Value Creation, Transactions and the Firm

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Going from supply and demand analysis to value creation can be puzzling. The paper defines a simple transaction model representing value creation with and without the intermediation of a firm, measuring transaction price indetermination, and defining conditions for a transaction to occur. Using Debreu's classification of "The theory of value", an analogy pictures the role of the firm. In the theory of knowledge, it is one of the four dimensions of a definition of an object. These dimensions are discussed, particularly the functions of the firm and its components, what it is made of.

INTRODUCTION

In the mind of some people, the concept of enterprise is nonexistent. While the term is familiar with numerous examples, the concept is confused with that of resource: a firm corresponding to resources it has access to. The purpose of the paper is to clarify its meaning. The firm is an organization and "the most fundamental unit of analysis in economic organization theory is the transaction - the transfer of goods or services from one individual to another" (Milgrom & Roberts, 1992, p. 21). This is a first premise of the paper and the second one is the survival condition of firms, to create value from resources they use.

The first part presents a simple transaction model. It has a limited claim to originality; it expands in some ways the pedagogical work initiated by Alchian & Allen (1977), particularly their section "Money, Markets and Middlemen". Like the folk theorem, concepts of the model or something close are common knowledge for analysts with a knowledge of economic theory. Besides the concept of transaction price, the model introduces four reserve price concepts. If the model can have some claim to originality, it would be its measure of transaction price indetermination. It is easy to derive standard economic material from the simple transaction model, for instance an individual demand curve is a stepwise function with each step being the value of a reserve price.

Advanced economic analysis as in estimated demand functions has a predictive power very useful for business decisions and public administration. While management schools do not aim to train professional economists, it is important students understand the constraints of a social environment and economics is great at communicating this understanding. At least in the short term, there are limits "below the sky", for instance the maximum amount people can spend. Even without direct competitors, a business cannot choose both the price of its product and the quantity it will sell. Students must also be aware of gross managerial errors like pricing in the inelastic portion of a demand curve. Beyond this, what is the "eminent domain" of economic teaching in management schools?

Industrialization and globalization have pushed further specialization, which, in context of exchange, raises an incentive compatibility issue. We sell what we have specialized for. Is it what is the most

needed? With informed buyers, the issue would be less pressing but asymmetric information is a corollary of specialization. The sector of health and medical care offers numerous examples of incentive compatibility problems. The surgeon will propose a surgery for a dysfunctional prostate while a dietician, a physical activity specialist or an acupuncturist would propose alternative solutions curing some patients but with less adverse effects. Teaching can pose a similar problem. Regarding economics for instance, should social science students and business students have the same course? The temptation is great to teach neoclassical economics to both, since the training of a professional economist requires a good knowledge of it. As recalled by Demsetz (1997), neoclassical economics demonstrates the feasibility of a decentralized economic system. It is valuable business students be exposed to this demonstration but managers' life has much to do with the working of the system. A common aggregation error about it is to argue that firms pursue a profit objective. Specialized production, as household production, pursues the satisfaction of human needs. In most part of the world, firms assume a sizable portion of specialized production. Managers' concern for profits is a constraint imposed on them so that value creation orients their decisions. The challenge of making the constraint effective gives a clue for understanding the evolution of laws related to firms since industrialization: corporate law, bankruptcy law, labour law, consumer protection law, competition law, … In the specialization theory of the firm, placing inputs in "highest value uses" is the alternative to "on-the-job consumption" or self-sufficiency (Demsetz, 1995, p.12). As managers internalize the profit constraint, it becomes their objective and optimization models can help them.

Revenues and costs of a firm are sums of transactions. A transaction may or may not occur. The simple transaction model represents conditions of realization of a transaction. It is a first step in understanding the role of the firm. Management has largely to do with information collection and processing. In the language of theory, firms and auctions are examples of economic mechanisms and "whatever the scope or domain of activity, as long as more than one agent is involved, the fact that essential information about the *environment* is distributed among the agents is at the root of designing economic mechanisms" (Hurwicz & Reiter, 2006, p.18, 19). In other words, limited information requires economic mechanisms. In the language of theory, tastes and reserve prices are elements of the *environment*. Limited information about them is at the root of many management practices, for instance posted price in retail trade, introduced by department stores in the 19th century.

Since the 1980s, many economic textbooks combine in various proportions neoclassical economics with contributions on transactions, organizations, and auction design. The Department of Managerial Economics and Decision Sciences of Kellogg Management School has been at the forefront of these contributions; besides Milgrom & Roberts quoted above, the paper gives a particular attention to two books by authors associated with Kellogg: *Economics and Management of Competitive Strategy* (Spulber, 2009b) and *Economics of Strategy* (Besanko et al, numerous editions since 1996).

Specialization in production has contributed to put in place a production system with numerous flows of products, from natural resources to consumers. Following different types of transactions and contracts, firms partition these flows and the input-output model has a classification making these differences more intuitive. The second part of the paper uses it for constructing a transaction classification giving a better view of boundaries of firms and their partition of trade flows. Firms are supposed to last even if business turnover and bankruptcy rate are high in many countries (Papillon, 2013b); the gap between value creation and the input-output concept of value added derives partly from this expected durability. Using commodity classification of *The theory of value* (Debreu, 1959), the second part proposes an analogy for picturing the role of the firm as an instrument of value creation. The third part goes beyond this analogy. Value creation is outward looking, placing the firm within a broader whole. It is largely the perspective of economic analysis and its numerous contributions on the role of the entrepreneur. Based on a synthesis of them (Barreto, 1989), the third part decomposes the role of the firm into three functions and relates them to the simple transaction model. In the theory of knowledge, the functions of an object are one of the four dimensions of its definition. Using concepts and classifications introduced in the first two parts, the third part explores also the composition dimension, along which the firm has a legal nature, as pointed out by Coase (1937).

A SIMPLE TRANSACTION MODEL

Concepts of the Model

Revenues of a firm are a sum of transactions, or more generally a dot (or scalar) product of a price vector and of a quantity vector. Its costs, either those generated by the purchase of goods and services, qualified in national accounts as secondary inputs, or those generated by the hiring of the primary inputs labor and capital, are also dot products of vectors. The prices in these mathematical descriptions of revenues and costs are **transaction prices** (Ptr), defined as the price at which the parties agree to trade. Some other price concepts are useful for representing a transaction.

The **acquirer's reserve price (Pr-a)** is defined as the price above which the buyer or prospective acquirer does not trade. Other expressions will be used to refer to this same amount, for instance the willingness to pay defined as "the maximum amount that the customer would pay for that product" (Spulber, 2009b, p.219). In the simple case of a consumption good readily consumable, **Pr-a** is the money value of the satisfaction of a need. Besides the characteristics of the good, other variables impact on this money value: the income and the wealth of the buyer, the expected transaction prices of substitute goods.

The **vendor's reserve price (Pr-v)** is defined as the price below which the vendor or seller does not trade. In the simple case of a used good, it will depend on the highest value of the possible uses by the vendor; we can then indistinctly speak of the seller's reserve price and the opportunity cost. In the case of manufactured goods, this will depend, among other things, on the level of transformation and the characteristics of the technology. It is analogous to the unit cost of production provided by the accounting data. There is, however, a difference; the input unit cost isn't based on transaction prices between the manufacturing firm and parties it trade with to get inputs, but rather on these parties' reserve prices.

People who do business do so for an expected gain. Three concepts make it possible to specify this gain: a fourth « first » concept of the model, besides the three previous price concepts, and two secondary concepts, derived from first concepts. One secondary concept is **gross gain from exchange (GGE)** given by the difference between the buyer's reserve price and the seller's reserve price. The fourth « first » concept of the model is the **cost of exchange activity (CEA).** It includes costs involved in the realization of a transaction. These costs fall in three categories. First, there are transportation and financing costs if both parties are at a spatial and temporal distance from each other. Secondly, there are transaction costs corresponding, in the neoclassical sense (Allen, 1998), to the « spending on time and resources, monetary and others such as expertise, associated with the process of buying or selling » (McAuliffe, R.E., 2005, p.241). Thirdly, there are taxes and other legal fees imposed on the transaction. The other secondary concept of the model is **net gain from exchange (NGE)** given by the difference between gross gain from exchange and cost of exchange activity.

Value Creation and Firms

Figure 1 represents the simple transaction model in a situation allowing the net gain from exchange to be positive. The net gain from exchange measures value creation by the transaction. From a transactional perspective, any firm is an intermediary. For example, the used car dealer will find a buyer for the car of an owner willing to sell it. In Industrial Classifications, car dealers belong to the Retailing Industry. Generally, what distinguishes a manufacturer firm from a car retailer will be the greater number and the greater diversity of owners of primary inputs (employees, lenders, investors) and of owners of secondary inputs (suppliers) it intermediates with for its customers. Because they combine several transactions and develop expertise, firms as intermediaries will be able, for numerous categories of transactions, to realize transactions with a lower CEA, thus generating a larger net gain from exchange, that is, higher value creation. **Figure 1** distinguishes the **cost of exchange activity with the intermediation of a firm (CEAwI)**, for situations where this intermediation is beneficial.

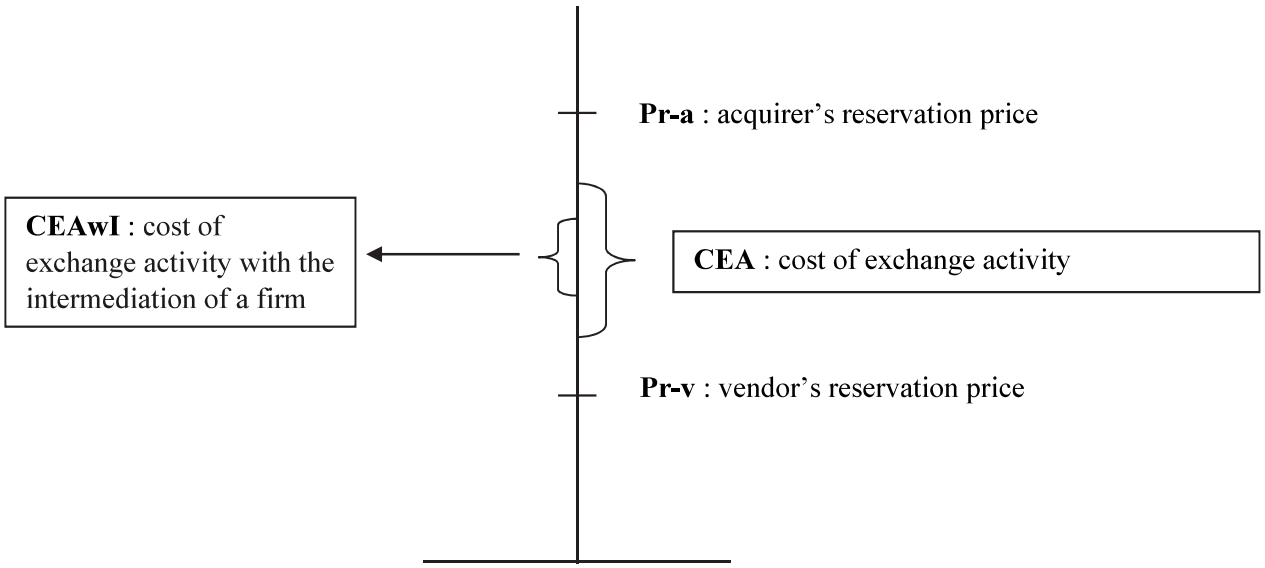
Necessary and Sufficient Conditions for a Transaction to Occur

Following the logic of the model and the definition of its concepts, there will be no transaction when Pr-v is higher than Pr-a since there will be no price at which both parties will be willing to trade. Such

prices exist when Pr-a is higher than Pr-v, that is, when the gross gain from exchange (GGE) is positive. In order for the parties to have an incentive to transact, the net gain from exchange (NGE) must also be positive. In other words, the GGE must be greater than the cost of exchange activity (CEA). These two conditions are not enough to ensure the completion of a transaction.

In societies with a commercial tradition, human beings learn rapidly, as they experience social life, to silence the value of their reserve prices. Vendors will not know the reserve prices of prospective acquirers or buyers and vice versa; furthermore, everyone wants to gain as much as possible from the transaction. Therefore, ignorance and conflict will be in the backdrop of any transaction.

FIGURE 1
SIMPLE TRANSACTION MODEL WITHOUT AND WITH THE INTERMEDIATION OF A FIRM



Source : B.M. Papillon (2001).

In order for a transaction to occur, both parties must agree on a price at which to trade, the transaction price. The two parties can agree or can disagree. The customer can buy or not buy the product at the price displayed. The job candidate can accept a job under the conditions offered or not accept it. A financial institution may or may not grant a loan. A new collective agreement may or may not be accepted resulting in a strike or lockout, a company may agree to purchase from a supplier or not do it ... The transaction is the basic unit of economic activity in the context of specialization of tasks. The realization of a transaction does not come in various degrees: it occurs or it does not occur. At its basis, economic activity is dichotomous. This dichotomy relates to the indetermination of the transaction price, or in other words, to the large number of price candidates for a transaction price.

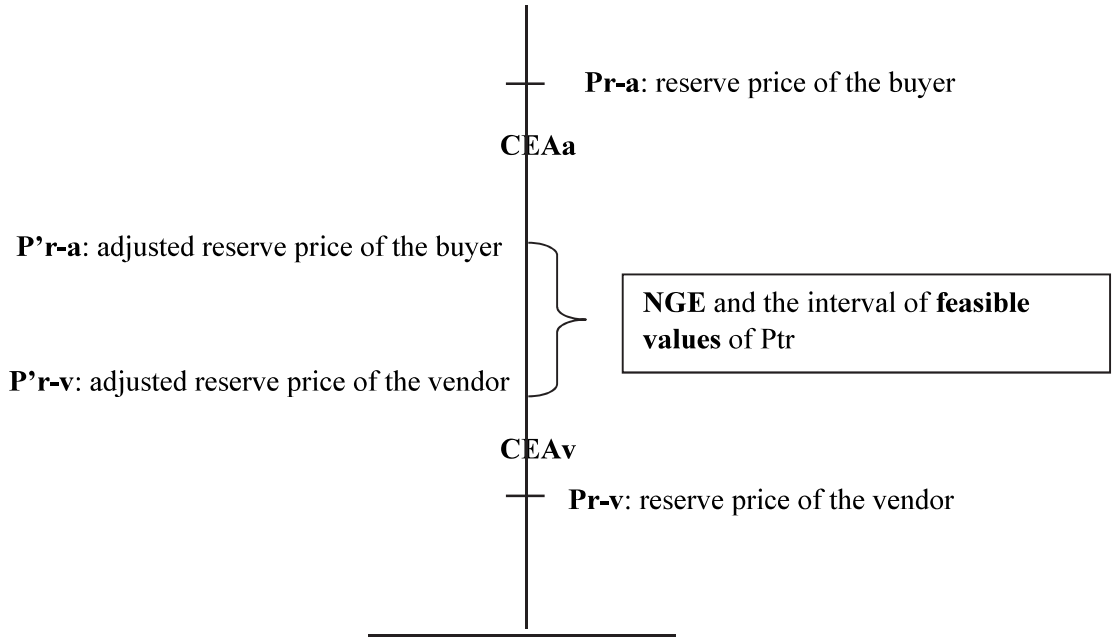
Transaction Price Indetermination, Competition and Globalization

In order to be more precise about transaction price indetermination, it is useful to introduce two other price concepts, represented on **Figure 2**. They are secondary notions of the model. First, there is the **adjusted reserve price of the buyer** (**P'r-a**), derived from the Pr-a, which has been reduced by the portion of CEA assumed by the buyer or the acquirer of the product being traded (**CEAa**). Secondly, there is the **adjusted reserve price of the seller** (**P'r-v**), derived from the Pr-v, which has been augmented by the portion of CEA assumed by the seller or vender (**CAEv**). The distance between the P'r-a and the P'r-v measures the net gain from exchange (NGE). Moreover, the interval delimited by P'r-a and P'r-v represents the numerous potential candidates or feasible values of Ptr, the transaction price, in the

sense that any value within this interval provides an incentive to each of the parties to trade. But a Ptr very close to the adjusted reserve price of the buyer gives him a very small part of the NGE which will be mostly captured by the seller and conversely if the Ptr is very close to the adjusted reserve price of the seller.

Each party wants as high a share as possible of the NGE, which is conflictual. There is, however, ignorance on both sides of the reserve price of the other party; therefore, the size of the interval delimited by P'r-a and P'r-v is not a common knowledge shared by the parties. There is a basic indetermination of transaction prices, and this indetermination is all the greater as the interval delimited by the P'r-a and the P'r-v is larger. Competition between sellers of a product, by providing opportunities for the buyer to purchase from a variety of sources, will tend to reduce the reserve price of the buyer for the product of a particular seller, and by the same token, to reduce the size of the (P'r-a , P'r-v) interval representing transaction price indetermination.

FIGURE 2
TRANSACTION PRICE INDETERMINATION: NGE AND FEASIBLE VALUES OF Ptr



In a number of sectors, globalization will increase the number of independent sellers from which a given clientele can buy a product. It increases competition. With a greater diversity of products available, the buyer has access to a wider variety of substitutes; this will also tend to reduce the reserve price of the buyer, and thereby to reduce transaction price indetermination. Globalization, by increasing the diversity of products accessible, is therefore reducing transaction price indetermination. It remains, however, that the main challenge, both for a decentralized organization of economic activity as well as for business management, is to resolve this indetermination.

As a measure of price indetermination, its conceptualization in Figure 2 is truncated. Some elements of the CEA are specific to the buyer or to the seller, especially the time and other resources required by some initial steps; for instance the owner of a used good who want to put it for sale will need to make it known. The allocation of other elements of CEA between the buyer and the seller is, however, indeterminate. In a used car transaction between two individuals, an inspection by a car mechanic, given limited knowledge of one individual or the two of them, may be useful. How is the cost of the inspection shared between the two? As a measure of price indetermination, the (P'r-a , P'r-v) interval should be enlarged by these elements of CEA. From a social perspective, this paper claims that the firm, in one of

its role, is similar to price setting organizations for instance the Chicago Board of Trade. It is to resolve this price indetermination.

INPUT-OUTPUT, TRANSACTIONS' CLASSIFICATION AND FIRMS' BOUNDARIES

Flows of Products, Production and Exchange

For the population in general, economic activity is associated with the physical production of numerous things and with the accumulation of machines, of buildings, of infrastructures, and of transportation and communication equipment. This accumulation supports flows of goods and services required by current and future levels of production. This more tangible view of economic activity has been present in early economic thought.

Input output tables measure flows of goods and services through various industries, from raw materials to final products. It is an informative description of the production activity, with an emphasis on technology. The first input output tables were published in 1941 by W. Leontief; produced from data on economic activity in United States, they described the structure of the American economy in the 1920's. In many countries, the system of national expenditure and income accounts generating GDP estimates will include input output tables; these tables, coming usually later in the statistical agency production cycle of national accounts, synthesize more data than the expenditure and income accounts and are useful to finalize the GDP estimates. Input-output tables had a predecessor in the work of F. Quesnay who presented Economic Tables in 1758.

« Economic activity has been classified as production, consumption and exchange » (Hurwicz and Reiter, 2006, p.14). Associating consumption and exchange with economic activity will challenge the intuition of many students more comfortable with the tangible aspects of production. In the case of consumption, one can however imagine numerous situations where the actions of the consumers are analogous to activities in production. The car consumer driving to work is doing something very similar to the work of a bus or taxicab driver with the difference that is both the driver and the passenger. The actions of a cooking appliance consumer preparing a meal at home, after work, are very similar to the actions of a restaurant cook, with the difference that the meal being prepared is for oneself rather than for others.

In most situations, consumption will embody some production activities for oneself or other members of the household. In the case of exchange, its association with economic activity is even less intuitive since there is no easy analogy to make with production. Looking further into input-output tables is helpful. While input output tables give formal expression to production views composed of images related to the physical transformation of materials, the informational content of these tables, however, is not purely technological.

A typical input-output table will have columns identifying categories of outputs and rows identifying categories of inputs. One entry in the table will indicate the amount of input of the corresponding row required in the production of the industry of the corresponding column. Entries are in dollar amounts, and factoring out prices, they stand as coefficients summarizing the working of current technology; for instance, how many tons of coal are required for one ton of steel. At this point, one could be tempted to identify input output tables with the technological structure of production, and pushing the logic, to oppose it to the institutional structure of production, emphasized by R.Coase in his 1991 Nobel lecture.

There are two categories of inputs in input-output tables: intermediate inputs and primary inputs. Intermediate inputs for industry A are some outputs of other industries used by A in its own production, for instance the coal supplied by the mining industry and used by the steel industry. Primary inputs correspond to labor and capital used in each industry. The term primary is no coincidence; all products require primary inputs otherwise the wood remains as forest trees and minerals remain underground.

The extent of the information about technology reported in input-output tables is a corollary of the distinction between intermediate inputs and primary inputs. This distinction derives from the boundaries of the firm. Although input output tables emphasized the technology dimension of production, input-output tables capture also some of the organizational and less tangible aspects of production. For

empirical researches on theory of the firm and on vertical integration, using input output tables is useful, but needs some complement.

For instance, Frésard et al (2017) use data set on product description at a much higher level of details than the product classification of input-output tables, in order to test hypotheses on firms' boundaries. Among their findings, there will be less vertical integration when transaction costs or "contracting difficulties" are important; they give the example of firms in R&D intensive industries. Another example is Atalay et al (2014a). They find that the main reason for vertically integration is not the transfer of products or intermediate inputs between establishments along the production chain but efficiency gains from sharing intangible inputs. They need also to go beyond input output tables in order to test their hypotheses; the online appendix of their paper explains the data limitations:

> … consider the two following hypothetical firms. One has two establishments. The upstream establishment refines copper ore into billets which are then shipped to the downstream establishment to be extruded into pipe. The second firm operates a similar production process in a single establishment: one side refines ore into billets, and the other side turns billets into pipe. We would define the former establishments as vertically integrated, but not the latter, even though each firm operates the same production process (Atalay et al, 2014b, p. 12, 13).

The distinction between intermediate inputs and primary inputs depends upon the existence of product flows through firms' or establishments' boundaries; it is conditional upon the nature of the organization of production. In the second firm above with one establishment, the intermediate input in the form of "copper billets" is replaced by the primary inputs labour and capital employed for the refinement of copper ore into billets.

In a world of complete integration of production within one very large firm, there would not be intermediate inputs beyond establishment boundaries. Historically, this situation is not wholly hypothetical as the one firm economy was evocated by Lenin in the first large experience of socialism; in the combined scenario of the private property of production means and of competition, even for a same level of task specialization, there will be a large number of firms supplying intermediate inputs to other firms.

There is a relationship over the very long term between specialization and the number of firms. Artisans of the old days, combining numerous activities in a vertically integrated process to supply consumer products, have been largely replaced by numerous firms belonging to a large diversity of industries and sectors managing very specialized tasks. Large vertically integrated firms of the first decades of the 20th century follow a similar path; reorganizations, which have become so common, tend to reduce their scope of activities and bring more specialization.

Specialization, Firms and Transactions

Thinking about the couple and the family, some task specialization is part of human history since its beginnings. With social organization, it has further developed. Trade and exchange, a corollary of specialization, go very far back in human history. Another turning point in the evolution of specialization has been the second agriculture revolution and industrialization. With globalization, it has kept increasing. Before industrialization, local needs were satisfied largely from local resources. Since then, the distance between production locations and where needs are satisfied - where consumers and households live - is growing. Production is more and more spatially specialized.

High levels of specialization has posed an organizational problem of unprecedented magnitude in history. First, people are more dependent on others and more concerned with sharing the benefits of specialization. Secondly, how do we ensure coordination, if each one carries out tasks more and more specialized?

Along with industrialization, various forms of organizations have developed. As reported by Spulber (2009) in a synthesis of researches tracing the emergence of firms from earlier forms of exchange-oriented productive organizations, "the establishment of the contemporary firm accompanies the emergence of the industrial economy" (p.102) and, we might add, of globalization, which is its continuity. As observed by Hart (2011) citing some empirical researches measuring both the growth in the size and in

the number of firms (Lafontaine & Slade (2007) and Rajan & Zingales (1998)) economic growth and globalization on the one hand, and growth and multiplication of firms on the other are closely related.

Firms are organizations dedicated to value creation and in the perspective of the simple transaction model, they support the growing level of production under specialization by resolving price indetermination and by reducing the cost of exchange activity (CEA) for given transactions, increasing the number of potential transactions for which the net gain from exchange is positive (NGE). Because ignorance and conflict are in the backdrop of any transaction, the firm will help to solve two problematic situations in a transaction. First, there is the mutual information asymmetry regarding reservation prices and there is an information asymmetry between the specialized producer, worker or supplier regarding the characteristics and quality of the product and the prospective buyer of the product. As intermediary, the firm will acquire relevant knowledge about the product and develop a reputation about it. Secondly, the prospect of a net gain predisposes to cooperate but the spirit of cooperation is constrained by the rivalry that arises from sharing this gain, one being an aggravating factor of the other. Problematic situations increase the probability that parties refuse to agree on a transaction price, even if the expected net gain is positive. The transaction price is the rule for sharing the gains and the firm can help to resolve some of the transaction price indetermination. By developing a reputation of helping to realize transactions beneficial for parties involved, proposed or posted prices by the firm become transaction prices for many.

It is useful to introduce a classification of transactions of the firm.

The firm generates revenue from transactions in which it sells its products. Through transactions with other firms, it buys products that it processes or stores for resale. Transactions in which the firm may be seller or buyer of products are qualified as *peripheral transactions* to the firm. They differ from transactions in which a firm will buy another firm. Transactions increasing the production capacity of a firm are qualified as *constitutive transactions*. Constitutive transactions involve one of the two or the two primary inputs, capital and labor. Unlike intermediate inputs, that is, the goods and services bought from other firms, these inputs will usually be more directly involved in the value creation process of the firm. In addition, mechanisms like auctions for managing transaction price indetermination will be of limited use with constitutive transactions, bilateral bargaining being more prevalent. *Intrinsic transactions* make up the third and last category of the classification.

Like constitutive transactions, intrinsic transactions involve primary inputs. To some extent, they are a follow-up on constitutive transactions. In general, contracts coming with constitutive transactions are far from complete, because of limitations coming from bounded rationality and asymmetric information. In the mid-size range and for the primary input capital, many fast growing firms will share ownership with a venture capital fund. The initial formalization of the association is a constitutive transaction. It is also the beginning of an adventure. The transaction price defines both the cost for the firm of the fund participation and the yield for the fund. Even if there are laws and formal contracts, including a shareholder agreement, unforeseen elements will arise requiring various dealings between the firm and the fund manager. These dealings or intrinsic transactions will frequently revise the transaction price. Even with debt financing from a bank, the contract will also be incomplete. The contract will sometimes run for several years and the effective rate of return is determined only at the very end. During this period, it is possible that certain contractual clauses referring to balance sheet items be revised resulting in unforeseen costs. Insolvency may also occur, resulting in costs and renegotiations, changing the "transaction price" with the lender. The situation with labor, the other primary input, is somewhat similar.

Following a job interview, the firm may sign a labor contract with the candidate. This constitutive transaction is a bet on the future for both the new employee, having expectations regarding monetary and non-monetary benefits of the job, and for the firm, having expectations on the contributions of the new employee. The employment relationship is, then, a sequence of intrinsic transactions with changes for both sides, at different levels: wages, motivation, ardor and effort, quality of cooperation with other employees, and the conditions of the working environment (office space, working schedule, air quality ...), these conditions translating into costs or savings for the firm and affecting the employee well-being.

While it appears intuitive to claim that firms in retail or wholesale trade are intermediaries, firms of any sector of activity are intermediaries. What is changing from one sector, for instance manufacturing, to another sector, for instance mining, it is the composition of inputs bought or hired by the firms.

Value Creation and Measurement

Debreu's Classification and Analogy on Firm's Role

Value creation by the firm comes from contributing to satisfaction of human needs; "all value creation begins with the company's final customer" (Spulber, 2009, p.218). Firms can produce consumer goods or services, or produce upstream of finished products, in the form of raw materials or semi-processed products. To represent this value creation, it is useful to establish initially a value classification of products. For illustration purposes, a classification limited to goods is sufficient. Debreu (1959) identifies a product by its physical characteristics as well as the place and the date it is available. Referring to physical characteristics is very intuitive: a ton of steel has characteristics that give it more value than all the tons of ore used in its production. Although a ton of steel will go through some other transformation before contributing to the satisfaction of a need, such as a home appliance let's say a stove in the need for eating, the characteristics of steel make it a product closer to a satisfaction of needs than ore. The place and the date are less tangible.

If your cell phone works well today, say August 21, 2018, the value you place on a second identical cell phone will be low. If in three days, on August 24, 2018, you drop it when crossing the street and a car drives over it, the value that you will give this second identical cell phone will be higher. The value of a thing depends on its ability to satisfy a need and this ability is not only a function of its physical characteristics but also the date it is available and the place where it available. In a northern country as Canada, a cord of firewood in the forest, two hundred kilometers from a city in July, has much less value than in January, when it is - 30 degrees Celsius, and is available nearby, in the inventory of a city merchant.

One can represent the value classification of Debreu by a space of multiple dimensions: the three dimensions of physical space, the time axis and the hundreds of thousands of dimensions to describe the product physical characteristics. The growing distance between needs and resources, mentioned above in connection with increasing specialization is a distance in this multiple dimensional space. Value creation stems from some travelling in this space; there is value creation when some resources get closer to a need.

Knowledge and physical as well as intellectual effort are required in all production sectors. For changes in physical characteristics, value creation will also require equipment and buildings and for changes of locations, it will require infrastructures, built or natural, such as canals, rivers and highways, and transport equipment. For changes in dates, value creation is generated with inventories of wholesalers and retailers; an item in inventory has a date changing continuously. From a value creation perspective, inventories are analogous to the carriers of a trucking company, in changing locations, or to the furnace of a steel plant, in changing physical characteristics of ore. For simplicity, discussion is limited to goods.

The value classification of Debreu is useful to describe generically value creation and to describe intuitively firms' contribution to this creation. The firm is a vehicle travelling in a multiple dimensional space, bringing resources it owns, or manages temporarily, closer to needs.

Value-added and Inputs

With the input-output classification and accounting data, value added is a well-defined measure. At firms' level, it corresponds to the income of the two primary inputs, labour and capital. Frequently, it is calculated by subtracting from sale revenues of firm X its expenses on intermediate inputs, in other words, the amount of its purchases of goods and services from other firms. In national accounts, this way of doing provides a check on income account estimates while avoiding double or multiple counting.

Accounting data entering in the calculation of value added by firm X are based on transaction prices between firm X on one hand and on the other hand its clients, its suppliers and the owners of primary inputs that it uses. The simple transaction model exposed above underlines limitations of value added by firm X as a measure of value creation through transactions involving firm X. First, in transactions with

buyers of the products of firm X, value added does not include their net gain from exchange; in transaction with suppliers of intermediate inputs to firm X, it does not include either their net gain from exchange. Secondly, it includes the cost of exchange activity assumed by firm X in these two sets of peripheral transactions of firm X.

Thirdly, and although value added of firms X appears as a residual when computed as a difference between revenues and some expenses, it relates more directly to the complex of constitutive and intrinsic transactions of firm X. These transactions will be either between the two primary inputs personified by the owner(s) and the employees or, in large firms, between their respective representatives: president and vice-president(s) selected by shareholders and union leader(s) selected by employees. As for peripheral transactions with clients and suppliers' of intermediate inputs, value added has limitations for measuring creation of value in constitutive and intrinsic transactions. Value added is based on the whole transaction price which includes, besides the net gain of exchange or value creation, the cost of exchange activity assumed by capital ("owners") and labour ("the employees"), and their respective reservation prices. In various ways, theses limitations recalled those discussed by Milgrom & Roberts (1992) in relation with the transaction approach and those discussed by Besanko et al (2010) in relation with accounting data.

Let us recapitulate. Firms are organizations orienting, through transactions, flows of products in a world of growing specialization. Value creation is a reminder that in this world, earning a living is conditional upon the ability to sell; we sell what we have and we must sell what we have. As a measure of value creation initiated from the firm, value added has a number of limitations. From the point of view of firms' management, and in order to gain perspective over measurement limitations, what is at stake in the amount of value creation that the firm leaves on the table for the parties it transact with?

Goodwill, Credit Rating, Motivation and Reliability

Value creation originates from the needs that a firm contributes, directly or indirectly, to satisfy. The analysis of firms contributing indirectly would be analogous to the analysis of derived demand in microeconomics; for simplicity, the discussion is limited to cases in which the firm contributes directly. In these cases, the acquirer or buyer's reservation price (Pr-a) of the simple transaction model corresponds to a money value of the satisfaction of a need. The goodwill of a firm, in other words customers' attachment to the firm's products, is based on a transaction price that is lower than the clients' Pr-a. Clients' attachment is due to the feeling of having made a good deal. The intensity of this feeling corresponds here to the gap between these two prices, intensity growing with its size.

Furthermore, in the distance between these two prices, there is the portion of the cost of exchange activity (CEA) assumed by the buyer. Among strategies for maintaining or even increasing goodwill, the firm can also adopt practices or introduce contractual clauses reducing this portion, increasing then the net gain from exchange the buyer will realize. For instance, the firm may find ways to reduce information costs, as in some advertisement, or to reduce buyers' concern about information, as with a warranty.

The same reasoning can be used for the other peripheral transactions of the firm, on the side of its suppliers, as well as at the level of transactions which are constitutive of the firm, that is to say with the employees and with its financial sources. Rather than referring to goodwill, we will refer here to motivation and reliability of employees and of suppliers and to the credit rating of the firm. The common denominator of all that is some portion, non-negligible, of value creation left to others. More precisely, it is the respective portion of value created retained by each of the firm "transacting partners", net of the cost of exchange activity assumed by these same "transacting partners": clientele, suppliers, outside sources of financing and employees, including here, in the case of large firms, all level of managers, and internal sources of financing ("the owners").

FIRMS BEYOND ANALOGIES

Definition of an Object and Economic Theory

In the theory of knowledge, we generally distinguish four ways of defining an object. A first one, based on the taxonomic approach, associates it with similar objects. A table is a piece of furniture. A

second way, called genesis, traces its origin. A plant comes from a fertilized seed combined with the effect of time in a favorable environment. The third way describes its function. As for the first way, it is necessary to rely on a larger entity, for example furniture, or on a context, daily life activities. A fourth way describes the composition of the object, names its constituent elements. For an inanimate object as a table, the second way and the fourth way converge, the genesis of the thing specifying an assembly order of elements.

For a long time, the object "enterprise" and, before that, entrepreneurs have been a topic of economic analysis with a focus oscillating between the third and fourth ways of defining an object. Coase (1937) focuses on the gap in economic theory between the allocation of resources by a price mechanism and that by a coordinating entrepreneur. He defines the firm by its coordination function and the constituent element is the employer-employee relationship, which leads him to consider the concept of enterprise close to the legal concept of "employer-employee" (Coase, 1937, p.403, note 3).

As recalled by Knight, people …"in general, and within limits, wish to behave economically, to make their activities and their organization "efficient" rather than wasteful" (quoted in Milgrom & Roberts, 1992, p.19). As for economic theory in general, the economic theory of the firm has much to do with the understanding of this behaviour. For coherence and for the preciseness required by applications, this understanding comes with mathematical formalization. Before the recent decades' emphasis on optimization with respect to organization, particularly vertical integration, the microeconomic theory of the firm has focused on optimization with respect to activities, which is what G.C. Archibald (1987) review of the theory of the firm primarily emphasized. Price indetermination has not been a theme of the theory, price analysis being limited to peripheral transactions, and more specifically to quasi-rent considerations and the effect of competition. Archibald also refers to the writings of Simon, Nelson and Winter, ... questioning the feasibility of optimization behaviour. On pricing by firms, he refers to simple methods evocated by Cyert and March, such as mark-up in retail trade. Mark-up is based, however, on production costs regardless of the buyer and his/her reserve price; price indetermination, as put forward by the simple transaction model, is not part of the picture.

Archibald surveys also some of the early contributions following Coase (1937), on transaction costs, particularly Jensen & Mecklin (1976) on agency costs. Within the transaction taxonomy presented above, they focus on constitutive transactions. The firm "is simply one form of legal fiction which serves as a nexus for contracting relationships and which is also characterized by the existence of divisible residual claims on the assets and cash flows of the organization which can generally be sold without permission of the other contracting individuals" (Jensen & Meckling, 1976, p.311). As for Alchian & Demsetz (1972) before them, Jensen and Mecklin approach the composition of the firm by referring to a network of contracts. There is, however, a difference. Jensen and Mecklin emphasize constitutive transactions related to the primary input "capital" while Alchian and Demsetz emphasize constitutive transactions related to the primary input "labour".

Alchian and Demsetz refer to the transaction price in a discussion of the challenges of measuring productivity of human effort in team in order to establish a remuneration contributing to efficiency; Jensen and Mecklin refer to the remuneration of managers in relation to their performance. Neither of these authors, however, state explicitly the problem of price indetermination. Following the work of Alchian, Demsetz, Jensen, and Mecklin, economic research on theory of the firm has grown exponentially, and has largely focused on contracts and the difference between incomplete more comprehensive contracts. In the transaction classification presented above, these more comprehensive ones relate to peripheral transactions with suppliers of the firm while incomplete contracts relate to firm constitutive or intrinsic transactions.

Many writings, following Coase tradition, will oppose the "firm", characterized by incomplete contracts, to the "market" characterized by contracts more comprehensive even if these contracts are between two firms. Analysis of vertical integration focuses on substitution between the two types of contracts; the claim is that "market" minimizes production costs because it allows for more task specialization and that the firm minimizes transaction costs which are lower with incomplete contracts.

With its emphasis on contracts, some economic analysts consider that "ìn contemporary economic theory the prevalent conception of a firm is essentially legal" (Mount & Reiter, 2002, p.12). We can also find jurists who will argue the opposite, "the firm is at the base an economic concept rather than a legal one" (Lacasse, 2011, p.49). For a matter of perspective, it is interesting to note that in a sociological analysis of the firm, negotiations replace contracts. For instance, Langevoort, D.C. (2004) argues that, in a view of the firm as "a nexus of negotiations, successful coordination begins with agreement about the prevailing state of affairs » (p.15).

Role and Composition of the Firm

In the basic economic scheme, we distinguish on the one hand, a limited set of resources and, on the other hand, a set of needs that extends to infinity. There are various ways to classify needs, for instance the Maslow pyramid starting at the base with physiological ones. The economic scheme represents the scarcity hypothesis, which is so dear to economic analysis, and captures the basic economic question of how to allocate limited resources to an unlimited set of needs. This is not, however, its main interest here.

In the contemporary world, needs of various groups of people are met increasingly by resources increasingly remote, making the distance between resources and needs larger. This transformation, initiated with industrialization, has accelerated with globalization. Among the factors responsible for this, we have an increase in the minimum efficient size of production units, an increasing diversity of products, as well as innovations in the field of transport and communications, reducing the costs of distance. The distance is both geographical, temporal and in terms of the diversity of intermediate inputs and of products, hence the previous vehicle analogy moving resources closer to needs and value creation as a corollary of this rapprochement. How to be more precise?

Functions of the Firm

Founders of a management science, particularly Fayol and economists interested in the entrepreneur, Cantillon and Turgot in the 18th century, Say and Cournot in the 19th, Schumpeter in the 20th, carry an integrated vision helping to link to the basic economic scheme and value creation what animates the firm in the image of a vehicle. A summary of these economists' contribution by Barreto (1989) distinguishes four functions reduced here to three: uncertainty bearing, coordination and arbitrage. There is a concordance between these functions and management tasks, as regrouped within specializations offered in most business schools (corporate finance, management, marketing…), the functions being another way to classify the tasks. It is a classification putting into some perspective the contingencies and factors conditioning the creation of value.

The firm carries a number of activities in order to bring resources closer to needs. Their value when undertaken is uncertain and will be known only when a satisfied human need will be paid for, and this payment occurs at some "distance" from when and from where the use of a given resource was contracted. The first function of the firm is to be the front bearer of this uncertainty. In this function, it uses savings of owners and receives the support of financial intermediaries as well as individual and institutional investors. Tasks in corporate finance relate to the function of uncertainty bearer.

The second function is coordination, required in the day-to-day operations of the firm. Coordination problems arise when the best action for an individual depends of the actions undertaken by other people (Besanko et al, 2010, p.78). For instance, the early or late arrival of a stock of semi-finished products can increase costs or reduce sale revenues; operation and logistic tasks would fall within the coordination function. An even more significant component of coordination tasks, for most firms, will be human resource management. Within Barreto's synthesis, as used here, motivation and agency problems falls within the coordination function.

The third function is arbitrage. It means that the firm searches for, within its range of activities and competences, more valuable needs to fulfill and / or less expensive resources to use. These more valuable needs or less expensive resources are conjectured by the firm from various sources, including transaction price data information A fourth function in Barreto (1989) is innovation, either cost reducing or product value increasing. Within Debreu multidimensional space, innovation is a form of arbitrage. A cost

reducing innovation by input substitution is some kind of backward-looking arbitrage, focusing more on resources. A product innovation is some kind of forward-looking arbitrage, focusing more on needs. In these arbitrages, firms search characteristics more valuable than their cost. The concept of innovation includes sometimes a third type, "process innovation". The activities related to it are a border case in the classification proposed by Barreto (1989) as the coordination function could include them.

In the transaction classification presented above, coordination is associated with intrinsic and constitutive transactions involving the primary input labour; it is also associated with particular aspects of peripheral transactions, particularly the logistic ones. Arbitrage within the same classification would be rather associated with peripheral transactions and with transactions involving the primary input capital. One must keep in mind, however, that classifications are an analytical tool and although a very basic one, they are not "watertight" under changing perspectives. Under the systemic perspective of the transaction cost literature, marketing relates to coordination while in the current perspective, the micro one of the management of a firm along with the simple transaction model which frames it, it falls within the arbitrage function.

In the simple transaction model, value creation originates from the realization of transactions with a positive net gain from exchange (NGE) along with the resolution of the transaction price indetermination. The NGE derives, in the first place, from reservation price variables. The arbitrage function, including innovation, relates to the reservation price of the buyer or the acquirer (Pr-a) and to the reservation price of the seller or vendor (Pr-v). The arbitrage function searches to increase the gap between the two, this gap measuring the gross gain from exchange (GGE). The coordination function relates to the cost of exchange activity (CEA) with the objective of making this cost lower. The uncertainty bearing function relates also to CEA; if the firm does not assume this function, it implies that its clients will have to pay in advance the product they would like the firm to produce. This would imply very costly contracts, making CEA higher than otherwise. Imagine for instance that a milk consumer needs to contract in advance with a dairy for having milk home-delivered weekly or that a sea shipping company needs to pay everything in advance, including the investment cost of the dry dock for having a shipyard constructing a cargo.

The initial condition of having transaction price indetermination resolved relates to CEA and to the ability of the firm to lower the cost of transaction price determination. Department stores, for instance, have used posted prices since a long time. This practice, when supported, informally and sometimes formally, with a multiple unit sequential trading auction model, either Dutch or English, in other to use relevant historical and current data to adjust posted prices, can help to optimize the volume of transactions.

Elements Composing the Firm: Law, Customs and Usages

Taxonomy, genesis, function, and composition identify the four different ways to define an object. Following previous considerations, firms belong to the set of production organizations, and if compared to households or cooperatives, their production is for people other than those involved in their production activities. The "steering" of the firm as a vehicle bringing resources closer to needs combine three functions: uncertainty bearing, coordination and arbitrage. The enterprise originates of constitutive transactions giving it access to capital and labor, which results in integration of activities, horizontally when similar, or vertically when downstream or upstream of its main process. To complete the definition of the firm, there remains its composition; what are the constituent elements?

If someone selected at random is asked to describe the composition of a firm like Westinghouse, it is most likely that the person will talk about the physical installations of Westinghouse, the know-how of its labour force or the amount of financial capital Westinghouse can have to support various ventures. In other words, the person will talk about the resources to which Westinghouse has access. In the spirit of many people, a distinct concept of firm does not exist as it is confused with the concept of resources. What are the firm' components, if not the resources it manages? Different ways of defining an object are interrelated; for instance, components of the firm should give some clues about how, from an organizational perspective, its functions operate.

Human behavior presents infinite possibilities, imagination being the only limit. The axis of real numbers extending from minus infinity to plus infinity is a picture of this infinity. Coordinated, value-creating actions are very small intervals along this axis, as it is the case for members of a professional sport team. Economic analysis addresses this issue by looking at contracts. What is a contract? It is a set of binding rules as it is the case of law. Contracts, along with firms' related laws (corporate law, bankruptcy law, …) which contracts extrapolate, provide a set of rules. These rules are a first component of the firm. The other components of the firm consist of other ways of constraining or guiding behaviour of people associated with the firm.

For peripheral transactions, rules are mainly from contracts, usually with many clauses as they aim to be as complete as possible. In a situation not ruled by the contract, in other words, when faced with contract incompleteness, parties will try to agree on ways of doing things, setting precedents that act as a rule for similar future situations. For intrinsic transactions, the rules derive from contracts, but also from customs and practices defining the culture of the firm. Constitutive transactions relating to labor input rely on employment contracts that are relatively incomplete, but of limited duration; for those involving capital units, physical or less tangible (patents ...), the extent of contracts will vary. Constitutive transactions for the acquisition of another firm rely on very elaborate contracts, as complete as possible. However, an acquisition involves the marriage of two organizations with their respective cultures, each culture carrying, according to Cremer (1993) analysis, a set of rules guiding human behavior as well as a common language and a shared knowledge of certain facts.

Gradually, a firm develops, frequently by trial and error, the many rules making up its customs and usages, its culture. Any rule taken in isolation has little rationality. A few snippets of the firm's history offer a very circumstantial understanding of a firm's culture and for a new employee this will sometimes be the only "explanation" available. The situation is more delicate when the new employee is an externally recruited manager. The new manager decision-making authority is constrained by the rules of the firm's existing culture. Coase even makes such constraint the essence of the employment contract: « … the contract into which a factor enters that is employed… The contract is one whereby the factor … agrees to obey the directions… The essence of the contract is that it should only state the limits to the power of the entrepreneur" (Coase, 1937, p.391).

By its composition, the firm is a legal object in the sense that it consists of rules guiding and constraining behavior. Within this framework, each individual has some decision-making power, the importance of which depends on his management responsibilities. In bottom-up management, the decision-making power is disperse within the firm. In a hierarchical mode of management, the power of those at the bottom of the hierarchy will be limited to their level of effort and, we should add, in its unobservable sides. In addition, and as observed by Hayek (1945), changes can be frequent in the environment of the firm. Value creation is synonymous with adaptation to changes; it is the economic foundation of a decision-making authority within the firm.

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