



# Globalisation vs. Slowbalisation: a literature review of analytical models for sourcing decisions in supply chain management

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# Globalisation vs. Slowbalisation: a literature review of analytical models for sourcing decisions in supply chain management

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## A B S T R A C T

In the context of the mainstream of globalisation and a new trend of slowbalisation, we review the existing literature including both empirical and analytical papers on the sourcing and location decisions in Supply Chains. After defining the different sourcing strategies, e.g., insourcing, outsourcing, offshoring and reshoring, we present the drivers for each strategy and how they can be incorporated in the analytical models in order to help to optimize the taken decisions. We also discuss the research perspectives in the field.

## Keywords:

Globalisation  
Slowbalisation  
Insourcing  
Outsourcing  
Operation research  
Operations management

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## 1. Introduction

Globalisation has been a strategical trend for the past decades, leading to international supply chains (SC). Inditex, the textile giant owning brands like Zara and Oysho among others, work with 1 866 suppliers, 7 235 factories and over 7 000 stores worldwide [Inditex](#). Airbus engages more than 12 000 suppliers around the world [Be an Airbus supplier](#). According to the World Trade Organization (WTO)

database, the total merchandise exports reached almost 20 000 000 Million US dollars in 2018.

Recently, though, we are probably witnessing a major change. The Economist refers to the current reshape of globalisation as “Slowbalisation”, a term first used by the Dutch trend-watcher Adjiedj Bakas in 2015. The world trade dropped from 61% to 58% of Gross Domestic Product (GDP) between 2008 and 2018. Intermediate imports and Foreign Direct Investment (FDI) have had a 2% drop in the same period. In 2018, 50% of the FDI flowing in Asia came from countries in Asia, and 60% of FDI in Europe came from the region [Globalisation has faltered \(2019\)](#).

Globalisation and slowbalisation are trade-related concepts linked to the geographical expansion of the supply chains. Be-

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side the location, the governance mode is an important aspect. Firms not only have to decide where to locate their activities, but also whether they prefer to keep the control and autonomy of them or to delegate them to external parties. Such decisions are named as outsourcing, offshoring, insourcing, reshoring and backshoring, which are business strategies that affect the organizational structure of a firm. Distinct definitions can be found in the literature.

Contractor, Kumar, Kundu, and Pedersen (2010) define outsourcing as the organizational restructuring of some activities either in the home nation of the firm or abroad to external providers. On the other hand, they consider offshoring as restructuring the firm geographically from the home nation to a foreign location where the same company activities are performed under either the company's own subsidiary or allocated to a foreign contract vendor. Y.Lewin and W.Volberdab (2011) define offshoring as "the transfer of business processes and activities to foreign locations" while stating that outsourcing "refers to services that are sourced from an external supplier within the boundaries of one country". Arlbjorn and Mikkelsen (2014) distinguish these concepts from an ownership perspective. They link offshoring to owned subsidiary out of the country and outsourcing to the transfer of ownership and control to a third-party. They consider insourcing and backshoring as relocating the production to a facility in another country owned by the company. Johansson and Olhager (2018) state that " 'Offshoring' refers to the relocation of firms' activities across the national borders of a firm, while the term 'backshoring' indicates a relocation back to the firm's home country of origin. 'Reshoring', which refers to a generic change of location with respect to a previous offshore country, can include further offshoring (i.e. relocation to another offshore location) or backshoring (i.e. relocation to the home country)."

Bals, Kirchoff, and Foerstl (2016) provide a conceptual framework of the reshoring/insourcing decisions. They define reshoring with a link to geographical distance and insourcing as a type of governance mode. They enumerate the motivations and results of each strategy adopted. In the first part of their paper, Talamo and Sabatino (2018) present different definitions related to reshoring from the literature. The authors note that the term "reshoring" is used in the USA while the terms "back-shoring" and "back reshoring" are used in Europe. They identify four reshoring procedures from the literature: in-house reshoring which is the return of outsourced production as part of the company in the country of origin, outsourcing reshoring which is moving the production to the country of destination, reshoring for outsourcing is when the production is repatriated to third suppliers in the same country as the company and reshoring for insourcing which is the internalisation of the previously outsourced activities in the domestic units.

Kinkel (2014) distinguishes between captive backshoring, which is the return of activities from foreign plants owned by the company, and outsource backshoring, which is the return of activities from foreign suppliers to the company.

As we can see, minor subtle differences can be found between the different definitions. Without loss of generality, we refer to outsourcing as subcontracting some of the company's processes to a third party. Offshoring is moving the processes to another country while still having the autonomy and control, it's a geographical activity within the company. Insourcing, is performing an activity or a process in-house, which implies control as a governance mode, regardless of the geographical location. Reshoring, at last, means relocating an activity back to a geographically close country as the firm's headquarters. In this case we can differentiate between nearshoring and backshoring where nearshoring implies a near country and backshoring the same country. As mentioned by Foerstl, Kirchoff, and Bals (2016), the differences between these strategies are ownership and location.

A comprehensive review of offshoring strategies was conducted by Mihalache and Mihalache (2016). They present a cross-disciplinary systematic review of the literature concerning six following types of decision: (i) offshoring decision, (ii) the business activity to offshore, (iii) location decision, (iv) ownership decision, (v) partner choice decision, and (vi) control/coordination decision. They suggest integrative research directions for each stream.

In their exhaustive review on the outsourcing decision, Tsay, Gray, Noh, and Mahoney (2018) point out the disconnection between the Theory of the Firm (ToF) and the Production and Operations Management (POM) literature regarding outsourcing and insourcing decisions. Our study extends their recent review by including the outsourcing contract arrangement between the company and its suppliers, as different contracts lead to different outcomes. We also add the discussion on the centralized-decentralized supply chain settings. In a centralized supply chain, the profit maximization or cost minimization concerns the whole supply chain. In a decentralized supply chain, the members decide independently, each one having a particular goal to achieve.

In this paper, we focus on analytical models that may help to optimize the sourcing and location decisions in Supply Chain Management. We briefly present our methodology in Section 2. We discuss the drivers and obstacles for globalisation and slowbalisation in Section 3. In Section 4, we focus on the analytical modelling in two streams of research: the insourcing-outsourcing decision and the outsourcing contract arrangement. We conclude this survey in Section 5 with our insights and research perspectives.

## 2. Review methodology

As mentioned in the introduction, several systematic reviews regarding the different sourcing decisions have been made. We do not intend to reproduce the work that has already been done. We rather seek to underline the fragmentation in the literature that brings the need to work within multi-disciplinary fields to better address the sourcing and location decisions. We choose to do an integrative review for this contribution for the following reason, presented by Snyder (2019): "the purpose of an integrative review is not to cover all articles ever published on the topic but rather to combine perspectives and insights from different fields or research traditions". We make an integrative review in which we present papers from different fields in order to synthesise the existing analytical models and draw the attention to new theoretical frameworks and perspectives. We omit papers related to IT service outsourcing and mention only a few related to Third-Party Logistics (3PL) as they are related to transport outsourcing. We run an advanced search on the Web of Science Core Collection database with the query "(TS = (globalisation OR slowbalisation OR insourcing OR outsourcing OR offshoring OR make buy OR backshoring OR reshoring OR make-buy OR make-or-buy OR make-vs-buy OR vertical integration) AND WC = (Engineering, Aerospace OR Engineering, Industrial OR Engineering, Environmental OR Engineering, Manufacturing OR Operations Research & Management Science)) AND LANGUAGE: (English) " within the time span 2000–2020, we get 3994 results. We made a first selection after reading the abstracts of the papers found. We also reached additional papers by looking in the references of the papers studied, which is known as the snow ball method. This method was an effective and relatively fast way to collect many articles related to the subject and see the different analytical formulations the authors used. We include discussion papers, press articles and consulting group reports.

In the next section, we firstly discuss the drivers and obstacles for globalisation and slowbalisation.

### 3. Drivers and obstacles for globalisation and slowbalisation

To understand the drivers and obstacles for globalisation and slowbalisation, we analyse empirical studies, articles from press journals like *The Economist* and also consulting group reports. Since the latter ones are related to industrial cases, they present interesting insights on the reasons behind the sourcing decision strategy.

From the definitions presented in the Introduction, we can say that outsourcing (offshoring) is the reverse strategy of insourcing (reshoring). This means that the obstacles of one decision are the drivers of the reverse one. In [Tables 1](#) and [2](#), we present the most frequent motivations for each strategy.

[Mauro, Fratocchi, Orzes, and Sartor \(2018\)](#) refer to offshoring and reshoring based on the geographical location, regardless of the governance mode. They review the literature on the motivations for both strategies and classify their findings within a framework separating internal and external environment as well as cost efficiency and customer perceived values. In this paper, we use a different classification, as we are interested in the analytical modeling of these drivers. We distinguish financial motivations, related to the cost efficiency including labour costs, freight costs, logistics costs, energy costs, subsidies and penalties (national subsidies for relocation, penalties for late orders), payment terms, coordination costs, exchange rate risks, total cost of ownership, and administrative costs.

The operational drivers are the ones related to quality, lead time and inventory as well as the “Made in” effect, one of the most influential drivers for reshoring. We group the following motivations under the “Made in” effect: firm’s global reorganization, redefinition of the global SC, change in firm’s business strategy, need to increase customers’ satisfaction and customers’ gratitude and willingness to pay.

Then there are labour-related motivations, other than the wages, and harder to quantify as home labour market flexibility, labour productivity, lack/availability of skilled workers, psychic distance and union pressures. Finally, we group the technology/resources-related drivers, such as lack/availability of infrastructure, product/process/organizational innovation (e.g. automation, lean management), raw material availability, production capacity, intellectual property and innovation potential.

Globalisation has proven to be effective in cost reduction and has resulted in international supply chains. Many qualitative and empirical studies present the drivers and advantages of outsourcing and offshoring. The most frequent ones are low labor wages, cost reduction (financial), flexibility and quick response to changes, promoting competition among suppliers which leads to better quality and lower price, logistics facilitation (operational), preference to focus on core competencies, easiness of market penetration (strategical) and availability of workers in the host country.

Once globalisation became a widely used strategy, its drawbacks became obvious. An early study by [Bettis, Bradley, and Hamel \(1992\)](#) already mentioned the risks related with outsourcing. The authors say that once a significant sourcing relationship has been established, Western firms become less and less able or willing over time to re-emerge as manufacturing competitors due to a high level of early satisfaction with the supplier firm, increasing internal incentives to expand the sourcing relationships and decreasing the product and process development capabilities. The advantages of outsourcing according to the authors are improvement in cost, product and possible market share while it does come with a decline of product and process technology competences and skills. They say that separating design and manufacturing is a source of competitive advantage, but it results in a worse coordination, longer lead times, slower skills and compe-

tence accumulation. They conclude that outsourcing should focus on areas other than core competences. According to [Gilley and Rasheed \(2000\)](#), outsourcing could result in the loss of overall market performance, the loss of long-run Research & Development (R&D) competitiveness, longer lead times, larger inventories, communication and coordination difficulties, lower demand fulfillment and higher transaction costs than planned. [Gertler \(2009\)](#) analyse the effect of offshoring on US economy by considering employment and rehiring.

The drawbacks of locating the activities far from the home country can be considered as the drivers for reshoring/insourcing. Related to the financial aspect, the rise of labour wages in what used to be “low cost” countries is one of the main reasons why firms rethink their location decision. In a report published by IAC Partners, a French consulting group, [Huyghevelde, Ranjbaran, and Achimi](#) state that the workers wages in China, which used to be 20 times cheaper than those in France, were only 5 times cheaper in 2017. They assume it will only be 2 to 3 times cheaper by 2022. Another financial argument is the rising cost of fuel and transportation. Also, when expanding the SC, the firms have to face transaction costs and additional hidden costs that are hard to be anticipated in advance.

The operational motivations of relocating the production close or in the home country are quality issues, longer lead times, larger inventories and disruption risks. [Bruccoli, Perrone, Mazzola, and Handfield \(2019\)](#) use Agency theory to develop hypothesis relating product recall to the sourcing strategy. They conduct an empirical study in the pharmaceutical industry to highlight the link between quality deterioration, offshoring and outsourcing.

Some outcomes of globalisation may have an important impact on the strategy of the company. Among those we refer to opportunism, increasing theft of intellectual properties and the loss of overall performance and skills. [Hansen, Mena, and Aktas \(2018\)](#) refer to those and other risks such as the burden and quality of bureaucracy, the geopolitical environment and currency fluctuations as political risks. Their empirical study shows that 38% of the variability in offshore outsourcing flows come from such risks. There is also the need to bring production closer to R&D for more effectiveness.

For resources-related motivations, some authors mention increased automation in the home country ([Talamo & Sabatino, 2018](#), [Guillaume, 2018](#) and [Arlbjorn & Mikkelsen, 2014](#)), poor IT, communication and transport infrastructure in the host country.

Backshoring and reshoring are gaining rising attention in the literature. [Ellram, Tate, and Petersen \(2013\)](#) and [Cohen et al. \(2018\)](#) focus on sourcing from owned manufacturing facilities. They present drivers for different manufacturing location decisions. [Stentoft, Mikkelsen, Jensen, and Rajkumar \(2018\)](#) present the performance outcomes of offshoring, backshoring and local manufacturing. Interested in the return of offshored activities, [Fratocchi, Mauro, Barbieri, Nassimbeni, and Zanoni \(2014\)](#), [Arlbjorn and Mikkelsen \(2014\)](#) as well as [L.Tate, M.Ellram, Schoenherr, and J.Petersen \(2014\)](#) look for drivers of this decision for European and US companies.

[Arlbjorn and Mikkelsen \(2014\)](#) mention the barriers of moving production back to Denmark which are the lack of information and communication on the process, the lack of internal competencies among the production staff, the lack of proper foundation for the decision to insource but also the lack of resource allocation.

[Fishman \(2012\)](#) analyses the General Electric example to better understand the offshoring and reshoring trends. The manufacturing jobs offered by the company attained 23,000 in the USA in 1973, then fell down to 1863 jobs in 2011. After explaining the movement to China and the different steps historically, the authors presents the reshoring case. When taking this decision, the

team re-designed the product and eliminated 20% of the parts and cut the costs of materials by 25%. The working hours for assembly went down from 10 to 2. By reshoring to USA, the material cost and labor required went down while the quality and energy efficiency went up. The author then gives other industrial examples of reshoring, stating that offshoring was motivated by low labor wages which is not the case anymore. Besides, it comes with many hidden costs and quality and lead time problems that were not anticipated and make it less interesting as a sourcing strategy.

The Consulting Group IAC Partners also mention the re-design to cost, as a way to reduce costs by reshoring, through changing the production process. It worked well for ATOL, a glasses industry. Veloscoot, a french company making electrical bikes, relied on local sourcing which resulted in better quality and higher customer value *Le redesign to cost au service de la reindustrialisation française*.

Fratocchi et al. (2016) characterize the reshoring motivations according to the goal (value and cost efficiency) and the level of analysis (internal or external). Then they build a database of reshoring decisions/projects based on 377 cases. After identifying the cases by home country, host country and industrial sector, they classify the motivations from the empirical study according to their framework.

Kinkel and Maloca (2009) relate the offshoring decision to the firm's size and industrial sector. Their results indicate that the activities with standardised production processes and lowly qualified labor are more offshored. They mention capacity bottlenecks among the drivers of offshoring. They relate the backshoring decision to former offshoring one, as a solution to the different problems that previously occurred.

Mauro et al. (2018) conduct a multiple case study including 4 Italian manufacturing firms from the Textile, Clothing, Leather and Footwear (TCLF) industry. What is interesting to note is that all of them stated offshoring as a consequence of their competitors strategies which allowed them to keep competitive prices. Another important point is that the offshoring decision does not include high end products, whereas low-end products are rarely included in the backshoring decision. The main reshoring reason highlighted by all of them is the "Made in" effect.

Anon (2012) focuses on the rising labor wages in coastal China. Although inland China offers lower labor costs, it is offset by the poor transportation infrastructure which will result in extending lead time. Even if other Asian countries such as Vietnam and Sri Lanka offer lower labor wages, they are reported to be less efficient and have a lower productivity than China. The author states that for China to become more internationally competitive, there is a need to make the Design of products and not only the manufacturing. Which brings us to an important aspect of the outsourcing decision: which activity to outsource.

Kinkel (2014) uses data from European Manufacturing Survey to analyse German companies' decisions to reshore. The author estimates that 20% of the backshoring decision in Germany is a response to the changing environment and the loss of the location advantages while the remaining 80% are a correction of the offshoring decision that first took place.

Talamo and Sabatino (2018) consider reshoring and its relation to resilience, by studying the Italian case. They mention industrial cases of reshoring like Bosch, Sagem, NafNaf, Caroll, Nokia, Nathan and Essilor. Then, after defining resilience as the ability to recover after a crisis, they list reshoring cases in Italy by region and by industrial sector. They use a resistance index, based on changes in employment, to compare the different regions of Italy in 3 crisis periods (oil crisis in 1970–1973, devaluation of Lira and political crisis in 1992–1995 and financial and economic crisis in 2008–2010). While stating the "Made-in" as the first region for reshoring,

the authors mention other drivers such as risk, safety procedures and the pressure of the country of origin.

The effect of Trade Facilitation (TF) on international trade is discussed in the work of Mann (2012). The author distinguishes between the macroeconomic aspect related to policy makers and the microeconomic one related to businesses. She mentions non tariffs direct costs (port facilities and logistics costs) as well as information and communication technology networks and globally linked financial institutions, and also the arm's length regulation and standards like the ones by the International Organization of Standardization (ISO). She refers to works that explicit the quality of road networks, logistics and shipping time and ports infrastructure.

There is no doubt that the sourcing decision is strongly related to the environmental performance of a supply chain. The decision to bring the production back in-house can be motivated by reducing emissions. Yet, a review published in November 2019 by Fratocchi and Stefano (2019) shows that only 7 out of 33 reshoring related papers and book chapters refer to the environmental aspect of the decision. In the empirical study presented by Stentoft, Mikkelsen, and Johnsen (2015), based on a survey conducted in Denmark regarding the local sourcing decision, none of the firms mentions the environmental argument. One of the rare correlations we found between reshoring and environmental sustainability are a two-page perspective by Orzes and Sarkis (2019) that was published in 2019 and a Life Cycle Assessment of an athlete made by Clarke-Sather and Cobb (2019). Aiming to quantify social, environmental and economic benefits of local sourcing, the authors use a sustainability indicator including direct and indirect greenhouse gas emissions.

The environmental impact, though rarely mentioned in reshoring cases, is gaining a rising attention in the recent literature. Sirilertsuwan, Ekwall, and Hjelmgren (2018) review the literature on proximity manufacturing in relation to enhancing sustainability in the clothing sector. They confirm that the correlation between local production and the environmental aspect is under-studied. They present their findings in different regions, which highlights the need to consider different markets and shows that the environmental dimension is frequently analysed in the European market, rarely in North America and only one paper is found for Asia. Another relevant point of these authors that we should keep in mind is the absence of using data from a specific location in the modeling techniques.

Dolgui and Proth (2013) mention the social consequences of outsourcing and offshoring, e.g., unemployment and decline of living standards by keeping labour wages low in developing countries.

Behar and Venables (2010) analyse the effect of transport costs on trade flows. The authors extend the gravity model of international trade by writing the volume of exports as a function of income, policy, cultural affinity and transport costs. With a focus on the transport costs, they examine the trade-off between speed and reliability in return for different costs for different modes of transport. The authors present the average costs and handling time of a container in different regions of the world. They mention the growing trend of air shipping and the contribution of delay in reducing trade. They collect evidence from cross-section and time-series data to look at the relationship between transport cost and distance, infrastructure, fuel costs, technology, trade facilitation and technology.

The works above take into consideration the industrial sector, the firm's size, the home/host countries and which activity is externalised/internalised. These aspects need to be incorporated in the analytical models as the outcome differs a lot according to them. In the next section, we discuss the analytical models proposed in the literature.



#### 4. Analytical models for sourcing decisions in globalisation vs. slowbalisation context

The insourcing and outsourcing decision lies within an important stream of Production and Operation Management research. A special issue of the International Journal of Production Research on outsourcing and offshoring was published in 2018 to address the need for more inclusive decision-aid tools. [Ishizaka, Bhattacharya, Gunasekaran, Dekkers, and Pereira \(2019\)](#) review the eight papers of this special issue, by clearly stating the contribution and future research direction of each. In this section, we analyse the analytical models developed in the literature in order to help supply chain managers to make the most profitable decisions.

##### 4.1. Insourcing and outsourcing decision

In this section we present analytical models developed in the literature in order to help the supply chain managers to decide to insource or outsource (make or buy). The analytical parameters for each reference are detailed in [Table 3](#)

[Kim, Park, Jung, and Park \(2017\)](#), [Liu and Nagurney \(2011\)](#) and [Wang, Niu, and Guo \(2013\)](#) consider cooperation and competition in different supply chain structures. They focus on the arm's length regulation, quick-response production and push and pull contracting, respectively. In addition to uncertainty, these papers have common decision variables, which are quantity and price.

[Kim et al. \(2017\)](#) consider cost uncertainty in a context of outsourcing and offshoring. The authors consider offshoring where the retailer decides order quantity independently from the production division, and outsourcing where there is competition between the firm's production division with outside suppliers. They investigate the choice of a multinational firm's SC structure for operations (centralized integration, decentralized offshoring or outsourcing) changes if buyers and sellers of a product act independently, both in their own self-interest.

In their paper, [Liu and Nagurney \(2011\)](#) elaborate supply chain networks by allowing multiple suppliers, multiple manufacturers and multiple demand markets to interact under both demand and cost uncertainty. In their configuration, each manufacturer maximizes his own expected profit through a two-stage stochastic programming problem. The authors assume that the manufacturers are competing with each other and cooperating with the offshore suppliers in the first stage. They use variational inequality to study the effects of demand and cost uncertainty on outsourcing, in-house production and sales under competition as well as on the supply chain's firms profits and risk. They also determine the effects of quick-response in-house production on the firms' decisions, profits and risk. [Kaur, Singh, and Majumdar \(2018\)](#) also consider a multi-tiers SC. They develop a Mixed Integer Non Linear Problem (MINLP) integrated with fuzzy multi-criteria decision making (MCDM) to model the joint offshoring and outsourcing decision. They rank the suppliers in case of outsourcing, determine the optimal quantity, from which supplier to buy and where to keep inventory in case of offshoring.

[Wang et al. \(2013\)](#) use game theory to compare the effect of different outsourcing structures and contracting arrangements on the inventory/capacity risks of a supply chain. They show which arrangement is the best for the Original Equipment Manufacturer (OEM) and under which conditions.

Similar to [Liu and Nagurney \(2011\)](#), [Teng and Hsu \(2017\)](#) assume that both strategies are applied and determine the optimal outsourced and produced quantities. But they consider a deterministic and not a stochastic demand function.

For a while now, increased attention has been brought to the environmental aspect in the sourcing decision. One or more of the following can be included: environmental regulations, investment

to reduce emissions and Customer Environmental Awareness (CEA). [Zhang, Padmanabhan, and Huang \(2018\)](#) and [Schenker, Koesler, and Löschel \(2014\)](#) base their work on the assumption of a tax on imports that would discourage firms from choosing far-away suppliers.

[Zhang et al. \(2018\)](#) develop a model to study the impact of environmental regulations on production level and supply chain structure. It is one of the first papers on the increasingly offshored pollution from developed countries to emerging economies. To address this problem of "pollution heaven", where firms choose to offshore to pollution - friendly countries in order to avoid environmental fines they will have to pay for their emissions, the authors assume an offshoring tax, which would increase costs of imported products. They consider different scenarios: a benchmark production decision model where only in-house manufacturing is considered, a pollution penalization model with a green tax and an offshoring model.

[Schenker et al. \(2014\)](#) also assume a border carbon tax in their work. It would compensate the offshoring decision to unregulated countries. The authors focus on how environmental regulations affect the international supply chains. They classify their results according to different sectors, which lacks in the present literature.

Another environmental regulation is mentioned by [citchoi](#). The author assumes that under the carbon footprint scheme, different tax rates are applied depending on the location of the supplier. He studies a supply chain consisting of one manufacturer and two suppliers. They are located in two different countries which influences the costs and the lead time. The author looks for the optimal sourcing decision. He first starts with a single - ordering scenario where no quantity adjustment can be made and determines the optimal sourcing strategy with respect to a certain service level rate. For the dual - ordering scenario, the retailer has different objective functions in each stage: achieve the inventory service target and maximize the expected profit.

Some authors consider game theory models where the government is one of the players. They present interesting findings from the government's perspective to either maximize revenues from the penalty, minimize emissions or maximize social welfare. [Meng, Yao, Nie, and Zhao \(2017\)](#) study the make - or - buy decision under environmental legislation, and the impact of a green tax on the firm's sourcing strategy and overall carbon emissions. They begin with an exogenous tax scenario where they solve both the make and the buy regime models. They determine the optimal production quantity and the wholesale price of the supplier in the case of outsourcing. They investigate the impact of the carbon tax on the overall emissions. The second scenario assumes an endogenous tax rate. The authors find out the optimal strategies for different objectives of the government (maximize the carbon tax income, minimize the carbon emissions or both) and under which conditions the government should or should not regulate the tax. More papers on the government's behaviour will be cited in the next section.

With the common assumption of an exogenous price, [Zhang, Wang, and You \(2015\)](#) study how CEA impacts order quantity and channel coordination for a one-manufacturer and one-retailer SC. Customers' willingness to buy greener products is a criteria that is more and more adopted in the literature. Related to the insourcing-outsourcing context, They consider 3 scenarios: centralized, decentralized and decentralized with return contract. The manufacturer produces traditional and green products. The authors then extend these models by including a capacity constraint. They assume that demand is function of both the products' prices and environmental quality.

[Facanha and Horvath \(2005\)](#) use Life Cycle Assessment to compare between the in-house and outsourced logistics. They add an environmental perspective by using indicators such as energy use and global warming potentials. They consider the life cycle of a

typical automobile in the USA and generalize their findings to other industry groups. They conclude that there is a reduction in energy utilization, global warming potential and fatalities due to logistics outsourcing.

The papers above present different analytical aspects that should be more regarded in the literature. While some differentiate between cooperation and competition scenarios, others incorporate capacity constraints and inventory risks. Some interesting analytical models incorporate uncertainty in demand and/or costs, quantity adjustment, and less frequently lead time and service level. We also note the assumption of a border carbon tax that would add costs to the outsourcing/offshoring decision and address the transfer of pollution. More authors should incorporate this assumption in order to analyse its outcomes and encourage governments to adopt it in case it turns out to be effective.

#### 4.2. Outsourcing contracts

The papers reviewed in the previous subsection present analytical models for the make or buy decision. However, if the company chooses to outsource its production to an external party, the question is how to make the best out of this sourcing strategy. In this subsection, we present models of the contract arrangement between SC members. Different contract parameters lead to different outcomes, and that is why we need to analytically model the different configurations to acknowledge the best decision. The most widely used contracts are cost sharing and revenue sharing, where the SC members share a ratio of the costs and revenues, respectively. The two-part tariff contract is an arrangement where a lump sum fee is paid in exchange for a lower wholesale price set by the manufacturer to the retailer.

We review Game Theory models that contribute to the coordination of the SC by considering different contract arrangements. We present a generic model that has been adapted in each paper according to the context. Unless we say otherwise, the references below consider a two-tiers SC consisting of one manufacturer and one retailer. They seek to maximize their profits. In a centralized setting, the players act simultaneously in order to maximize the whole SC profit as one entity, which can be understood as insourcing. In the decentralized setting, each player takes his decisions individually to maximize his own profit.

We denote  $X$  the vector of decision variables, and use the subscripts  $r$  and  $m$  for the retailer and the manufacturer, respectively.  $f_i$  ( $g_i$ ),  $i = r, m$  refer to the functions of revenues (costs). Thus, we can write the profit functions of the retailer  $\Pi_r$  and the manufacturer  $\Pi_m$  as follows:

$$\begin{aligned}\Pi_r(X) &= \alpha f_r(X) - g_r(X) - (1 - \beta)g_m(X) - \gamma F \\ \Pi_m(X) &= (1 - \alpha)f_r(X) + f_m(X) - \beta g_m(X) + \gamma F\end{aligned}$$

$F$  is the lump sum payment in case of a two-part tariff contract. Note that:

- If  $\alpha = 1$ ,  $\beta = 1$  and  $\gamma = 0$ , we are in the base model (without contracts or sometimes referred to as wholesale price contract)
- If  $0 \leq \alpha \leq 1$ ,  $\beta = 1$  and  $\gamma = 0$ , it is a revenue sharing contract
- If  $\alpha = 1$ ,  $0 \leq \beta \leq 1$  and  $\gamma = 0$ , it is a cost sharing contract
- If  $\alpha = 1$ ,  $\beta = 1$  and  $\gamma = 1$ , it is a two-part tariff contract
- If  $0 \leq \alpha \leq 1$ ,  $0 \leq \beta \leq 1$  and  $\gamma = 0$ , it is a combination of revenue sharing and cost sharing contract

We regroup the papers by the demand function. If not mentioned as stochastic, the demand function is considered deterministic. Yang, Zheng, and Xun (2014), Singh, Haldar, and Bhattacharya (2016) and Ji, Xu, Yan, and Yu (2020) consider a demand function linearly decreasing in retail price  $p$ , which is a decision variable, e.g.,  $D = D_0 - \eta p$ , where  $D_0$  is the market potential and  $\eta$  the demand sensitivity to price.

Ji et al. (2020) consider the cap and trade environmental regulation, Singh et al. (2016) a carbon tax as a percentage of the net revenue and Yang et al. (2014) compare the outcomes of emission trading, carbon tax and a combination of both under an all-unit wholesale quantity discount contract. This results in different cost functions. Ji et al. (2020) consider a wholesale price and revenue sharing contract. The contribution of this work is the consideration of the inverse relationship between the cap allocated by the government and the carbon trading price. They also consider the government as one of the players and determine the optimal cap that maximizes the social welfare. Singh et al. (2016) consider long-term and short-term contracts, and include import and export duties as well as the total cost of transshipment in their cost functions, referred to as *TRANS* in Table 4.

The product greenness and customers' environmental awareness are incorporated in the analytical models as variables impacting the demand function. In the papers presented next, the demand is linearly decreasing in both retail price  $p$  and sustainability level  $s$ , e.g.,  $D = D_0 - \eta p + \mu s$ . It is assumed that the firms make an investment  $I$  to reduce the emission from production. Unless we say otherwise, the investment is a quadratic cost of the sustainability level to achieve,  $I = ks^2$ , where  $k$  is the investment coefficient.

Dong, Shen, Chow, Yang, and Ng (2014) consider a stochastic demand function that only depends on  $s$ . Ghosh and Shah (2015), Ghosh and Shah (2012), Song and Gao (2018), Yang and Chen (2018) and Li, Zhang, Zhao, and Liu (2019) consider demand as a function of both  $p$  and  $s$  and costs function as sum of production costs and green investment. We refer to the cost of trading emission and holding inventory as  $c_{TRAD}$  and  $c_{INV}$ , respectively.  $c_{BB}$  is the cost of returning products in case of buyback contract. Ghosh and Shah (2015) investigate the cost sharing contract, Ghosh and Shah (2012) the two-part tariff contract, Song and Gao (2018) the revenue sharing contract and Yang and Chen (2018) compare between cost sharing, revenue sharing and a combination of both under a carbon tax. Except the latter model who consider the retailer as the Stackelberg leader, the others consider different scenarios where each SC member is the leader then a Nash bargaining scenario. Li et al. (2019) compare the results with a fixed sharing rate, symmetric and asymmetric bargaining power.

Xu, He, Xu, and Zhan (2017) and Xua, Chen, and Bai (2016) also consider a demand function that is linearly decreasing in retail price and increasing in the greening level. They add a carbon trading price to their cost functions. While the former study the outcome of wholesale price and cost sharing contracts, the latter consider revenue sharing and two-part tariff. Li, Xiao, and Qiu (2018) consider the same demand formulation. They assume that the retailer is fairness-concerned, in which they maximize a utility function instead of the profit function for the retailer. Zu, Chen, and Fan (2018) analyse both the microscopic and macroscopic effects in the emission reduction problem. They present the government-based situation where a carbon subsidy (penalty or reward) is applied to the manufacturer (*SUBS* in Table 4). They also state that it is not a one-period decision and consider a differential game to assess the impact of time. Taleizadeh and Rabie (2018) consider a SC consisting of one retailer and two manufacturers. We refer to them with the subscript  $m_i$ ,  $i = 1, 2$ . They formulate the demand function as follows:  $D = D_0 p^\eta s^\mu$ . Yang, Zhang, and Ji (2017b) consider a two-manufacturer, two-retailer SC. Their demand function depends on the greening level of manufacturer  $i$  and that of his rival  $3 - i$ ,  $i = 1, 2$ . Yang, Luo, and Wang (2017a) consider a non-linear demand function that depends on price and greening level. In their paper,  $D = k(s)D_0 - p$ , where  $k$  is a coefficient that depends on the abatement level. Dey and Saha (2018) consider a two-period setting. They develop three models for different procurement scenarios. The first one assumes procurement in both periods with strategic inventory (SI) maintaining. The



**Table 1**  
Drivers of globalisation.

References	Paper type	Financial	Operational	Strategical
Lau and Zhang (2006)	Case study	✓	✓	✓
Gilley and Rasheed (2000)	Survey	✓	✓	✓
Beaumont and Sohal (2004)	Survey	✓	✓	✓
Gonzalez, Gasco, and Llopis (2005)	Survey	✓		✓
Harland, Knight, Lammings, and Walker (2005)	Delphi study	✓	✓	✓
Talamo and Sabatino (2018)	Data base analysis	✓		✓
Kinkel and Maloca (2009)	Large-scale survey	✓		✓
Kremic, Tukel, and Rom (2006)	Review	✓	✓	
Mykhaylenko, Ágnes Motika, Waehrens, and Slepnirov (2015)	Survey	✓	✓	✓
Persaud and Floyd (2013)	Survey	✓	✓	✓
Ancarani, Mauro, Fratocchi, Orzes, and Sartor (2015)	Survival Analysis	✓		✓
Canham and Hamilton (2013)	Survey	✓		✓

**Table 2**  
Drivers of slowbalisation.

References	Paper type	Financial	Operational	The “Made in” effect	Policies and regulation
L.Tate et al. (2014)	Survey	✓	✓	✓	✓
Bergman and Ramachandran (2010)	Company overview	✓			
Sirkin, Zinser, and Hohner (2011)	Consulting Group report	✓	✓		
Fishman (2012)	Press article	✓	✓		
Talamo and Sabatino (2018)	Data base analysis	✓	✓	✓	
Kinkel (2014)	Comment based on empirical evidence	✓	✓		✓
Behar and Venables (2010)	Discussion Paper	✓			
Arlbjorn and Mikkelsen (2014)	Note based on a large-scale survey		✓		
Mauro et al. (2018)	Case study		✓	✓	✓
Guillaume (2018)	Article	✓	✓	✓	✓
Kinkel and Maloca (2009)	Large-scale survey	✓	✓	✓	
Sirilertsuwan et al. (2018)	Literature review	✓	✓		✓
Heikkilä, Martinsuo, and Nenonen (2018)	Survey	✓	✓	✓	✓
Fratocchi and Stefano (2019)	Literature review and empirical evidence	✓	✓	✓	✓

second one assumes two-period procurement without SI. The third one assumes a one-time procurement in the beginning of the first period. In Table 4, we refer to inventory level as  $INV$  and we use the subscript  $i$ ,  $i = 1, 2$  to indicate the period.

We refer now to the models in which an additional decision variable impacting the demand has been introduced. In these cases, we still have a demand function that is linearly decreasing in price and increasing in  $s$  and another variable. Swami and Shah (2013) assume that each of the manufacturer and the retailer make a greening effort. If we refer to them respectively as  $s_m$  and  $s_r$ , the demand function can be written as  $D = D_0 - \eta p + \mu_m s_m + \mu_r s_r$ . Dai, Zhang, and Tang (2017) and Yuyin and Jinxi (2018) consider both reducing carbon emission and energy-saving (*ener*) as greening efforts. While the former consider an increasing demand in emission reduction effort, the latter consider a decreasing demand in carbon emission level. Dai et al. (2017) introduce the government subsidy rate, a government support for green products referred to as *subs* in Table 4. The authors also use empirical data from the Chinese new energy vehicle industry to verify their results.

On another hand, Raj, Biswas, and K.Srivastava (2018) consider greening level and Corporate Social Responsibility (CSR). The parameters of the contracts in this paper are decision variables and not exogenous. Zhou, Bao, Chen, and Xu (2016) consider a greening effort made by the manufacturer and an advertising effort (*ADV*) made by the retailer. Like Li et al. (2018), they consider a utility function for the retailer who is fairness concerned. Kuiti, Ghosh, Gouda, Swami, and Shankar (2019) formulate the greening effort as pack-size reduction and shelf-space allocation, referred to as *PACK* and *SHELF* in the analytical models of Table 4. Bai, Chen, and Xu (2017) consider a demand function varying in sustainable investment, promotional effort (*PROM*), price and time. They incorporate inventory costs and item deterioration to their cost functions. We refer to them with subscripts  $INV$  and  $DETER$ .

Basiri and Heydari (2017) and Ma, Zhang, Hong, and Xuc (2018) consider two substitutable products. Thus, their demand functions depend on both products' prices but also on the difference between prices, green qualities and sales efforts (*SAL*) of the two products in Basiri and Heydari's work Basiri and Heydari (2017). They assume that one manufacturer offers the two substitutable products while Ma et al. (2018) consider two manufacturers each offering one type of product. Their demand function also depends on customers' loyalty to each product, referred to as *LOY* in Table 4.

Table 4 presents an overview of these contributions. In this table,  $D$  is the demand function,  $p$  the retail price and  $\omega$  the wholesale price. We refer to costs as  $c$  and use subscripts to refer to those that are not production costs.  $q$  refers to production quantity. Under environmental regulations, we refer to the total emission of a firm as  $E$  and the carbon cap as  $CAP$ .

## 5. Discussion

In this survey, we analyse both the drivers and obstacles for slowbalisation and globalisation and the analytical models developed in the literature for sourcing decisions. We can observe a gap between the factors that influence the decisions in practice and the models developed to help the decision makers. Currently, the analytical models existing in the literature remain rather simple and the state-of-the-art operational research methodology should be better employed in order to model more realistic factors discussed in Section 3. For large supply chains, it is also important to take into account such settings as uncertainty, complexity of the supply chain structures and multi-period optimization where the evolution of legislation can be taken into account. Uncertainty is relevant for the demand function, cost functions (carbon tax, exchange rate), delivery and lead time which impacts inventories and demand fulfillment. Such factors as capacity constraints, for produc-

**Table 3**

Analytical models for the make or buy decision.

Reference	SC structure	Demand structure	Objective function	Decision variables	Solution method	Driver modeled analytically
Teng and Hsu (2017)	one distributor, one warehouse	deterministic	profit maximization	order quantity and outsourced fraction	Algorithmic solution	Made in effect and higher cost for insourced products
Kim et al. (2017)	one manufacturer - one retailer under arm's length regulation	deterministic	profit maximization	quantity, wholesale price	First and second order derivative	Lower tax and production cost in foreign countries, cost uncertainty
Liu and Nagurney (2011)	multiple manufacturers, suppliers and demand markets	stochastic	profit maximization	quantity outsourced and locally produced, price	Variational inequality	Lead time (quick-response production), production capacity, demand and cost uncertainty, higher in-house production cost
Kaur et al. (2018)	multiple manufacturers, suppliers and demand markets	stochastic	profit maximization and cost minimization	supplier's rank, quantity outsourced, quantity produced, from which supplier	MINLP with fuzzy MCDM	demand uncertainty, capacity constraint, inventory and ordering costs
Wang et al. (2013)	three-tiers	stochastic	profit maximization	order quantity, wholesale price	Game theory	Lead time (early and late orders), lower cost and higher capacity in-house and power structure
Zhang et al. (2018)	one manufacturer - one supplier	deterministic	profit maximization	quantity	First and second order derivatives	Higher in-house cost
Choi (2013)	one manufacturer - two suppliers	stochastic	Inventory service target and profit maximization	quantity offshored and locally produced	First and second order derivative	Lead time (quick-response production), higher local costs, Bayesian forecast updating model
Meng et al. (2017)	one manufacturer - one supplier	stochastic	profit maximization for the manufacturer and the government and emission minimization	quantity, wholesale price and tax	First and second order derivatives	Higher costs and lower emissions in-house
Zhang et al. (2015)	one manufacturer-one retailer with 2 substitutable products	deterministic	profit maximization	quantity, wholesale price and return credits	First and second order derivatives	Capacity constraint

**Table 4**

Analytical parameters related to the outsourcing contracts 0.8.

Reference	Game leader	$X$	Demand function	$f_i(X)$	$g_i(X)$	Contract
Singh et al. (2016)	manufacturer then retailer	$p, \omega$	$D = D_0 - \eta p$	$f_r(p) = pD$ $f_m(\omega) = (1 - c_{tax})(1 - c_{export})\omega D$	$g_r(p) = (1 + c_{import})\omega D$ $g_m(p) = (1 - c_{tax})(cD + TRANS)$	long and short terms contracts
Ji et al. (2020)	government, then manufacturer	$p, \omega$ and $Cap$	$D = D_0 - \eta p$	$f_r(p) = pD$ $f_m(\omega) = \omega D$	$g_r(\omega) = \omega D$ $g_m(s) = cD + c_{TRAD}(E - CAP)$	$\alpha = 1, \beta = 1$ and $\gamma = 0$ $0 \leq \alpha \leq 1, \beta = 1$ and $\gamma = 0$
Dong et al. (2014)	manufacturer	$q$ and $s$	$D = D_0 + \mu s + \epsilon$	$\mathbb{E}f_r(q) = p \min(q, D) + c_{BB}(q - D)^+$ $\mathbb{E}f_m(s) = \omega q$ $f_r(p) = pD$ $f_m(\omega) = \omega D$	$\mathbb{E}g_r(q) = \omega q + c_{INV}(q - D)^+$ $\mathbb{E}g_m(s) = cq + I + c_{TRAD}(E - CAP)$ $g_r(\omega) = \omega D$ $g_m(s) = cD + I$	$0 \leq \alpha \leq 1, \beta = 1$ and $\gamma = 0$ $\gamma = 0$ $\alpha = 1, \beta = 1$ and $\gamma = 1$ and $c_{BB}$ $\alpha = 1, 0 \leq \beta \leq 1$ and $\gamma = 0$
Ghosh and Shah (2015)	manufacturer, then retailer, then bargaining model	$p, \omega$ and $s$	$D = D_0 - \eta p + \mu s$	$f_r(p) = pD$ $f_m(\omega) = \omega D$	$g_r(\omega) = \omega D$ $g_m(s) = cD + I$	$\alpha = 1, \beta = 1$ and $\gamma = 1$
Ghosh and Shah (2012)	manufacturer then retailer then Nash bargaining	$p, \omega$ and $s$	$D = D_0 - \eta p + \mu s$	$f_r(p) = pD$ $f_m(\omega) = \omega D$	$g_r(\omega) = \omega D$ $g_m(s) = cD + I$	$0 \leq \alpha \leq 1, \beta = 1$ and $\gamma = 0$
Song and Gao (2018)	retailer then Nash bargaining	$p, \omega$ and $s$	$D = D_0 - \eta p + \mu s$	$f_r(p) = pD$ $f_m(\omega) = \omega D$	$g_r(\omega) = \omega D$ $g_m(s) = cD + I$	$0 \leq \alpha \leq 1, \beta = 1$ and $\gamma = 0$
Yang and Chen (2018)	retailer	$p, \omega$ and $s$	$D = D_0 - \eta p + \mu s$	$f_r(p) = pD$ $f_m(\omega) = \omega D$	$g_r(\omega) = \omega D$ $g_m(s) = cD + I$	$0 \leq \alpha \leq 1, \beta = 1$ and $\gamma = 0$ $\alpha = 1, 0 \leq \beta \leq 1$ and $\gamma = 0$ $0 \leq \alpha \leq 1, 0 \leq \beta \leq 1$ and $\gamma = 0$ $0 \leq \alpha \leq 1, 0 \leq \beta \leq 1$ and $\gamma = 0$

(continued on next page)

Table 4 (continued)

Reference	Game leader	X	Demand function	$f_i(X)$	$g_i(X)$	Contract
Li et al. (2019)	manufacturer	$\alpha, \beta, p, \omega$ and $s$	$D = D_0 - \eta p + \mu s$	$f_r(p) = pD$ $f_m(\omega) = \omega D$	$g_r(\omega) = \omega D$ $g_m(s) = cD + I$	$0 \leq \alpha \leq 1, \beta = 1$ and $\gamma = 0$ $\alpha = 1, 0 \leq \beta \leq 1$ and $\gamma = 0$ $0 \leq \alpha \leq 1, 0 \leq \beta \leq 1$ and $\gamma = 0$
Xu et al. (2017)	manufacturer	$p, \omega$ and $s$	$D = D_0 - \eta p + \mu s$	$f_r(p) = pD$ $f_m(\omega) = \omega D$	$g_r(\omega) = \omega D$ $g_m(s) = cD + I + c_{TRAD}(E - CAP)$	$\alpha = 1, \beta = 1$ and $\gamma = 0$ $\alpha = 1, 0 \leq \beta \leq 1$ and $\gamma = 0$
Xua et al. (2016)	supplier	$p, \omega$ and $s$	$D = D_0 - \eta p + \mu s$	$f_r(p) = pD$ $f_m(\omega) = \omega D$	$g_r(\omega, s) = \omega D + I + c_{TRAD}(E - CAP)$ $g_m(s) = cD$	$0 \leq \alpha \leq 1, \beta = 1$ and $\gamma = 0$ $\alpha = 1, \beta = 1$ and $\gamma = 1$
Li et al. (2018)	manufacturer	$p, \omega$ and $s$	$D = D_0 - \eta p + \mu s$	$f_r(p) = pD$ $f_m(\omega) = \omega D$	$g_r(\omega) = \omega D$ $g_m(s) = (c + TAX_s)D + I$	$0 \leq \alpha \leq 1, \beta = 1$ and $\gamma = 0$
Zu et al. (2018)	manufacturer	$p, s_r, s_m$ and $SUBS$	$D = D_0 - \eta p + \mu(s_r + s_m)$	$f_r(p, SUBS) = pD + SUBS dX$ $f_m(s_m) = \int_0^\infty \omega D dX$	$g_r(s_r) = \int_0^\infty \omega D + I_r s_r dX$ $g_m(s_m) = \int_0^\infty I_m dX$	$\alpha = 1, 0 \leq \beta \leq 1$ and $\gamma = 0$
Taleizadeh and Rabie (2018)	manufacturer for quantity discount, retailer for cost sharing	$p, q$	$D = D_0 p^{-\eta} s^\mu$	$f_r(p) = pq$ $f_m(q_i) = \omega_i q_i$	$g_r(q) = \omega q + c_{INV} q + c_{ORD} \frac{D}{q}$ $g_m(q_i) = c_i q_i + c_{INV} q_i + c_{ORD} \frac{D_i}{q_i} + I_i$	$\alpha = 1, 0 \leq \beta \leq 1$ and $\gamma = 0$ and quantity discount
Yang et al. (2017b)	manufacturer, Nash game in horizontal direction	$p_i, \omega_i$ and $s_i$	$D_i = D_{0i} - \eta p_i + s_i - \mu s_{3-i}$	$f_{ri}(p_i) = p_i D_i$ $f_{mi}(\omega_i) = \omega_i D_i$	$g_{ri}(p_i) = \omega_i D_i$ $g_{mi}(s_i) = I + c_{TRAD}(E - CAP)$	$0 \leq \alpha \leq 1, \beta = 1$ and $\gamma = 0$
Yang et al. (2017a)	the manufacturer then retailer	$\omega, q$ and $s$	$D = k(s)D_0 - p$	$f_r(q) = pq$ $f_m(\omega) = \omega q$	$g_r(q) = \omega q$ $g_m(s) = cq$	$\alpha = 1, \beta = 1$ and $\gamma = 0$ $0 \leq \alpha \leq 1, \beta = 1$ and $\gamma = 0$
Deya and Saha (2018)	manufacturer	$p, \omega, s$ and $INV$	$D_i = D_0 - \eta p_i + \mu s$	$f_{ri}(p_i, INV) = \sum_{i=1}^2 p_i D_i$ $f_{mi}(\omega_i, s) = \sum_{i=1}^2 \omega_i D_i$	$g_{ri}(\omega_i) = \omega_i (D_i \pm INV) + c_{INV}$ $g_{mi}(s) = (c + s)(D \pm INV) + I$	$\alpha = 1, 0 \leq \beta \leq 1$ and $\gamma = 0$
Swami and Shah (2013)	manufacturer	$p, \omega, s_r, s_m$ and $F$	$D = D_0 - \eta p + \mu s_m + \mu_r s_r$	$f_r(p) = pD$ $f_m(\omega) = \omega D$	$g_r(\omega, s_r) = (\omega + r)D + I_r$ $g_m(s_m) = cD + I_m$	$\alpha = 1, \beta = 1$ and $\gamma = 1$
Dai et al. (2017)	manufacturer, joint decision on the investment	$p, \omega, s$ and $ener$	$D = D_0 - \eta p + \mu(s + ener)$	$f_r(p) = pD$ $f_m(\omega) = \omega D$	$g_r(\omega, s) = (\omega + SUBS)D + I_r$ $g_m(ener) = I_m$	$\alpha = 1, 0 \leq \beta \leq 1$ and $\gamma = 0$
Yuyin and Jinxi (2018)	manufacturer	$p, \omega, s$ and $ener$	$D = D_0 - \eta p + \mu_s s + \mu_{ener} ener$	$f_r(p) = pD$ $f_m(\omega) = \omega D + SUBS$	$g_r(\omega, s, ener) = \omega D$ $g_m(s, ener) = (c + TAX)q + I_s + I_{ener}$	$\alpha = 1, 0 \leq \beta \leq 1$ and $\gamma = 0$
Raj et al. (2018)	supplier	$p, \omega, s, CSR, \alpha, \beta$ and $\gamma$	$D = D_0 - \eta p + \mu_s s + \mu_{CSR} CSR$	$f_r(p) = pD$ $f_m(\omega) = \omega D$	$g_r(\omega, s, CSR) = (\omega - c)D + I_{CSR}$ $g_m(s, CSR) = cq + I_s$	$\alpha = 1, \beta = 1$ and $\gamma = 0$ $0 \leq \alpha \leq 1, \beta = 1$ and $\gamma = 0$ $\alpha = 1, 0 \leq \beta \leq 1$ and $\gamma = 0$ $\alpha = 1, 0 \leq \beta \leq 1$ and $\gamma = 0$
Zhou et al. (2016)	manufacturer	$s, ADV$ and $\beta$	$D = D_0 + \mu_s s + \mu_{ADV} ADV$	$f_r(ADV) = pD$ $f_m(s, \beta) = \omega D$	$g_r(ADV, \beta) = I_{ADV}$ $g_m(s, \beta) = I_s$	$\alpha = 1, 0 \leq \beta \leq 1$ and $\gamma = 0$
Kuiti et al. (2019)	manufacturer	$p, \omega, PACK, s$ and $c_{transport}$	$D = D_0 + \mu_s s + \mu_{PACK} PACK$	$f_r(p, s) = pD$ $f_m(\omega, PACK, c_{transport}) = \omega D$	$g_r(s) = \omega D + K + I_s$ $g_m(PACK, c_{transport}) = cD + I_{SHELF} + I_{PACK} + K$	$\alpha = 1, 0 \leq \beta \leq 1$ and $\gamma = 0$ $\alpha = 1, 0 \leq \beta \leq 1$ and $\gamma = 1$
Bai et al. (2017)	manufacturer	$s, \omega, p$ and $PROM$	$D = (D_0 - \eta p + \mu_s s + \mu_{PROM} PROM) v(t)$	$f_r(p, PROM) = p(D - q_{DETER})$ $f_m(\omega, s) = \omega D$	$g_r(PROM) = \omega D + c_{DETER} + c_{INV} + I_{PROM}$ $g_m(s, PROM) = cD + I_s + c_{TRAD}(E - CAP)$	$0 \leq \alpha \leq 1, 0 \leq \beta \leq 1$ and $\gamma = 0$ $\alpha = 1, \beta = 1$ and $\gamma = 1$
Basiri and Heydari (2017)	retailer	$p, s$ and $SAL$	$D = D_0 - \eta p_i + \mu s_i + \lambda SAL_i + \zeta_p(p_{3-i} - p_i) - \zeta_s(s_{3-i} - s_i) - \zeta_{SAL}(SAL_{3-i} - SAL_i)$	$f_r(p, SAL) = \sum_{i=1}^2 p_i D_i$ $f_m(s) = \sum_{i=1}^2 \omega_i D_i$	$g_r(SAL) = \sum_{i=1}^2 \omega_i D_i + I_{SAL}$ $g_m(s) = \sum_{i=1}^2 c_i D_i + I_s$	$\alpha = 1, 0 \leq \beta \leq 1$ and $\gamma = 0$
Ma et al. (2018)	both competing manufacturers or only one of them or retailer	$p_i, \omega_i$ and $s_i$	$D_i = LOYD_0 - \eta p_i + \lambda p_{3-i} + \mu s_i$	$f_r(p_i) = \sum_{i=1}^2 p_i D_i$ $f_m(\omega_i, s) = \omega_i D_i$	$g_r(p_i) = \sum_{i=1}^2 \omega_i D_i$ $g_m(s) = c_i D_i + I_s$	$\alpha = 1, 0 \leq \beta \leq 1$ and $\gamma = 0$

tion, inventory holding and transport loads should be also incorporated. In order to support the decision makers in taking sourcing decisions in slowbalisation vs globalisation contexts, more comprehensive decision-aid tools have to be developed. For SC design, complex models should be developed to determine the optimal decisions related to facility locations, production technology, material flows, supplier selection and transportation modes.

The questions related to the human capital, technology development and environment impact should not be ignored in new analytical models. The new models have to be developed in the light of sustainable development covering all the aspects impacting the supply Chain performance and resilience that was shown to be very important under the possibility of new global crisis. Although these questions are discussed in the literature for over a decade

now, there is still a lack of holistic analytical models. In particular, the sustainability aspect should include legislation, investment to reduce the overall emissions, customers' sensitivity to the greenness of the product and CSR initiatives, the different processes considered for emissions, etc. Regarding the environmental legislation for example, such factors as carbon cap, trade and carbon tax as well as governmental subsidies may influence the sourcing decisions. Analytical models of the different legislation schemes should be developed not only to support the decision makers but also to give insightful perspectives for governments to guide the policy makers in building such legislation schemes.

There is also a need for a standard and common definition of the different sourcing strategies, insourcing, outsourcing, offshoring and reshoring. This will be crucial in the definition of the responsibilities for the emissions and negative impacts on the society across the supply chain. This means that the appropriate analytical models should include different SC activities, such as production, inventory and transport, to better assess the environmental and social impacts of the supply chain.

## 6. Conclusion

The sourcing strategy is a complex multi-disciplinary decision that keeps evolving due to the dynamic behaviour of the global market and the international trade conditions and legislation. It is linked to supply chain design, facility location, supplier selection, inventory management, production management, logistics management and contract arrangement. It has gained researchers' attention for decades now.

In this study, we provide an overview of the drivers and obstacles for slowbalisation and globalisation and the analytical models developed in the literature for sourcing decisions in these different contexts. We can observe a gap between the factors that influence the decisions taken in practice and the analytical models presented in the literature. A discussion on the research perspectives in the field and the factors to be included in the new analytical models is also presented.

## Declaration of Competing Interest

The authors declare that they do not have any financial or non-financial conflict of interests

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