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## **The impact of e-marketplace on the B2b relationships**

### **Abstract**

**Purpose** – Considering the growing momentum of online marketplaces worldwide the purpose of this paper is to develop a model to identify the main activities impacted by the implementation of an e-marketplace in the Business-to-business relationship and assess the savings on costs for the main actors involved (i.e., manufacturer, distributor, and retailer).

**Design/methodology/approach** - The methodology used in the study is a quantitative one. The analytical model used to evaluate B2b e-marketplace's impacts followed three main steps: *(i)* model settings and general assumptions, *(ii)* cost structure, and *(iii)* model simulation.

**Findings** – The findings reveal that beyond stock-out costs and inventory levels also other operating costs (i.e., transportation, penalty, and administrative costs) play a significant role in determining overall impacts of B2b e-marketplace, and as such should be considered by managers in their process of e-marketplace evaluation, selection and performance optimization. The model shows that compared with the offline scenario the B2b e-marketplace is expected to bring value to the overall supply chain, which tends to increase as the share of e-sales penetration is increased, ranging from a cost reduction of 0.1% (€ 229.2k) in the base-case of 10% e-sales adoption, up to 0.9% (€ -2.2M) in case of full e-marketplace adoption.

**Originality/value** – This study aims at shedding light and fostering the adoption of B2b e-marketplace by providing some practical tools to support *(i)* research in future studies, filling the existing gaps on the topic, and *(ii)* managers in the process of adoption and execution of e-sales through online marketplaces.

**Keywords:** marketplace, supply chain collaboration, B2b relations, digitisation

**Paper type:** Research paper

## 1. Introduction

Recent decades have seen increasing interest in establishing what are the marketing relationships between buyers and sellers in the Business-to-business (B2b) area where a major role is being played by the new information and communications technologies (ICT) (Janita and Miranda, 2013). The growth of usage of the Internet for business transactions has led to investigating the B2b e-commerce (Wise and Morrison, 2000), and electronic marketplaces (e-marketplace) are getting more and more popular, pushed also by the globalisation of economic activity (Grieger, 2003). They emerge in different industries, supporting the exchange of goods and services of different kinds, with and for different types of actors, and are following different architectural principles. Furthermore, and most importantly, e-marketplaces are becoming important players in the internet economy because they promise to strongly enhance Supply Chain performances by improving communication, coordination, and collaboration with trading partners at operational, tactical and strategic levels (Liu *et al.*, 2010), as well as to significantly improve market efficiency by reducing costs, increasing speed to market and make procurement more efficient ((Aboelmaged, 2010); (Wang *et al.*, 2008)).

When Business-to-business e-marketplaces (also called online marketplaces) entered the market during the “dot-com boom” in the late 1990s, they were supposed to dramatically improve the effectiveness and efficiency of commercial relationship between companies, radically changing traditional procurement strategies, and restructuring supply chains, organisations, and industries (Balocco *et al.*, 2010; Wang *et al.*, 2007). However, after an initial phase of strong diffusion and worldwide proliferation, B2b e-marketplaces missed to deliver on their huge expectations (Chien, Chen and Hsu, 2012), leaving the scene to the raise of the B2c, which lately became the true Rockstar of e-commerce in the past two decades (Drigas and Leliopoulos, 2014). After passing through a severe consolidation process that reduced the

number of providers from above two thousand firms in 2001 to a few big players dominating both the B2b and B2c scenarios (Son and Benbasat, 2007), B2b e-marketplaces are now closer to maturity and are indeed expected to grow in relevance in the upcoming years (Brohan, 2019). On the other side, the huge opportunities offered by online marketplaces have not been captured yet by several firms whose level of adoption is still low (Digital B2b, 2019). Compared with a few years ago, firms seem finally ready to embrace this new form of e-business, as confirmed by last year triple-digit growth in the share of companies engaged in B2b e-marketplace sales, and the entrance in the market of foreign players and colossus of the market, such as eBay Business Supply and Amazon Business, which are expected to positively influence B2b e-marketplace growth and strongly speed-up adoption in the upcoming years (Brohan, 2019).

Considering the growing momentum of online marketplaces worldwide this study aims at the developing a model to assess the impact of the e-marketplace into Business-to-business relationship, in terms of savings on costs for the main actors involved (i.e., manufacturer, distributor, and retailer).

The paper is structured as follows: in the second section a classification and review of the outstanding literature body is presented; the research questions that this study will try to address are formulated in the third section, along with the description of the methodology adopted. In the fourth section the model is proposed while in the fifth part, the main insights and findings of this research are presented and discussed. Finally, implications for both academics and practitioners and main areas for future research are identified.

## **2. Literature review**

Supply chain collaboration has gained a lot of attention in the field of supply chain management, considered as an important research topic (Soosay and Hyland, 2016). Collaboration between supply chain partners has been covered extensively in the strategic management literature (Bowersox 1990, Hanman 1997, Laseter 1998, Gilmour 1999, Bowersox et al. 2000). Several research has shown that improvement of inter-enterprise processes is one of the major issues in supply chain management (Boyson et al. 1999, Stank et al. 1999). Other studies (Lambert et al. 2004, Simatupang and Sridharan 2005) have proposed different directions to improve the characterization of the relation in collaborative supply chain. Simatupang and Sridharan (2005) defined collaboration as two or more firms working jointly to have a competitive advantage and increase profits that could not be achieved by acting alone.

Kandampully (2003) stated that the relationships are fundamental to the effective development and adoption of new business models. Nowadays, firms manage a greater variety of value-creating relationships with a much larger pool of stakeholders. These business-to-business (B2B) relationships are crucial to a modern firm's competency, competitive advantage, and profitability. In these regards, the technology can help to (i) minimise the cost of essential infrastructure, (ii) maximise accessibility for every partner in the chain, (iii) facilitate knowledge and exchange of products and services to all network partners simultaneously (Kandampully, 2003).

Iansiti and Lakhani (2014) consider the relation of two or more companies as a central issue with digitalisation, linked to the new way in which data is being generated and analysed, and activities are being connected. The age of information and communication technologies, in fact, as well as globalisation, are forcing companies to adopt incentive collaboration as a new source of competitive advantage (Derrouiche et al., 2010). The advent of technology impacted supply chain operations and the collaboration between firms (Soosay and Hyland, 2005). Information Technologies support and boost the relation between enterprises and its partners (inter-enterprises relations) (Derrouiche et al., 2010). Technology can be used to improve the effectiveness of the tasks carried out by two or more firms (Derrouiche et al., 2010). The Internet provides an effective interactive on-line tool that allows business processes to be aligned with growing demands for increased speed and efficiency at lower cost (Pagani and Pardo, 2017). Firms today use the Internet to extend their relationships with tens of thousands of entities, including customers, suppliers, retailers, brokers, co-producers, employees, and shareholders, and try to maintain personalised relationship with them all (Kandampully, 2003). In the B2b relationship context, the e-marketplace is more and more used to support the relationship of enterprises (Sila, 2013). As provided by Loukis *et al.* (2011), "*an e-marketplace is defined as an inter-organisational information system providing a "virtual space" where multiple buyers and sellers can collaborate (e.g., exchange information on products/services offerings, either generic ones required across industries or industry-specific ones, and their prices) and transact (e.g., sell and buy products/services and pay for them), very often supported by various additional required services (e.g., financial, transport, logistic, etc.) as well*".

Several authors point out many benefits for companies that support this process through e-marketplaces: the reduction of purchasing costs, the decrease of inventory levels, the enhancement of process integration capabilities, the time savings in sourcing and purchasing

activities, and the increase in the numbers of potential suppliers (e.g., (Aboelmaged, 2010);(Alarcon *et al.*, 2009);(Ordanini and Rubera, 2008)).

Grey *et al.* (2005) classify the potential sources of value for e-marketplaces adopted in relationship-based supply chains in three main categories: i) resource allocation, by providing a cost-effective way of creating spot markets for suppliers to offload excess inventory or capacity and for buyers to address periodic shortages; ii) information aggregation and dissemination, by providing electronic means for collecting and sharing information among participating firms and enhancing price visibility; and iii) risk management, decreasing price risks through the usage of spot markets and/or revenue management practices, enabled by higher information availability, to manage and decrease likelihood of under and over-stock situations, which ultimately generate price risk (Grey *et al.*, 2005).

Nevertheless, only a limited number of papers in the literature have been focusing so far on exploring the impacts of B2b e-marketplace on participants, but some significant contributions on the topic can be found. Focusing on the distribution of value between actors, several authors highlight that while B2b e-marketplaces seem to bring efficiency to the supply chain and market (Dai and Kauffman, 2001), this value is mainly concentrated on buyers thanks to the increase in the number of suppliers, higher transparency and price erosion (Wang and Archer, 2007). On the other side, suppliers seem to face negative externalities from adopting online marketplaces (Dai and Kauffman, 2001) as confirmed by several analytical models on the adoption and diffusion of e-marketplaces which demonstrate that marginal returns to suppliers tend to decrease as the concentration of suppliers in the marketplace increase, thus leading to an equilibrium whereby only some suppliers participate in the game (e.g., Yoo *et al.*, 2007;White and Daniel, 2003). As a reaction to this, several authors suggest that buyers, to achieve full potential from e-marketplace adoption, should try to share part of the gains and provide incentives to stimulate suppliers' participation (Zhang and Bhattacharyya, 2010), which in some cases could come in the form of negotiation policies, customer's tactics and coalition tools to foster long-term sourcing contracts (Renna, 2010). Shifting the focus towards the main activities impacted at each different echelon of the supply chain, Zhang and Bhattacharyya (2010) developed a simulation model based on the agent-based-modelling technique to analyse the impacts of online marketplaces in terms of average inventory levels and stock-out costs of its participants, highlighting an overall decrease in out-of-stock units across all the actors of the supply chain, but a significant increase in inventory levels at the upstream levels of the network. In these types of study, the suggestion in the literature review

is to consider more and more a multi-firm perspective, going beyond the dyadic one (Soosay and Hyland, 2015).

The works present in the literature all contend the idea that digitalisation is profoundly changing the way business is carried out between companies (Pagani and Pardo, 2017), but they do not analyse in depth the activities impacted through the implementation of the electronic marketplace nor the potential cost savings stemming from its implementation.

Being these the premises, this work aims at studying the B2b relations with the support of e-marketplace, developing a quantitative model to assess the main benefits achievable, in terms of savings on costs impacted, for the main actors involved (i.e., manufacturer, distributor, and retailer) in a multi-firm perspective approach.

Building on the above considerations, the next section will present the main objectives of the analyses.

### **3. Research questions and methodology**

#### **3.1. Research questions**

The study aims at developing an analytical model based on empirical evidence able to simulate companies' supply chain operations in traditional supply chains and on online marketplaces. The study compares companies' performances in the two settings to determine the impact of participating in the e-marketplace on participants, and to identify potential differences amongst actors, key activities and costs impacted, by considering a three-tier supply network that includes multiple retailers, distributors, and manufacturers. Agents' performances are measured looking at all the potential costs impacted by e-marketplace implementation and not only stock-out costs and inventory levels as most of the scholars did in other researches (Zhang and Bhattacharyya, 2010), and are based on empirical evidence gathered through several case studies from companies engaged in online marketplace sales. Based on the above considerations, the research questions are formulated:

*RQ1: What are the main activities impacted by the use of an e-marketplace in a Business-to-business relationship?*

*RQ2: What saving on costs – considering the activities impacted – can be achieved from the adoption of B2b e-marketplace for retailers, distributors, manufacturers, and the overall supply chain?*

## 3.2. Methodology

The methodology used to address the aim of the paper is the development of a quantitative model. In the next sub-sections, all the steps followed for the analytical model are illustrated.

### 3.2.1. The analytical model

The last step of the methodology is the development of the analytical model used to evaluate B2b e-marketplace's impacts on participating firms. The three-step approach followed to develop the model is divided into *(i)* model settings and general assumptions, *(ii)* cost structure, and *(iii)* model simulation.

#### 3.2.1.1. Model setting and general assumptions

The starting point during the development of the analytical model is the definition of the two different supply network architectures in the traditional or offline supply chain (AS-IS) and in the e-marketplace or online supply chain (TO-BE) scenarios. The supply chain has been defined as a three-tier network to show the connections and relationships amongst the three actors of the game – i.e., retailers, wholesalers and manufacturers – and the way they interact in the two different scenarios. Then, the general assumptions and settings of the model have been defined to set the boundaries of the problem to be modelled.

#### 3.2.1.2. Cost structure

The model has been implemented following a four-modules structure consisting of i) inputs, which represents key information and data to feed the model, ii) demand generation algorithm, used to generate demand data in the AS-IS and TO-BE scenarios, iii) model algorithm, used to compute the final cost structure calculate each cost item, and iv) outputs, a dashboard of KPI to monitor both supply chain and each single player's performance compared with the AS-IS scenario flexibly – i.e. all parameters can be modelled by companies to understand potential variations on their performance. Once the model architecture has been built the required inputs to feed the model have been collected either through literature review or following assumptions or hypotheses tested through existing cases, retrieved from the Digital B2b Observatory's (of Politecnico di Milano) sources. Demand inputs have been passed into the algorithm of demand

generation to calculate demand for every single actor of the model and in the different scenarios under analysis. Demand information along with other inputs have then been used by the model algorithm to return the outputs of the analysis.

#### 3.2.1.3. Model application

The last step of the process is the model testing and analysis of outputs. First, the model has been tested on the collected inputs and assuming an initial 10% share of B2b e-marketplace penetration, which was defined as the base-case TO-BE scenario. Then, to test reliability and robustness of results and to understand potential impacts to supply chain performance from increasing shares of e-sales penetration, a sensitivity analysis on the share of B2b e-marketplace penetration has been performed.

### **4. The model**

This section describes the model, illustrating the model setting and the general assumptions, the cost structure, and the model inputs.

#### 4.1. Model setting

As a first step of the model, we considered a three-tier, multi-actor supply chain network, as suggested by Soosay and Hyland (2015) which, as highlighted in the literature review, is commonly used to model high degree of complexity in real-world supply networks and e-marketplace scenarios (Zhang and Bhattacharyya, 2010). Two different supply chain networks have then been modelled to represent respectively the traditional supply chain (TSC), fully off-line, and the e-marketplace supply chain (ESC), either fully or partially on-line. In both cases, the number of actors in each tier was limited to 8 retailers, 4 wholesalers, and 2 manufacturers, which represents the minimum number of actors able to replicate the different demand dynamics in the two supply chain settings, without losing generality of results. In the TSC model (Figure 1) agents always order from the same supplier. This recurrent purchase behaviour represents the long-term, stable supplier relationship we usually observe in traditional supply chains (Grey *et al.*, 2005).



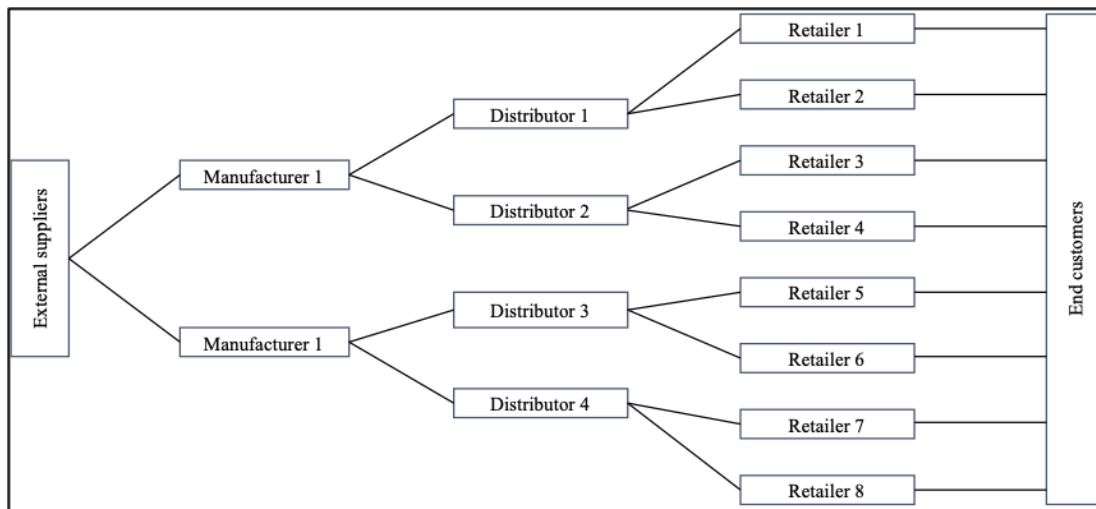


Figure 1. Traditional supply chain network

In the ESC model (Figure 2) agents can order from different suppliers at each iteration, according to different sourcing strategies (e.g., random, inventory-driven, or price-driven). The ESC model embodies the short-term, spot and dynamic supplier relationships observed in e-marketplaces (Ganesan *et al.*, 2009). Ultimately, these different behaviours have different impacts on demand variability across the actors of the supply chain. It follows that to properly factorize these different supply patters in the two networks, we modelled two different demand behaviours. In the TSC model, we assumed demand to be constant across actors, while in the ESC model, to reproduce a spot and dynamic purchasing behaviour, we reproduced the bullwhip effect across the actors of the supply chain, and empirically observed demand means and standard deviations for the different actors.

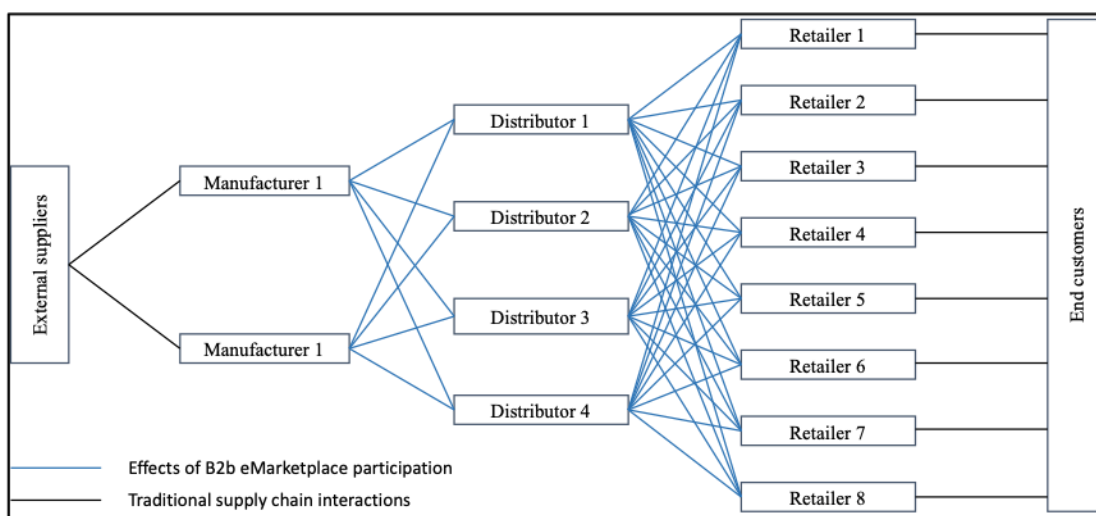


Figure 2. B2b e-marketplace supply chain network

## 4.2. General assumptions

As a natural step of the process of model design, which is ultimately a simplification of the real world and its context, some hypotheses need to be formulated. Assumptions are needed to ensure the generality and scalability of the model, as it would be impossible to account for all the different characteristics of each company and the context in which they operate. However, these assumptions must adhere as much as possible to reality, to ensure reliability of results. For this reason, the hypotheses adopted in this model have first been formulated, and then reviewed with experts in the supply chain, inventory and planning sectors (Mohrman and Lawler, 2012).

The periodic review model is assumed to be the inventory management policy adopted at each tier of the supply chain, meaning that each company in the model orders at a fixed reorder time  $T$  a variable quantity  $Q(T)$  (Sarkar and Mahapatra, 2017). While the periodic review model is generally associated to the upstream actors of the supply chain – i.e., manufacturers and distributors/wholesalers – we assume that also retailers adopt this ordering policy, based on findings from existing cases of retailers operating in the B2b e-marketplace. Then, we compute the total number of stock-keeping units (SKUs) exchanged in the model as the average number of SKUs for two manufacturers operating in the grocery industry. Starting from real customers' data collected through existing cases, the average demand per SKU has been computed as normally distributed around its mean and standard deviation, considering also seasonality effects. The calculated demand is assumed to be equally distributed within players of the same echelon, as the model does not factorise dynamic customers' behaviours in front of different purchasing conditions or suppliers' performances. However, as we look at the overall demand generated by the customers, and overall demand in each echelon of the supply chain, the way demand splits amongst actors of the same tier does not undermine the reliability of the results. Furthermore, the average number of items per pallet, number of pallets per truck, vehicle saturation and other transportation related inputs were directly retrieved from existing case of companies operating in the distribution tier of the supply chain. However, transportation costs per truck were not provided, hence they were assumed to be equal to € 1,500 per truck, as commonly identified in supply chain and logistics reports. Besides, we assume the same transportation settings to apply to all the actors of the supply chain, considering that the dimension, size, and mix of products exchanged is assumed to be the same across all the actors. Eventually, we consider the traditional supply chain as the AS-IS scenario, and we compare it against several TO-BE scenarios, characterized by different levels of e-marketplace adoption.

In particular, we assumed the base-case scenario as the TO-BE case with 10% of total demand generated through the B2b e-marketplace; this assumption reflects the forecasted growth of B2b e-marketplaces in 2019-20, as it emerged from the information gathered from existing cases of companies.

### 4.3. Cost structure

Before defining the cost structure, the existing cases retrieved from Politecnico's sources have revealed that switching from a traditional supply chain to an e-marketplace situation has an impact on both operating and sourcing costs. Concerning the operating costs, i) stock-out costs, ii) inventory carrying costs, iii) transportation costs, iv) penalty costs, and iv) administrative costs are the ones affected. As impacted sourcing costs, instead, the total procurement costs are impacted, which is a blended metric considering both pure procurement costs – i.e., pure cost of goods sold – promotions, discounts, and shipping costs.

For the sake of simplicity and for example, in the next sub-section for each actor considered, i.e., manufacturer (M), wholesaler (W), retailer (R)., only the inventory carrying costs will be discussed.

#### 4.3.1. Inventory carrying costs

Inventory carrying costs (ICC), also called holding costs, refer to the total cost of holding inventory, and are sustained anytime there is a lead time between production (or stow) and sales. The ICC are computed as:

$$ICC_R = ihr_R * APC_R * (CS_R + SS_R) \quad Eq. 1$$

$$ICC_W = ihr_W * APC_W * (CS_W + SS_W) \quad Eq. 2$$

$$ICC_M = ihr_M * APC_M * (CS_M + SS_M) \quad Eq. 3$$

Where,

$$CS_i = \bar{D}_i * T_i * N \quad \forall_i \quad Eq. 4$$

$$SS_i = k_i * \sigma_{(D,T+LT)_i} * N = k_i * \sqrt{(T_i + LT_i) * \sigma_{D_i}^2 + \bar{D}_i^2 * \sigma_{LT_i}^2} * N \quad \forall_i \quad Eq. 5$$

$$I(k_i) \leq [\bar{D}_i * T_i * (1 - SL_i)] / [\sigma_{(D,T+LT)_i}] \quad \forall_i \quad Eq. 6$$

KPIs and units of measurement are summarised in the Table 1 and Table 2 below.

Table 1. Inventory carrying cost variables

KPI	Description	Unit of measurement
$ihr_i$	Annual inventory holding rate at the Retailers/Wholesalers/Manufacturers	%
$APC_i$	Average product cost at the Retailers/Wholesalers/Manufacturers for one SKU	€/year
$CS_i$	Average Retailers/Wholesalers/Manufacturers Cycle Stocks	units
$SS_i$	Average Retailers/Wholesalers/Manufacturers Safety Stocks	units

Table 2. Cycle and safety stock variables

KPI	Description	Unit of measurement
$\bar{D}_i$	Average demand at the Retailers/Wholesalers/Manufacturers during the reorder time T per one SKU	units/weeks per SKU
$T_i$	Reorder period for the Retailers/Wholesalers/Manufacturers	weeks
N	Number of SKUs	SKU
$k_i$	Constant depending on the service level at the Retailers/Wholesalers/Manufacturers	-
$LT_i$	Procurement lead time for the Retailers/Wholesalers/Manufacturers	weeks
$\sigma_{D_i}^2$	Standard deviation of demand for the Retailers/Wholesalers/Manufacturers	units
$\sigma_{LT_i}^2$	Standard deviation of LT for the Retailers/Wholesalers/Manufacturers	units
$SL_i$	Service level at the Retailers/Wholesalers/Manufacturers	%

#### 4.4. Model inputs

Once identified the cost items, the analytical model is developed. The model is fed with several different inputs, ranging from basic information (e.g., number of weeks per year) to inventory and transportation variables. This information is then processed by the demand algorithm, which elaborates inputs to generate a forecast of demand across all the actors of the supply chain in the different scenarios under analysis. To ensure the reliability of results, the model runs over a one-year time horizon, which is here assumed to be a sufficiently long period time to absorb any inefficiency that may arise in the short-term as part of activities' ramp-up in the process of e-marketplace adoption. Also, to ensure flexibility and scalability, the model itself was built in a way that automatically reacts to changes in the inputs. Accordingly, it can be easily customised to a specific industry or company peculiarities. The outputs are then processed to feed a KPIs dashboard, through which companies can monitor performance and run sensitivity analysis to understand the best set of inputs to maximize expected outcomes.

Four main categories of inputs feed the model: i) context inputs; ii) inventory and demand inputs; iii) transportation inputs, and iv) administrative inputs. Context inputs are context-specific data that either refer to the overall supply chain structure or to the context in which companies operate. These inputs stay constant across actors and do not vary moving from the AS-IS to the TO-BE scenario. All other inputs, instead, are specific to each tier of the supply chain, and they do vary as we move through the four different TO-BE scenarios under analysis: a) 10% of total demand passing through B2b e-marketplace (base case scenario, corresponding to the 2019/20 estimated B2b e-marketplace growth); b) 20%; iii) 50%; and iv) 100% (extreme scenario). All the main categories of the inputs are displayed in the Appendices section.

### 5. Findings

In this section, the results for all the actors and the entire supply chain are discussed.

#### 5.1. Findings for retailers

Table 3 summarises model's outputs for the retailers. Particularly, it shows how the different cost items under analysis evolve according to different shares of B2b e-marketplace adoption, starting from base-case scenario up to the extreme case of 100% of demand passing through the e-marketplace. Absolute values are expressed in thousands of euros.

Table 3. Savings for the retailer

Data in k€	SCENARIO 1 - 10% B2b				SCENARIO 2 - 20% B2b		
	AS-IS	TO-BE	Delta (abs.)	Delta (%)	TO-BE	Delta (abs.)	Delta (%)
<b>Stock-out cost</b>	450.9	437.8	-13.2	-2.9%	423.6	-27.317	-6.1%
<b>Inventory Carrying Cost</b>	560.1	557.8	-2.3	-0.4%	555.6	-4.503	-0.8%
<b>Transportation costs</b>	2,524.6	2,524.6	-	0.0%	2,524.6	-	0.0%
<b>Penalty costs</b>	152.5	152.5	-	0.0%	152.5	-	0.0%
<b>Administration costs</b>	-	28.2	28.2	na	55.3	55.3	na
<b>Procurement costs</b>	92,305.1	92,006.7	-298.4	-0.3%	91,708.3	-596.8	-0.6%
<b>Total</b>	<b>95,993.1</b>	<b>95,707.5</b>	<b>-285.6</b>	<b>-0.3%</b>	<b>95,419.8</b>	<b>-573.3</b>	<b>-0.6%</b>
Data in k€	SCENARIO 3 - 50% B2b				SCENARIO 4 - 100% B2b		
	AS-IS	TO-BE	Delta (abs.)	Delta (%)	TO-BE	Delta (abs.)	Delta (%)
<b>Stock-out cost</b>	450.9	375.2	-75.7	-16.8%	274.8	-176.1	-39.1%
<b>Inventory Carrying Cost</b>	560.1	576.8	16.7	3.0%	619.5	59.4	10.6%
<b>Transportation costs</b>	2,524.6	2,524.6	-	0.0%	2,524.6	-	0.0%
<b>Penalty costs</b>	152.5	152.5	-	0.0%	152.5	-	0.0%
<b>Administration costs</b>	-	112.80	112.8	na	253.8	253.8	na
<b>Procurement costs</b>	92,305.1	90,813.1	-1,492.0	-1.6%	89,321.2	-2,983.9	-3.2%
<b>Total</b>	<b>95,993.</b>	<b>94,555.0</b>	<b>-1,438.1</b>	<b>-1.5%</b>	<b>93,146.3</b>	<b>-2,846.8</b>	<b>-3.0%</b>

Focusing first on the base-case scenario, retailers seem to benefit immediately from e-marketplace adoption, even when its penetration is low. Looking at Table 3, in case of 10% e-marketplace adoption retailers are expected to realize a total € -285.6k cost reduction (-0.3% vs AS-IS), mainly explained by decreases in procurement costs, stock-out costs, and inventory carrying costs, which more than offset increases in administrative costs.

Procurement costs are by far the main driver of cost reduction, driven by the decrease of average product costs across the supply chain due to the higher transparency (i.e., price erosion). Stock-out costs represent the second driver of improvement, accounting for € -13.2k (or 5%) of total variation, fully driven by an increase in service level, moving from 95.0% to 95.3% as a consequence of the higher tendency for retailers to stock-up (due to overall lower procurement costs in the e-marketplace), which more than offsets the increase in stock-out loss per unit driven by the increase of retailers' marginality (indeed, we assume that retailers will

not split benefits with the customers, keeping the average selling price constant despite lower procurement costs). On top of that, inventory carrying costs surprisingly represent an additional tailwind to cost reduction, accounting for € -2.3k (or 1%) of total variation, fully explained by the decrease in both inventory carrying cost per unit, due to lower product costs, and safety stocks, due to better procurement LT, which ultimately compensate extra-costs due to increased service level. Finally, while no variations occur in terms of either transportation or penalty costs, as there are no changes for the retailers in terms of customers' demand, additional administrative costs come from the need of full-time employees managing the B2b e-marketplace channel.

The higher the share of B2b e-marketplace, the higher the cost reduction we should expect at the retailers, which could reach up to € -2.8M in savings in the extreme-case scenario of full e-marketplace adoption. This improvement is fully driven by significant reductions in both i) procurement costs (up to € -2.9M, or 105% of total variation), which decrease linearly with the increase of e-marketplace penetration due to more favourable procurement costs, and ii) stock-out costs, which decrease exponentially as retailers move deeper into e-sales thanks to the increase of service level (moving from 95% up to 98% in the extreme TO-BE scenario). Nevertheless, for the retailer there are extra administrative costs for managing the new e-channel.

## 5.2. Findings for wholesalers

Table 4 summarises model's outputs for the wholesalers. Focusing first on the base-case scenario, also wholesalers seem to benefit from e-marketplace adoption, although entitlements are lower compared with retailers. In case of 10% e-marketplace adoption wholesalers are expected to realize a total € -45.6k cost reduction (-0.1% vs AS-IS) mainly explained by decreases in procurement costs and stock-out costs, which together more than offset increases in other operating costs such as transportation costs, administration costs, penalty costs and inventory carrying costs.

Table 4. Savings for the wholesaler

Data in k€	SCENARIO 1 - 10% B2b				SCENARIO 2 - 20% B2b		
	AS-IS	TO-BE	Delta (abs.)	Delta (%)	TO-BE	Delta (abs.)	Delta (%)
<b>Stock-out cost</b>	237.8	234.4	-3.4	-1.4%	231.1	-6.7	-2.8%
<b>Inventory Carrying Cost</b>	616.2	618.5	2.3	0.4%	620.9	4.7	0.8%

<b>Transportation costs</b>	2.270.2	2,278.0	7.8	0.3%	2,285.8	15.5	0.7%
<b>Penalty costs</b>	92.3	94.9	2.6	2.8%	97.4	5.1	5.6%
<b>Administration costs</b>	-	5.1	5.1	na	9.0	9.0	na
<b>Procurement costs</b>	80,969.4	80,909.4	-60.0	-0.1%	80,849.0	-120.3	-0.1%
<b>Total</b>	<b>84,185.9</b>	<b>84,140.3</b>	<b>-45.6</b>	<b>-0.1%</b>	<b>84,093.2</b>	<b>-92.6</b>	<b>-0.1%</b>
Data in k€		<b>SCENARIO 3 - 50% B2b</b>			<b>SCENARIO 4 - 100% B2b</b>		
	<b>AS-IS</b>	<b>TO-BE</b>	<b>Delta (abs.)</b>	<b>Delta (%)</b>	<b>TO-BE</b>	<b>Delta (abs.)</b>	<b>Delta (%)</b>
<b>Stock-out cost</b>	237.8	221.1	-16.6	-7.0%	205.0	-32.8	-13.8%
<b>Inventory Carrying Cost</b>	616.2	627.8	11.6	1.9%	639.1	22.9	3.7%
<b>Transportation costs</b>	2.270.2	2,309.4	39.1	1.7%	2,349.4	79.1	3.5%
<b>Penalty costs</b>	92.3	105.1	12.8	13.8%	117.5	25.2	27.3%
<b>Administration costs</b>	-	20.3	20.3	na	56.4	56.4	na
<b>Procurement costs</b>	80,969.4	80,665.7	-303.7	-0.4%	80,352.6	-616.8	-0.8%
<b>Total</b>	<b>84,185.9</b>	<b>83,949.4</b>	<b>-236,5</b>	<b>-0.3%</b>	<b>83,719.9</b>	<b>-466.0</b>	<b>-0.6%</b>

Procurement costs are by far the main driver of cost reduction, contributing alone € -60.0k (or 132%) to total costs variation, also in this case driven by the decrease of average product costs across the supply chain due to the higher transparency (i.e., price erosion) that we observe in the e-marketplace. As for retailers, stock-out costs represent the second driver of improvement, accounting for € -3.5k (or 7.4%) of the total variation, fully driven by the decrease in both margins and ASP (average selling price). These factors ultimately more than offset the overall increase in out-of-stock units, driven by higher demand perceived at the wholesalers as a consequence of increasing demand variability, thus resulting in a perceived cost relief. On the other side, the adoption of the e-marketplace leads to a general, although not significant, increase in all other operating costs. Transportation costs are the most impacted, increasing € +7k (contributing +17.0% to total cost variation) as a reaction to lower trucks saturation, which is fully explained by the increase in the number of spots, low volume and geographically spread customers. Administrative costs increase € +5k (contributing +11.1% to total cost variation) due to the need of full-time employees managing the B2b e-marketplace channel. Benefits for the wholesalers grow as we increase the share of e-marketplace adoption.

Transportation and penalty costs should be the main points of attention for wholesalers. Indeed, if wholesalers were not able to mitigate decreases in both truck saturation and on-time delivery, driven by higher customer dispersion (both geographically and in terms of average order



volumes), this efficiency drop would generate severe operating cost losses, up to € 104k. Finally, it is worth noticing that while inventory carrying costs increase as a reaction to the bullwhip effect, these costs are more than offset by decreases in stock-out costs which could play as an incentive to carry extra inventory.

### 5.3. Findings for manufacturers

Table 5 summarises model's outputs for the manufacturers. Focusing first on the base-case scenario, manufacturers are the only actors of the supply chain that are not expected to generate benefits from e-marketplace adoption. However, excluding variations in production costs, purely driven by an increase in demand variability in the e-marketplace, the overall cost increase in operating costs would be marginal and easily compensated by intangible benefits of e-marketplace adoption (e.g., potential increases in turnover). In the case of 10% e-marketplace adoption manufacturers are expected to realize a total € +102.0k cost increase (+0.2% versus the AS-IS scenario), mainly explained by increases in procurement costs, which more than offset decreases in stock-out costs.

Table 5. Savings for the manufacturer

Data in k€	SCENARIO 1 - 10% B2b				SCENARIO 2 - 20% B2b		
	AS-IS	TO-BE	Delta (abs.)	Delta (%)	TO-BE	Delta (abs.)	Delta (%)
<b>Stock-out cost</b>	290.5	283.0	-7.5	-2.6%	275.7	-14.8	-5.1%
<b>Inventory Carrying Cost</b>	516.0	528.8	12.8	2.5%	566.1	50.0	9.7%
<b>Transportation costs</b>	2,230.5	2,237.0	6.5	0.3%	2,243.5	13.0	0.6%
<b>Penalty costs</b>	48.6	50.3	1.8	3.6%	52.1	3.5	7.2%
<b>Administrative costs</b>	-	2.5	2.5	na	4.5	4.5	na
<b>Procurement costs</b>	58,251.3	58,337.2	85.8	0.1%	58,423.0	171.7	0.3%
<b>Total</b>	<b>61,336.9</b>	<b>61,438.9</b>	<b>102.0</b>	<b>0.2%</b>	<b>61,564.9</b>	<b>227.9</b>	<b>0.4%</b>
Data in k€	SCENARIO 3 - 50% B2b				SCENARIO 4 - 100% B2b		
	AS-IS	TO-BE	Delta (abs.)	Delta (%)	TO-BE	Delta (abs.)	Delta (%)
<b>Stock-out cost</b>	290.5	254.0	-36.5	-12.6%	219.5	-71.0	-24.4%
<b>Inventory Carrying Cost</b>	516.0	607.0	91.0	17.6%	706.3	190.3	36.9%
<b>Transportation costs</b>	2,230.5	2,263.2	32.8	1.5%	2,296.5	66.0	3.0%
<b>Penalty costs</b>	48.6	57.3	8.8	18.0%	66.1	17.5	36.0%

<b>Administratio n costs</b>	-	10.2	10.2	na	28.2	28.2	na
<b>Procurement costs</b>	58,251.3	58,680.5	429.1	0.7%	59,109.6	858.3	1.5%
<b>Total</b>	<b>61,336.9</b>	<b>61,872.2</b>	<b>535.3</b>	<b>0.9%</b>	<b>62,426.2</b>	<b>1,089.3</b>	<b>1.8%</b>

As mentioned, production costs are by far the main driver of cost increase, contributing alone € +85.9k (+84% vs AS-IS) to total costs variation. They are fully driven by an increase of yearly perceived demand which is explained by higher demand variability in the e-marketplace (i.e., bullwhip effect) and higher service level at the retailers, ultimately impacting the average volumes in the supply chain. The inventory carrying costs increase, instead, is fully explained by both higher average cycle stock, due to increase of demand variability and higher service level from the retailers, and higher safety stocks, which instead is completely driven by higher mean and significantly higher standard deviation of the demand.

Both transportation (€ +6.5k) and penalty costs (€ +1.8k) increase due to the decrease in both average truck saturation and on-time delivery, driven by an increase of spot and geographically spread customers with relatively low average product size. Vice versa, stock-out cost is the only driver of cost improvement, accounting for € -7.5k (-7.3% vs AS IS) of the total variation, fully driven by the decrease in both margins and ASP. These factors more than offset the overall increase in out-of-stock units, driven by higher demand perceived at the manufacturers as a consequence of increasing demand variability, thus resulting in a perceived cost relief.

Differently from what we observed for both retailers and wholesalers, the benefits for the manufacturers decrease as we increase the share of e-marketplace adoption, thus making this actor the weak ring of the chain. A potential target of incentives should come from the other players that could try to split benefits to ensure participation of all the actors. Manufacturers could lose up to € +1.1M in additional costs, fully driven by significant increases in both i) production costs (up to € +858k, or 79% of total variation), which grow linearly with the increase of e-marketplace penetration due to the increase in volumes (explained by increased variability and service level at the retailers), and ii) inventory carrying costs, which grow exponentially as manufacturers move deeper into e-sales due to higher variability in demand. Looking at operating costs only, manufacturers' loss would be less severe but still significant at € +231k. Thus, to ensure their participation, a proper set of incentives to redistribute value across the supply chain is needed.

#### 5.4. Findings for the supply chain

Table 6 summarises model's outputs for the overall supply chain, which are obtained as the sum of the costs observed at each echelon of the network.

Table 6. Savings for the supply chain

Data in k€		SCENARIO 1 - 10% B2b			SCENARIO 2 - 20% B2b		
	AS-IS	TO-BE	Delta (abs.)	Delta (%)	TO-BE	Delta (abs.)	Delta (%)
<b>Stock-out cost</b>	979.2	955.2	-24.0	-2.4%	930.4	-48.8	-5.0%
<b>Inventory Carrying Cost</b>	1,692.2	1,705.1	12.9	0.8%	1,742.5	50.2	3.0%
<b>Transportation costs</b>	7,025.3	7,039.5	14.3	0.2%	7,053.9	28.6	0.4%
<b>Penalty costs</b>	293.4	297.7	4.3	1.5%	302.0	8.7	2.9%
<b>Administration costs</b>	-	35.8	35.8	na	68.8	68.8	na
<b>Procurement costs</b>	231,525.8	231,253.2	-272.5	-0.1%	230,980.3	-545.5	-0.2%
<b>Total</b>	<b>241,515.9</b>	<b>241,286.7</b>	<b>-229.2</b>	<b>-0.1%</b>	<b>241,077.9</b>	<b>-438.0</b>	<b>-0.2%</b>
Data in k€		SCENARIO 3 - 50% B2b			SCENARIO 4 - 100% B2b		
	AS-IS	TO-BE	Delta (abs.)	Delta (%)	TO-BE	Delta (abs.)	Delta (%)
<b>Stock-out cost</b>	979.2	850.4	-128.8	-13.2%	699.4	-279.9	-28.6%
<b>Inventory Carrying Cost</b>	1,692.2	1,811.5	119.3	7.0%	1,964.9	272.6	16.1%
<b>Transportation costs</b>	7,025.3	7,097.1	71.9	1.0%	7,170.4	145.1	2.1%
<b>Penalty costs</b>	293.4	314.9	21.5	7.3%	336.1	42.7	14.6%
<b>Administration costs</b>	-	143.3	143.3	na	338.4	338.4	na
<b>Procurement costs</b>	231,525.8	230,159.3	1,366.5	-0.6%	228,783.3	-2,742.5	-1.2%
<b>Total</b>	<b>241,515.9</b>	<b>240,376.6</b>	<b>1,139.3</b>	<b>-0.5%</b>	<b>239,292.4</b>	<b>-2,223.5</b>	<b>-0.9%</b>

The first message worth highlighting is that the B2b e-marketplace brings incremental value to the overall supply chain, regardless of the share of e-sales engagement from its actors. Nevertheless, to ensure the sustainability of the e-marketplace, all the actors must be joining and actively participating. Thus, to realise the e-marketplace benefits, both retailers, wholesalers and potentially the e-marketplace providers will have to provide proper incentives to the manufacturers to cover for the increase in operating costs. Production costs, instead, will be covered by the expected increase in turnover at the manufacturers' side. Focusing on the base-case scenario, the overall supply chain is expected to realise a total € -229.3k decrease in

costs (-0.2% vs AS-IS) mainly explained by significant decreases in procurement costs and stock-out costs, which more than offset increases in all remaining operating costs.

Procurement costs are by far the main driver of cost reduction, contributing alone € -272.5k (or -119%) to total costs variation, fully driven by the decrease of average product costs across the supply chain due to the higher transparency (i.e., price erosion) that we observe in the e-marketplace, which tends to benefit buyers only – i.e., retailers first, and wholesalers second. Stock-out costs represent the second driver of improvement, accounting for € -23.9k (or -10.5%) of the total variation. On the other side, the adoption of the e-marketplace leads to a general, although not significant, increase in all other operating costs. Despite transportation costs keep being the needle mover in terms of operating costs within the supply chain, companies should start paying increasing attention towards inventory carrying costs, which overall grow beyond stock-out cost reductions, and penalty costs, which are ultimately related to both logistics performances and customer satisfaction.

The benefits for the supply chain do increase as we increase the share of e-marketplace adoption. The overall supply chain could achieve up to € -2.2M in cost reduction, driven by significant decreases in both i) procurement costs (up to € -2.7M, or -123% of total variation), which decrease linearly with the increase of e-marketplace penetration due to more favourable procurement costs, and ii) stock-out costs, which grow exponentially as retailers, wholesalers and manufacturers move deeper into e-sales thanks to lower margins and ASP, together more than compensating extra operating costs.

## **6. Conclusions**

The paper is focused on the B2b e-marketplace and aimed at identifying the main activities impacted by its implementation and assessing the cost savings stemming from its implementation. This study had to shed light and provide valuable insights into a new field for both academics and practitioners.

In terms of academic contributions, this research:

- answers to the general lack of research and knowledge around the B2b e-marketplace and the overall paucity of empirical contributions worldwide (Sila, 2015);
- develops the first analytical model able to evaluate e-marketplace impacts on the supply chain and its operating companies, which is an area of research still unexplored by other scholars;

- considers all the potential costs impacted by e-marketplace implementation and not only stock-out costs and inventory levels as most scholars did in other researches on e-marketplace impacts (Zhang and Bhattacharyya, 2010). Indeed, despite these costs are among the most impacted by e-sales implementation, other significant impacts can be recorded in terms of transportation, penalty costs or administration costs and a holistic overview of the whole cost structure helps to provide a more accurate picture of real e-marketplace implications on its participants;
- goes beyond the dyadic perspective towards a multi-firm perspective, properly in line with the suggestion for future research on B2b relations according to Soosay and Hyland (2015);
- considers the different way of coordination between the companies, discussing the new way in which data is being generated and analysed, shifting from a traditional supply chain to an electronic one, supporting the idea of the central issue of digitalisation as stated by Iansiti and Lakhani (2014);
- confirms the idea that digitalisation changes the way two or more business companies interact and analyses the impact of the specific activities in the case of electronic marketplace technology (Pagani and Pardo, 2017).

In terms of managerial implications, instead, the research answers to the witnessed lack of understanding from companies (either retailers, wholesalers, or manufacturers) on (i) the full set of activities and costs impacted by e-marketplace implementation, (ii) a comprehensive quantification of benefits and costs that goes beyond the first level of operating costs (i.e., stock-out costs or inventory levels), and iii) how to improve performances and participation in the e-marketplace. The analysis unveils that participation in the e-marketplace has significant impacts across all participants in terms of stock-out costs, inventory carrying costs, penalty costs, transportation costs, procurement costs, and administrative costs. No impacts are expected for production costs unless also this part of the supply chain will be managed through e-marketplace, a scenario which, however, does not find confirmation yet from empirical analysis since no changes happen in terms of end-customers' demand variability.

Managers of buyers' firms are encouraged to invest in e-marketplace adoption and should strategically incorporate this form of e-business within their procurement portfolio. Manufacturers should focus on identifying a set of incentives to stabilise demand, such as "skip the middle-man" and supply directly retailers. Furthermore, considering that all actors of the

chain should participate to ensure e-marketplace sustainability and increase the value generated, both retailers/wholesalers and e-marketplace providers should work to foster manufacturers' participation. Wholesalers could explore longer-term sourcing contracts to stabilize demand with key suppliers and enjoy benefits from lower sourcing costs in the e-marketplace. Instead, managers of providers' companies should work to ease and improve the sharing of demand and market information across participants, which is considered critical success factors for e-marketplace sustainability (Zhang and Bhattacharyya, 2010) and could smooth demand fluctuations' impacts.

Besides the results achieved, the research presents some limitations, which open up to both new opportunities for further improvements and new potential areas of focus. The first limitation regards the assumptions and estimates that can be overtaken in future research, collecting all the data from companies involved in an electronic marketplace.

Moreover, the model does not allow to run continuous and dynamic interactions between agents, nor to design clever agents able to react to external stimuli and modify decision criteria at each iteration of the process. To overcome this limitation, a simulation software supporting a multi-method simulation type of both Agent-Based-Modelling (ABM) and System Dynamics should be used to recreate dynamic relationships between clever agents, which would allow building a supply chain structure which approximates the real world and its inner and outer dynamics. Again, despite demand information build on real means and standard deviations of products' sales retrieved from existing cases of companies, the distribution of this demand across the year was performed using a casual distribution, manually adjusted to account for seasonality effects. Yet, as a future improvement demand distribution could be performed using real-world data thanks to support from companies operating in the context. Moreover, while the model takes into consideration almost the full range of operating costs of a company, ranging from administrative to safety stocks, no impacts in terms of either turnover or bottom line were taken into consideration. By including these impacts in the model in future studies, potential extra benefits or impacts at the different tiers of the supply chain could be observed, thus representing a potential area of improvement for the model.

Also, intangible benefits and/or impacts such as market share evolution, branding, or indirect-marketing impacts were not included in the analysis and final costs calculation. Nevertheless, these benefits depend on exogenous factors and customers' behaviours, which cannot be quantified and generalised with the available information.

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## Appendices

Variable	KPI	Unit of measurement	Value	Source
Number of weeks per year	NW	weeks/year	52	Hypothesis
Number of days per week	NDW	d/week	6	Existing case
Number of hours per day	NHD	h/day	8	Existing case
Employee holidays	EH	week/year	5	Hypothesis
Employee working days	ED	d/week	5	Existing case
Number of retailers	NR	-	8	Assumption
Number of wholesalers	NW	-	4	Assumption
Number of manufacturers	NM	-	2	Assumption
Number of SKUs	N	SKU	1,090	Existing case

*Appendix 1: Context inputs*

Variable	KPI	Unit of meas.	AS-IS	100% B2b	10% B2b	20% B2b	50% B2b	Source
Avg. Weekly demand	Davg	u/week	80.92	82.12	7.96	15.91	39.78	Estimate
Std. Dev. Weekly demand		u/week	26.49	40.73	4.79	9.58	23.96	Estimate

Reorder interval	T	1/week	1	1	1	1	1	Existing case
Procurement LT	LT	week	2.29	2.29	2.29	2.29	2.29	Existing case
Standard Deviation procurement LT		week	0.3	0.3	0.3	0.3	0.3	Existing case
Inventory Carrying Costs as a percentage of the item value	ICC %	%	30%	30%	30%	30%	30%	Assumption
Service level	SL	%	98%	98%	98%	98%	98%	Existing case
Avg. Selling price	MASP	€/u	17.7	17.3	17.6	17.6	17.5	Existing case
Average Product Cost	APC	€/u	12.7	12.7	12.7	12.7	12.7	Assumption
Avg. margin	MMavg	%	39%	37%	39%	39%	38%	Assumption
Expected loss	P(LS)r	%	46%	38%	45%	44%	42%	Estimate

*Appendix 2: Summary of manufacturer's inventory and demand inputs*

Variable	KPI	Unit of meas.	AS-IS	100 % B2b	10 % B2b	20 % B2b	50 % B2b	Source
Units per pallet	UPP	u/p	265	265	265	265	265	Existing case
Pallets per truck	PPT	p/t	12	12	12	12	12	Existing case
Avg. Units per truck	UPT	u/t	3,180	3,180	3,180	3,180	3,180	Existing case
Avg. Truck saturation (%)	TS	%	97.0%	95.6%	96.9%	96.7%	96.3%	Existing case
Avg. Units per truck - incl. saturation	UPTS	u/t	3,085	3,040	3,080	3,076	3,062	Existing case
Number of trucks	NT	t/y	1,487	1,531	1,491	1,496	1,509	Existing case
Avg. Cost per truck	CT	€/t	1,500	1,500	1,500	1,500	1,500	Assumption
Transp. Cost per units	TCU	€/u	0.49	0.49	0.49	0.49	0.49	Estimate
% on-time delivery	OTD	%	97.0%	95.9%	96.9%	96.8%	96.5%	Existing case



*Appendix 5: Summary of retailer's inventory and demand inputs*

<b>Variable</b>	<b>KPI</b>	<b>Unit of meas.</b>	<b>AS-IS</b>	<b>100% B2b</b>	<b>10% B2b</b>	<b>20% B2b</b>	<b>50% B2b</b>	<b>Source</b>
Units per pallet	UPP	u/p	265	265	265	265	265	Existing case
Pallets per truck	PPT	p/t	12	12	12	12	12	Existing case
Avg. Units per truck	UPT	u/t	3,180	3,180	3,180	3,180	3,180	Existing case
Avg. Truck saturation (%)	TS	%	86%	86%	86%	86%	86%	Existing case
Avg. Units per truck - incl. saturation	UPTS	u/t	2,725	2,725	2,725	2,725	2,725	Existing case
Number of trucks	NT	t/y	1,683	1,683	1,683	1,683	1,683	Existing case
Avg. Cost per truck	CT	€/t	1,500	1,500	1,500	1,500	1,500	Assumption
Transp. Cost per units	TCU	€/u	0.55	0.55	0.55	0.55	0.55	Estimate
% on-time delivery	OTD	%	93%	93%	93%	93%	93%	Estimate
Avg. shipment value per truck	ASVT	€/t	64,716	64,716	64,716	64,716	64,716	Estimate
Average penalty cost (% of shipment value)	APe nC	%	2.0%	2.0%	2.0%	2.0%	2.0%	Existing case

*Appendix 6: Summary of retailer's transportation inputs*

<b>Variable</b>	<b>KPI</b>	<b>Unit of meas.</b>	<b>AS-IS</b>	<b>100% B2b</b>	<b>10% B2b</b>	<b>20% B2b</b>	<b>50% B2b</b>	<b>Source</b>
FTE working on B2b e-marketplace channel	FTE	FTE	-	0.75	0.25	0.35	0.50	Existing case
Hours devoted by an account manager to B2b e-marketplace channel	HEM	h/y	-	1,410	470	658	940	Estimate



Avg. Truck saturation (%)	TS	%	95.3 %	93.2 %	95.1 %	94.9 %	94.3 %	Existing case
Avg. Units per truck - incl. saturation	UPTS	u/t	3,03 1	2,96 4	3,02 4	3,01 7	2,99 7	Existing case
Number of trucks	NT	t/y	1,51 3	1,56 6	1,51 9	1,52 4	1,54 0	Existing case
Avg. Cost per truck	CT	€/t	1,50 0	1,50 0	1,50 0	1,50 0	1,50 0	Assump tion
Transp. Cost per units	TCU	€/u	0.49	0.51	0.50	0.50	0.50	Estimat e
% on-time delivery	OTD	%	95.0 %	93.5 %	94.9 %	94.7 %	94.3 %	Estimat e
Avg. shipment value per truck	ASVT	€/t	60,9 88	57,7 16	60,6 57	60,3 27	59,3 41	Estimat e
Average penalty cost (% of shipment value)	APe nC	%	2.0 %	2.0 %	2%	2%	2%	Existing case

*Appendix 9: Summary of wholesaler's transportation inputs*

<b>Variable</b>	<b>KPI</b>	<b>Unit of meas.</b>	<b>AS-IS</b>	<b>100% B2b</b>	<b>10% B2b</b>	<b>20% B2b</b>	<b>50% B2b</b>	<b>Source</b>
FTE working on B2b e-marketplace channel	FTE	FTE	-	0.50	0.15	0.20	0.30	Exist ing case
Hours devoted by an account manager to B2b e-marketplace channel	HEM	h/y	-	940	282	376	564	Esti mate
Hourly account manager rate	HR	€/h	-	30	30	30	30	Esti mate

*Appendix 10: Summary of wholesaler's administrative inputs*