

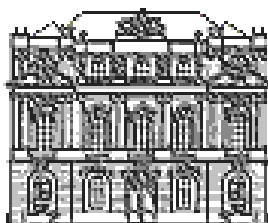
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The Effects of Electronic Commerce on the Structure of Intermediation

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The paper questions the notion that the diffusion of electronic commerce will lead to disintermediation. Rather than interpreting intermediation as a single service it is pointed out that intermediaries can provide a number of services. The analysis based on the New Institutional Economics, Market Microstructure Theory, and Information Economics shows that the three intermediation services studied are, generally, not under threat by the diffusion of electronic commerce. The overall effects on intermediation depend on the relevance of these services relative to others (e.g. order processing) which are supposed to become obsolete.¹

Introduction

The notion that electronic commerce will lead to disintermediation seems to be widely accepted in the scientific community² and well established in the popular debate. It is frequently argued that online-consumers will interact directly with online-suppliers and, hence, prices would decrease due to the disappearance of margins calculated by intermediaries. Sarkar, Butler, Steinfield (1995) call this the Threatened Intermediaries Hypothesis:

¹ The present study is part of the research project "Mediamatikpolitik für die Digitale Ökonomie (Engl. A Mediamatics Policy for the Digital Economy)", funded by the Austrian Ministry of Sciences and Transport and conducted by ICE. I have to thank Michael Latzer for valuable comments on an earlier draft. The usual disclaimer applies.

² E.g. Benjamin, Wigand (1995, p. 68): "When appropriate information technology can reach the consumer directly ... the manufacturer can use the NII [National Information Infrastructure] to leap over all intermediaries." Picot, Bortenlänger, Röhl (1997, p. 113): "With the support of information and communication technology, principals can acquire the agent's superior problem-solving capabilities, thus enabling them to fulfil the originally delegated tasks on their own. Agents will become increasingly obsolete."

Intermediaries minimise high transaction costs which prevail in traditional trade. E-commerce reduces transaction costs. Therefore, many intermediaries will become obsolete.

The scope of this paper is to analyse the structure of intermediation by methods of the New Institutional Economics, Market Microstructure Theory, and Information Economics and debate the expected effects of the proliferation of electronic commerce. The main fallacy of the Threatened Intermediaries Hypothesis is its interpretation of intermediation as a single service rather than a number of different services. Therefore, the effects of the diffusion of electronic commerce on each of the intermediation services have to be studied before one can draw conclusions on e-commerce and the structure of intermediation based on their relative importance. The paper is structured along the following lines:

A definition of electronic commerce is presented in section 1. The notion of disintermediation will be discussed as well.

Intermediaries provide a number of services. Three of which are identified and further analysed in section 2: (1) hold inventory to provide the service of immediacy and insurance against systematic valuation risk, (2) reduce asymmetric information by establishing a reputation, (3) gather, organise, and evaluate information which is dispersed in society. The effects of the diffusion of electronic commerce on each of these characteristics of intermediation will be analysed. Furthermore, its effects on the relative costs of internal provision versus a principal agent relation will be discussed. There are, of course, many more services intermediaries offer.³ To reach a more general conclusion about the future of intermediation more intermediation services have to be analysed.

Section 3 summarises the results and concludes the paper.

³ Sarkar, Butler, Steinfield (1995) offer a list of other intermediation services. They distinguish between services that benefit consumers (e.g. assistance in search and evaluation, needs assessment and product matching, risk reduction, and product distribution/delivery) and those that benefit producers (e.g. creating and disseminating

1. A DEFINITION OF ELECTRONIC COMMERCE AND DISINTERMEDIATION

ELECTRONIC COMMERCE

There is no generally accepted definition of electronic commerce. The overview presented in Box 1 covers international institutions (e.g. OECD, WTO), national ministries (e.g. MITI, DTI), researchers (e.g. Wigand), and a computer magazine (e.g. Wired Magazine). The selection represents institutions and individuals that are quite influential in the areas of politics, research, and public opinion, respectively.

Box 1

Electronic Commerce Definitions

„It [electronic commerce] is concerned specifically with business occurring over networks which use non-proprietary protocols that are established through an open standard setting process such as the Internet. As used here, the term „business“ broadly means all activity that generates value both within a firm (internally) and with suppliers and customers (externally). In this sense it would include internal networks (e.g. intranets) as well as networks that extend to a limited number of participants (e.g. extranets). Some of this activity may result in monetary transaction and some will not. To assess the economic impact of e-commerce more fully, that portion of the infrastructure which is primarily dedicated to such activity is also included.“ (OECD 1999, p. 28).

„Broadly speaking, electronic commerce includes any form of economic activity conducted via electronic connections.“ (Wigand 1997, p. 2).

„Through the development of information technology, such efforts towards the development of information society have resulted in the present introduction of electronic commerce, or, that is to say, attempts to replace all economic activity with that based on digital information are becoming the main focus.“ (MITI 1997, p. 1).

product information and creating product awareness, influencing consumer purchases, providing customer information, reducing exposure to risk, and reducing costs of distribution through transaction scale economies).

„E-commerce: Doing Business on the network. More and more companies are making the web their storefront. It's cheap, global, and quick, with no margin-sapping middlemen. That's why forecasters predict that online-retail transactions will explode, reaching \$ 10 billion annually by 2000. And retail sales are merely part of the picture. While only a minority of netusers have made a purchase online (security is still a big fear), the vast majority have used it to research which products to buy offline.

The mail-order catalogue industry is one obvious target. Online retailers don't face the costs of printing or mailing paper, nor do they pay people to wait by phones for orders to come in. The hottest markets for consumer sales are computer equipment (...), books, music, travel, and finance. ...“ (Wired magazine, Encyclopaedia of the New Economy)

„Electronic commerce may be simply defined as the production, advertising, sale, and distribution of products via telecommunication networks. Most of the discussion is limited to the Internet – the medium with which electronic commerce is primarily associated. The study points out, however, that earlier technological innovations such as the telephone and fax have been used in similar, albeit more limited, ways to conduct business electronically, and future directions in which technology may lead remain uncertain.“ (WTO 1998, p. 1).

„Electronic commerce – using an electronic network to simplify and speed up all stages of the business process, from design and making, to buying, selling and delivery – is revolutionising the way business is done.“ (DTI 1998, p. 1).

The definitions differ with respect to the media under consideration. Some focus on the Internet, some include all sorts of direct electronic distribution channels (e.g. TV-shopping), and others include all forms of electronic market places (e.g. electronic trading systems on stock exchanges).

A few of them distinguish between different phases of a transaction, such as: (1) information and search, (2) negotiation and contracting, (3) settlement (delivery and/or payment). These more differentiated definitions are important to analyse certain policy problems such as the impact of digital money on the money demand function or the stability of the payment system.

When estimating the volume of electronic commerce the differences of the underlying definitions are of critical importance. Some studies (OECD 1999) include infrastructure expenditure (e.g. costs of installing a Web-site), volume of sales via a pre-specified electronic media (e.g. Internet), and do not distinguish between business-to-business and business-to-consumer electronic commerce. The decision as to whether a certain transaction should be included in the volume of electronic commerce usually rests on the occurrence of the phases (2) negotiation and contracting and/or (3) settlement over the pre-specified electronic channel (e.g. Internet). *Interestingly, the mere occurrence of phase (1) information and search via the Internet is usually not enough to include a transaction in the volume of electronic commerce. But in most of the arguments on disintermediation the reduction of information and search costs due to the diffusion of electronic commerce play a central role.* The empirical results building on different definitions of electronic commerce differ widely.

For the purpose of this paper a broad definition of e-commerce will be used.

„Electronic commerce denotes the seamless application of information and communication technology from its point of origin to its end point along the entire value chain of business processes conducted electronically and designed to enable the accomplishment of a business goal. These processes may be partial or complete and may encompass business-to-business, as well as business-to-consumer and consumer-to-business transactions.“ (Wigand 1997, p. 5)

The paper focuses on the effects of the increased utilisation of information and communication technology in business transactions. Electronic commerce is one of the fastest growing areas of application of these technologies. Whereas EDI (electronic data interchange) usually involved a certain number of long-term business partners electronic commerce via the Internet also includes consumers.

The effects of electronic commerce on intermediation will also depend on the characteristics of the goods under consideration: High degrees of standardisation, a low complexity of valuation,

and ease of description are pre-requisites to distribute goods via electronic commerce. Obviously, the goods that can be sold this way largely consist of all the goods that are distributed via catalogue sales and TV shopping channels (e.g. books, fashion, CDs, travel arrangements etc.). The production of a catalogue (or a TV commercial presentation) is costly and time consuming relative to producing and up-dating a Web-site. Therefore, the set of goods that can be distributed via electronic commerce is larger than the set of goods distributed via catalogue sales and TV shopping channels. It also includes all goods for which the production of a catalogue would be either (1) excessively expensive, or (2) excessively time consuming (e.g. stock market information services etc.). Furthermore, it includes all digitised goods for which the delivery of hard copies (e.g. software CDs) via mail is excessively expensive and time consuming. Therefore, mostly intermediaries dealing in these sets of goods can be expected to be directly affected by electronic commerce. The diffusion of information and communication technology can also influence the set of goods which can be distributed via e-commerce. This problem, however, is beyond the scope of this paper.

To evaluate the effects of electronic commerce on intermediation a typology of effects of electronic commerce⁴ is necessary.

Electronic Communication Effect: The costs of processing existing information decrease. More digitised information can be processed within the same period of time.

Electronic Integration Effect: In addition to increase the efficiency of information processing electronic commerce is also expected to lead to an integration of different processes of collecting, manipulating, and transmitting information. Thereby, existing digitised information stored in various places can be interconnected.

⁴ See Haenel, Brand, Knothe, Bloechl 1999.

Electronic Brokerage Effect: The electronic market place can be described as a number of meeting places where large numbers of buyers and sellers interact.

DISINTERMEDIATION

„Disintermediation is the displacement or elimination of market intermediaries, enabling direct trade with buyers and consumers without agents.” (Wigand 1997, p. 4).

The elimination of intermediaries can have one of two causes: There is no longer demand for the services provided by the intermediary or the provider of these services is integrated into another company at a different step in the value chain (e.g. the acquisition of a distributor by a producer) and the service will be produced internally. In section 2 the effects of electronic commerce on three different types of services provided by intermediaries are studied.

2. THE NATURE OF INTERMEDIATION AND THE EFFECTS OF ELECTRONIC COMMERCE

Which are the services offered by an intermediary? Why is there demand for intermediation? One prominent feature of an intermediary is to act as a communicator of consumer preferences and, on the other hand, to inform consumers about new products and their characteristics (e.g. quality, price, function etc.). Thereby, they bear some of the inventory risks of producers and reduce the search costs for consumers. But this is by no means the only service an intermediary offers. Others include ensuring compliance with consumer protection (and bearing the related risks), customer service, inventory management (and bearing the related risks), distribution (and bearing related risks), and costs savings due to economies of scale in transportation or distribution in general.

The relationships between producers (or buyer/seller) and intermediaries are frequently interpreted as principal-agent relations. What are the variables that influence the decision to engage in a principal-agent relation?

Due to opportunistic behaviour of the agent the principal is confronted with agency costs which are caused by informational problems like moral hazard (hidden or unverifiable action), adverse selection (hidden information) and hidden intentions. Moral hazard refers to a situation in which an agent receives a pre-specified compensation given a certain state of nature which occurs with a certain probability. If this probability is not exogenous (independent of the agent's actions) to the agent's decision problem the pre-specified compensation must also take into account how a specific compensation scheme affects the decisions and actions of the agent.⁵ The straight-forward solution to this problem is to condition the pre-specified compensation on the agent's actions. Unfortunately, this is not always possible since these actions may be very costly to verify. In such cases of asymmetric information specific contractual arrangements (i.e. incentive schemes) can be employed to ensure that the agent complies with the actions set forth in the contract. Though, these contracts are the results of maximisation problems that incorporate more constraints than similar problems in settings without asymmetric information.

Adverse selection means that different groups of agents would be faced with different probabilities of being of a certain type in a certain state of nature.⁶ Therefore, any pre-specified compensation for a certain state of nature would have to be conditioned on an agent's characteristics. The agents are informed about their types. Unfortunately, these characteristics can again be very costly to verify for the principal. A failure to do so might result in losses for the principal. Rothschild, Stiglitz (1976) discuss the issue of adverse

⁵ See Kreps 1990, pp. 577.

⁶ See Kreps 1990, pp. 625 for more details - e.g. the underlying equilibrium concepts, the role of pre-commitment.

selection in the context of an insurance market with asymmetric information. A single contract for high and low risk individuals which is based on the average probability of the two groups to have an accident will not be demanded by low risk individuals. They would consider the premium too high in relation to their probability to have an accident. Therefore, they would not choose the contract. Consequently, only high risk individuals would choose the contract and their premium would be too low in relation to their probability to have an accident. Therefore, the expected profit of the contract would be negative for the insurance company. Rothschild, Stiglitz (1976) argue that there might be no equilibrium at all under asymmetric information. Contractual arrangements to handle this problem of hidden information include actions taken by the agents (signalling) or actions taken by the principal (screening through self-selection mechanisms). In the model of Rothschild, Stiglitz (1976) the screening mechanism consists of separate contracts for high and low risk individuals which are structured in a way that high risk individuals are indifferent between the contracts and low risk individuals choose a contract which does not offer full insurance.

The problem of hidden intentions refers to a situation in which the expected benefits for the principal depend on the agent's intentions (e.g. time period a new employee intends to work for a company) and the establishment of a principal-agent relation involves sunk costs for the principal (e.g. a specific investment like training to a newly hired employee).⁷ The investment is expected to be profitable if the principal-agent relation exists for a certain minimum period of time. Unless the agent can assure the principal that it is not her intention to end the relation before the end of that minimum period of time the principal might not be willing to bear the risk associated with the investment. Contractual arrangements to resolve this problem include the "exchange of hostages" through mutually specific investments (e.g. The newly hired employee may be obliged to compensate the employer for a part of the training if she wants to quit within a pre-specified period of time.).

⁷ See Picot, Bortenlänger, Röhl 1997, p. 112.

The most obvious way to reduce agency costs⁸, though, is to abolish the agent altogether. This would imply that the principal has to perform the task herself, thereby, reducing costs by saving the agent's compensation and the principal's share of the agency costs, but incurring additional production costs.

The agent must therefore have a comparative advantage in performing the task under consideration, otherwise the principal would have no incentive to engage in a principal-agent relation in the first place. *The marginal efficiency gains resulting from the employment of the agent (i.e. marginal costs of procurement minus the marginal costs of internal production) must compensate the principal for her share of the agency costs and the agent's compensation at the margin.* For each service the effects of the diffusion of e-commerce on the produce or buy decision will be analysed.

The following section is devoted to a description of three services intermediaries can offer:

In subsection A. (The Service of Immediacy and Insurance against Systematic Valuation Risk) the role of intermediaries in markets which are characterised by a random arrival of buy and sell orders is studied while in subsection B. (The Reduction of Asymmetric Information – Reputation) the structure of intermediation in markets characterised by asymmetric information is analysed. In subsection C. (Informational Efficiency) intermediaries are interpreted as agents who gather, organise, and evaluate knowledge that is dispersed in society.

⁸ Broadly speaking, these are the costs associated with overcoming the problem of asymmetric information between principal and agent and include costs of structuring, monitoring and enforcing a contract and the related risks.

A. Inventory – The Services of Immediacy and Insurance against Systematic Valuation Risk

In markets which are characterised by a random arrival of buy and sell orders traders are confronted with uncertainty regarding the possibility to trade at a specific moment in time.⁹ Since each buyer has to wait until a sell order arrives at the market there is a positive probability that a buy order cannot be executed immediately. Similarly, each seller has to wait until a buy order arrives such that he can complete the desired transaction.

Early and quite simple solutions to the double coincidence of timing¹⁰ problem are organised markets, i.e. prearranged trading posts where market participants meet at pre-determined times. These social artefacts increase the probability that a trader will actually meet a potential trading partner. Albeit, this reduction of uncertainty comes at a price – the organised market takes place only at certain points of time (e.g. once a month). Thus, traders lose the opportunity to trade whenever they feel the desire to do so – they lose immediacy. It is in this situation that some participants assume the roles of market makers who provide the service of immediacy for other market participants. “The specialist market maker interposes himself as a principal in the market by offsetting the fluctuating imbalances in demand and supply with purchases or sales for his own account.” (Goodhart 1989, p. 5). The market maker always quotes a price he is willing to buy at and a price he is willing to sell at, irrespective of his own consumption demand. Apart from absorbing imbalances of buy and sell orders the market maker, thereby, performs another important function in a market: He always quotes market prices and, consequently, increases market transparency and provides insurance against stochastic price fluctuations.

⁹ Throughout the following section it is assumed that all orders are market orders. “Market orders are orders to buy and sell for immediate execution, as opposed to limit orders, which are orders to buy and sell at some pre-specified price.” (O’Hara 1997, p. 37).

¹⁰ See O’Hara 1997, pp. 3. Double coincidence of timing means that the moment when a seller wants to sell a unit a buyer wants to buy a unit have to coincide in order to achieve instantaneous market clearing.

The consequence of his readiness to buy and sell is that his inventory position and the associated holding period are, at least in the very short-run, determined by the trading patterns of other market participants and, therefore, not at his own discretion. Given that he has fairly good knowledge of the underlying probability distributions of the arrival rates of buy and sell orders he will quote ask (sell) and bid (purchase) prices such that the deviations of his actual inventory from his desired position will cancel out over time as long as the underlying demand and supply functions do not change. The spread between ask and bid prices will be calculated to cover the marginal costs of carrying the average or desired inventory position. These consist of opportunity costs incurred by investing in inventory rather than a productive asset (e.g. almost riskless government bonds), the associated risk of capital losses due to shifts in the underlying demand and supply schedules, and exogenous transaction costs due to the processing of orders, settlement, and payment.

If the underlying demand and supply functions can change over time the market maker has to bear the risk that the value of his inventory position changes. An outward shift of the supply schedule will result in an increase in the market makers' inventory that is not caused by a short-run imbalance of order arrival rates. Therefore, he will not be able to readjust his inventory position in accordance with his own underlying preferences unless he readjusts his ask and bid prices. But the market maker may not always be in the position to judge whether a deviation of his actual from his planned inventory is a consequence of short-term imbalances or of a shift in the underlying demand and supply schedules. Therefore, he has to bear the risk of accumulating inventory when market prices fall and of reducing inventory when market prices increase. In both cases he would suffer capital losses. Therefore, the market maker has to have some confidence that he is comparatively well informed since his inventory position is subject to systematic valuation risks. In the absence of market makers, individual traders would have to bear the risks associated with unintended inventory positions. Those traders who are not able to execute their planned market transactions would have to hold an inventory position (positive or negative) until the transaction can be executed. Therefore, they would

face systematic valuation risks themselves. Consequently, the market maker also provides insurance services for other market participants.

Market microstructure theory originated in financial markets but it can be applied to all sorts of markets. “Assuming that the retailer has some degree of pricing discretion, the retailer acts in fact as market maker in that good, presenting bid prices to potential sellers and ask prices to customers.” (Goodhart 1989, p. 5).

The provision of the service of immediacy comes at a cost such that participants have to pay a price for immediacy, a price to cover the costs of intermediation. The market maker must not only hold an inventory position in the good(s) under consideration to be able to sell on demand but he must also have access to the means of payment to be able to buy on demand. His marginal costs will consist of opportunity costs of holding an additional unit of inventory and securing access to an additional unit of the means of payment (e.g. cash holdings or standby credit arrangements). In addition, the market maker will employ certain resources to provide his service, e.g. labor, office space, communication equipment and services.

THE EFFECTS OF ELECTRONIC COMMERCE ON MARKET MAKING

It has been shown that the random fluctuations of the arrival rates of buy and sell orders are a potential reason for intermediation to exist in a market characterised by low probabilities of a double coincidence of timing. How will the increasing usage of advanced communication and information technology affect the double coincidence of timing and, thereby, the demand for this particular intermediation service?

The time pattern of buy and sell order arrival rates is a function of individual preferences and quite independent of any technological innovations. Arrival rates reflect the desire of traders to sell or buy – the willingness to pay a price of immediacy reveals that individuals want to do so as and when they want to. There is no reason to assume that the communication and integration effect will reduce individuals' time preference rates or their risk preferences. They

will, *ceteris paribus*, continue to pay a premium for immediacy and for the smoothing of price variations. The direct effect of the diffusion of advanced communication and information technology on intermediation is negligible in markets which are characterised by stochastic fluctuations of the arrival rates of buy and sell orders.

But, on the other hand, there is no doubt that a reduction in communication and information costs will reduce marginal costs of immediacy and, thereby, the spread between the bid and the ask prices. Therefore, the marginal costs of intermediation (the price of immediacy) will fall if the market for the underlying service of immediacy is sufficiently competitive. These price reductions and the brokerage effect of electronic commerce might attract new traders and, thereby, increase liquidity in the market. Due to decreasing communication and information costs market access might be affordable and efficient for more potential traders. Market liquidity would increase further. The effects of an increase in market liquidity on the double coincidence of timing depends on the parameters of the underlying probability distributions of the arrival rates of buy and sell orders. Although the brokerage effect of electronic commerce will result in larger trading volume it does not automatically imply that the probability that the market clears each period increases. Intuitively, the following situation can occur to a seller: Though, the arrival of a potential trading partner (a buyer) becomes more likely the probability of another seller competing to do business with the same buyer increases as well. This, again, either leads to price volatility due to short-term market imbalances or to the loss of immediacy. Therefore, the increase in market liquidity does not imply a reduction in demand for the services of immediacy and insurance against systematic valuation risk.

INTERNAL PRODUCTION VS. PRINCIPAL-AGENT RELATION

Intermediation is efficient as long as the marginal efficiency gains resulting from outsourcing the provision of the service of immediacy compensate the principal for her share of the agency costs and the agent's compensation at the margin. Therefore, disintermediation by internal production occurs if one of the three following statements is true, *ceteris paribus*:

I. Electronic commerce reduces the marginal costs of internal provision of the service of immediacy.

II. Electronic commerce increases the agent's marginal costs of provision of the service of immediacy.

The marginal costs of providing the service of immediacy consist of opportunity costs incurred by investing in inventory rather than a productive asset (e.g. almost riskless government bonds), the associated risk of capital losses due to shifts in the underlying demand and supply schedules, and exogenous transaction costs due to the processing of orders, settlement, and payment. The communication and integration effects (i.e. process innovations) will tend to reduce the marginal costs of both, the principal and the agent, as they reduce exogenous transaction costs. At the same time, opportunity costs and the costs of bearing the risk of capital losses will be unaffected by the diffusion of electronic commerce. Therefore, the comparative advantage of the intermediary will prevail.

Internal production would imply risk bearing by the principal rather than shifting it on to the agent. The relative efficiency of such an arrangement depends on the relative degrees of risk aversion. The more risk averse principal pays an "insurance premium" such that the less risk averse agent bears some of the principal's risk. The diffusion of electronic commerce will not alter the relative risk aversions of the principal and the agent. Therefore, the efficiency of shifting (at least some) risk associated with holding an inventory position on to the intermediary will remain unaffected.

III. Electronic commerce increases marginal agency costs or the agent's compensation at the margin.

The monitoring costs incurred by the principal will decrease due to the communication and integration effect. If the market for intermediation is sufficiently competitive the agent's compensation will shrink due to the reduction of marginal costs of intermediation.

Therefore, the diffusion of electronic commerce favours principal agent relations rather than internal production. The diffusion of electronic commerce is, therefore, not likely to result in disintermediation by internal provision of the services of immediacy and insurance against systematic valuation risk

B. The Reduction of Asymmetric Information - Reputation

Many markets are characterised by imperfect information of traders about the quality of goods and services (including auxiliary and complementary services – e.g. fulfilment, privacy and consumer protection policies) traded. In many markets goods and services are heterogeneous and asymmetric information prevails between buyers and sellers. The most popular example is the market for lemons (market for used cars).¹¹ Rationally, buyers who know less about the quality of a used car than the seller will base their willingness to pay on expectations concerning the quality of the used car under consideration. These expectations will be based on the subjective probability distribution of the quality of cars. Since buyers are unable to distinguish between high and low quality cars they will pay a uniform price at which some cars will be under-priced while others will be overpriced. If the market price falls below a certain threshold the sellers of high quality cars will withdraw from the market. Since this is anticipated by the buyers they will rationally lower their prices to reflect lower expected quality of the remaining cars.¹² As this might lead another group of sellers at the high quality segment to withdraw from the market this process could lead to an equilibrium in which no cars are exchanged at all. This equilibrium is individually rational even though it is less efficient socially than an equilibrium in which information would be symmetric. This result is due to

¹¹ See Kreps 1990, pp. 625.

¹² Buyers can anticipate the withdrawal of high quality cars from the market as the market price falls if the following conditions prevail: (1) The sellers thresholds to sell („willingness to accept“) are ordered according to the quality of the cars and (2) buyers know about that fact. Since sellers are informed about the quality of their cars these conditions are not restrictive.

the negative externality exerted by the sellers of low quality cars on the sellers of high quality cars. This is the familiar problem of adverse selection.

One of the underlying assumptions of this argument is that individuals trade only once or at least very occasionally. Otherwise, *repetition* would enable buyers to obtain the relevant information by a trial and error process – given that the expected losses due to errors do not out-weight the expected gains from improving the buyers information at the margin. At the same time repetition is a necessary condition¹³ for sellers to invest in reputation, i.e. to forego present profit by revealing private information truthfully in order to avoid under-pricing by prospective customers. Establishing a reputation for selling high quality products can be interpreted as an investment decision and is, therefore, nonsensical if there are no future customers or if the discount factor of the seller is very low ($\ll 1$).¹⁴

In a market which is characterised by random sequences of buy and sell orders the probability to trade with the same counterparty is small, i.e. repetition is unlikely. Therefore, there is no incentive for sellers to establish a reputation for selling high quality goods. The costs of gathering information can be quite high for individual buyers. At the same time they only trade very infrequently with the same counterparty which implies that the share of information costs for each transaction is very high. Since information has the characteristic of non-rivalry in consumption the following market microstructure is efficiency enhancing: Certain specialists act as information gathering agents for buyers. Even if their information costs are as high as for each individual buyer the specialists transacts more frequently due to his position as a middleman and can, therefore, spread these fixed costs over a larger number of transactions. Thereby, the middleman reduces transaction costs per transaction and avoids

¹³ “It is enough that the party [seller] who puts the other party [buyer] at risk repeats the transaction fairly frequently, has a substantial amount at stake in the execution of any single transaction, and has her performance observed by potential future trading partners.” (Kreps 1990, p. 761).

¹⁴ Noisy variables and fixed, finite horizons can complicate matters (see Kreps 1990, pp.531) but are not discussed further in the analysis presented here.

inefficient duplication of information gathering activities among buyers. In addition the specialist might develop a comparative advantage in information gathering such that transaction costs can be reduced even further.¹⁵ Therefore, economies of scale in information gathering prevail up to some specific firm size.¹⁶ “In those markets where most traders only enter at rare intervals, the markets will be augmented by information-purveying specialists and/or markets will tend to be high cost and fragile.” (Goodhart 1989, p. 21).

Not only buyers can profit from the characteristic of non-rivalry in consumption. It might also be efficiency enhancing for sellers to delegate the task of establishing a reputation to an intermediary since the higher number of transactions enable the intermediary to spread the costs of establishing a reputation over a larger number of transactions. Thereby, the middleman reduces transaction costs per transaction and avoids inefficient duplication of efforts with respect to establishing a reputation among sellers. In addition the specialist might develop a comparative advantage in establishing a reputation such that transaction costs can be reduced even further. An intermediary of good repute can shelter sellers of high quality goods, at least partly, from the negative externality exerted on them by sellers of low quality goods.

So far, the problem of asymmetric information has not been solved completely since the specialist market maker still enjoys an informational advantage vis-à-vis the buyers. But since he transacts very frequently the market maker has an incentive to establish a reputation. Repetition enables buyers to learn about the quality of the goods sold by a specific intermediary via a trial-and-error process.¹⁷ Any negative experience – concerning quality - will be punished by market participants – buyers and/or sellers - via a diversion of trading volume from one market maker to another. Due to the higher number of transactions an

¹⁵ See Diamond 1984.

¹⁶ In the single product case this would imply a natural monopoly if the market size is below this threshold.

¹⁷ The loss to the intermediary is even larger if negative experience can be communicated amongst buyers and amongst sellers.

intermediary conducts the amount at stake for him is higher than for each individual seller. Thus, his commitment to high quality is more credible. This immediately points out two necessary conditions: The market for intermediation must be sufficiently competitive since market power would result in a reduction of incentives to establish a reputation. Furthermore, the market makers must not be completely homogeneous to enable buyers and sellers to link counterparty characteristics between different points of time.

THE JOINT PROVISION OF THE SERVICES OF IMMEDIACY AND OF REDUCING ASYMMETRIC INFORMATION

It was pointed out before that market makers need to be relatively well informed about the underlying supply and demand curves in order to avoid capital losses due to shifts in the underlying equilibrium price. This implies, in its own right, that they will also have to be quite well informed about the characteristics of the good traded. In addition, they are frequently holding large inventory positions in the good which confronts them with the risk of stocking low quality products. In order to avoid losses they would have to sell those low quality products overpriced which, in turn, implies that they would risk their reputation. A market maker, therefore, faces strong incentives to gather the relevant information about the underlying product quality. Consequently, there exist strong economies of scope¹⁸ up to some specific firm size between the provision of the services of immediacy (including insurance against systematic valuation risk) and of reducing asymmetric information.

THE EFFECTS OF ELECTRONIC COMMERCE ON ASYMMETRIC INFORMATION

As pointed out before, the diffusion of advanced communication and information technology will not alter traders preferences per se. In a market characterised by random order arrival rates

¹⁸ The fixed costs of information gathering imply economies of scale which, in combination with economies of scope of the provision of the two services in one company, could lead to a natural monopoly. Decreasing average incremental costs of each product plus economies of scope at the output level of market demand are sufficient conditions to ensure the existence of a natural monopoly. But the size of output up to which the production function of a combined firm exhibits subadditivity may be well below total market volume. Therefore, a competitive market structure is not contradictory to above analysis.

repetition will remain unlikely. Intermediation will, therefore, remain necessary to provide incentives for establishing a reputation by guaranteeing repetition.¹⁹ But due to a reduction in information costs (due to the communication and integration effects) it will be cheaper for individual traders to acquire the necessary information to overcome the informational asymmetries between buyers and sellers. But at the same time also market makers will be confronted with lower information costs. Their comparative advantage is likely to remain, i.e. they still face lower information costs than individual traders. And, in addition, they still spread their information costs over a larger number of individual transactions and they avoid the inefficient duplication of information efforts. Thereby, intermediation is still more efficient, even though, the production function might change considerably due to the communication and integration effect.

The communication and integration effects reduce the costs of communicating and integrating the experience of multiple customers (e.g. user groups). Therefore, it could be argued, repetition might not be crucial anymore. But, even if an individual buyer will not have the opportunity to trade again with the same seller the latter will have an incentive to establish a reputation and to play by the rules. Otherwise, the information about non-compliance would spread easily and the seller would lose his reputation. Even though, the communication and integration effect could increase the incentives for sellers to establish a reputation it is still more efficient to delegate this task to an intermediary since he spreads the associated costs over a larger number of transactions and avoids duplication of efforts among sellers. Furthermore, the argument rests on another crucial assumption: Namely, that all information transmitted by other buyers is reliable. The asymmetric information problem is merely shifted from the sellers to those buyers who report their experiences. For fellow buyers it could be quite costly to verify this information.

¹⁹ At least the party (middlemen) that puts the other party (buyer) at risk repeatedly engages in transactions.

The brokerage effect will result in an increase in the number of market participants and, thus, reduce the probability that either partner to a transaction will trade with an identical trading partner repeatedly. Consequently, it will become increasingly difficult to establish a reputation for a seller. Therefore, the demand for intermediation tends to increase even in electronic markets (e.g. eTrust, Trusted Third Party Services and online-retailers).

INTERNAL PRODUCTION VS. PRINCIPAL-AGENT RELATION

Intermediation is efficient as long as the marginal efficiency gains resulting from outsourcing the task of establishing of a reputation compensate the principal for her share of the agency costs and the agent's compensation at the margin. Therefore, disintermediation by internal production occurs if one of the three following statements is true, *ceteris paribus*:

- I. Electronic commerce reduces the marginal costs of internal production of the task under consideration.
- II. Electronic commerce increases the agent's marginal costs of production of the task under consideration.

The opportunity costs of establishing a reputation are the foregone profits of engaging in opportunistic behaviour. Additional costs are incurred by informing potential trading partners about past performance. For both, the principal and the agent, the costs are reduced by the communication and integration effects of electronic commerce. As reputation has the feature of non-rivalry in consumption an intermediary can use his reputation to trade in various goods and services. By increasing the number of transactions he can increase the credibility of his commitment and the overall payoff of reputation. Therefore, the diffusion of electronic commerce tends to reduce the risks associated with an investment in reputation and reducing the amortisation time as long as the middleman acts in accordance with his commitment. Overall, the diffusion of electronic commerce is unlikely to reduce marginal efficiency gains

from outsourcing the task of establishing a reputation as it allows for specialisation and avoids the duplication efforts among sellers.

III. Electronic commerce increases marginal agency costs or the agent's compensation at the margin.

The communication and integration effects could reduce the marginal costs of informing potential trading partners about past performance of the intermediary. In a sufficiently competitive market this implies that the agent's compensation falls. Monitoring costs will be reduced as well.

Electronic commerce does neither tend to decrease the relative marginal costs of internal production nor does it increase the marginal costs associated with a principal agent relation. Therefore, there is no indication of disintermediation by internal provision of the service of overcoming asymmetric information by establishing a reputation.

C. Informational Efficiency

THE DISPERSION OF KNOWLEDGE IN SOCIETY

The rational economic activity of a firm is based on the relationship between expected marginal costs (incremental costs due to the production of an additional unit of output) and expected marginal return (incremental return due to the sale of an additional unit of output). As long as marginal costs are below marginal return the firm will increase output until the two are equal. At this point the firm maximises expected profits.²⁰ The main problem, though, is not to solve the relevant maximisation problem mathematically or to derive the optimal output based on the assumption that the firm knows the (expected) demand and supply functions it faces.

²⁰ If the firm is not risk neutral it maximises expected utility of profits.

The supply schedule is derived from the minimisation of costs at each level of output. Therefore, it is mostly determined by (i) technology and (ii) factor prices. The demand schedule the firm faces is determined by (i) consumer preferences, (ii) consumer budget constraints, and (iii) the behaviour of the firm's competitors. To assume that this knowledge is given to the firm at no costs can only be misleading. Rather, it is the firm's main challenge to gather the relevant information on which to base the derivation of the optimal, profit or utility maximising production decision.

"The peculiar character of the problem of a rational economic order is determined precisely by the fact that the knowledge of the circumstances of which we must make use never exists in concentrated or integrated form but solely as the dispersed bits of incomplete and frequently contradictory knowledge which all the separate individuals possess." (Hayek 1971, p. 17).

According to Hayek, all economic activity is planning. Thus, a firm is also a planning institution. The main questions therefore are: What is the optimal structure of intermediation with regard to informational efficiency? How will the diffusion of electronic commerce influence the intermediaries' role with regard to informational efficiency?

Hayek intended to show that centralised economic planning was indeed impossible due to informational obstacles any central planning bureau would face. According to Hayek, it is the distinct advantage of an economic order based on decentralised planning that the producer of a specific good does not have to gather all the relevant information by himself. It is sufficient if it is communicated to him.

"... in a society in which many people collaborate, this planning, whoever does it, will in some measure have to be based on knowledge which, in the first instance, is not given to the planner but to somebody else, which somehow will have to be conveyed to the planner." (Hayek 1971, p. 18).

At any given time, the body of knowledge which could be relevant to the planner is, of course, enormous. A considerable proportion of his resources would have to be directed not only to gathering and organising but also to evaluating the relative importance of each bit of new information. But for most changes of the economic environment the underlying details are of no importance: The crucial information is whether or not a profit opportunity for the planner arises. This is conveyed to him by changes in relative prices. The price system co-ordinates the economic activities, the decentralised decisions of consumers, producers, and intermediaries. For most goods and services in the economy the causes of such changes are only of secondary importance.

But for the goods and services which are of direct relevance for a certain company knowledge of the causes of such changes forms the very basis for a learned decision. To react properly to changes in relative prices some background information is required: Will they be temporary or permanent? Can these changes be influenced (e.g. reversed) at all? If so, how can they be influenced? Has the legal or tax framework changed? For a publisher the causes of a change in oil prices is of secondary importance. Any increase of the fuel price might lead to a more efficient use of fuel by the car fleet of the publisher but not to a change in business strategy. A drop in the prices of economics textbooks in Korea, on the other hand, could lead to a reorientation of the publisher's Korean activities if the changes seem to be permanent. To react properly the publisher needs to gain more information about the causes of the price changes.

"Today it is almost heresy to suggest that scientific knowledge is not the sum of all knowledge. But a little reflection will show that there is beyond question a body of very important but unorganized knowledge which cannot possibly be called scientific in the sense of knowledge of general rules: the knowledge of the particular circumstances of time and space. It is with respect to this that practically every individual has some advantage over all others because he possesses unique information of which beneficial use might be made, but of which use can be made

only if the decision depending on it are left to him or are made with his active co-operation.” (Hayek 1971, p. 20; emphasis added).

The particular knowledge of time and space includes information about any newly established local competitors, and changes of the local economic conditions which affect consumer demand (e.g. tax laws, fiscal measures, regulations, changes in consumer preferences etc.) – any profit opportunities which arise for an entrepreneur. Some of the information might be considered even worthless by those who have access to it. An entrepreneurial intermediary learning of some particularities of time and space might regard the exploitation of this informational advantage a profit opportunity.

It is crucial to understand that this knowledge does not exist in any organised form. There is no individual agency which is in the possession of all the relevant information. A firm (or an entrepreneur, a producer) has to be in the market to perceive of the particular circumstances of time and space. If there are substantial economies of scale it is inefficient to produce solely for the local market (Assuming that local demand is below the optimal output under economies of scale). In such a case the producer can only gain knowledge of the particular circumstances of local markets via a representative, an intermediary.²¹ It is one of the central features of the intermediary’s commercial activity to gather, organise and evaluate the knowledge of local particularities.

This forms the basis for his decision to bundle, un-bundle and re-bundle goods and services for which he acts as an intermediary. The value added by his activities is that his supply is “made to measure” for the local market. Consumers are willing to pay for this service because their preferences are matched more closely. At the same time producers profit because they share some of the risks associated with their inventory with the intermediary and would otherwise

²¹ This is not to say, though, that this commercial activity must be accomplished externally. Alternatively, a subsidiary might be established.

lack important information. The producer does not have to gather, organise, and evaluate all the relevant information which forms the basis for the intermediaries decision. It is sufficient if any changes in demand and supply conditions of a local market are communicated to the producer via an intermediary. “ ... intermediaries also provide valuable information about customers. ... Even in cases where producers do not receive explicit consumer information, retail intermediaries implicitly provide information processing services by aggregating demand information from a variety of local markets.” (Sarkar, Butler, Steinfield 1995, p. 7). Without intermediation the producer would have to gather, organise, and evaluate the relevant knowledge of the local markets by himself. This centralised decision making process is less efficient than a decentralised one. The informational burden is shared between the producer and the intermediary.

A Korean book retailer, for example, knows more about the local particularities of the Korean book market than a publisher in the USA. Instead of engaging in costly market research the USA publisher sells to the Korean retailer who has an informational advantage.

Any perceived profit opportunities will result in a change of the intermediaries inventory position. Misperceptions with regard to this profit opportunity will reduce the intermediaries profits but leave those of the producer unaffected.²² Apart from the aforementioned effect of risk sharing, this also represents an incentive compatible mechanism to shelter the principal (producer) from insufficient effort by the agent (intermediary).

Williamson (1990, p. 125) argues that car sales depend on specific local knowledge. As more people exchanged their old cars for new ones special local knowledge became more important. Since unified governance would reduce the incentives to examine the used cars appropriately the US automobile industry established a franchise system.

²² The arrangement that the retailer bears all the risk of devaluation of his inventory is wide spread but other, more complex arrangements are feasible (see Sarkar, Butler, Steinfield 1995).

*It is the central task of intermediation to gather, organise, and evaluate the knowledge of particular circumstances of time and space and to communicate it to producers. As an intermediary specialises in the acquisition of relevant knowledge he gains a competitive advantage due to prevailing economies of scale in the production of information.*²³

Once the intermediary has accomplished his task it seems that producers and consumers could do easily without him since the necessary knowledge has already been gathered, organised, and conveyed to the market participants. To conclude that the intermediary would now be under threat is not justified since in a dynamic economy the particular circumstances of time and space are always and constantly subject to change. To ensure that the producer can adapt to such changes quickly the necessary information has to be conveyed to him.

THE JOINT PROVISION OF THE SERVICES OF IMMEDIACY, OF REDUCING ASYMMETRIC INFORMATION AND INFORMATIONAL EFFICIENCY

The provision of the services of immediacy and of reducing asymmetric information were shown to exhibit strong economies of scope since both involved being very well informed about the characteristics of the good traded (see p. 16). Gathering, organising, and evaluating the knowledge of particular circumstances of time and space was identified to be one the central tasks of intermediaries. At the same time, market makers need to be relatively well informed about the underlying supply and demand curves (see pp. 9) which also implies that they need to obtain the knowledge of the particular circumstances of time and space. Therefore, strong economies of scope up to a specific firm size prevail between the provision of the services of immediacy and of informational efficiency. Consequently, the joint provision of the three intermediation services discussed in this paper is more efficient than their provision by three independent intermediaries as the later would inevitably lead to a duplication of efforts. As long as the aforementioned specific firm size is well below total

²³ See Diamond 1984.

market volume a competitive market structure in the relevant market is not contradictory to the argument.

THE EFFECTS OF ELECTRONIC COMMERCE ON THE DISPERSION OF KNOWLEDGE IN SOCIETY

The electronic communication effect will reduce the costs of communicating and processing existing information. The electronic integration effect will enable users to interconnect various sources of existing digitised information. Therefore, the value added by gathering and organising information will increase. But the dispersion of knowledge will be unaffected by these consequences of the diffusion of electronic commerce. Particularities of time and space will still exist. Someone has to gather, organise, and evaluate any information concerning these particularities.²⁴ As soon as firms²⁵ perceive their exploitation as profit opportunities the relevant knowledge will be communicated via the price system. Even if the market infrastructure is an electronic network price adjustments are based on changes in excess demand and excess supply in the local markets. To react properly to such changes producers need to know their causes. These are conveyed to them by the intermediaries either implicitly or explicitly. Only when the relevant information is digitised and fed into the electronic network the efficiency enhancing effects of the diffusion of electronic commerce will become fully operational. As a result, decentralised planning becomes more efficient.

The consequences of the electronic brokerage effect are entirely different. An electronic market has its own particular circumstances of time and space. Before electronic markets completely substitute for traditional markets the diffusion of electronic commerce increases the number of 'local' markets a supplier has to be informed about. Amazon, for example, has an informational advantage concerning the particularities of the online book market. Therefore,

²⁴ See also Steinfield, Whitten 1999.

²⁵ Be they independent intermediaries or fully integrated subsidiaries.

publishers rather supply this particular market via this particular intermediary than set up their own B-2-C e-commerce distribution network.

The conclusion that intermediaries are under threat rests on the assumption that all traditional local markets are substituted for by one single electronic market in which all producers and all consumers interact directly.²⁶ Any information that is relevant for the producers would then have to be communicated to them via relative prices and in direct interaction with other market participants (e.g. online discussion groups, online customer care programs, user groups etc.). Even though the costs of direct interaction with all other market participants are drastically reduced due to the communication and integration effect it seems unlikely that this could be a substitute for specialised local expertise. The rising numbers of online bookstores (e.g. topically or locally focused) suggests that the informational efficiency of intermediation prevails even in the world of e-commerce.

Furthermore, it is assumed that the producer has the same capacities as the intermediary in processing this information and spotting profit opportunities based on it. The success of Amazon suggests that producers are not always best suited to be the first to spot profit opportunities. Complete centralisation of information gathering, organising, and evaluating, therefore, seems to be an unlikely consequence of the diffusion of electronic commerce.

INTERNAL PRODUCTION VS. PRINCIPAL-AGENT RELATION

Disintermediation can also result from a decision of the principal (e.g. the producer) to provide the intermediation service under consideration internally. How will the diffusion of electronic commerce influence this strategic decision? Intermediation is efficient as long as the marginal efficiency gains resulting from outsourcing the task of information gathering, organising, and

²⁶ Alternatively, intermediaries might disappear after they have been acquired by the more centralised producer. Then the service of intermediation is produced internally. The following section intends to analyse the effects of the diffusion of electronic commerce in this respect.

evaluating compensate the principal for her share of the agency costs and the agent's compensation at the margin. Therefore, disintermediation by internal production occurs if one of the three following statements is true, *ceteris paribus*:

I. Electronic commerce reduces the marginal costs of internal production of the task under consideration.

II. Electronic commerce increases the agent's marginal costs of production of the task under consideration.

Consequently, the existing intermediaries would lose their competitive advantage in gathering, organising, and evaluating information on local particularities. The communication and the integration effects of electronic commerce clearly mark it as a process innovation rather than a product innovation. As such it will reduce the agents' marginal costs as well as those of the principal and might leave comparative advantage unaffected. For the communication and integration effect to become fully operational the relevant information has to be digitised and fed into the network. Therefore, the marginal efficiency gains from delegation would still be positive.

The brokerage effect implies that the principal has direct access to his current customers. Therefore, the principal would be informed about price changes immediately. But the causes of these changes are still not known to him. Only if all relevant information could be gathered by the principal as efficiently as by the agent, disintermediation would result. Although the costs of information gathering via online sources (e.g. online discussion groups, online customer care programs etc.) will be reduced due to the communication and integration effect it seems highly unlikely that (i) all relevant information can actually be gathered via online sources and (ii) as efficiently as via an intermediary.

III. Electronic commerce increases marginal agency costs and/or the agent's compensation at the margin.

The literature²⁷, though, points in the opposite direction: Marginal agency costs decrease due to the communication and integration effect of electronic commerce because monitoring costs are reduced. Given the market is sufficiently competitive, the aforementioned reduction of marginal costs of the agent's intermediation service will reduce his compensation as well.

To conclude: As the marginal costs of internal production and the agent's marginal costs are both affected by the diffusion of electronic commerce the effect on the comparative advantage is ambiguous. But there are no clear indications that the marginal efficiency gains from intermediation would be reduced. At the same time, the decrease in monitoring costs and the agent's compensation provide a strong case for a shift from internal production to principal agent relations. "Increased use of IT in the retail industry has contributed to an increase in the importance of retailers and credit companies as sources of consumer information." (Sarkar, Butler, Steinfield 1995, p. 7). Disintermediation by internal production is an unlikely consequence of the diffusion of electronic commerce.

3. CONCLUSIONS

Although a trend towards disintermediation seems so obvious to many commentators on e-commerce the results of this paper clearly show that disintermediation due to electronic commerce cannot be generalised to all intermediation services. The Threatened Intermediation Hypothesis is too simplistic. Three intermediation services – which have received little attention in the literature so far - were identified: (1) hold inventory to provide the service of immediacy and insurance against systematic valuation risk, (2) reduce asymmetric information by establishing a reputation, (3) gather, organise, and evaluate information which is dispersed in society. The analysis of the effects of the diffusion of electronic commerce on the demand for these services yielded the following results:

²⁷ See, for example, Benjamin, Wigand 1995, p. 65.

The diffusion of electronic commerce will not have any systematic influence on the arrival rates of buy and sell orders nor on individual risk and/or time preferences. Therefore, the demand for the *services of immediacy and insurance against systematic valuation risk* will not decrease.

As electronic markets increase the number of participants in any single market the probability to trade with the same counterparty repeatedly decreases. This can reduce the payoffs to *establishing a reputation* for individual sellers. Due to the communication and integration effect the task of monitoring can be shifted more easily from the individual buyer to a specialised intermediary who monitors the performance of the party that has an informational advantage. Also sellers profit from the delegation of the task of establishing a reputation. The higher transaction volume of the intermediary enables him to reduce the costs of establishing a reputation per transaction, to increase the credibility of his commitment and to avoid the duplication of efforts among sellers. Therefore, electronic commerce is more likely to increase the demand for this particular intermediation service.

Gathering, organising, and evaluating information is one of the main functions of an intermediary as knowledge of the particular circumstances of time and space is dispersed in society. The diffusion of electronic commerce will not reduce the demand for this particular intermediation service. The informational efficiency of intermediation will prevail. Complete centralisation of information gathering, organising, and evaluating seems unlikely.

Regarding disintermediation by internal provision of the intermediation services by traders no indication was found that electronic commerce would reduce the marginal efficiency gains from engaging in a principal agent relation nor increase its marginal costs to the principal. In all three of the cases analysed intermediaries would continue to have a comparative advantage in the provision of the intermediation services. This is intuitively appealing since electronic commerce is a process innovation and can be utilised by intermediaries as effectively as by other traders.

The conclusion of this paper deviates considerably from the literature because (i) intermediation services were identified which received very little attention in the existing literature and (ii) the relative importance of these services is likely to out-weigh the simple order processing services (e.g. airline ticketing) which have been discussed in previous studies²⁸.

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