Bridging the gap: state-of-the-art on vertical integration

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Received 21 March 2023
Revised 13 August 2023
15 November 2023
23 January 2024
20 February 2024
Accepted 8 March 2024

Abstract

Purpose – This paper aims to present the vertical integration state-of-the-art and propose an expansion of the operations and supply chain management (OSCM) field by identifying gaps and bottlenecks.

Design/methodology/approach – This paper uses a systematic literature review based on a sample of 173 OSCM field articles, collected from Scopus and Web of Science databases.

Findings – There are no single factors, such as future costs, structures or skills development, in the decision to vertically integrate operations. It is necessary to combine the vision of production costs with the perspective of governance and transaction costs. In addition, it is essential to consider the competency perspective and its impact on capability building.

Research limitations/implications – Few studies have attempted to understand how vertical integration is used in terms of OSCM research themes and theories. Vertical integration can help companies face challenges and serve as a potential solution for achieving better prices, demand control and quality management.

Practical implications – The significant role of vertical integration mechanisms in supply chains is crucial for managers evaluating a firm's reconfiguration with more vertical operations. Policymakers interested in supporting the smoothness of vertical integration decisions in regulatory agencies play a key role as contingencies.

Social implications – In times of global challenges, vertical integration is a strategy known to be more effective for firms to obtain a competitive advantage, making them more resilient.

Originality/value – This paper addresses gaps in the vertical integration theme and provides insights for future research development.

Keywords Vertical integration, Strategy, Operations, Supply chain, Review

Paper type Literature review

1. Introduction

In the realm of operations and supply chain management (OSCM), the global landscape is currently marked by disruptions, external shocks and significant challenges, including crises, pandemics, geopolitical tensions, overall uncertainty and risk (Koç, Delibaş, & Anadol, 2022). These conditions have necessitated considerable efforts from the OSCM community. We are

Funding: This work was supported by the coordination for the improvement of Higher Education Personnel (CAPES), foundation within the Brazilian Ministry of Education.

Statements and declarations: The authors declare that the associate/thematic editor is from the same department and business school as the authors.

RAUSP Management Journal
Vol. 59 No. 3, 2024
pp. 229-255
Emerald Publishing Limited
2531-0488
DOI 10.1108/RAUSP-03-2023-0041

now facing a phenomenon that has been called deglobalization (also called the renationalization of production), which can drive companies to embrace vertical integration, a timeless OSCM strategy. The debate on deglobalization was driven by a wave of technological innovation moving the world away from one-size-fits-all globalization (Foroohar, 2022), from causes arising from nationalism, such as Brexit and the US-China trade war, and more recently by the Covid-19 pandemic (Zhang, Wu, Tang, Feng, & Dai, 2020). As a result of this phenomenon, companies tend to seek to carry out in-house operations (Ryan, Buciuni, Giblin, & Andersson, 2022). Almost half (48%) of logistics companies are pursuing vertical integration strategies (Reiss, 2022). These events caused a wave of vertical integration, known to make firms more resilient to sudden economic crises thence be more effective for firms to obtain a competitive advantage.

The choice of vertical integration usually considers its effect on internal decision-making processes (Brahm & Tarziján, 2016). When behavioural and environmental uncertainty are high, contractual governance, via outsourcing, harms the performance of alliances, and trust-based governance does not work at its best. Under these conditions, it may be better for companies to resort to vertical integration (Krishnan, Geyskens, & Steenkamp, 2016). On the other hand, vertical disintegration might be beneficial because it can promote upstream and downstream competition (Carvalho & Marques, 2014). It should be noted, however, that the seemingly advantageous strategy of vertical separation may actually be disadvantageous because it can allow another competitor to enter the market, which reduces the company's profits in the long run (Matsui, 2012).

Vertical integration ensures resource acquisition (Barney, 2002), minimizes opportunistic behaviour (Williamson, 1985) and mitigates the negative impact of uncertainty (Kogut, 1991). If a company only integrates a small part of its providers, however, and leaves the rest free, it will not eliminate the chances of opportunistic behaviour and instability, which apply depending on the size of those left free and/or the possibilities they had of competing against it. Even if the company does not need non-integrated providers, it can supply the company's competition, which will create sources of instability and uncertainty in multinational companies. (Bucheli & Kim, 2015).

Prior literature described vertical integration as an important strategic priority for exploring firm-specific knowledge (Armour & Teece, 1980; Wernerfelt, 1984). Companies are usually faced with a make-or-buy decision (Teece & Pisano, 1994), so choosing a company's vertical scope is critical (Williamson, 1971). Vertical integration is more likely than protecting the firm's imitable resources (Wernerfelt, 1984), especially in high-tech environments, because this choice is critical to the company's profitability due to the high specificity of the asset and the need for activities to be broadly coordinated (Monteverde, 1995). Vertical integration, therefore, can improve performance, mainly because of the coordination benefits associated with internalization (Leiblein, Reuer, & Dalsace, 2002).

The real effect of vertical integration is driven by better coordination rather than an attempt to control agency costs (Brahm & Tarziján, 2016). It is plausible to affirm that vertical integration along the supply chain is desirable (Ernst & Kamrad, 2000). Companies may also integrate and assume monopoly positions in the region where they operate when there are no direct competitors or they have no incentives to improve. With the recent external shocks, while some firms needed to raise money quickly, others with slack financial and with potential growth revenues, took the opportunity to become more vertical (Loeb, 2022).

Although the growing body of literature has made vertical integration more interdisciplinary, with applications in engineering, healthcare and business, in OSCM, the previous studies are focused on just one industry (e.g. Young, Swarts, Prior, Doherty, & Campbell, 2022), just one

OSCM topic (e.g. Bressanelli, Perona, & Saccani, 2019) or limited to partial integration (e.g. Pishchulov, Richter, & Golesorkhi, 2022). Therefore, the union of some articles would still represent a limited panorama of vertical integration. Therefore, the aim of this article is to present the state-of-the-art with an exploratory intention for the fruitful development of vertical integration research. Specifically, we intend to answer two questions:

Q1. What is the state-of-the-art of vertical integration in the OSCM field?

Q2. How continue to explore the vertical integration debate in the OSCM themes?

Given the interrelated nature of the research questions, a systematic literature review (SLR) was conducted using two fundamental databases, Scopus and Web of Science. A total of 173 articles were selected, and a content analysis was executed to synthesise the OSCM literature and to analyse the complexity deeply scholarly and OSCM thematic interaction. The study also highlights research opportunities, suggestions and research gaps for possible future exploration.

Not only Covid-19 pandemic, the Russia–Ukraine conflict, US-China trade war and Suez Canal obstruction are drivers of exogenous shock in supply chains, but multiple social and political developments lead to frequent and high-amplitude shocks. This research reminds us that vertical integration is one of the best strategies to apply to firms in scenarios like these. Roughly, to the best of our knowledge, no study has been reported in the OSCM literature that examines state-of-the-art and how theories are used in terms of vertical integration within the OSCM context.

2. Literature review

Vertical integration refers to the consolidation of two or more tiers within the supply chain (KEK et al., 2022), whether they are suppliers or distributors (Shraah, Abu-Rumman, Alqhaiwi, & Alsha'ar, 2022), executed within a single business group (Ellram, 1991). This movement shortens supply chain tiers, coordinating them within the same business group, indicating the extent to which manufacturing is carried out within the same firm (Olausson & Magnusson, 2011). Increasing the vertical integration level means increasing the number of chain activities carried out internally (Saccani, Johansson, & Perona, 2007). Full vertical integration, moreover, creates an environment in which the company operates almost as a closed company, performing all activities in the value chain internally with minimal external links (Rothaermel, Hitt, & Jobe, 2006).

Vertical integration occurs not only in manufacturing processes but also in distribution, services and business processes (Vallespir & Kleinhans, 2001). It can be classified into at least two types. Downstream integration enables a manufacturer to better control retail prices, respond to changes in demand effectively, swiftly adapt to changing consumer trends (Lin, Parlaktürk, & Swaminathan, 2014) and consequently "getting" closer to its customers (Baines & Lightfoot, 2014). This decision is related to extending the company's domain of activities (Vallespir & Kleinhans, 2001). Upstream integration allows a manufacturer to exercise greater control over the quality of the supplied material, thereby improving product quality – a decision linked to focusing on the core business (Vallespir & Kleinhans, 2001). The processes required for achieving vertical integration include self-expansion using internal capabilities and the internalization of activities, usually via mergers and acquisitions (Hashimoto, 2021).

Manufacturing systems resulting from the distribution of work among specialized units are characterized as low vertical integration units (Nassimbeni, 2003). This occurs between firms in different echelons of a supply chain and can eliminate the negative influence of

double marginalization (Gao, 2015; Gunaratne, Krook, & Andersson, 2022; Kouvelis, Xiao, & Yang, 2018; Lin et al., 2014; Wei, Zhao, & Hou, 2019). Many manufacturers adopt vertical integration, therefore, to gain competitive advantage (Pi & Li, 2022), allowing them to control retail prices (Martín-Herrán & Taboubi, 2015; Wei et al., 2019), manage changes in demand efficiently and exert tighter control over the quality of supplies and the product (Wei et al., 2019).

Vertical integration has the potential to hinder coordination of rival products (Zhou & Wan, 2017). Vertically integrated companies are better insulated from uncertainty during the deregulation process than non-integrated companies. On the other hand, if they focus primarily on buying from the wholesale market and selling direct to consumers, they can quickly adopt the administrative skills they need for writing complex contracts and dealing with price volatility (Delmas & Tokat, 2005). Vertical integration allows the centralized authority to be used for coordinating activities that interact intensively. Particularly in more complex and uncertain environments, therefore, vertical integration plays an important role because of the need for greater coordination (Brahm & Tarziján, 2016).

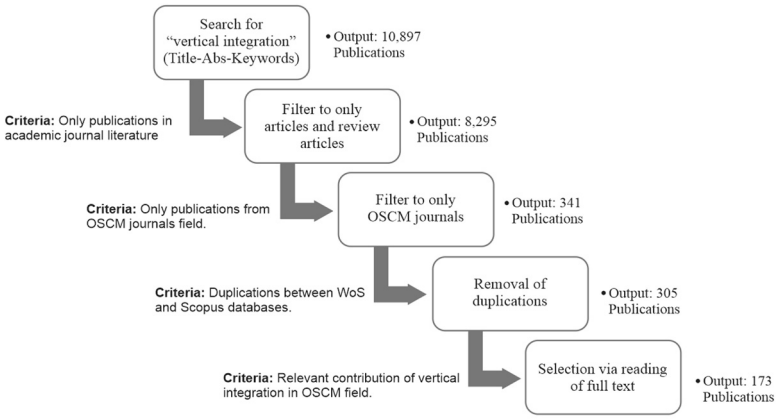
In times of global challenges, vertically integrated companies upstream are more successful at withstanding crises (Chong, Wang, Yue Tan, & Cheong, 2014). Although the concept of complete vertical integration exists, companies are unable to do everything, depending on raw materials, distribution and delivery to the consumer. If they cannot do everything and local supply sources are insufficient, they must become more vertically integrated. (Ettlie & Sethuraman, 2002). Searching for sources globally, in this scenario, is not an option.

3. Method

This research is classified as a SLR, drawing on various terms found in the literature (Whittemore & Knafl, 2005) and following a study guide (Durach, Kembro, & Wieland, 2017). According to the recent work by Durach, Kembro, and Wieland (2021), it can be characterized as a contextualized review, aiming to enhance our understanding of the contexts, particularly the themes and theories, in which the phenomenon of vertical integration manifests.

This study begins with an analysis of international scientific production on vertical integration in the OSCM field. The Scopus and Web of Science databases were used for operationalization. Supplementary File 1 provides a concise summary of the study criteria, facilitating potential replication. Figure 1 outlines the selection process to ensure transparency, reliability and replicability of the findings (Thomé, Scavarda, & Scavarda, 2016). The search term "vertical integration" yielded 10,897 records. Additional terms such as "verticalization", "vertical organization", "verticality", "vertical strategy", "make inside", "vertical hierarchy" and "centralized coordination" were also used, but no results were obtained. Other terms, such as: "vertical coordination" and "internalization", were also used, resulting in a total of 31 articles being found. After thoroughly reading the introduction, method and results, the articles were discarded.

The first filter, focusing on article type, resulted in 8,295 articles. Applying a manual selection analytical filter specific to journals in the OSCM field, 341 relevant articles were identified. The final criterion involved confirming that these articles belonged to OSCM journals. In the database system, a filter was applied to source titles (journals only) containing words like production, supply, operation(s), logistics, decision, manufacturing, purchasing, engineering, industrial, scheduling or procurement. We did not discard others. After this preliminary classification, two sources were consulted to ensure that the identified journals fell under OSCM categories: the Academic Journal Guide from the Chartered



Source: Authors

Figure 1.
The paper's search and selection process

Association of Business Schools, focusing on the Operations and Technology Management and Operations Research and Management Science fields, and Scimago Journal Rank for the "Decision Sciences" subject area. In a sample of articles, we also verified the "aim and scope" section of the journal's official website.

Following this, duplicate articles were identified and reduced to one, and an analytical filter was subsequently applied to ensure that the selected articles specifically addressed vertical integration as a firm's decision (excluding decision made by policymakers, for instance). This process was organized using Microsoft Excel software, leading to the removal of 36 duplicates. Finally, all articles were thoroughly read in the selection of 173 relevant articles for further analysis (see Supplementary File 2).

4. Results

A timid surge of academic interest is observed (see Supplementary File 3). Until the 2000s, the most significant number of publications was three articles. This changed in 2007, when nine publications were registered, surpassing the previous records. The highest incidence of research in the collected sample occurred in 2014, with 14 publications. Despite the illustration indicating low numbers, possibly influenced by environmental factors such as an increased number of researchers, there is no sign of heightened interest in publications since the number reduced to three in 2017. However, it is essential to note that, even with low numbers, there has been a greater number of publications after 2014, which may be attributed to various factors.

Vertical integration is sought to provide further control of the stages of the chain; nothing is more plausible than the company holding managerial control and not just ownership. The pandemic has exposed vulnerabilities in global supply chains. Therefore, we discuss in later sections why a growth trend in publications was expected from the scenario of external shocks from 2020 onwards.

4.1 Theories

Articles were classified according to the theories (see Supplementary File 4), with a focus on those cited twice or more, totalling 132 articles. The most prevalent theory in vertical

integration articles is the transaction costs theory (37), constituting more than 21% of the sample. Game theory (24) and the resource-based view (14) also stand out.

Approximately 30 articles lack a supporting theory, an aspect we will investigate in the following sections, correlating it with the chosen methods. The related literature on vertical integration provides a theoretical perspective for the research questions presented in this paper, with a detailed discussion in Section 5.

4.2 Themes

We classified the themes of the articles in the sample following Tranfield, Denyer, and Smart (2003) (see Supplementary File 5). The interpretative process to obtain the themes was guided by the extraction of data from the reading of the main contributions (Tranfield et al., 2003) and supported by the inductive approach to content analysis, which is the testing and revising by constant category comparison with the article sample (Seuring & Gold, 2012).

The theme that appears most is supply chain management (51), in more than 31% of the articles. The second most chosen topic is operations strategy, which appeared in 38 articles, or approximately 23% of the sample. Third, with 22 articles (13.50% of the articles), was operations performance. We observe that there are a variety of themes related to vertical integration in the OSCM field, including emerging themes.

4.3 Methods

We classify the articles based on the method (see Supplementary File 6), whether quantitative, qualitative or other. On the quantitative side, the most widely used approach was modelling, with 65 articles, or more than 37% of the total. On the qualitative side, the case study method appeared in 43 studies, more than 24% of the total. In other methods, theoretical essays appeared in more than 10% of the total, in 18 articles.

An important point to highlight is the greater number of theoretical articles than studies using secondary data. We can infer that although vertical integration has been a topic studied for several decades, some studies are still trying to establish themselves in the field, especially when we relate to the themes found where there is great diversity and little repetition.

5. Discussion

Based on the results obtained, a range of themes were found to explain vertical integration. The following text presents the themes found and serves as the basis for the development of the discussion, future studies and an analytical model.

5.1 Supply chain management

The sample we analysed focused on supply chain relationships that explored the relationships between buyer and supplier, risk management and distribution channels. Companies in France and Italy have been modifying their governance and expanding the use of vertical integration. Food processors that are seeking to establish themselves in the market are planned like French and Italian supply chains, where food processors have reconsidered their relationships with their suppliers and moved towards vertical integration (Ghozzi, Soregaroli, Boccaletti, & Sauvée, 2016). Both resource-based view (RBV) (as a "potential" superior knowledge) and transaction cost economics (TCE) (as an opportunistic behaviour) were used, in contrast, to understand the driver of the governance structure. For the context and location studied, only RBV explained the option to migrate to hierarchical governance characteristic of vertical integration.

Following vertical integration, supplier and buyer become two units within an integrated company, which reduces production costs by allowing production managers to centralize

production scheduling. When considering inventory levels and the cost of goods sold in a distribution network, the effects of vertical integration alternate over time (Wan & Sanders, 2017). Meanwhile, from inventory theory, although high inventory levels that result from increased product variety are moderated by vertical integration, it is still unknown which elements of the inventory strategy firms better manage the relationship between product variety and its impact on inventory, even before going vertical integration. For example, in a soft drinks industry, vertical integration has been shown to mitigate the impact of product variety on forecast bias. An increase in product variety generates 38.89% less inventory after vertical integration, which is in line with the transparency perspective of vertical integration, which plays a role in mitigating the impact of product variety and forecasting on inventory levels (Wan & Sanders, 2017).

In an junction of T CE, RBV, and the relational view, vertical strategies were identified in the rail sector, typically referred to as intermodal, due to the integration among the port, the rail operator, and the internal terminal (for example, Hamburger Hafen und Logistik AG). Railcar ownership is not only a good indicator of the level of vertical cooperation but also indicates that the transport service itself is recognized as part of the core business (Monios & Bergqvist, 2016). With a theoretical view, the rail cars are the specific assets, and, not only as a specificity of the asset (via TCE) or of a specific company (via RBV), being the owner of the car becomes a good indicator of the level of vertical cooperation and of the existence of trust and learning within a collaborative environment.

The make-and-buy strategy needs to change as the technology matures, leaving the most advanced technologies within the vertical structure. There is no doubt between outsourcing and in-house based on TCE and the theory of growth of the firm, the company must adopt the very rigorous choice of "doing" during the early days of adopting the new technology in the manufacturing processes (Perrons & Platts, 2005). Still on the choice of technologies, these are seen in smaller numbers when in integrated supply chains, because in vertically integrated companies it is possible to standardize interfaces and integration between system – already seen in renowned organizations such as Zara (highly vertically integrated) and Apple (highly vertically disintegrated technologies) (Bhakoo, Jagat Singh, & Chia, 2015).

In the corrugated cardboard industry (e.g. Field & Sroufe, 2007), vertical integration is common. Non-integrated companies are both customer and competitor of integrated companies; that is, non-integrated companies buy paperboard from vertically integrated companies that produce cardboard and corrugated board and usually generate market power imbalances, with those that are not vertically integrated operating at a disadvantage. From reverse supply chain literature, the use of recycled material inputs is expected to be dominated by non-integrated companies, and with capital costs decreasing over time, the ratio of independents to integrated companies will increase.

5.2 Operations strategy

When dealing with strategy, we must think in the short, medium and long term. If there is (economic) uncertainty in production planning, companies can execute a vertical integration as a way of remaining competitive and profitable. In addition, from the perspective of agency theory, manufacturing must be willing to agree on a set of business practices, share pertinent information and essentially compete as a vertically integrated company (Smith, 2012). But are rare the vertical manufacturing and performance investigations. Decision-making on vertical integration is mostly based on cost considerations. However, even eventually reduced, costs can be easily lost if one considers the increase in transaction costs, thus ignoring the strong

side effects that outsourcing decisions can have on competence management (another major factor that influences performance). (Broedner, Kinkel, & Lay, 2009).

Theorists are in full agreement, however, that from core competence view, strategists should analyse firms in terms of their competence, resources and activity so that they can more fully address decisions on the upstream and downstream vertical axis (Philpott, Hamblin, Baines, & Kay, 2004). In terms of TCE, it has also been shown that vertical integration is utilized when a company seeks to expand its activities, such as through the franchise system, in the presence of uncertainty regarding the success of the business. On the other hand, in the path dependence view, with business growth (reduced uncertainty), one could expect to see market relationships; however, due to the governance structure in the previous situation, it continues to be used even after the environment changes (Azevedo & Silva, 2003).

Path dependence has been described in vertical integration strategies in the Japanese steel industry when, by "always doing it this way", this industry has virtually integrated push–pull boundaries. While vertically integrating may involve a large investment in specific assets (facilities and machinery), this strategy can control all the links in the supply chain as a single flow and thus maximize cost efficiency. In other words, this leaves a manufacturer just one step away from its customer, a strategy that enables every confidence to be placed in the company's name (Byun and Lee 2015). If TCE has already been approached as a decision maker before and during a deal, from the point of view of competitive advantage, especially barriers to market entry, the search for gains with large-scale production created market generalists, who also have a high degree of integration vertical (Sabourin, 1999).

There may be an increasing incentive to acquire a foreign facility to control costs, quality and delivery, or to reduce supplier dependence and facilitate coordination. Every stage in the physical production of ships in Norway is carried out in a Norwegian shipyard (Semini et al., 2018). The company's competitiveness is not only promoted by consumer access but by vertical integration through ownership, and this satisfies its key customers; however, when it comes to using TCE, the traditional explanations of TCE (for the vertical integration choice) did not pay much attention the role of customers, especially understanding customer needs, satisfying customer needs, providing timely services, creating customer value (Guan & Rehme, 2012).

5.3 Operations performance

A company will continue to integrate vertically and monopolize an industry if it can maintain efficiency (Nugent & Hamblin, 1996), namely, maintain cost of organizing production below the cost of transacting on the market. Would a company's performance, therefore, be strengthened by adopting a vertical integration strategy? Vertical integration may not lead to instant benefits, and managers should not expect rapid improvements in overall company performance (Wan, 2019). To verify these effects, TCE is related with vertical integration to imply reduction supply uncertainties to the downstream; therefore, inter-firm transactions become internal operations. Vertical mergers create higher abnormal returns; in RBV literature, this implies that investors value mergers that aim to expand the acquirer's core competence more than those native of the acquirer; in the logistics sector, in fact, the acquiring organization can improve capabilities because vertical M&As can lead to greater positive market reactions compared to horizontal M&As (Liu, Si, & Peng, 2020).

The lower the degree of vertical integration, the greater the cost of implementing product improvement. This is essentially due to the difficulty of integrating and coordinating vertically disintegrated chains (Iakymenko, Brett, Alfnes, & Strandhagen, 2022): vertical

integration can lead to better governance of agency problems, resulting in a better operational performance (Peltokorpi, Matinheikki, Lehtinen, & Rajala, 2020). From the claims of contingency theory, the impacts of contingency factors on the performance of the implementation of changes are still subjective, but such factors could be evidenced through longitudinal studies following the change since the implementation.

Vertical integration is a means of increasing organizational efficiency, so scholars have been trying to integrate this topic to extend agency theory (Pellinen, Teittinen, & Järvenpää, 2016). Vertical integration also has a positive effect on raw material inventory turnover, finished goods inventory and return on sales, but not on volumes of unfinished or in-process inventory (Andreou, Louca, & Panayides, 2016). Although empirical literature has not established in absolute terms the relationship between vertical integration and performance, in TCE view, a higher degree of internal transfers in a vertically integrated firm will reduce transaction costs and improve information exchange. When observing the airline ticket market, there was an attempt to improve efficiency with the vertical integration of the ticket issuer, but there was no evidence that a vertically integrated system of ticket distribution improved efficiency. TCE theory asserts that there is an incentive to vertically integrate retailing when costs and difficulties associated with market transactions are significant, but in an environment that has been fairly stable and traders have been highly regulated, like in the airline industry, exchanges have not been complex or uncertain; thus, it is not necessary to reduce the risk of exchanges. (Cheng, Lee, & Shomali, 2012).

As seen, not all findings are the same. IBM's vertical integration was widely considered a clear source of competitive advantage, and the flexibility generated by outsourcing the Dell business model considered a model for companies (Chu, Teng, Huang, & Lin, 2005). Like the US bicycle industry, which followed the effects of vertical integration, Shimano had a similar market share to SunTour and Campagnolo. Subsequently, Shimano moved to the whole product, which generated interdependencies between components. Rival companies could not respond to Shimano's move because the new integral architecture reduced the compatibility of Shimano's components with those of other competitors, thus creating a competitive advantage for Shimano (Sorkun, 2016).

From knowledge-based view's point of view, even in the absence of opportunism, transaction costs still arise in knowledge-based transactions because, if the information is not easily transferable between companies, firms tend to be vertically integrated. At the fashion industry, if all the competitors in an industry outsource, this leads to an improvement in scale and efficiency. But the world has been supportive of the benefits of (full) vertical integration, including its ability to increase bargaining power, which is well represented by the Fordist production model (Kotabe & Mol, 2009). Two Taiwanese semiconductor companies have used vertical integration to control their need for certainty, but if competition and demand become too unfavourable, they will face pressure to reduce or outsource the number of stages they verticalized (Chu et al., 2005). This is a movement that seems to be more consolidated: the degree of outsourcing is negatively related to the firm's performance, and the higher the levels of market uncertainty, the difference is accentuated.

5.4 Operations management

A lot of attention has been paid to deciding whether operations should be verticalized or contracted from external suppliers (Olausson, Magnusson, & Lakemond, 2009). Companies in industries around the world that were less vertically integrated in durable goods were consistently more likely to use overseas sources of supply (Ettlie & Sethuraman, 2002). While Caplan (1977) questions vertical integration and adopts a much more critical approach to transaction cost analysis, with make-or-buy decisions guided by a wide range of

economic and technical considerations, Mixon and Upadhyaya (1995) show that for US carriers, larger companies have advantages over smaller companies in terms of asset ownership by theory of regulation, where large firms face lower costs of capital.

For companies in the early stages of operation, when quick responses to market reactions are crucial, chain coordination cannot be achieved (Chen, Chowdhury, & Donada, 2019). Companies also face the prisoner's dilemma that forces them to invest when the development cost is high despite the level of competition, but the equilibrium that outsourcing can provide, or the *ex ante* technological advantage that comes from having independent suppliers were found (Grahovac, Parker, & Shittu, 2015). In the electricity sector, by scope economies, generation-only companies generate more than double the amount of electricity when they are vertically integrated and can choose between manufacturing and purchasing electricity (Triebs, Saal, Arocena, & Kumbhakar, 2016). Economies of scale were confirmed from vertical integration in water supply in Portugal, where a single, vertically integrated concessionaire (responsible for the whole activity, from water production to water distribution) is able to supply water at a lower cost than several companies that are not vertically integrated (Carvalho & Marques, 2014). Other than that, the relationship between vertical supply chains and the environmental performance of vertically integrated chicken producers – rearing, milling feed, processing and distributing the meat – is not supported by empirical evidence (McCarthy, Matopoulos, & Davies, 2015). This is similar to the case of the New Zealand dairy industry, which has developed into a highly vertically integrated system – a farmer-owned cooperative structure – since mostly family-owned producers supply their cooperatively owned processing plants with milk (Sankaran & Luxton, 2003).

5.5 Operations service

Evidence from the transport sector indicates that there may be important factors within the nature of the industry that have an impact on the buy-or-make decision. Among the suggested factors to investigate in these service operations are the level of competition, the degree of government regulation and the maturity of the industry; besides, combined (transaction and production) costs must be considered (Bienstock & Mentzer, 1999). Carriers are moving beyond transportation and becoming involved with storage. Even though the larger carriers are more likely to offer storage in their own buildings when using their own employees, expertise and location become a big factor in warehouse efficiency. As a result, they prefer owning the assets rather than entrusting them to third parties (Hanna & Maltz, 1998).

The traditional model of vertical integration found in the manufacturing industry, with its focus on design and production, is rarely seen in service operations (Baines, Lightfoot, & Smart, 2011). Social interaction tie's view, in response to the autonomy of physicians and the complexity of health service processes, hospitals are increasingly applying vertical integration strategies by employing physicians to provide services. This is because many physicians who work in hospitals may have jobs in addition to their hospital job; they may work there in an outsourced capacity and may have other remuneration and objectives that differ from those of the hospital (Dobrzykowski & Tarafdar, 2015). In less vertically integrated companies, the exchange of information and transactions with suppliers increases, as does the speed at which cost savings are realized, but there is no evidence that integration significantly influences customer satisfaction (Xue, Ray, & Sambamurthy, 2013). Therefore, while the existing literature on transaction costs still does not examine the evolutionary dynamics of the industry (how and why transaction costs are reduced), it is necessary to consider in the models the evolutionary dynamics of the industry, where service operation strategies are not only statically determined by transaction costs but also by information asymmetries and differences in capabilities and resources between companies.

5.6 Production scheduling

Vertical integration has a positive effect on observed production; that is, it improves production efficiency (Lin & Chiang, 2011). Dotoli, Fay, Miśkowicz, and Seatzu (2019) contribute to the findings by stating that vertical integration of manufacturing plant automation systems contributes to at least three requirements:

(1) flexibility, with respect to lot size;

(2) flexibility, to the reconfiguration of supplies; and

(3) reliable communication across heterogeneous systems.

Factory automation management requires supply chain integration, standardization, specialization and learning effects (Jonsson, Rudberg, & Holmberg, 2013). As the example of IKEA (a Swedish multinational furniture company), which has a fully integrated downstream chain, in addition to many suppliers having IKEA as their only or main customer, including some that are partially or fully owned by IKEA.

5.7 Quality management

"Centralized decision making is an effective way to obtain high quality products" (Xie, Yue, Wang, & Lai, 2011, p. 407). Vertical integration also benefits situations in which quantity and quality are lost in the fresh agri-food produce sector because they are highly perishable products, or where service sensitivity is high (Orsdemir, Hu, & Deshpande, 2019). Vertical integration can be seen as an alternative strategy for corporate, social and environmental responsibility (CSER) in sourcing when conventional approaches such as auditing are ineffective. Because vertical integration does not generate any distortion of efforts – as occurs in vertically separated firms – the upstream and downstream R&D efforts are aggregated, as is the existing level of quality itself (Lambertini, 2018).

To investigate how decide on quality investment and price decision in a make-to-order supply chain with uncertain demand, based on the preference theory, centralized decision-making is an effective way to achieve high-quality of products. As consumer preferences for high quality products increase, manufacturing more high-quality products is advantageous for companies. When the average consumer quality standard reaches a certain level, it may be more beneficial for an industry to offer premium products if other companies in the same industry choose to stop producing inferior products (Han & Liu, 2020). A supply chain that adopts a vertical integration strategy tends to provide "high quality, high price" products, which is a good choice when the focus is on end consumers (Xie et al., 2011).

Vertically integrated companies are uncommon in the European meat industry, even though vertical integration is the most traditional way of dealing with quality uncertainty. It is estimated that players in this industry prefer to invest in partnerships. According to coordination theory, the coordination of information and basic rules may be outsourced, while production and marketing are coordinated through the open market (Bahlmann & Spiller, 2009).

In a highly competitive market, retailers are concerned with the relationships they have with suppliers, which are also retail competitors, as they ensure the supply of high quality products (Hingley, 2001), such as in the production of fresh food products, for example. In other words, importance is given to a hierarchy of retailers. Because of perishability, quality and risks arising during the coronavirus pandemic, it has become clear that to build a supply chain that is highly resilient to risks, by dynamic capabilities, firms were more resilient when opting for vertical integration and thus adopting strict quality control. It occurred in the domestic furniture market in Japan, which achieved vertical chain integration by adopting strict quality control (Ishida, 2020).

5.8 Sustainability

From a CSER perspective, vertical integration may be economically justifiable as it improves the livelihoods of people in developing countries (Orsdemir et al., 2019). Nike, Nutella and Zara are classic examples of this. As product circularity, the vertical integration of disassembly units and scrap processing and shredding communities helps contain price fluctuations and so helps in a closed-loop material flow in the vehicle industry. Toyota (Japan) has partnered with scrap metal dealers and other vehicle manufacturers to dismantle and form a company to recycle materials from automobiles (Mohan & Amit, 2021). In the home appliance supply chain, a high degree of vertical integration by one element in the supply chain is not a situation that is suitable for implementing the circular economy (Bressanelli et al., 2019).

Partial vertical integration, following the principles of lean, reduces energy consumption and carbon dioxide emissions in the chain (in the Indian context), while complete integration, in addition to the increased benefits to the partial integration factors, reduces lead times and results in cleaner production with reduced lean waste (e.g. waiting, inventory, movement and quality) and green waste (e.g. energy, water, waste and transport) (Sultan, Routroy, & Thakur, 2021). When thinking about the community, vertical integration is an efficient structure, although from a perspective that evaluates the environment, the investments do not translate into sufficient reduction efforts to compensate for the polluting effect of the large volume of production, leading to a degraded environment that cancels the social welfare benefit (Sim, El Ouardighi, & Kim, 2019). In the metal coating supply chain, vertical integration concentrates processes in large companies, from the production of paints to the application of coating materials, which requires an optimization of procedural processes and recycling cascades (Geldermann, Schollenberger, & Rentz, 2004).

5.9 Emerging issues

Faced with the common sense dictum of "don't outsource what's going to generate a lot of money", there is a fundamental principle to apply here: those who control the interdependent links in a value chain obtain the most profit (Christensen, Smallman-Raynor, & Verlinden, 2001). From *behavioural operations*, we can extend the literature flow and provide a clear understanding that the change in the governance mode is a *de facto* choice, as well as a change in supplier, or a strategy re-assessment (Foerstl, Franke, & Cataldo, 2021). From the perspective of the theory of planned behaviour, Foerstl et al. (2021) carried out an experiment looking for the effects of pressure and the mimetic attitude of managers on the decision to internalize operations. Given increasing investment in the strategy of internalizing operations, companies still do not have full knowledge of the behavioural biases of their managers' decision-making. There is evidence that supply chains are not always rational because managers' attitudes have an influence on the decision to internalize. Team behaviour (attitudes and feelings) and its effect on the intentions and the decision to verticalize are still uncertain and need further investigation.

Throughout economic history, a common link has been suggested between the level of vertical integration and the rate of innovation (Gadde, 2013). From an *innovation* point of view, therefore, a vertical integration network and strong market share capabilities are capital, while a lack of resources and capabilities forces companies to adopt a more flexible form of frugal innovation just to survive (Lu, Chang, Rong, Shi, & Yu, 2019). Vertical integration maintains control over the product internally, which is why projects with high levels of vertical integration are two and a half times more likely to implement "green" systemic innovations even after controlling for the cost of innovation (Hall, Whyte, & Lessing, 2020). The firms that have broken their dependence on specialized industry knowledge have developed systemic

innovations to capture value from digital manufacturing technologies and consequently obtain a competitive advantage. Although industries with specialized assets can eliminate inefficiencies due to imperfect competition and save on transaction costs, entry and the number of competitors have a relatively greater impact on vertical integration levels than technological rivalry (Balakrishnan, 1994).

We have confirmed that vertical integration is a facilitator of *new product development* (Hall et al., 2020). Competition between companies has its stages. When the product is launched, companies compete for development and performance. As customer needs are met, competition for flexibility, pricing and differentiation comes into the picture. It is well known, however, that subcontractors and even service providers are often low-level suppliers; that is, they are rarely involved in complex processes such as new product development. (Spina, Verganti, & Zotteri, 2002). Entrepreneurial actions of a product introductory stage led to vertical integration due to strong uncertainties and asset specificity needs. An exception to this occurred when Tesla, which is increasingly verticalized, outsourced its battery manufacturing process to Panasonic, but it was almost a vertical franchise since the construction decisions were all Tesla's (Chen et al., 2019).

Even in situations where manufacturing is entirely outsourced, it seems necessary to keep certain manufacturing competences in-house (Olausson & Magnusson, 2011), because the product may not be good enough and, therefore, being a vertical company is essential for success (Christensen et al., 2001). Looking for *learning from operations* over time, manufacturing companies experience higher long-term costs when they choose to outsource. When purchasing components (market hierarchy), the manufacturer learns less about component production and system integration, which increases the manufacturing and integration costs; the lessons learned reduce over time, so if the manufacturer decides to go to market again, it will no longer have any experience of in-house manufacturing (Anderson & Parker, 2002).

6. Future research directions

To deepen our understanding of vertical integration, we propose a research agenda for each of the areas that emerged from the content analysis, as summarized in Table 1. We applied an aggregative and interpretative approach, drawing on themes in the OSCM field and highlighting and establishing readiness contributions, as suggested by Tranfield et al. (2003). We present aggregated results from the analysed articles in a more comprehensive way, which could support future, more extensive theoretical work on vertical integration. In addition, we pose new questions critical for advancing the theorizing on the topic.

The findings reveal and expose the value of vertical integration operations strategy for literature, theory and practice. From a theoretical standpoint, "there is no general theory for vertical integration" (Chan & Reiner, 2019, p. 280). For TCE, the question of whether an activity is economically viable for vertical integration or not depends on the specificity of the assets needed to carry out that activity. On the other hand, from resources (or competence) based view, the company is considered as a resource box and, therefore, it is likely that it will develop and grow based on existing competences by expanding rather than acquiring the substantially different competences needed for new activities. Although the lack of competition in the segment may facilitate a greater level of vertical integration, in the context of carriers, there is no support for the TCE uncertainty argument between using employee operators or market operators (C. Han, Corsi, & Grimm, 2008). There is a certain inducement for manufacturers of specialist products to use vertical integration more often than market relationships. Even with the contributions of TCE, industries that manufacture specialized products generally experience high levels of transaction costs and are therefore

Theme	Aggregative result	Suggested research questions
Supply chain management	• RBV explained the option to migrate to hierarchical governance, a characteristic of vertical integration • Vertical integration, by centralizing production scheduling, reduces production costs • High inventory levels resulting from increased product variety are moderated by vertical integration • The greater variety of products offered reduces the amount of stock after adopting vertical integration • Technologies are seen in fewer numbers in integrated supply chains as it is possible to standardize interfaces • In highly verticalized industries, there may be an imbalance of market power, with non-integrated companies	• What the vertical integration effects on inventory levels? And one the cost of goods? • Which elements of the inventory strategy companies best manage the relationship between product variety and inventory, even before vertical integration? • How to reach the advanced level of technology within vertical chains? • How can the circular economy work together with non-vertical companies, to balance market power, to increase responsibility for processing inputs from recycled material? • Could capital costs increase the chance of independent chains becoming increasingly vertical?
Operations strategy	• Under economic uncertainty (e.g. franchising), vertical integration is a means to keep companies competitive and profitable • Customer confidence and cost efficiency are a result of vertical integration, as well as bringing manufacturing just one step away from the customer • The quest for scale gains created market generalists, who have a high degree of vertical integration	• What are the guidance factors to decision-making for vertical integration besides cost aspects? • In an environment of reduced uncertainty, through organic business growth, vertical integration is also used as an extension of economic uncertainty
Operations performance	• Performance effects are not instantaneous • Equity returns are higher in vertical mergers due to greater appreciation of investors due to the expansion of capacities • The lower the degree of vertical integration, the higher the cost of implementing product improvements • Vertical integration improves the governance of agency issues, resulting in better performance; coordination and information exchange	• Which contingent performance factors are improved (or not) after vertical integration? • What are the longitudinal effects in the field of performance with respect to contingency? And for TCE? • What aspects, contexts and characteristics of unregulated markets impose the need for vertical integration? • When is a high degree of vertical integration beneficial?

Table 1.
Summary of proposed research agenda

(*continued*)

Theme	Aggregative result	Suggested research questions
	• Regulated sectors do not have complex or uncertain exchanges, reducing the need for vertical integration	
Operations management	• From regulation theory, larger companies have advantages in owning assets and, therefore, lower capital costs • Companies in the initial stage of operations cannot coordinate the chain • Due to the prisoner's dilemma, given the cost of investment, companies can balance outsourcing or having independent suppliers • Vertical integration provides scope and scale economy gains	• How can vertical integration be used to pursue environmental concerns?
Operations service	• Asset specificity is the most common explanation reason via TCE for vertical integration • Hospitals are increasingly using vertical integration to configure doctors with an exclusive role in the hospital	• What is the response to uncertainty and frequency in the services sector regarding TCE? • How after-sales it is configured in the supply chain? • In smaller companies, the greater ease of communication and suppliers' relationship makes vertical integration unfeasible
Production scheduling	• Vertical integration of manufacturing plant automation systems contributes understanding of an efficient vertical information flow in factories must be improved	• What are the requirements for manufacturing plant automation systems when upstream vertically integrated?
Quality management	• Centralized decisions favour obtaining high-quality products (e.g. fresh foods) • R&D efforts are not dissipated and favour both upstream and downstream • A verticalized chain tends to offer a high-quality product at a high price • Risk resilience moderates' quality control in a vertically integrated chain	• How to become quality free of the noising of coordination of information and ground rules? • What is the relationship between vertical integration and quality assurance? • Is there competition between supplier and retailer when the retailer demands high quality from its supplier? Can the supplier become a retailer too?
Sustainability	• Vertical integration improves the livelihoods of people in developing countries	• What are the intrinsic factors in industries that are favourable to the vertical integration of the material recycling activity (e.g. automobile)

(*continued*)

Table 1.

Theme	Aggregative result	Suggested research questions
	• From product circularity, vertical integration helps contain price fluctuations • Partial vertical integration leads to energy savings and carbon dioxide emissions. As for the complete, it also reduces lead times and produces less waste • The efficient vertical structure does not translate into compensation when looking at the polluting effect of the large production volume	and in industries that are undesirable (e.g. home appliance)? • What is the vertical integration process and recycling management plan regarding optimization?
Emerging issues – behavioural operations – innovation – new product development	• Supply chains are not rational 100% of the time • Capacity for innovative participation is capital • Lack of resources and capabilities forces companies to adopt frugal innovation • Breaking dependency led companies to develop innovations that gave them a competitive advantage • Vertical integration favours the development of new products	• What are the behavioural biases of managers for choosing to verticalize? • Based on higher costs when outsourcing, what is the limit of tiers that can be verticalized without losing focus on the core business? • What is the cyclicality of the decision between vertical integration and outsourcing, without losing learning about in-house operations?

Table 1. **Source:** Authors

more likely to vertically integrate (Heriot & Kulkarni, 2001), while manufacturers of non-specialized products are less likely to experience supplier opportunism (Kelly, Wagner, & Ramsay, 2018).

While there are three conditions that can increase transaction costs (uncertainty, frequency and asset specificity), it is important to consider the combination of these with production costs. Vertical integration helps in simplifying communication, having real-time data, faster allocation of resources and costs – by eliminating unnecessary factors (KEK et al., 2022). Such emphasis is given to asset specificity because it is the most consistently verified influence in empirical tests of the TCE. Uncertainty has been difficult to conceptualize, measure and support. It is a construct with subjective measure but is similar to risk tolerance and propensity to trust the organization and its decision-makers. While TCE literature still does not examine the evolutionary dynamics of the industry (how and why transaction costs are reduced), it is necessary to consider in the models the evolutionary dynamics of the industry, where service operation strategies are not only statically determined by transaction costs but also by information asymmetries and differences in capabilities and resources between companies.

Clearly, there are areas where further research is needed, and this review could serve as the basis for future research questions. An industry that has undergone significant

vertical disintegration, however, is banking. A future analysis of strategic opportunities for the reintegration of credit business models is required, not least because institutional variables seem to affect the vertical integration of the credit assessment phase (Scannella, 2015). After-sales service is another sector that is little explored in the operations literature, although there is no correct way to configure this chain (Saccani et al., 2007). It is needed to explore how vertical integration contributes to environmental performance improvements and, especially, to explore the trade-offs with outsourcing, especially regarding waste management.

Understanding an efficient vertical information flow in factories must be improved. Supply chain planning is important for ensuring and expanding the global supply of low-cost, highly efficient production. Several research opportunities are useful in the implementation of sustainable approaches (e.g. green supply chain management and circular economy) (e.g. green supply chain management and circular economy) (Pohlmann, Scavarda, Alves, & Korzenowski, 2020).

It is necessary to develop general models that extend the dynamic analysis to include sectors where buyers and suppliers can initiate profits by generating innovations. Related theories do not help much when intermediate forms of ownership, such as joint ventures, are involved in make-or-buy strategies (Balakrishnan, 1994). Also, the verification of the extent to which firm-level transactions influence the boundary decisions of companies is awaited. For example, tests for fixed or random effects and effects versus a cross-sectional model will be conducted (Leiblein & Miller, 2003). It would also be productive to examine how differences in the level of a firm's absorption capacity (Leiblein et al., 2002) influence vertical integration decisions (Cohen & Levinthal, 1990). We highlight the need for exploring how heterogeneity, capabilities and governance are mutually determined (Brahm & Tarziján, 2014). If the degree of competition is high, integration is negatively affected, with the optimal level of integration negatively depending on the degree of competition. While these results are strongly supported by the theory and evidence (as reported in Section 2), the topic of vertical integration strategy is both complex and controversial. Even on the threat of new entrants in one or more tiers not occupied by the incumbent firm, the latter have vertical integration as a mechanism to reverse their inferior position under the threat of substitutes and achieve coopetition (Pi & Li, 2022).

Attempts at identifying managerial implications concern a particular industry or a set of sectors, so replicating empirical studies in individual companies or in a group of companies would be a fruitful exercise (Balakrishnan & Wernerfelt, 1986). It would also be beneficial to initiate investigations that define in precise terms what a main supplier is (Perrons & Platts, 2005) and whether vertical integrations have focused on them to internalize operations.

Companies also are unlikely to integrate activities that differ greatly in formality from the technical approaches on which they are based. For example, activities that benefit from basic scientific knowledge differ from those that rely primarily on experience and intuition and follow strategic commitments that may be mutually exclusive. Therefore, the stable set of activities that the company performs is partially determined by its historical development and not exclusively by its savings in transaction costs. Capabilities are also important when knowledge related to the activities in question is partly tacit and team-based and therefore takes significant time to acquire. New research can address supply-side integration in a different approach to customer service that leads to cost savings (Crotti, Ferrari, & Tei, 2022; Xue et al., 2013). Additional research should seek to discover the characteristics of knowledge that generate differences and similarities between activities. This is necessary for delivering predictive content for the enterprise resource approach (Argyres, 1996). Studies with customers core element of the vertical integration strategy and TCE are necessary (Guan & Rehme, 2012).

All in all, there are future opportunities for further investigations in emerging markets, with an expectation of growing empirical investigation of the effects of supply decisions on company performance in more industries and countries, as well as an exploration of the representative data. Expanded empirical knowledge in combination with a greater conceptual understanding can be immensely helpful for expanding the field. It is hoped that, from a management perspective, executives will stop questioning whether the power of making attractive profits is going to change, anticipate them and be able to assess when they will make them so they thrive across product cycles rather than in just one (Christensen et al., 2001). Despite the incipient nature of some themes, vertical integration in operations management and supply chain studies, whose intensity has varied over the years, has served as an incentive and starting point for future studies.

Finally, we summarize the integrated output model resulting from our empirical evidence (see Figure 2). Essentially supported by the research questions that are the gaps and bottlenecks of vertical integration, we split them into three major sections. Drivers are the motivators for vertical integration research, whether favourable or undesirable. The mechanism is the vertical integration strategy, and the bottlenecks are exclusively about the process. Outputs are the topics linked to vertical integration effects and are split into three: economic, organizational and sustainable.

7. Concluding remarks

Whenever there is a need to encourage the academic community to pursue more research and explore new directions in OSCM literature, it is achieved through a literature review that invites researchers to contribute to a given research framework. In this regard, we presented an analysis of the state-of-the-art knowledge from sample papers, concisely summarized these findings and demonstrated a suggested research agenda on vertical integration.

We contribute to clearly unifying the vertical integration strategy as a platform to access final demand and resource ownership to a single business unit. A state-of-the-art vertical integration operations strategy is designed within the OSCM field. The results showed that

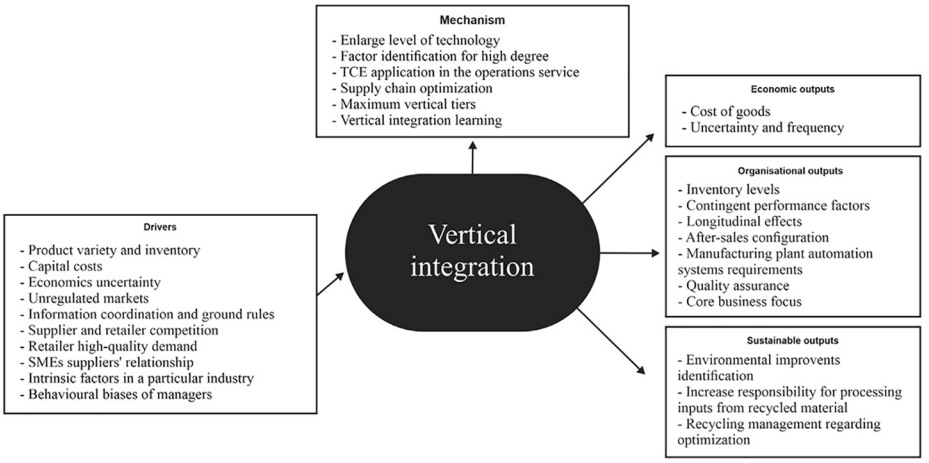


Figure 2.
Integrated output model

Source: Authors

there are no single factors such as future costs, structures or skills development. Rather, we need to combine the view on production cost comparisons with the governance perspective, considering the transaction costs caused by different modes of governance and the competency perspective in relation to their impact on capacity building.

The findings of the study have several implications for both practitioners and researchers. Vertical integration poses a dilemma: companies in industries that use specialized assets can eliminate the inefficiencies of imperfect competition and save on transaction costs. Downstream vertical integration is obviously a critical success factor in many cases, while upstream integration is often a necessity. "There is no general theory for vertical integration" (Chan & Reiner, 2019, p. 280). For transaction cost savings, the question of whether an activity is viable for vertical integration or not depends on the specificity of the assets needed to carry out that activity. On the other hand, from the resource-based (or competency-based) view, the firm is considered a resource box and probably will develop and grow based on existing competencies, expanding rather than acquiring the different competencies needed for new activities. If the degree of competition is set to high, integration is expected, with the optimal level of integration depending on the degree of competition.

This strategy is also compatible as a blue ocean strategy, since with vertical integration, firms can make real product innovations to reduce competitors' former market power and market share (Pi & Li, 2022). Firms are encouraged to integrate activities that differ greatly in formality from the technical approaches on which they rely. For example, activities that benefit from basic scientific knowledge differ from those that rely primarily on experience and intuition and follow strategic commitments that may be mutually exclusive. Therefore, the stable set of activities that the company undertakes is partly determined by its historical development and not exclusively by its savings in transaction costs. This is important for both managers evaluating vertical integration possibilities and policymakers interested in supporting vertical integration decisions. Specifically, managers must evaluate a reconfiguration of the firm supply chain and policy actors, which need to expect and plan an economy more vertically, with a smoothness process in the regulatory agencies, as key contingencies, and integration factors to generate excellent benefits.

Finally, if capabilities are also important when the knowledge related to the activities in question is partly tacit and team-based and therefore takes a significant amount of time to acquire from up-to-date external shocks, we want to highlight research on vertical integration and performance. Therefore, a growing empirical investigation of the effects of sourcing decisions on firm performance in more industries and countries, as well as an exploration of representative data, is expected.

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Supplementary material

The supplementary materials for this article can be found online.

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Associate editor: Maciel Queiroz