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A Review of Production and Operations Management Research on Outsourcing in Supply Chains: Implications for the Theory of the Firm

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This paper reviews the state of the art in Productions and Operations Management (POM) academic research regarding outsourcing in supply chain contexts. We first acknowledge the "Theory of the Firm" (ToF), the venerable and vast body of thought regarding where the firm draws the boundary between what it performs in-house and what it outsources. Despite the clear linkage between outsourcing and POM, the ToF literature is most closely associated with the fields of strategy and economics. This disconnect might in part be due to a difference in theoretical lenses and terminology, which we address for the POM audience by providing a ToF tutorial. Our review of publications by the POM community from 2000 to 2016 includes a framework that organizes the in-scope papers and a structured summary of each work. We partition the research into empirical/conceptual and analytical sub-literatures, each of which gets its own critical assessment and discussion of open opportunities. Along the way, we articulate the features of the POM lens that distinctively position POM researchers to contribute further to the ToF, a convergence which we hope to encourage through this study. A deeper conversation among strategy, economics, and POM would enrichen the rigor and the relevance of each field.

Key words: outsourcing; Theory of the Firm; vertical integration; make-vs.-buy
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1. Introduction

Many a product bears the brand of a company whose internal resources comprise a surprisingly small part of the enterprise that creates and delivers that product. In toys, electronics, garments, and footwear segments, just the contract-manufacturing portion often represents more than 50% of cost of goods sold (UNCTAD 2011, providing a statistic for 2009). An example familiar to many consumers is Apple's i-devices. While a tagline emblazoned on each device chassis declares these devices to be "Designed by Apple in California," contract manufacturers[1] (CMs) like Foxconn (a subsidiary of Hon Hai Precision Industry Co., Ltd.) handle much of the final assembly. Foxconn offers a nearly complete suite of supply chain services including product design, component procurement, and logistics. The popularity in the electronics industry of this style of outsourced supply chain is evident from Foxconn's roster of clients, which reads like a "who's who" of that sector.

For a product's brand owner,[2] outsourcing can improve focus on activities retained in-house, offer financial flexibility, and provide access to capabilities not available internally. As e2Open (2016) notes regarding the electronics industry, "The (supply chain) outsourcing trend is expected to continue into 2016 and beyond. Whether a manufacturer is looking to scale up quickly (and is unable to do so using internal resources), expand globally, or focus on core competencies, outsourcing can provide these capabilities." Similarly, in the pharmaceutical industry, a 2015 Research and Markets study[3] anticipated 8.3% annual growth, and noted: "Started initially as a one-off activity, contract manufacturing has evolved into a dynamic business model; currently most prevalent in manufacturing, outsourcing is steadily spanning the entire pharmaceutical value chain. With CMBOs now offering the entire multitude of services from design

and discovery to final packaging, the concept of 'one stop shop' service provider is gradually gaining pace. . ..One of the most significant changes in the outsourcing space is the emergence of strategic contract manufacturing." A similar trend continues in other industries.

While brand-owning firms in many industries have been outsourcing many activities, currently many firms are also "in-sourcing," or vertically integrating. Some prominent examples of recent vertical integration moves include those by Boeing (Cameron 2017) and Tesla (Gorzelany 2014). As the pharmaceuticals quote in the previous paragraph suggests, yesterday's recipients of functions outsourced by other firms may in turn be striving to vertically integrate. For example, Foxconn has gradually vertically integrated its own upstream and downstream activities, including acquiring Sharp and developing its own branded products (Luk 2014, Mochizuki 2016). This movement of CMs becoming competitors to their customers has been occurring in various industries for some time (Arruñado and Vázquez 2006). Li & Fung in apparel has followed a similar path, starting its "Global Brands Group" in 2005, but spinning this off in 2014 (Olsen 2014). Thus, while we refer to "outsourcing" throughout the article, all theories and insights apply (in reverse) to its counterpart, "insourcing" or vertical integration. Indeed, for some reviewed papers, we reverse-coded the insights because the paper framed them in terms of the latter. We did this for clarity, not to imply that outsourcing is the sole or dominant direction of these decisions.

Outsourcing is a natural fit for the research agenda of Production and Operations Management (POM), which focuses on: (i) linking operations to the external environment and the strategy of the firm; (ii) improving operations within the internal organization, and (iii) effectively managing activities performed by vendors or suppliers. Meanwhile, outsourcing decisions: (i) are inextricable from the strategy of the firm and the characteristics of the external environment, (ii) dictate the scale and scope of the internal organization (including its geographic spread), and (iii) determine which activities will be performed by vendors or suppliers, which then must be managed. POM scholars have devoted considerable attention to understanding the challenges that outsourcing presents for internal capability development, coordination, and incentive alignment.

The theory and research regarding where the firm draws the boundary between what it performs in-house and what it outsources is collectively called the "Theory of the Firm" (ToF). Despite the clear linkage between outsourcing and POM, the ToF literature is most closely associated with the fields of strategy and economics. As such, this essay intends to motivate POM researchers to more directly contribute to the ToF literature, while also increasing ToF specialists' awareness of the progress already made by the POM community. With those objectives in mind, we organize the paper as follows: section 2 recaps salient theoretical frameworks in the ToF literature. Section 3 defines the scope of our review, including the time frame and journals, as well as how we filtered articles from these journals. Section 4 organizes the POM literature on supply chain outsourcing and reviews the papers within our scope. Section 5 documents opportunities for future research and ways the POM community can contribute to the ToF literature. We conclude in section 6.

2. Brief Review of Research on the Theory of the Firm

Any scholar examining questions related to outsourcing and insourcing must be conversant in the vast ToF literature, which dates at least from Coase (1937). Operations research and operations management initially took the boundaries of the firm as given and focused on tactical issues such as how to organize for efficiency (Taylor 1911) or how much inventory to carry (Whitin 1955). In contrast, economics and business strategy have long focused on higher level questions of organization, under the names of vertical integration, vertical coordination, firm boundaries, make-vs.-buy (or make-or-buy or make-buy), and outsourcing/insourcing. The ToF literature originally focused on defining a firm and explaining a firm's existence, given the benefits of the market (Coase 1937). This inquiry spawned much theoretical and empirical work on where firm boundaries should be drawn; that is, which activities should be performed inside the firm and which should be performed outside the firm. This section briefly discusses key approaches to this topic. We organize this as follows: First, we review theories based on outsourcing's effect on incentives. The dominant theory here is transaction cost economics (TCE). Second, we review theories related to capabilities, with the dominant theory being the resource-based view (RBV). Finally, we briefly touch upon the real options perspective, which has received much less attention in the ToF literature.

2.1. Incentive-Based Theories and Perspectives

We first review a set of theories that focus on organizing to achieve cooperation among parties to a transaction.

2.1.1. Transaction Cost Economics. The development of the massive stream of literature comprising TCE has resulted in at least two Nobel Prizes in economics: Ronald H. Coase (awarded in 1991) and Oliver E. Williamson (awarded in 2009). Many publications in economics, strategy, and beyond draw from TCE, refining it and empirically testing its propositions (Macher and Richman 2008).

The basic idea of this theory is that coordinating a transaction between a buyer and a seller using the market mechanism results in both *ex-ante* and *ex-post* transaction costs. Activities generating these costs include searching for and selecting a business partner, negotiating on price and other terms, writing contracts (which will almost always be incomplete), monitoring and enforcing contractual compliance, and renegotiating contracts when unforeseen circumstances arise. When these costs become large, performing the activities within a single entity, thereby managing by fiat instead of contract, may be comparatively more efficient. The risk of appropriability or value capture by others due to, for example, the loss of intellectual property (Gulati and Singh 1998, Oxley 1997, Pisano 1990), is a related concern. While contracts can specify what is not allowed, violations still need to be enforced in court, which carries potentially high *ex-post* transaction costs. Williamson (1971, p. 114) states that: "fiat is frequently a more efficient way to settle minor conflicts ... than is haggling or litigation." Williamson (1979, p. 253) also notes that: "The advantage of vertical integration is that adaptations can be made ... without the need to consult, complete, or revise interfirm agreements." Put directly, given the "business judgment rule" in contract law, courts exercise forbearance in which corporate-level managers serve as a "court of appeal" for firms' divisional-level conflicts, which thereby mitigates costly interfirm renegotiation or litigation (Williamson 1991).

TCE rests on two key assumptions about decision makers. One is that these decision makers exhibit bounded rationality, which Herbert Simon defined via the statement: "*The capacity of the human mind for formulating and solving complex problems is very small compared with the size of the problems whose solution is required for objectively rational behavior in the real world*" (1957, p. 198, emphasis in original). Such decision makers are consequently unable to stipulate in the formal contract all actions for all possible future contingencies. The second key assumption is that some managers may behave opportunistically. This means acting in their own self-interest, "with guile" (Williamson 1975, p. 255) by playing outside the "rules of the game." Given these assumptions, contingencies can arise in an exchange where one party may harm the other through post-contractual opportunistic behavior such as the economic holdup problem of renegotiating contract terms to capture greater economic value once the other party has become locked in to the exchange relationship (Klein et al. 1978, Williamson 1979).

TCE goes further to define characteristics of the exchange that increase the likelihood and severity of when such opportunistic behavior might arise, resulting in increased costs. The unit of analysis is the transaction. Different transactions, depending on key characteristics discussed below, should be governed differently, on a continuum from market (i.e., arms-length/transactional) to hierarchy (i.e., in-house). The "discriminating alignment hypothesis" (Williamson 1996) is that performance will be better when governance choice better aligns with transaction characteristics.

The most robust explanatory variable is asset specificity. Williamson (1985, p. 56) submits that: "asset specificity is the big locomotive to which TCE owes much of its predictive content." Considering the level of joint investment in human or physical resources, the level of asset specificity is the degree to which such investments have lower economic value when used outside the context of the specific exchange relationship; such investments may also be called idiosyncratic to the transaction (Williamson 1979). High asset specificity in the buyer–supplier relationship has correspondingly high transactional hazards due to potential opportunistic behavior. Specifically, when assets are costly to redeploy then the appropriable economic quasi-rent (i.e., the difference between the first-best and second-best use value of the asset) may be substantial. Because of this, one of the exchange parties may try to take advantage and renegotiate the contract to appropriate part, if not all, of this economic quasi-rent (Klein et al. 1978, Williamson 1979). Asset specificity may be low at the onset of a bilateral transaction, but this relationship may transform over time as the two exchange parties learn how to work with each other. As Williamson (1975, p. 29) put it: "Although a large-numbers exchange condition obtains at the outset, it is transformed during contract execution into a small-numbers exchange;" often referred to as the "fundamental transformation" (Williamson 1985, pp. 61–63). Even without asset specificity, the time for a buyer to switch suppliers or a supplier to find new buyers can pose a challenge, which is called "temporal specificity" by Masten et al. (1991, p. 9). For example, high perishability for goods (such as fruits and vegetables) can lead to economic holdup problems. If vertical coordination does not take place quickly then the economic value of these perishable goods diminishes and exchange partners can appropriate economic rents. Such transactional hazards often necessitate vertical integration as an economic safeguard to avoid

such problems of temporal specificity (Bucheli et al. 2010, Chandler 1977, Masten et al. 1991).

Any increase in uncertainty that leads to challenges in incomplete contracting is also relevant, as this creates the need for "unprogrammed adaptation" (Williamson 1971, p. 113). Per TCE, asset specificity and uncertainty together lead to situations where prior agreements need to be renegotiated, creating an opportunity for one party to behave opportunistically, such as by engaging in economic holdup of exchange partners (Macher and Richman 2008), which may motivate vertical integration as an economic safeguard (Williamson 1985). The POM literature has shown that, in the presence of demand uncertainty and (implied) low asset specificity, outsourcing to a common supplier or vendor can be beneficial for the risk-pooling benefits (Chaturvedi and Martínez-de-Albéniz 2016); this scenario was also noted by Williamson (1985). Furthermore, the real options lens, discussed in section 2.3 below, indicates that under technological uncertainty firms will be less inclined to invest in internal non-redeployable assets for fear of technological obsolescence; this is another case where uncertainty leads endogenously (i.e., strategically) to low asset specificity, and thus may favor outsourcing (Balakrishnan and Wernerfelt 1986, Lajili et al. 2007). Managers must be aware of all these types of uncertainties, and to capture this point, Weber and Mayer (2014) join bounded rationality and uncertainty constructs by noting the importance of "interpretative uncertainty" by decision makers.

Frequency of the transaction is the third, but by far least discussed, transaction characteristic of the theory. Williamson (1985) divides frequency into two buckets: occasional and recurrent. We submit that frequency has largely been neglected in much literature because researchers are analyzing or considering recurrent transactions (e.g., an ongoing buyer–supplier relationship); this is the case in the types of transactions examined in most operations and supply chain settings. Indeed, Gibbons' (2010, p. 273) review of transaction costs, as they apply to vertical integration, states that: "frequency . . . is beyond the scope of this subsection's focus on vertical integration and contracting." For non-asset-specific transactions, frequency does not affect the appropriate governance choice (market). In the case of high asset specificity, Williamson (1985) submits that recurrent transactions are more likely to be performed in-house because "the costs of specialized governance will be easier to recover for large transactions of the recurring kind." In addition, "vertical integration does not offer advantage over a contract for a one-time exchange" (Lajili et al. 2007, pp. 347–348). But, recurring transactions can also make reputation effects more pronounced, reducing the likelihood of opportunistic behavior (Klein and Leffler 1981); "It is perhaps because of these competing effects that researchers have been largely unable to confirm (or refute) the effects of transactional frequency on governance modes" (Macher and Richman 2008, p. 7).

2.1.2. Incomplete Contracts/Property Rights Theory. The more formalized incomplete contracting/property rights theory initiated by Grossman and Hart (1986) and Hart and Moore (1990)—the so-called GHM models—(see also Hart 1995, Tirole 1999) emphasizes that *ownership matters*. From this perspective, ownership is based on the (*ex-post*) residual rights of control in the case of missing contractual provisions. Differences between the market and vertical integration are entirely ascribed to the differences in asset ownership that distinguish these alternative governance modes. The key commonalities of this formalized theory and TCE (Williamson 1985) are that governance modes are evaluated comparatively, and that in each theory higher levels of asset specificity favor vertical integration. The key difference is that the GHM models focus exclusively on *ex-ante* incentives to invest and neglect *ex-post* negotiating costs and governance inefficiencies (Whinston 2001, Williamson 2002). For example, the GHM models: ignore incentive distortions and potential bureaucratic failures that occur in firms; explicitly deny that internal audits in the vertically integrated firm differ in any way from external audits in market organization; deny the adaptability advantages of fiat; disregard the potential bureaucratic failures of internal organization; and posit that third-party enforcement by courts is perfectly efficacious. In general, analytical modeling—such as the GHM models—provides an "audit trail" in terms of the necessary and sufficient conditions leading to conclusions. However, both researchers and practitioners who base their recommendations and decisions on such modeling need to be sensitive to the losses in translation from verbal arguments to formal models, and the possibility that simplifying assumptions necessary for analytical tractability may lead to prescriptions that miss important information. As will be discussed later, this is a tradeoff well known to POM scholars. A key difference between POM and the ToF literature is that POM's history is heavily analytical, whereas the ToF's history is largely conceptual and empirical.

2.1.3. Measurement Perspective. Arguably a subset of TCE, the measurement perspective focuses not on the level of asset specificity but rather on the ability of the buyer to evaluate all-important aspects of the output of the supplier. Alchian and Demsetz (1972)

suggest how and why observation of the joint output from the supplying party does not enable the buying party to infer individual productivity. Their example is "team production," such as loading a piece of heavy furniture onto a truck, wherein each individual's contribution would be difficult to discern by merely observing the output, and thus requires close monitoring of each individual's behavior (effort). The question then becomes: who monitors the monitor? Alchian and Demsetz' (1972) solution is that the monitor becomes the residual claimant in the firm. Note that instead of ownership being defined as *ex-post* residual control rights as described in the GHM models above, ownership is now defined in terms of *ex-ante* residual income rights or residual claimancy. To the extent that the firm has superior monitoring capabilities *vis-à-vis* external monitoring, this perspective supports internal organization in the context of team production. Barzel (1982, p. 42) provides a similar measurement argument, which focuses on measuring all-important aspects of quality, stating succinctly: "Distinct firms will form and trade with each other at junctures where output can be readily measured, but where output is difficult to measure the different steps will be performed within the firm." Different governance modes may differentially attenuate this value-capture problem. Thus, for both Alchian and Demsetz' (1972) measurement problem in team production and Barzel's (1982) quality measurement problem, governance mode choice and measurement costs are interdependent.

Agency theory (e.g., Holmstrom 1979, Holmstrom and Milgrom 1991) is not, and was not intended to be, a theory of firm boundaries *per se*. That said, some insights from this literature apply to our discussion. For example, Jensen and Meckling (1976) note that minimizing agency costs involves minimizing the sum of (i) the monitoring costs incurred by the principal, (ii) the economic bonding costs incurred by the agent, and (iii) the residual loss (the latter being an expansive category). We note the interdependence between monitoring (measurement) costs and bonding (transaction) costs. Consider a franchise contract in which the principal is the franchisor and the agent is the franchisee. To protect the value of the franchise system's brand name the franchisor may be required to monitor the franchisee extensively. Suppose the franchisor requires the franchisee to post an economic bond or economic hostage in the form of the franchisee making a franchise-specific investment that loses value upon franchise termination (Williamson 1985). This credible commitment by the franchisee to the franchisor gives the franchisee incentive to maintain high quality, which then lowers the monitoring costs that need be incurred by the franchisor. The introduction of these economic hostages produces efficiencies in the franchise system independent of who initiates the proposal. Here, as elsewhere, it is useful to consider contracting in its entirety (Williamson 1985), and a comparative assessment of imperfect governance form alternatives to align with the economic problem at hand is applicable.

2.2. Resource-, Knowledge-, and Capability-Based Approaches

In contrast to theories that focus on incentive alignment to achieve *cooperation* between parties in an exchange, several "views" focus on the benefits of *coordination* of internal activities vs. outsourced activities (Conner 1991, Conner and Prahalad 1996). As noted by Mayer and Salomon (2006): "because transactions cost economics fundamentally concerns characteristics of exchange, its logic typically holds firm capability constant." Clearly, however, relative capabilities matter. Indeed, Williamson (1999, p. 1103) explicitly discusses how TCE and capabilities can complement each other: "Rather, therefore, than ask the question 'What is the best generic mode (market, hybrid, firm, or bureau) to organize X?', which is the traditional transaction cost query, the question to be put instead is 'How should firm A—which has preexisting strengths *and* weaknesses (core competencies *and* disabilities)—organize X?'"

2.2.1. Resource-Based View. The RBV also has a long history, formally dating back at least to Edith Penrose's (1959) *The Theory of the Growth of the Firm* and even David Ricardo (1817) (some of the key concepts appear in Adam Smith (1937, originally published in 1776)). Penrose (1959) emphasized the internal resources of the firm as the drivers of, or impediments to, its growth. This approach contrasted with the literature at the time, which focused not on growth but on the optimal size of the firm, and more on factors external to the firm, such as industry position. A recent article in *Production and Operations Management* (Kor et al. 2016) summarized the key ideas of Penrose (1959), which highlighted the importance of firm-specific experience and the coordination challenges created by growth. Penrose (1959) emphasized that with experience comes improvement, likely freeing up resources to allow growth. The "Penrose effect" or "Penrose theorem" posits that: "[m]anagerial capability is the binding constraint that limits the growth of the firm" (Kor et al. 2016, p. 1732).

More recent seminal works are Wernerfelt (1984) and Barney (1991). Barney (1991) is most often credited for defining the characteristics of resources that lead to sustainable competitive advantage: valuable, rare, inimitable, and non-substitutable (VRIN).

Although transaction cost and measurement theories discussed above delineate conditions under

which a firm should outsource, works under the umbrella term of the RBV focus more on economic rents (for this review, we consider economic rents to mean positive NPV and sustainable competitive advantage). However, scholars have applied the RBV to firm boundaries in various ways. One is to conclude that firms should keep in-house those resources that are VRIN and outsource the rest (Santos and Eisenhardt 2005). Corollaries to this are that resources that are co-specialized to those that are VRIN must also be kept in-house (Mahoney and Pandian 1992, Teece 1986), and that certain in-house activities may need to be kept in-house to develop the VRIN resources of the future that take advantage of inter-temporal and inter-project spillovers (Kang et al. 2009).

The above discussion suggests that RBV considerations applied to outsourcing require precision in the definition of a resource, and how the outsourcing decision relates to it. Research has shown that both resource and TCE-related considerations matter in governance choice (Argyres 1996), and that existing resources in a given activity (operationalized as production experience) make firms more likely to internalize that activity (Leiblein and Miller 2003).

Furthermore, Mayer and Salomon (2006) show that under situations where economic holdup is a concern, strength in what they call "governance capabilities" can favor outsourcing because these capabilities can reduce the holdup hazards. Mayer and Salomon (2006) conclude that: "governance capabilities (a potentially valuable, rare, inimitable, and non-substitutable firm-specific capability) may be central to governance decisions." Such capabilities are similar to the "alliance capability" in the relational view of Dyer and Singh (1998) and Kale et al. (2002). Both imply that choices to outsource when holdup risks are high may not be "mistakes" (Mayer and Salomon 2006, p. 956). In the book *The Machine that Changed the World* that documented the Toyota Production System, Womack et al. (1990, p. 127) emphasize the importance of governance capabilities: "The make-or-buy decision that occasioned so much debate in mass production firms struck Ohno and others at Toyota as largely irrelevant as they began to consider obtaining components for cars and trucks. The real question was how the assembler and the supplier could work together smoothly to reduce costs and improve quality, whatever formal, legal relationship they might have."

2.2.2. Knowledge-Based View. The knowledge-based view (KBV) goes beyond simply maintaining that knowledge is the critical VRIN resource that firms can develop. As a ToF, the KBV (Grant 1996a,b, Kogut and Zander 1992) focuses on the ease with which knowledge can be developed and transmitted. A well-established classification describes knowledge as either codified or tacit (Nonaka 1994, Polanyi 1962). The KBV primarily concerns itself with the transmission and use of tacit knowledge, and the relative ease with which this knowledge can be developed and shared within and between firms. Kogut and Zander (1992, p. 384) note that: "Firms exist because they provide a social community of voluntaristic action structured by organizing principles that are not reducible to individuals." To the extent that a technical dialog (Monteverde 1995) develops more effectively within a firm than without, a firm boundary can inhibit inter-firm flow of knowledge. Concerns with intellectual property protection may also inhibit the free flow of knowledge between firms relative to within firms (Teece 1986, Ziedonis 2004).

The KBV identifies characteristics of a transaction that drive whether an activity should be performed in-house or outsourced. When a transaction depends on the exchange of tacit knowledge, this view recommends that (all else equal) the activity be performed in-house. This recommendation is often consistent with that of TCE; that is, transactions requiring the exchange of tacit knowledge also typically would involve high levels of (human) asset specificity. However, the KBV is focused on coordination (*vis-à-vis* incentive) benefits of internal organization. That said, disentangling pure coordination from pure incentive motives can be elusive. Indeed, Foss (1996) and Mahoney (2001) independently noted that the importance of improvements in language and exchange are enhanced even further when opportunism is taken into account. As is often the case, even these subtle points have been considered by Oliver Williamson (e.g., Williamson 1975, p. 25): "A further advantage of internal organization is that, as compared to recurrent market exchange, efficient codes [of communication] are more apt to evolve and be employed with confidence by the parties. Such coding also economizes on bounded rationality. Complex events are summarized in an informal way using what might be an idiosyncratic language. Although, in principle, the parties to recurrent market contracts could devise the same language, thereby realizing the same economies, such exchanges are more subject to risks of opportunism—hence, are less apt to be developed as fully." The standardization of language to which Williamson (1975) refers may take the form of accounting systems, blueprints, and other reporting systems (Mahoney 2001, Nelson and Winter 1982).

2.2.3. Dynamic Capabilities. A criticism of the above perspectives is that they are static. Another ToF focuses on the path-dependent nature of competitive advantage. This "dynamic capabilities" approach

focuses not on the current state of resources or knowledge, but rather on how adept firms are at adaptation and their capability of coping with change. Dynamic capabilities are defined as "a firm's ability to integrate, build, and reconfigure internal and external competences" (Teece et al. 1997, p. 516), which can be sources of persistent performance differences among firms in rapidly changing environments. Williamson (1996, p. 227) states: "One way to unpack the 'capabilities' view of the firm is to ask what—in addition to an inventory of physical assets, and a census of its workforce—is needed to describe the capabilities of the firm. Features of organization that are arguably important include the following: (i) the communication codes that the firm has developed (Arrow 1974); (ii) the routines that it employs (Cyert and March 1963, Nelson and Winter 1982); and (iii) the corporate culture that has taken shape (Kreps 1990)."

Zollo and Winter (2002) join the organizational learning literature with the dynamic capabilities literature. Going beyond the view of capabilities as (tacit) routines, deliberate learning mechanisms such as explicit knowledge articulation and codification activities are emphasized as complementary means through which firms build their capabilities.

2.2.4. Problem-Solving Perspective. Another perspective that prescribes when activities should be performed in-house or outsourced is the "problem-solving perspective" (Nickerson et al. 2012). Here, the key consideration is the nature of the problem to be solved. Nickerson and Zenger (2004) explain and predict how knowledge sets can be organized to efficiently search for and create new knowledge, which mitigates knowledge-formation and knowledge-transfer problems and generates the following predictions: non-decomposable problems (Simon 1962) are assigned to consensus-based teams; nearly decomposable problems are assigned to authority-based teams; and decomposable problems are assigned to the market (e.g., outsourcing). Macher (2006) empirically corroborates this perspective. The POM literature (e.g., Fine 2000) has considered the idea that supply chain architecture (especially the degree of vertical integration vs. outsourcing) correlates with product architecture (modular vs. integral, cf. Ulrich 1995) that dictates the decomposability of the product design and process management tasks, which are usually heavily knowledge-based.

2.3. Real Options Perspective

The real options lens is much less frequently employed in the ToF literature than TCE and RBV.[4] A recent piece on real options theory (ROT) (Trigeorgis and Reuer 2017, p. 57) wondered about the "interplay between ROT and other, more established perspectives" and specifically how it can "better connect to and be integrated with other theories in strategy." ROT explicitly notes that outsourcing decisions are not only motivated by minimizing costs but also can create transactional value (Zajac and Olsen 1993). That is, there is "governance inseparability" (Argyres and Liebeskind 1999), wherein the governance choice for one transaction may enable or constrain the governance choice for other transactions. A real options lens can encourage outsourcing or insourcing.

"Growth options" are real options that offer the right to further develop an asset, and to make follow-on investments. As Leiblein (2003, p. 949) articulated, "[g]rowth options are particularly valuable in high-technology industries where there are often weak appropriability regimes and inter-generational knowledge spillovers are significant. In these contexts, it will often be desirable to internalize activities associated with an early generation of a product." Moreover, Kang et al. (2009) note that governance choice can be influenced by growth options in the form of inter-temporal business with the current exchange partner and of inter-project spillovers in gaining business with other companies.

In addition to growth options, flexibility options (Leiblein 2003, Sanchez and Mahoney 1996) imply that "under uncertainty, it may be optimal to utilize market like mechanisms that provide greater flexibility" (Leiblein 2003, p. 949). As an example, Kouvelis et al. (2001) modeled and empirically showed that macroeconomic volatility of a foreign market motivates multinational firms to employ flexible entry modes (e.g., a joint venture over a wholly owned subsidiary). By ROT logic, unlike behavioral uncertainty discussed earlier in the context of TCE, technological uncertainty about the obsolescence of specific assets makes outsourcing a more likely governance choice (Balakrishnan and Wernerfelt 1986, Lajili et al. 2007). Furthermore, hybrids such as joint ventures may be viewed as real options, which provide an opportunity but not an obligation to acquire (and vertically integrate) as uncertainty is resolved over time (Kogut 1991).

ROT is a growing, but less mature, part of the ToF literature reviewed in this section. The precise conditions leading to a prescribed organizational form are not as clearly established as in the more dominant theories reviewed in the prior sections.

2.4. Concluding Remarks on the Theory of the Firm Literature

Substantiating our earlier observation, note that a very small minority of the ToF work cited above comes from the POM literature; most emanates from strategy and economics. Yet in the modern business

school these three fields often reside in silos, obstructing the realization of highly promising synergies. This review hopes to lower some of these barriers, and specifically encourages POM researchers to carefully and precisely use the ToF literature and continue to contribute to it.

3. Review Methodology

While the above theories apply broadly, this review focuses on outsourcing in stewarding a physical product from concept to market and then operating the resulting supply chain, specifically the areas of manufacturing, product design, materials procurement, and logistics. We include product design, which is a key driver of the architecture of the supply chain (Fine 1998), and is often performed in conjunction with suppliers and vendors (Lee and Schmidt 2017). Furthermore, service providers such as Foxconn and Li & Fung increasingly bundle design services together with contract manufacturing. Thus, our scope addresses work that develops, transforms, or moves a physical good. Tsay (2014) provides a practitioner-oriented discussion of management challenges within this exact domain. We do not intend to review the literature focused on business process outsourcing (BPO).[5] Works on retail supply chains are out-of-scope for this study, unless the presented retailers develop and/or manufacture their own products. These scope restrictions reduce the heterogeneity of contexts, improving our ability to develop coherent frameworks and insights. These apply to many service settings as well.

We further clarify our scope by reiterating the distinction between outsourcing and offshoring. Outsourcing is about "who" will do the work whereas offshoring is about "where" the work will be done. Both strategies create boundaries (organizational and geographic, respectively), potentially creating transaction hazards (Hennart 1982). Geographic separation can exacerbate the problems engendered by organizational distance, and vice versa. Both factors arise in the case of outsourcing that is mixed with offshoring, that is, offshore outsourcing, which has been the subject of extensive media coverage and public concern. Furthermore, international business scholarship contains a substantial literature on ownership and location, much of which builds on Dunning's (1988) eclectic theory. However, to be in scope for this review, a paper's main research topics need to be directly attributable to a task's ownership shifting to or away from an external entity, not just to a change in the location. Tsay (2014) sharply delineates between the impacts of offshoring and of outsourcing. Mihalache and Mihalache (2016) provide a recent review of the scholarly literature on offshoring.

The maintenance or improvement of an extant buyer–supplier (client–vendor) relationship is out-of-scope. This rules out papers that take the firm boundary as given and then focus on how to best manage the relationship. While the structure of an existing buyer–supplier relationship certainly dictates where the transaction falls on the continuum from market to hierarchy, we limit ourselves only to situations where "make" is contrasted with "buy." This rules out the majority of analytical research on supply contracts, which has been reviewed extensively elsewhere (cf. Cachon 2003, Tsay et al. 1999), as well as the large empirical and conceptual literature on the management of buyer–supplier relationships or the evaluation/selection of suppliers (Handley and Gray 2013, Reidl et al. 2013). However, some work falls into a gray area. Analytical papers that juxtapose a centrally controlled (vertically integrated) version of a supply chain (sometimes called the "first-best" benchmark) and the decentralized version are *de facto* equipped to comment on the ramifications of outsourcing. In such a case, however, the work is not automatically included unless the author(s) stated the intent to examine outsourcing and/or interpreted the comparison between centralized vs. decentralized settings to provide insight on make-vs.-buy. Similarly, we exclude empirical/conceptual papers that do not consider make-vs.-buy in the conceptual model (as independent or dependent variable) or in the discussion.

Finally, the structured portion of our review is limited to four leading peer-reviewed journals in POM: the *Journal of Operations Management* (*JOM*), *Management Science* (*MS*), *Manufacturing and Service Operations Management* (*MSOM*), and *Production and Operations Management* (*POM*).

Our process of selecting articles for consideration is as follows. Restricting the time horizon to the period 2000–2016, we used the following keywords for our initial search within the four journals: "outsourcing;" "make-buy" and its variants "make-or-buy," "make-vs.-buy;" "vertical integration;" "Theory of the Firm;" "firm boundaries" and its variants "firm boundary," "boundaries of the firm," "boundary of the firm;" "supply contract." A total of 1118 articles included one or more of these keywords in their title, abstract, author-supplied keywords, and/or full-text[6] (i.e., 252 articles in *JOM,* 406 articles in *MS*, 112 articles in *MSOM*, and 348 articles in *POM*). For *MS*, we filtered out articles from scholarly fields besides POM by including only articles accepted by the "Operations Management (or Operations and Supply Chain Management)" department editor.[7] This process excluded 234 articles, leaving 172 POM articles in *MS* to further review. Then examination of the titles and abstracts identified the articles that are not about make-vs.-buy at all, such as works on scheduling of call center

agents (Mehrotra et al. 2010), inventory policies for deteriorating products (Ferguson and Koenigsberg 2007), and a literature review on e-businesses (Gupta et al. 2009).[8] This filtering process left 624 articles (i.e., 189 articles from *JOM*, 115 articles from *MS*, 70 articles from *MSOM*, and 250 articles from *POM*). We evaluated the full text of each of these against our scope definition, coming to a final set of 72 papers (37 from *JOM*, 8 from *MS*, 3 from *MSOM*, and 24 from *POM*) of which 45 are empirical/conceptual and 27 are analytical.

4. POM Literature on Outsourcing in Supply Chains

This section reviews the POM literature that falls within our defined scope. We first provide a framework that organizes the papers and then systematically summarize each work. We partition the research into empirical/conceptual and analytical sub-literatures, each of which subsequently gets its own treatment. We define empirical research as using data to estimate the structure of relationships and to determine which factors are relevant, typically attempting to infer causality. Data could range from qualitative case study to the analysis of large structured datasets. Conceptual research logically describes relationships without employing data. We define analytical research as specifying mathematical equations to describe relationships presumed to be causal, and obtaining conclusions by manipulating these equations.

Figure 1 presents a framework that organizes all the POM papers falling within our scope. The framework consists of three components: *antecedents*, *make-vs.-buy decision*, and *performance outcomes*. This organization is conceptually consistent with paradigms that predict that firms with aligned organizational strategy (e.g., diversification) and structure (e.g., decentralization) perform well (Galbraith and Nathanson 1978, Miles and Snow 1984, Rumelt 1974).[9] Similar frameworks have been used in review articles in strategy, for instance, on diversification decisions (Ramanujam and Varadarajan 1989) and on strategic decision processes of a firm (Rajagopalan et al. 1993). While a paper solely on managing outsourced activities would fall outside our scope, *Management of outsourced activities* is a component of the framework because some in-scope articles consider aspects of this component that affect performance (Cui et al. 2012, Handley 2012, Handley and Benton 2009, Li et al. 2008, Mahapatra et al. 2012, Mishra and Sinha 2016).

All the factors contained within the *antecedents* block in the figure emerged from our in-scope papers. While most antecedent factors are captured directly from the conceptual models and/or discussions (for empirical/conceptual papers) or structural and/or parametric assumptions of the mathematical models (for analytical papers), some are extracted from the underpinning mechanisms of the hypothesized relationships between constructs.[10] For example, Steven et al. (2014) submit that offshore outsourcing is positively associated with product recalls. In this line of reasoning, while the location of suppliers is an apparent antecedent that affects performance of outsourcing, the underpinning factors are information asymmetry and misaligned interests between the focal firm and its suppliers as implied in agency theory that they draw on. As such, all three factors (i.e., location of suppliers, information asymmetry, and misaligned interests) identified by their study are included in the *antecedents* component of our framework.

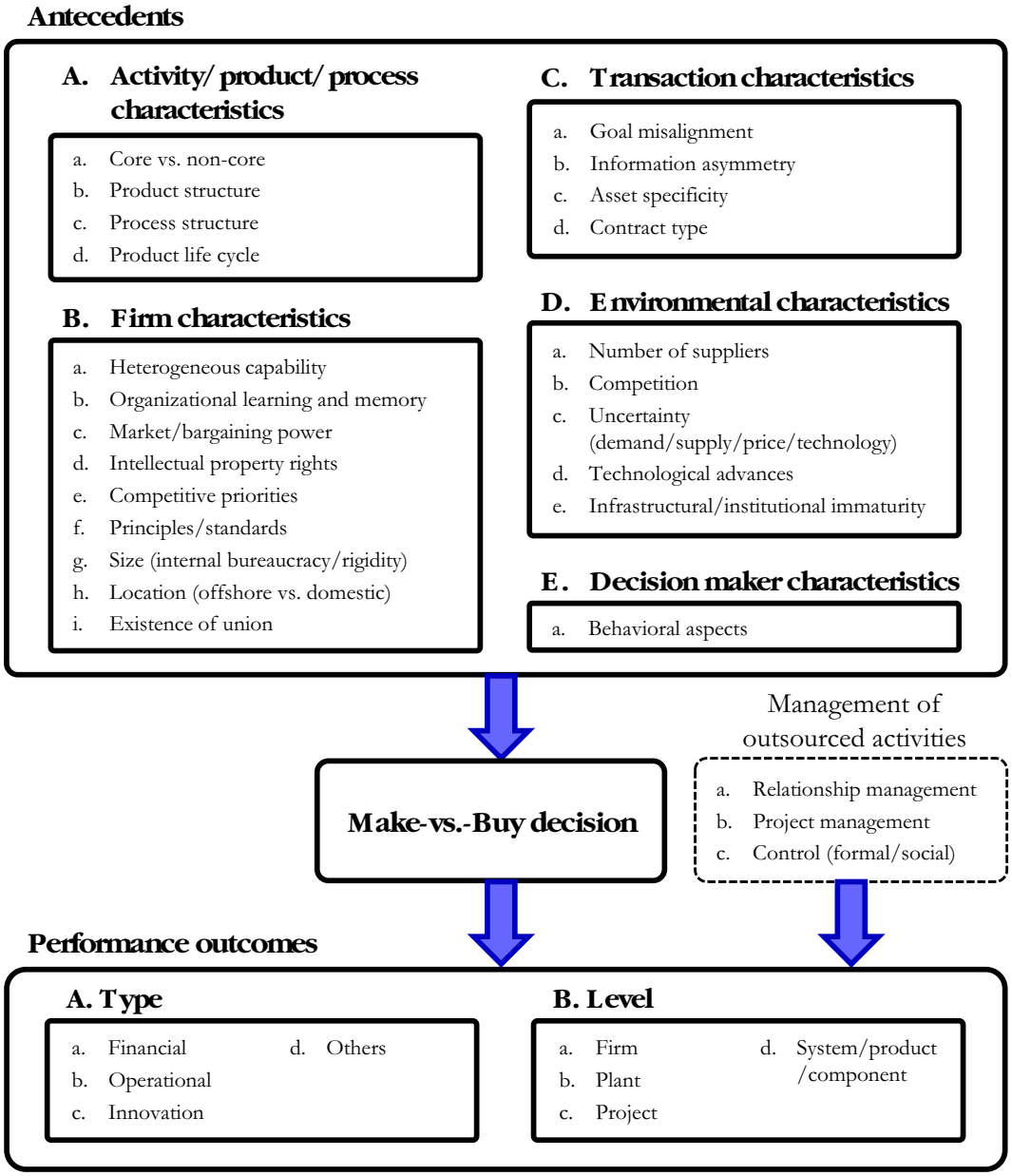
The factors within the *antecedents* block are subdivided into five groups: A. activity/product/process characteristics, B. firm characteristics, C. transaction characteristics, D. environmental characteristics, and E. decision-maker characteristics. The *performance outcomes* component captures both the type (e.g., financial, operational) and level (e.g., firm, plant, project) of performance outcomes associated with the make-vs.-buy decision from each of the in-scope papers (that have performance outcomes). This approach is necessary because POM articles frequently have dependent variables at a level more granular than the firm, and/or examine specific (operational) performance dimensions.

Table 1 catalogs all in-scope POM articles, tagging each as empirical, conceptual, or analytical. The table reports for each paper the antecedents of the make-vs.-buy decision and associated performance outcomes (if any), as well as the relevant key findings. The letter codes in the "Links" column of Table 1 reference the parts of the Figure 1 framework that are most relevant to the given paper. Thus, Table 1 and Figure 1 together provide a comprehensive but concise guide to the extant POM research on outsourcing within our defined scope.

4.1. Analytical POM Literature on Outsourcing in Supply Chains

Twenty-seven of the 72 in-scope papers were classified as analytical. We focus here on the methodology by which this analytical research produces its conclusions, since they do not derive from observational data in the same way as in the empirical studies. To that end, we describe the "typical" analytical approach to the modeling of outsourcing in supply chains, as depicted in Figure 2. This is a composite that none of the individual papers necessarily matches perfectly. We use individual papers to illustrate the components of the framework.

Figure 1 POM Literature on Supply Chain Outsourcing: A Framework [Color figure can be viewed at wileyonlinelibrary.com]



4.1.1. Supply Chain Structure. The prevailing approach examines an outsourced supply chain by juxtaposing it with the vertically integrated version. Figure 2a depicts the vertically integrated supply chain. Q is the quantity to offer to the market. The set A comprises all attributes of how the customer experiences the end product, which thereby drive demand, as well as costs and other metrics of concern. Figure 2b replaces the vertically integrated OEM with a dotted box containing two parts: the OEM and the Service Provider[11] (SP). B is the subset of A that the OEM delegates to the SP, which then leaves the OEM with control over the actions in the set denoted as A \B. The decision of what to place into B is usually a structural assumption of the formulation. In the objective functions at the bottom of the figures, revenue comes from selling finished goods to the end market. "Payment to SP" can shift the "Cost of Q" to the SP.

This framework is versatile. Our scope definition places the SP upstream of the OEM along the path of physical flow, for example, a parts supplier of a CM. Simply changing some of the labels would enable this diagram to cover much of the literature of supply chain coordination with contracts (cf. Cachon 2003, Tsay et al. 1999). We consider some papers in this area to belong to the literature of supply chain outsourcing per the previously discussed scope parameters. The framework also works when the SP is

Table 1 Summary of POM Articles on Supply Chain Outsourcing in *JOM*, *MS*, *MSOM*, and *POM* Journals in 2000–2016

Article	Method	Industry or supply chain structure	Activities considered for outsourcing	Decision variables [decision maker] (analytical models)	Antecedents	Management of outsourced activities	Performance	Links in Figure 1 framework	Relevant findings
Anderson and Parker (2002) (POM)	Analytical (simul., game)	Parties: 1 OEM, 1 supplier; Products: 1 product	Production	Percentage of insourcing quantity [OEM]	Product structure (modularity); Heterogeneous capability (supplier production cost); Volume-based learning and forgetting (decrease in production cost, increase in integration cost)	—	Total cost (operational; firm)	Antcd: A(b), B(a,b) Mgt: - Perf: A(b), B(a)	Outsourcing for supplier's production cost advantage increases buyer's production and integration cost over time (due to capability erosion, or "forgetting"), which may cause higher long-run costs after an immediate cost benefit. This effect of outsourcing is dampened when the product is modular
Bardhan et al. (2007) (POM)	Empirical (survey)	Cross-sectional (US-based manufacturing plants)	Production and supporting businesses	—	Heterogeneous capability (e.g., supplier cost efficiency, knowledge); Technological advances (Inter-firm IT application)	—	Delivery (operational; plant); Gross margin (financial; plant)	Antcd: B(a), D(d) Mgt: - Perf: A(a,b), B(b)	Motivations to access supplier capabilities (e.g., cost efficiency, knowledge), as well as inter-firm IT infrastructure, drive a plant's outsourcing decision, which in turn improves plant performance
Belavina and Girotra (2012) (MS)	Analytical (game)	Parties: 2 buyers, 2 suppliers, 1 third-party intermediary (in the case of mediated sourcing); Products: 1 product for each buyer	Procurement	Allocation of business among suppliers [buyers, when insourced; intermediary, when outsourced]	Uncertainty (in cost: effect of pooling of uncertainty in supplier cost-advantages)	—	Total profit of buyers (financial; firm)	Antcd: D(c) Mgt: - Perf: A(a), B(a)	Pooling of two buyers' heterogeneous long-term preferences over suppliers through procurement outsourcing (i.e., intermediary) improves profits, especially when the two buyers' preferences are not correlated
Blackburn (2012) (JOM)	Analytical (descriptive)	Functional product industry (products with predictable demand and long life cycles)	Production	—	Heterogeneous capability (supplier production cost)	—	Inventory cost (operational; firm)	Antcd: B(a) Mgt: - Perf: A(b), B(a)	Marginal value of supply chain lead-time, defined as the change in total inventory costs per unit change in lead-time, is small compared to the benefit of low production cost associated with outsourcing, which might explain the expansive growth of global outsourcing
Bolandifar et al. (2016) (POM)	Analytical (game)	Parties: 2 competing OEMs (small and large), 1 common CM, 1 component supplier (S); Products: 2 substitutable products	Procurement	(i) Procurement strategy (i.e., control/direct "D" or delegation/ indirect "I") [OEMs]; (ii) (when S is strategic) component prices [S, to CM and/or to OEMs]; (iii) Wholesale prices [CM, to OEMs]; (iv) Market prices [OEMs] and component order quantities [OEMs, to CM under "I;" to S under "D"]; (v) (under "I" from either OEMs) Component order quantity [CM, to S]	Heterogeneous capability (CM's scale efficiency); Market power (relative positions of OEMs in the market in terms of potential market size); Competition (between OEMs)	—	Profit (financial; firm)	Antcd: B(a,c), D(b) Mgt: - Perf: A(a), B(a)	When component price is exogenous, "II" (due to CM's order aggregation effect) or "DD" (when discount-sharing effect dominates price-competition softening effect upon deviation) may arise in equilibrium. The discount-sharing effect is strengthened when discount rate is large. While OEMs always prefer "II" over "DD," CM prefers "DD." When supplier sets the component prices, "II" or "DI" (where smaller OEM deviates from II, when price discrimination effect dominates order aggregation effect) may arise in equilibrium. "DI" equilibrium is more likely when the difference in market size between two OEMs is large, discount rate is small, and market is more competitive
Bradley and Guerrero (2008) (POM)	Analytical (descriptive)	Parties: 1 manufacturer, 1 component supplier; Products: 1 end product, 1 (durable or non-durable) part	Design	—	Product/component life-cycle mismatch; Heterogeneous capability (focal firm production cost)	—	Profit (financial; product)	Antcd: A(d), B(a) Mgt: - Perf: A(a), B(d)	Life cycle mismatch between end-product and component, along with the production cost (when using a proprietary vs. off-the-shelf component), determines the profitability of make (durable product design) vs. buy (non-durable product design)

(continued)

Table 1 (Continued)

Article	Method	Industry or supply chain structure	Activities considered for outsourcing	Decision variables [decision maker] (analytical models)	Antecedents	Management of outsourced activities	Performance	Links in Figure 1 framework	Relevant findings
Brumme et al. (2015) (POM)	Empirical (case)	Computer industry	Production	—	Product life cycle (industry/product maturity); Heterogeneous capability (availability of capable/low cost suppliers); Competition	—	—	Antcd: A(d), B(a), D(b) Mgt: - Perf: -	As industry and product mature (i.e., product becomes standardized/commoditized, competition becomes severe, and capable suppliers emerge), the focus (i.e., manufacturing strategy) of a plant should change accordingly. For example, a plant's manufacturing strategy can change from "innovation" to "operational excellence" (i.e., high level of outsourcing to capable suppliers for lower production cost) as industry and product mature
Chen et al. (2012) (POM)	Analytical (game)	Parties: 2 OEMs (OEM1 & OEM2, OEM2 always outsources its procurement function to CM), 1 CM, 1 supplier; Products: 2 competing products	Procurement	• Under buy-sell contract: (i) Truth-telling menu of contract to CM (selling price, production quantity, transfer payment) [OEM1], (ii) Wholesale price [CM, to OEM2], (iii) Order quantity [OEM2]; • Under turnkey contract: (i) Production quantity, transfer payment [OEM1], (ii) Wholesale price [CM, to both OEMs], (iii) Order quantity [OEM2]	Heterogeneous capability (OEM procurement cost relative to CM's); Information asymmetry (CM's unit raw material purchasing cost from supplier is unknown to OEMs); Competition (between OEMs, on quantity)	—	Profit (financial; firm)	Antcd: B(a), C(b), D(b) Mgt: - Perf: A(a), B(a)	OEM1's preference between buy-sell vs. turnkey contract (i.e., make-vs.-buy) depends on its procurement cost (relative to CM's), the intensity of competition with OEM2 (i.e., product substitutability), and the volatility of the CM's procurement cost (degree of information asymmetry): when OEM1 (CM) has superior procurement expertise than CM (OEM1), relative advantage of buy-sell over turnkey is strengthened as the product substitutability increases (decreases), or CM's procurement cost uncertainty increases
Corbett and Karmarkar (2001) (MS)	Analytical (game)	Parties: n assemblers, n part suppliers; Products: 1 end product (for which 1 part is required)	Production	Production quantities (which in turn determine price) [Assemblers, suppliers]	Goal misalignment (double marginalization); Competition (on quantity)	—	Profit (financial; firm)	Antcd: C(a), D(b) Mgt: - Perf: A(a), B(a)	(i) when $n = 1$: A vertically integrated monopolist earns more profits than the total profits of two successive unintegrated monopolists, by elimination of double marginalization; (ii) when $n > 1$, total supply chain profit is larger for the unintegrated case (i.e., benefit of vertical integration by avoiding double marginalization is less than the benefit of allowing competition at each tier, by lower input prices in the upstream)
Cui et al. (2012) (POM)	Empirical (case)	Siemens (manufacturing company)	Design	—	Heterogeneous capability (supplier knowledge)	Project management	R&D project success (innovation; project)	Antcd: B(a) Mgt: b Perf: A(c), B(c)	Match between outsourcing motivation (i.e., access to supplier capability) and supplier strengths, along with project management practices (e.g., communication, process control, etc.), affects the success of inter-firm R&D projects

(continued)

Table 1 (Continued)

Article	Method	Industry or supply chain structure	Activities considered for outsourcing	Decision variables [decision maker] (analytical models)	Antecedents	Management of outsourced activities	Performance	Links in Figure 1 framework	Relevant findings
da Silveira (2006) (JOM)	Empirical (survey)	Cross-sectional (international manufacturing firms)	Production	—	Core vs. non-core	—	Flexibility (operational; firm)	Antcd: A(a) Mgt: - Perf: A(b), B(a)	Outsourcing non-core activities (e.g., IS management, maintenance, material handling) and other practices including implementation of ICT and pull production together lead to simplicity in the information and material flow processes in manufacturing, which in turn improves volume/mix flexibility and time-to market performance
Devaraj et al. (2001) (JOM)	Empirical (survey)	Cross-sectional (international manufacturing firms)	Production	—	Product structure (product line complexity); Process structure (process complexity)	—	Cost, cycle time, inventory, flexibility, delivery, quality (operational; plant); innovation (innovation; plant)	Antcd: A(b,c) Mgt: - Perf: A(b,c), B(b)	Proper combinations of the degrees of product line complexity (e.g., end-product complexity), process complexity (e.g., interconnectedness of production tasks and stages) and organizational scope (e.g., vertical integration) lead to superior performance of a manufacturing plant
Devaraj et al. (2004) (JOM)	Empirical (survey)	Cross-sectional (international manufacturing firms)	Production	—	Product structure (product line complexity); Process structure (process complexity); Competitive priorities	—	Cost, cycle time, inventory, flexibility, delivery, quality (operational; plant); innovation (innovation; plant)	Antcd: A(b,c), B(e) Mgt: - Perf: A(b,c), B(b)	Fit between the stated manufacturing objectives (i.e., competitive priorities) and actual manufacturing strategies (i.e., combinations of the degrees of product line complexity, process complexity and organizational scope) leads to superior performance of a manufacturing plant
Dong et al. (2016) (POM)	Analytical (principal-agent)	Parties: (Dyadic SC) 1 brand owner-manufacturer (BM), 1 component supplier (S); (Multi-level SC) 1 brand owner (B), 1 contract manufacturer (CM), 1 component supplier (S); Products: 1 product	Production	• Dyadic SC: (i) Prices for accepted/rejected components (under inspection-based) or good/failed (due to S) components (under failure-based) [BM]; (ii) Quality effort [S]; (iii) Quality effort [BM]; • Multi-level SC: (i) Prices for accepted/rejected products (under inspection-based) or good/failed products (under failure-based) [B, to CM]; (ii) Quality effort [S]; (iii) Prices for accepted/rejected components (under inspection-based) or good/failed (due to S) components (under failure-based) [CM, to S]; (iv) Quality effort [CM]	Heterogeneous capability (lower production cost of CM); Information asymmetry (unobservability of agent (s)' quality effort); Contract type (quality management contract: inspection-based approach vs. external failure-based approach)	—	Profit (financial; firm)	Antcd: B(a), C(b,d) Mgt: - Perf: A(a), B(a)	Outsourcing increases the inefficiency (i.e., agency cost) of an external failure-based approach more than that of an inspection-based approach, since, in the latter approach, supplier's profit is higher and thus the added agency cost when outsourcing (i.e., CM's profit) is smaller. When considering potential production cost savings due to outsourcing, brand owner prefers outsourcing when the potential production cost savings is greater than the added agency cost between the brand owner and CM when outsourcing

(continued)

Table 1 (Continued)

Article	Method	Industry or supply chain structure	Activities considered for outsourcing	Decision variables [decision maker] (analytical models)	Antecedents	Management of outsourced activities	Performance	Links in Figure 1 framework	Relevant findings
Feng and Lu (2012) (MS)	Analytical (game)	Parties: 2 manufacturers, 2 suppliers (when exclusive for each of manufacturers) or 1 supplier (when common for both manufacturers); Products: 2 competing products	Production	Order quantities (when outsourcing deal is settled) [(bilateral) Nash bargaining between manufacturers and supplier(s)]	Heterogeneous capability (supplier's relative cost advantage); Bargaining power; Number of suppliers (2 exclusive vs. 1 common); Competition (between manufacturers)	—	Profit (financial; firm)	Antcd: B(a,c), D(a,b) Mgt: - Perf: A(a), B(a)	In case of exclusive suppliers, both manufacturers outsource (i.e., "O-O") in equilibrium, since it increases the channel profit. However, the cost advantage of suppliers weakens the manufacturers' bargaining position (i.e., disagreement points), which in turn hurts their outsourcing profits. In case of a common supplier, however, an equilibrium may arise where only the one with a higher cost outsources (i.e., "O-I" or "I-O"). Moreover, in this case, a manufacturer is more likely to outsource when its bargaining power is lower (with the rival's bargaining power fixed) (Note that this is a contrast to the finding of Plambeck and Taylor (2005))
Feng and Lu (2013) (POM)	Analytical (game)	Parties: 2 manufacturers, 2 suppliers (when exclusive for each of manufacturers) or 1 supplier (when common for both manufacturers) Products: 2 competing products	Production	(i) Contract parameters [(bilateral) Nash bargaining between each manufacturer and supplier]; (ii) Order quantities or prices (depending on the mode of competition) [manufacturers]	Heterogeneous capability (supplier's relative cost advantage); Bargaining power; Contract type (wholesale price vs. two-part tariff); Number of suppliers (2 exclusive vs. 1 common); Competition (between manufacturers on price or quantity)	—	Profit (financial; firm)	Antcd: B(a,c), C(d), D (a,b) Mgt: - Perf: A(a), B(a)	In case of wholesale-price contracts, both manufacturers outsource (i.e., "O-O") in equilibrium, regardless of the competition mode and the number of suppliers (exclusive vs. common). In case of two-part tariffs and exclusive suppliers, "O-O" arises in equilibrium when manufacturers compete on quantity; when competing on price, a manufacturer prefers outsourcing regardless of its bargaining power when facing an insourcing rival, but may prefer insourcing when facing an outsourcing rival, if it has weak bargaining power. In case of two-part tariffs and a common supplier, "O-O," "O-I," or "I-O" can arise in equilibrium, depending on the manufacturers' bargaining power, under both modes of competition
Ferdows et al. (2016) (JOM)	Empirical (case)	Cross-sectional	Production	—	Product structure (complexity and proprietariness); Process structure (complexity and proprietariness)	—	—	Antcd: A(b,c) Mgt: - Perf: -	The proposed framework suggests that a company's plant subnetworks, classified based on the products that each plant produces, should be congruent—i.e., a subnetwork shows a match between (i) complexity/proprietariness of products, (ii) complexity/proprietariness of production processes, and (iii) competency level (e.g., high level of production outsourcing represents low competency). A mismatch among these factors might suggest a possible anomaly in the allocation of products to plants and/or in the outsourcing strategy

(continued)

Table 1 (Continued)

Article	Method	Industry or supply chain structure	Activities considered for outsourcing	Decision variables [decision maker] (analytical models)	Antecedents	Management of outsourced activities	Performance	Links in Figure 1 framework	Relevant findings
Fine (2000) (POM)	Conceptual	General (high clock-speed industries)	Production	—	Product structure (complexity); Heterogeneous capability; Market power; Internal bureaucracy and rigidity; Competition (niche competitors)	—	Development speed (operational; firm)	Antcd: A(b), B(a,c,g), D (b) Mgt: - Perf: A(b), B(a)	When a supply chain is vertically integrated (and the product architecture is integral), the factors below push the supply chain toward disintegrated (and modular product) configuration: entry of (niche) competitors, challenges due to complexity of integrated system, and bureaucracy/ organizational rigidity. Conversely, market power, which enhances a focal firm's control, pushes a disintegrated supply chain toward vertical integration (and integral product). Moreover, modular product architecture, along with outsourcing, speeds up development cycles
Fine et al. (2005) (JOM)	Analytical (goal programming)	Parties: 1 focal firm, *s* potential suppliers; Products: 1 (chosen) configuration	Production	Supply chain structure and supplier selection (in-house production or outsourcing to a particular supplier), configuration (triplet of product version, design, and assembly sequence) [focal firm]	Product structure (modularity)	—	Goal achievement (minimum weighted sum of deviations from the goal in five objectives—fidelity, cost, lead-time, partnership, and dependency) (others; firm)	Antcd: A(b) Mgt: - Perf: A(d), B(a)	While a set of objectives influences a firm's product and supply chain design decisions, the clustering of the solutions to the representative numerical examples indicates that the product and supply chain designs are matched (i.e., modular–modular or integral–integral)
Fixson (2005) (JOM)	Conceptual	General	Production	—	Product structure (product architecture—e.g., modularity)	—	—	Antcd: A(b) Mgt: - Perf: -	Product architecture (e.g., modularity, interface, complexity, commonality) has implications on supply chain domain decisions (e.g., outsourcing non-core or commodity components, contractual relations with suppliers), as well as on product domain decisions (e.g., product functionality, product line variety) and process domain decisions (e.g., selection of number and type of manufacturing processes)
Gao et al. (2014) (POM)	Analytical (game)	Parties: 1 buyer, 1 supplier; Products: 1 product	Production	(i) Yield information acquisition and disclosure decision [supplier]; (ii) Input raw material quantity [buyer, for supplier]	Goal misalignment (double marginalization); Information asymmetry (supplier's production yield information is unknown to buyer)	—	Profit (financial; firm)	Antcd: C(a,b) Mgt: - Perf: A(a), B(a)	The decentralized supply chain structure under turnkey contract suffers lower input raw material quantity, hence lower profits (than the centralized supply chain), due to both double marginalization and strategic information withhold by supplier. This finding might explain the steady growth of vertical integration in China's export-processing trade

(continued)

Table 1 (Continued)

Article	Method	Industry or supply chain structure	Activities considered for outsourcing	Decision variables [decision maker] (analytical models)	Antecedents	Management of outsourced activities	Performance	Links in Figure 1 framework	Relevant findings
Grahovac et al. (2015) (POM)	Analytical (game)	Parties: 2 competing firms, N identical suppliers; Products: 2 homogenous products	Production	(i) Investments [firms, N suppliers]; (ii) Output quantities, and thus make-buy decisions [firms]	Product structure (module's relevance); Heterogeneous capability (supplier's scale efficiency in terms of development cost; resource/investment modularity)	—	Profit (financial; firm)	Antcd: A(b), B(a) Mgt: - Perf: A(a), B(a)	Outsourcing equilibrium occurs when a module is of low to medium relevance that is costly to develop, and the equilibrium area shrinks as the supplier's resource modularity decreases. As cost decreases and/or relevance increases, in equilibrium at least one firm makes investment. The firms are forced to overinvest (i.e., prisoner's dilemma) when the development cost is sufficiently high for the given level of relevance, which cannot be alleviated by outsourcing (since the region of outsourcing equilibrium does not overlap with that of the prisoner's dilemma) unless the firms pre-commit
Gray and Handley (2015) (JOM)	Empirical (survey)	Cross-sectional (food, drug, and medical device)	Production	—	Information asymmetry (low testability/root-cause assignability/ monitorability); Number of suppliers	—	Quality (operational; firm)	Antcd: C(b), D(a) Mgt: - Perf: A(b), B(a)	When there is a high level of quality performance ambiguity, characterized by low level of testability, monitorability, and root-cause assignability, outsourcing is associated with low quality performance, more specifically, with CM's low conformance quality performance. This quality risk is exacerbated when a single CM (vs. multiple CMs) is employed, possibly due to the increased risk of opportunism
Gray et al. (2009) (POM)	Analytical (game)	Parties: 1 OEM, 1 CM; Products: 1 product	Production	(i) Wholesale-price contract [CM]; (ii) Production and procurement quantities [OEM] (above decisions repeated twice)	Heterogeneous capability (OEM's relative initial production cost advantage); Volume-based learning (decrease in production cost)	—	Profit (financial; firm)	Antcd: B(a,b) Mgt: - Perf: A(a), B(a)	When neither party learns, OEM completely insources (outsources) in both periods, if it has an initial production cost advantage (disadvantage) compared to CM. When both parties learn, OEM can completely insource or outsource, or partially outsource, differently from one period to the next, depending on its initial cost advantage and learning speed relative to CM
Handley (2012) (JOM)	Empirical (survey)	Cross-sectional (US-based companies)	General	—	Organizational learning and memory (capability loss due to outsourcing)	Relationship management	Cost, quality, responsiveness, flexibility, reliability, dependability (operational; firm)	Antcd: B(b) Mgt: a Perf: A(b), B(a)	The lack of an extensive capability evaluation results in a higher level of capability loss when outsourcing, which in turn hurts outsourcing performance. Capability loss also negatively impacts the firm's ability to develop committed and cooperative relationships with outsourcing providers, which in turn leads to lower outsourcing performance

(continued)

Table 1 (Continued)

Article	Method	Industry or supply chain structure	Activities considered for outsourcing	Decision variables [decision maker] (analytical models)	Antecedents	Management of outsourced activities	Performance	Links in Figure 1 framework	Relevant findings
Handley and Benton (2009) (JOM)	Empirical (survey)	Cross-sectional	General	—	Core vs. non-core activities; Organizational learning and memory (capability loss due to outsourcing); Goal misalignment; Information asymmetry; Asset specificity	Relationship management	Cost, quality, responsiveness, flexibility, reliability, dependability (operational; firm)	Antcd: A(a), B(b), C(a, b,c) Mgt: a Perf: A(b), B(a)	Strategic evaluation on a firm's capability related factors (i.e., core vs. non-core activities, capability loss in the future) and risk related factors (i.e., supplier opportunism due to goal misalignment, information asymmetry, and asset specificity) affects outsourcing performance, through relationship management (i.e., commitment and cooperation)
Hartmann and Moeller (2014) (JOM)	Empirical (vignette-based experiment)	Cross-sectional	Production	—	Core vs. non-core (focus on core competences); Heterogeneous capabilities (supplier expertise); Information asymmetry (lack of control)	—	Consumers' emotional (anger) and behavioral (boycotting) reactions to unsustainable supplier behavior (others; firm)	Antcd: A(a), B(a), C(b) Mgt: - Perf: A(d), B(a)	Firms outsource to focus on core competencies and access specialized supplier capabilities. However, this can increase the probability of adverse incidents in the supply chain (e.g., unsustainable supplier behavior that reduces ecological capital and harms the environment), which may result in consumer anger and boycotts against the focal firm, due to "chain liability" effect
Hendricks et al. (2009) (JOM)	Empirical (secondary)	Cross-sectional	Production	—	Uncertainty (in supply, leading to lack of control due to incomplete contract)	—	Stock market reaction to supply chain disruption announcement (financial; firm)	Antcd: D(c) Mgt: - Perf: A(a), B(a)	Stock market's reaction to supply chain disruption announcements is less negative for firms that are more vertically integrated, since one expects that those firms can exert more control over its external partners (i.e., suppliers), and thus are more likely to recover quickly from a disruption
Holcomb and Hitt (2007) (JOM)	Conceptual	General	Production	—	Heterogeneous capabilities; Goal misalignment; Asset specificity; Number of suppliers; Uncertainty (in technology)	—	—	Antcd: B(a), C(a,c), D (a,c) Mgt: - Perf: -	TCE-related factors affect outsourcing propensity as follows: requirement for relationship-specific investment (+ or −), number of possible suppliers in the market (+), and technological uncertainty (inverse U-shape). Also, RBV related factors affect outsourcing propensity as follows: availability of complementary capabilities in the market (+), aligned goals between focal firm and suppliers (+), and governance capabilities (e.g., knowledge sharing routines, relational capability sharing mechanisms, and past cooperative experiences) (+)
Jack and Raturi (2002) (JOM)	Empirical (case, survey)	Cross-sectional	Production	—	Heterogeneous capabilities (supplier capability in pooling demand uncertainty); Uncertainty (in demand)	—	Volume flexibility, delivery (operational; firm); Financial/ sales and market share growth (financial; firm)	Antcd: B(a), D(c) Mgt: - Perf: A(a,b), B(a)	Outsourcing is a long-term and external source of volume flexibility, since suppliers can absorb demand uncertainty by pooling. Large firms rely more on external sources of volume flexibility (e.g., outsourcing) than do small firms. Volume flexibility improves both delivery and business performance of a manufacturing (buying) firm

(continued)

Table 1 (Continued)

Article	Method	Industry or supply chain structure	Activities considered for outsourcing	Decision variables [decision maker] (analytical models)	Antecedents	Management of outsourced activities	Performance	Links in Figure 1 framework	Relevant findings
Jiang et al. (2007) (JOM)	Empirical (secondary)	Japanese manufacturing industry	General	—	Core vs. non-core; Supplier location; Information asymmetry; Asset specificity; Uncertainty (in technology)	—	Stock market reaction to a firm's outsourcing (financial; firm)	Antcd: A(a), B(h), C(b, c), D(c) Mgt: - Perf: A(a), B(a)	Market values are positively and significantly associated with core business-related (positive signaling effect since it is not generally outsourced), offshore (easy to see the cost benefits but difficult to pin down the problems), and short-term outsourcing (long term contract is not effective due to fast changing technology)
Kayış et al. (2013) (MSOM)	Analytical (game)	Parties: 1 manufacturer (M), 1 tier-1 supplier (S1), 1 tier-2 supplier (S2); Products: 1 product	Procurement	• Under "control" scenario: Wholesale prices [M, to both S1 and S2]; • Under "delegation" scenario: (i) Wholesale price [M, to S1], (ii) Wholesale price [S1, to S2, if S1 accepts M's offer]	Heterogeneous capability (M's cost of an alternative source); Information asymmetry (suppliers' production costs are private; under delegation, S1's wholesale price to S2 is unknown to M)	—	Profit (financial; firm)	Antcd: B(a), C(b) Mgt: - Perf: A(a), B(a)	Control (i.e., make) outperforms delegation (i.e., buy) when M is uncertain about both suppliers' costs but anticipates that S1's (assembly) cost is likely to be low compared to S2's (component production) cost. To the extent that S1 obtains better information about S2's cost, delegation tends to outperform control. Control is optimal when M knows S1's cost, whereas delegation is optimal when M and S1 know S2's cost, or M has an attractive alternative source (e.g., low in-house production cost)
Ketokivi (2006) (POM)	Empirical (case)	Metal working industry	Production	—	Process structure (separability of production steps); Intellectual property rights (concern)	—	Manufacturing flexibility (operational; firm)	Antcd: A(c), B(d) Mgt: - Perf: A(b), B(a)	When production steps are highly separable and when concern about protection of intellectual property is low, (dynamic) outsourcing can be used as an adaptation strategy to enhance manufacturing flexibility
Kistruck et al. (2015) (JOM)	Empirical (private archival)	Cross-sectional	Marketing and distribution	—	Organizational learning and memory; Information asymmetry; Institutional immaturity (corruption)	—	—	Antcd: B(b), C(b), D(e) Mgt: - Perf: -	When there is a high level of customer heterogeneity in size, sector, and type (i.e., private vs. government), a firm entering foreign markets tends to use intermediary for local market knowledge and delivery of products. This relationship is less pronounced when the level of corruption in an institutional environment is high (due to difficulties in monitoring and enforcement of contracts, thus potentially severe opportunism) and when the new market initiative is a replication of a previous one (due to organizational learning).

(continued)

Table 1 (Continued)

Article	Method	Industry or supply chain structure	Activities considered for outsourcing	Decision variables [decision maker] (analytical models)	Antecedents	Management of outsourced activities	Performance	Links in Figure 1 framework	Relevant findings
Kroes and Ghosh (2010) (JOM)	Empirical (survey)	Cross-sectional (US-based manufacturing companies)	Production	—	Core vs. non-core (focus on core); Heterogeneous capabilities (supplier capabilities); Competitive priorities	—	Cycle time, delivery accuracy, delivery timeliness, return costs (operational; firm); Profit margin, ROS, ROA, sales over assets (financial; firm)	Antcd: A(a), B(a,e) Mgt: - Perf: A(a,b), B(a)	Congruence between outsourcing drivers (e.g., focus on core, and access to supplier capabilities) and competitive priorities in five dimensions (i.e., cost, flexibility, quality, time, innovation) improves supply chain performance, which in turn enhances business performance
Li et al. (2008) (JOM)	Empirical (survey)	Cross-sectional (Chinese-based companies)	General	—	Heterogeneous capability (supplier innovation capability); Supplier location (offshore)	Controls (social/formal)	Innovation outcome (radical and/or incremental) (innovation; firm)	Antcd: B(a,h) Mgt: c Perf: A(c), B(a)	Firms with greater motive to acquire tacit knowledge from offshore outsourcing partners tended to emphasize both social control and formal control in the Chinese context. The social control mechanism is beneficial to radical innovation, but may limit incremental innovation. On the other hand, formal control has a positive effect on incremental innovation, but limits radical innovation
Lin et al. (2014) (POM)	Analytical (game)	Parties: 1 supplier (SPL), 1 manufacturer (MFR), 1 retailer (RTR) for each of two competing supply chains; Products: 2 competing products	Production	(i) Direction of vertical integration (i.e., no (NI), forward (FI), or backward (BI)) [each MFR]; (ii) Quality investment levels [depends on VI direction]; (iii) Contract parameters (material price and/or wholesale price) [depends on VI direction]; (iv) Retail prices for two periods [depends on VI direction]	Product life cycle (product demand perishability); Goal misalignment (double marginalization, which affects quality investment and retail price decisions); Competition (between two supply chains, on quality and price)	—	Profit (financial; firm)	Antcd: A(d), C(a), D(b) Mgt: - Perf: A(a), B(a)	Both MFRs choose to vertically integrate in the same direction in equilibrium—i.e., FI (BI) when controlling retail price (quality investment) becomes more important—although it results in a prisoner's dilemma situation (in terms of both MFRs' profits and supply chains' profits). While BI always increases MFR's profit (regardless of the structure of the competing supply chain), FI is beneficial only when product perishability is high (e.g., declining stage of the PLC)
Mahapatra et al. (2010) (JOM)	Empirical (case)	Motorbike manufacturing industry (1 OEM and its 5 suppliers)	Production	—	Heterogeneous capability (supplier capacity, flexibility); Uncertainty (in demand)	—	—	Antcd: B(a), D(c) Mgt: - Perf: -	Analysis of one case revealed that one (tier-1) supplier outsourced its production processes to a (tier-2) supplier to address the increase in the business volume. However, the (tier-1) supplier was bringing some of the processes back in-house, due to the tier-2 supplier's lack of manufacturing and logistics flexibility to absorb highly uncertain demands

(continued)

Table 1 (Continued)

Article	Method	Industry or supply chain structure	Activities considered for outsourcing	Decision variables [decision maker] (analytical models)	Antecedents	Management of outsourced activities	Performance	Links in Figure 1 framework	Relevant findings
Mahapatra et al. (2012) (JOM)	Empirical (survey)	Cross-sectional (US-based manufacturing companies)	Production	—	Core vs. non-core (focus on core); Product life cycle (growth vs. mature stage); Heterogeneous capability (supplier capabilities); Internal bureaucracy; Competition (competitive intensity)	Relationship management	Supplier capabilities (engineering capability, flexibility, R&D) (operational, innovation; firm)	Antcd: A(a,d), B(a,g), D (b) Mgt: a Perf: A(b,c), B(a)	Manufacturers' supplier development investment (SDI), viewed as an alternative to vertical integration, may increase in situations of high competitive intensity (CI), where manufacturers are more encouraged to focus on core and rely on supplier capabilities, and avoid costs of internal bureaucracy. However, CI has a positive impact on SDI only through manufacturer's relationship orientation (i.e., mediation), which is especially true in the maturity stages of the product life cycle (PLC). SDI improves supplier capabilities, regardless of the stages of the PLC
Mantel et al. (2006) (JOM)	Empirical (vignette-based experiment)	Cross-sectional (manufacturing companies)	Production	—	Core vs. non-core (focus on core competency); Heterogeneous capability (supplier cost capability); Number of suppliers; Behavioral aspects (information sufficiency, information source formality)	—	—	Antcd: A(a), B(a), D(a), E(a) Mgt: - Perf: -	The likelihood to outsource is inversely related to the level of core competency, and strategic vulnerability (i.e., small number of suppliers, low information sufficiency, and high cost). Core competency and strategic vulnerability interact such that when both are high (low), the choice will be to insource (outsource). For the high core competency/low strategic vulnerability group, those that viewed an informal information source are more likely to outsource
Marucheck et al. (2011) (JOM)	Conceptual	Cross-sectional	Production	—	Heterogeneous capability (supplier cost capability); Supplier location (offshore); Goal misalignment; Information asymmetry	—	Product safety issues (recall) (operational; product)	Antcd: B(a,h), C(a,b) Mgt: - Perf: A(b), B(d)	Analysis of high profile product safety incidents in the five industries (i.e., food, pharmaceuticals, medical devices, consumer products and automobiles) reveal that prevalent global outsourcing trend is the common source of those issues. That is, global outsourcing tends to entail the trade-off between lower cost and safety issues, due to difficult coordination and monitoring
McIvor (2009) (JOM)	Empirical (case)	Cross-sectional	General	—	Core vs. non-core (criticality of an activity to competitive advantage); Heterogeneous capability (relative capability position); Organizational learning (dynamic capabilities); Asset specificity; Number of suppliers; Uncertainty (in general)		—	Antcd: A(a), B(a,b), C (c), D(a,c) Mgt: - Perf: -	"Criticality of a capability (i.e., activity) to competitive advantage," "relative capability position (and whether the gap is significant, thus impossible to replicate)," and "opportunism associated with outsourcing (e.g., number of suppliers, uncertainty, asset specificity) (and whether manageable or not if outsourced)" should be taken together into account when making outsourcing decisions

(continued)

Table 1 (Continued)

Article	Method	Industry or supply chain structure	Activities considered for outsourcing	Decision variables [decision maker] (analytical models)	Antecedents	Management of outsourced activities	Performance	Links in Figure 1 framework	Relevant findings
Mishra and Sinha (2016) (POM)	Empirical (survey)	Cross-sectional	Design	—	Supplier location (offshore)	Project management (collocating personnel; joint task ownership)	Project integration glitches (others; project); Project performance (e.g., adherence to schedule, budget) (operational; project)	Antcd: B(h) Mgt: b Perf: A(b,d), B(c)	Integration glitches (e.g., low functionality when integrated, rework), which are associated with lower project performance, are more likely to manifest in technology projects when they are offshore outsourced compared to when domestic-insourced or domestic-outsourced. On-site ratio (i.e., proportion of the project tasks carried out by supplier at client's location) and joint task ownership (i.e., collective responsibility of supplier for the execution of multiple tasks) weakens the impact of offshore outsourcing on integration glitches
Narasimhan et al. (2004) (JOM)	Empirical (survey)	Cross-sectional	Production	—	Core vs. non-core; Organizational learning (competence building)	—	Flexibility competence (operational; firm)	Antcd: A(a), B(b) Mgt: - Perf: A(b), B(a)	Firms with high flexibility competence (i.e., more efficient in transforming both technology and sourcing inputs into volume/new product/modification/equipment flexibility) (i) outsourced less (24%) than those with low competence (35%), and (ii) tended to reserve high complexity parts for in-house manufacturing and outsource simpler components, maintaining core manufacturing capabilities for competence building
Nassimbeni (2003) (JOM)	Empirical (case, survey)	Italian eyewear industry	Production, design	—	Heterogeneous capability (supplier capability)	—	—	Antcd: B(a) Mgt: - Perf: -	Analysis of the Italian local eyewear district revealed that the local manufacturing system (i.e., "flexible specialization model") is either shifting to vertically integrated structure (due to unsatisfactory supplier performance) or rationalizing/globalizing their supply base (to access specialized supplier capabilities—e.g., innovation, efficiency)
Novak and Eppinger (2001) (MS)	Empirical (survey)	Automotive industry	Production	—	Product structure (complexity, platform); Existence of labor union	—	Quality ratings (consumer report) (operational; product)	Antcd: A(b), B(i) Mgt: - Perf: A(b), B(d)	Product complexity has a positive and significant effect on the percentage of components produced in-house. Moreover, complex components produced in -house or simple components outsourced had higher quality performance. Other factors (e.g., platform requirement and union agreement) also increase the likelihood of in-house production
Pagell and Handfield (2000) (POM)	Empirical (survey)	Cross-sectional (North American MTO firms)	Production	—	Existence of labor union	—	—	Antcd: B(i) Mgt: - Perf: -	Union plants produce a significantly greater share of assemblies in-house than non-union plants

(continued)

Table 1 (Continued)

Article	Method	Industry or supply chain structure	Activities considered for outsourcing	Decision variables [decision maker] (analytical models)	Antecedents	Management of outsourced activities	Performance	Links in Figure 1 framework	Relevant findings
Pagell and Krause (2004) (JOM)	Empirical (secondary, survey)	Cross-sectional	Production	—	Heterogeneous capability (supplier flexibility capability)	—	—	Antcd: B(a) Mgt: - Perf: -	In testing the contingency theory between environmental uncertainty, manufacturing flexibility, and performance, outsourcing, which is considered as a source (or substitute) of manufacturing flexibility in previous studies, is found to be not associated with measures of flexibility, nor with measures of environmental uncertainty
Park and Ro (2011) (JOM)	Empirical (survey)	US bicycle derailleur and freewheel market (longitudinal)	Production, design	—	Product structure (modular vs. integral); Organizational learning (absorptive capacity)	—	Quality (operational; product)	Antcd: A(b), B(b) Mgt: - Perf: A(b), B(d)	When product architecture is integral, firms keeping both design and production in-house (i.e., make) or firms keeping design in-house and outsourcing production (i.e., pseudo-make) have better product performance (i.e., number of missed shiftings; derailleur movement gap) than those outsourcing both design and production (i.e., buy), due to better coordination across components and higher knowledge capability (i.e., absorptive capability) maintained within a firm
Parmigiani et al. (2011) (JOM)	Conceptual	General	General	—	Heterogeneous capability (knowledge); Market power	—	Social and environmental performance (others; firm)	Antcd: B(a,c) Mgt: - Perf: A(d), B(a)	When the focal firm has a high degree of control over the supply chain partners, through vertical integration and resulting market power and knowledge, the impact of its social/environmental technical capabilities (i.e., specific knowledge to measure and improve social/environmental performance within the supply chain) on improving social/environmental performance is higher
Perols et al. (2013) (JOM)	Empirical (survey)	Cross-sectional (international manufacturing firms)	Design	—	Heterogeneous capability (technology); Organizational learning (absorptive capacity); Asset specificity; Uncertainty (in general)	—	New product development time-to-market (operational; project)	Antcd: B(a,b), C(c), D (c) Mgt: - Perf: A(b), B(c)	Supplier product integration (SPI) (i.e., the extent to which a firm outsources product engineering, development of component parts, and development of entire subassemblies) has a negative direct effect on the new product development time-to-market performance, due to a set of activities increasing transaction costs. However, SPI improves the performance through the increased external technology adoption (i.e., mediation), if firms simultaneously invest in internal exploration activities for enhancing absorptive capacity (i.e., moderation)

(continued)

Table 1 (Continued)

Article	Method	Industry or supply chain structure	Activities considered for outsourcing	Decision variables [decision maker] (analytical models)	Antecedents	Management of outsourced activities	Performance	Links in Figure 1 framework	Relevant findings
Plambeck and Taylor (2005) (MS)	Analytical (game)	Parties: 2 OEMs, 1 CM; Products: 1 product	Production	• Under "make" scenario (no CM): Innovation investment (i.e., market size or success probability), capacity investment, and production quantity decisions [OEMs]; • Under "buy" scenarios (pooling through common CM): (i) Innovation investment decisions [OEMs], (ii) Capacity investment and allocation decisions [negotiation between OEMs and CM]	Heterogeneous capability (capacity investment cost); Bargaining position (OEM, *vis-à-vis* CM)	—	Profit (financial; firm)	Antcd: B(a,c) Mgt: - Perf: A(a), B(a)	Outsourcing (pooling through CM) is most attractive when the capacity cost is moderate and OEMs are in a strong bargaining position *vis-à-vis* the CM (due to increased innovation and capacity investments of OEMs in such case)
Ramasesh and Browning (2014) (JOM)	Conceptual	General	General	—	Heterogeneous capabilities (access to external knowledge); Organizational learning and memory (knowledge fragmentation)	—	Unknown unknowns (others; project)	Antcd: B(a,b) Mgt: - Perf: A(d), B(c)	Outsourcing to acquire the breadth of knowledge might cause overspecialization and fragmentation of knowledge over time. This makes it difficult for a project manager to understand the project in its entirety and, thus, increases the likelihood of encountering unknown unknowns in a project
Randall and Ulrich (2001) (MS)	Empirical (secondary, survey)	U.S. bicycle manufacturing industry	Production	—	Heterogeneous capability (supplier's scale efficiency); Supplier location (proximity to customers)	—	ROA, ROS (financial; firm)	Antcd: B(a,h) Mgt: - Perf: A(a), B(a)	Variety strategy of a firm drives the make-vs.-buy decision. Firms with a variety strategy that incurs high production cost tended to outsource their production to a scale-efficient location outside the target market (i.e., Asian suppliers), while firms with a variety strategy that incurs high market mediation cost (i.e., costs associated with mismatches between supply and demand) tended to keep their production in-house (located within the target market). Moreover, firms matching variety strategy and supply chain structure outperformed firms that fail to make such matches

(continued)

Table 1 (Continued)

Article	Method	Industry or supply chain structure	Activities considered for outsourcing	Decision variables [decision maker] (analytical models)	Antecedents	Management of outsourced activities	Performance	Links in Figure 1 framework	Relevant findings
Savaskan et al. (2004) (MS)	Analytical (game)	Parties: 1 manufacturer (M), 1 retailer (R), 1 third-party collector (3P); Products: 1 product	Collection of used products	• When R + M collecting (centralized): Retail price, return rate [centralized decision maker]; • When M collecting: (i) Wholesale price and return rate [M], (ii) Retail price [R]; • When R collecting: (i) Wholesale price, and transfer payment (for collected products) [M], (ii) Retail price, and return rate [R]; • When 3P collecting: (i) Wholesale price, and transfer payment [M], (ii) Return rate [3P] and retail price [R]	Goal misalignment (double marginalization); Contract type	—	Profit (financial; firm)	Antcd: C(a,d) Mgt: - Perf: A(a), B(a)	The structure of closed-loop supply chain (i.e., who collects used products: retailer vs. manufacturer vs. third-party vs. centralized firm) affect the optimal retail price and product return rate, hence profitability of each entity and entire system (i.e., Profit: Centralized > R > M > 3P), due to double marginalization. A single two-part tariff is suggested, which coordinates the retailer collecting structure
Schmenner and Vastag (2006) (JOM)	Empirical (survey)	Cross-sectional (international manufacturing plants)	Production	—	Competitive priorities	—	Plant competence (perceived ranking in industry) (others; plant)	Antcd: B(e) Mgt: - Perf: A(d), B(b)	Clustering analysis revealed that plants with rapid new product introduction or quick delivery as competitive priority were more likely to be vertically integrated. Moreover, vertical integration, together with other factors (e.g., high capacity utilization, high labor productivity), is found to positively affect plant competence (i.e., perceived plant ranking in industry)
Shunko et al. (2014) (POM)	Analytical (principal-agent)	Parties: 1 HQ, 1 local manager (LM); Products: 1 product	Production	Transfer price decision (to maximize global after-tax profit) [HQ]; Sourcing decision (i.e., portion sourced from offshore subsidiary vs. sourced from domestic supplier, to maximize before-tax division profit) [LM]	Goal misalignment (principal-agent); Information asymmetry (outsourcing cost)	—	Profit (relative and absolute inefficiency of single transfer-pricing strategy, compared to dual transfer-pricing strategy) (financial; firm)	Antcd: C(a,b) Mgt: - Perf: A(a), B(a)	HQ (principal) sets a (single) transfer price strictly less than the first-best solution (i.e., dual transfer pricing): if the transfer price is set at its maximum, which would be optimal for tax purposes, LM will not offshore and the HQ will not be able to take advantage of the tax benefit. Moreover, when the average outsourcing cost is high, or its distribution is symmetric around the mean, the single transfer pricing system results in highest efficiency loss

(continued)

Table 1 (Continued)

Article	Method	Industry or supply chain structure	Activities considered for outsourcing	Decision variables [decision maker] (analytical models)	Antecedents	Management of outsourced activities	Performance	Links in Figure 1 framework	Relevant findings
St. John et al. (2001) (JOM)	Conceptual	General	Production	—	Core vs. non-core; Heterogeneous capabilities (coordination capability); Number of suppliers; Uncertainty (in demand); Technological advances	—	—	Antcd: A(a), B(a), D(a, c,d) Mgt: - Perf: -	Development in IT makes outsourcing a more attractive option over vertical integration, since (i) technology-driven low entry barriers create a thriving market for efficient (smaller) manufacturers (i.e., large number of suppliers), (ii) IT enables a better coordination of sourcing partners (i.e., coordination capabilities), (iii) IT increases the imitative behaviors of competitors and makes it harder to preserve the uniqueness of resources (i.e., hard to keep core competencies), and (iv) IT reduces uncertainty through improved forecasting ability (i.e., low uncertainty)
Steven and Britto (2016) (JOM)	Empirical (secondary)	Cross-sectional	Production	—	Supplier location (offshore emerging markets); Information asymmetry (low monitorability, lack of knowledge on supplier capability); Uncertainty (supply and demand); Institutional and infrastructural immaturity	—	Quality and inventory (operational; firm)	Antcd: B(h), C(b), D(c, e) Mgt: - Perf: A(b), B(a)	Outsourcing to suppliers in emerging markets (EMs) is found to be associated with lower quality (i.e., more product recalls) and inventory performance (i.e., higher inventory levels). While firms' physical presence in EMs (i.e., in-house offshoring in the same location) mitigates (i.e., negatively moderates) the impact of outsourcing on quality performance, institutional and infrastructural immaturity exacerbates (i.e., positively moderates) the impact. Finally, infrastructural immaturity strengthens the negative impact of outsourcing on inventory performance
Steven et al. (2014) (JOM)	Empirical (secondary)	Consumer product industry (US-based manufacturing firms)	Production	—	Supplier location (offshore vs. domestic); Goal misalignment; Information asymmetry	—	Quality failure (recall) (operational; firm)	Antcd: B(h), C(a,b) Mgt: - Perf: A(b), B(a)	Outsourcing is associated with higher quality failures, and this relationship is stronger when the outsourced firm is located offshore
Stock et al. (2000) (JOM)	Empirical (survey)	Cross-sectional	General	—	Heterogeneous capabilities (coordination capability)	—	Cost and service performance (delivery, flexibility and quality) (operational; firm); Market share, ROI, sales growth (financial; firm)	Antcd: B(a) Mgt: - Perf: A(a,b), B(a)	Firms *not* achieving fit between enterprise logistics (i.e., high internal and external logistics integration) and network (i.e., low level of vertical integration and strong supply chain links) had higher service and financial performance (i.e., firms having one or the other, not both or neither, performed better), possibly due to low level of redundancy in coordination mechanisms

(continued)

Table 1 (Continued)

Article	Method	Industry or supply chain structure	Activities considered for outsourcing	Decision variables [decision maker] (analytical models)	Antecedents	Management of outsourced activities	Performance	Links in Figure 1 framework	Relevant findings
Ulku and Schmidt (2011) (POM)	Analytical (game)	Parties: 1 OEM, 1 supplier; Products: single product composed of 2 sub-systems (only the sub-system 2 may be outsourced)	Design	• If design of sub-system 2 is kept in-house: OEM determines (i) Modularity level, (ii) Quality levels for both sub-systems, (iii) Sales price of end product; • If outsourced: (i) Modularity level [OEM], (ii) Quality level for sub-system 1 [OEM], for sub-system 2 [supplier], (iii) Sales price of end product [OEM], (iv) Transfer payments	Heterogeneous capability (supplier's specialized development capability)	—	Profit (financial; firm)	Antcd: B(a) Mgt: - Perf: A(a), B(a)	Outsourcing development activities may lead to more integral product architecture, when supplier's development capability is sufficiently superior (i.e., achieving higher quality sub-system with less cost), outweighing the penalty for cross-firm collaboration
Ulku et al. (2005) (POM)	Analytical (newsvendor)	Parties: 1 OEM (in "make" scenario); 1 CM (serving M identical, non-competing OEMs) (in "buy" scenario); Products: 1 product	Production	Time of entry and capacity level decisions [OEM, in "make" scenario; CM in "buy" scenario]	Heterogeneous capability (supplier's cost, scale efficiency); Uncertainty (in demand)	—	Profit (financial; firm)	Antcd: B(a), D(c) Mgt: - Perf: A(a), B(a)	When CM has deterministic efficiency (i.e., low capacity cost and/or production cost) and/or stochastic efficiency (i.e., large number of OEMs, thus resulting in pooling effect), outsourcing results in faster time-to-market and higher revenues, relative to vertical integration
Ulrich and Ellison (2005) (POM)	Empirical (survey)	Mountain bicycle industry (US-based companies)	Production, design	—	Core vs. non-core (unique design and material processing capabilities); Heterogeneous capability (supplier scale efficiency) Asset specificity (proprietary product design)	—	—	Antcd: A(a), B(a), C(c) Mgt: - Perf: -	Firms competing based on the uniqueness of suspension designs perform design internally, to cultivate the capability for itself and to avoid potential risk of supplier opportunism due to asset specificity if outsourced. Moreover, firms competing based on unique material and lacking scale are found to perform production internally, to achieve competitive advantage
Vairaktarakis (2013) (MSOM)	Analytical (game)	Parties: M manufacturers, 1 supplier; Products: M types of jobs	Production	Amount of workload to be subcontracted [manufacturers]	Heterogeneous capabilities (access to supplier capacity)	—	Minimum makespan (each manufacturer) (operational; firm); Maximum total amount outsourced (supplier) (others; firm);	Antcd: B(a) Mgt: - Perf: A(b,d), B(a)	Manufacturers, competing to minimize their own makespan, outsource part of their works to a supplier facility. Nash schedules are suggested under three types of production protocols (i.e., overlapping allowed, preemption allowed, preemption not allowed) to best take advantage of the supplier's capacity

(continued)

Table 1 (Continued)

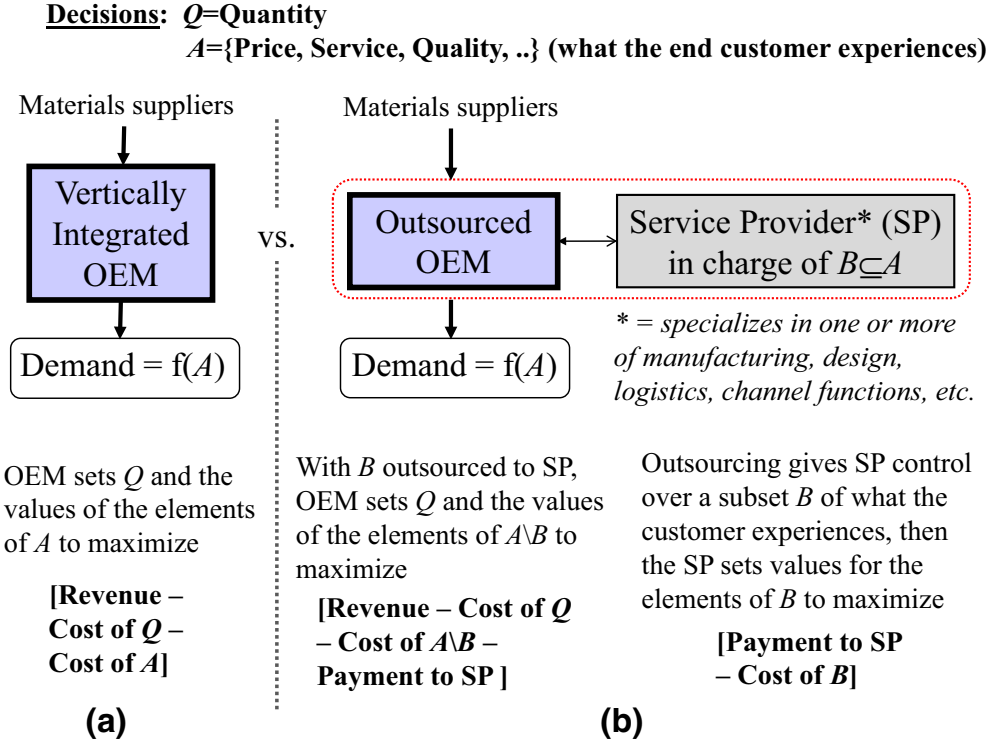
Article	Method	Industry or supply chain structure	Activities considered for outsourcing	Decision variables [decision maker] (analytical models)	Antecedents	Management of outsourced activities	Performance	Links in Figure 1 framework	Relevant findings
Wang et al. (2013) (POM)	Analytical (game)	Parties: 1 OEM, 1 CM (upstream partner, and also a downstream competitor to OEM); Products: 1 OEM product and 1 CM self-branded product	Production	• "Simultaneous" scenario: (i) Wholesale price [CM], (ii) Outsourcing proportion [OEM], (iii) Production quantities [OEM and CM]; • "OEM first" scenario: (i) Wholesale price [CM], (ii) Outsourcing proportion and production quantity [OEM], (iii) Production quantity [CM]; • "CM first" scenario: (i) Wholesale price and production quantity [CM], (ii) Outsourcing proportion and production quantity [OEM]	Competition (between OEM and CM)	—	Profit (financial; firm)	Antcd: D(b) Mgt: - Perf: A(a), B(a)	OEM prefers outsourcing entirely to the competitive CM as long as its wholesale price is no more than that of the OEM's alternative sources (preventing severe competition with the competitive CM). Further, the competitive CM sets the wholesale price sufficiently low to maintain its contract manufacturing business (allowing both parties to coexist in the market)
Wang et al. (2014) (POM)	Analytical (game)	Parties: 1 OEM, 1 CM, 1 supplier (S); Products: 1 product	Procurement	• Push × Control: (i) Wholesale prices [CM, S], (ii) Prebooking quantity [OEM, to CM and S], (iii) Capacities [CM, S]; • Push × Delegation: (i) Wholesale price [S, to CM], (ii) Wholesale price [CM, to OEM], (iii) Prebooking quantity [OEM, to CM and S], (iv) Capacities [CM, S]; • Pull × Control: (i) Wholesale prices [OEM, to CM and S], (ii) Capacities [CM, S]; • Pull × Delegation: (i) Component price [CM], (ii) Wholesale price [OEM, to CM], (iii) Capacities [CM, S]	Contract type (push or pull);	—	Profit (financial; firm)	Antcd: C(d) Mgt: - Perf: A(a), B(a)	Under push contract (i.e., order before demand is realized), both OEM and CM prefers control (i.e., OEM contracts with both CM and supplier) over delegation (i.e., OEM contracts with the CM only), while supplier prefers delegation over control. Under pull contract (i.e., order after demand is realized), only OEM prefers control over delegation, and CM and supplier prefer delegation over control
Williams et al. (2002) (JOM)	Empirical (case)	Aerospace industry	General	—	Heterogeneous capabilities (supplier capability); Technological advances (electronic commerce)	—	—	Antcd: B(a), D(d) Mgt: - Perf: -	In response to the business environment change in aerospace industry (i.e., drivers of demand chain where electronic commerce allows improved inter-organizational coordination), firms are outsourcing manufacturing activities to suppliers for superior performance

(continued)

Table 1 (Continued)

Article	Method	Industry or supply chain structure	Activities considered for outsourcing	Decision variables [decision maker] (analytical models)	Antecedents	Management of outsourced activities	Performance	Links in Figure 1 framework	Relevant findings
Wu and Pagell (2011) (JOM)	Empirical (case)	Cross-sectional	Production	—	Heterogeneous capabilities (supplier cost capability); Principles and standards	—	—	Antcd: B(a,f) Mgt: - Perf: -	Analysis of a case revealed that a firm's operating principles (i.e., general schema or simple rules to guide all decisions) and technical standards (i.e., specific rules and criteria that define the scope of a company's environmental tasks and prescribe decisions) regarding environmental sustainability affect outsourcing decision, when facing cost-environment trade-off
Xiao and Gaimon (2013) (POM)	Analytical (game)	Parties: 1 buyer, 1 supplier; Products: 1 product	Production	(i) Integration process investment (IPI), wholesale price [supplier]; (ii) Amount of component demand to produce in-house [buyer]	Product structure (complexity); Volume-based learning (decrease in production cost, development capability building)	—	Profit (total profit for two periods) (financial; firm)	Antcd: A(b), B(b) Mgt: - Perf: A(a), B(a)	When product complexity increases (i.e., thus integration cost increases), supplier reduces its investment in IPI, and consequently buyer pursues more in-house production. When the future value is sufficient, buyer pursues a partial outsourcing strategy, even if the marginal cost of outsourcing is less than the marginal cost of in-house production. When the supplier's learning rate is large, the supplier's investment in IPI is high and the buyer's unit outsourcing cost is low, which in turn leads to more outsourcing. When the buyer's learning rate is large, the buyer undertakes more in-house production
Yang and Babich (2015) (MS)	Analytical (principal-agent)	Parties: 1 buyer, 2 suppliers (high or low reliability), procurement service provider (PSP, in case of indirect procurement); Products: 2 homogeneous components	Procurement	• Indirect procurement: (i) Menu of contracts (payment, quantity, penalty) [buyer, to PSP]; (ii) Production size assignments [PSP, to suppliers]; • Direct procurement: (i) Menu of contracts [buyer, to suppliers]; (ii) Production size [each supplier]	Information asymmetry (suppliers' reliability types not known to buyer, and only known to PSP); Uncertainty (supply disruption);	—	Profit (financial; firm)	Antcd: C(b), D(c) Mgt: - Perf: A(a), B(a)	Value of using PSP is jointly determined by (i) the effect of implicit collusion between suppliers facilitated by PSP (i.e., PSP coordinates suppliers under indirect procurement vs. suppliers make decisions independently under direct procurement), which may increase or decrease buyer's informational costs, and (ii) the effect of change of control, which may alter the supply availability and the corresponding informational costs. The value is also influenced by buyer's revenue per unit, supply base's reliability, and reliability gap between the two suppliers
Zhang et al. (2014) (MSOM)	Analytical (game)	Parties: 1 buyer (risk neutral), 1 supplier (risk averse); Products: 1 product	Procurement	(i) Screening menu of contract [buyer]; (ii) Raw material procurement quantities in period 0 and 1 [supplier]	Information asymmetry (supplier's raw material process efficiency and raw material procurement quantities are unknown to buyer); Uncertainty (in raw material price: trend, risk)	—	Profit (for buyer) (financial; firm); Utility (for supplier) (others; firm)	Antcd: C(b), D(c) Mgt: - Perf: A(a,d), B(a)	Compared to "buy" contracts considered in the study (e.g., fixed-price contract and cost-reimbursement contract), procurement-control contract (i.e., "make") yielded higher OEM profit and system-wide profit, when raw material price uncertainty is low (which is in part because supplier's information rent decreases as uncertainty decreases)

Figure 2 Analytic Models of Supply Chain Outsourcing [Color figure can be viewed at wileyonlinelibrary.com]



downstream, such as a reseller for the OEM, although this is out of scope for us. This relates to the distribution channels literature in marketing (cf. Bergen et al. 1992, Jeuland and Shugan 2008, Moorthy 1985), some of which has an outsourcing flavor. The objective functions in the diagram might need modification if the revenue from selling the end product goes to the SP instead of the OEM.

Individual papers may consider structures more complex than Figure 2. Variations include proliferating the number of supply chains or the number of parties in any of the layers in the supply chain, which highlights the effects of competition (Bolandifar et al. 2016, Chen et al. 2012, Corbett and Karmarkar 2001, Feng and Lu 2012, 2013, Grahovac et al. 2015, Lin et al. 2014) or pooling (Belavina and Girotra 2012, Plambeck and Taylor 2005, Ulku et al. 2005), as well as adding layers to the supply chains (Belavina and Girotra 2012, Bolandifar et al. 2016, Dong et al. 2016, Kayıs et al. 2013, Lin et al. 2014, Savaskan et al. 2004, Wang et al. 2014, Yang and Babich 2015).

4.1.2. Model of Participant Behavior. The scope of activity is typically one or two selling periods, with each period possibly containing multiple decisions made serially or simultaneously. These implicitly or explicitly include the meta-level decision of which supply chain structure to use. For example, Wang et al. (2014) consider a three-tier supply chain comprising an OEM, a CM, and a supplier, in a two-period setting. In the first period (pre-selling), the CM and the supplier make wholesale price decisions, then the OEM decides its order quantity with both the CM and the supplier (when the OEM outsources product manufacturing to the CM, but keeps in-house the component procurement decision), and finally the CM and the supplier build their respective capacity levels. In the second period (selling), demand is realized, and revenues and costs are incurred. A larger number of periods is unlikely in such models, as the linkages from period to period quickly become messy, especially in the multi-player decision structure created by outsourcing.

An analytical model of interaction in the supply chain specifies the following elements: (i) demand model, (ii) decision structure, (iii) cost structure, (iv) decision variables, and (v) informational assumptions. We elaborate below on each of these.

(i) *Demand model*. This reflects customer preferences toward attributes of the product and the consumption experience. Market demand can be completely exogenous to the model (e.g., Blackburn 2012, Kayıs et al. 2013, Shunko et al. 2014, Vairaktarakis 2013, Wang et al. 2014, Xiao and Gaimon 2013, Yang and Babich 2015), or a function of one or more decision variables such as selling price (e.g., Bolandifar et al. 2016, Savaskan et al. 2004), innovation investment

(e.g., Plambeck and Taylor 2005), time of market entry (e.g., Ulku et al. 2005), quality of the product or some input component (e.g., Ulku and Schmidt 2011), or service level or effort (usually alluding to something that customers experience beyond inventory availability). Requiring the market to entirely consume the available quantity will make demand an endogenous function of the OEM's or CM's order size, production quantity, or capacity (e.g., Corbett and Karmarkar 2001, Gao et al. 2014, Grahovac et al. 2015). In Figure 2, set A comprises those decisions that influence demand.

As in the broader modeling literature, the functional form of market demand might be declared as a model primitive (Anderson and Parker 2002, Bolandifar et al. 2016, Bradley and Guerrero 2008, Chen et al. 2012, Corbett and Karmarkar 2001, Feng and Lu 2012, 2013, Gao et al. 2014, Grahovac et al. 2015, Gray et al. 2009, Savaskan et al. 2004, Ulku et al. 2005, Wang et al. 2013), or derived by aggregating the individual purchase decisions of a population of consumers with stated utility functions (although no examples of this latter approach appeared in our in-scope set).

Stochastic demand has a long tradition in the POM literature and often leads to a framing that resembles the newsvendor problem (e.g., Ulku et al. 2005). Alternatively, demand might be viewed as deterministic as a concession to the complexity that comes from the additional decision makers and decisions required to model an outsourcing scenario (e.g., Feng and Lu 2012, 2013, Yang and Babich 2015).

In reality, demand may depend on the control structure of the supply chain. But rather than ordain that directly, for example, by declaring a completely different demand function for each control assumption, analytical models usually funnel the dependence through the independent variables or parameter settings. This could mean that the functional form of demand is the same across all control scenarios but outsourcing changes the equilibrium value of some decision variable, which in turn influences the instantiation of demand. For example, in Lin et al. (2014), outsourcing changes the equilibrium level of material quality investments in two competing supply chains, which, along with the equilibrium retail prices, changes customers' realized utilities and thus demand for the two competing products.

(ii) *Decision structure*. Typical papers use the vertically integrated supply chain as a straw man for evaluating outsourcing.

- *Vertically integrated benchmark*. The OEM is the single decision maker in the vertically integrated benchmark. The OEM's decision problem is usually a constrained profit-maximization. If demand is stochastic, the objective function might resemble the classic newsvendor objective, but is likely more complex due to additional decision variables that may be attached to non-linear cost terms.
- *Outsourcing*. To represent outsourcing, the model formulation parses out the decisions and pieces of the objective function to the OEM and SP, who then each have their own optimization problem to solve. The existence of independent players makes this a game-theoretic scenario. The game's decision sequence is a critical assumption, since it conveys the balance of power.

  Some take a Stackelberg approach, which directly assigns leadership power to one party. For example, in Gray et al. (2009), the Stackelberg leader is the powerful CM offering a take-it-or-leave-it contract to the OEM, who in turn determines the quantity to outsource to the CM. Nash bargaining (Myerson 1997), which allows a continuum of power relationships, is becoming popular in this literature (e.g., Feng and Lu 2012, 2013, Plambeck and Taylor 2005, Ulku and Schmidt 2011).

  The analytic outsourcing literature has some examples that do not use the vertically integrated structure as a benchmark, but instead model the OEM's make-vs.-buy decision explicitly through decision variables, such as outsourced vs. in-house production quantity (Gray et al. 2009, Vairaktarakis 2013, Xiao and Gaimon 2013), the proportion of the total quantity that is outsourced (Anderson and Parker 2002, Shunko et al. 2014, Wang et al. 2013), or the direct binary decision of whether to make a component in-house or to outsource (Fine et al. 2005).

(iii) *Cost structure*. The objective functions usually reflect revenues and costs that are mostly linear (due to a constant per-unit selling price and a constant per-unit procurement/manufacturing cost) much like in the newsvendor framework. Sometimes these may be augmented with a non-linear cost (e.g., quadratic, which contributes just a linear term to the first-order condition) for one of the activities,

often some sort of service (e.g., Savaskan et al. 2004, in which the service is effort to collect used product) or a non-price product attribute such as quality (e.g., Lin et al. 2014, Ulku and Schmidt 2011).

(iv) *Decision variables*. The main decision variable is usually the quantity (Q) to offer to the market. We do not include Q in set A since most models disallow Q from directly affecting the demand, except through its relationship with the selling price. A common assumption is that Q also is exactly the amount of materials procured from the immediate supplier and then converted into finished goods. This precludes overages and underages upstream in the supply chain.

The demand model might be such that the market-clearing selling price is determined by the quantity made available (e.g., Chen et al. 2012, Corbett and Karmarkar 2001, Feng and Lu 2013, Gao et al. 2014, Grahovac et al. 2015, Gray et al. 2009, Plambeck and Taylor 2005, Wang et al. 2013). A popular alternative makes the selling price the main decision variable (e.g., Bolandifar et al. 2016, Feng and Lu 2013, Savaskan et al. 2004).

Given the relative maturity of this literature, the threshold for publication at the time of this writing usually entails that at least one of the entities have more than one decision variable. One such example is Ulku and Schmidt (2011), which considers a supply chain consisting of one OEM and one supplier, where the OEM's product is composed of two sub-systems. The OEM first decides whether to outsource the design of one sub-system to the supplier or keep the design of both sub-systems in-house. In the outsourcing case, the OEM first makes the product architecture decision (i.e., modularity of the product), and then the OEM and the supplier (i.e., internal and external development teams) choose the quality level for each sub-system. Next, the OEM sets the profit-maximizing sales price for the end product. Finally, the profit is allocated via Nash bargaining.

(v) *Informational assumptions*. Figure 2 does not depict the informational assumptions. Most papers in this literature assume common knowledge of all parameters, but some introduce information asymmetry in very controlled ways. For example, Chen et al. (2012) consider a supply chain with two OEMs competing on quantity, a CM, and a supplier. The OEMs do not know the CM's unit cost for purchasing a component from the supplier, which provides the CM an information rent under certain outsourcing structures.

4.1.3. Model Analysis. Given a model formulation as framed above, the typical analysis involves standard techniques from constrained optimization (for an individual firm's problem) and non-cooperative Game Theory (to obtain the equilibrium when outsourcing creates a multi-firm setting). The goal is to characterize how the optimal/equilibrium values of key decisions and performance metrics vary with changes in the game structure, especially *vis-à-vis* how outsourcing alters the division of labor. There may be quite a few different games to analyze, covering permutations of which party has control of which decisions and the chronological sequence of those decisions.

If the vertical integration model is presumed to be best-case for the system, the formulation is likely incomplete because in reality outsourcing is sometimes superior. Per a basic mathematical principle, vertical integration will dominate if outsourcing/decentralizing/delegating simply partitions a global objective function into pieces that become the objective functions of separate local optimizations. This kind of model focuses only on the distortion in incentives due to decision makers focusing on individual goals instead of global ones. The phenomenon of double marginalization (Spengler 1950), which has become prominent in the study of decentralized supply chains, is of this nature.

More than a thousand papers in economics and strategy had already examined the various motivations for vertical integration (e.g., revenue growth via increase in market power; reduction in production and transaction costs; and risk reduction in incomplete markets that cannot be replicated by the shareholder) as of the review by Mahoney (1992). Those researchers found many contractual forms that could enable the outsourced supply chain to replicate the performance of the vertically integrated one. This class of models, which omits factors such as agency or transactions costs, is thus unable to explain and predict an organizational form.

One way to avoid the automatic superiority of vertical integration is to hardwire explicitly some comparative advantage into the cost structure. That is, the formulation depicted in Figure 2 can directly make the "Cost of B" for the SP different from the cost the OEM would incur for performing the B activities internally (e.g., Feng and Lu 2012, 2013, Ulku and Schmidt 2011).

These kinds of tradeoffs are made even more explicit by papers that model the make-vs.-buy choice as a decision variable. In Gray et al. (2009) and Xiao and

Gaimon (2013), the choice to outsource reduces the immediate unit manufacturing cost, but also foregoes learning that would enable unit cost reduction in the future. Anderson and Parker (2002) implement similar structure, augmented by integration costs that increase due to outsourcing.

4.1.4. Commentary on Research Findings. We have not found a critical mass of analytical model formulations similar enough to support unifying conclusions. Instead, we have presented the "typical model" to highlight what the papers have in common in methodology and assumptions, as well as some characteristics of the findings. As evident from the diversity of descriptions in Table 1, each specific model comprises a very particular combination of elements and assumptions. The findings are highly idiosyncratic to the specific assumptions and model formulation. Even within an individual paper, the multiplicity of parameters and decisions might preclude succinct conclusions. A given paper is likely to find that outsourcing is favorable under certain complex combinations of parameter values and not others. The comparative statics are often not monotonic. However, there may be some single threshold such that when a certain function of the parameters crosses this threshold the direction of the conclusion flips. Although these models are highly simplified, the analysis must often be numerical in part, which suggests relationships but does not prove them with generality. Section 5.1 discusses some real-life elements that merit more attention in the analytical literature of supply chain outsourcing.

4.2. Empirical and Conceptual POM Literature on Outsourcing in Supply Chains

Forty-five of the 72 in-scope articles are empirical or conceptual. We partitioned these into two streams: antecedents of the decision to make or buy, and performance implications of the outsourcing decision. Of course, these two streams are inextricably intertwined: A proper antecedent to outsourcing would presumably relate to improved performance of the outsourced activity, through "discriminating alignment" as defined in our discussion of TCE. As expected, the dominant theoretical perspectives employed were TCE (in 20 articles) and RBV (in 14 articles).[12]

4.2.1. Antecedents of Outsourcing. Many of the papers in the antecedents literature theorize and/or find empirical evidence that would be expected per logic and/or theory. These include several papers proposing and showing (often among other results) that firms are less likely to outsource activities that relate to their core competences or distinctive capabilities (Handley and Benton 2009, Mantel et al. 2006, McIvor 2009, Ulrich and Ellison 2005, Williams et al. 2002), and are less likely to outsource in the presence of factors related to concern for opportunism, such as asset specificity (Holcomb and Hitt 2007, McIvor 2009, Ulrich and Ellison 2005), small numbers of suppliers (Holcomb and Hitt 2007, Mantel et al. 2006, McIvor 2009), uncertainty (Holcomb and Hitt 2007, McIvor 2009), intellectual property (Ketokivi 2006), and corruption in institutional environments (Kistruck et al. 2015). POM papers also find that a presumed lower cost at the supplier tends to favor the decision to outsource (Bardhan et al. 2007, Brumme et al. 2015, Mahapatra et al. 2010, Randall and Ulrich 2001, Ulrich and Ellison 2005), particularly when the decision maker's priority is short-term costs (Novak and Eppinger 2001, Wu and Pagell 2011). Kistruck et al. (2015) find that firms entering a foreign market prefer outsourcing (i.e., use a local intermediary) when there is a high level of customer heterogeneity, not only to lower costs but also to utilize the knowledge and network capability of the intermediary for enhancing customization and delivery of products.

Some papers in the antecedents literature show that firms outsource to improve specific operational performance dimensions,[13] especially flexibility. The relevant findings, however, have been less obvious. Jack and Raturi (2002) show that outsourcing practices, and the resulting supply networks and strategic alliances, are long-term and external sources of volume flexibility, especially to large companies (in terms of sales). Ketokivi's (2006) case study maintains that outsourcing is a means to achieve manufacturing flexibility (i.e., adaptation strategy) under conditions of high separability in production steps and low concern for intellectual property protection. Pagell and Krause (2004) hypothesized that plants would increase outsourcing, measured by the percentage of total cost that corresponds to direct materials, to gain flexibility for dealing with environmental uncertainty, but found no empirical support for their argument. Other factors favoring outsourcing that appear in the antecedents literature include advances in information technology (St. John et al. 2001, Williams et al. 2002), absence of a labor union (Pagell and Handfield 2000), and modular/non-complex/non-proprietary product and process structures (Ferdows et al. 2016, Fixson 2005).

4.2.2. Performance Implications of Outsourcing. The POM empirical/conceptual literature directly examining the performance implications of outsourcing often focuses on specific operational performance dimensions vs. an overarching outcome like competitive advantage or return on assets. In a conceptual piece,

Ramasesh and Browning (2014) maintained that, due to overspecialization and fragmentation of knowledge, outsourcing increases adverse events (e.g., unknown unknowns) in a project. Parmigiani et al. (2011) reasoned that social/environmental/economic performance would drop with outsourcing due to loss of control within a supply chain. Hendricks et al. (2009) found the time required to recover from supply chain disruptions to increase with the extent of outsourcing, which they attributed to increased difficulties in coordinating with external partners. Schmenner and Vastag (2006) showed that outsourcing hurt a plant's perceived ranking within an industry, especially when the plant's competitive priorities are quick delivery or rapid new product introduction. In contrast, Bardhan et al. (2007) found that outsourcing of production and supporting processes (e.g., logistics) increased gross margins at the plant level (i.e., annual plant revenue less the cost of goods sold, reported as a percentage of plant revenue). Regarding quality, Steven et al. (2014) showed a positive association between outsourcing and quality failures (recalls). Gray and Handley (2015) found empirical evidence that outsourcing production to a CM when there is a high level of quality performance ambiguity, characterized by low level of testability, monitorability, and root-cause assignability, leads to low conformance quality by the CM.

4.2.3. Moderators of the Outsourcing-Performance Relationship. This literature has also examined factors that may moderate the relationship between the outsourcing decision and its performance implications, often focusing on flexibility. Regarding core/non-core, POM research has found that keeping core and complex components in-house tends to improve flexibility competence (i.e., a firm's ability to convert or exploit investments in advanced manufacturing technologies and strategic sourcing initiatives to develop manufacturing flexibilities) (Narasimhan et al. 2004), and that outsourcing non-core activities tends to improve production volume flexibility performance (da Silveira 2006). While neither result is surprising given existing theory, the focus on flexibility performance is not common outside of POM. Note also that the consideration of core/non-core may shed light on any inconsistent findings in the antecedents literature with respect to outsourcing for flexibility.

"Match" or "Fit" between the make-vs.-buy decision and product/process characteristics is another common moderator examined in the POM performance implications literature. Randall and Ulrich (2001) showed in the bicycle manufacturing industry that the match between a firm's product variety strategy and the make-vs.-buy decision related to the firm's performance. More specifically, higher financial performance accrued to two classes of firms: outsourcing firms offering product variety that increases production cost, and vertically integrated firms offering product variety that increases market mediation costs. Novak and Eppinger (2001) found that fit between component complexity and the outsourcing decision (i.e., complex in-house; simple outsourced) related to better product quality performance in the automotive industry. Similarly, Park and Ro (2011) demonstrated in the bicycle manufacturing industry that when product architecture is integral (vs. modular), design and production in-house is superior to outsourcing in terms of product performance. Devaraj et al. (2001) measured "fit" as the congruence among product requirements (i.e., product line complexity), manufacturing process capabilities (i.e., process structure complexity), and organizational scope that includes the degree of vertical integration as an element, and showed that fit among those three dimensions resulted in better plant performance.

The POM empirical literature has also examined the impact of the supplier being offshore vs. onshore, and found mixed results. Specifically, Steven et al. (2014) and Marucheck et al. (2011) found offshore suppliers fared worse in quality performance (recalls) and safety and security performance, respectively.[14] Similarly, Steven and Britto (2016) established outsourcing to offshore suppliers (in emerging markets) to correlate with lower quality performance (more product recalls) and lower inventory performance (higher inventory levels). Their study also determined that institutional and infrastructural immaturity of the supplier location exacerbates the negative impact of offshore outsourcing on quality performance, while physical presence of a firm in the supplier location mitigates it. Mishra and Sinha (2016) similarly identified empirical evidence that offshore outsourcing of technology projects leads to more integration glitches (e.g., low functionality when integrated, rework) and thus lowers project performance, compared to domestic insourcing or domestic outsourcing, which is mitigated by co-locating personnel and giving suppliers joint task ownership. However, Li et al. (2008) concluded that the utilization of offshore suppliers of firms, along with social and formal control mechanisms (i.e., mediators), related to improved radical and/or incremental innovation performance. Their context differed from the others in surveying solely firms located in certain provinces in China. Examining stock market returns, Jiang et al. (2007) drew on signaling logic to argue and demonstrate that the use of offshore outsourced partners for

mature products by Japanese firms related to improved stock market performance.

Taking the empirical/conceptual work as a whole, much of the POM literature corroborates existing theory, most frequently TCE and/or the RBV. Indeed, roughly two-thirds of our in-scope empirical/conceptual articles (i.e., 27 out of 45) draw on TCE and/or RBV. However, the POM papers do often investigate operational performance dimensions, such as quality and flexibility, which are typically not the focus of mainstream ToF literature. In addition, POM often researches at a level of the organization more granular than the firm or business unit. Such research sometimes corroborates existing theory in a new context (e.g., Bardhan et al. 2007, Li et al. 2008, Mishra and Sinha 2016, Novak and Eppinger 2001), but also provides some new nuance and findings, which include different performance implications between the short-term and longer term with regard to quality (Novak and Eppinger 2001), and performance implications of fit between supply chain structure and manufacturing product/process characteristics (e.g., Randall and Ulrich 2001) or firms' logistics practices (Stock et al. 2000). We see POM empirical/conceptual research as well positioned to continue to contribute to the ToF, which we elaborate upon in section 5.

5. Opportunities for POM to Further Contribute to the Theory of the Firm

POM researchers examining make-vs.-buy decisions, and even those investigating related supply chain topics, have the opportunity to contribute to the ToF. A necessary first step is to deeply understand the threads within this theory and reference them in motivation and hypothesis development or in analytical models; section 2 was intended to spur such understanding. A second step is to understand what POM research has already done. Surveying four leading journals using a methodology described in section 3, section 4 was intended to accelerate that process. We now articulate recommendations based on our review. Section 5.1 proposes ideas for analytical modeling, which are a bit more concrete than those articulated for empirical research in section 5.2. This section concludes with some key ways that POM, in general, can enhance its contribution to the ToF.

5.1. Analytical Research Opportunities

POM's many formal modelers have a great opportunity to leverage their considerable analytical skills to directly contribute to the ToF. Williamson (1993, p. 38) noted a "natural progression … [from] (1) informal analysis … [to] (2) pre-formal and (3) semi-formal stages, …[culminating] with (4) fully formal analysis," but cautioned against "[p]rematurely formal theory [that] purports to deal with real phenomena without doing the hard work of making serious contact with the issues" (p. 43). Williamson (1998, p. 50): notes that "[a] continuing challenge to TCE is to move beyond semi-formal analysis of a reduced-form kind to do fully formal analysis—in the spirit of the work by Grossman and Hart (1986), but to place greater emphasis on plausible constructions." Bajari and Tadelis (2001), Blair and Stout (1999), Gibbons (2005), Kleindorfer and Knieps (1982), Levin and Tadelis (2010), Rajan and Zingales (1998), and Riordan and Williamson (1985) represent some good starting papers for modeling the ToF. POM analytical modelers interested in taking on this challenge should review the cautions in section 4.1.

Competent modelers are well aware that realism is compromised by the assumptions they impose for the sake of mathematical tractability. Deciding where to push for realism is part of the art in modeling. Below, we highlight certain assumptions that future POM analytical work on outsourcing should focus on relaxing, and how this might contribute to the ToF.

Real outsourcing scenarios possess a structural richness that extant analytical models, in POM and elsewhere, have not quite captured. Actual supply chains usually have multiple parties at each layer, including competitors and partners, or even firms that are both at once. Conflicts exist within each of the individual firms (e.g., between a product designer and a supply chain manager that both work for the OEM). The decision space includes intermediate forms of relationships rather than just the extremes of make or buy (although several papers already allow for the option of "partial outsourcing," e.g., Anderson and Parker 2002, Gray et al. 2009, Wang et al. 2013). The current modeling paradigms appear capable of incorporating these features since significant changes to the assumptions are not necessary and the POM modeling community is already following this trajectory. Because closed-form results will become more elusive due to the proliferation of decision variables and scenarios, the audience must be willing to accept conclusions obtained numerically.

More challenging will be a thrust to add nuance to the interactions among the firms. Existing POM analytical models predominantly assume that contracts can be enforced and are (almost) never renegotiated, (nearly) all information is common knowledge, (nearly) all decisions are observable so that opportunistic behavior can happen only in very circumscribed ways, and firms' governance capabilities are the same across scenarios. In other words, the transaction costs that are necessary for markets vs.

hierarchies to be a meaningful dilemma are largely absent. To be fair, POM researchers generally do not set out to or claim to answer this central ToF question. Instead, they focus on the tactical management of a specific supply chain structure, of which the make-vs.-buy decision for a single activity is part of the manager's decision problem but not the only focus. It is also a lot to ask the POM community to do what the economics and strategy modelers have not been able to with several decades of sustained effort using models that, on average, choose to incorporate fewer moving parts than POM models contain. With these caveats, we elaborate below on some attention-worthy elements in the domain of POM responsibilities within firms.

Knowledge/information assets, many of which are featured in the KBV, merit greater consideration in the analytical formulations. Consider that institutional know-how can slip away when practices are outsourced, since this sacrifices learning-by-doing (which has been modeled by Anderson and Parker 2002, Gray et al. 2009, Xiao and Gaimon 2013). Intellectual property is at greater risk of falling into the wrong hands when more parties have access to it. Even something as seemingly mundane as materials pricing information needs special protection in an outsourcing strategy (Amaral et al. 2004, 2006). Moreover, without private information there can be no deliberate deception, which is a significant risk of outsourcing.

Existing models are weak at capturing the cost of organizational complexity. Outsourcing increases some forms of complexity (to coordinate and monitor a constellation of independent role-players) and decreases others (ostensibly allowing the OEM to focus on its core competencies). Investments in coordination capabilities (people, process, and technology) can moderate these effects.

TCE emphasizes the risks of dependence on outside parties. These risks are unbounded in variety, and exist even if the other side's intentions are good, but are amplified by any inclination toward opportunistic behavior. These risks usually motivate investments in due diligence and monitoring. However, individual analytical models struggle to capture the breadth and richness of the risks. Examples that illustrate the typical approach appear in the analytical supply chain quality literature, identifying formal controls (such as finished goods inspections, monitoring, and external failure penalties) to reduce suppliers' assumed quality shirking propensity (much of this literature is not in-scope for our review because of a focus on managing an existing relationship rather than the make–buy question). Such models are invariably limited to a very specific kind of opportunistic behavior, which still presumes of the buyer a good amount of anticipatory ability. For example, in Baiman et al. (2001) the probability of high product quality is a function of the supplier' financial investment in the production process. The buyer's inability to verify this investment creates a hazard of supplier underinvestment, and the impact is exacerbated by the buyer's inability to perfectly detect and fix bad product before selling to end customers.

This challenging list is by no means complete. For example, it does not address numerous other complexities of the real outsourcing decision, such as the organizational politics that trigger outsourcing/insourcing choices that might not be defensible on concrete financial grounds (e.g., Bidwell 2012). In addition, the best wisdom available is that firms must think of these factors strategically, and avoid obsessing over short-term financial impact. This necessitates a longer term (and more nebulous) objective function and a model formulation containing a time dimension, which may quickly become intractable.

Rather than becoming discouraged or see this discussion as a criticism, POM analytical modelers should view the preceding discussion as a roadmap to open research areas. These researchers can use their knack for finding interesting business problems, their skill at modeling operational details, and their tolerance for complexity, to produce formulations that provide insights on these issues. This may require different model formulations, inspired by perspectives that thus far have not been very prominent in the published literature of outsourcing, such as systems dynamics (Dutta and Roy 2005, McCray and Clark 1999). Besides building the models, POM analytical researchers should do more to interpret the assumptions and findings using language and constructs from the ToF. Such efforts will make the new research more broadly accessible and reveal connections between new papers and previous ones that strengthen the value of both sets.

5.2. Empirical Research Opportunities

While but a small proportion of extant analytical research can be considered part of the ToF literature, mainstream ToF researchers have long employed empirical methodologies to test the proposed relationships in the theory (Macher and Richman 2008). This implies that empirical methods seem better suited than analytical approaches to addressing the nuances and complexities of the ToF. We suggest that empirical POM researchers can leverage their considerable established expertise in developing multi-item perceptual measures of constructs for primary data collection (Roth et al. 2008) and their emerging skill in carefully employing secondary source measures

(Roth et al. 2015) in empirical research to contribute to the ToF.

A necessary condition for this contribution is for POM research to consistently, precisely, and clearly articulate the theoretical logic behind any hypotheses, and link whatever results are obtained to the existing knowledge in the ToF. Unexpected non-results or results opposing theory should be carefully examined in light of theory. Assuming good research design, these unexpected results may help to identify boundary conditions or moderators for an existing theory. See Anand and Gray (2017), and citations therein, for more discussion aimed at POM researchers about contributing to mainstream strategy and organization theories. Hitt et al. (2016) and Bromiley and Rau (2016) specifically discuss OM and the RBV.

Methodologically, empirical POM researchers can no longer fail to carefully address endogeneity when examining outsourcing. This is certainly already recognized in the field (Ho et al. 2017, Ketokivi and McIntosh 2017), but consideration of endogeneity was not common in the early years of our review. Outsourcing is a managerial decision, made with full consideration of firm, supply market, and other characteristics of the environment. Thus, careful treatment of the endogenous nature of this decision is necessary, particularly when relating outsourcing decisions to performance (Hamilton and Nickerson 2003). If a study examines only antecedents of the decision, endogeneity is arguably less of a concern; but such an argument must be made.

Empirical POM researchers should follow their natural tendency to conduct engaged scholarship (Van de Ven 2007) by interacting directly with managers and focusing on problems of practical interest to them. When a problem-driven approach is combined with a deep understanding of the relevant theories, strong theoretical contributions can be made, particularly when multiple theories are simultaneously considered in one study (Mayer and Sparrowe 2013). Examples of such contributions could include identifying boundary conditions of one theory and/or explicating the conditions under which one theory provides more explanatory power than another.[15] Indeed, our review reveals that 22 of the 45 in-scope empirical/conceptual papers draw upon more than one theory,[16] although not all successfully articulate an explicit contribution of the type mentioned in the prior sentence. An example of such a problem-driven, multi-theory approach in POM is McIvor (2009), who joined TCE and RBV to understand companies' governance choices that cannot be properly explained by each theory alone, and provide a prescriptive framework for outsourcing. Another example is Mantel et al. (2006), who supplemented TCE and RBV with theories from the behavioral decision-making literature to better understand make-vs.-buy decisions, demonstrating how the biases of decision makers can affect outsourcing decisions.

Relatedly, empirical POM research could contribute to the ToF, and arguably improve its practical recommendations, by reconciling some key prescriptions from the buyer–supplier literature with the theories. For example, much of the POM literature on supply chain integration (Flynn et al. 2010) and supply chain risk (Christopher and Lee 2004) recommends substantial relationship-specific investments between buyers and suppliers, aligning with TCE's prescription for mitigating opportunism by requiring *mutual* investments or substantial safeguards if there is *unilateral* investment. POM researchers are well equipped to articulate the conditions under which such practices expose one party to a risk of opportunism. An analogous situation, not directly tied to outsourcing, comes from the Total Quality Management (TQM) literature (Nair 2006). The TQM literature favors close relationships with a single supplier, which TCE would strongly oppose in the presence of potential opportunism combined with a lack of ability to redeploy investments. Through careful engaged scholarship in the TQM context, Dyer (1997) identified trust (informal self-enforcing safeguard), along with financial hostages (formal self-enforcing safeguard) that align economic incentives between exchange partners, as key moderators of the relationship between asset specificity and transaction costs.

Empirical POM researchers have other ways to contribute further to the ToF literature. Since to some extent these also apply to analytical POM researchers, the next section unifies this discussion.

5.3. Opportunities to Increase POM Contribution to the ToF

Empirical and analytical POM research share some characteristics that can be better exploited to improve their contribution to the ToF. We begin this section with such characteristics and close with a couple of specific ToF topics that POM researchers seem well positioned to address.

First, POM's dependent variable is often not sustained competitive advantage, or some other firm-level variable such as NPV, EVA, or Tobin's Q. Instead, POM research often examines operational performance dimensions given less attention by strategy and economics scholars, such as quality (Gray and Handley 2015, Park and Ro 2011, Steven and Britto 2016, Steven et al. 2014), flexibility (Jack and Raturi 2002, Narasimhan et al. 2004, da Silveira 2006), inventory level (Steven and Britto 2016), and delivery (Bardhan et al. 2007). This could be considered a drawback, and perhaps would be by many in economics and strategy. However, careful

consideration of how outsourcing may influence specific performance dimensions or business processes may lead to different prescriptions and/or more granular findings than studies focusing entirely on firm-level effects (Ray et al. 2004). POM research can perhaps reveal risks and costs that the ToF literature has neglected, or find new relationships between antecedents, the make–buy decision, and specific dependent variables. Even if unable to contribute to the ToF this way, such POM research could help mid-level managers (e.g., those responsible for quality) understand how outsourcing affects their area of responsibility.

Second, POM research often has a unit of analysis below the level of the firm, such as plant level (Bardhan et al. 2007, Devaraj et al. 2001, 2004, Schmenner and Vastag 2006), project level (Cui et al. 2012, Mishra and Sinha 2016, Perols et al. 2013, Ramasesh and Browning 2014), or product/system level (Novak and Eppinger 2001, Park and Ro 2011). Said differently, POM research tends to focus on operational-level decisions, taking a more micro-level view than do other disciplines. Research at this level of analysis is essential since the practitioner discussion of outsourcing consistently affirms that, while high-level strategic concepts are valuable, success is determined through the specifics of operational processes (Tsay 2014). Thus, a POM research project might examine a specific process decision or transaction within an outsourcing structure (see, e.g., Chen et al. 2012, Guo et al. 2010). With such potential contribution in mind, we recommend that POM researchers be more *level sensitive* when utilizing theories formulated at a different (e.g., higher) level of analysis. Dissimilarities across levels (e.g., firm vs. plant) might lead to a mistaken conclusion that the explanation of a theory should be limited to a certain level of analysis (Whetten et al. 2009). POM research can push the envelope of the ToF by answering questions like: at what levels of analysis do theories developed at the firm level (hence, the label "firm boundaries") hold (or not hold)?

Some mainstream ToF authors would smile upon the fact of POM research often living at the level of the transaction(s). Lajili et al. (2007, p. 355) noted that as "Oxley (1997) suggests, many empirical studies relying on transaction cost rationale use firm-level characteristics to approximate for the transaction-level characteristics outlined in the theory. Oxley (1997), drawing from Williamson's work (1985), emphasizes that micro-analytic attributes of transactions, and not firm attributes, influence governance choices and should be used in empirical work." Argyres and Liebeskind (1999) added that the single transaction is often inseparable from other transactions (which they called governance non-separability), so the interactions must be considered as well.

POM's natural focus on processes, practices, and the problem all provide great opportunities. The "problem-solving perspective" (Nickerson and Zenger 2004, applied in Novak and Stern 2008) and "practice-based view" (Bromiley and Rau 2014, 2016) are both ripe for contributions from POM researchers. The organizational capabilities literature is built primarily around routines, and has arguably neglected processes.[17] Perhaps POM can help to join processes and routines in our collective thinking.

Related to the preceding discussion, POM research, if properly framed, can participate in the emerging interest in microfoundations of strategy theories (Foss and Pederson 2016). Many POM scholars would correctly argue that they already do this; but a common language across disciplines can increase the impact of all disciplines involved. POM is particularly well equipped to discern the origin of knowledge, resources, and dynamic capabilities, all of which relate to outsourcing decisions and the capability-based ToF. After introducing governance capability, Mayer and Salomon (2006, p. 956) suggest that: "to the extent that we have uncovered a general governance capability, future studies could examine how such capabilities develop;" one could argue that POM research on buyer–supplier relationships has long done this examination.

One topic directly related to the ToF that POM is well equipped to investigate is the relationship between activity characteristics, particularly asset specificity and uncertainty, and *internal* costs of bureaucracy, or the costs of governing the activity internal to the firm (as opposed to market failure costs of outsourcing, which is quite well developed). The ToF focuses mostly on how activity characteristics make transacting in the market more expensive, but are relatively silent on how they affect the internal costs. Williamson (1975) was well aware of this, in articulating many drivers of the costs of internal organization. Such internal costs include: *internal procurement bias* and norms of reciprocity, which lead to the norm of "I buy from your division and you support my project or job promotion" (1975, pp. 119–120); *internal expansion bias*, which shows a size-preserving tendency in organizations and in which growth is needed to avoid internal conflicts (1975, p. 120); *persistence*, which can be due to sunk costs and/or to managers not admitting mistakes (1975, pp. 121–122); and *communication distortion in (large) bureaucracies* (1975, pp. 122–123). Williamson summed up these drivers by noting that: "internal opportunism takes the form of sub-goal pursuit—where by sub-goal pursuit is meant an effort to manipulate the system to promote the individual and collective interests of the affected

managers. Such efforts generally involve distorting communications in a strategic manner…The upshot of this is that distortion-free internal exchange is a fiction and is not to be regarded as the relevant organizational alternative in circumstances where market exchange predictably experiences non-trivial frictions" (1975, pp. 124–125). Still, the "main costs of vertical integration are more difficult to discern" (Williamson 1985, p. 153). Masten et al. (1991, p. 1) explicitly noted that "recognition that variations in internal organization costs may also play a role in the decision to integrate exposes an inherent weakness in … [the existing] tests." More recently, Lajili et al. (2007) observed that "[i]nternal costs of organization may play a significant role in integration decisions," and Gibbons (2010) stated that "TCE theory does not provide as clear an explanation for *variations* in the costs of integration as it does for the costs of non-integration" (p. 277). POM is well positioned to address this important gap in the ToF literature.

Another specific area to develop is the conditions under which internal manufacturing (or service) activity is necessary to maintain innovation capabilities. The demise of former brand-owning firms who outsourced production and the rise of their CMs' own branded products (Tsay 2014) indicate that some firms failed to appreciate this in the past. Core POM topics like Lean Production (Shah and Ward 2007), TQM (Nair 2006, also discussed extensively in Grant 1996b, 2013), and Six Sigma (Schroeder et al. 2008) are structured approaches to developing knowledge and situating knowledge appropriately. These could be considered microfoundations of resource-based competitive advantage (Schroeder et al. 2002), to the extent they cannot be copied exactly.

6. Concluding Remarks

Our main goal in writing this paper is to help POM researchers of supply chain outsourcing increase their impact outside of the POM field. To this end, we first provided a tutorial on the ToF, covering the most well-established theories, which inform the outsourcing decisions. Understanding the language and the logic of these theories is a precondition for contributing to them in a way that will be widely read. We then reviewed recent POM research on supply chain outsourcing. While this review covered only four POM journals, and had stringent criteria for a paper to be included, it provides a solid foundation about the state of the art. Finally, we identified avenues for further contributing to these theories, leveraging both the methodological tendencies and the domain knowledge of POM researchers. A success indicator will be an increase in the POM papers on this topic that are used and cited extensively outside of the discipline.

The creative and energetic have a great opportunity to run with the proliferation of good ideas offered in the extant literature, perhaps in directions we outlined here. The evolving science of POM can and will do better in joining rigor and relevance.

Notes

[1]These service providers sometimes have industry-specific labels, such as "contract (development and) manufacturing organization" (CMO or CDMO) in pharmaceuticals (Hammeke 2015) and "contract packer" or "co-packer" in food (Coffin 2013).

[2]In the electronics industry, this brand owner is called an OEM (a name that is historically abbreviated "Original Equipment Manufacturer" and persists even though nowadays a separate party often does the actual manufacturing).

[3]http://www.researchandmarkets.com/research/lbq8h6/contract

[4]For example, a Google Scholar search on December 1, 2017, of "ToF" *and* (i) "transaction cost" had 30,100 results; (ii) "resource based" had 39,800 results; and (iii) "real options" had 4810 results.

[5]Manufacturing, distribution, and design are sometimes considered business processes, and thus the outsourcing of one of those activities would be a form of "business process outsourcing." Typically, though, this term refers to back-office activities like IT, accounting, and payroll processing (e.g., Tsay 2014).

[6]We initially used ESBCO host's Business Source Complete to perform this search. However, this did not output some articles that we knew should have appeared. Due to the journal publishers' embargo that governs external database platforms, the journals were *fully* accessible in EBSCO only for the following periods: *MS*: 01/01/2000 to 5 years ago (from the current day); *POM*: 03/01/2002 to 1 year ago; *JOM*: no coverage in BSC (although some articles are still accessible); *MSOM*: 01/01/1999 to 5 years ago. To fill in the substantial gaps, we repeated the search from the publisher website of each journal.

[7]For special issues, we checked the topic and/or the editor(s) of the issue (i.e., whether the affiliated editors were faculty in a POM academic department).

[8]We checked each of these for the presence of a make-vs. buy argument.

[9]The idea of "fit" and performance in this paradigm resembles that in the "discriminating alignment" hypothesis discussed earlier.

[10]This statement pertains only to some empirical papers.

[11]"Service" is meant in a general sense, in that these firms perform some activity rather than directly selling the physical good.

[12]Only one in-scope article, Novak and Eppinger (2001), draws on the property rights view, and the problem-solving or real-options perspective does not appear at all in our reviewed papers. This reflects a tendency in the ToF literature in general. Other literature surveys have also reported POM researchers' preference for certain theories, especially TCE and RBV (e.g., Burgess et al. 2006, Carter et al. 2014).

[13]In the POM literature, "capability" typically refers to realized or desired performance in one or more operational performance dimensions. The dimensions typically considered included cost, quality, delivery, flexibility, and innovation. Because this usage is not the same as in the ToF literature, and given the focus of this study, we explicitly use the term "performance dimension" instead of capability.

[14]This is consistent with Gray et al. (2011) and Gray and Massimino (2014), which both examined offshore locations within multinational enterprises (i.e., no outsourcing).

[15]As an example, Gray and Handley (2015) maintain that, in the presence of high quality performance ambiguity, the logic from TCE (i.e., risk of opportunism due to using a single contract manufacturer) dominates those from the relational view and quality management literatures (i.e., relational benefits from a single, committed contract manufacturer).

[16]Besides those summarized in section 2, theories employed in the multi-theory papers within our review include: behavioral decision-making theories (Mantel et al. 2006), signaling theory (Jiang et al. 2007), social exchange theory (Li et al. 2008), resource dependence theory (Parmigiani et al. 2011), contingency theory (Mahapatra et al. 2012), and intermediation theory (Kistruck et al. 2015).

[17]Grant (2013, p. 556) calls for processes (as opposed to routines) to be the "basic unit of productive activity," stating that: "The organization theory literature has tended to identify *tasks* and *activities* as the basic units of organization. The evolutionary economics literature has focused upon *routines*; while the operational management literature is concerned with *processes*. While tasks and activities are associated with the actions of individuals, routines and processes are concerned with the interactions between multiple individuals. Hence, if our basic interest is coordination, then either routines or processes are appropriate elements for considering the essential features of organization. Of the two, the major emphasis of management scholars has been upon organizational routines. However, I contend that there is a sound case for scholars of organizational design to concentrate upon processes as the basic unit of organization. Processes avoid the ideological baggage that have become attached to routines, include productive interactions that have not become routinized, and are readily comprehensible by practicing managers."

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