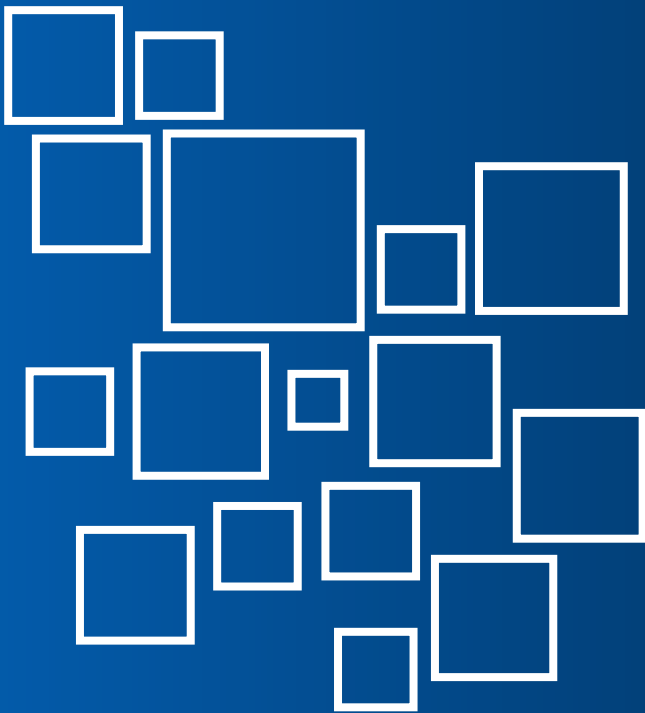


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# Economic Analysis of Law Review

## The Contractual Nature of Two-Sided Platforms: a research note

*A Natureza Contratual de Plataformas de Dois Lados: nota de pesquisa*

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### RESUMO

O presente trabalho discute a natureza organizacional de plataformas de dois lados. O artigo se afasta do caso clássico de uma indústria que apresenta algumas características intrínsecas que lhe dão o status de um mercado de dois lados. Especificamente, este artigo considera que a decisão de uma firma em operar como um comerciante tradicional ou como uma plataforma é baseada em um processo de negociação entre a empresa e seus fornecedores, resultando em um contrato incompleto que é apoiado por uma combinação particular de instrumentos de preço e não-preço. Baseando-se nessa abordagem, este ensaio discute algumas questões fundamentais associadas à economia de formas híbridas em plataformas de dois lados, por meio da análise da decisão de um supermercado em operar como um varejista convencional ou como uma plataforma.

**Palavras-chave:** Plataformas de dois lados, Comerciantes, Contratos Incompletos, Formas Organizacionais.

**JEL:** L22, D23, D86.

### ABSTRACT

The present paper discusses the organizational nature of two-sided platforms. The article departs from the classical case of an industry that presents some intrinsic characteristics which give to it the status of a two-sided market. Specifically, the paper considers that the decision of a firm to operate as a traditional merchant or as a platform is based on a bargaining process between the firm and its suppliers, resulting in an incomplete contract which is supported by a particular combination of price and non-price instruments. Founded on this approach, this essay addresses some fundamental issues in the economics of hybrid forms in two-sided platforms through the examination of the decision of a supermarket to operate as a conventional retailer or as a platform.

**Keywords:** Two-sided Platforms, Merchant, Incomplete Contracts, Organizational Forms.

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## 1. Introduction

A firm is regarded as a two-sided platform when serving different groups of consumers – buyers and sellers – who are characterized by some kind of interdependence. In general terms, a platform provides meeting space and facilitates interaction between agents who operate on different sides of the market. The recent research on the theoretical implications of two-sided platforms has gained particular recognition in antitrust analysis (Rysman, 2007). Underlying this debate one finds the assumption that an industry presents some intrinsic characteristics which give to it the status of a two-sided market, then creating the need for a specific analytical framework.

While the above reasoning holds true for a wide variety of industries (e.g., computer operating systems), one can identify some markets in which the configuration of firms as platforms is not the result of some basic attribute of the industry itself, but corresponds to a firm's organizational choice. A particularly interesting case refers to supermarkets: firms can operate as a “merchant”, buying goods from suppliers and reselling to consumers, or operate as a platform which commercializes shelf space with suppliers. The possibility that a firm may engage in some kind of discretionary influence on its configuration as a platform encourages the analysis of the tradeoff between merchant and platform as a contractual problem between the firm and its suppliers (Hagiu, 2007).

Based on this fundamental insight, the present paper deepens the current understanding on the organizational nature of two-sided platforms. The paper's main proposition is that a two-sided platform is characterized by a complex pricing structure (Rochet and Tirole, 2006)<sup>4</sup> which is supported by a particular organizational design and an institutional structure (Evans and Schmalensee, 2007). The configuration of a firm as a merchant or as a platform is then examined as a bargaining process between the firm and its suppliers, resulting in an incomplete contract based on a particular combination of price and non-price instruments. Founded on this framework, the article addresses some fundamental issues in the economics of hybrid forms in two-sided platforms through the examination of the decision of a supermarket to operate as a conventional retailer or as a platform.

The paper is divided into four parts besides this introduction. Section 2 analyzes the foundations and section 3 discusses the contractual nature of two-sided platforms. Both sections serve as a basis for examining the decision of a supermarket to operate as a merchant or as a platform in section 4. Section 5 then presents the conclusions and some questions for future research.

## 2. Two-sided Platforms: taking step

The formal, systematic analysis of what is known as two-sided platforms goes back to the pioneering work of Rochet and Tirole (2003).<sup>5</sup> It starts with the observation that markets with network externalities are characterized by two distinct sides (buyers and sellers) that interact through a common platform. As in the classical treatment of multi-product monopolies or oligopolies, the interaction between the two sides generates strong complementarities; however the corresponding externalities are not internalized by the economic agents. Based on this general setting, Rochet and Tirole (2003) investigate how the price allocation between the two sides of the platform varies in

<sup>4</sup> Complex pricing structure is one that aims to capture the indirect effects generated by the network interaction of the end users of the platform. See section 2 for further discussion.

<sup>5</sup> Rochet and Tirole (2003) use the term “two-sided market” to refer to situations in which firms serve two interdependent groups of consumers. The term “market”, however, should not be interpreted strictly; it is best interpreted as “platform” (Evans and Schmalensee, 2007).

accordance with a set of factors which include the platform governance, connection costs, and differentiation. In general, the authors argue that their theory lies in the intersection between the network economics, which emphasizes externalities, and the literature of pricing of multi-products, which emphasizes cross elasticities.

From the contribution of Rochet and Tirole (2003) the subject of two-sided platform has become an active area of research in economics, fostering the emergence of a significant theoretical and empirical literature (Evans and Schmalensee, 2007). This literature generally assumes the existence of the platform as a given and analyzes specific elements such as the competition between platforms (Armstrong, 2006; Caillaud and Jullien, 2003), the pricing within the platform (Galeotti and Moraga-González, 2009; Hagiu, 2006; Schmalensee, 2002), the design of the platform (Bakos and Katsamakis, 2008) and antitrust issues (Evans, 2003; Rysman, 2007).

It's worth noting, however, that a formal definition of two-sided platform was introduced by Rochet and Tirole only three years after the publication of their seminal work. In their article *Two-Sided Markets: A Progress Report*, Rochet and Tirole (2006) note that the literature that addresses the theme of two-sided platforms tends to be industry-specific and based on a general concept according to which a platform should deal with two distinct groups of consumers. Although this concept is an interesting characterization, it is not sufficiently restrictive because the existence of any market assumes that buyers and sellers interact in some common trading space. In the words of the authors, the literature had “much of a ‘You know a two-sided market when you see it’ flavor” (Rochet e Tirole, 2006:645).

Rochet and Tirole (2006) define two-sided platform as one in which the volume of transactions between end users (i.e., buyers and sellers) depends not only on the price level, but also on the pricing structure established by the firm. The notion of pricing structure can best be understood by assuming the existence of a platform that sets per-interaction charges. The market for interactions between the two sides is one-sided if the volume of transactions in the platform depends only on the aggregate price level, i.e. the sum of per-interaction charges. On the contrary, if the volume of transactions is sensitive to price reallocations between buyers and sellers, the market is said to be two-sided.

It is implicitly assumed that the owner of the platform, when balancing the demands of both sides of the market, has the ability to establish a pricing structure with the explicitly aim of capturing the indirect effects generated by the network interaction of end users of the platform. The definition assumes that two conditions are met: (i) the relationship between end users of the platform is characterized by externalities, and (ii) the two sides are not able to arbitrate the pricing structure. Thus, two-sided platforms emerge in situations where externalities are present and transaction costs prevent the two sides to directly deal with the externalities (Evans and Schmalensee, 2007).

Specifically, Rochet and Tirole (2006) analyze the relationship between transaction costs and platforms starting from the Coase theorem. The theorem states that in a world where transaction costs are zero and property rights are well delineated, agents can reach efficiency through the exchange regardless of the initial allocation of rights. In a Coasian world, the gain of the transaction between end users of a platform depends on the price level, no matter its initial distribution. The pricing allocation (i.e., the initial pricing structure) has no impact on the volume of transactions, the profit of the platform, and the social welfare. As a result, when transaction costs are zero, the pricing structure is neutral and markets are one-sided.

Although the Coase theorem is a useful characterization, in practice several factors make it unlikely that both parties of a platform reach an effective agreement. This finding does not indicate, however, that markets are no longer one-sided when transaction costs are positive. According to

Rochet and Tirole (2006), there is no direct equivalence between the idea that users are unable to achieve an efficient outcome through bargaining and that the pricing structure of the platform is not neutral. The inability to achieve an efficient bargain is a necessary but not sufficient condition for the non-neutrality of the pricing structure of a two-sided platform. Accordingly, the failure of the Coase Theorem does not imply that the market is two-sided.

On the other hand, the opposite is true: the existence of a two-sided platform indicates that the conditions of the Coase Theorem are not met. In this sense, Evans and Schmalensee (2007:154) argue that the platform provides a “technology to solve externalities” in a way that minimizes transaction costs. According to Evans and Schmalensee (2007), the role of a two-sided platform is to make possible the realization of gains by reducing transaction costs related to the interaction of agents that have some kind of interdependence. The platform fulfills this role through three main functions or activities (Evans, 2008): (i) matchmaking – to facilitate transactions by making easier the matching between members of different groups, (ii) building audience – to make more likely that members of a group find a proper partnership, and (iii) cost sharing – to provide shared resources that reduce the duplication of efforts.

It is interesting to note that from Rochet and Tirole (2006)’s perspective, the “technology to solve externalities” provided by a platform is the pricing structure established by the owner of the platform. The pricing structure would have the power to solve the allocative problem generated by the inability of end users to internalize the network externalities. As observed by Boudreau and Hagiu (2008):

MSPs [Multi-sided platforms] are characterized by interactions and interdependence between their multiple sides. [...]. For this reason, the thrust of prior work has been on the question of how to get the different sides around an MSP “on board” in large numbers, while setting-up a pricing model that maximizes platform profits [...]. Overall, the literature has emphasized arm’s length pricing as the central strategic instrument used by platform owners to intermediate the ecosystem of users and complementors surrounding an MSP.

Evans and Schmalensee (2007) identify, however, three “robust results” of the literature that deals with two-sided platforms. Besides (a) the existence of a complex pricing structure, the authors note (b) the influence of the design of the platform on the level of interaction between end users, and (c) the incentive of the owner of the platform to formulate rules and regulations that promote positive network externalities and limit negative externalities. These results are interesting because it implicitly points towards a broader concept of two-sided platforms compared to the definition introduced by Rochet and Tirole (2006). The performance of activities of matchmaking, audience building and cost-sharing not only depend on the price level and pricing structure, but also rely on the trading environment (i.e., design of the platform) and the restrictions that apply within this environment (i.e., rules and regulations). In addition to solving a pricing problem, the two-sided platform has to consider non-price attributes related to its “physical” and institutional setting. This analysis contrasts with the traditional view of the literature of two-sided platform.

Boudreau and Hagiu (2008) also analyze non-price instruments used by multi-sided platforms. The authors start with the assumption that platforms regulate the interactions around it by means of subtle combinations of a long list of legal, technological, informational, and pricing instruments. The fundamental hypothesis is that “establishing the right price” may not be sufficient to ensure the efficient distribution of production around the platform. The essence of the argument is that markets around platforms are inherently inundated with externalities and other sources of coordination problems which create scope for regulation. Platforms, in turn, are in a unique position to assume a regulatory role because of private one-to-many relationship established between it and

other agents in the market.

It should be emphasized that the examination of non-price elements expands the analytical approach developed by Rochet and Tirole (2003, 2006). As previously described, much of the research in two-sided markets consider the form of market mediation (i.e., the platform) as a given, focusing on issues of pricing and efficiency. The question that one traditionally seeks to answer involves the pricing structure that ensures the participation of both sides in the platform, resulting in an efficient pattern of transactions. Yet, Evans and Schmalensee (2007) and Broudeau and Hagiu (2008) suggest that this type of approach is incomplete. The existence of a platform cannot be summarized to the setting of a pricing structure. A firm that takes a function of a two-sided platform is characterized by a complex pricing structure that operates within a particular design and a given institutional structure.

A two-sided platform must then consider four elements when solving its maximization problem: the price level, the pricing structure, its design and the set of rules governing transactions within the platform. More importantly, the choice of all these variables cannot be unilateral because a firm is only a platform if end users agree to operate in a certain way – i.e., act in accordance with a given design and with a set of rules. This reasoning suggests that a comprehensive analysis of two-sided platforms involves, besides considerations on the pricing structure, an investigation into the nature of the contracts that support relationships within the platform. We further examines this issue in the next section.

### 3. Two-Sided Platforms as (Incomplete) Contracts

In two-sided platforms, price and non-price attributes combine so that the gains associated with the interaction between end users are not dissipated. Because all the variables cannot be unilaterally determined, the establishment of a platform requires a bargaining process between end users and the owner of the platform. Accordingly, two-sided platforms present a contractual nature. This section examines the contractual rationale of two-sided platforms starting with a model developed by Hagiu (2007).

Hagiu (2007) examines the decision of a firm to operate as a platform or as a traditional intermediary. The main difference between a platform and a market intermediary in its traditional sense (merchant) is that the former simply provides access for buyers and sellers to the trading space so that the control of sales is allocated entirely to the sellers. On the other hand, a merchant, for having possession of the goods produced by sellers, has control over the sale to buyers.

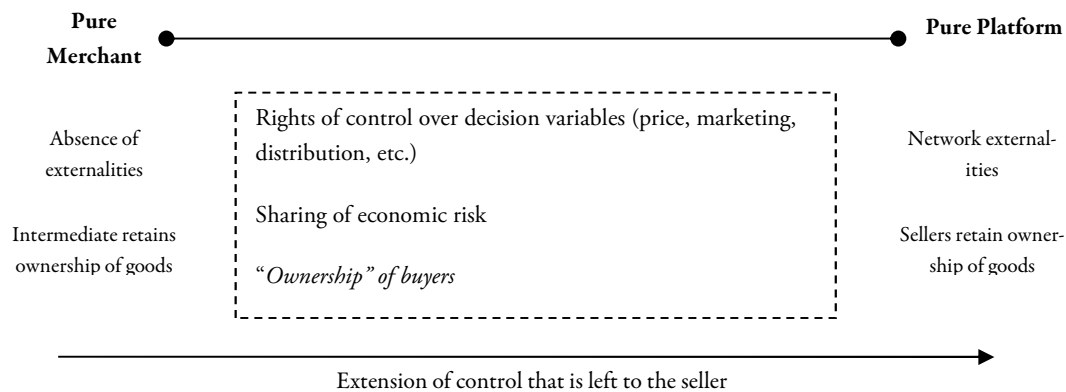
Considering a market composed of buyers, sellers and a single market intermediary that may operate as a merchant or as a platform, Hagiu (2007) builds his argument based on the contractual division of control between the intermediary firm (platform or merchant) and the sellers. In the model, network externalities – whose existence is treated as a given in the literature of two-sided platforms – are dependent on the nature of the contracts between the intermediary and the sellers.

In the case of a merchant, the establishment of pure buy-out contracts makes externalities disappear because it is fully internalized by the intermediary firm. This is the classical case investigated by standard microeconomics. On the other hand, under the platform mode, network externalities between sellers and buyers reach its climax, whereas the intermediary assumes a “passive” role as a provider of trading space. The key point is that the extent of network externalities depends on the nature of contracts established between the intermediary firm and the sellers. These contracts determine the operating mode of the intermediary itself and, ultimately, the strategies available for the firms.

More generally, Hagiu (2007) identifies the existence of a continuum of types of market intermediaries between a pure merchant and a pure platform depending on the contractual relations established in the market. The location of the intermediary firm in the platform-merchant continuum is defined by three dimensions: (i) the division of control between the intermediary and the sellers over the variables that impact the sale of products to consumers (price, marketing, distribution, etc.), (ii) the division of economic risk (is risk borne by the seller or the intermediary?), and (iii) the influence on consumers (which plays the greatest influence on buyers' decision, the brand of the seller or that of the intermediary?).

The specific position of the intermediary in the platform-merchant continuum is the result of a bargaining process between the firm and the sellers, resulting in a contract that specifies a division of the set of transaction attributes – which, as said, includes aspects of the good itself, the risk sharing, and the influence on consumers. Thus, each position in the platform-merchant continuum is associated with a division of control rights over the traded attributes. This division, in turn, determines the extent of network externalities which agents must deal with and the nature of the buyer/seller relationship.

Figure 1 – Merchant-Platform Continuum



Source: The authors, based on Hagiu (2007).

Although Hagiu (2007)'s model is an interesting characterization, it is not free from criticism. The model seems to be based on the implicit notion that the division of control over the transaction attributes represents a partition of the space of attributes, suggesting that all relevant variables are observable by the intermediary firm and the sellers. In other words, each position in the platform-merchant continuum seems to be associated to a perfect division of control rights over transaction attributes. If this is the case, a comprehensive contract can be potentially formatted without costs.<sup>6</sup> The contract specifies all obligations of all parties in all possible states. Accordingly, contracts are complete, transaction costs are zero and markets are one-sided. However, as outlined by Rochet and Tirole (2006), platforms only represent efficient governance mechanisms when transaction costs are positive and, therefore, contracts are incomplete.

<sup>6</sup> As in the standard microeconomics, this condition is fulfilled if one assumes that a third party is also able to observe the variables and enforce any penalty applicable. As noted by Hart (1995: 23), "even if the parties can plan and negotiate about the future, it may be very difficult for them to write their plans down in such a way that, in the event of a dispute, an outside authority – a court, say – can figure out what these plans mean and enforce them". On the other hand, one can assume some kind of relational contract by which the gain of the recurrent relationship is greater than the gain of breaking the implicit contract.

In effect, if the division of control rights between the intermediary and the sellers is perfect, the interesting content of the firm's organizational strategy loses much of its meaning. Illustrating this point, we can resort to Cheung (1983). The author, in examining what he calls the "ambiguity of firm size", highlights "the case of a big department store bearing only one name but consisting in fact of separate sellers, each leasing a space under one roof, paying a rent to one central agent, and governed by a set of rules on the line of products each can sell and his hours of operation. That would seem to represent a single firm. However, exactly the same arrangements are found in most shopping centers, except that the shops bear various names" (Cheung, 1983: 17).

While Cheung (1983) focuses on the analysis of the "firm size", it is interesting to note that at the heart of his argument lies the issue of characterization of a platform. From Cheung (1983)'s perspective, the existence of a platform is irrelevant since any organizational form generates the same result, the difference between them being a matter of "naming" of sellers. From Hagiu (2007)'s perspective, the organizational modes – department store and shopping – vary only in the extent of control held by the "central agent" (i.e., intermediary). In fact, according to Hagiu (2007) the department store represents an organizational form closer to a merchant, given the greater control the "central agent" has over the sellers. However, if this is the case, the characterization of a platform is as irrelevant as the description of Cheung (1983) might suggest. If the platform exists because the perfect division of control is possible, the various organizational forms are equivalent in terms of efficiency. That is, although sustainable competitive advantage can be examined in contexts with zero transaction cost, most of the interesting content of the strategy is eliminated because all the competitive advantages are established by initial endowments and there is no room for problems of protection and division of value (Foss, 2003). Accordingly, for a platform to be a relevant organizational choice, transaction costs must be positive what is equivalent to say that the contracts that support it are incomplete.

The contractual incompleteness in the context of two-sided platforms involves the formatting of contracts between the intermediary and the sellers which do not specify all transaction attributes. The division of control between the intermediary and the sellers is neither mutually exclusive, nor jointly exhaustive. As a result, agents can operate within certain margins what justifies the need to establish a set of rules within the platform – or, more generally, justifies the use of non-price instruments. From this perspective, the position of the intermediary in the platform-merchant continuum is the product of a bargaining process that results in a contract which specifies an imperfect division of the set of transaction attributes. Contracts explicitly describe some attributes of the transaction, implicitly outline others, but do not specify all traded aspects.

As a general result, among the attributes not specified by contract, some are controlled by one party to the transaction whereas others are under control of the other party. Control is defined as the freedom of agents to manipulate an attribute without making side payments to other agents (Barzel, 1997). The intermediary then determines a pricing structure, a design and a set of rules considering not only the attributes formally under the contract, but also the free attributes under sellers' control. The issues of bargaining and coordination become prominent and the contract shall be supported by a particular combination of price and non-price instruments characterizing what Evans and Schmalensee (2007) call "technology to solve externalities".

In its whole, the discussion undertaken in this section extends the characterization of platforms, introducing explicitly a component of transaction costs in the examination of two-sided markets. Perhaps more importantly, the discussion extends the analytical possibilities of so-called "hybrid forms", i.e., the modes of governance that do not exist at the extremes of the platform-merchant continuum. Founded on the framework introduced above, the next section addresses some funda-



mental issues in the economics of hybrid forms in two-sided platforms. Specifically, the research focuses on the organizational rationale of a retail firm in selecting an organizational structure.

#### 4. Hybrid Forms: the case of supermarkets

Hagiu (2007)'s analysis is relevant because it broadens the definition of Rochet and Tirole (2006), defining a space in which the boundary between what is and what is not a two-sided platform depends on a more comprehensive set of factors besides network externalities and the pricing structure. According to Hagiu (2007), two-sided platform is not a dual notion because one can find a continuum of forms of intermediation. More interestingly, the position of a firm on this continuum can be regarded as a strategic decision. The analysis of the contractual nature of two-sided platforms points out the possibility that a firm may engage in some kind of discretionary influence on its configuration as a platform. The present section investigates this subject. In particular we analyze the decision of a supermarket to operate as a merchant, buying goods from suppliers and reselling to consumers, or as a platform that negotiates shelf space with suppliers.

It bears emphasizing that the assessment of supermarkets as two-sided platforms is not usual either in the literature of food retailing or in the literature of platforms<sup>7</sup>. For a long time, supermarkets have been examined as firms that buy products and manage the entire retail distribution. Nonetheless, a branch of the literature found some controversial results when investigating the rapid spread of supermarkets and the changes in the modus operandi of large retailers in developing countries (Alvarado and Charnel, 2002; Faiguenbaum et al. 2002; Gutman, 2002; Reardon and Berdegué, 2002; Reardon et al. 2003; Reardon, 2004; Reardon et al. 2009).

In general, the expansion of supermarkets is associated with a restructuring of its procurement structures from systems of supplying centered in stores to centered systems that exploit economies of scale and whose geographic base of supplying is regional (Reardon et al. 2003; Reardon, 2004, Reardon et al., 2005). The modification of procurement structures involves a change in the contracts established between the retailers, the wholesale sector and the farmers. Specifically, there is evidence that wholesalers assume some supplying functions of supermarket stores, establishing a platform relationship. Alvarado and Charnel (2002:481) note that, in Costa Rica, “[t]he wholesalers buy produce on behalf of the supermarkets and form a ‘pool’ of suppliers by produce category. The pools include farmers who have contracts with the wholesalers to meet the supermarkets’ private quality standards. Moreover, **these non-traditional intermediaries [...] are responsible for managing the produce section in the supermarket itself, employing sales staff, maintaining the equipment and shelves, and managing the advertising.** [...] Interfrutd has an exclusive contract with MegaSuper [a leading supermarket chain], which essentially fully outsources the produce section of its stores to Interfrutd via a **management concession under which Interfrutd pays rent for the space**”. (emphasis added).

The similarity of the above description to the configuration of a platform is clear. Rather than being an isolated case, the relationship described by Alvarado and Charnel (2002) seems to be a blooming phenomenon in the food retail sector in developing countries.

Taking into account the particular investigation proposed in this paper, the analysis of the retail sector is interesting because a supermarket which operates as a platform does not act as a plat-

<sup>7</sup> Armstrong (2006) when considering the competition in two-sided markets examines the case of supermarkets. However, the author assumes that supermarkets are platforms, not doing any kind of discussion about the nature of this hypothesis.

form in its pure sense. In general, a supermarket that commercializes shelf space with suppliers also has some influence on the price of the good. This indicates that a supermarket which operates as a platform is located in a position between a pure merchant and a pure platform. In what follows we propose a simple economic rationale for examining this subject.

Fundamentally, the decision of a supermarket to operate as a conventional retail distributor or as a platform involves analyzing the tradeoff between the costs of “reselling goods” versus “providing the platform”. Reselling implies costs of purchase of goods and costs related to the management of all aspects of retailing distribution (stock, shelf space, price, promotion, etc.). In the case of a supermarket that operates as a platform some of these costs are transferred to the supplier.

The analysis becomes more intricate when one considers the situation in which some sections of a supermarket operate as platforms (e.g., Fresh Fruit and Vegetables – FFVs) and others are still organized as a conventional retail distribution. In this case, the externalities between the two groups of consumers are the same in both situations – the higher the number of suppliers, the better for the buyers; the greater the number of buyers, the better for the supplier. Even so, in the case of a merchant, the supplier may want only to sell to the retailer and not manage its shelf space.

In order to examine the decision of a supermarket, we advance a simple formal argument<sup>8</sup>. Let’s consider that the supermarket first chooses the governance structure – merchant or platform – to manage each of the goods offered to consumers. In the platform mode, the supermarket avoids the cost of retail management  $g$  and receives a side payment  $m$  from the supplier for the space occupied in the store. By definition, the quantities ( $q$ ), consumer prices ( $p$ ) and prices paid to suppliers ( $c$ ) are sensitive to the governance structure. We assume, in particular, that a supermarket has to incur in some purchase cost ( $c$ ) no matter the governance structure it has selected<sup>9</sup>.

In formal terms, as indicated by the first condition below, the supermarket chooses the highest return between the two governance structures for each product  $i \in [1, \dots, n]$  (the “tilde” over the symbol denotes a reference to the platform mode). The second equation is the indifference condition between the two governance structures. An inference that can be drawn from the indifference condition is that transactions which involve products whose presence is important in the selection of a store by the consumer (e.g., brand leaders) tend to be organized under the merchant mode because the premium paid by the supplier ( $m$ ) tends to be low and the prices tend to be less sensitive to the governance structure.

$$\max\{p_i q_i - c_i(q_i) - g_i, \tilde{p}_i \tilde{q}_i - \tilde{c}_i(\tilde{q}_i) + m_i\} \quad (1)$$

$$\tilde{q}_i \tilde{p}_i - q_i p_i + m_i = \tilde{c}_i(\tilde{q}_i) - c_i(q_i) - g_i \quad (2)$$

Once the governance structure has been chosen, the store space is allocated for each product. The shelf space of product  $i$  is represented by  $a_i$  expressed as a fraction of the total area of the store. Consumer demand is an increasing function of the shelf space, although demand exhibits diminishing returns. Formally,  $\frac{\partial q_i}{\partial a_i} > 0$  and  $\frac{\partial^2 q_i}{\partial a_i^2} < 0$ .

The problem of the supermarket is then to allocate the available area to each of the products so as to maximize total profit.<sup>10</sup> As expressed in the equation below which represents the maximiza-

<sup>8</sup> The authors do not intend to build a full formal argument. The main objective is to highlight some fundamental aspects of the discussion.

<sup>9</sup> This is usually the case in concrete experiences.

<sup>10</sup> Total profit = operating income + side payments – costs.

tion problem of the supermarket, products are separated into two categories, merchant and platform. The commercialized quantity depends not only on the shelf space, but also on the price vector ( $\mathbf{p}$ ).

$$\begin{aligned} \max_{\{p_i, a_i, a_j\}} \Pi &= \sum_{i=1}^m (p_i q_i(a_i, \mathbf{p}) - c_i(q_i)) + \sum_{j=m+1}^n (\tilde{p}_j \tilde{q}_j(a_j, \mathbf{p}) - \tilde{c}_j(q_j)) - \sum_{i=1}^m g_i(a_i) + \sum_{j=m+1}^n m_j(a_j) \\ \text{s.t.} \sum_{i=1}^m a_i + \sum_{j=m+1}^n a_j &= 1 \end{aligned} \quad (3)$$

Assuming that the supermarket is a price taker<sup>11</sup> and that side payments and management costs are proportional to the shelf space, the optimal allocation is such that for any product one of the following conditions is met:

$$p_i \frac{\partial q_i}{\partial a_i} = \frac{\partial c_i}{\partial q_i} \frac{\partial q_i}{\partial a_i} + g_i \quad (4)$$

$$\tilde{p}_j \frac{\partial \tilde{q}_j}{\partial a_j} + m_j = \frac{\partial \tilde{c}_j}{\partial \tilde{q}_j} \frac{\partial \tilde{q}_j}{\partial a_j} \quad (5)$$

Under the platform mode, it is additionally assumed that the supplier has a reservation price  $k_i$  associated with the expected sales in the supermarket chain ( $\hat{q}_i$ ) which includes a premium that reflects the value of being present in the retail channel (liquidity, turnover, brand exposure, etc.)<sup>12</sup>. There is a strong preference for the transaction via platform if:

$$k_i(\hat{q}_i) < \tilde{c}_i(\hat{q}_i) - (m_i + g_i) \quad (6)$$

The above discussion suggests that the supermarket's decision to operate as a platform can be expressed as a contract between the firm and each of its suppliers. The contract explicitly specifies a shelf space and a side payment  $m$ . The supermarket is then organized as a platform when the shelf space and the side payment are such that (i) the return of the supermarket under the platform mode is higher than the return under the merchant mode and (ii) the supplier has a strong preference for the transaction via platform. It is interesting to note that these conditions are equivalent to a compatibility incentive constraint, i.e., one can assume that there is a distribution of income and risk that simultaneously satisfy the two agents (supermarket and supplier).

Consistent with our preceding analysis, such contractual relation between a supermarket and its suppliers is incomplete. The contract specifies neither the design of the platform, nor the free attributes that can be manipulated by the parties in the transaction. Particularly, until this point the supermarket is described as a firm which rents shelf space for suppliers, but maintains a centralized financial control. Platform externalities can be emphasized with the (realistic) assumption that the quantity sold of product  $i$  depends on the flow of consumers in the store, which in turn depends not only on the number of stores of the supermarket chain, but also on the mix of products offered within the store. In this case, the value  $m_i$  can be adjusted to the importance of each product in the at-

<sup>11</sup> This hypothesis is inconsistent with possible externalities between groups and will be discussed later on.

<sup>12</sup> The existence of the reservation price connects to the existence of a positive cost that has to be borne by the supplier under the platform mode.

traction of customers to the store (or supermarket chain).<sup>13</sup> Additionally, the flow of customers also depends on the design of the platform (urban location, parking facilities, comfort provided by the store, payment facilities, etc.). Thus, the quantity sold of product  $i$  is a function of the shelf space allocated to it, the shelf space allocated to substitute and complementary products, and the services offered by the platform. That is  $q_i = f(a_i, a_{-i}, l)$ , where  $l$  refers to the services offered by the store.

The problem becomes more complex with the introduction of interdependencies between products. In this respect, an important issue is whether the presence of leading brands affects the flow of customers on a continuous basis (e.g., if the store does not have Coke, the sale of detergent goes down) or it is a necessary condition for operation of the platform (when leading brands are missing, the consumer chooses another store). In any case, the effects of the presence of a particular product on the quantities sold of other products are captured by the financial result of the store. Through a bargaining process, the supermarket and their supplier reallocate the premium  $m$  and the externality generated by the specific product.

The analysis of services offered by stores, in turn, brings us to the existence of free attributes that can be manipulated by the supermarket or the suppliers. In general terms, the agent who has control over a free attribute uses it to the point where his or her net income is positive. Because the supermarket controls the services offered in the stores, it manages the trading space in order to make it more attractive to buyers and suppliers interact with each other, *ceteris paribus*. The supermarket determines a particular design that maximizes the flow of consumers in the store given the socio-economic and demographic conditions of a specific region. Conversely, suppliers control some product attributes which are hardly measured by the supermarket (FFVs being a classic example). The optimal solution in this case is to make the supplier a residual claimant of product's quality (Barzel, 1997). This can be easily achieved through the establishment of a platform<sup>14</sup>.

In conclusion, a supermarket that operates as a platform negotiates a contract with its suppliers, specifying a shelf space and a side payment; the firm also establishes a particular design and explicitly considers the free attributes under suppliers' control. In the context of organizational research, this characterization highlights the incomplete contract rationale underlying the decision of a supermarket to operate as a platform.

## 5. Concluding Remarks

The present paper examines the organizational foundations and the contractual nature of two-sided platforms. The article departs from the classical case of an industry that presents some intrinsic characteristics which give to it the status of a two-sided market. Specifically, the paper considers that the decision of a firm to operate as a traditional merchant or as a platform is based on a bargaining process between the firm and its suppliers, resulting in an incomplete contract. Platforms correspond to incomplete contracts because its existence implies that the conditions of the Coase Theorem are not fulfilled.

<sup>13</sup> In this regard, one particular case is that of products which do not differentiate the supermarket store because every chain offers it, but whose absence could adversely affect the flow of costumers in the store. Then, the supermarket also has a reservation price which it would pay not to be without the product.

<sup>14</sup> A corresponding solution is the establishment by the supermarket of private standards of quality. The supermarket assumes then a regulatory (institutional) function. According to Reardon (2004), private standards play the role of coordination instruments of supermarket's suppliers, exerting reflections on the investment options of the suppliers. In this sense, a supermarket may set a standard in order to regulate a particular free attribute whose control is held by the supplier.

The paper's main proposition is that a two-sided platform is characterized by a complex pricing structure which is supported by a particular organizational design and an institutional structure. Much of the complexity of platforms, however, cannot be credited only to the existence of a pricing structure. A two-sided platform has to consider four elements when solving its maximization problem: the price level, the pricing structure, its design, and the set of rules governing transactions within the platform. This approach adds to the traditional analysis of two-sided platforms. Additionally, the discussion on hybrid forms proposed in this paper examines the conditions under which a market intermediary may choose to operate as a platform.

As a final remark, one may identify two areas for future research. In line with Broudeau and Hagiu (2008), the present paper stresses the importance of non-price instruments in two-sided platforms. This is a particularly relevant topic for the strategic positioning of platforms, and as such more research efforts should be devoted to it if one expects to produce a comprehensive strategic panorama.

On the other hand, the present article is focused on the organizational choice between the merchant mode and the platform mode. A natural question that emerges from this investigation relates to the dynamic nature of the transformation of a firm from a traditional merchant into a platform. One should keep in mind two specific questions: What are the resources and competences that a firm has to develop in order to produce a successful transition to the platform mode? What are the organizational bases for a perennial platform operation?

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