Factors determining the acceptance of payment methods by online shops in Poland

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Abstract

The work deals with an analysis of factors influencing the acceptance of the seven major payment methods (i.e. cash on delivery, online payment integrator, card payment, bank transfer, pay-by-link, virtual payment provider, and payment in person) by the Polish online shops. Our research was based on empirical data obtained through surveys interviews with the managers of online shops. The univariate logit models describing acceptation of seven payment methods were constructed. A total of 89 explanatory variables divided into five categories were taken into account. The results obtained in the study demonstrated that a shop's strategy of using distribution channels has a strong influence on its acceptance of particular payment methods. The preferences of online shop managers, the involvement in online auctions and cross-border sales also play a significant role. The study confirmed competition between banks and non-bank intermediaries on the payment market as well as the widespread popularity of outsourcing in the area of online payments.

JEL classification – G2, L1, L8
Keywords – Payment acceptance, Online shops, Electronic Commerce, Non-bank payments, Online auctions

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1. Introduction

The payment market is an example of a two-side market where technological and business platforms compete (Rochet and Tiroley, 2003; Milne, 2005; Chakravorti and Roson, 2006), so they need to be accepted by both customers and merchants. The constantly growing significance of e-commerce all over the world led to that it has become a subject of many studies (Eastin, 2002; Min and Galle, 2003; Koyuncu and Bhattacharya, 2004; Liu *et al.*, 2008; Schrödera and Zahariab, 2008). However, most of these researches focuses on the demand side of the market and takes into account various factors influencing the preferences and choices of individual customers. Factors affecting the decisions of merchants have not been studied thoroughly, probably due to that they are more difficult to analyse. It should be remarked that the availability of payment instruments accepted on the Internet for customers is an extremely important, but simultaneously frequently underestimated, factor influencing the development of e-commerce. In a situation when the basic instruments are available to a limited degree, an example of which is the availability of credit cards in Poland[2], on-line shops' decisions concerning the methods of payment become more and more important.

Just as payment instruments influence the expansion of online shopping, e-commerce is a vital stimulus to the development of payment services (Evans and Schmalensee, 2008). Analyses of innovations in the field of payment services in the last 20 years have clearly shown that on-line payment systems have provided more solutions than those used in local Points-of-Sale (OECD, 2006; Heng, 2007; Chande, 2008). On the one hand this results from considerably varied payment needs of Internet users, but on the other hand it stems from relatively low costs of online payment systems, owing to which niche solutions can function (Heng, 2007). Low costs needed to introducing them into the market result from the fact that online payment does not require the development of a dedicated national-wide network of acceptance in local Points-of-Sale (Levitin, 2007) as it uses the already existing and universal infrastructure of the Internet. The abundance of online payment methods compel Internet shops to select only those that will be accepted. The result of these decisions strongly affects the development of the whole e-commerce market.

This study seeks to identify the drivers underlying the decision of online shop managers to accept particular payment methods. The empirical analysis presented here is based on a sample of online shop managers and employs an extensive set of explanatory variables. The logit models were constructed to explain the reasons for accepting or rejecting

[2] In 2007 only 8.2% of Poles aged 15-75 held credit cards, 35% possessed debit cards, and only 48% had a bank account, (source: Polasik and Maciejewski, forthcoming 2009).

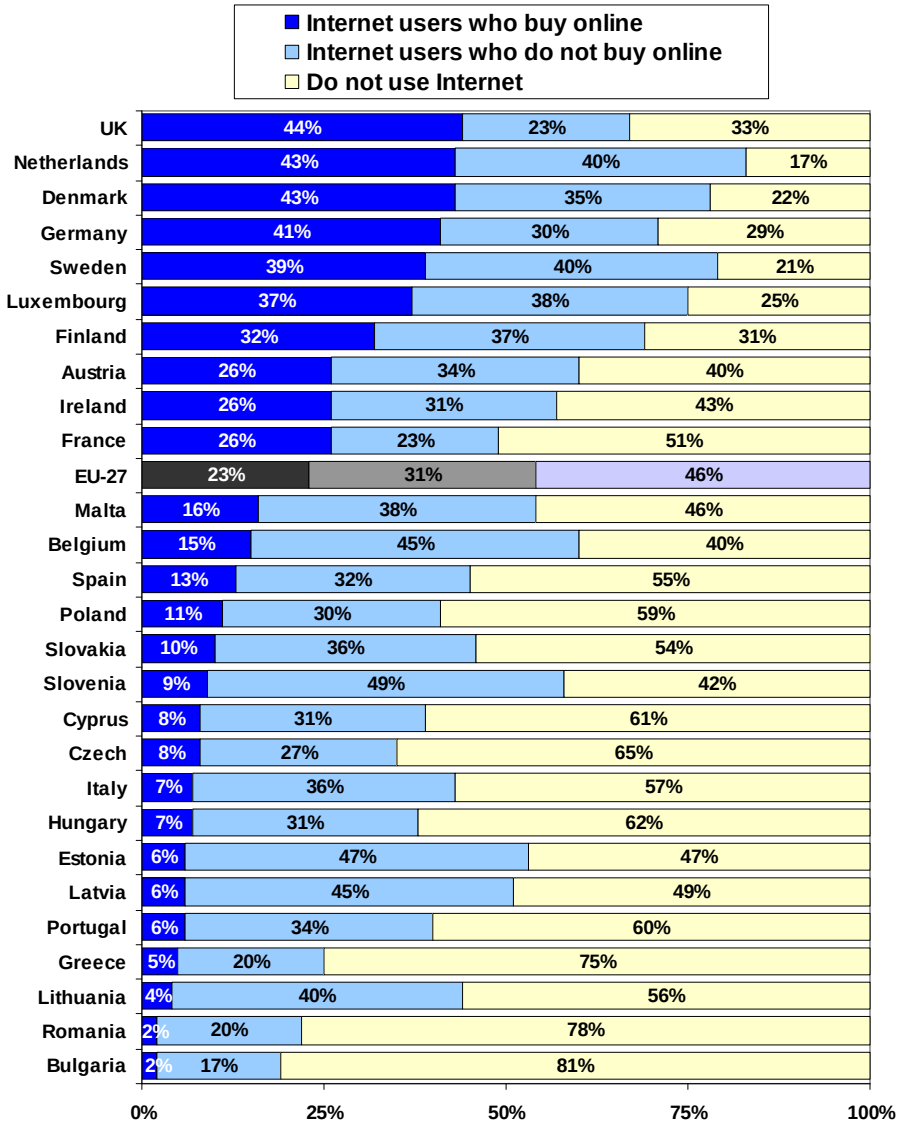
the most important seven payment methods by an online shop. So far, the research concerning e-commerce supply side has been rarely published and many factors taken into account in our study, such as parallel physical distribution channels, the role of auction markets, or managers' preferences, are a real novelty. This study focuses on the Polish market, which is the biggest among the new EU member states (Eurostat, 2008) and which records extraordinarily large dynamics of e-commerce development.

The work is structured as follows. Section 2 provides a brief comparison of e-commerce in Poland and other EU member states, whereas Section 3 contains a description of the major methods of payment used in e-commerce in Poland and abroad. The conceptual research model and research hypotheses are presented in Section 4. Section 5 focuses on the methodology used in the study as well as on potential explanatory variables. The results of empirical research conducted on the basis of the logit model for selected seven payment methods are presented in section 6. The last section contains the summary and conclusions.

2. E-commerce in Poland as compared with other European Union countries

Owing to its unusually dynamic development, the Internet has been used for various commercial purposes with e-commerce as one of the most important applications. This market has already become a vital segment of retail in many countries all over the world. However, the degree of e-commerce development depends on many factors, including the availability of the Internet, the activity of users as regards shopping, the level of trust in online transactions in society, and the amount of a household's disposable income per capita (Oxley and Yeung, 2001). Consequently, there exist considerable differences in the use of e-commerce and payment methods in particular countries. Figure 1 illustrates the percentage of Internet users and online shoppers in the European Union in 2007. The percentage of online shoppers in the whole population (aged 16-74) was the biggest in the United Kingdom (44%), and only slightly lower in the Netherlands and Denmark (43%) and in Germany (41%). The average percentage of online shoppers in the whole European Union (27 states) equalled 23%. In Poland 11% of the society shopped online, which ranked the country first among the new EU member states from Central Europe. It must be noticed that this result was only slightly lower than in Spain (13%) and higher than in Italy (7%) and Portugal (6%).

Figure 1. Percentage of Internet users and online shoppers in the European Union in 2007

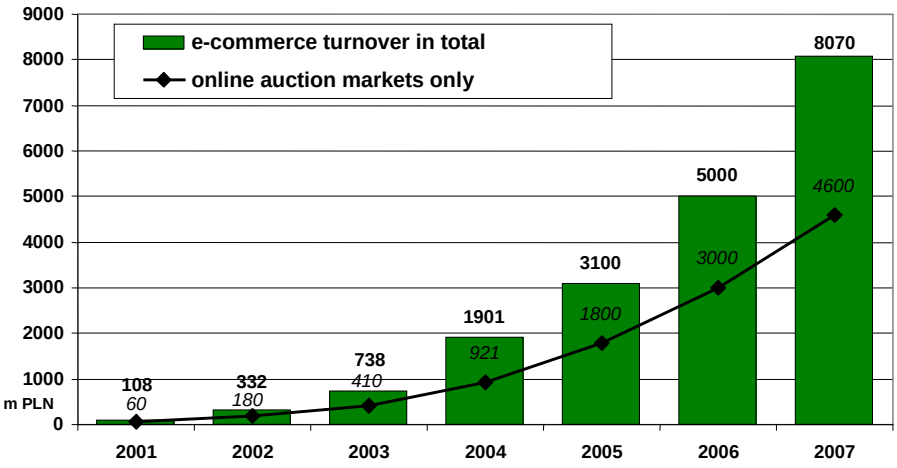


Source: Authors' own compilation based on Eurostat (2008); Data for 2007 concerning persons aged 16-74; the percentage takes into account persons who performed a given activity within three months before the study.

At the end of the 20th and the beginning of the 21st centuries e-commerce played a minor role in Poland. It was only in 2004 that one could observe the start of dynamic development of e-commerce in Poland (see Figure 2). According to IAB data (Kaznowski, 2005) the first time e-commerce accounted for 1% of total retail trade in Poland was in 2005 (whereas it was 2.5% in Western Europe and 4% in the USA). In 2007 the Polish e-commerce turnover increased by 61% and equalled PLN 8.07 billion (Grzechowiak and Jarosz, 2008). A typical feature of the Polish Internet market is a considerable share of online auction markets, accounting for 50 to 60% of the total turnover. In 2007 the value of the Allegro.pl auction market turnover, the leader of the Polish Internet auction markets, increased to PLN 3.9 billion (an annual increase of 56%). The other four leading auction systems had their turnover

estimated at about PLN 0.7 billion, whereas approximately 4,000 online shops recorded a total turnover of more than PLN 3.4 billion. It must be remarked that a part of the Internet shops turnover is generated through online auctions where the shops offer their products. The development of e-commerce in Poland is stimulated by a dynamically increasing number of Internet users, which rose from 8.8 million to 14.1 million between 2005 and 2007 (Internet World Stats, 2008).

Figure 2. E-commerce turnover in Poland between 2001 and 2007



Source: Grzechowiak and Jarosz (2008).

3. Payment methods in e-commerce

The dynamic development of e-commerce stimulates the demand for the servicing of payments for the product purchased via the Internet. The suppliers of payment services used in e-commerce can be divided into two groups: (a) banks and acquirers and (b) non-bank intermediaries offering payments based on various innovative solutions. The emergence of a new group of intermediaries resulted from the demand for servicing transactions conducted on specific new electronic markets, particularly Internet ones. Initially, banks were not interested in such payment methods as they were unprofitable due to the limited value of transactions, especially the so-called micropayments (OECD, 2006; McGrath, 2006; Kisiel, 2006). Moreover, traditional bank and card payment methods were often inconvenient to make online transactions and did not guarantee security to the transaction parties, especially to the buyer. In many cases it is also difficult to use them due to legal or system limitations, e.g. when making cross-border payments. Consequently, there emerged a market niche that was used mostly by IT firms (Chande, 2008).

The growing importance of e-commerce for economy in recent years encouraged many banks to offer payment services dedicated to electronic and low-amount transactions, which has resulted in an increased competition in this segment of the retail payments market. Since banks enjoy public trust and deal with millions of customers in traditional distribution channels, they find it relatively easy to win the trust of Internet users (OECD, 2006; Heng, 2007). Consequently, many customers who appreciate security will opt for payment services offered by banks, especially that in most cases the cost of the service for the customer is low. Payment methods offered by non-bank institutions are usually more flexible (e.g. payments persons-to-persons, via e-mail) and quicker as compared to services provided by banks (González, 2004; Jackson, 2006). They facilitate easy and effective conclusion of cross-boarder transactions, which is greatly appreciated by many customers living in the era of globalisation (the advantage of non-bank institutions in this respect has been partially eliminated as a result of SEPA development[3]; Bolt and Humphrey, 2007; Jonker and Kosse, 2008). It must be noticed that non-bank entities include also online payment integrators, which specialize in combining and servicing the maximum number of payment methods within one system. Their role often goes unnoticed as they are almost transparent[4]. However, as their offer the outsourcing of online payments, they bring in a new quality and functionality for online shops, owing to which these institutions exert considerable influence on the e-commerce market.

The most important payment methods used in e-commerce are presented in Table I. Generally, it must be concluded that customer can choose from a wide range of payment methods, including various forms of cash payments, cards and mobile payments as well as totally virtual instruments. Due to customers' concerns about the security of online transactions, the usefulness of pre-paid instruments (limiting the amount of possible losses resulting from fraudulent transactions) is much greater than that of payments in local Points-of-Sale. It must be noticed that the customers who do not have access to bank and card instruments may perform online transactions using various forms of cash transfer, including

[3] SEPA – Single Euro Payments Area – The SEPA project will allow customers to make non-cash euro payments to any beneficiary located anywhere in the euro area using a single bank account and a single set of payment instruments (source: European Central Bank, http://www.ecb.int/paym/sepa/html/links.en.html).

[4] Customers consider online payment integrators to be transparent because they usually provide an Internet interface that services many payment methods. Thus is not perceived as a payment method by customers for whom the payment method is the instrument they will eventually use to make their payment, such as a credit card. The intermediation of online payment integrators have secondary importance for the customers (excluding the question of trust and security). However, online shops treat online payment integrators as a separate payment method because they are often not informed about the way the customers used to pay the intermediary. Online shops receive payments, diminished by the commission for the intermediary, in the same way, irrespective of the methods customers used to pay.

online vouchers and cash payments at the traditional cash desk for the shopping done online (payment in other POS).

Table I. Comparison of types of payments used in e-commerce

	Use of cash	Bank's intermediation	Non-bank's intermediation
pay before	• online vouchers	• virtual/pre-paid card	• mobile payment (e-wallet) • virtual (e-mail) payment provider • virtual (e-mail) payment + Escrow • online vouchers (online purchase)
pay now	• cash on delivery • payment in person • payment in other POS • payment onto banking account (eg. at post office)	• bank transfer (any ordering channel) • pay-by-link • debit card	• mobile payment (current account) • virtual (e-mail) payment provider
pay later		• credit/charge card	• mobile payment via SMS • mobile payment (based on credit card) • virtual (e-mail) payment provider (based on credit card)

online payment integrator

Source: Authors' own study.

Most of the above payment methods are common in online transactions; however, some of them need to be precisely defined in order to be further used in the research model. Thus,

- **online payment integrator** is a company providing many types of payment for Internet shops. On the basis of a framework agreement, this intermediary automatically services many payment channels, owing to which the shop is not engaged in this process. This activity should be treated as a form of outsourcing;
- **pay-by-link** is a solution consisting of an online interface, which automatically generates a bank transfer form that is authorised by the customer at their bank's online banking service. Thus, it is a cover for traditional bank transfers; however, that the transaction is convenient for the customer and the online shop is immediately informed about that it has been made produces a significant added value;
- **virtual (e-mail) payment provider** is a company (usually non-bank) which facilitates sending the payment at the recipient's e-mail address through virtual accounts. The money needed to make the payment usually comes from debiting the buyer's credit card. Owing to this method individuals can accept payments in

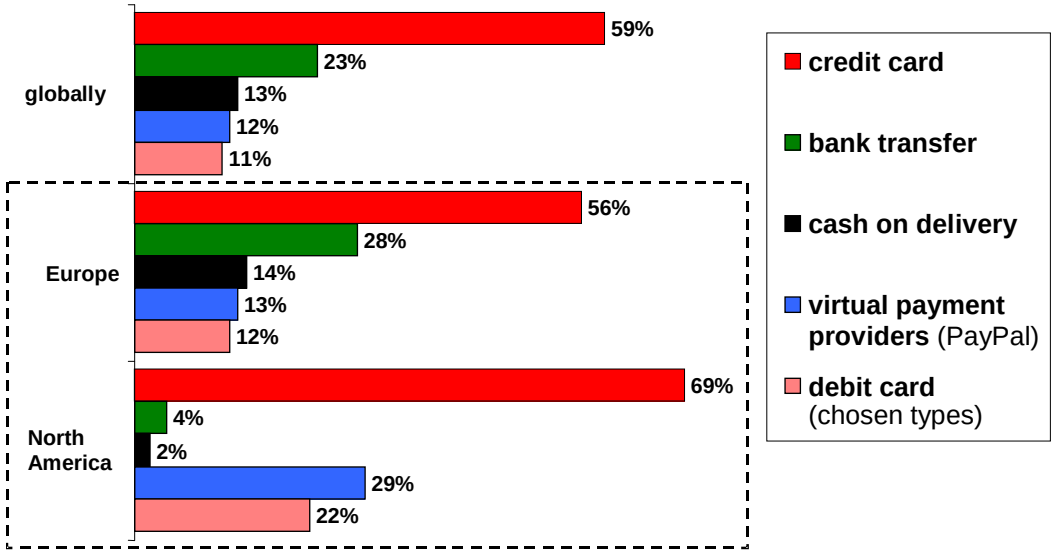
person-to-person transactions. The most popular instrument of this type is PayPal (Chande, 2008);

- **payment in person** means that the customer receives the goods ordered via the Internet and pays for them at a local Point-of-Sale or at the warehouse belonging to the online shop;
- **payment in other POS** means that customer pays for the shopping done online through a system applied to make cash payments for bills (for electricity, gas, or telecommunications services) in shops and other Points-Of-Sale, which usually use a dedicated terminal network.

3.1 Dominant payment methods in global e-commerce

Credit cards are the most popular payment method in global e-commerce (OECD, 2006). In 2005 it was used by 59% online shoppers (Figure 3), whereas the bank transfer was the second most popular payment instrument in the world (23%). Payment in person, virtual payment providers (e.g. PayPal) and debit cards were used less frequently (13%-11%). The biggest e-commerce market in the world, North America was overwhelmingly dominated with credit card payments (69%), while the second popular method were virtual payment providers (29%). Another popular payment method was the debit card (22%), whereas the bank transfer (4%) and payment in person (2%) played a minor role in North America (ACNielsen, 2005).

Figure 3. The most popular payment methods in global e-commerce in 2005



Customers could use several payment methods (multiple choice).

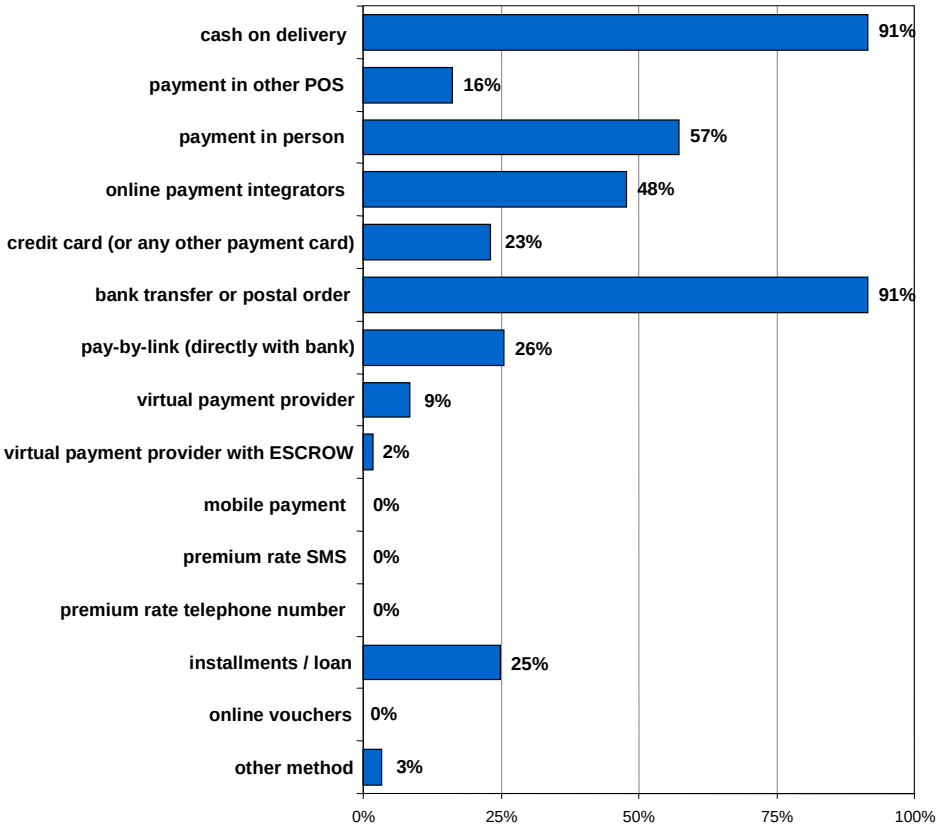
Source: ACNielsen (2005).

European Internet users displayed other preferences in relation to methods of payment for their online shopping. Similar to North America, credit cards were the most popular payment method (56%); however, European customers often used bank transfers (28%). Payment in person (14%), virtual service providers (13%) and debit cards (12%) were less popular. In the countries which were taken into account in the study of ACNielsen (2005), the bank transfer was used by most customers in Germany (as many as 83%) and Austria (65%), whereas Poland and Belgium came third with 42%. In Europe bank transfers are an important payment method in e-commerce (European Commission, 2008). However, in order to use them conveniently and effectively to pay for their online shopping, customers must have access to the Internet banking system, which may limit the availability of bank transfers (Polasik and Wisniewski, 2009).

3.2 The structure of payment methods in Poland

The survey research commissioned by the National Bank of Poland in 2008 showed that the structure of payment methods used in e-commerce in Poland significantly differs from that observed on the main world markets (Polasik and Maciejewski, 2009). In terms of the popularity of acceptance, the Polish online market is overwhelmingly dominated by two payment methods (see Figure 4): (1) cash on delivery and (2) the bank transfer (or its equivalent in the form of a postal order transferred to the shop's bank account) which are accepted by 91% of Internet shops. The third most commonly accepted method was payment in person (57%). The advantage of this solution is the possibility of overcoming the customer's mistrust, especially in the case of high-value transactions (e.g. the purchase of a laptop or refrigerator). However, this method is effective from the economic point of view only when used close to the customer's place of residence, which deprives it of one of the greatest advantages of e-commerce, i.e. its national-wide range. The popularity of cooperation between shops and online payment integrators is worth noticing. Almost a half of Internet shops (48%) decided to employ these intermediaries to outsource all or some types of payments. Owing to such a solution customers are offered a wide range of payment methods without involving shops in their servicing (in particular, shops do not have to sign agreements with banks or acquirers to accept card payments or pay-by-link transfers). Moreover, 26% of shops accepted pay-by-link without the mediation of online payment integrators.

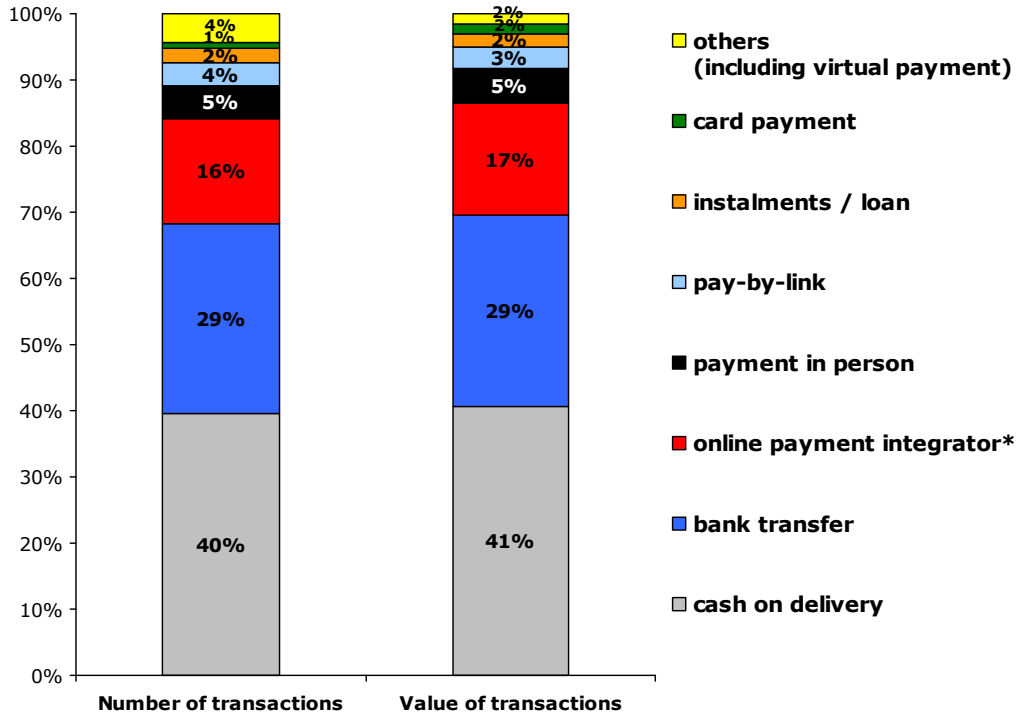
Figure 4. Structure of payment methods accepted in e-commerce in Poland



Source: Research conducted by Polasik and Maciejewski (2009), online shops sample N=117.

The results of this survey show that the popularity of accepting various payment methods (Figure 4) was connected with the volume of trade turnover generated by a particular method (Figure 5). Three most important payment methods in e-commerce included: (1) cash on delivery (39.5% of transactions and 40.6% of turnover value), (2) bank transfer to the shop's bank account (28.7% of transactions and 29% of turnover value), and (3) online payment integrators (15.9% of transactions and 16.9% of turnover valuer, including all available methods of payment). It is worth noticing that within the online payment integrators bank transfer and card payment have significant shares in number and value of transactions. However even adding direct and outsourced card payments, they still play rather small role on the Polish market.

Figure 5. Percentage of payment transactions for online shopping according to payment method



* Within the online payment integrators occurred the following payment methods:

	% of total number of transactions	% of total value of transactions
pay-by-link	2.6	2.2
card payment	3.3	2.8
bank transfer	8.7	7.9
others	1.3	4.0
Total for online payment integrator	15.9	16.9

Source: Research conducted by Polasik and Maciejewski (2009), online shops sample N=117.

The above results indicate that the structure of payment methods used in e-commerce in Poland significantly differs from the international one (see Figure 3). Due to a considerable significance of bank transfers, which demonstrates a major role of banks, it resembles the structure of the European markets rather than that of the North American market. The dominance of methods which are based on national settlement systems and are thus difficult to apply in cross-border trade, i.e. cash on delivery and bank transfer, is worth noticing. However, both these methods may find direct application in online auctions, which is impossible in the case of payment cards that require the mediation of virtual payment providers.

4. Conceptual research model and hypotheses

On the basis of the usage structure of the payment methods in Polish e-commerce (presented on Figure 5) and the data from developed markets (see Figure 3), i.e. North American and West European ones, seven most important methods of payment have been distinguished. These methods include: (1) *cash on delivery*, (2) *online payment integrator*, (3) *card payment*, (4) *bank transfer*, (5) *pay-by-link*, (6) *virtual payment provider* and (7) *payment in person*. In the research the acceptance of each of these methods have been established as dependent variables and analysed in the econometric models described in consecutive parts of this work.

The selected methods differ considerably in many respects. The most innovative methods include *virtual payment provider*, *online payment integrator*, and *pay-by-link*. *Bank transfer* and *pay-by-link* are based on a domestic system of credit transfer settlements, whereas *card payment* depends on payment cards settlements. Only *card payment* and *virtual payment provider* facilitate the acceptance of foreign payments, whereas the other methods shall be rather used on the domestic market. Since it does not entail any commissions *bank transfer* is clearly the cheapest method in terms of the cost of acceptance (OECD, 2006). *Card payment* is the least safe method for the shop because it is exposed to chargeback (Frank, 2004; OECD, 2006), whereas accepting *cash on delivery* the shop runs the risk of losing the postage if the customer does not collect the parcel. The safest methods use payments in advance, i.e. *bank transfer* and *pay-by-link*. There are significant differences in the scope of the acceptance of particular payment methods on the Polish e-commerce market as shown on Figure 4.

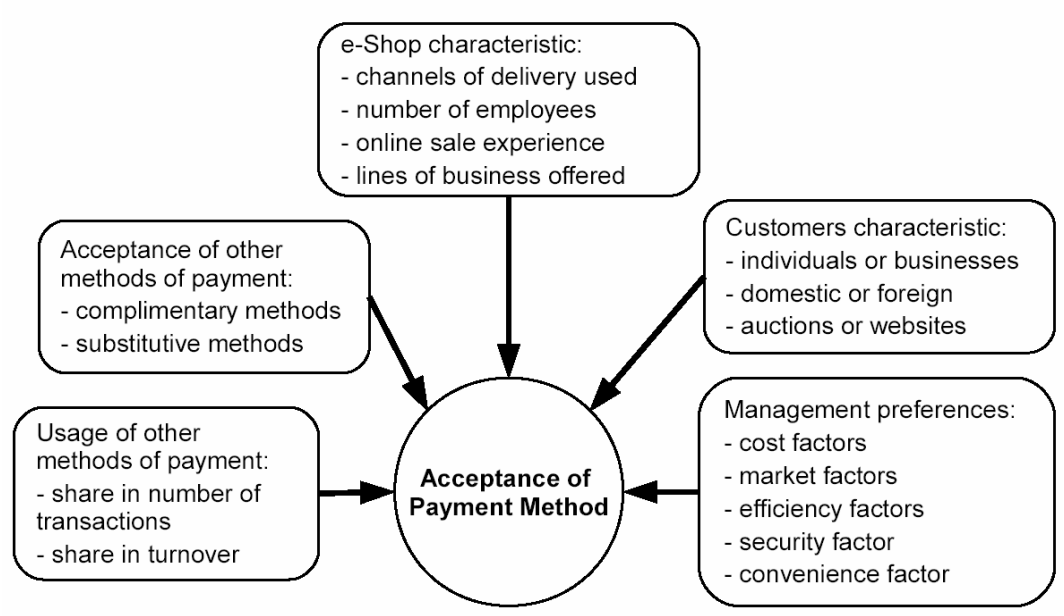
The methods vary also in respect to their availability for Polish citizens. In September 2007 (Polasik and Maciejewski, 2009[5]) only 48% of Poles aged 15-75 held a bank account (and thus could make *bank transfers*), whereas 13% had a bank account that could be managed via the Internet and offered access to *pay-by-link*. 35% of Poles held debit cards, most of which excluded online payments. Only 8% of Polish citizens had credit cards, which significantly limited the use of *card payment*. The least popular method were accounts offered by *virtual payment providers*, held by as little as 0.6% of the society. *Online payment integrator* allowed customers to use any of the above payment methods, and was thus readily available, whereas almost all citizens could use *cash on delivery* and *payment in person*. The survey study of Polish society revealed that the customers considered *pay-by-link* and *cash on*

[5] The second survey study conducted by Polasik and Maciejewski for the National Bank of Poland under the project "Innovative payment services in Poland and Worldwide" based on a representative sample of Poles (Polasik and Maciejewski, forthcoming 2009).

delivery to be the most convenient payment methods on the Internet and thought *virtual payment provider* to be the least advantageous one.

In order to perform the analysis of factors influencing the acceptance of chosen payment methods by the Polish online shops we have formulated a conceptual research model presented in Figure 6. Within the proposed model, the authors divided into five major categories the hypothetical factors which might influence an online shop management's decision about the acceptance of a particular payment method. These categories include: *(i) e-Shop characteristic, (ii) customers characteristic, (iii) management preferences, (iv) acceptance of other methods of payment, and (v) usage of other methods of payment*. Each category was further divided into particular factors and each factor was studied with one or several explanatory variables.

Figure 6. Research model



Source: Authors' own study.

The analysis of specialist literature and interviews with experts in e-commerce conducted at the initial stage of the study convinced the authors that the decision about accepting or not accepting a particular payment method may be based on a *given shop characterisitc* which consists of several particulars. Selling via both the Internet and various physical distribution channels shall encourage the acceptance of *payment in person* and payment cards as long as they are accepted at local POS. A considerable number of employees shall encourage the acceptance of laborious methods, such as *payment in person*, *cash on delivery* and *bank transfer*. Firms with few employees shall prefer automated

methods, especially *online payment integrator*, which relieve the shop staff of their duties. It may be assumed that shops with greater experience in e-commerce shall be more likely to optimise decisions and accept particular payment methods. Market observations imply that offering particular types of products requires accepting certain methods of payment, e.g. *pay-by-link* to sell services, and *bank transfer* and *cash on delivery* to sell expensive goods.

The choice of payment methods may also depend on the target group of customers to whom the shop addresses its offer. Some methods, such as *bank transfer* and *card payment*, are preferred by businesses, whereas others, i.e. *cash on delivery*, *payment in person* and *virtual payment*, are used almost exclusively by individuals. The geographical location of the target market also plays a significant role. Methods such as *cash on delivery*, *payment in person, pay-by-link* as well as *bank transfer* (before SEPA implementation) are used mostly on the domestic market, whereas *online payment integrator* can service foreign transactions only through selected channels. Thus, a decision to sell abroad entails the necessity of accepting *card payment* and/or *virtual payment*. It is also important whether an online shop chooses to use auction markets to sell its products. customers who conclude transactions on this unusual market, which has dominated the Polish e-commerce, are used to using two methods (Polasik and Maciejewski, 2009). Depending on customers' preferences, these methods are *bank transfer* for payment in advance and *cash on delivery* when they want to feel more secure. Contrary to that, Western auction markets are dominated by a payment instrument that has been created especially for person-to-person transactions conducted via e-mail communication, i.e. *virtual payment*.

Not only are the decisions of online shop managers conditioned by external factors, but they also greatly depend on the preferences of policy makers (managers). The authors of the study distinguished five groups of factors which are typical of *management preferences*. *Cost factors* mean the importance attached by managers to the amounts of the commission on sales and the fixed costs of accepting payments. It may be assumed that the managers for whom these factors are of vital importance will prefer *bank transfer* and consider *cash on delivery* to be the least attractive method of payment. *Market factors* concern the market position of a particular method of payment, i.e. its popularity among prospective customers and competitor online shops. Theoretically, *online payment integrator* shall be the best method in this respect, whereas innovative niche methods shall be the least popular. *Efficiency factors* concern the attitude of policy makers to such features of payment methods as the automation of payment servicing, the time of payment settlement, the possibility of settling the payment in many currencies, and the inclusion into an offer of *online payment integrator*.

Those who prefer these factors shall be discouraged from accepting laborious payment methods that engage the shop staff, i.e. *cash on delivery* and *payment in person*. The *security factor* reflects the importance of transaction security for managers. Those who attach great significance to this factor will be unlikely to accept *card payment*, and, simultaneously, encouraged to opt for *bank transfer*, *pay-by-link* and *payment in person*. The last one is the *convenience factor* which relates to the meaning managers attach to the convenience of their customers while making payments. Policy makers who seek to provide maximum convenience for their customers shall be more likely to accept *pay-by-link*. The impact of this factor on the acceptance of the other payment methods can be diversified. It shall be emphasised that the influence of all *management preferences* factors is based on a subjective perception of methods by managers.

The last two groups of factors include the *acceptance of other methods of payment* and the *usage of other methods of payment*. It may be assumed that the availability of many methods shall entail the occurrence of both substitution and complementary effects. Thus, *bank transfer* and *pay-by-link* shall constitute substitutions for *card payment*. It can be also expected that *cash on delivery* will substitute *payment in person*, whereas *online payment integrator* will substitute most methods of payment. Moreover, it can be assumed that the fact of accepting of payment methods will entail several complementary effects as shops usually seek to increase possibilities of choice for customers. However, the usage of particular methods shall be connected with substitution effect since shops focusing on dominating method are not motivated to accept other, less popular, ones. Based on the analysis presented above, the following research hypotheses were formulated:

H1: Parallel usage of the Internet and traditional delivery channels has an impact on the selection of accepted payment methods.

H2: The sale to foreign markets discourages shops to accepting methods based on domestic settlementsystems or personal contact.

H3: Involvement in online auctions stimulates the acceptance of particular payment methods.

H4: Security concern has a strong impact on the decision to accept a given payment method in e-commerce.

H5: The number of employees has a positive effect on the tendency to accept labour-consuming methods of payment (such as cash on delivery) and a negative effect on the tendency to accept automated methods of payment (such as payment integrators and virtual payment).

H6: The acceptance of particular payment methods produces a significant substitution effect.

H7: The cooperation with online payment integrator is a substitute for many payment methods.

H8: The popularity of a particular payment method among prospective customers is a vital factor determining its acceptance online.

H9: Online shops consider customer convenience an important factor determining the acceptance of particular payment methods online

H10: Cost sensitiveness of online shop managers stimulate significantly the acceptance of bank transfer.

5. The methodology of the survey and the variable definitions

The purpose of the survey directed to payment recipients was to collect source data based on the information from persons who decide about the forms of payment for goods and services purchased online. The study and the survey questionnaire were devised by M. Polasik and K. Maciejewski, whereas the MillwardBrown SMG/KRC institute sampled the respondents and collected their replies, as commissioned by the National Bank of Poland. The study was conducted all over Poland between December 2007 and March 2008 on a sample of 117 online shops. It is worth emphasising that at the end of 2007 there were only 3,257 online shops in Poland (Grzechowiak and Jarosz, 2008); therefore, it can be estimated that the survey was conducted among 3.6% of this population. It must be underlined that the term 'online shop' means both entities conducting only Internet sales and those selling on the Internet in parallel with traditional channels (such as shops, salons, branches, registered offices, small Points of Sale, or sales representatives).

The survey used a method called the Computer Aided Web Interview (CAWI). The initial stage of the very survey consisted of Computer Aided Telephone Interviews (CATI) which distinguished the respondents who met the survey assumptions and who agreed to participate in the experiment. The respondents were authorised to decide about and accept the payment methods used by their shop. Next, they individually completed the survey forms on the Internet. Respondents could take breaks in the process of filling in the forms (the system would save their answers), which allowed them to use external sources of information needed to complete the form thoroughly (e.g. to provide financial data or to consult other employees).

Owing to the survey the authors obtained 89 explanatory variables which are compared in Table II. These variables were tested in respect to their usefulness in models explaining shops managers' decisions concerning the acceptance of the seven major methods of online payments.

Table II. Explanatory variables used in the study

Variable names	Definition
E-shop characteristic	
Traditional_sales	Traditional sales channels in Poland; 1 if owned by the shop, 0 otherwise.
Other_sales	Other distribution channels (e.g. sales representatives); 1 if owned by the shop, 0 otherwise.
Number_websites, Number_auctions, Number_shopping_passages, Number_other_locations_online	Number of Internet locations concerning: online websites and portals, auction systems, shopping passages of other portals, other locations.
Polish_Post, Courier_company, Electronic_delivery, Collection_in_person, Other_collection	Manner of collecting goods by the customer through: the Polish Post, a courier delivery company, electronic delivery, collection in person, or other collection; 1 if a given method is possible; 0 otherwise.
Number_shops, Number_small_shops, Number_sales_representatives, Number_other_locations	Number of: shops, salons, and branches; small local Points-of-Sale, sales representatives, other untypical locations.
Years_in_internet	Years of conducting online sales
Years_in_business	Years of conducting traditional sales
Sales_abroad	Foreign sales; 1 if conducted by the shop, 0 otherwise.
Foreign_language_website	Website in a foreign language version; 1 if owned by the shop, 0 otherwise.
Number_ employee_online	Number of staff employed in e-commerce
Foodstuff, Clothing, Cosmetics, RTV_household_appliances, Electronics_computers, Books_press, Films_music, Internet_service_software, Office_equipment, Medicine_health, Gardening_tools, Building_materials, Furniture, Automobile_commodities, Tourism, Other_sector	Line of business: foodstuffs, clothing, shoes, sports equipment, cosmetics; radio, television and household appliances, electronics and computers, books and press; music, films and multimedia, Internet services and software; office equipment, health and medicine, gardening tools, building materials, furniture and interior design, automobile commodities, tourism, other; 1 if connected with the shop's line of business, 0 otherwise.
Number_NET_transactions	Number of online transactions in September 2007
%_NET_transactions	Share of online transactions in all retail transactions in September 2007 (in %)
Internet_turnover	Value of turnover on the Internet
Traditional_sales _turnover	Value of turnover in traditional distribution channels
Customers characteristic	
%_transactions_business	Share of transactions concluded with businesses and institutions (in %)
%_turnover_business	Share of turnover value with businesses and institutions (in %)
%_transactions_foreigners	Share of online transactions concluded with foreign customers (in %)
%_turnover_ foreigners	Share of turnover value with foreign customers (in %)
%_ transactions_auctions	Share of online auctions in Internet transactions (in %)
%_ turnover_ auctions	Share of online auctions in Internet turnover value (in %)

Management preferences - Weights (in %) ascribed to particular factors influencing the decision to accept a new method of payment (summing up to 100)	
Factor_fixed_costs	Fixed costs of accepting a given method of payment
Factor_commission	Commission on the value of accepted transactions
Factor_popularity_consumer	Popularity of a given method with Polish Internauts
Factor_competitor_shops	Share of other shops conducting similar activity and accepting a given payment method
Factor_foreign_settlement	Possibility of settling transaction in many currencies
Factor_security	Transaction security
Factor_customer_convenience	Payment convenience for customer
Factor_speed_settlement	Speed of settlement
Factor_automation	Payment automation
Factor_within_integrator	Offering a given method within online payment integrator
Acceptance of other methods of payment	
Cash_on_delivery, Payment_integrator, Card_payment, Bank_transfer, Pay-by-link, Virtual_payment, Payment_in_person, Credit_or_installment, Escrow, Payment_in_other_POS, Other_payment.	Accepted methods of payment: cash on delivery, online payment integrator, card payment, bank transfer, pay-by-link, virtual payment provider, payment in person, purchases on credit or installment, virtual payments with Escrow account, cash payment at other POS via bills payments system, other method; 1 if the method is accepted, 0 otherwise
Usage of other methods of payment	
%_tran_cash_on_delivery, %_tran_payment_integrator, %_tran_card_payment, %_tran_bank_transfer, %_tran_pay-by-link, %_tran_virtual_payment, %_tran_payment_in_person, %_tran_ credit_or_installment, %_tran_Escrow, %_tran_payment_in_other_POS, %_tran_other_payment.	Share of the number of transactions generated with a given payment method for (in%): cash on delivery, online payment integrator, card payment, bank transfer, pay-by-link, virtual payment provider, payment in person, purchases on credit or installment, virtual payments with Escrow account, cash payment at other POS via bills payments system, other;
%turnover_cash_on_delivery, %turnover_payment_integrator, %turnover_card_payment, %turnover_bank_transfer, %turnover_pay-by-link, %turnover_virtual_payment, %turnover_payment_in_person, %turnover_credit_or_installment, %turnover_Escrow, %turnover_payment_in_other_POS, %turnover_other_payment.	Share of turnover value generated with a given payment method for (in %): cash on delivery, online payment integrator, card payment, bank transfer, pay-by-link, virtual payment provider, payment in person, purchases on credit or installment, virtual payments with Escrow account, cash payment at other POS via bills payments system, other;

Source: Self-compilation.

6. Empirical Results

The authors identify empirically the factors underlying the decision to adopt a particular payment method. The acceptance of a selected payment method is a binary choice which can take only two values. A convenient way of formalizing this situation is to consider the variable Y as a Bernoulli random variable and analyse its distribution conditional on the explanatory variables gathered in a vector **x**, so that (Greene, 2003):

$$\text{Prob}\,(Y=1) = F(\boldsymbol{\beta}'\boldsymbol{x}),$$

$$\text{Prob}\,(Y=0) = 1 - F(\boldsymbol{\beta}'\boldsymbol{x}).$$

The set of parameters $\boldsymbol{\beta}$ reflects the impact of changes in **x** on the probability. The logit and probit models are the most often used models to explain a binary dependent variable (see for example Maddala, 1983, 1996; Wiśniewski, 1986; Hosmer and Lemeshow, 1989; Gruszczyński, 2002). In the probit model function F is a normal cumulative distribution function, while in the logit model the logistic cumulative distribution function is employed:

$$\text{Prob}\,(Y=1) = \frac{\exp(\boldsymbol{\beta}'\boldsymbol{x})}{1+\exp(\boldsymbol{\beta}'\boldsymbol{x})}.$$

The logistic distribution is similar to the normal one except in the tails which are considerably heavier. For intermediate values of $\boldsymbol{\beta}'\boldsymbol{x}$ the two distributions tend to give similar probabilities (see for instance Long, 1997; Hsiao at el., 1998). In some cases there are practical reasons for favouring one or the other for mathematical convenience, but it is difficult to justify the choice of one distribution or another on theoretical grounds. Here the logistic model is used; however, very similar conclusions were obtained for most payment methods, also from the probit analysis. There were some differences for cash on delivery, bank transfer (very few Y's equal to zero) and virtual payment (very few Y's equal to one). It seems that for those methods the logit model is better because the departures from the normal distribution are more evident.

For all analysed payment methods the parameters of the logit models were estimated by the quasi-maximum likelihood. Estimates of parameters, robust standard errors, t-statistics, and corresponding p-values are reported in Tables III-IX. Additional information can be obtained through analysis of the marginal effects calculated as the partial derivatives of the non-linear probability function, evaluated at each variable's sample mean. In order to better evaluate the quality of the models, the tables present some additional statistics, such as: the log likelihood, LR test for joint significance of explanatory variables, the percentage of cases

correctly predicted by the model, the McFadden pseudo-R^2, mean of dependent variable and f($\boldsymbol{\beta}'\mathbf{x}$) at mean of explanatory variables.

The likelihood ratio test decidedly rejects the null hypothesis of no relationship between the dependent variable and the regressors for all payment methods. Moreover, the results from individual t-tests imply that most of explanatory variables are strongly significant. The models can be divided into two groups. The first one contains models for the following payment methods: cash on delivery, bank transfer and virtual payment. The second group includes models for online payment integrator, card payment, pay-by-link and payment in person. Measures of goodness of fit indicate a significantly better quality of models for cash on delivery, bank transfer and virtual payment. The McFadden R^2 are about two times higher (from 0.63 to 0.74) for models from the first group and those models correctly predicted more than 96 % of the observations. Those measures suggest that the logistic model is well fitted for the data for the first group. On the other hand, marginal effects for explanatory variables in those models are quite low, which is connected with close to zero values of f($\boldsymbol{\beta}'\mathbf{x}$) at mean of independent variables. Measures of closeness of fit for the second group indicate worse effectiveness of models but still a satisfactory one. Based on the classification with the prediction cut-off value of 0.5, the models correctly classified from 76.9% to 87.2% decisions to adopt selected payment method. The marginal effects for explanatory variables for models from this group are much higher.

First of all, the results for each payment method were discussed separately; following that the conclusions concerning many methods were presented. General acceptance of *cash on delivery* resulted from a well-developed distribution network (*shops_number*, see Table III), which is used to conduct traditional sales parallel to online ones. It is probable that the use of physical channels, which are dominated by cash transactions in Poland, makes shop managers accept cash in virtual transactions as well. The acceptance of this payment method is also encouraged by the services of the Polish Post which, despite being a state-owned company, uses attractive prices for servicing *cash on delivery* as compared to courier delivery companies[6]. Moreover, the acceptance of this method is complementary with using *online payment integrator*. It results from that these intermediaries often do not service *cash on delivery*; therefore, although such a company turns to payment outsourcing, it has to process this popular method itself if it wants to offer it to its customers.

[6] Self-calculations on the basis of: the Polish Post, http://www.poczta-polska.pl and DHL Express http://www.dhl.com.pl (read: January 2009).

It turned out that a considerable share of business-to-business and foreign transactions was the factor that could discourage shops from accepting *cash on delivery*. It results from that the companies which buy online are unwilling to accept such a form of payment for practical and booking reasons since this method would entail transferring cash to the courier by an appointed employee. At the same time, *cash on delivery* is a method that can be applied on the domestic market solely and practically cannot be used to service foreign transactions due to that posts offices and courier delivery companies are not interested in servicing transborder payments. Moreover, the managers who value customer convenience and payment automation are less likely to accept this method.

Table III. The logit model for acceptance of cash on delivery

Variable	Coefficient	Std. error	t ratio	p-value	Marginal effect
Constant	4.1549	1.4487	2.87	0.0041	-
Polish_Post	5.3371	1.9923	2.68	0.0074	4.4543e-9
Number_shops	2.5425	1.0606	2.40	0.0165	2.1219e-9
%_transactions_business	-0.0817	0.0246	-3.32	0.0009	-6.8178e-11
%_transactions_foreigners	-0.1928	0.0631	-3.06	0.0022	-1.6094e-10
Payment_integrator	8.7099	2.7220	3.20	0.0014	7.2692e-9
Factor_customer_convenience	-0.0729	0.0218	-3.34	0.0008	-6.0846e-11
Factor_automation	-0.2646	0.0697	-3.80	0.0001	-2.2083e-10
Statistics					
Log likelihood	-8.5481		McFadden R^2		0.7497
LR statistic (7 df)	51.2154		Mean of Y		0.9151
Percentage of cases correctly predicted	0.966		f(**β'x**) at mean of independent vars.		0.000

Source: Authors' calculations.

The cooperation between an Internet shop and *online payment integrator* is based on payment outsourcing. The factor that is most closely connected with this cooperation is the acceptance of *card payment* (see Table IV). It is demonstrated by the highest value of t-statistics and the biggest marginal effect. The probability of using *online payment integrator* was 42 percentage points greater, all else equal, when a given shop accepted *card payment*. The complementarity of these payment methods may result from two premises. Firstly, shops accepting *card payments* are more open for payment methods which are alternative to *cash on delivery* and the *bank transfer*. Secondly, *card payments* are closely connected with certain types of business and transactions (see Table V), which can indirectly favour *online payment integrator*. Managers who value the popularity of a given payment method with customers are inclined to use *online payment integrator*, which does help them meet this goal. It is similar in the case of those who need to settle transactions in foreign currencies. However, shops concluding many foreign transactions rarely cooperate with *online payment integrator* as they tend to use other payment channels, such as *card payment*. On the other hand, most payment

channels serviced by *online payment integrator* are domestic ones and are of no use in such transactions. The tendency to cooperate with *online payment integrator* is much smaller in the case of those Internet shops which service most transactions on their own, using methods such as *cash on delivery* and *bank transfer* (two dominant methods on the Polish market), and, especially, *payment in other POS*. *Ceteris paribus*, the increase by 1 percentage point in the share of these methods in the number of transactions serviced induces a drop in the probability of cooperation with *online payment integrator* of 1.1, 0.9 and 3.4 percentage points, respectively, for *cash on delivery, bank transfer* and *payment in person.* They shall be considered as substitute methods for payment outsourcing. It can be concluded that hypothesis H7 is supported by the data. However, the biggest obstacle for the acceptance of *online payment integrator* are the physical distribution channels owned by online shops. The probability of accepting this method, all else equal, is 35 percentage points greater in the case of shops without physical distribution channels. Therefore, it is typically virtual shops that are most enthusiastic about payment outsourcing.

Table IV. The logit model for acceptance of online payment integrator

Variable	Coefficient	Std. error	t ratio	p-value	Marginal effect
Constant	3.0938	1.2909	2.40	0.0165	-
Traditional_sales	-1.4024	0.5073	-2.76	0.0057	-0.3505
%_transactions_foreigners	-0.0651	0.0297	-2.19	0.0284	-0.0163
Card_payment	1.6913	0.5260	3.22	0.0013	0.4226
%_tran_cash_on_delivery	-0.0467	0.0148	-3.16	0.0016	-0.0117
%_tran_payment_in_other_POS	-0.1358	0.0447	-3.04	0.0024	-0.0339
%_tran_bank_transfer	-0.0368	0.0135	-2.72	0.0065	-0.0092
Factor_foreign_settlement	0.0737	0.0401	1.84	0.0663	0.0184
Factor_popularity_consumer	0.0261	0.0154	1.70	0.0896	0.0065
Statistics					
Log likelihood	-55.9103		McFadden R^2		0.3097
LR statistic (8 df)	50.1622		Mean of Y		0.4792
Percentage of cases correctly predicted	0.769		f(**β'x**) at mean of independent vars.		0.250

Source: authors' calculations.

Despite that this method is quite commonly accepted by online shops, the share of *card payment* in the Polish market is insignificant (compare Figure 4 and Figure 5). *Card payment* seems to be strongly complementary to *online payment integrator* and *pay-by-link* (see Table V), both of which are open to cashless and innovative payments. Taking into consideration that most *card payments* are made with credit cards, it is natural that there is a positive connection between this method and credit acceptance. A major advantage of *card payment* on the Polish market is that it is one of the few methods facilitating the acceptance of foreign payments. Conducting foreign sales does encourage shops to accept this method – the

probability of accepting card payment, all else equal, increases by as much as 24 percentage points.

Estimated on the basis of the time of conducting sales and the number of shops, experience in conducting sales via traditional channels is conducive to card acceptance as many traders have become convinced about the growing popularity of cards among Polish customers. The positive influence of certain types of business activity (e.g. horticulture) and transactions (e.g untypical location of online sales) is also essential for the acceptance of this method. As regards managers preferences, paying too much attention to customer convenience has a negative impact on the acceptance of *card payment*. It means that policy makers realize customers do not consider this method to be very convenient (Polasik and Maciejewski, 2009).

Table V. The logit model for acceptance of card payment

Variable	Coefficient	Std. error	t ratio	p-value	Marginal effect
Constant	-4.6188	0.9639	-4.79	1.65e-06	-
Number_other_locations_online	0.6892	0.3725	1.85	0.0643	0.1117
Number_shops	0.1328	0.0626	2.12	0.0339	0.0215
Years_in_business	0.1189	0.0497	2.39	0.0167	0.0193
Sales_abroad	1.4626	0.5663	2.58	0.0098	0.2371
Gardening_tools	1.6691	1.0130	1.65	0.0994	0.2705
Payment_integrator	2.1907	0.6786	3.23	0.0012	0.3551
Pay-by-link	1.9889	0.6738	2.95	0.0032	0.3224
Credit_or_installment	1.1758	0.5826	2.02	0.0436	0.1906
Factor_customer_convenience	-0.0472	0.0264	-1.79	0.0741	-0.0077
Statistics					
Log likelihood	-40.3477		McFadden R^2		0.3616
LR statistic (9 df)	45.7123		Mean of Y		0.2313
Percentage of cases correctly predicted	0.872		f(**β'x**) at mean of independent vars.		0.162

Source: authors' calculations.

Bank transfer is an extremely popular method of payment in Polish e-commerce. It plays a very significant role in transactions concluded during online auctions, when it is commonly used (see Table VI). The features contributing to the positive perception of bank transfer include: low commissions, a short time of settlement, and the possibility of paying in various currencies, which is confirmed by the preferences of online shop managers. Actually, domestic *bank transfer* is the only fully commission-free method of payment acceptance; therefore, it can be concluded that the empirical evidence corroborates hypothesis H11.

Bank transfer acceptance seems to be a substitute for *virtual payment* acceptance, which is natural as these methods are direct competitors in online auctions. The substitution for the share of the number of transactions generated with *payment in person* concerns online shops with physical distribution channels. A considerable share of foreign transactions has a

negative influence on the acceptance of *bank transfer*, which confirms hypothesis H2. It results from that this method is not very much popular on many foreign markets; moreover, high commissions were charged on foreign bank transfers before SEPA implementation (at the time of the study). Due to that this instrument was used mainly to make domestic payments. Apart from this, the sales of multimedia and office equipment are not conducive to the acceptance of this payment method.

Table VI. The logit model for acceptance of bank transfer

Variable	Coefficient	Std. error	t ratio	p-value	Marginal effect
Constant	2.0094	0.8848	2.27	0.0231	-
Films_music	-3.9327	1.6979	-2.32	0.0205	-4.4522e-3
Office_equipment	-4.2144	1.5172	-2.78	0.0055	-4.7712e-3
%_transactions_foreigners	-0.1571	0.0514	-3.06	0.0022	-1.7784e-4
%_ transactions_auctions	0.0435	0.0257	1.69	0.0902	4.9247e-5
Virtual_payment	-3.8882	2.2926	-1.70	0.0899	-4.4018e-3
%_tran_payment_in_person	-0.0790	0.0363	-2.18	0.0294	-8.9441e-5
Factor_commission	0.0640	0.0371	1.72	0.0847	7.2498e-5
Factor_foreign_settlement	0.9225	0.3228	2.86	0.0043	1.0444e-3
Factor_speed_settlement	0.2060	0.1085	1.90	0.0576	2.3317e-4
Statistics					
Log likelihood	-10.5852		McFadden R^2		0.6901
LR statistic (9 df)	47.1412		Mean of Y		0.9154
Percentage of cases correctly predicted	0.983		F($\boldsymbol{\beta}$'**x**) at mean of independent vars.		0.001

Source: authors' calculations.

The *pay-by-link* payment constitutes an example of an innovative method which has been successful on the Polish market (see Figure 4). Its acceptance is complementary with *virtual payment* and *card payment*, whose servicing considerably increases the probability of accepting *pay-by-link* (see Table VII). Simultaneously, *pay-by-link* is a substitution for *bank transfer* as a rise in the use of the latter diminishes the opportunity of accepting *pay-by-link*. It results from the fact that this method constitutes an Internet interface which is conducive to conducting *bank transfer* via the Internet. However, due to that *pay-by-link* is connected with commissions at the level of *card payment* and *bank transfer* is free of charge for the payment recipient, shops may be unlikely to accept a more expensive method once their customers have become convinced to *bank transfer*. The biggest obstacle for the acceptance of *pay-by-link* is that this method facilitates only the acceptance of domestic payments from the customers of Polish Internet banks. Therefore, having a website in a foreign language version, all else equal, diminishes the probability of accepting *pay-by-link* by as much as 38 percentage points. Moreover, the law requiring customers to hold Internet accounts in Polish banks (only 13% of Poles have it ; Polasik and Maciejewski, 2009), makes this instrument a

niche one, which discourages those shop managers who attach a great significance to the popularity of a given method of payment.

A strong incentive to use *pay-by-link* is shops pursuit to maximize customer convenience. Managers can very well understand the preferences of clients for whom it is the most convenient payment method (Polasik and Maciejewski, 2009). Consequently, this aspect of competition increases the probability of accepting *pay-by-link*. It has also occurred that the use of *pay-by-link* is strongly and positively influenced by conducting business activity in sectors requiring quick payment, dispatch of goods (e.g. books), and especially delivery of services. In comparison to a typical *bank transfer*, the advantage of *pay-by-link* is a considerable acceleration of the payment process.

Table VII. The logit model for acceptance of pay-by-link

Variable	Coefficient	Std. error	t ratio	p-value	Marginal effect
Constant	-1.5130	0.5805	-2.61	0.0092	-
Foreign_language_website	-2.6942	1.1227	-2.40	0.0164	-0.3820
Books_press	1.8875	0.8539	2.21	0.0271	0.2676
Internet_service_software	1.9595	1.0023	1.96	0.0506	0.2778
Card_payment	1.6018	0.6297	2.54	0.0110	0.2271
Virtual_payment	2.0930	1.2102	1.73	0.0837	0.2967
%_tran_bank_transfer	-0.0302	0.0100	-3.01	0.0026	-4.2786e-3
Factor_popularity_consumer	-0.0391	0.0196	-1.99	0.0467	-5.5364e-3
Factor_customer_convenience	0.0773	0.0252	3.07	0.0021	0.0110
Statistics					
Log likelihood	-45.4651		McFadden R^2		0.3174
LR statistic (8 df)	42.2786		Mean of Y		0.2563
Percentage of cases correctly predicted	0.846		f(**β'x**) at mean of independent vars.		0.142

Source: authors' calculations.

Virtual payment providers and their innovative solutions usually use e-mail communication, owing to which they have already won popularity with 8.5% of Internet shops. Their usage is encouraged by a considerable share of auction sales in a shop's turnover because auctions constitute a natural environment for this payment method (see Table VIII). This conclusion confirms hypothesis H3. Online auctions are usually connected with delivery by the Polish Post, which is demonstrated by a positive relation with the use of *virtual payment*. Accepting *virtual payment* seems to be complementary with accepting *pay-by-link*, which is a sign of a shop's openness to innovative methods; however, an increase in the share of *pay-by-link* payments in the total number of transactions produces a negative effect. It is logical because using *pay-by-link* to service a large number of transactions diminishes the demand for an additional method addressed to 'innovative' clients. Moreover, accepting *pay-by-link* is substitutive in relation to the number of *card payments* as these methods compete in

servicing foreign clients. On the other hand, a big share of *cash on delivery* transactions does not encourage the acceptance of innovative methods and probably competes with them in servicing Internet auctions on the Polish market. The managers preferring methods which are greatly popular with clients avoid accepting *virtual payment*. Nevertheless, it is favoured by the policy makers planning to implement payment outsourcing and wishing to have this method included on the *online payment integrator* offer.

Table VIII. The logit model for acceptance of virtual payment

Variable	Coefficient	Std. error	t ratio	p-value	Marginal effect
Constant	-13.7369	5.1850	-2.65	0.0081	-
Polish_Post	11.0266	4.1682	2.65	0.0082	1.1563e-3
Office_equipment	16.2661	5.4167	3.00	0.0027	1.7057e-3
%_ turnover_ auctions	0.0589	0.0265	2.22	0.0262	6.1777e-6
Pay-by-link	3.4090	1.5942	2.14	0.0325	3.5748e-4
%_tran_cash_on_delivery	-0.0604	0.0264	-2.29	0.0223	-6.3325e-6
%_tran_card_payment	0.8351	0.2623	3.18	0.0015	8.7574e-5
%_tran_pay-by-link	-0.2794	0.1019	-2.74	0.0061	-2.9297e-5
Factor_popularity_consumer	-0.3325	0.1093	-3.04	0.0023	-3.4863e-5
Factor_within_integrator	0.1818	0.0602	3.02	0.0025	1.9068e-5
Statistics					
Log likelihood	-12.7455		McFadden R^2	0.6268	
LR statistic (9 df)	42.8207		Mean of Y	0.0851	
Percentage of cases correctly predicted	0.957		f($\boldsymbol{\beta}$'**x**) at mean of independent vars.	0.000	

Source: authors' calculations.

The last payment method included in the study is *payment in person*, which, despite its small share in the number and turnover of online transactions (see Figure 4), was accepted by as much as 57% of Internet shops (see Figure 5). Estimated on the basis of a logit model, t-statistics and marginal effect values (see Table IX) imply that the main positive factor is the possibility of collecting goods by the client in a traditional shop or warehouse and paying for them in person. The probability of accepting *payment in person* can be as much as 56 percentage points higher, all else equal, in shops facilitating individual collection of goods. Another important factor is accepting payment in the form of a loan or installments. The probability of accepting *payment in person* is 45 percentage points higher, all else equal, in shops accepting this method of payment. It results from that due to a limited popularity of the electronic signature in Poland, signing a loan agreement requires a meeting between the client and a representative of a bank or a shop, which may happen when the client comes to the shop to collect and pay for their goods.

It turns out that the acceptance of *payment in person* is also encouraged by a high turnover the shop may generate during Internet auctions as clients, who conclude his kind of transactions, are more likely to collect their goods in person. A positive relation between

payment in person and *virtual payment* acceptance results probably from addressing the offer to clients participating in online auctions. Thus, these data may support hypothesis H3. Contrary to that, this method is used less frequently by shops participating in shopping passages on Internet portals as these entities focus more on virtual trading. Consequently, the tendency to accept *payment in person* decreases with a rise in online turnover in the total turnover of the shops. By the same token, there is a negative correlation with accepting *pay-by-link*, which is also preferred by typically virtual shops.

Moreover, accepting *payment in person* is not suitable for foreign transactions, which explains the negative effect of running a website with a foreign language version. Shops with longer the experience in online sales tend to accept *payment in person*. This method is also positively correlated with the share of card payments in online transactions, which may result from the fact that, apart from cash, *payment in person* often includes card payment at a POS terminal, which means that the shop has an agreement with an acquirer. It is worth noticing that the managers who attach significance to low costs of payment servicing realize that *payment in person* burdens the employees of physical distribution channels and generates additional costs; therefore, they are less likely to accept this method.

Table IX. The logit model for acceptance of payment in person

Variable	Coefficient	Std. error	t ratio	p-value	Marginal effect
Constant	-2.0328	0.7454	-2.73	0.0064	-
Number_shopping_passages	-0.3940	0.2292	-1.72	0.0856	-0.0933
Collection_in_person	2.3603	0.5508	4.29	1.82E-05	0.5589
Years_in_internet	0.4153	0.1454	2.86	0.0043	0.0983
Foreign_language_website	-1.1927	0.6331	-1.88	0.0596	-0.2824
Internet_turnover	-5.8189e-7	2.8784e-7	-2.02	0.0432	-1.3779e-7
%_ turnover_ auctions	0.0260	0.0122	2.12	0.0339	0.0061
Credit_or_installment	1.9122	0.7108	2.69	0.0071	0.4528
Virtual_payment	1.8934	0.8206	2.31	0.0210	0.4483
%_tran_card_payment	0.4737	0.1715	2.76	0.0057	0.1122
%_tran_pay-by-link	-0.0847	0.0247	-3.43	0.0006	-0.0200
Factor_fixed_costs	-0.0299	0.0165	-1.82	0.0693	-0.0071
Statistics					
Log likelihood	-46.5291		McFadden R^2		0.4174
LR statistic (11 df)	66.6594		Mean of Y		0.5732
Percentage of cases correctly predicted	0.838		f(**β'x**) at mean of independent vars.		0.237

Source: authors' calculations.

The empirical results obtained during the study allowed the authors to relate to the hypotheses. Thus, it became apparent that the usage of traditional delivery channels, parallel with the Internet, has a significantly positive impact on the acceptance of *cash on delivery*, *card payment,* and *payment in person*. Simultaneously, using such a distribution strategy reduced the chance of accepting *online payment integrator*. Thus, it can be concluded that

hypothesis H1 is supported by the data. The analysis of the influence of transborder trade on the acceptance of particular payment methods is interesting. The involvement of shops in foreign sales or running a website in a foreign language version exert a negative influence on the acceptance of many methods of payment, including the most popular ones. In this case, the favourite method was *card payment*. Such a considerably limiting influence of foreign sales on the range of accepted payment methods confirms hypothesis H2. The examples of *bank transfer, virtual payment* and *payment in person* demonstrated that conducting sales via online auctions stimulates the acceptance of some payment methods. Thus, the data supports hypothesis H3.

Surprisingly, the security factor determining the decision to accept particular payment methods was not present as explanatory variable in any of the considered models. In order to additionally confirm the lack of relation between the acceptance of a payment method and the factor of security, the means of percentages attributed to security, separately for adopters and non-adopters of a specific payment method, were calculated. Further, the test for equality of means was performed. The values of z-statistic equalled -1.141, -0.398, 0.723, -2.487, 0.185, -0.255, -1.223 for cash on delivery, online payment integrator, card payment, bank transfer, pay-by-link, virtual payment and payment in person, respectively. It means that for all methods except the bank transfer there was no reason to reject hypothesis of the lack of relation between the acceptance of payment method and the factor of security at the 0.05 significance level. The research did not corroborate hypothesis H4 relating to the strong influence of security on the acceptance of particular payment methods in e-commerce. In particular, there is no basis to assume that the influence of the security factor on *card payment* acceptance is negative, despite that the problems of card fraud and chargeback are well-documented reality (APACS, 2007).

Similarly, the number of employees was not an explanatory variable in any model. The test for equality of means for adopters and non-adopters of a specific payment method was also performed to additionally check the relation between this variable and the acceptance of payment methods. The values of z-statistic equalled -5.267, 1.373, 0.629, -0.315, -0.210, 3.171, -1.006 for cash on delivery, online payment integrator, card payment, bank transfer, pay-by-link, virtual payment and payment in person, respectively. It means that for all methods except cash on delivery and virtual payment there was no reason to reject hypothesis of the lack of relation between the acceptance of payment method and the number of employees at the 0.05 significance level. Thus, the results do not allow the authors to

unambiguously corroborate hypothesis H5 and the influence of the number of employees in an online shop on the acceptance of particular payment methods had not been confirmed.

Taking into account acceptance, most methods of payment seem to be complementary with one another. It was only *bank transfer* and *virtual payment* that are negatively correlated. On the other hand, the higher share of particular payment methods in the number of online transactions often discouraged managers from using other instruments. As many as three payment methods, including *cash on delivery* and *bank transfer* that dominate the Polish market, have a negative influence on accepting *online payment integrator* by a shop. Thus, whereas it is possible to conclude that the substitution of payment methods is true in relation to *online payment integrator* and that empirical evidence corroborates narrow hypothesis H7, the more general hypothesis H6 cannot be unambiguously confirmed. The question of the substitution effect on payment methods acceptance in e-commerce requires further research.

It is much simpler to explain the influence of the popularity of particular payment methods with prospective clients. Managers wishing to reach the mass market are more likely to coopearate with *online payment integrator*, which offers various channels of payment service and less inclined to accept niche methods, such as *pay-by-link* and *virtual payment*. Consequently, the data supports hypothesis H8 as an accurate description of reality. The focus on customer convenience also affects the acceptance of particular payment methods. The more importance an online shop attaches to this factor, the more likely it is to accept *pay-by-link* and the less likely to use *cash on delivery* and *card payment*. Therefore, the decisions of shops coincide with the preferences of Polish Internauts, and hypothesis H9 cannot be rejected. Moreover, it can be concluded that the empirical evidence corroborates hypothesis H10, which assumes that cost sensitiveness of online shop managers significantly stimulates the choice of bank transfer as the least expensive method to accept. However, it must be emphasised that cost factors occurred to be unimportant while choosing particular payment methods.

7. Summary and conclusions

The work deals with an analysis of factors influencing the acceptance of major payment methods by the managers of Polish online shops. The study was based on empirical data obtained through surveys interviews with the managers of online shops who decided about the usage of certain forms of payment for goods and services. Taking into account the share of particular payment methods in e-commerce in Poland and abroad, seven major instruments were selected and thoroughly analysed. These methods include: (1) *cash on delivery*, (2)

online payment integrator, (3) *card payment*, (4) *bank transfer*, (5) *pay-by-link*, (6) *virtual payment provider,* and (7) *payment in person*. The methods differ considerably in many respects, such as: the level of innovation, the use of settlement systems, the participation of banks, the security of transactions, the costs incurred by shops, speed, and convenience for clients. In order to evaluate econometrically the determinants of the adoption status of a particular payment method, a binomial logistic regression was employed. The univariate logit models describing acceptation of seven payment methods were constructed. Divided into five categories within the proposed research model, a total of 89 explanatory variables were taken into account. They include both detailed e-shop characteristic and customers characteristic as well as management preferences. The research took into data concerning the acceptance of other payment methods and the intensity of their usage. The analysis showed that the acceptance of particular payment methods depends on various sets of factors which differ significantly from one another.

The research verified statistically many assumptions and statements which relate to the influence of various factors on the acceptance of particular methods of payment in e-commerce and are greatly popular in business and in academic works. The study results demonstrated that a shop's strategy of using distribution channels has a strong influence on its acceptance of particular payment methods. The shops that decided to use traditional local Points-of-Sale alongside Internet sales tended to choose a different payment methods than typically virtual shops. Shops involvement in online auctions requires them to adapt themselves to their specificity o auctions, including payment. In the case of Poland, it encourages them to use *bank transfer* on the one hand and opens an opportunity to apply innovative methods offered by non-bank providers on the other.

From the business point of view very interesting is the fact, that managers attach more importance to the payment related factors determining the market competitiveness of online shops – i.e. customer's convenience and popularity of the method – rather than to the amount of commission and fixed costs of acceptance of particular payment method. Furthermore it has been found that the security factor does not have significant influence on managers' decisions about selection of payment methods. It is indication for payment solution providers, how to increase chances of adoption of their products by online shops.

The results of analysis has revealed that most of payment methods used by Polish online shops and preferred by consumers are characterized by slight usefulness for cross-boarder transactions. It creates the market niche for non-bank *virtual payment providers*. However one has to expect changes in the near future connected with development of SEPA

and higher competition in the mail and courier delivery market. That is why non-bank competitors have to undertake urgent activities if they want to make use of favorable current conditions to increase their market share. *Virtual payment providers* play a marginal role on the Polish market so far.

Both *pay-by-link* and *virtual payment* are niche products on the Polish market. It seems that *pay-by-link* method has higher chances for popularization, because they benefits from strong banks and acquirers support. The substantial share of *bank transfer* in e-commerce payment market in Poland assures favourable position to this method nowadays. This situation creates a high potential to convert part of *bank transfer* payments into *pay-by-link* payments. Therefore it seems that banks will remain important players on the online payment market in Poland. Implementation of the SEPA program will certainly favour banks in competition with non-banks *virtual payment providers*.

The main and permanent barrier for development of most cashless payment methods in Poland, including online payments, is low penetration of banking accounts in the society, and as a result low availability of payment cards. It is a vital reason for large usage of cash as a component of payment in e-commerce. It gives additional possibilities for development of non-banks agents in online payments, especially for *online payment integrator*, which can exploit this opportunity.

An interesting feature of the Polish e-commerce is that many Internet shops often opt for full or partial payment outsourcing which is implemented through their cooperation with *online payment integrators*. Due to that they do not have physical distribution channels, typically virtual shops reveal a special interest in such solutions. *Online payment integrators* play a major role on the Polish market as they cooperate with almost a half of online shops and, through their offer, are able to attract to e-commerce many Poles who do not hold credit cards or even bank accounts.

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The results described in the article have demonstrated that in order to explain the processes occurring in e-commerce, it is important to analyse the factors influencing the decisions made by online shop managers and not to limit oneself to studying the behaviour of customers. The acceptance of particular payment methods by online shops is a wide subject requiring further comprehensive research. It would be particularly interesting to study similar variables in America and Western Europe which have more developed e-commerce markets and different structures of accepted payment methods.

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