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Card Payments in Poland: Determinants and Prospects[1]

Abstract: The paper examines Poland's card payment market. It analyzes the determinants of card transactions and makes projections for the development of this market from 2015 to 2017.

Studies point to a strong relationship between the development of cashless transactions and the rate of economic growth recorded by countries, the authors say. The article seeks to identify the key factors driving the card payment market, such as the number and value of card transactions, the number of cards held by individuals, and the number of electronic-funds-transfer-at-point-of-sale (EFTPOS) terminals.

The authors build models based on panel data from European Union countries from 2000–2012. They use Blundell and Bond's system-GMM estimator to treat the results in terms of causality rather than coexistence of the obtained effects.

The role of trust in society and GDP growth are found to be important determinants of the development of the cashless transactions market. The authors' projections suggest that Poland's cashless transactions market will develop rapidly in the years ahead even if economic growth is slower than projected.

Keywords: card payments, non-cash transactions, retail payments

JEL classification codes: E42, E58

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Introduction

From the dawn of trade, the development of means of payment has been aimed at increasing dematerialization. Yet only in recent years has this development truly succeeded in its goal with the increasing use of card and internet payments. Today the proliferation of payment cards – and by such we understand debit, credit, and prepaid cards – has significantly changed the way we buy and sell goods and services. This indicates progress towards a more efficient payment system, as older, more expensive payment instruments are substituted with newer, cheaper options which in turn decreases the overall social cost of the payment system. In the European Union the use of credit and debit cards slowly begins to exceed the use of cash for smaller transactions. Wholesale payment systems are now purely cashless, and most of the money exists only in the electronic form.

The aim of the article is to provide projections on what the future may hold in store for card retail payments in Poland for the 2015–2017 period. To this end, four econometric models are constructed to determine the development of card transactions measured by four variables:
1. Total value of annual card payments per capita
2. Number of terminals per 1 million inhabitants
3. Number of cards per 1 thousand inhabitants
4. Total number of annual card payments (transactions) per capita.

The models are estimated with the use of panel data from the EU countries in years 2000–2012. The countries in the dataset are at different stages of card payment expansion and that allows us to determine the factors that are relevant for the behavior of the above-described variables. In the next step projections for the Polish card system are made in different variants relating to diverse economic conditions. Each of the considered variables is expected to exhibit fast growth, even in the very pessimistic variant if the economy stalled much below expectations.

The next part of the article presents a literature review. The third part presents the models used to explain the considered measures of card payments and the fourth part discusses the projections based on the models described in the previous section. Last part of the article concludes with policy implications.

Literature Review

The focus in the retail payments literature is on theoretical assessment whether payments are being made in an efficient manner, analysis of the network effects of card holding, or empirical estimations relating to the consumer choice based on surveys. These three strands of the state of the art will be analyzed in turn.

The theoretical literature focuses on the 'two-sidedness' of the card payment market and its network property [Rochet, Tirole, 2003]. Both characteristics

are intriguing for the researchers since these arrangements result in a situation in which retail payment instruments are hardly ever priced explicitly. Even though payee cost and card issuer profits may differ considerably with the method of payment, this fact is generally unknown to the paying consumer. While the social optimum of the retail payment market would be to differentiate costs along different payment methods, the consumers are generally irrationally reluctant to pay openly any additional fees on a marginal cost basis. It follows, that the retailers are also unwilling to charge their customers with different surcharges based on the payment mean [Saxén, 2014]. In addition, the banks themselves are not willing to charge the consumer with costs on a transaction-basis aiming to make impossible informative price comparisons between them and their competitors. Therefore, the payments that the payor pays are direct monthly account maintenance fees or indirect minimum balance requirements. This has led to prices that deviate from the social optimum and results in a situation in which the payor is not motivated to use the optimal payment method [Lee, 2014].

As far as the network effect property of retail payments is concerned, it seems that the fixed costs of entering the payment market are substantial and then the costs of extending are relatively small which entails increasing returns to scale. Kahn and Roberds [2009] review both aspects in great detail. However, more importantly, the consumer utility derived from possessing a payment card increases with the popularity of the system as a whole. The presence of network externalities relates to the fact that the number of payees equipped with EFTPOS (Electronic Funds Transfer at Point Of Sale) terminals increases with the number of cardholders, while at the same time the increasing number of cardholders makes the payees install more terminals. In addition, there are also usage externalities because an agent who holds a card could private-rationally choose to pay with that card which generates the highest cost for the payee and frequently, the payee is not able to refuse such a payment [Veridier, 2008]. However, both theoretical aspects of the card payment are difficult to measure with the use of econometric methods – the pricing schemes of card companies are very complicated, vary not only between countries but even cities – sometimes the dominant company in the card payment market is even able to charge the merchants in a case by case scenario on a price discriminating basis (see more in ECB [2011]).

The empirical literature on the subject of card payments has taken a very different route. The consumer choice has been analyzed mainly with the use of surveys. When analyzing this way the fairly permanent choice of means of payment one has to take into account a number of factors which are not necessarily economic in nature, but sociological or institutional, such as general trust, trust in financial institutions, relative safety, the ease of enforcing private contracts of overdue payments etc. These factors therefore are similar determinants of the development to the economic factors related to the Baumoll and Tobin model (transaction cost, transaction demand, and interest rates).

Studies indicate that a large number of factors can potentially affect decisions to pay with debit or credit card (see Borzekowski, et al. [2008] for a review). Some of the studies even investigate psychologically the role of the temporal and physical separation between receiving goods and paying for them that may encourage credit card spending and, consequently, credit card debt [Bar-Gill, 2004]. While these analyses have been informative, their lack of transaction-specific data has limited researchers' abilities to model the microeconomic behavior of consumers. Thus the main drawback of this method is that the surveys are not repeated over time and the studies are aimed at studying very different factors. These features make them largely incomparable.

Relatively little research has been aimed at discriminating between various factors which determine the development of card transactions. Regrettably, a great part of the studies in this field is descriptive in nature and most of the literature concerning the growth in non-cash transactions is dedicated only to analytical or case study analysis. Among exceptions are the panel analyses by Humphrey et al. [1996] and later works by the same authors. Newer example of such an analysis can be found in Ardizzi and Iachini [2013]. Altogether, these studies indicate a very important effect. The overall level of development of the financial sector, i.e. the number of transactions is beneficial for the development of cashless transactions. Moreover, the surveyed studies indicate large delayed effects, probably related to existing consumer habits. This in turn emphasizes the need to pay special attention to the discussed issue.

In the Polish literature a series of statistical reports prepared by the Department of Payments of the NBP (National Bank of Poland) are particularly noteworthy. These present a number of important insights into scale cashless statistics. A particularly interesting study devoted to the analysis of the acceptance of payment cards from the perspective of entrepreneurs made based on surveys of businesses can be found in NBP [2012]. Marzec et al. [2013] present the results of a research concerning the usage of two basic payment methods in daily shopping in Poland, i.e. cash and debit card. The data were obtained through a survey conducted in the late 2010 and in the beginning of 2011. The research allowed to determine payment habits and preferences of Polish customers. However, the only study that describes international differences is the National Bank of Poland report [2011], which does not include analysis of the causes of the current discrepancy between the relatively low development of the Polish non-cash market and much faster growth in other European Union countries. As highlighted by the authors themselves in the introduction "this material is not intended to indicating or clarifying the causes of variation in level of each indicator." Therefore, to the knowledge of the authors there are no econometric studies which analyze the relative discrepancy between Poland and other EU countries in cashless payment or providing projections regarding their development.

The Model

This section examines how usage of card retail payment media has evolved in recent years in the countries of the European Union. One of the main uses of debit and credit cards is to make retail payments. These involve monetary value being exchanged between purchaser and merchant by using the card in conjunction with an electronic funds transfer terminal at the point-of-sale (known as POS terminals). Thus, the card usage can be measured by quantifying each aspect of this exchange. The following four variables have been treated as dependent in four groups of equations:
1. Total value of annual card payments per capita
2. Number of terminals per 1 million inhabitants
3. Number of cards per 1 thousand inhabitants
4. Total number of annual card payments (transactions) per capita.

Figure 1. Comparison of the Measures of Card Usage Investigated in the Empirical Analysis
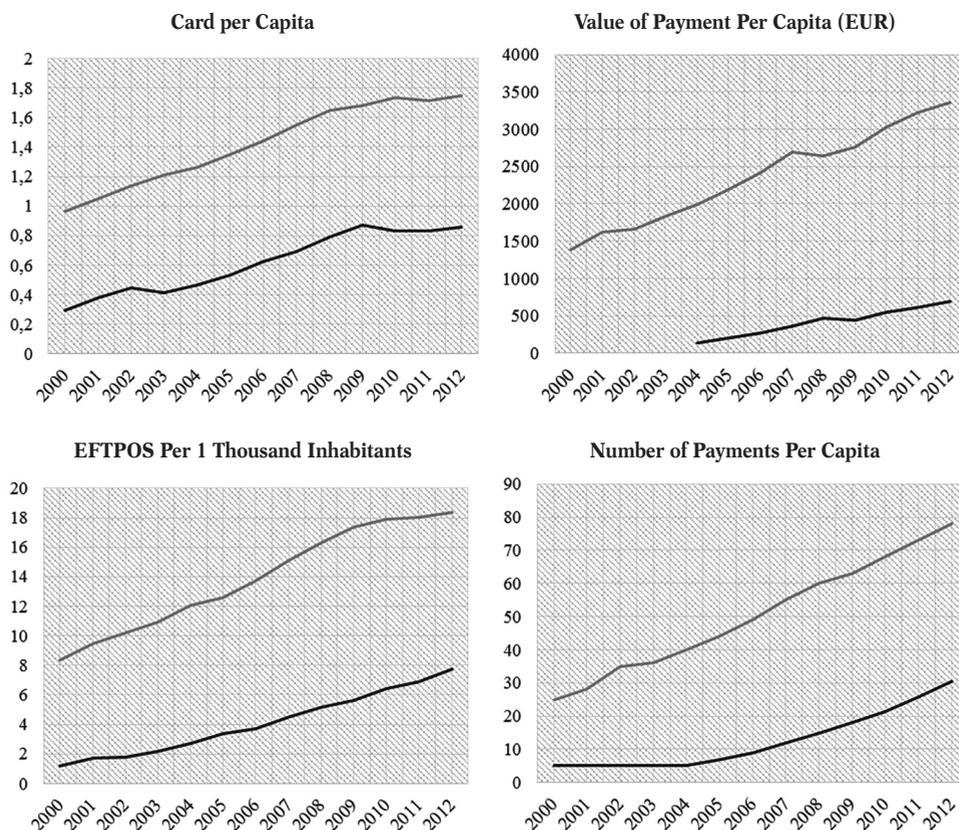
Note: Poland is represented by the darker line, EU average by the lighter line in each panel
Source: own based on EBC data.

The multitude of the variables used in the study is a significant improvement over most analytical studies usually dedicated to the analysis of just one of these. Each of the used measures has some advantages and disadvantages that are discussed in detail in this article. The data are drawn from the European Central Bank Data Warehouse and concern all of the European Union countries as of 2012 and follows them over the period of 2000–2012. All variables are annual end of year time series data. In order to simplify the international comparisons payment data are given in per capita terms (where appropriate) and, where values are involved, they are deflated to adjust for inflation. Additional control variables were compiled from Eurostat, World Bank, and the European Social Survey.

Figure 1 shows a steady increase over time in the each measure in Poland and the EU. However, Poland is not only significantly lagging behind in the relative popularity of the card payments, but more importantly, the discrepancy is still growing showing no catching up in the sample period. Across all the investigated measures Poland was the country among the countries with the least card popularity – Bulgaria and Romania. It can be expected that the proper model could shed some light on the reasons of this situation.

The general form of each of the analyzed equation is the following:

$$CMeasure_{i,t} = \alpha + \theta CMeasure_{i,t-1} + \sum_j \beta_j x_{it} + \eta_i + \gamma_t + \varepsilon_{it}, \qquad (2.1)$$

where i denotes one of 27 EU countries (all except Croatia), t denotes 13 years in the sample (the 2000–2012 period), $CMeasure_{i,t}$ is the value of one of the four non-cash card measures described above, $CMeasure_{i,t-t}$ is the lagged value of the dependent variable. The lagged dependent variable coefficient θ is used to capture how resistant to change payment behaviors are and it is included to measure the influence of past habits on the current use of selected payment. x_{it} is a vector of characteristics measured during or at the start of the period. β_j, for $j = 1, 2,...,b$ are the regression coefficients. Among other things, the unobserved country-specific effects η_i reflect differences in the initial level of efficiency, while the period-specific intercepts, γ_t, capture changes that are common to all countries, ε_{it} is the i.i.d. error term.

Two methods were chosen to estimate (1), the System GMM (Generalized Method of Moments) Blundell-Bond [1998] estimator and the Kiviet [1995] LSDVC (Least Squares Dummy Variables Corrected) estimator. Under the assumption of exogenous explanatory variables, the Kiviet estimator derives an approximation of the bias of the LSDV (fixed effects) estimator in panel models where the set of regressors contains a lagged dependent variable. In small N samples, this estimator is usually better than GMM and most of other instrumental-variable estimator and has been shown to compare favorably with other consistent estimators (Kiviet [1995], Bruno [2005]). However, in the case of this study, the endogeneity is created by the relation of reverse causality that may arise between the card payment values and the number of cards,

EFTPOS terminals. Therefore, the use of the bias-corrected LSDV (that is: the LSDVC) estimator could potentially lead to inconsistently estimated coefficients. Therefore, in order to address the likely endogeneity issues, the technique of consistent System Generalized Method of Moments (System-GMM) estimator suggested by Blundell and Bond [1998] has been applied and all the macroeconomic variables used in the analyses are allowed to be endogeneous, which is easily obtained with the use of their proper instrumentalization. This method is particularly relevant to estimation of dynamic panels in which the stochastic data generating process of the dependent variable follows a random-walk showing in the large value of autoregressive parameter. Moreover, this method is particularly superior to the Fixed Effects methods in our investigation, since it allows to consistently estimate effects of variables that show very small variation over time in our sample, such us trust in other members of the society, urbanization, age dependency ratio, or even GDP over 13 year period. To this end, the selected GMM estimator incorporates, in a single system, the regression equation in both changes and levels, each with its specific set of instruments. In each specification, instruments for differenced equation were the lags of second order and higher of the autoregressive term and its lagged first differences, differences of other explanatory variables. Instruments for level equation were the lagged first differences of the autoregressive term.

The variables whose names start with "log" are logarithmized and indeed most of the variables representing levels are given in logarithms. The variables that represent fractions and rates were not logarithmized due to lack of interpretation of estimated parameters. However, lack of clear-cut theory makes it difficult to motivate clearly the use of logarithmized/non-logarithmized data (except for the above mentioned fractions) despite the general preference for the logarithmized variables in most macroeconomic applications. That is why we base our choice on the empirics – the fit of the model. This results in the first three variables explained with the logarithmized equation and the fourth – on the equation in levels (not the logarithms).

It is always an issue what independent variables should be selected for particular equations. As it has been stated, there is hardly any literature devoted to macroeconomic analysis of the discussed phenomena. Usually the dataset is not big enough to enable pure statistics-based selection. Furthermore, it is out of the question that the good model should not be constructed without economic rationale at this stage. That is why the choice of regressors is based on (1) the existing literature, (2) the theoretical models (such as the Baumol-Tobin model) and additionally, (3) on microeconomic analysis. While the first two sources need no further comments, the last one stems from the obvious logic: the macroeconomic country level data are a result of behavior of a set of agents in the market – their common activity results in the observed macroeconomic (as well as demographic, sociologic etc.) data. In 2013, TNS Polska performed a survey of the group of 1000 Polish citizens. The questions in the survey referred to bank accounts and payment cards held by the respondents

as well as their payment customs. Additionally, a number of questions that regarded the sociodemographic status were asked. 967 respondents were adult at the time of research and their answers were used in the research, which has been described in Goczek and Witkowski [2015]. The model estimated in that paper shed light on the main determinants found to have influence on the decision whether to hold a payment card. These include: age structure, level of education and income. It might be that the size of the place of residence shall be transmitted to the index of urbanization in the macroscale, however as discussed here, it might be the low availability of cash-dispensers and POS terminals that cause lower popularity of payment cards in the country and so these factors might be more relevant from the country perspective. The level of education and frequency of the use of Internet suggest that it would be useful to include some proxy for the society's openness to novelty – if available and not demonstrated to a sufficient extent with the level of education. The respondents were also asked whether they trust in security of the `paypass' system. Their opinion on this issue turned out to be an important factor that explains the decision on holding a payment card. The importance of the belief in the security of `paypass' can possibly be interpreted as the importance of trust in the financial system. However, the mistrust here could be due to either lack of proper knowledge of the financial instruments functioning or, on the contrary, enough knowledge to think – for one reason or another – that indeed, the system is not secure. Yet it is also possible that they are the people who do not trust their society rather than the system of financial instruments, who will be anxious to use modern payment options. The latter would suggest that that the problem might lay in the low level of social capital more than in the low level of trust in the banking system. That in turn would suggest including certain index of social trust in the macro data model.

The conclusions drawn from the above described microeconomic model, the literature review and the theoretical models resulted in the set of regressors further considered as potential determinants in the discussed equations. These are given in table 1.

Table 1. Data Used in the Macroeconomic Equations

Variable group	Abbreviation	Description
Card means of payment usage EBC (2014)	logvalue	Logarithm of the total value of annual card payments per capita
	eftpos (logeftpos)	Number (Logarithm of the number) of terminals per 1 million inhabitants
	cardno (logcardno)	Number (Logarithm of the number) of cards per 1 thousand inhabitants
	payments	Total number of annual card payments (transactions) per capita
Trustindex (European Social Survey, 2014)	trustindex	Trust Index = 100 + (% Most people can be trusted) – (% Can´t be too careful)

Variable group	Abbreviation	Description
Control variables EBC (2014)	ATM (logATM)	Number (Logarithm of the number) of ATM (Automatic Teller Machines) per 1 million inhabitants
	inflation	CPI (Consumer price annual inflation), %
	adr	Age dependency ratio (old + young)
	nonperform	Bank nonperforming loans to total gross loans (%)
Control variables Eurostat (2014)	urban	Proportion of population living in cities (%)
	secondary	Secondary school enrollment (% total)
Control variables WDI (2014)	McapGDP	Market Capitalization of stock market listed companies
	GDP	GDP (Gross Domestic Product), PPP (in constant 2005 int. dollars)
	GDP_growth	Annual change of the GDP (defined as above)
	GNI (logGNI)	Value (Logarithm) of the GNI (Gross National Income) per capita (PPP)
	cons	Consumption (% of GDP)
Doing Business	ec_cost	Enforcing Contract costs (% of GNI)

Source: Own.

Table 2. The Results of Estimation

	logvalue	logeftpos	logcardno	payments
	(1)	(2)	(3)	(4)
L.logvalue	0.507***			
	(9.44)			
L.logeftpos		0.605***		
		(17.15)		
L.logcardno			0.539***	
			(11.08)	
cardno				–0.00368
				(–1.56)
L.payments				1.002***
				(37.80)
logATM	–0.186*	0.173***	0.142**	
	(–2.02)	(3.49)	(2.98)	
ATM				0.00380
				(0.78)
trustindex	0.0151**	0.00264	–0.00305	0.439***
	(2.71)	(0.76)	(–1.12)	(3.53)
logeftpos	0.379***		0.146***	
	(4.95)		(3.76)	
eftpos				0.000307

	logvalue	logeftpos	logcardno	payments
	(1)	(2)	(3)	(4)
				(1.88)
logGNI	1.012***	0.0211	0.240*	
	(5.16)	(0.23)	(2.54)	
cons	0.0159*	0.00134	0.00489	
	(2.02)	(0.27)	(1.09)	
McapGDP	–0.000038			
	(–0.07)			
adr		0.0344***		
		(4.15)		
urban		0.00460		
		(1.43)		
secondary		–0.00219*		
		(–2.08)		
nonperform			–0.00433	
			(–1.58)	
GDP				0.000264
				(1.42)
GDP_growth				0.469***
				(5.37)
inflation			0.00891**	0.383*
			(2.61)	(2.14)
ec_cost		–0.00473		
		(–0.85)		
constant	–11.22***	1.302	–1.366	–46.84***
	(–6.22)	(1.44)	(–1.52)	(–4.35)
N	212	202	211	223
AB_AR (2)	0.5745	0.1825	0.4789	0.3390

Source: Own; _cons stands for the constant (intercept); L. represents the one-year-lag of the given variable; t statistics in parentheses, * $p<0.05$, ** $p<0.01$, *** $p<0.001$.

Regarding the card payment value per capita, as for all other payment instruments, we found a positive impact of the force of habit. This can be seen in the high significance of the lagged value coefficient (which is also robust to the inclusion of other variables). The interplay between different measures of card facilities and usage seems to be the most interesting part of the results. The number of ATMs per 1 million inhabitants was added to the specification to measure the relationship between cash and noncash payment instruments. On the one hand, ATMs increase the benefits of holding a credit or debit card without using it for retail payments. Markose and Loke [2002] argue even that that the cost effectiveness of ATM cash dispensation has enabled cash

to maintain its competitiveness vis-à-vis EFTPOS instruments such as credit cards and debit cards. Contrary to these arguments, it can be hypothesized that the availability of ATMs increases the convenience of cash payments. These contrasting effects result in a general lack of significance of this variable in the value of payments investigation, but overall the effect of ATMs on card payments seems to be small but negative at the 10% level of significance. This suggests a relationship neither of substitution nor of complementarity between the two types of payment instruments, which seem to be substitutes, yet not very close ones. The variable "trustindex" seems to be the most significant variable aside the habit component. It portrays general trust toward other members of the society. It seems that the more people trust other, the more they are inclined to substitute cash with cashless card payment. This relates to the microeconomic analysis in which it was established that belief in security of the payment is one of the most significant variables. It could be argued, that trust to other people in general is related to trust in given type of payment transactions. Relating to the Baumol-Tobin model it can be hypothesized that EFTPOS terminals increase the convenience of card use. The coefficient at the number of EFTPOS terminals per person is positive. The variable that denotes lending interest rates is negatively related to card payment value, in line with the predictions of the theoretical payment model. In addition, other variables suggested by the B-T model turn out to be significant, however these are not included as the final specification selected here for the projection reasons (see Goczek and Witkowski [2015], for more results of estimation). On the other hand, the financial development as portrayed by the number of stock market listed companies (Mcap) is not significantly related to the value of card payments. Overall, it seems that card payment value is mostly influenced by past habits and factors relatively stable over time and the Baumol-Tobin model is confirmed to be a good approximation of reality.

The number of EFTPOS terminals per 1 million inhabitants measures the availability of the technology and its impact on the use of cash and cards through the payee supply problem. We find that the effect of lagged number of EFTPOS terminals portraying the habit component is similar in the terminal number regressions compared to the card payment value regressions. The terminals are supposed to decrease the relative use of cash by reducing the convenience costs of using cards. Therefore, we expected this variable to be positively correlated with card popularity. This was confirmed in the data (column 2). Insignificant results were obtained for most "financial" variables: surprisingly the total size of the market for payments as proxied by total GDP or GNI have any impact on the pattern of terminals across countries. The same refers to the CPI as another way of measuring opportunity costs of holding cash, which is skipped in the equation given in this paper. Moreover, neither of the variables relating to the consumption or income came out to be significant, but negative, contrary to expectations. While it could be argued that the growth of household final consumption expenditure is primarily used for

consumable products and services that are most often paid by card, such as leisure, travel, entertainment, healthcare and so forth, unfortunately, coefficients for these variables are not significant. In contrast, other variables such as age dependency ratio and the number of ATMs came out to be the most significant regressors. It seems that the advances in the number of terminals are preceded by growing number of cards and ATMs. It could be hypothesized (GMM estimation instrumenting allow for interpreting the endogenous results in the Granger causality sense) that the card issuers first give out as many cards as possible and invest in a large ATM network. Having done that they switch to EFTPOS payments. As Borzekowski et al. [2008] note, ATM cash withdrawals are then declining, while debit is becoming the dominant form of payment for many consumers.

Poland is lagging behind both EU and Euro area significantly in the number of cards, though there is some catching up toward the end of the sample period. Overall, the investigation of the determinants of the number of cards per 1 million inhabitants brought interesting results. Similarly to the previous investigations concerning card popularity, it can be seen that the EFTPOS and ATM variables are positively and significantly associated with the card popularity. Obviously, credit and debit cards can be used for cash withdrawals, ATMs increase the benefits of holding such a card without using it. Markose and Loke [2002] argue that that the cost effectiveness of ATM cash dispensation has enabled cash to maintain its competitiveness vis-à-vis EFTPOS instruments such as credit cards and debit cards. This was largely confirmed as in the previous parts of the investigation. The other significant determinant of card holdings is the GNI per capita, suggesting that the number of possible clients in the working age, the size of the market, and the income accruing to each member of the society are all positive and significant determinants of card holdings (this is further confirmed by the regressions which have not been described here and can be found in Goczek and Witkowski [2015]: the GDP and age dependency ratio are also found to be the drivers of the card holding process, which strengthens the discussed conclusion). These effects are straightforward. However, this was not a by-product of financial development associated with higher economic development, but rather the sheer number of clients in the market. In contrast to other studies, the coefficient for the private consumption is not significant. Not in line with the microeconomic investigation, the education variables were in general not significant and not of the expected sign. Neither secondary, nor tertiary education have any macroeconomic effects. Generally, it could be argued that this is one of the non-cash determinants that significantly affect whether a given individual holds a card or does not, but in the aggregate these effects do not matter significantly.

The equation that describes the number of card transactions seems to be an attractive alternative to the equation of the transactions' value. That is due to different level of earnings and prices in the considered countries, which

might by itself affect the value equation, but should have no influence on the number of transactions equation, although one can argue (and actually we do argue) that including the GDP/GNI in the regression wipes out this effect to big extent if not entirely. It must be emphasized, that this particular equation turned out to be the least informative of the considered specifications and also the only one which – while estimated on logarithms – provided no conclusive results. The conclusions that can be drawn from the equation estimated in levels suggest that the popularity of card transactions mostly coincides with economic growth, which is the key factor in this equation, apart from the autoregressive term, which turns out to be the strongest one throughout the analyzed categories. Apart from the GDP growth, the only undoubtedly significant factor is the level of trust. These two results are, however, very logical. Not only do they confirm the coincidence of the development of the economies as a whole with the development of cash-free transactions market, but they also confirm the role of social capital: the element whose role cannot be overestimated.

Concerning the policy implications it can be pointed out that trust was a positively related to card payment value. It seems that trust which usually can be defined as "the belief or perception by one party (e.g. a principal) that the other party (e.g. an agent) to a particular transaction will not cheat" [Knack, 2001]. In the case of payor, payee, and the banks, trust can be defined as a belief that the bank, as the agent in a principal-agent relationship, will deliver on its stated policy – deliver the payment amount from the payor to the payee. There is little doubt that public trust in policy-making institutions, not only banks, is of fundamental importance for their long-term success. This is an important implication visible both in the macro and in micro data investigations.

This is important to note, since in general we find that payment choices are mainly driven by habits, which are generally difficult to change. This suggests a public trust card campaign would be relatively costly and long-term in its scope in order for the people who do not trust in the economic system in general to gain trust in the card-system in particular.

Projection for Poland

In this part of the paper, we intend to make projections of the variables which describe the cash-free transactions market for Poland: the number of cards and the number as well value of card transactions per person. Although the number of EFTPOS terminals is not the variable of main interest, it is used as an independent variable in other equations. That is why it needs to be projected as well. The projection of the number of EFTPOS are thus made and provided.

There is a number of variables which are treated as exogenous in the models. In the process of making projections out-of-sample, their values need to be

assumed. Obviously, their values are not known for the future, thus a couple of scenarios are proposed: these differ in the GDP and GNI growth. Table 3 describes the assumptions that have been adopted in all the three considered scenarios for each of the variables except GDP and GNI growth and the three different paths of the GDP and GNI for each considered case: between pessimistic, baseline and optimistic.

Table 3. Assumptions Regarding Exogenous Variables in Projections for 2013–2017 Period[1]

Variable	Description	Assumption
trustindex	Trust Index	constant, as in 2012
cons	Consumption (% of GDP)	constant, as in 2012
urban	Proportion of population living in cities	constant, as in 2012
secondary	Secondary school enrollment (% total)	constant, as in 2012
ec_cost	Enforcing Contract costs (% of GNI)	constant, as in 2012
ATM	Number of ATMs per 1 million inhabitants	linear trend from 2009–2012 preserved all along
McapGDP	Market Capitalization of stock market listed companies	Linearly increasing till 45% until 2020
adr	Age dependency ratio (old + young)	increase by 0,5 pp p/a
inflation	Consumer price annual inflation (%)	2,5% in 2013, 1,5% in 2014, 1% in 2015, 1,5% in 2016, 2% afterwards
nonperform	Bank nonperforming loans to total gross loans (%)	Linearly decreasing till 5% until 2020
GDP	Gross Domestic Product PPP (in constant 2005 int. dollars)	pessimistic: 2% increase in 2014, 1% increase p/a afterwards
		baseline: 2% increase in 2014, 2,5% increase p/a afterwards
		optimistic 2% increase in 2014, 3,5% increase p/a afterwards
GNI	Gross National Income per capita (PPP)	Same as GDP

Source: Own. [1]At the time of writing the complete macroeconomic data for 2013 were not available yet, which is why the behavior of some of the independent variables needed to be assumed in that period. Also, we only use the data until 2017 even if the assumptions regarding the regressors are made for further future, which takes place if we assume some of the variables to reach certain level until 2020.

Most of the projected variables are quite steady over time. This applies mostly to variables relating to indexes and shares. These were assumed to be constant as in the last data point – that is 2012. Other variables, mostly those that have shown significant trends in the past, are assumed to be preserving the trend in the future. For example, this includes the share of trade in GDP number of ATMs. Stock market capitalization and domestic credit are expected to increase to achieve some steady level at 45% of GDP and 75%, respectively. Inflation and interest rates are compiled according to market

central projections. Age dependency ratio is increasing, as shown by GUS demographic projections. The number of nonperforming loans is expected to fall, since all of the scenarios, including the very pessimistic one, assume positive GDP growth and some inflation. This will allow for the effects of the recent financial crisis to die out.

Having adopted the above-described assumptions, the following projections are obtained: these are provided in table 4. Although in some of the equations it is the logarithm of particular variables that is computed, the data in the table are ex-post exponentiated and the values given refer to the non-logarithmized values of the variables of interest.

Table 4. Final Projections for Poland

	year	2015	2016	2017
	value of annual card payments per 1 million inhabitants			
VALUE	OPTIMISTIC	864,8562	916,8624	996,9471
	BASELINE	856,3807	894,4214	955,5724
	PESSIMISTIC	843,8285	861,8202	896,8062
	number of EFTPOS terminals			
EFTPOS	OPTIMISTIC	8968,279	9464,158	10190,15
	BASELINE	8966,511	9459,281	10180,88
	PESSIMISTIC	8963,86	9451,971	10167,00
	number of cards per 1 million inhabitants (ths. units)			
CARD NO	OPTIMISTIC	1089,718	1158,888	1238,55
	BASELINE	1087,071	1151,735	1225,394
	PESSIMISTIC	1083,114	1141,088	1205,922
	number of annual card payments per 1 million inhabitants			
PAYMENTS	OPTIMISTIC	50,19776	54,41975	62,36067
	BASELINE	50,14086	54,31684	62,15791
	PESSIMISTIC	50,05648	54,16637	61,86351

Source: Own.

As it can be seen, the results for the reasonable considered behavior of particular demographic, macroeconomic, and sociologic variables reveal quite positive expectations as regards the development of cash-free transactions. Each of the considered variables is expected to grow fast, even if the GDP growth slowed down below expectations (the very pessimistic variant). This naturally could have been expected: Poland trails behind most of the EU countries, whereas in face of permanent globalization of all sorts of markets, the technological development should affect Poland in the forthcoming years as well, which should result in catching up with the EU in this respect.

Obviously, the faster economic growth should be expected to speed up this process, yet the differences in the rate of growth of the cash-free transactions market under different GDP growth assumptions are lower than expected.

Nevertheless, it should be emphasized that these projections should be taken with great caution. It can be expected that people's affection to card payment is strongly related with the interchange fee. Its changes might have huge impact on the development of the cash-free transactions market, however it is difficult to predict what the influence will exactly be as there are virtually no historical data that would enable for the estimation of its influence on people's payment habits. In view of that, the above quoted results should be treated rather as a bottom point – the true development might be even higher. A good example of the transmission mechanism in this respect is the newly taken measure by the network of "Biedronka". Officially "for the convenience of customers" yet truly – probably in response to the interchange decrease the network are introducing regarding card payments. Considering its big popularity, this may attract many customers to indeed setting an account and obtaining a payment card to it, whereas smaller shops can be expected to follow "Biedronka's" example. On the other hand, Agarwal et al. [2014] check that despite expectations, reduction of interchange fee did not actually change the payment cards market in the USA. This suggests that the results of our projection might still be close to reality despite interchange fee changes. Still, we make relatively strong assumptions regarding the behavior of regressors and do not make very big insight into the nature of time-series of interest, not to mention the fact, that there is very little theory on the behavior of card payment market, which in turn makes it impossible to base the whole model used in this article on a theoretical construct. That is why we prefer to use the term "projection" rather than "forecast".

Summary

Recently much interest has been dedicated to the growing use of non-cash transactions in retail payments. In the article we surveyed this growing literature and found that relatively small amount of research has been dedicated to the aim of investigating the determinants of card transaction. We provide econometric models from four panel models relating to different aspects of card payment. Overall, it seems that card payment is mostly influenced by past habits and factors relatively stable over time and the Baumol-Tobin model is confirmed to be a good approximation of reality. Most of the investigated card usage determinants were quite steady over time. Therefore, based on the estimations projections for the development of the Polish card system are considered in three variants relating to different economic circumstances regarding economic growth of the Polish economy.

In each variant, however, each of the considered variables is expected to exhibit rapid growth. While this is an expected development, since Poland

lags behind most of the EU countries in terms of card development, this was not a trivial result. Poland is not only significantly lagging behind in the relative popularity of cards, but more importantly, right now the discrepancy in terms of terminals is still growing, showing in lack of convergence among the investigated countries. Therefore the obtained result of "catching up" is a relatively an important one. As argued in the review section the element of habit and network effect is substantial. To overcome the persistence associated with these effects, the technological development associated with transferring the non-cash payments into more and more convenient electronic means of payment should affect Poland in the forthcoming years as well, which should result in catching up with the EU in this respect. Obviously, the faster economic growth the quicker this process will be.

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NATĘŻENIA TRANSAKCJI BEZGOTÓWKOWYCH W POLSCE: DETERMINANTY I PROGNOZY

Streszczenie

Artykuł ma na celu identyfikację głównych czynników mających wpływ na takie charakterystyki rynku płatności bezgotówkowych jak liczba oraz wartość transakcji zawieranych przy użyciu kart płatniczych, liczba posiadanych kart oraz liczba terminali EFTPOS. Estymacja stosownych modeli umożliwia wyznaczenie prognoz wymienionych zmiennych dla Polski w horyzoncie do 2017 r. W analizie wykorzystano przede wszystkim dane panelowe z krajów Unii Europejskiej z lat 2000–2012, zaś do estymacji zastosowano systemowy estymator Blundella i Bonda. Wyniki wskazują na kluczowe znaczenie przede wszystkim wskaźników zaufania społecznego oraz w nieco mniejszym stopniu rozwoju gospodarczego dla rozwoju rynku płatności bezgotówkowych. Jednocześnie prognozuje się dynamiczny wzrost tego rynku w najbliższych latach, zaś dynamika tego wzrostu powiązana jest ze spodziewaną dynamiką wzrostu gospodarczego, przy czym nawet przy przyjęciu pesymistycznego scenariusza wzrostu gospodarczego, wyniki wskazują na oczekiwany znaczny rozwój rynku płatności kartami.

Słowa kluczowe: płatności kartą, transakcje bezgotówkowe, płatności detaliczne

Kody klasyfikacji JEL: E42, E58