Economic Foundations of Electronic Commerce

A Sketch of a Theoretical Framework

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Abstract

The paper explores the economic role electronic commerce will play in the evolving economic conditions of the next decade. It does so by developing the concepts of 'first order EC' and 'second order EC' distinguishing traditional trade supported by electronic devices and trade of this support itself. In chapter 1 this idea is introduced with the use of standard concepts of economic theory. Building on this analytical distinction, chapter 2 adds the concept of 'global players', which we think will be crucial for a realistic picture of economic dynamics of the next century. Large companies, national governments and groups of consumers are examples for global players. Again we lend ideas from economic theory to model their characteristics. Finally, in chapter 3, we show how market processes and political/economic processes (e.g. exchange rate developments) initiated by these global players might combine to encompass electronic commerce in a mid-term perspective. A concluding chapter highlights the advantages and shortcomings of the presented framework.

Introduction

Electronic Commerce is a new and prospering field of actual economic activity. But it is a rather less developed area of economic theory, proving once again that theory often follows practice instead of guiding it. Information economics, as initiated by Marschak and others, flourished in the 60-ies and 70-ies but became increasingly inattractive for young researchers as the difficulties of the field became apparent. Economists with their standard toolset had opened the box of Pandora: Production and consumption of information proved to be a quite different thing than what they usually dealt with. The standard toolset became obsolete.

This paper does not invent a new economic toolset. It also does not remain on a purely descriptive level, telling the success stories of EC. It tries something in between. In chapter 1 some simple economic concepts are used to introduce electronic commerce as an economic activity. In condensed form the importance of expectation formation and utility and 'value' evaluation are highlighted. Chapter 2 sets the arena, the world economy and the global players, in which the game 'Electronic Commerce' will be played. Finally chapter 3 comes down to earth and gives an idea of the mechanics of this play which currently can be observed.

1 Electronic Commerce as an Economic Activity

Economic activities are usually characterized by the fact that the involved actors are motivated by the pursuit of a goal, which usually is described as an optimization problem of an objective function. More precisely, economic transactors like consumers try to maximize expected utility derived from the expected consumption of goods, services and leisure time, while firms try to maximize expected profits. Goal seeking behaviour is essential for the characterization of economic actions.

Exchange of goods and services is a subset of economic activities[1]. It can be viewed as that set

[1] Two remarks are in order: First, his subset is a proper subset since there are activities, which are not exchange and still qualify as economic activity; e.g. production. Second, exchange of leisure time and its complement working time is excluded here because it overlaps with coercive, political actions which might generate appropriate concepts for the political economy of the production process, but has limited relevance for electronic commerce.

of actions that brings about a new distribution of goods and *services for which the expected utility or expected profit of the entity pursuing the trade* is rising. That is, the expected utility or expected profit of those goods and services I have given away in trade must be smaller than the one that I expect from the newly acquired bundle. Note that there might be a considerable change in the expected utility of the goods *not* involved in the trading process. A simple formulation for the condition for consumers to start trading activities is

$E(U(X))+E(U(R^X))\langle E(U(M))+E(U(R^M))$

Here X is the vector of goods and sevices given away while M is the vector of those gained. The vector R represents the goods and services not directly involved in trade. The suffixes X and M at the utility function signify that it is derived at a state where vector X or vector M are available too. A similar condition must hold for firms to engage in trade:

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$$E(V(X))+E(V_x(R))\langle E(V(M))+E(V_M(R))$$

In this case function V replaces the utility functions of consumers because the value V of a bundle of goods and services for a firm is derived differently and cannot be compared with the preference orders of individuals.

Commerce as a specialized activity of firms can be understood as exchange mediated by *money* and systematically performed by *special economic actors*. These actors, trade firms, take part of the difference between the two sides of the conditions of the inequalities given above and *enable* the original actors to perform the exchange. This implies that the original actors are *not* able to exchange their respective goods and services without a trade firm[2]. And it also implies that utilities of consumers and values for firms are represented by money, part of which can be charged by the trade firm for their intervention. From the point of view of trade firms a simple condition for intervention is

$C(X)+C^F+C^T\langle P(X)$

[2] It is one of the most attractive features of electronic commerce that, in principle, the intervention of 'unnecessary' traders can be circumvented.

It buys vector X for a price C(X), 'transports' it for a cost C^T and has some fixed cost C^F. What it earns from a sale of X is the amount P(X) which must be less than total cost. Clearly cost function C and revenue function P depend on the difference between the two sides of inequalities describing the motivation of original actors.

An important issue is the disability of original actors to enter trade relations without an intervening trade firm. This deficiency of actors can stem from different sources: There might be geographical reasons, reasons of time disparities, simply missing information on trade possibilities or mixtures of these. Trade firms have an incentive to deal with these difficulties in specific forms. While they will try to reveal the trading possibilities, they will at the same time support all those barriers to direct trade which make their own business necessary.

New information technologies lower the cost of information processing. Evidently, with lower cost the exploration of the universe of exchange for consumers and firms has been enhanced, a boom in trading activities has been launched. As far as traditional commodity trade is concerned, this means that C decreases (more possibilities lead to increased demand for trade), C^F decreases (lower administrative cost) and even C^T might fall a little (cheaper information on transport possibilities might strengthen competition and lower prices). This *direct* impact of information technologies lead to what we will call *'first order electronic commerce*'. Advertising, orders, billing and all administrative work of trade firms is electronically supported and thus enhanced to a more or less gobal level – but there still is the traditional physical commodity or service, which is delivered to the customer.

Contrary to that, *'second order electronic commerce'* can be analytically distinguished by its property to 'transport' pure information to the customer. This information, of course, must suffice the inequality conditions for trade given in the beginning of this chapter. Note that data items as well as descriptions of behavioral algorithms can constitute 'information'. In particular, information on first order electronic commerce could be the commodity traded in second order electronic commerce[3]. A striking feature of second order electronic commerce is that in this case C^T is drastically lowered, marginal cost for this position approach zero.

Taken together the two forms open up a field of commercial activities which due to its global

[3] Indeed this is the very reason why we named it that way.

dimension could lead to something like a renaissance of merchant capitalism. But, as with any comparison, some caveats are given. First, many types of information have to be considered as public goods and therefore should rather be bought by public institutions instead of small private owners. Second, national currencies and legislatures shape the terrain on which trade mechanisms work. As both cases show, political entities are an important ingredient for a realistic picture of what we will have to expect. These aggregated institutional bodies and groups of economic actors which actually interplay in global electronic commerce will be called 'global actors'.

2 The concept of Global Players

As the recent decade has shown, the dynamics of the world economy are mainly determined by the competition between the three major continental blocks, namely North America, Japan and Europe. A closer look at that plain picture immediately shows that there are economic and political actors at work, whose actions tend more and more to go beyond the blocks where they emerged. This is most evident for the large transnational firms, but it is also true for national governments which influence, e.g. with their exchange rate and interest rate policy, the economic conditions for their competitors. Electronic commerce will increasingly take a third type of important economic groups, namely consumers, a level above the nation state. Buying of an increasing share of the consumer bundle will become a global affair.

The interdependent, partly contradicting, partly colluding goals of these types of actors are not easily understood or represented. One reason is the fact that only *firms* seem to have a clear-cut objective function, though even in this case the difficulty to distinguish between long-run and short-run profit maximisation is a severe one[4]. It is much harder to nail down *government* behavior to a formal political-economic actor fitting in a manageable model. On the one hand they depend on consumer groups as well as on firms to be re-elected. On the other hand some of their major control variables, e.g. the exchange rate, are in a state of permanent flux co-shaped by the decisions of other national governments as well as by the decisions of large corporations. One of their most important instruments is to encompass national expectations – an instrument that easily can be proven counterfactual if not used wisely. Therefore there might be a differ-

[4] Another one is the question how to design the game-theoretic model that gives a realistic picture of the anticipatory capacities of firms in highly oligopolistic markets.

ence between pretended and actual, as well as between long-run and short-run goals. The problem for *consumer groups* is the well-known fact that the economic concept of utility is a metaphysical one. Strictly spoken utilities cannot be compared interpersonally, even worse, there is no hint how to measure the expected utility of something that a consumer group never consumed before. This issue clearly becomes urgent with the newly provided services of electronic commerce.

Despite these problems what follows is a sketch of a simple description of the interaction between the three types of actors. Figure 1 represents these interactions.

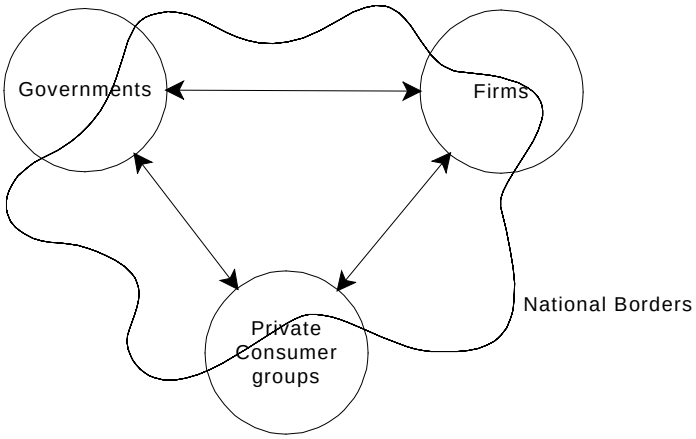

Figure 1: Interacting global players

Speaking broadly, nation states are on their way to being dissolved into larger conglomerates of continental blocks, EC firms clearly become or are already global actors while consumer groups still are in a status nascendi. A first and necessary precondition of a prosperous future development surely is that these three groups accept each other as indepent and at the same time 'depending on each others action'. In much of what we will see in EC in the next dacade the logic of this 3-players game, its mechanism design will be the pivotal ingredient.
To understand what is on the agenda of such a mechanism design the next chapter summarizes the role of electronic markets.

3 The role of Electronic Markets

In this chapter will be discussed what kind of changes the Global Players have to face as a result from the emergence of new market conditions trough EC and what kind of opportunities open up for each of them.

3.1 Changing market conditions

Firstly, it has to be asked what the relevant differences are compared to the status quo. One important point of view is the relation between information flows and those in the "real" sector. To mention only the most substantial aspects, focusing on different points of interest, conditions are being changed in the following areas:

Locality

International enterprises have been acting worldwide for quite some time and maintain well-established relations to their suppliers and wholesalers. This used to involve much capital and a somewhat longer perspective of planning, combined with a tight relationship between producers and their customers. Most companies have been acting in a local context, not having to fear competition from foreign manufacturers. Due to the emergence of electronic markets (mostly through the internet), costs to offer products on a worldwide scale as well as to place orders drop dramatically, making it cost-efficient for medium and small firms to participate in global competition.

Distribution: speed, scope and new paths

While the named phenomenon has to be accompanied by lower distribution costs for conventional products in order for firms to be able to offer at a competitive price, market share increases for immaterial products and information services which can be distributed through networks instantly and at almost no costs. Due to just in time production and improved logistics, the time needed from raw materials to finished products decreases rapidly. Cheaper distribution and easier, possibly automated communication with the potential customers results in an increase of the supported area, leading to a closer interrelation between them.

Products vs. services

Production moves close to the end users, whilst (especially financial) services concentrate and

can often be provided over telephone or data lines, reversing the traditional situation[5]. This does not mean that companies focusing on production move there as a whole, but rather that it's much easier either building factories where they are needed or sourcing out such divisions as a whole, possibly to another country without any efficiency reductions.

Increasing competition

In some areas, competition increases due to a greater number of firms in the same market; in other fields, though, the opposite is true. Two phenomenons play a crucial role here which will be described later in this paper: market segregation and increased (dis)information.

New market services emerge

In addition to new conditions for conventional commerce, new markets emerge for second order services (compare chapter 1). On these markets, services are traded that are used for allocating other goods and services, thus enhancing first order EC. Directory services, financial market services or brokerage fall in this category.

The last topic emphasizes an important point: a lot of new opportunities emerge, but markets do not necessarily provide more information for participants and are certainly far from producing perfect information for them. In fact, there is a good chance in certain markets that they are even *less* efficient: financial markets, for instance, tend to evolve at a much higher speed, and, due to the importance of *relative informational advantage* in these markets, traders need to participate in electronic trading just to remain in an equal position as before.

If groups manage to appropriate knowledge and access to certain markets for them, these systems become intransparent and less usable by others, thus lowering efficiency and increasing information costs and inequality.

Second order EC works against this development by providing services that enhance chances for market participants to acquire knowledge about first order markets, charging for this service themselves.

These services stand in between the interests of the different global players. For instance, big corporations would be interested in exploiting their factual monopoly status, whilst private consumer groups would rather demand this for them, being interested in more competition. For a national government the issue becomes a delicate matter. In the short-run consumers are prospective voters, but attracting successful monopolistic firms, and as a side effect employ-

[5] Compare FREEMAN & SOETE 1994

ment, might be prudent in the mid-run. Still the question remains how long a transnational corporation can be kept in a national location without falling into the trap of an accelerating social dumping race between nation states.

Another point is the fact that current markets, even high competitive ones, are inherently producer-determined: corporations decide what to produce or which services to offer, often acquiring information on potential demand at high costs; at the same time there is no chance for consumers to initiate the production or provision of some good or service, even if there would be a great market potential. This is mostly due to the fact that currently consumers can't organize easily.
This situation can change fundamentally in that Electronic Commerce provides efficient, low-cost feedback channels for retailers and end users to initiate producer actions. Such a development is an advantage and a drawback for producers at the same time: on the one hand they can save much money, such feedback being a kind of market research at no cost, on the other hand they are exposed to much higher competition. This would be advantageous for smaller, flexible firms and problematic for inflexible, powerful ones. Again the role of governments is ambigous. Providing infrastructure for organized consumer action is part of a forced competition policy that could run danger of driving large ligopolistic firms out of the country while the remaining SMEs will (due to increasing returns) not survive on the global market anyway. And permanent subsidies will not be feasable under the likely tighter financial constraints in the future. In other words, competition policy has to become a global economic policy to be feasable.

In the following, the diverging interests of the participants in emerging EC will be discussed, clearly showing opportunities and (dis)advantages for each of them.

3.2 Changing Conditions for the Global Players

Relevant groups clearly have different preferences for how EC should evolve, but are restricted and shaped by the development of the 'electronic environment' themselves. The interrelation between them as well as to the emerging technologies will be discussed here. It will become clear that even the Global Players themselves might not be a fixed, static group anymore, but might, depending on the current development, change in their possibilities as well as identity, by making formation of large amounts of capital much easier.

3.2.1 Corporations

Properties that are beneficious for firms' survival are being changed by the emergence of EC. Two major fields of change can be identified:

- The structure of companies themselves, and
- market related characteristics.

Firm size and structure

The relation between firm size and increasing availability of information technologies ist not clear but has been shown[6] to be *negative* for the U.S. For EC this is supposedly true as well, but can *not* generally be taken as given: transaction costs for established structures decrease, but entry costs into such a market might rise due to necessary technological equipment, training and access to market data. In the age of outsourcing and downsizing, a higher number of companies have to work together in order to produce final products or services. This is made possible by lowering coordination costs and making it easy to find appropriate business partners as needed – moving to a higher number of large project-oriented conglomerations which can also be called *virtual enterprises*. This can lead in two directions: high competitive advantage for large companies if they can control these inter-firm markets or make them less transparent (thus increasing entry and/or usage costs for small ones), or the opposite might happen, making it easy for anybody to use such a market. In any case, firms won't be as rigid as they used to be and can build large enterprises across borders for a very limited amount of time.

This is problematic especially for nation states: if they try to raise more taxes or control economic developments inside national borders, raise waiges, etc., it's easy for firms to move certain divisons to another country at very little cost, the local arrangement being unimportant for many types of units.

As a result, large commercial global player groups can form dynamically, being only dependent on efficient systems of coordination to make this possible. This implies an inherent instability for long-term planning of others like governments.

Market conditions

For the relation between firms and customers, the situation is even worse; this is the primary field where EC will make things different.

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[6] BRYNJOLFSSON ET AL. 1993

Companies try to increase their profits, and they have different means to do this. An increase in the number of competing firms alone doesn't necessarily improve the situation for customers: there's a tendency for market segregation on the one hand and disinformation by making comparison more difficult on the other hand. Especially the latter effect can currently be observed on the internet: "real-world" shopping malls are mapped into the digital landscape, everyone structured nicely for itself, but making it very hard for customers to search different sites and compare supplies. Moreover, as development goes until now, the broad public tends to follow pre-defined paths through the “information flood”, so power is owned by those who define these paths and can draw enough attention to them.

In short, corporations try to take control over contents and information flows, impeding (potential) customers in getting the information they want[7].

On the other side, entry costs are much lower so that medium and small companies can enter this field as well. They can almost only be found through general 'entry points', this currently being mostly search engines. What's missing is some kind of structured directory service that can be maintained in a distributed manner by the users themselves. It is clear that such a service is important to provide for conditions closer to neoclassical assumptions, namely low (ideally zero) search costs. Such a 'market service' doesn't necessarily have to be provided by the state: once it is possible to easily charge small amounts of money for such a service, there will be an incentive for private entrepreneurs to provide it as a business itself.

3.2.2 Governments

Governments, trying to sustain their power, therefore having to please firms as well as private citizens (mainly for fiscal reasons and to get re-elected), are facing a changed environment here. Conventional instruments cannot be assigned unambigously to policy goals and become restricted in their use: exchange rate policy in a strongly interwoven economic setting is a kind of incomes policy: what favours exporting firms will hurt importing firms and consumers. Moreover exchange rates tend to be just partially affectable by the state because of high trade volumes in international currency markets. In order to directly influence the development of EC, it can either work with import taxes on certain goods or services (which is increasingly impossible if they are delivered directly through telephone or data lines), or become a market provider itself. As an alternative to this active role, governments can support the development of EC by providing certain conditions, e.g. improving chances for small competitors.

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[7] Probably the best example for this are the actions of Microsoft lately in this field by e.g. providing MSNBC

3.2.3 Private Consumer Groups

Up to now, private consumers were forced into a passive role because they didn't have the chance to coordinate easily. Hence, market development has been producer determined, and actions of customers were restricted to choosing between *available* products or services, provided they had information about them. In this setting, neoclassical assumptions are never met. Through EC there is a chance to make the supply of information more easily available, but also to provide feedback channels for customers so that 'real' demand can be determined by firms. If consumers can group together easily, the dynamic emergence of global player groups is made possible.

This would again require producer-independent electronic markets which provide market information and coordination as a business of their own: second order EC. Emergence of such markets depends on many criteria, the most important being the availability of secure, low cost electronic payment for small amounts through networks. Moreover the provision of the infrastructure for these markets cannot be a national affair. It needs an international effort to form cross-national consumer groups able to act as global players. And perhaps it is not too daring to assume that only with a partial coalition with large transnational firms the principal agent problem for these groups can be solved.

4 Conclusions

In chapter 1 we have tried to determine economic the sources for the profitability of Electronic Commerce. In last consequence they rest in the appearance of new, or at least unknown expected utilities and values, an appearance made possible by EC. The following chapters showed that the adequate global level of a rational design for EC could be, and should be, initiated. But it also showed the inherent difficulties of such a design: Choices between long-run and short-run welfare maximisation, principal agent problems, game-theoretic problems of conflicting goal functions, a proper understanding of what is a public good – to name only a few. Further research on the economic foundations of Electronic Commerce probably will have to draw on results coming from these areas to advance from the preliminary sketch given here to a richer picture.

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