The Link Between Advanced Servitization, Global Distribution Channels and the Longitudinal Performance of Sales in International Markets

Waleed Shleha

Toulouse School of Management, Toulouse, France

Yancy Vaillant

Department of Strategy, Entrepreneurship and Innovation, TBS Education, Toulouse, France, and

Jonathan Calleja-Blanco

Department d'Empresa, Facultat d'Economia i Empresa, Universitat de Barcelona, Barcelona, Spain

ABSTRACT

Purpose: The research presented in this paper has been conducted to understand the impact of advanced-servitized-products on the longitudinal sales performance of manufacturing companies across international markets. The research strives to understand how the onsite presence leverages this impact.

Method: To reach this objective, an empirical sample of more than 4,000 sales transactions covering the period 2010-2019 in 74 foreign markets was collected from a single high-tech manufacturer producing and selling servitized solutions. We use a time fixed-effects model to test our theoretically deduced hypotheses.

Findings: We find the proportion of advanced servitized products to positively impact sales performance over time and that this relation is moderated by the choice of international distribution channel. As compared to direct exports, onsite presence and intermediaries present a positive and negative moderating effect, respectively.

Keywords: Servitization, Distribution Channels, Service, Internationalization, Service-dominant logic.

1. Introduction

Internationally, manufacturers are shifting their strategies from product-based to service-augmented value propositions (Gomes *et al*., 2021). Such transformation happens because manufacturers realize that bundling products with value-adding services is a potential source of competitive advantage when competing in international markets (Bustinza *et al*., 2021; Bustinza *et al*., 2017). Such product-service bundling is known as “Servitization" and it is defined as a process of enhancing the product’s core value by establishing product-service systems to meet the needs of customers (Vandermerwe and Rada, 1988). The positive impact of servitization on firm performance, in terms of sales growth, value generation, and profitability has been empirically confirmed (Gomes *et al*., 2021; Bustinza *et al*., 2019; Kohtamäki and Partanen, 2016; Antioco *et al.,* 2008; Eggert *et al.,* 2014).

Service injection and innovation are at the core of product-service systems bundling, where servitization is directly linked to the service-dominant-logic (Aminoff and Hakanen, 2018; Kowalkowski, 2010). The service-dominant-logic considers all actors implicated in such service-based value generation, shedding the light on the importance of involving distribution channels and customers in value creation and co-creation (Hakanen *et al*., 2017; Vargo and Lusch, 2004). This focus involves developing and maintaining strong relationships and fluid communication between manufacturers and their customers in international markets. These communications are managed or controlled through direct channels, by manufacturers, or indirect channels, through intermediaries (Ekeledo and Sivakumar, 2004; Gadde, 2014), synchronically in local and international markets (Malhotra *et al*., 2003).

Intermediaries can be commercial, relational or knowledge transfer-based and collectively they are described as international distribution channels (Vendrell-Herrero *et al*., 2020a; Aminoff and

Hakanen, 2018). These channels are crucial for conveying the knowledge transfer between manufacturers and the end customers (Skarmeas *et al*., 2008). Their role becomes critical in international markets due to the physical and cultural distance between producers in one country and their customers in another country (Tokman and Beitelspacher, 2011). In the case of servitization strategy on an international scale, international distribution channels play a key role due to the critical need for close contact with the customer. Manufacturers can obtain and use needed customer knowledge and, subsequently, employ this knowledge to fulfill the customers' needs through a downstream oriented service approach and value-proposition (Liu *et al*., 2019; Lusch *et al.,* 2010; Tokman and Beitelspacher, 2011). Therefore, global distribution channels are expected to impact the effectiveness of servitization strategies and consequently affect the firm's international performance (Vendrell-Herrero *et al*., 2020a)

Nevertheless, when manufacturers implement servitization strategy as part of their global expansion, they encounter various levels of challenges (Parida and Jovanovic, 2022). Like any international business, international manufacturers who adopt servitization face the challenge of the psychic distance caused by the differences in cultures and business practices (O'Grady and Lane, 1996). International manufacturers need to know and realize what are the best product-service offerings for their international customers so as to be able to achieve desired competitive advantage (Vendrell-Herrero *et al*., 2021a; Parida and Jovanovic, 2022; Zhou *et al.*, 2021). Furthermore, international servitization manufacturers need to reduce the psychic distance to be able to acquire the needed knowledge from their customers (Chester Goduscheit and Faullant, 2018). However, little attention has been given to examine the link between product servitization, global distribution channels, and the firm's international performance (Parida and Jovanovic, 2022; Aminoff and Hakanen, 2018; Hakanen and Aminoff, 2016).

Our study argues, based on the servitization literature and the meta-theoretical foundations of the service-dominant-logic, that advanced-servitized-products positively affect the international performance of manufacturers over time. International performance is measured by the level of sales. Furthermore, we argue that global distribution channels (onsite presence and intermediaries) moderate the link between advanced-servitized-products and sales performance, where onsite presence positively influence this relation, but external intermediary channels have the opposite moderating effect (Li *et al*., 2019). To test our hypotheses and proposed theoretical framework, we analyze an original dataset, collected from a high-tech manufacturer specialized in optic servitized solutions. The data was collected from 2010 to 2019, inclusively.

Our analysis makes the following key contributions and implications. First, we contribute to prior literature by exploring the relationship between advanced-servitized-products, sales performance in international markets, and global distribution channels, through the lens of the service-dominant-logic. Second, we strive to enrich the understanding of the role of global distribution channels in selling advanced-servitized-products internationally, and how this role impacts the performance of servitized manufacturers. Finally, our findings give indications that may be helpful for servitized manufacturing firms. The results of the study indicate that global distribution channels are essential for value co-creation through advanced-servitized-products, knowing that this importance will vary depending on the channel, where physical presence in the customer's home-market has the highest positive impact.

2. Theoretical Framework

2.1 Service Dominant Logic

In consonance with contemporary marketing theoretical frameworks, *e. g.*, network perspectives and interaction perspectives, Vargo and Lusch (2004) synthesized and introduced the concept of the service-dominant-logic (Kowalkowski, 2010; Aitken *et al*., 2006; Day, 2014). The authors first define the term "Service" as: *"The application of specialized competences (skills and knowledge), through deeds, processes, and performances for the benefit of another entity or the entity itself."* Through the lens of service-dominant-logic, service is considered as a fundamental element for businesses to gain advantages against competition, propose and co-create a value, and grow in the global market. In contrast, goods are considered the support mechanism in business to enable service provision (Vargo and Lusch, 2008; Bustinza *et al*., 2019a). Following the latter differentiation between service and goods, Vargo and Lusch (2004) distinguish firms' resources into two forms; "Operant" and "Operand". Operant resources include knowledge and skills, which are the core elements of the service (Lusch *et al*., 2007). Operand resources are physical assets, such as plants and equipment, which have a vital importance for the counterparty "Goods-Dominant Logic" (Chakkol *et al*., 2014).

The distinguished resources paved the road for scholars to relate the service-dominant-logic with product-service offerings. Scholars adopted the service-dominant-logic to explain how these offerings influence the firm's sales or financial performance (Queiroz *et al*., 2020) and how the offerings affect the global distribution channels (Aminoff and Hakanen, 2018; Sousa and da Silveira, 2017). In this research, we adopt the service-dominant logic's three meta-theoretical foundations: network of actors, resource density and resource integration.

First, in the network of actors, the service-dominant-logic emphasizes the role of the customers in value creation and co-creation. The service-dominant-logic addresses the downstream shift in the supply chain, whereby the dyadic relationship between suppliers and producer will be extended to include customers and mediators (Burton *et al*., 2017; Vargo and Lusch, 2017; Wynstra *et al*., 2010). Research shows that companies that offer product-service systems can gain robust benefits from various collaborations with downstream partners, *e*. *g*., network of global intermediaries and customers (Aminoff and Hakanen, 2018; Hakanen *et al*., 2017), and increased co-creation to improve product innovation and inventiveness (Zhou *et al*., 2021)

Second, the ability of global companies to acquire and activate the resources required to offer value to the customer is measured by resource density (Lusch *et al*., 2010). It highlights a company's ability to respond to international market needs, create relevant new value propositions and, hence, supply new service solutions by utilizing its operant resources (Chester Goduscheit and Faullant, 2018; Melton and Hartline, 2013; Vargo and Lusch, 2004). For value creation and co-creation, international actors need to interchange contextually relevant resources (Lusch and Nambisan, 2015). According to the service-dominant-logic, the optimal service is delivered as a result of the highest resource density levels. This density is achievable when the optimum resources' combination is adequately interchanged (Lusch and Nambisan, 2015; Lusch *et al*., 2010).

The interchange is firmly embedded in the firm’s operant resources. Unlike operand resources - that are produced to create an impact but easy to copy - operant resources are considered the core competences to create a value and a competitive advantage that is difficult to imitate (Chester Goduscheit and Faullant, 2018). The literature shows the impact of resource density on the agility and performance of global companies (Li *et al*., 2021).

Third, the service-dominant-logic considers that all actors are potential value creators. It perceives integrating resources, alongside with customers, a crucial factor to achieve irreplaceable competitive advantage (Vargo and Lusch, 2008; Brodie *et al*., 2019). Service researchers argue that by integrating resources with customers, companies can gain international competitive advantages through value co-creation (Lusch and Nambisan, 2015). Subsequently, companies' proximity to their international customers is considered a substantial factor to enable companies to create and co-creating such value (Chester Goduscheit and Faullant, 2018). The core of this proximity occurs through 'value-in-use', where the customer can use the given service and interchange the resources (*e. g*., knowledge) with producers during the lifespan of the offering (Grönroos and Voima, 2013). The closer the company to its customer, the better the knowledge interchange between the two actors, and the bigger the participation of the customer in co-creating a better offering (O'Cass and Sok, 2015; Ngo and O'Cass, 2013). Research shows the role of customer's proximity to the producer and the positive impact of co-creation through value-in-use (Chester Goduscheit and Faullant, 2018; Vetterli *et al*., 2016; Van de Vrande *et al*., 2009).

2.2 Servitization in the international context

International manufacturing companies incorporate services into their products as a means to generate new competitive advantages in international markets (Rabetino *et al*., 2018; Li *et al*., 2021). In general, international manufacturers transition their business model from trading a mere product towards servitization through the development of product-service offerings (Vendrell-Herrero *et al*., 2020; Aminoff and Hakanen, 2018). The competitive advantage is mainly embedded in increasing the value-added of the offerings through enhancing the products with services (Bustinza *et al*., 2019).

However, international manufacturers who implement servitization strategy often face multiple challenges while penetrating new markets (Parida and Jovanovic, 2022). The main challenge facing managers is defining whether to offer basic services, where they maintain the minimal amount of effort and cost, or they offer more advanced services, where they require a higher cost of maintenance (Sousa and da Silveira, 2017). Nonetheless, regardless of the level of international offerings, manufacturers still need to define the optimal international distribution channels (Parida and Jovanovic, 2022; Aminoff and Hakanen, 2018; Hakanen and Aminoff, 2016). This need is more vivid when international manufacturers offer their international customers different types of servitization. And how the different levels of servitization and international distribution channels will impact the international sales growth of manufactures over time.

2.3 Levels of servitization

Servitization scholars have studied different types of product-service offerings (Bustinza *et al*., 2021). A common categorization distinguishes between servitization levels, such as basic and advanced (Sousa and da Silveira, 2017; Sousa and da Silveira, 2019). Eggert *et al*. (2014) analyzed the impact of different types of product servitization on growth strategies and concluded that firm performance depends on the level of servitization implemented. The categorization of servitization in different levels is made in accordance with the type of added services, and how these services are participating in the value creation of the offerings (Baines et al., 2009).

Add-on services, *e. g.*, physical product development, logistics services or basic maintenance, are considered as basic services in the literature of servitization (Rabetino *et al*., 2021; Kohtamäki *et al*., 2020). The logic of basic-servitized-products is consonant with the logic of product-centric approach, where the product is considered as the core value, while services are considered a support mechanism to the main manufactured product (Vargo and Lusch, 2004; Vargo and Lusch,

2008). The value in this strategy is considered in the "exchange" of the product with add-on services where customers are perceived as passive receivers of the offerings (Green *et al*., 2017).

Alternatively, another stream of servitization research focuses on the value-added of advanced servitization through the quality of included services to the offerings (Bustinza *et al*., 2019a; Rabetino *et al*., 2017, 2018; Rönnberg Sjödin *et al*., 2016). Although researchers do not downsize the significance of the physical product, the focus in this approach shifts towards the combined service actions and their added value (Bustinza *et al*., 2021). Since the customers are the receivers of the offerings, they are seen as inherent in the process of value-creation and co-creation (Green *et al*., 2017). Manufacturers are proposing the value through their offerings and customers, however, determine the value through the use of the delivered offerings (Vargo and Lusch, 2004). In other words, the value-in-use is an essential component in the service-centric approach of advanced servitization. Therefore, after customers use the designed offerings, they play a crucial role in developing and re-developing new offers from manufacturers. The value-added happens in the re-designed service actions, albeit the probable changes and modifications on the physical products (Green *et al*., 2017). This value-added would not effectively materialize without the collaboration and resource integration between manufacturers and customers (Bustinza *et al*., 2021; Jaakkola and Hakanen, 2013).

This type of service actions, such as specialized trainings, digital services, long service contracts and Pay-Per-Use are defined as advanced services in the servitization literature (Bustinza *et al*., 2019; Rabetino *et al*., 2017, 2018; Sousa and Silveira, 2017; Sousa and da Silveira, 2019). This approach is customer-centric in that the customer is considered a main actor in value-creation and a resource integrator. Additionally, products are considered as a support mechanism to the delivered services (Vargo and Lusch, 2004). The core distinction of advanced servitization is

explained through the density of the integrated resources with downstream actors, such as global distributors and customers (Liu *et al*., 2019; Kowalkowski 2010; Normann, 2001). The higher the density of provided service, the better perception of the value-in-use, and the more effective value creation and co-creation (Grönroos and Voima, 2013).

Generally, categorizing servitization into levels helps manufacturers with two main advantages (Baines et al., 2009): first, it presents the qualitative difference in servitization strategy and, second, it is helpful to analyze the quantitative maturity level and its impact on performance, such as sales and/or profitability (Sousa and da Silveira, 2019). In this research we explore the impact of advanced-servitized-products on the firm's international sales performance. Advanced-servitized-products, in contrast to basic-servitized-products, are highly customer-oriented and focus on the value co-creation process with customers.

3. Hypotheses development

3.1 Advanced servitized products and international performance

Advanced servitized products in international markets are combined with sophisticated service actions (Bustinza *et al*., 2019; Rabetino *et al*., 2017, 2018; Sousa and Silveira, 2019; Aminoff and Hakanen, 2018; Sousa and da Silveira, 2017; Hakanen and Aminoff, 2016). The value in this combination is proposed in the use of the offering by the customer, where manufacturers and customers become partners and co-actors in delivering the desired service to the customer (Vargo and Lusch, 2004; Vargo and Lusch 2008). Consequently, downstream network expansion is fundamental for manufacturers to prospectively integrate the resources and interchange knowledge with distribution channels and customers (Lusch and Nambisan, 2015).

Unlike basic servitization, advanced-servitized-products require long-term relationship building between co-actors (Lafuente *et al*., 2017, 2019; Vaillant *et al*., 2019; Vendrell-Herrero *et al*., 2021). These offerings imply an advanced level of complexity of the proposed service (Liu *et al*., 2019). In order to deliver such a complex level of service to the customer, the actors' network, including manufacturers, international distribution channels and customers, have to commit to a long time relationship (Vendrell-Herrero et al., 2021; Parida and Jovanovic, 2022), by-virtue-of the need to propose the first service from the manufacturer to the customer, get feedback from the customer after use and apply the knowledge and skills to re-deliver a modified service according to the co-created value (Li *et al*., 2021). Nonetheless, the long-term interaction between actors creates a mutual trust, as well as a deeper understanding of the customer's needs and wants. Manufacturers, therefore, become able to produce more complex service that proposes higher value to the customers (Liu *et al*., 2019; Kowalkowski, 2010), and a consequent satisfaction is obtained by customers (Jaakkola and Hakanen, 2013; Oliva and Kallenberg, 2003)

Customers find advanced-servitized-products offerings more service centric and, therefore, they will be more willing to invest in such offerings thanks to the consequent higher added value (Antioco *et al*., 2008). For manufacturing companies, such value-added will translate into better international sales over time (Sousa and da Silveira, 2017).

We therefore present the following hypothesis:

Hypothesis 1: *Offering greater proportions of Advanced Servitized Products has a positive impact on international sales performance over time.*

3.2 Global Distribution Channels of Servitizing Manufacturers

Several studies have examined multiple moderation factors between servitization and firm performance (Moreno *et al*., 2019; Ruiz-Alba *et al*., 2019; Zhang *et al*., 2020; Martín-Peña *et al*., 2020; Zhou *et al*., 2020; Hyun and Kim, 2021; Zhou *et al*., 2021; Li *et al*., 2021). Scholars have explored the relationship between product servitization, supply chain integration (Li *et al*., 2021), supply chain network (Zhou *et al*., 2020) and firm performance. Li *et al*. (2021) examined the moderating role of supply chain integration between the basic and advanced levels of servitization and firm performance. They confirm that supplier integration and customer integration have a positive moderating role. Zhou *et al*. (2020) analyze and confirm that the supply chain network has a partial moderating impact on the link between servitization and performance. Moreover, Aminoff and Hakanen (2018) analyze the combined relationship among servitization, distribution channels and performance. They examine the direct impact of servitization on performance and distribution channels individually, using the service-dominant-logic. They confirm that servitization positively affects performance, and it builds a value co-creation network among distributors and manufacturers.

Manufacturing firms use multiple types of distribution channels depending on their servitization strategies (Vendrell-Herrero *et al*., 2020a). The selection of appropriate distribution channels depends on two critical elements (Kaleka, 2002; Lin and Chen, 2018): first, financial and operational characteristics of the manufacturing firms that implement servitization to compete in international markets (Vendrell-Herrero *et al*., 2021a) and, second, the role of distribution channels in transferring knowledge and information to and from the customer (Aminoff and Hakanen, 2018).

The distribution channels refer to either the direct existence of the manufacturer in the destination country, or through a network of intermediaries (Liu, 2017; Olsson *et al*., 2013). These distribution channels have a different impact on the relationship between product servitized strategy and firm performance (Mehta *et al*., 2006; Sousa and da Silveira, 2017). Selecting adequate global distribution channels for manufacturing firms implementing servitization is critical and challenging for managers to make their advanced-servitized-products competitive in foreign markets (Zou *et al*., 2011; Aminoff and Hakanen, 2018). In the case of the international servitized products, the complexity of the advanced-servitized-products requires proper competences from the team who is delivering the servitized offerings in the host country. In the case of delivering such offerings through intermediaries, the latter should have enough knowledge and experience with the product, added services and service mindset to be able to deliver the optimum solution to the customer. Without this, the desired solution may reach the end-user with little value proposition and the customer satisfaction may negatively be impacted (Aminoff and Hakanen, 2018).

Based on the need to integrate resources with the network of actors (Lusch and Nambisan, 2015), we argue that the onsite presence of a global distribution channel has the highest positive moderating role between servitized products and sales performance in international markets. We support our argument with the fact that onsite presence provides a direct proximity between the manufacturers and customers and, subsequently a smooth flow of knowledge and information directly to and from end customers (Li *et al*., 2019; Aminoff and Hakanen, 2018). This allows for greater value-added through better value creation of the service augmented products. Customers also feel a more secure connection with manufacturing firms through direct interaction with the support team available in the foreign market and acknowledge the advanced-servitized-products features that positively influence the firm's international sales performance (Li *et al*., 2019; Zhou

et al., 2020). Distant or indirect distribution channels distort the effective flow of information between servitized manufacturers and their international clients by having a relatively poorer transfer of information to end customers, by not giving manufacturers direct customer feedback; and since it has been documented that intermediary firms often feel insecure about sharing customer information with manufacturers (Aminoff and Hakanen, 2018). Such indirect exchange between manufacturers of advanced-servitized-products and their end customers can become detrimental to advanced value-creation, value-customization, and consequently, value perception. The use of external intermediaries may therefore not be ideal for the international sale of advanced-servitized-products.

Following the previous discussion, we hypothesize:

Hypothesis 2a: *Onsite distribution by manufacturers has a positive moderating impact on the relation between Advanced Servitized Products and international sales performance.*

Hypothesis 2b: *Distribution through intermediaries has a negative moderating impact on the relation between Advanced Servitized Products and international sales performance.*

4. Methodology

4.1 Data

To test our hypotheses, we make use of primary data from a Polish international servitized manufacturer, selling high-tech optic solutions for companies worldwide. Its main product lines are offered at different service-augmented levels and diverse product-service integrated solutions.

Confidential data was directly provided by the company, upon request and non-disclosure agreements signed by the authors of this study.

Only foreign markets being considered, our original dataset gathers 12,751 observations, from 2010 to 2019[1], inclusively. Each observation refers to an individual item sold by the company. Most of these items were labeled either as a product (*i. e.*, a main device or an added accessory) or as a service (*i. e.*, a specific advanced service or any sort of customization for the main product). All these services were customer-oriented, such as software adapted configuration, training (often on-site), software development, specific licensing or hosting, among others.

In practice, several items can be included within the same invoice, and several invoices can create a business transaction. So, first, items were classified under their unique invoice ID. Second, transactions were built on the aggregation of invoices: a given client with two or more different invoices within a period of 15 days would be considered as one single transaction. Often, an accessory or a service can be requested to complement a recent (product) acquisition[2]. This aggregation resulted in a total of 4,024 transactions, 661 of them including products in tandem with advanced services. The other 3,363 transactions refer only to isolated products or services. If only transport and/or payment services were included, the transaction was previously dropped, as they are not specifically meant to servitize. Finally, transactions were leveled up per country, which is *the unit of analysis*, and year[3]. This leveling offers us an unbalanced panel dataset for 10 years in 74 countries. *Annex* 1 shows a map with all the countries the company had sales over the

[1] 2010 is the year this company started its international expansion and 2019 is the last year of data available. Plus, data from 2020 would be indeed affected by the pandemic shocks.

[2] Considering only follow-up invoices, that is, excluding the first invoice where the client generally acquires a main product, only 14% of the items sold were devices. That illustrates that the majority of subsequent invoices within the same transaction arise on the need to complement the starting purchase. Reasonably, the client can understand its specific needs and/or customization within the 15 days after buying the main device.

[3] In our data, no two invoices within the same transaction occur over two different years.

10-years period, as well as the distribution channel used (this variable is explained in the following section).

4.2 Variable Description

Dependent variable – The (logged) sales quantifies the sum of the real sales value of the company, for a country in a specific year (Sousa and da Silveira, 2017; Queiroz *et al*., 2020). Nominal sales were deflated by the Polish service producer index (base = 2010). Namely, the cumulative service producer index is used to assess the value of sales in constant 2010 prices. Our data does not provide further information to build other performance measurements at the country level. For instance, to measure productivity or profitability, we lack not only data on inputs and costs, respectively, but also the allocation mechanisms necessary to obtain a trustable country-level measurement.

Independent variables – Proportion represents the average (monetary) importance of services within transactions, for a country in a specific year, in percentage terms. We calculate this for the subset of 661 transactions of advanced-servitized-products. That is, we exclude transactions containing only products or only services, as the percentage of services would be 0 or 100, respectively. First, we calculate per individual transaction the percentage that the value of services represents over the total monetary value of that transaction (*i. e*., real sales). Then, these percentages are averaged out per country and year.

The distribution channel variable is categorized according to the entry mode the firm is using to serve its products in a given country and year: exports from the home country (v=0), sales through intermediaries (v=1) and onsite presence (v=2). The latter represents the highest level of investment effort, where the company has directly established its technical and sales operations in

the host country. We expect onsite presence to positively moderate the impact of the proportion of advanced-servitized-products on sales as compared to direct exports. To the contrary, the use of intermediaries is expected to negatively moderate international performance, as the information flows and the value-adding services for the customer are distorted. For many countries in the sample, the company changed from one channel to another over the years. Specifically, starting with direct sales, it changed to intermediaries or onsite presence[4] (see *Annex* 1 for a map on countries served and distribution channels).

Control Variables – the Global Competitiveness Index (GCI) aims to control for country specific characteristics changing over time. This multi-level index collects different economic and development indicators, ranking countries on their competitiveness and prosperity levels. The yearly GCI score[5] is directly assigned to countries in the dataset. As well, we included a set of regional dummy variables to collect some regional characteristics affecting countries similarly. Ten world regions were created: Eastern Europe, Western Europe, North America, Latin America, Africa, Middle East, Central Asia, East Asia, South Asia and Oceania.

It is relevant to mention that for our data we observed around 75% of the customers making transactions only in one year. The optic solution device provided by this company is meant to have a few years lifespan. An average client would not repeat a purchase if the product works properly. That is, new sales in the country are caused by company efforts to find new clients rather than repeated transactions with the same clients. In that sense, the year sales and its lagged value can be correlated because of the company expansion but not because of the clients' repetition (Vaillant

[4] In 2019, the company had an onsite presence for 15% of the countries where it has clients: Andorra, Austria, Canada, Chile, France, Germany, Ireland, Portugal, Spain, United Kingdom and United States.
[5] GCI 4.0 for the years 2018 and 2019 (scale 0 to 100) were adapted to previous years' scoring (scale 1 to 7).

et al., 2019a). We included in our models the lag for our dependent variable, as well as the lag of the proportion of advanced-servitized-products. The latter may account for patterns in the product-service solutions provided by the company.

Table 1 shows the descriptive statistics for the variables used in this study, both for the overall sample and the subset including advanced-servitized-products. Our dependent variable for the real sales value shows the high dispersion of the company performance among countries (mean > quartile 3). Being a young entity, we think this behavior is normal as it is still expanding for some markets. It is interesting how, for countries where advanced-servitized-products transactions happened, the average amount of sales duplicates the global mean. We can see the same pattern with the quartiles' results. For the independent variable, measuring the relative importance of services within transactions, we found the average percentage to be 14.64% (zeros excluded in the advanced-servitized-products subset). A few countries had values over 50% (maximum 73%), increasing this average value considerably (see how this mean value is closer to quartile 3 than quartile 1).

--- Table 1 here ---

4.3 Methodology

A fixed-effects estimation would analyze how the company performance varies within the countries, across the years (Wooldridge, 2008). In other words, how sales change over time, affected by the proportion of advanced servitization, while ruling out any country-specific effect, observed or unobserved. Often, models control for both individual and year effects, that is, two-ways effects. However, recent studies put into question the real utility of two-ways models, arguing that only one-way specifications cleanly capture the panel data dimensions aimed (Kropko and

Kubinec, 2020). Thus, as we are using data from a single company, it is more appropriate to control for time effects: matrix strategic decisions (*e. g.*, new services offered) or economic cycles may affect all foreign markets similarly. A time fixed-effects model eliminates bias from unobserved variables that are constant across countries, or affects countries the same way, but evolve over time. As the country effect may still have an influence, we include the GCI index and the country region as controls. We propose the following time fixed effects model:

$$\begin{aligned}\ln(sales_{it}) = \quad & \beta_1\, Proportion_{it} + \beta_2\, Proportion_{it-1} + \beta_3\, \ln(sales_{it-1}) \\ & + \beta_4\, Intermediary_{it} + \beta_5\, Onsite_{it} \\ & + \beta_6\, Proportion * Intermediary_{it} + \beta_7\, Proportion * Onsite_{it} \\ & + \beta_8\, GCI_{it} + \beta_9\, Region_i + \eta_t + \varepsilon_{it}\end{aligned} \qquad (1)$$

In equation (1), the dependent variable represents the log of real sales per country *i* (*i=1, 2,…,74*) and year *t* (*t=1, 2,…,10*). β_j are parameter estimates for the j^{th} independent/control variable. η_t refers to the time-specific intercepts, accounting for unobserved heterogeneity over time. It contains time trends that influence sales, eliminating bias from variables changing across countries in a given year. Finally, ε_{it} represent the residuals, across-countries and across-time.

For this study, we expect $\beta_1 > 0$, where a higher proportion of advanced servitization would positively impact the international sales performance of the company (**H1**). Moreover, we predict that $\beta_5 > 0$, showing the positive impact of onsite presence. Eventually, interaction terms are included to assess how the distribution channels in place moderate the positive impact of advance servitization proportion on sales. In that sense, we expect $\beta_7 > 0$ (**H2a**), showing that onsite distribution channels enhance that positive impact, as compared to direct exports. In contrast to

this, the use of intermediaries may hamper servitization efforts and the positive impact is attenuated, as compared to direct exports $\beta_6 < 0$ (**H2b**).

5. Results

The time fixed-effects models estimating the impact of the proportion of advanced servitization on sales performance are depicted in *Table 2*. Model in column (1) provides support to our Hypothesis 1 (H1): a higher proportion of advanced servitization has a positive impact on the international sales of the company over time ($\beta_1 = 4.248$). This result is aligned with past evidence (Sousa and da Silveira, 2017; Queiroz *et al*., 2020), indicating that firms find increased performance in the international markets as a result of higher servitization efforts.

--- Table 2 here ---

Model in column (2) introduces the distribution channel set of dummies, where the direct exports act as the reference category. The proportion of advanced servitization holds its positive impact on sales ($\beta_1 = 4.390$). Plus, we find the onsite expansion mode to exert the strongest positive impact on the sales performance, as compared to direct exports alternative ($\beta_5 = 0.607$).

Model in column (3) adds the interaction between the proportion of advanced servitization and the distribution channels, direct exports as the baseline. This model reinforces the positive impact of advanced servitization proportion on sales over time, as expected in our first hypothesis ($\beta_1 = 5.229$). Findings also support our second hypotheses (H2a & H2b). On the one hand, onsite presence of the company positively moderates the impact that a higher proportion of advanced servitization has on sales performance ($\beta_7 = 8.263$). In other words, onsite activities have a

positive leverage effect on how a higher proportion of advanced servitization contributes to increased performance. Interestingly, model (3) also indicates that it is the interaction effect that contributes the most to increase the international performance, mitigating the onsite channel contribution *per se*. Technically, the interaction term being positive shows us that the positive relation between the proportion of advanced servitization and international sales presents a higher slope when onsite presence is the distribution channel being used. Figure 1 partially depicts this fact. As compared to direct exports, the slope of the onsite distribution channel over the years is significantly higher. An interpretation of this is that direct contact between the company and the client in the host country, allowing for knowledge flows and co-creation (Liu *et al*., 2019), clearly benefits performance. We can also observe that the onsite alternative does not present the highest proportions of servitization (*i. e*., points' size).

On the other hand, the use of intermediaries has a negative leverage effect on how a higher proportion of advanced servitization contributes to increased performance ($\beta_6 = -2.400$). However, the interpretation here seems slightly different. Using intermediaries in the host country increases performance, *per se*, as compared to direct exports ($\beta_4 = 0.541$). But increasing the proportion of advanced servitization in countries with intermediaries does not pay off, as shown by the negative interaction effect. This result endorses the idea that intermediaries weaken the capacity for co-creation and information flows. Figure 1 also shows this situation, as the case of intermediaries, while being better than direct exports as a whole, over the years, it presents the lowest slope. Plus, we can observe very high levels of servitization within this channel, but that is not always translated into higher sales.

--- Figure 1 here ---

We must also note that the lagged value of sales is positively correlated with the actual value of sales. However, as suggested above, we can conclude that the main reason for this result is not client repetition (recall the long-term lifespan of this product). Given the high rate of new clients every year, we link this correlation with company efforts to find new markets or any sort of word-to-mouth effect among industry partners in the host countries.

Finally, for all models we estimated the Hausman (1978) specification test to validate the appropriateness of our fixed-effects model. Results of this test indicate that fixed effects estimators are consistent, as compared to random effects model estimators.

6. Concluding Remarks and Implications

The research presented in this paper is conducted to understand the impact of advanced-servitized-products on the longitudinal sales performance of manufacturing companies across international markets. In our study, we strive to understand how onsite presence leverages the aforementioned impact, as compared to direct exports or intermediaries. To do so, data was originally collected from a high-tech manufacturer specialized in producing and selling optic servitized solutions worldwide. We made use of a sample with more than 4,000 sales transactions, part of them including advanced-servitized-products with different levels of servitization. The sample covers the period 2010-2019 of 74 foreign markets.

Using this primary data, we controlled for company-specific features, which allowed us to isolate the effects particular to sales transactions (Visnjic and Van Looy, 2013). The model was deducted according to theory and the relevant literature that proposes advanced-servitized-products as drivers of international sales performance for manufacturing companies. Following the

servitization literature and the meta-theoretical foundations of the Service Dominant Logic, we hypothesized that onsite presence would positively moderate the impact of advanced-servitized-products on international performance and that the use of external intermediaries would have the opposite effect. The hypotheses were tested using a time fixed-effects estimation, that eliminates any effect from variables that are common across countries, or affects countries the same way, but change over time. The nature of our data, coming from a single company, makes this approach more appropriate.

First, we find that the proportion of the advanced-servitized-products has a significant and positive impact on the international sales performance of the manufacturers, on a longitudinal basis. We conclude that a higher proportion of the advanced-servitized-products results in improved performance. This link is positively leveraged in countries where international manufacturers operate onsite. Interestingly, intermediaries negatively affect the latter relationship. We may argue that offsite expansion alternatives, while requiring less effort and implying lower risk, also offer the lowest performance gains when the proportions of advanced-servitized-products are increased in the manufacturing sales. Future research could disentangle whether such weakness is due to a higher distance (psychic and/or physical), or the lack of relationship between key actors, or both.

The results support our argument on the value-added of onsite proximity and direct interaction between manufacturers and customers in the hosting country. By using the onsite distribution channel, both producer and customer can benefit from knowledge transfers, value creation and co-creation. Manufacturers on one hand, will be capable of proposing the properly designed and redesigned value-added solutions to the customers through direct advanced services. On the other hand, customers will receive the desired offerings that cover their needs over time. This twofold collaboration is the foundation of continuous successful performance for the manufacturers.

The findings of this research have important managerial implications. As a consequence of increasing pressure for manufacturers to gain competitive advantages, there is a need for both internationalization and offering of complex products with embedded services (Vendrell-Herrero *et al*., 2020). In line with the previous discussion, the research findings give a clear indication how manufacturers can improve their international sales performance by applying global expansion strategies for their servitized products. Precisely, manufacturers should promote advanced servitization in their offerings in the international markets as a strategy to gain more customers through the embedded value-added service into the offerings. Furthermore, the results show that the optimum distribution channel to deliver the service-oriented offerings is having an onsite presence in the international destinations. By the onsite existence in the hosting markets, manufacturers can share higher knowledge and skills with customers, whereupon the manufacturers will be able to create and co-create the value proposition simultaneously with the customers.

The academic implications of the research are also present. The main contribution of the study comes from the importance of exploring and understanding the relationship between advanced servitized offerings, international sales performance and global distribution channels. The relationship is first to be explained through the lens of servitization literature, combined with the meta-theoretical foundations of the Service-Dominant-Logic (Vargo and Lusch, 2004). Despite the importance of the service-oriented offerings in servitization, research using this lens is still scarce in the literature. We strive to shed light on the importance of customer's value creation and co-creation in building and delivering advanced servitized products internationally.

As with any research, the results presented in this study are open to future verification, and it would be valuable to extend the proposed analysis in various directions. In this study, we find how foreign

sales performance was improved when greater proportions of advanced service provision were adopted, especially with an onsite presence in foreign markets. However, it may be interesting to analyze the levels of profitability in these markets over time, including the importance of value-chain relational proximity and customer satisfaction as well as repeat purchases of servitized products.

It may also be insightful to replicate the study within other industrial and business contexts. The study presented in this paper purposely constructed a model where the foreign sales transactions for each foreign market were observed. To provide for a consistent and controlled analysis, the model was tested using data coming from one firm offering products of varied servitized intensity levels to many foreign markets using a mix of different distribution channel strategies. Replicating this study across other firms and industrial contexts may further illuminate this sprouting research track.

References

Aitken, R., Ballantyne, D., Osborne, P. and Williams, J. (2006), "Introduction to the special issue on the service-dominant logic of marketing: Insights from The Otago Forum", *Marketing Theory*, vol. 6, no. 3, pp. 275-280.

Aminoff, A. and Hakanen, T. (2018), "Implications of product centric servitization for global distribution channels of manufacturing companies", *International Journal of Physical Distribution and Logistics Management*, vol. 48, no. 10, pp. 1020-1038.

Antioco, M., Moenaert, R.K., Lindgreen, A. and Wetzels, M.G.M. (2008), "Organizational antecedents to and consequences of service business orientations in manufacturing companies", *Journal of the Academy of Marketing Science*, vol. 36, no. 3, pp. 337-358.

Baines, T.S., Lightfoot, H.W., Benedettini, O. and Kay, J.M. (2009), "The servitization of manufacturing: A review of literature and reflection on future challenges", *Journal of Manufacturing Technology Management,* vol. 20, no. 5, pp. 547-567.

Brodie, R.J., Fehrer, J.A., Jaakkola, E. and Conduit, J. (2019), "Actor Engagement in Networks: Defining the Conceptual Domain", *Journal of Service Research,* vol. 22, no. 2, pp. 173-188.

Burton, J., Story, V.M., Raddats, C. and Zolkiewski, J. (2017), "Overcoming the challenges that hinder new service development by manufacturers with diverse services strategies", *International Journal of Production Economics,* vol. 192, pp. 29-39.

Bustinza, O. F., Opazo-Basaez, M., & Tarba, S. (2021), "Exploring the interplay between Smart Manufacturing and KIBS firms in configuring product-service innovation performance", *Technovation,* 102258.

Bustinza, O.F., Gomes, E., Vendrell-Herrero, F. and Baines, T. (2019), "Product–service innovation and performance: the role of collaborative partnerships and R&D intensity", *R and D Management,* vol. 49, no. 1, pp. 33-45.

Bustinza, O. F., Lafuente, E., Rabetino, R., Vaillant, Y., & Vendrell-Herrero, F. (2019a), "Make-or-buy configurational approaches in product-service ecosystems and performance", *Journal of Business Research,* vol. 104, pp. 393-401.

Bustinza, O.F., Vendrell-Herrero, F. and Baines, T. (2017), "Service implementation in manufacturing: An organisational transformation perspective", *International Journal of Production Economics,* vol. 192, pp. 1-9.

Chakkol, M., Johnson, M., Raja, J. and Raffoni, A. (2014), "From goods to solutions: How does the content of an offering affect network configuration?", *International Journal of Physical Distribution and Logistics Management,* vol. 44, no. 1, pp. 132-154.

Chester Goduscheit, R. and Faullant, R. (2018), "Paths Toward Radical Service Innovation in Manufacturing Companies—A Service-Dominant Logic Perspective", *Journal of Product Innovation Management,* vol. 35, no. 5, pp. 701-719.

Day, G. (2014), "Achieving advantage with a service-dominant logic" in *The Service-Dominant Logic of Marketing: Dialog, Debate, and Directions*, pp. 85-90.

Eggert, A., Hogreve, J., Ulaga, W. and Muenkhoff, E. (2014), "Revenue and Profit Implications of Industrial Service Strategies", *Journal of Service Research,* vol. 17, no. 1, pp. 23-39.

Ekeledo, I. and Sivakumar, K. (2004), "International market entry mode strategies of manufacturing firms and service firms: A resource-based perspective", *International Marketing Review*, vol. 21, no. 1, pp. 68-101.

Gadde, L. (2014), "Distribution network dynamics and the consequences for intermediaries", *Industrial Marketing Management*, vol. 43, no. 4, pp. 622-629.

Gomes, E., Lehman, D.W., Vendrell-Herrero, F. and Bustinza, O.F. (2021), "A history-based framework of servitization and deservitization", *International Journal of Operations and Production Management*, vol. 41, no. 5, pp. 723-745.

Green, M.H., Davies, P. and Ng, I.C.L. (2017), "Two strands of servitization: A thematic analysis of traditional and customer co-created servitization and future research directions", *International Journal of Production Economics*, vol. 192, pp. 40-53.

Grönroos, C. and Voima, P. (2013), "Critical service logic: Making sense of value creation and co-creation", *Journal of the Academy of Marketing Science*, vol. 41, no. 2, pp. 133-150.

Hakanen, T., & Aminoff, A. (2016), "Servitization of manufacturers and global distribution." In *2016 5th World Conference on Production and Operations Management (P&OM)*. Department of Industrial Engineering, Universidad Tecnologica de la Habana.

Hakanen, T., Helander, N. and Valkokari, K. (2017), "Servitization in global business-to-business distribution: The central activities of manufacturers", *Industrial Marketing Management*, vol. 63, pp. 167-178.

Hausman, J. A. (1978), "Specification tests in econometrics". *Econometrica: Journal of the Econometric Society*, vol. 46, no. 6, pp. 1251-1271.

Hyun, M. and Kim, J. (2021), "Challenge or opportunity? A case of tire rental servitization from financial and channel perspectives", *Service Business*, vol. 15, no. 1.

Jaakkola, E. and Hakanen, T. (2013), "Value co-creation in solution networks", *Industrial Marketing Management*, vol. 42, no. 1, pp. 47-58.

Kaleka, A. (2002), "Resources and capabilities driving competitive advantage in export markets: Guidelines for industrial exporters", *Industrial Marketing Management*, vol. 31, no. 3, pp. 273-283.

Kohtamäki, M., Einola, S. and Rabetino, R. (2020), "Exploring servitization through the paradox lens: Coping practices in servitization", *International Journal of Production Economics*, vol. 226.

Kohtamäki, M. and Partanen, J. (2016), "Co-creating value from knowledge-intensive business services in manufacturing firms: The moderating role of relationship learning in supplier-customer interactions", *Journal of Business Research*, vol. 69, no. 7, pp. 2498-2506.

Kowalkowski, C. (2010), "What does a service-dominant logic really mean for manufacturing firms?", *CIRP Journal of Manufacturing Science and Technology*, vol. 3, no. 4, pp. 285-292.

Kropko, J. and Kubinec, R. (2020), "Interpretation and identification of within-unit and cross-sectional variation in panel data models", *PLoS ONE*, vol. 15, no. 4.

Lafuente, E., Vaillant, Y., & Vendrell-Herrero, F. (2019). Territorial servitization and the manufacturing renaissance in knowledge-based economies. *Regional Studies*, *53*(3), 313-319.

Lafuente, E., Vaillant, Y. and Vendrell-Herrero, F. (2017), "Territorial servitization: Exploring the virtuous circle connecting knowledge-intensive services and new manufacturing businesses", *International Journal of Production Economics*, vol. 192, pp. 19-28.

Li, H., Yang, Y., Singh, P., Sun, H. and Tian, Y. (2021), "Servitization and performance: the moderating effect of supply chain integration", *Production Planning and Control*.

Li, R., Liu, Y. and Bustinza, O.F. (2019), "FDI, service intensity, and international marketing agility: The case of export quality of Chinese enterprises", *International Marketing Review*, vol. 36, no. 2, pp. 213-238.

Lin, C.-. and Chen, H. (2018), "Deconstructing B2B, co-creation and service deployment in East Asia: evidence from Taiwan and PRC manufacturers", *Asia Pacific Business Review*, vol. 24, no. 3, pp. 351-370.

Liu, Y., Lattemann, C., Xing, Y. and Dorawa, D. (2019), "The emergence of collaborative partnerships between knowledge-intensive business service (KIBS) and product companies: the case of Bremen, Germany", *Regional Studies*, vol. 53, no. 3, pp. 376-387.

Liu, Y. (2017), "Born global firms' growth and collaborative entry mode: the role of transnational entrepreneurs", *International Marketing Review*, vol. 34, no. 1, pp. 46-67.

Lusch, R.F. and Nambisan, S. (2015), "Service innovation: A service-dominant logic perspective", *MIS Quarterly: Management Information Systems*, vol. 39, no. 1, pp. 155-175.

Lusch, R.F., Vargo, S.L. and Tanniru, M. (2010), "Service, value networks and learning", *Journal of the Academy of Marketing Science*, vol. 38, no. 1, pp. 19-31.

Lusch, R.F., Vargo, S.L. and O'Brien, M. (2007), "Competing through service: Insights from service-dominant logic", *Journal of Retailing*, vol. 83, no. 1, pp. 5-18.

Malhotra, N.K., Agarwal, J. and Ulgado, F.M. (2003), "Internationalization and entry modes: a multitheoretical framework and research propositions", Journal of International Marketing, Vol. 11 No. 4, pp. 1-31.

Martín-Peña, M.-., Sánchez-López, J.-. and Díaz-Garrido, E. (2020), "Servitization and digitalization in manufacturing: the influence on firm performance", *Journal of Business and Industrial Marketing*, vol. 35, no. 3, pp. 564-574.

Mehta, R., Polsa, P., Mazur, J., Xiucheng, F. and Dubinsky, A.J. (2006), "Strategic alliances in international distribution channels", *Journal of Business Research*, vol. 59, no. 10-11, pp. 1094-1104.

Melton, H.L. and Hartline, M.D. (2013), "Employee Collaboration, Learning Orientation, and New Service Development Performance", *Journal of Service Research*, vol. 16, no. 1, pp. 67-81.

Moreno, R., Marques, L. and Arkader, R. (2020), "Servitization impact on performance moderated by country development", *Benchmarking*, vol. 27, no. 1, pp. 302-318.

Ngo, L.V. and O'Cass, A. (2013), "Innovation and business success: The mediating role of customer participation", *Journal of Business Research*, vol. 66, no. 8, pp. 1134-1142.

Normann, R. (2001), "Reframing business: When the map changes the landscape". John Wiley & Sons.

O'Cass, A. and Sok, P. (2015), "An exploratory study into managing value creation in tourism service firms: Understanding value creation phases at the intersection of the tourism service firm and their customers", *Tourism Management*, vol. 51, pp. 186-200.

O'Grady, S. and Lane, H.W. (1996), "The psychic distance paradox", *Journal of International Business Studies*, vol. 27, no. 2, pp. 309-333.

Oliva, R. and Kallenberg, R. (2003), "Managing the transition from products to services", *International Journal of Service Industry Management*, vol. 14, no. 2, pp. 160-172.

Olsson, R., Gadde, L.-. and Hulthén, K. (2013), "The changing role of middlemen - strategic responses to distribution dynamics", *Industrial Marketing Management*, vol. 42, no. 7, pp. 1131-1140.

Parida, V. and Jovanovic, M. (2022), "Servitization in global markets: role alignment in global service networks for advanced service provision", *R and D Management*, vol. 52, no. 3, pp. 577-592.

Queiroz, S.A.B., Mendes, G.H.S., Silva, J.H.O., Ganga, G.M.D., Cauchick Miguel, P.A. and Oliveira, M.G. (2020), "Servitization and performance: impacts on small and medium enterprises", *Journal of Business and Industrial Marketing*, vol. 35, no. 7, pp. 1237-1249.

Rabetino, R., Kohtamäki, M., Kowalkowski, C., Baines, T.S. and Sousa, R. (2021), "Guest editorial: Servitization 2.0: evaluating and advancing servitization-related research through novel conceptual and methodological perspectives", *International Journal of Operations and Production Management*, vol. 41, no. 5, pp. 437-464.

Rabetino, R., Harmsen, W., Kohtamäki, M. and Sihvonen, J. (2018), "Structuring servitization-related research", *International Journal of Operations and Production Management*, vol. 38, no. 2, pp. 350-371.

Rabetino, R., Kohtamäki, M. and Gebauer, H. (2017), "Strategy map of servitization", *International Journal of Production Economics*, vol. 192, pp. 144-156.

Rönnberg Sjödin, D., Parida, V. and Kohtamäki, M. (2016), "Capability configurations for advanced service offerings in manufacturing firms: Using fuzzy set qualitative comparative analysis", *Journal of Business Research*, vol. 69, no. 11, pp. 5330-5335.

Ruiz-Alba, J.L., Soares, A., Rodríguez-Molina, M.A. and Frías-Jamilena, D.M. (2019), "Servitization strategies from customers' perspective: the moderating role of co-creation", *Journal of Business and Industrial Marketing*, vol. 34, no. 3, pp. 628-642.

Skarmeas, D., Katsikeas, C. S., Spyropoulou, S., and Salehi-Sangari, E. (2008), "Market and supplier characteristics driving distributor relationship quality in international marketing channels of industrial products", *Industrial Marketing Management*, *37*(1), 23-36.

Sousa, R. and da Silveira, G.J.C. (2019), "The relationship between servitization and product customization strategies", *International Journal of Operations and Production Management*, vol. 39, no. 3, pp. 454-474.

Sousa, R. and da Silveira, G.J.C. (2017), "Capability antecedents and performance outcomes of servitization: Differences between basic and advanced services", *International Journal of Operations and Production Management*, vol. 37, no. 4, pp. 444-467.

Tokman, M. and Beitelspacher, L.S. (2011), "Supply chain networks and service-dominant logic: Suggestions for future research", *International Journal of Physical Distribution and Logistics Management*, vol. 41, no. 7, pp. 717-726.

Vaillant, Y., Lafuente, E., & Bayon, M. C. (2019a), "Early internationalization patterns and export market persistence: a pseudo-panel data analysis", *Small business economics*, vol. 53, no. 3, pp. 669-686.

Vaillant, Y., and Lafuente, E. (2019), "The increased international propensity of serial entrepreneurs demonstrating ambidextrous strategic agility: A precursor to international marketing agility", *International Marketing Review*, vol. 36, no. 2, pp. 239-259.

van de Vrande, V., de Jong, J.P.J., Vanhaverbeke, W. and de Rochemont, M. (2009), "Open innovation in SMEs: Trends, motives and management challenges", *Technovation*, vol. 29, no. 6-7, pp. 423-437.

Vandermerwe, S. and Rada, J. (1988), "Servitization of business: Adding value by adding services", *European Management Journal*, vol. 6, no. 4, pp. 314-324.

Vargo, S.L. and Lusch, R.F. (2004), "Evolving to a New Dominant Logic for Marketing", *Journal of Marketing*, vol. 68, no. 1, pp. 1-17.

Vargo, S.L. and Lusch, R.F. (2008), "Service-dominant logic: Continuing the evolution", *Journal of the Academy of Marketing Science*, vol. 36, no. 1, pp. 1-10.

Vargo, S.L. and Lusch, R.F. (2017), "Service-dominant logic 2025", *International Journal of Research in Marketing*, vol. 34, no. 1, pp. 46-67.

Vendrell-Herrero, F., Bustinza, O. F., & Vaillant, Y. (2021a), "Adoption and optimal configuration of smart products: The role of firm internationalization and offer hybridization", *Industrial Marketing Management*, vol. 95, pp. 41-53.

Vendrell-Herrero, F., Vaillant, Y., Bustinza, O. F., & Lafuente, E. (2021). Product lifespan: the missing link in servitization. *Production Planning & Control*, 1-17.

Vendrell-Herrero, F., Darko, C.K. and Ghauri, P. (2020a), "Knowledge management competences, exporting and productivity: uncovering African paradoxes", *Journal of Knowledge Management*, vol. 24, no. 1, pp. 81-104.

Vendrell-Herrero, F., Lafuente, E. and Vaillant, Y. (2020), "Territorial servitization: Conceptualization, quantification and research agenda", *Investigaciones Regionales*, vol. 2020, no. 48, pp. 5-15.

Vetterli, C., Uebernickel, F., Brenner, W., Petrie, C. and Stermann, D. (2016), "How deutsche bank's IT division used design thinking to achieve customer proximity", *MIS Quarterly Executive*, vol. 15, no. 1, pp. 37-53.

Visnjic Kastalli, I. and Van Looy, B. (2013), "Servitization: Disentangling the impact of service business model innovation on manufacturing firm performance", *Journal of Operations Management*, vol. 31, no. 4, pp. 169-180.

Wooldridge, J. M. (2008), "Instrumental variables estimation of the average treatment effect in the correlated random coefficient model". In *Modelling and evaluating treatment effects in econometrics*. Emerald Group Publishing Limited.

Wynstra, F., Von Corswant, F. and Wetzels, M. (2010), "In chains? An empirical study of antecedents of supplier product development activity in the automotive industry", *Journal of Product Innovation Management*, vol. 27, no. 5, pp. 625-639.

Zhang, Y., Wang, L., Gao, J. and Li, X. (2020), "Servitization and business performance: the moderating effects of environmental uncertainty", *Journal of Business and Industrial Marketing*, vol. 35, no. 5, pp. 803-815.

Zhou, D., Yan, T., Dai, W. and Feng, J. (2021), "Disentangling the interactions within and between servitization and digitalization strategies: A service-dominant logic", *International Journal of Production Economics*, vol. 238.

Zhou, D., Yan, T., Zhao, L. and Guo, J. (2020), "Performance implications of servitization: Does a Manufacturer's service supply network matter?", *International Journal of Production Economics*, vol. 219, pp. 31-42.

Zou, Z., Tseng, T.-., Sohn, H., Song, G. and Gutierrez, R. (2011), "A rough set based approach to distributor selection in supply chain management", *Expert Systems with Applications*, vol. 38, no. 1, pp. 106-115.

Table 1. Descriptive Statistics of the Variables.

	All data				Advanced-servitized-products Subset			
	Mean	sd	q1	q3	Mean	sd	q1	q3
Real sales (€)	74,397	220,493	5,121	46,187	143,884	306,314	14,333	142,162
ln (sales)	9.4020	2.1413	8.5412	10.7399	10.6923	1.5772	9.5702	11.8647
Proportion	0.0691	0.1187	0	0.0972	0.1464	0.1363	0.0567	0.1861
Direct exports	0.5339	0.4996	0	1	0.4311	0.4967	0	1
Intermediary	0.3107	0.4634	0	1	0.3593	0.4812	0	1
Onsite	0.1554	0.3628	0	0	0.2096	0.4082	0	0
GCI	4.8561	0.5840	4.3884	5.3690	4.9917	0.6049	4.4532	5.5063
Observations	354				167			
# transactions	4,024				661			

Observations refer to the unit of analysis (country-year). Transactions refer to client's operations.

Table 2. Time Fixed-Effect Estimator Models: Ln (real sales)

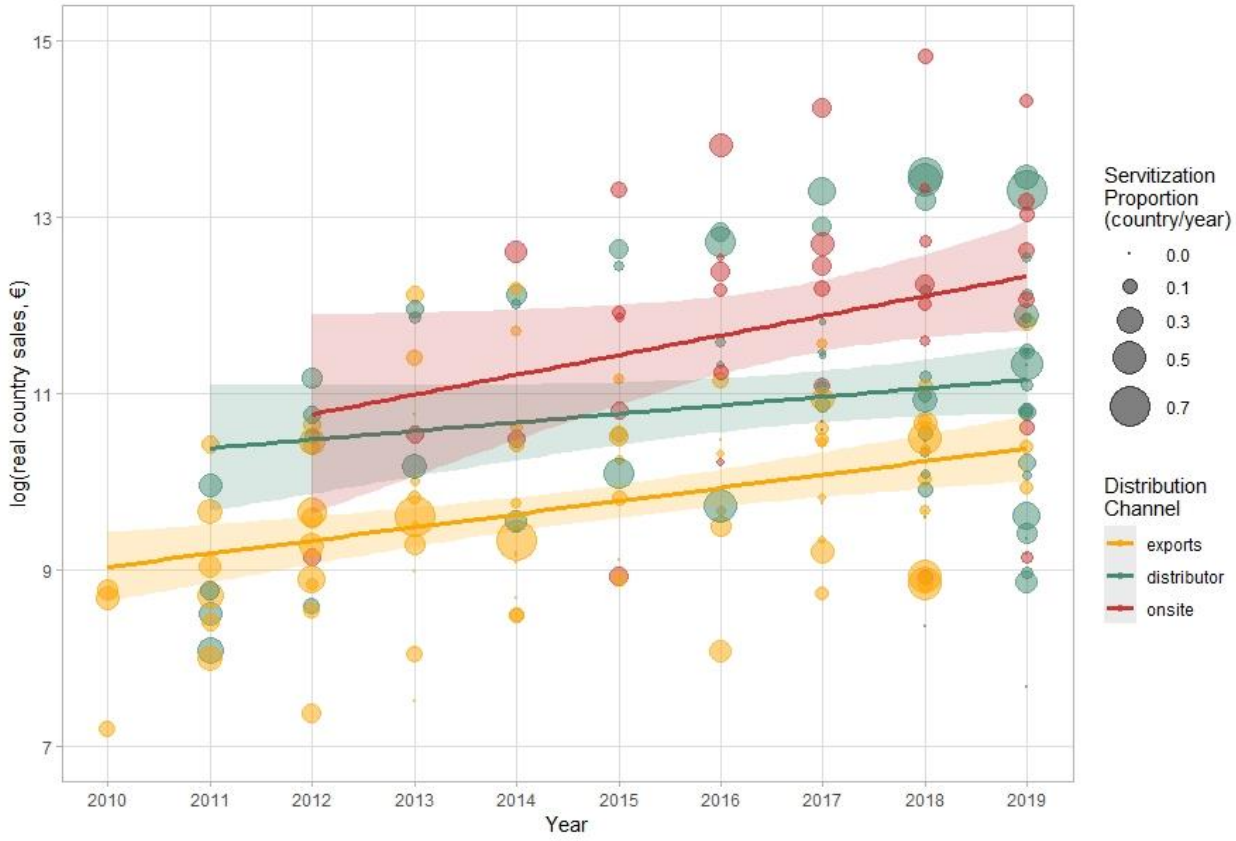
	(1)	(2)	(3)
Proportion $_{it}$	4.248***	4.390***	5.229***
	(1.057)	(1.060)	(0.865)
Proportion $_{it-1}$	- 0.687	- 0.701	- 0.352
	(0.856)	(0.843)	(0.798)
ln (real sales) $_{it-1}$	0.505***	0.480***	0.459***
	(0.073)	(0.076)	(0.083)
Intermediary $_{it}$		0.338	0.541*
		(0.208)	(0.213)
Onsite $_{it}$		0.607*	0.001
		(0.321)	(0.386)
Prop. x Intermediary $_{it}$			- 2.400*
			(1.317)
Proportion x Onsite $_{it}$			8.263***
			(2.659)
GCI	0.501*	0.539*	0.443
	(0.295)	(0.280)	(0.284)
Region dummies	Yes	Yes	Yes
Time Effect	Yes	Yes	Yes
Observations	279	279	279
R^2	0.495	0.502	0.520
Adjusted R^2	0.454	0.457	0.472
F Statistic	19.38***	17.14***	16.11***
Hausman Test	21.04	26.27	26.78
	(p-value = 0.072)	(p-value = 0.035)	(p-value = 0.061)

Clustered, robust standard errors in parenthesis.

*, ** and *** denote significance at the 10%, 5% and 1% level, respectively

Observations, n = 279 as a result of 354 country/year observations minus 74 (number of countries) missing values after using the lagged variables and minus 1 observation (GCI index does not report any score for Andorra)

Figure 1. Advanced servitization proportion, sales, and distribution channels.



Annex 1. Foreign markets and distribution channels.