this sense, the higher the firm's participation level in the cluster, the greater the possibility of accessing external information and developing knowledge (Giuliani et al., 2019).

In this aspect, it is important to highlight that a process of organizational mimicry can occur (Abernethy & Chua, 1996). That is, the adoption of sustainability practices may be anchored in the movement of observation and imitation of characteristics of other firms considered successful. However, firms adopt imitation processes when they have insufficient absorptive capacity, making it difficult to form their core competitiveness (Li et al., 2019). In this study, firms present ACAP developed, if not fully, at intermediate levels.

The literature also indicates that different levels of participation in the cluster represent different possibilities to access relevant knowledge to generate new practices (Tsai, 2001). The knowledge transfer process between the cluster firms allows the best practices to be disseminated quickly (Hervas-Oliver et al., 2012). Interactions within the cluster, for example, make it possible to both access and transmit knowledge that, shared among the members of the cluster, generate learning (Lis & Rozkwitalska, 2020), affecting the adoption of sustainability practices (Garay et al., 2017).

Another issue is that the growth levels of each company are different, even if they are all participating in a cluster (Villar & Walter, 2017). The characteristics of each firm can act promoting or limiting its growth (Penrose, 1959). The cluster firms' level of growth directly

impacts the cluster's success or failure (Villar & Walter, 2017). It is worthwhile to pay attention to the fact that the firm's growth requires attention to sustainability (Vaz & Nijkamp, 2009) to adopt sustainability practices (Hashim et al., 2015).

To grow, the firm needs, in some way, to increase productivity, and the increase in productivity cannot be a sign of lack of control, mainly environmental and social (Vaz & Nijkamp, 2009). A cluster is more or less productive to the extent that the firms that participate in it are more or less productive. They are not expected to reach the same levels of productivity. Productivity is related to the use of technology and the generation of innovation (Porter, 1998).

Participating in a cluster allows each firm, at different levels, to increase its capacity for innovation, thus creating differentials for the cluster itself (Albuquerque, 2016). Clusters are considered to facilitate the transfer of knowledge and technologies that assist in adopting innovative practices aimed at sustainability (Aboelmaged & Hashem, 2019). Although external knowledge can be obtained internationally (Patel et al., 2018), it is the local environment that offers useful and unique knowledge and that becomes difficult for other firms to access (Solano et al., 2020).

The local cluster constitutes a valuable and unique source of knowledge (Porter, 1998), capable of promoting the absorptive capacity and achieving higher market positions (Plumer & Acs, 2014). As it is known that clusters vary in knowledge bases and sharing intensity, the development of ACAP of firms in each cluster will also not be uniform (Solano et al., 2020). Even so, the cluster is a possibility for the firm to access innovations or obtain information to develop them to meet its needs (Albuquerque, 2016; Porter, 1998). The adoption of innovations and sustainable practices is related to the firm's ability to acquire external information, assimilate it, transform it, and use it (Aboelmaged & Hashem, 2019).

Firms that have a higher level of participation in the cluster have the possibility of greater access to resources, more remarkable capacity development, as well as an increase in the quality of products and services (Lis & Rozkwitalska, 2020). Participating in the cluster makes it possible to identify customer needs more quickly, greater flexibility in decisions, and agility in adopting actions aimed at sustainability (Larentis et al., 2013). More helpful knowledge sharing allows for generating more sustainability practices (Riikkinen et al., 2017). In this same sense, greater participation in the cluster allows greater connection with the participants, generating benefits and advantages for members (Pinkse et al., 2018).

Making the adoption of sustainability practices a reality is still a challenge for firms, even for those that operate in clusters, those form partnerships and establish networks, and even more difficult for those firms that carry out some actions in isolation (Larentis et al., 2013). Most participants in a cluster can acquire, assimilate, transform, and use external knowledge to generate sustainability practices compared to firms with a lower participation level.

CONCLUSION

This study aimed to analyze the role of the firm's participation level in a cluster in the relation between absorptive capacity and practices of economic, social, and environmental sustainability in small and medium-sized firms. We sought to respond to research calls to deepen the relation between organizational capabilities and sustainability (Annunziata et al., 2018; Gelhard & Delft, 2016; Langenus & Dooms, 2018; Riikkinen et al., 2017; Salim et al., 2019), as well as to the need to study the moderating function of the context and the agglomerations where firms are located (Galdeano-Gómez et al., 2008).

It is understood that in small and medium-sized firms participating in a cluster, the absorptive capacity influences the adoption of sustainability practices in a heterogeneous way since the size of the effect generated differs in each of the dimensions. Therefore, in a certain period, the focus may be on economic practices, and in another period on environmental or social practices. This reality leads the firm to seek external information and use it according to the moment experienced and its resources. Such results contribute to the literature as they approach the calls made by Salim et al. (2019), Annunziata et al. (2018), Amui et al. (2017), and Gelhard and Delft (2016). It was found that the adoption of sustainability practices is influenced by the firm's ability to acquire, assimilate, transform, and use external information and that this relation is enhanced as the firm's level of participation in the cluster increases. This result contributes to Galdeano-Gómez et al.'s (2008) study of the moderating role of the geographic context, such as cluster participation.

Therefore, it is suggested that it is necessary for small and medium-sized firms participating in a cluster to develop their absorptive capacity, considering that knowledge is a resource with essential characteristics for the adoption of sustainability practices.

Firms need to devise strategies to achieve competitive advantages, and the adoption of sustainability practices is a possibility to achieve a performance superior to that of their competitors. The results indicated that absorptive capacity generates practices of economic, social, and environmental sustainability. It also reinforces the importance of firms to acquire external information, assimilate it, transform it, and use it. That way, they will be more prepared to operate in a dynamic and competitive market.

It is concluded that participation in the cluster allows the firm to achieve advantages since both the high level and the low level of participation moderate the relation between absorptive capacity and practices of economic, social, and environmental sustainability. However, the high level had a more significant effect than the low level, indicating that the firms that most participate in the cluster have greater strength in the effect of ACAP as a generator of sustainability practices. In this sense, firms must return efforts to increase their relation with other firms within the cluster, either by intensifying specific commercial transactions or by establishing long-term relation with other actors in the cluster.

When adopting sustainability practices, doubts may arise. When this occurs, it is suggested that managers seek to identify and acquire important external information to develop the firm's

activities. One suggestion is to establish partnerships with other firms, universities, and research centers. Based on their routines and processes, it is indicated that firms analyze, process, interpret, and understand the information acquired. In possession of the acquired knowledge externally, one can decide what could/should be changed in their routines and processes. The next step is to leverage the skills or create others, to facilitate the adoption of new practices – in this case, sustainability practices.

Some aspects can be considered as limitations in this study. One of them refers to the number of cases collected per cluster. In the case of many cases per cluster, the results can be compared to deepen the relations between the constructs. Another limitation related to the previous one is that in some clusters, the number of respondents was small, with the possibility of bias, since the analysis was performed based on all respondents.

Another limitation to be highlighted refers to the issue of technological intensity. On this subject, the study made small approximations. Technological intensity is related to the development of a place or nation. High technological intensity is related to the generation of new jobs in sophisticated and high technology services. This relation also drives salaries in the sectors. However, in some regions, especially in some countries, this stage is not reached and is restricted to middle income, which may be linked to low technology and complexity.

Future studies may expand the collection to have a closer number of respondents per cluster and make it possible to compare the results between the clusters, such as, for sample, the food sector, compared to the metallurgy and furniture sector. Future studies may also address the technological intensity in the clusters and seek explanations for their relation with the generation of jobs and income, to understand the reality of the place under study. One can also study the relation between technological intensity and knowledge flows within the clusters.

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Annex 1 — Research instrument used for data collection

Table A1

Sustainability practices construct

Order	Question	Construct	Code
01	How committed was my company to efficiency and productivity?	Economic	PSECO1
02	How committed was my company with actions to face crises and survive in the market?	Economic	PSECO2
03	How committed was my company to comply with tax obligations?	Economic	PSECO3
04	How committed was my company to managing and improving processes?	Economic	PSECO4
05	How committed was my company to activities aimed at reducing costs?	Economic	PSECO5
06	How committed was my company to practices aimed at reducing material waste?	Environmental	PSAMB1
07	How committed was my company to practices that aim to minimize environmental impacts?	Environmental	PSAMB2
08	How committed was my company to the separation of recyclable material?	Environmental	PSAMB3
09	How committed was my company to the efficient use of available resources in the environment?	Environmental	PSAMB4
10	How committed was my company to reusing consumables or encouraging their reuse?	Environmental	PSAMB5
11	How committed has my company been to providing education or training to employees?	Social	PSSOC1
12	How committed was my company to practices that ensure the health and safety of employees and customers?	Social	PSSOC2
13	How committed was my company to practices that guarantee workers' rights?	Social	PSSOC3
14	How committed was my company to improvement actions aimed at employee benefits and incentives?	Social	PSSOC4
15	How committed was my company to practices aimed at attracting and retaining talent?	Social	PSSOC5

Table A2

Absorptive capacity construct

Order	Question	Code
01	My company has the ability to recognize and acquire external knowledge.	AC1REC
02	My company has the ability to understand and internally disseminate the knowledge acquired externally.	AC2ASS
03	My company has the ability to combine internal knowledge with new external knowledge.	AC3COM
04	My company has the ability to use new knowledge to develop products/services.	ACP4USAR

Table A3

Level of participation in the cluster construct

Order	Question	Code
01	In the last three years, participating in cluster xxx in municipality xxxx favored the growth of my company.	CL1CRESC
02	In the last three years, participating in cluster xxx in municipality xxxx favored my company to establish partnerships.	CL2PARCE
03	In the last three years, participating in cluster xxx in municipality xxxx favored my company to carry out innovations.	CL3INOVA
04	In the last three years, participating in cluster xxx in municipality xxxx helped my company to increase productivity.	CL4PRODU

Note. * The spaces xxx and xxxx were replaced respectively by the cluster name and the name of the municipality where the cluster is established. When forwarding to companies in another cluster, the xxx and xxxx were again replaced.