

WILL WE PAY IN THE SAME WAY?

EMPIRICAL EVIDENCE OF PAYMENT BEHAVIOURS CONVERGENCE ON EMU PANEL DATA

First draft: July 2004

Revised February 2005

ABSTRACT

Over the last fifteen years, the market for retail payments has been witnessing important transformations arising from emerging information technologies and their integration across the world. Adapting legislation to the requirements of the increasing global integration of financial services provides new business opportunities for banks. However, along with these new opportunities come new challenges, namely the international standardization of payment methods and the integration of retail payments markets. Convergence of payment technologies is the main solution to new challenges banks are facing. This convergence process is propagated from upstream to downstream through the channel of standardized products, leading to a convergence of the demand for payment services. In this study we intend to analyse the effects of this harmonization trend on payment behaviours. By underlining the influence of factors such as financial opening, regulations and technological innovation, we show how forces acting in order to mould the national retail banking markets into a Single Payment Area (SPA) within the European Monetary Union (EMU) might have led to a convergence of the demand for payment instruments. The model of conditional convergence concerning the use of five payment instruments is tested using the techniques of instrumental variables on annual panel data in EMU.

JEL classification: D12, F36

Keywords: Convergence; Retail payment market; Bank supply

1. INTRODUCTION

Payment habits develop within a specific legal, financial and technological context. Any modification of the characteristics of this environment is likely to involve changes in payment behaviours. Over the last two decades, significant changes of payment instrument use were observed. According to studies undertaken by Snellman and al (2001), and Markose and Loke (2000; 2002), these changes were, for the most part, a result of technological innovation. Other authors, such as Guariglia and Loke (2004), have developed empirical studies combining technological and macroeconomic factors. However, although many authors, including Snellman (2000) agree that the legislative environment and banking integration have an influence on payment behaviours, no empirical study has focused on this issue. Only Humphrey, Pulley and Vesala (1996), have integrated some institutional indicators such as the banking concentration in their study.

The novelty and originality of our approach lies in the introduction of regulation and financial opening as potential explanatory variables of changes in demand for payment instruments. We presume that modifications of payment behaviours observed in the European Monetary Union (EMU) are as a result of at the same time the unification of national markets for retail payments through the Single Payment Area (SPA), and the changes of the technological and macroeconomic factors. In fact, the development of a comprehensive and effective legal framework for retail payments undertaken by the European Commission and the integration of payment structures carried out by the banking associations are likely to harmonize banking practices and to lead to the convergence of payments behaviours. Indeed, the greater the integration of the payment market of an economy, the more intense the banking competition is likely to be. Furthermore, the bigger the degree of harmonisation of

national regulations with international practices, the easier domestic banks can imitate and implement foreign payment technologies and habits. The purpose of this study is thus to determine the importance of this convergence process by highlighting the effects of financial opening, banking integration and harmonisation of regulations in the European Union.

Another contribution of our paper is the use of the techniques for dynamic panel data models, within the framework of the generalized method of moments (GMM). In addition, in order to address the issue of substitution, we consider that the demands for competitive payment instrument are predetermined variables as opposed to strictly exogenous ones. Lastly, unlike the previous papers, we study cash¹ use and the demand for cashless instruments simultaneously.

The structure of the paper is as follows. In the next section, we present some features of regulations and prices that have been on the European payment instruments market since 1990. Then, in Section 3, we present the methodological approach of our model. In Section 4 we carry out the convergence tests; and finally we conclude in the last section.

2. THE SINGLE PAYMENT AREA

The SPA is one domestic euro payment area grouping together the fifteen existing national areas, and in which payments are carried out with identical time and costs. Since 1990, many measures, either in the form of legal regulations or banking agreements have been implemented in order to achieve its construction. For the most part, they focused on two points. On the one hand, to allow the credit institutions to offer their services in an identical way inside the Internal Market, by eliminating "the border effect". On the other hand, to give consumers the possibility of having payment services across the European Union with a

¹ The term "cash" refers to government supplied notes and coins.

quality-to-price ratio equivalent to the national payments. By enhancing the transparency and comparability concerning the pricing of payment services, and by harmonizing the related regulations, these measures have led to greater competition at European level. Now, consumer groups are acting for many issues, such as low account closing fees or portability of bank account numbers, in order to promote customer mobility. Another effect that is worth mentioning is that foreign banks now develop new strategies that can bring some meaningful points of differentiation when they enter a domestic market. For example, thanks to the EU law on the freedom to provide services, the French subsidiary of a Spanish bank, Caixabank, broke the French tradition of "ni-ni" (i.e. no interest on current accounts and no cheque handling fees) by offering an interest-paying current account. This creates a new form of competition based on deposit interest rate in this national retail market.

However the SPA is far from being achieved because of legislative differences and heterogeneous payment systems. In each country, financial systems have developed in a specific lawful context and at different speeds leading to great divergences in the use and regulations of payment instruments. The Tables 1 and 2 present some statistics on the use of payment instruments in terms of volume and value. These figures indicate that, in general, the proportions of cash, card and direct debit use have increased in the most part of countries both in volume and value, while on the contrary, the average percentages of cheque transactions has declined. Nevertheless, this general tendency hides a far more complex reality since the European retail payments market is still segmented with payment services varying from one country to another. To carry out a homogeneous classification of Europe into groups of countries using the same payment instruments is difficult because it varies according to whether one considers the volume or the value of the transaction. Likewise, this classification depends on the ratios taken as measures of payment instruments use. The analysis of each country independently, shows how and why European disparity occurred.

%	Cash ²		Card		Cheque		Credit transfer		Direct debit	
	1990	2002	1990	2002	1990	2002	1990	2002	1990	2002
Belgium	29.00	41.33	7.82	21.85	16.88	1.06	40.90	29.55	5.40	6.20
Denmark ³			17.72	54.99	32.54	4.52	38.25	24.63	11.49	15.86
Germany	33.78	33.26	1.02	11.11	6.56	0.83	34.06	30.01	24.58	24.79
Greece ⁴	92.29	95.62	5.65	2.47	0.91	0.87	0.89	0.47	0.26	0.57
Spain	45.98	38.89	4.70	22.31	16.06	3.70	3.45	8.84	29.81	26.26
France	20.42	27.37	11.39	22.31	47.17	24.93	12.84	13.49	8.17	11.90
Ireland	0.22	77.44	7.77	10.69	70.19	5.94	16.76	3.01	5.05	2.93
Italy	15.18	36.36	2.53	20.28	38.76	11.97	40.89	22.02	2.65	9.38
Luxembourg	30.08	5.00	22.43	61.39	8.80	0.71	34.53	24.94	4.17	7.96
Netherlands	22.81	30.01	1.22	23.55	11.79	0.00	47.86	26.59	16.32	19.85
Austria	34.20	29.59	1.07	12.42	6.41	0.47	39.79	33.38	18.53	24.14
Portugal	36.02	50.37	3.95	28.94	50.91	11.97	5.23	3.10	3.89	5.62
Finland	44.56	43.80	19.56	25.59	1.38	0.05	34.09	27.73	0.41	2.83
Sweden	32.10	38.41	9.34	31.20	9.34	0.05	46.88	23.92	2.34	6.41
United Kingdom	25.76	22.70	10.17	31.87	38.21	16.29	15.79	13.56	10.06	15.58
Average	33.03	40.72	8.42	25.40	23.73	5.56	27.48	19.02	9.54	12.02
Std. dev.	20.68	22.47	6.85	15.66	21.13	7.48	16.48	10.98	9.01	8.57

Source: Percentages calculated based on data supplied in ECB Blue Book: April 1996 and April 2004

%	Cash ⁴		Card		Cheque		Credit transfer		Direct debit	
	1990	2002	1990	2002	1990	2002	1990	2002	1990	2002
Belgium	0.76	0.86	0.12	0.24	7.42	0.74	91.47	97.81	0.23	0.34
Denmark ⁵			1.04	4.29	54.48	16.52	40.52	69.59	3.96	9.59
Germany	9.29	2.71	0.19	0.42	33.85	2.27	34.87	83.09	21.80	11.51
Greece ⁶	4.78	3.81	0.19	0.04	4.39	3.31	90.45	92.80	0.19	0.04
Spain	6.73	5.42	0.64	1.66	70.41	24.98	9.77	53.06	12.46	14.88
France	0.54	0.31	0.22	0.19	10.81	2.36	87.65	96.39	0.78	0.75
Ireland	0.01	27.66	0.23	2.98	76.81	49.67	20.28	11.79	2.68	7.91
Italy	0.36	0.82	0.04	0.22	9.40	3.12	90.00	95.12	0.21	0.72
Luxembourg	7.24	0.74	5.31	5.02	0.08	7.08	86.83	85.12	0.00	2.04
Netherlands	2.76	4.25	0.04	1.51	1.11	0.00	89.00	89.16	7.09	5.08
Austria	9.69	3.60	0.26	0.73	19.28	1.06	65.93	89.70	4.84	4.90
Portugal	2.20	3.07	0.22	0.65	0.00	13.59	12.45	81.91	1.01	0.78
Finland	2.46	2.53	0.68	0.89	10.10	3.28	86.64	92.20	0.12	1.11
Sweden	3.98	8.01	0.52	4.90	10.70	0.19	81.92	83.53	2.88	3.37
United Kingdom	0.35	0.23	0.12	0.24	24.66	2.20	73.95	96.63	0.92	0.70
Average	3.65	4.57	0.66	1.60	22.23	8.69	64.12	81.19	3.94	4.25
Std. dev.	3.39	7.00	1.32	1.80	25.40	13.40	31.26	22.52	6.00	4.68

Source: Percentages calculated based on data supplied in ECB Blue Book: April 1996 and April 2004

² The use of cash is computed by multiplying the number/value of cash withdrawals at ATM by the velocity of the money, i.e. GDP/M1

³ Credit transfers: series from 1995-2002

⁴ Series from 1994-2002

Ireland is the country in which the use of cash is the most important in Europe, in volume and in value. This can be due to two principal reasons: Firstly, Ireland has the lowest average deposit rate of the EU (0.035% against a European average of 1.84% in 2002). Secondly, there is a lack of investment in electronic payments infrastructure. Indeed, Ireland has, after Sweden, the lowest rate of Automated Teller Machines (ATM) terminals per 1,000,000 inhabitants (361 in 2002). As a result, customers did not develop the habit of using cards and therefore, cash has remained the main mean of payment at POS. A study undertaken in 1999 by the BCG found that less than one-half of civil servants' wages were paid by automatic transfers. Furthermore, customers use cash to pay 75% of their water, gas and electricity bills. Three quarters of social security benefits are paid by cash, or bank cheque and only 55% of Irishmen have a bank account.

In Finland⁵, despite the high rate of electronification of retail payment methods, the use of cash also remains significant with more than 46 annual withdrawals per capita at ATM, of an average value of EUR 71 in 2002. Nevertheless, the number of ATM machines is one of the lowest in Europe; 406 ATMs per 1,000,000 inhabitants, against a European average of 717 per 1,000,000 inhabitants in 2001. The number of ATMs has actually been steadily declining since the early 1990s because of Finland's Great Depression 1990-1993, which led banks to hold down costs by decreasing the number of ATM terminals and charging additional fees when customers were having many cards issued on the same account. This measure encouraged customers to return their ATM cards. In addition to this, banks encouraged retailers to install Electronic Funds Transfers at Point Of Sale terminals (EFTPOS). They also promoted card use by charging fees for each transaction conducted by cheque whereas they were issuing debit cards free of charge. Moreover, banks implemented customer self-service payments by charging higher fees for over-the-counter transactions. All

⁵ For more information about the evolution of retail payments in Finland, see Snellman 2000.

these measures led to a high degree of electronification in retail payments methods and to a decrease in cash withdrawals over-the-counter, nevertheless, cash continues to be widely used certainly because of the size of underground economy. According to Paunonen and Jyrkönen (2002), the share of unexplained cash usage in 2000 was about one-half of currency.

In France⁶, the cheque is the second more used instrument both in volume and in value. Its great usage comes from the existence of a regulated guarantee scheme of payment. Indeed, the increasing number of cheques is a direct consequence of the rule of "ni-ni", i.e. no interest on current accounts and no cheque handling fees. This rule springs from the regulations and the banks' deposit policies whose aim was to raise the level of bank usage and to encourage the opening of savings accounts. Other legal rules also increased customer confidence in using cheques. For example, regulation requires payments by cheque or credit transfer for all transactions whose amount is higher than 1 500 Euros. In addition, it is illegal to antedate or to postdate a cheque. Cancellation of a cheque payment is allowed only in the event of loss, robbery, fraudulent use or bankruptcy. Lastly, writing a cheque without cover is an offence which is punished by very heavy legal sanctions. This cheque guarantee scheme has created a favourable legal and commercial environment for cheque use. According to a study conducted in 1999 by the Boston Consulting Group (BCG), banks bear an average cost of 0.75 Euro for each free cheque. Thereby, there is a strong financial equalization between deposit products and credit products. To discourage cheque use, French banks have invested heavily in electronic equipment becoming, after Spain and Denmark, the EU country having the third largest number of EFTPOS terminals per 1,000,000 inhabitants in 2001. As a result, in 2003 the card became the principal means of payment at POS, displacing the cheque as the dominant payment instrument in terms of the volume of transaction.

⁶ The web site of the monetary and financial French code:
<http://www.legifrance.gouv.fr/WAspad/UnCode?code=CMONFINL.rev>

In like manner, cheques became popular in United Kingdom after the mid-1960s with a marked increase in the number of bank account holders and the introduction of cheque guarantee cards. However, today, few banks cash the cheques free of charge leading to the decrease of its use.

Conversely, in Germany⁷ the share of transactions made by cheque is lower than 5% because there is no regulated guarantee scheme for cheque payment such as that in France. Thereby it is unusual to send cheques by post (e.g. the rent to your landlord). The credit institutions, with the exception of the Bundesbank, are not allowed to issue a redemption guarantee for cheques. A debtor can stop an issued cheque at any time before it is presented for payment. These regulations, as well as handling fee charged for cheque transactions, have held down the growth of cheque usage instead of cash. The 1921-1923 hyperinflationary crisis in Weimar Germany is also often cited as a reason to explain the German preference for cash rather than cheques. In addition, because of the high minimum transaction value for credit card payments at POS, Germany has the lowest number of EFTPOS terminals in Europe: 5,291 per 1,000,000 inhabitants against an average European of 11,792 in 2001. Thereby, cash is also preferred over cards for small purchases. This lack of competing payment instruments at POS explains why cash is always the most widely used payment method for face-to-face payments.

Payment behaviours are also influenced by the international environments. Various legislative measures adopted by the European Parliament in order to promote EU integration and to achieve the objective of the SPA have affected payment behaviours:

➤ 27 January 1997: Directive 97/5/EC of the European Parliament and of the Council on cross-border credit transfers. This specifies transparency obligations with respect to the method of calculating the commission fees and charges. It also establishes standards

⁷The web site of the regulation of instruments of payment in Germany:
<http://www.grundmann-norderstedt.de/gfb4.htm>

regarding the value dates applied and the execution time needed to carry out transfers of less than € 50.000. By facilitating the cross-border transfers, this Credit Transfer Directive (hereafter CTD) encourages customers to use this particular means of payment.

➤ 1st January 1999: The beginning of the third stage of the EMU, with the irrevocable fixing of the exchange rates, introduction of the single currency (EURO), and the beginning of the TARGET system of payments (Trans-European Automated Real-time Gross settlement Express Transfer). This phase is an important stage for the accomplishment of the SPA because it improves the transparency of financial information and foreign prices as well as the integration of payment systems. A consequence of this is the increasing influence of foreign supplies on the domestic demand of a means of payment.

➤ 19 December 2001: Regulation (EC) 2560/2001 on cross-border payments. It eliminates the differences in price between cross-border and national payments processing via cash, cards or credit transfers. The regulations became effective in July 2002 for card payments and withdrawals at cash points, and in July 2003 for transfers and electronic purses. This measure does not apply to cheques. It only recommends to banks to include a statement warning on cheque books relating to the cross-border use of cheques. In effect, banks charge high fees for the use of domestic cheques abroad (these costs can reach as high as 40 euros). The non-application of the principle of equal charges to cheques, as well as the withdrawal of the guarantee for eurocheques on 1st January 2002, decrease the international use of this payment instrument, though some customers still prefer to pay by cheque because it delays their payments by about 2 to 10 days.

➤ 1st January 2002. The introduction of euro notes and coins. This step is likely to improve the use of cash instead of the other competing payment instrument whose use abroad is not harmonized as yet.

As far as European regulators are concerned, the next step is to establish a common Legal Framework for Payments, so as to harmonise the payment services industry across the Internal Market. Banks' practices, such as value date, revocability of a payment order or execution times for credit transfers, are discussed within this framework. In this study we analyse the consequences of existing regulations on the use of payment instruments by emphasizing the fact that a single regulation can lead to the convergence of payment behaviours and thus explain the changes that have been observed over the last few years.

3. METHODOLOGY

3.1. Data

We study five payment instruments: cash, cheque, card, credit transfer and direct debit. We do not include the electronic money because it was not much used during the period of study. We also do not make any distinction between credit card and debit card, and between paper based credit transfer and electronic credit transfer. For each country, we use annual data from 1990 to 2001. These data measure the importance of payment instruments use in volume and in value. They are collected from the Blue Book of the European Central Bank (ECB) and from the Red Book of the Bank for International Settlements (BIS). Macroeconomics variables and the banking opening indicator come from IMF-IFS database.

3.2. Assumptions

We assume that the payment instruments do not have any intrinsic value. They are just seen like means of transferring money. Thus, the preference and usage of a payment method depends both on the characteristics of banks supply and on the related regulations. We identified four main features which determine the demand for a payment instrument:

- **Price and security:** Price includes banking fees and additional products and services such as insurance, bonuses, gifts, etc. Security refers to the potential risk associated with the use of a payment instrument. For instance, by accepting cheque payments, the depositary is exposed to credit risk if the customer does not have sufficient funds in his or her account to cover the returned cheque. For card payments, the potential risks are credit losses due to contractual delinquency, risks to customers' physical safety at ATM locations, and risks due to fraud losses (which include unauthorized use of lost or stolen cards, fraudulent applications, counterfeit or altered cards). For cash payments, the risk is cash losses resulting from theft or acceptance of counterfeit money. The security is managed and provided by banks through insurance contracts whose cost is included in the price. We took interest rates to measure both price and security and we assume that the demand is price elastic.

- **The accessibility:** That is the transaction time, the speed, reliability and ease of use a means of payment. The quicker the payment service technology, and the more convenient the payment method, the faster the transaction. So, fast and easy-to-use payment technology increases customer's satisfaction and revenues for retailers by speeding up the checkout line. It therefore generates repeated behaviours. We measure technology for face-to-face cash and card payments by the number of ATM and EFTPOS terminals. Unfortunately, we did not find similar data for the other instruments.

- **Standardization:** This depends on the payment interface compatibility and on the harmoniousness of legislations. A standardized payment instrument can be used in the same way across Europe: e.g.: euro currency, international card, eurocheques and so on. However, each EU country has laws that deal with the sale of payment instruments and those laws vary extremely from country to country. Since 1990, the European institutions and the banking industry have attempted to create statutory frameworks that tie together the various types of legislation and banking operating rules (e.g. by providing a uniform and cost-effective manner

of the reporting and record-keeping requirements, by creating an International Bank Account Number and so forth). The cooperation between payment systems, the sharing and exchange of information reduce the cost of processing and the price of a payment instrument. To measure these phenomena we took variables for the integration of payment systems and for the standardized European legislations.

- Past habits: Empirical studies found that people base much of their decision-making on the simple rule of familiarity. They are often buying on the basis of past habits and general familiarity. If simplistic decision-rule is the key element of the process for consumers choosing the payment instrument to use, then this suggests that breaks in usual habitual practices come in a high probability from banks' commercial policies and tends to emphasise the importance of marketing strategies. Therefore, testing convergence of payment behaviours comes to testing convergence of banks products.

In addition, there are a variety of payment transactions. Each one depends on characteristics such as the distance between debtors and creditors, the frequency of the payment, the confidence in the counterpart. Therefore, there are a great number of payment instruments having properties adapted to a specific kind of transaction. Thus, competition between payment instruments depends at the same time on the type, the place and the amount of the transaction. So, one cannot have a perfect substitution between all the payment instruments and only some are accurately in competition. This is why in our study we will distinguish two groups of payment instruments in which competition can be observed: on the one hand the Point of Sale (POS) payment instruments which are cash, card, and cheque, and on the other hand the remote payment instruments which are card, cheque, credit transfer and direct debit. Indeed, a customer can prefer to use card rather than cheque at point-of-sales because it finds it easier and quicker (no need to present a guarantee card); but, the same

customer could also prefer cheque to card for remote payment because it appears less risky. Therefore, we test conditional convergence considering these assumptions.

3.3. Variables

Payment instruments

It is difficult to measure empirically the value and volume of cash payments because there is no data available for cash use at point-of-sale. We therefore used two proxy variables.

$$CASH(vol)_{it} = n_{it}\theta_{it} \quad \text{and} \quad CASH(val)_{i,t} = \psi_{i,t}\theta_{i,t}$$

where n_{it} is the total number of cash withdrawal per inhabitant for the country i , ψ_{it} is the real total value of cash withdrawal at ATM per capita and θ_{it} is the velocity of the money. The latter is obtained by dividing the Gross domestic Product (GDP) by the stock of money (M1). However, we must emphasise that values obtained are only approximations because there is a substantial amount of cash, difficult to measure precisely, in circulation outside the country of origin. In addition, statistics provided do not include at-the-counter withdrawals since these data were not available.

Because account-based instruments require intermediaries, it was easier to gather data. Use of cashless instruments is measured by the total number/value of cashless transactions per capita. Values are all deflated taking 2002 as the base year. These statistics do not take into account the transactions in which the debtor is also the recipient. For instance, cheques written by the account holder for himself in order to obtain cash are not included in the number/value of transactions. Postal money orders are included in the credit transfers and traveller's cheques in the cheques.

Macroeconomic indicators:

- Private consumption per head (CONSUMP). This is defined as total real household consumption expenditure.

- Interest rates: We took the real average deposit rate and the real average lending rate in order to study the relation between the use of payment instrument and the cost of credit.

Technological indicators:

- Number of ATM (Automated teller Machines) terminals per person (ATM)
- Number of EFTPOS terminals per person (EFTPOS)

Indicator of the integration of the payment systems:

- Financial flows per person (OPENING): It is measured using the ratio of total foreign assets and liabilities to GDP.

Indicators of the regulation:

There is much speculation about the consequences of these different regulations on payment behaviours and banking competition. To settle the matter, we chose the three indicators of payment systems regulation that seem to be more important.

- Directive 97/5/EC on cross-border credit transfers (REG_CTD). This regulation is represented by a binary variable which equals 0 for the period 1990–1996 and 1 otherwise.

- The third step of the SPA (REG99). We also used a dichotomous variable that is zero for Eurozone countries before 1999 and 1 otherwise. Since Greece's joining occurs after, its variable takes 1 only in 2001.

- The introduction of euro banknotes and coins into circulation in 2002 (REG02). This regulation is included only into face-to-face payments equation

4. TEST OF CONVERGENCE

In this section we carry out tests of conditional β -convergence developed by Barro and Sala-i-Martin (1992, 1995). This test is an extension to panel data of the conventional convergence test in cross section. There is convergence if the demand for payment

instruments tends towards a common value. So, we make a regression of the growth rate on the initial level.

$$y_{i,t} - y_{i,t-1} = \alpha + \beta y_{i,t-1} + \varepsilon_{i,t}, \quad i = 1, \dots, 15, \quad t = 1, \dots, 11 \quad (1)$$

y_{it} is the natural logarithm of the degree of use a payment instrument in country i in year t . β , the coefficient of convergence, and α , the intercept are parameters to be estimated. There will be β -convergence if β is significantly different from zero and negative. The smaller the β , the faster the process of convergence is. The coefficient of convergence is supposed to be the same for all the countries. We assume that the error term follows a one-way component model:

$$\varepsilon_{it} = \mu_i + V_{i,t} \quad (2)$$

where $\mu_i \sim IID(0, \sigma_\mu^2)$ and $V_{i,t} \sim IID(0, \sigma_v^2)$ are independent of each other and among themselves. We add lagged values of the dependent variable ($\delta y_{i,t}$) as an indicator of the importance of past payment habits. We obtain the equation of the absolute β -convergence.

$$\Delta y_{i,t} = \alpha + \beta y_{i,t-1} + \rho \Delta y_{i,t-1} + \mu_i + V_{i,t} \quad (3)$$

To this absolute convergence model, we add two groups of conditioning variables. The first one is composed of the strictly exogenous variables. It includes the macro-economic indicators, the technological variables, the financial opening and the regulations. The second group is made up of the predetermined explanatory variables, which are the demand for competing payment instruments. Indeed, this is a plausible assumption because the use of other payment instruments could have some persistency in determining the current demand for the alternative payment methods.

The model with control variables added is hence:

$$\Delta y_{i,t} = \alpha + \beta y_{i,t-1} + \rho \Delta y_{i,t-1} + \gamma X_{i,t} + \eta W_{i,t} + \mu_i + V_{i,t} \quad (4)$$

where $X_{i,t}$ is a $1 \times k_1$ vector of strictly exogenous regressors, that is with $E(X_{i,t} V_{i,s}) = 0$ for all $t, s = 1, \dots, 12$.

$W_{i,t}$ is a $1 \times k_2$ vector of predetermined variables. In other words, current values of these regressors are correlated with the past errors but are independent of the contemporaneous and future errors. Explicitly, $E(X_{i,t} v_{i,s}) \neq 0$ for all $s < t$ and zero otherwise. Note that we consider past habits as endogenous variables, instead of just predetermined

γ and η are respectively $1 \times k_1$ and $1 \times k_2$ vectors of parameters to be estimated. We assume that predetermined and strictly exogenous regressors are all correlated with the fixed effects μ_i . Finally, all variables are in natural logarithms⁸.

This dynamic panel data model with fixed effects has two sources of persistence over time: Autocorrelation due to the presence among the regressors of a lagged dependent variable which is correlated with the individual specific effects, and individual effects characterizing the heterogeneity among countries. Autocorrelation makes the OLS estimator biased and inconsistent. The standard fixed effects estimator is also not consistent for N large and finite T . Indeed, notwithstanding the fact that the Within transformation wipes out the μ_i , $(y_{i,t-1} - \bar{y}_{i,\cdot-1})$ will still be correlated with $(v_{i,t} - \bar{v}_{i,t})$ (Nickell 1981). Since T is small (12 years) in our panel, we do not use LSDV estimator. The problem is similar with GLS estimation of the random effects model. A procedure with which to face this difficulty consists firstly of taking first-differences transformation of equation (4) so as to eliminate the country-specific fixed effects which are the source of bias; and secondly, of utilizing instrumental variables in order to replace explanatory variables that are correlated with the error term.

We use the Arellano and Bond (1991) generalized method of moments (GMM) estimator. It utilizes instruments whose validity is based on the orthogonality conditions

⁸ Because of the double-logarithmic form of the model, we can interpret the estimated coefficients as elasticities.

between lagged values of the dependent variable y_{it} and the errors v_{it} ⁹. For the strictly exogenous variables X_{it} , all past, current, and future values are valid instruments. For predetermined variables, only $X_{i,1}, \dots, X_{i,t-2}$ are valid instruments in the first-differenced equation at time t . We avoid including more than two lags as instrument for each set of variables because the GMM estimator may perform poorly in small samples when there are too many over-identification restrictions due to a large instrument matrix. We assume that the lagged variable of a payment instrument demand contains sufficient customers' memories relating to past payment behaviours. This hypothesis helps us to avoid multicollinearity problems among explanatory variables while still maintaining most of the information.

The consistency of the GMM estimator depends on the validity of the instruments that is tested using two model specification tests. The first is a test of a lack of second-order serial correlation among the residuals of the differenced equation. To address this issue, we report the m_2 under the null $E[\Delta v_{it} \Delta v_{it-2}] = 0$. The second is a test of over-identifying restrictions also referred as the Sargan test. Failure to reject the null hypothesis for both tests means that lagged values of dependent and independent variables are valid instruments.

We also compute the half-life (or the double-life), i.e. the time necessary for the gap to be cut in half (or to be doubled). We obtained it by the following equation:

$$\tau^{10} = -\ln(2)/\ln(1+\beta). \quad (5).$$

Results are shown in tables 3 and 4.

⁹ For instance, $\Delta y_{i,t-2}$ is a valid instrument in (4) because it is highly correlated with $(\Delta y_{i,t} - \Delta y_{i,t-1})$ and not correlated with $(v_{i,t} - v_{i,t-1})$. Thus, GMM estimator is based on the moment conditions : $E(\Delta \mathcal{E}_{it}, Y_{is}) = 0$, $E(\Delta \mathcal{E}_{it}, X_{is}) = 0$ and $E(\Delta \mathcal{E}_{it}) = 0$, for $t = 3, \dots, T$ and $Y = \Delta y_{i,t} - \Delta y_{i,t-1}$

¹⁰ Half-life: If $T = 1$, then $y_{i1} = y_{i0} + \beta \cdot y_{i0}$
 $= y_{i0} \cdot (1+\beta)$;

If $T = x$, then $y_{ix} = y_{i0} \cdot (1+\beta)^x$.

By definition, half-life is $y_{ix} = 0,5 \cdot y_{i0} \Rightarrow 0,5 \cdot y_{i0} = y_{i0} \cdot (1+\beta)^x$
 $\Rightarrow 0,5 = (1+\beta)^x$
 $\Rightarrow x = -(\ln 2) / \ln(1+\beta)$

Table 3 – Conditional β -Convergence for Point of Sale payment instruments

	Δ CASH		Δ CARD		Δ CHEQUE	
	Volume	Value	Volume	Value	Volume	Value
Δy_{t-1}	0.000 [0.999]	0.098 [0.145]	-0.112 [0.347]	-0.172** [0.025]	-0.225** [0.026]	-0.128 [0.405]
β	-0.475*** [0.005]	-0.580*** [0.004]	-0.421*** [0.000]	-0.533*** [0.000]	-0.075 [0.758]	-0.328** [0.046]
Cash			-0.021 [0.196]	0.177*** [0.000]	0.024 [0.235]	0.099*** [0.004]
Card	0.183 [0.635]	0.592 [0.129]			0.052 [0.820]	-0.324*** [0.000]
Cheque	0.090 [0.328]	0.043 [0.621]	-0.019 [0.547]	-0.113 [0.357]		
ATM	-0.257 [0.652]	-0.445 [0.506]	-0.013 [0.889]	-0.105 [0.285]		
EFTPOS			0.248*** [0.000]	0.197* [0.088]		
Deposit rate	-0.629** [0.026]	-0.551** [0.039]	0.131* [0.075]	0.007 [0.965]	-0.0006 [0.997]	0.099 [0.146]
Lending rate	0.242 [0.735]	-0.140 [0.868]	-0.149 [0.199]	-0.236** [0.037]	-0.006 [0.986]	-0.453*** [0.008]
Consump	2.331 [0.124]	1.918 [0.198]	0.091 [0.452]	0.240 [0.450]	0.064 [0.720]	-0.392 [0.443]
OPENING	-0.216 [0.690]	0.442 [0.377]	-0.097* [0.083]	-0.222 [0.134]	-0.088 [0.459]	-0.184* [0.052]
REG99	0.381 [0.661]	0.533 [0.410]	-0.005 [0.913]	-0.037 [0.675]	-0.026 [0.747]	-0.120 [0.441]
REG02	0.408* [0.077]	0.410** [0.029]	0.028 [0.674]	-0.005 [0.942]	-0.506 [0.131]	0.020 [0.807]
α	-0.100 [0.356]	-0.179 [0.125]	0.033 [0.091]	0.015 [0.599]	-0.025 [0.569]	-0.005 [0.882]
m_2	-1.22 [0.222]	-1.22 [0.223]	0.87 [0.384]	-1.52 [0.128]	0.88 [0.377]	-1.26 [0.209]
Sargan test	$\chi^2(74)=88$ [0.123]	$\chi^2(74)=93$ [0.063]	$\chi^2(74)=71$ [0.584]	$\chi^2(74)=71$ [0.581]	$\chi^2(74)=84$ [0.191]	$\chi^2(74)=89$ [0.110]
Wald test	$\chi^2(11)=120000$ [0.000]	$\chi^2(11)=110000$ [0.000]	$\chi^2(12)=4435$ [0.000]	$\chi^2(11)=3594$ [0.000]	$\chi^2(10)=461$ [0.000]	$\chi^2(10)=174$ [0.000]
df_m	12	12	13	13	11	11
No of obs	93	89	93	88	96	89
Half-life	1.07	0.80	1.27	0.91		1.74
Double life					8.84	

*, ** and ***: significant at the 10%, 5% and 1% levels. All significant coefficients are shown in bold. The p-values at 5% level are reported in brackets below the coefficient values. df_m is the model degree of freedom. m_2 is the test of second-order autocorrelation in the first-differenced residuals. Sargan statistic is a Chi-squared test of the null that the over-identifying restrictions are valid. Since its asymptotic distribution is not known under the assumptions of the robust model we obtain it by assuming a homoskedastic error term. Wald statistic is a Chi-squared test of the null that all the coefficients except the constant and time dummies are zero. For these two statistics, degrees of freedom are reported in parentheses. Both tests give positive results for all the variables. Half-life is computed as we explained above.

Table 4 – Conditional β -Convergence for remote payment instruments

	Δ CARD		Δ CHEQUE		Δ CREDIT TRANSFERS		Δ DIRECT DEBIT	
	Volume	Value	Volume	Value	Volume	Value	Volume	Value
Δy_{t-1}	-0.063 [0.487]	0.103 [0.189]	-0.098 [0.511]	-0.0002 [0.998]	-0.046 [0.483]	0.050 [0.666]	0.272 [0.220]	0.184 [0.247]
β	-0.251*** [0.000]	-0.490*** [0.004]	0.061 [0.778]	-0.423*** [0.009]	-0.440*** [0.000]	-0.379*** [0.000]	0.029 [0.833]	-0.690*** [0.002]
Card			-0.103 [0.564]	-0.144* [0.074]	-0.240** [0.020]	-0.230*** [0.007]	0.129 [0.273]	0.097 [0.424]
Cheque	-0.006 [0.820]	-0.046 [0.624]			-0.022 [0.425]	0.017 [0.914]	0.197*** [0.006]	0.018 [0.755]
Transfers	-0.276*** [0.000]	-0.036 [0.400]	-0.022 [0.934]	0.017 [0.672]			-0.054 [0.671]	0.170 [0.274]
Debit	0.010 [0.822]	0.047 [0.643]	0.398 [0.158]	0.124 [0.203]	0.097 [0.157]	0.586** [0.034]		
Deposit rate	0.075** [0.025]	0.011 [0.851]	-0.083 [0.400]	-0.025 [0.733]	0.113 [0.109]	0.419*** [0.000]	0.023 [0.853]	-0.090 [0.443]
Lending rate	-0.186** [0.044]	-0.379 [0.184]	0.0321 [0.375]	-0.219 [0.306]	0.253 [0.120]	-0.663** [0.024]	-0.369 [0.197]	0.281 [0.394]
Consump	0.113 [0.344]	0.348 [0.319]	0.353 [0.130]	-0.319 [0.503]	-0.183 [0.178]	-0.186 [0.632]	0.514*** [0.000]	0.373 [0.300]
Opening	-0.003 [0.931]	-0.049 [0.480]	-0.024 [0.781]	0.021 [0.819]	0.031 [0.586]	0.356* [0.059]	0.056 [0.413]	-0.386** [0.015]
Reg_CTD	0.001 [0.973]	-0.172 [0.274]	-0.052 [0.606]	0.100 [0.160]	0.018 [0.775]	-0.219 [0.113]	-0.114 [0.293]	0.129* [0.094]
Reg_99	0.030 [0.299]	0.148 [0.370]	-0.125 [0.389]	-0.042 [0.761]	0.164*** [0.006]	0.022 [0.872]	-0.069 [0.341]	-0.083 [0.416]
α	0.044** [0.011]	0.040** [0.037]	-0.006 [0.811]	-0.053* [0.080]	0.027* [0.067]	0.027 [0.590]	-0.052* [0.059]	0.038 [0.179]
m_2	0.99 [0.322]	-1.27 [0.206]	1.34 [0.179]	0.97 [0.331]	-1.08 [0.282]	0.20 [0.844]	-0.60 [0.549]	-1.26 [0.132]
Sargan test	$\chi^2(93)=85$ [0.7121]	$\chi^2(93)=88$ [0.6318]	$\chi^2(93)=93.37$ [.4698]	$\chi^2(93)=90$ [0.567]	$\chi^2(93)=98.50$ [0.3285]	$\chi^2(93)=90$ [0.5732]	$\chi^2(93)=107.65$ [0.1421]	$\chi^2(93)=102$ [0.247]
Wald test	$\chi^2(11)=1629$ [0.000]	$\chi^2(11)=1457$ [0.000]	$\chi^2(11)=20.84$ [0.0351]	$\chi^2(11)=9312$ [0.000]	$\chi^2(11)=2373$ [0.000]	$\chi^2(11)=19939$ [0.000]	$\chi^2(11)=2306$ [0.000]	$\chi^2(11)=34809$ [0.000]
df_m	12	12	12	12	12	12	12	12
No of obs	106	99	105	97	104	95	104	98
Half-life	2.40	1.03		1.26	2.52	1.45		0.59
Double life			11.63				24.07	

Same remarks as below Table 3

Results show evidence of conditional β -convergence for all payment instruments except cheques and direct debit in volume. This means that, in general, the evolution of the demand for payment instruments follows the European harmonization movement initiated by the creation of the SPA. The divergence in the frequency of cheque and direct debit use may be explained by the fact that they remain primarily national payment instruments which are subject to very different legal rules. For instance, in England, customers may post-date a cheque, and the bank does not have the right to cash it earlier than the date inserted on it (if a post-dated cheque is paid before the date on it, customer can ask the bank to refund it). While on the contrary, to post-date a cheque is illegal in France. Likewise, in Germany the debtor can stop a cheque for commercial reasons, whereas it is not possible in France. Similarly the legal requirements and the banking agreements with respect to direct debits vary from country to country. For example, regarding the revocability of a payment order, in the majority of countries, the payer has the right to revoke the payment, but this is possible only within a specified amount of time which may range, depending on the country, from few hours several days. While cheque is generally accepted as a declining instrument, a Pan European Direct Debit a contrario is about to be created with homogenous processing and common legal characteristics. So its divergence is expected to decrease.

Results also disclose that all payments are converging in value. Additionally, the process is faster in value than in volume. This is a consequence of the fact that contractual practices are generally related to the value of the transaction like the existence of a maximum or minimum amount for payments by cards or cheques, or the fees proportional to the amount of transactions for payments made by credit transfers or direct debits. There are few pricing methods applying to consumers that are based on the number of transactions.

In a general way, the convergence process is faster for cash than for the other instruments. This can be explained by the fact that cash payments are more flexible. They have less technological and administrative constraints than the other payment methods. Indeed, the use and the processing of all cashless instruments requires a specific technology (EFTPOS, giro ATM, internet connection...) to carry out the payment transactions. These constraints heighten their transaction costs whereas the convenience of cash payment increases its use.

Contrary to the study of Humphrey and al. (1996) which demonstrated competition between all payment methods, except debit cards, our results relating to the substitution between payment methods, reveal a little competition. Indeed, we find a bilateral competition only between card and credit transfers in volume. Besides, card also seems to be the principal challenger for cheque and credit transfer in value. This suggests that the decrease of cheque use is mainly caused by card competition. In their paper, Guariglia and Loke (2004), also found a negative relation between card use and cheque demand in value. The competition between card and credit transfers may appear surprising because cards are currently instruments mainly used for face-to-face payments while credit transfers are exclusively used for remote payments. This unexpected result is due to the high level of electronification of retail payments in Scandinavian countries (Sweden, Denmark and especially Finland).

The results also contrast with the prediction of the conventional substitution relation between payment methods. Indeed, our findings reveal four positive relations: The first two are between cheque and card demand and cash use in value. This complementarity can be due to the fact their average amount of transactions are different. Cash is generally used for small purchases while cheque primarily relates for medium to large-value transactions. Besides, cheque and cards are also used for cash withdrawal. Finally, this result can also be justified by

the existence of a 'de minimis' threshold for cheque payments at POS. Indeed, the minimum amount for payments made either via card or cheque shift the competition above that value and enhances the use of cash for transactions of low value. This can also explain why changes from cash to new instruments, especially electronic payments, have been slower than predicted

The third positive relation is between the demand in value for direct debit and the cheque use, and the last one between the demand for credit transfers and the use of direct debit, also in value. This lack of competition is owing to the imperfect exchangeability of these payment methods. In actual fact, each payment instrument has some features which distinguish it from the others. Therefore, it cannot easily be substituted for particular transactions (deposit cheque, cash payments at distributors...).

So, results showing that direct debits do not compete against credit transfer can be explained by the characteristics of these two instruments. indeed, with the direct debit it is the beneficiary who initiates the payment from the account of the customer to his own account while with the credit transfer the payment order is given directly by the debtor to its payment service provider without passing through the beneficiary. Thus the differentiation is owing to the fact that the payment order can be direct or indirect. That is why the two instruments are not perfectly substitutable.

The lagged dependent variable coefficient is used to capture how resistant to change, payment behaviours are. Unlike Guariglia and Loke (2004) who found a positive impact of the force of habit in volume and in value for all the payment instruments, our results show that habits are significant only for cheque use at POS in volume and. Furthermore, past habits appear to be the single significant coefficient. In fact, a one percent increase in changes of payment habits eventually leads to a narrowing in the demand variations of about 22.5 percent.

This explains why the decrease in the use of cheque has been relatively important these last twelve years (77% in average) and reflects a fairly low degree of persistence. Lagged values of changes in demand for payment instrument contribute little to current changes. These findings are in marked contrast to the idea according to which payments behaviours are mainly due to past habits.

Results also disclose that the financial opening has strengthened the trend of variations in payment behaviours. This variable consistently has a statistically significant coefficient for cheque in value at POS and card in volume also at POS, and for credit transfers and direct debit both in value. As we expected, the more open a retail market is, the more important the use of payment instruments suitable for cross-border transactions. Effectively, the setting up of bank branches in foreign countries, by increasing among other things international credit business, induces increasing use of international payment methods. Opening up banking to overseas customers speeds up the transfer of technology and products to national consumers which otherwise might have taken longer.

Regarding the card, the coefficient of the financial opening variable is significantly negative for POS demand in volume. This means that the cost per transaction of payments made by card abroad is always high. This raises the average value of card transactions, and makes them less competitive for low-value transactions (transportation tickets, vending machines or other small cash purchases).

The coefficient of financial opening is also significantly negative for POS cheque in value and for direct debit in volume. This is a fair result because, as we explained above, these instruments are not suitable for international transactions. The use of cheque abroad is slowed down by its high cost and the absence of homogeneous infrastructures. Likewise, there are neither bank agreements nor regulations, which define the cross-border use of direct

debit. Though it is one of the simplest means of payment, it is quite impossible to make a cross-border payment by direct debit chiefly because of the incompatibility of payment systems and domestic legal rules. Therefore, it is plausible that the opening of retail payments markets does not have any impact on the variation of the demand for this means of payment.

Conversely, the positive relation between the banking opening up and the demand for credit transfers in value cash reflects the decrease of the transaction costs owing to the limited fluctuations of the inflation, interest rates and exchange rates. It is also a result of the efforts made by banks (agreement on multilateral interchange fees that avoid the practice of double charging cross-border credit transfers) and legislators (directive 97/5/EC, Regulation 2560/2001) in order to drive down the costs of cross-border credit transfers. This reduction decreases the price the payment transaction and enhances, de facto, its use both for international and national transactions.

Notwithstanding the fact that the variable use to proxy the integration of retail payment markets is not certainly the best, the results are in generally in line with our expectations. A high degree of integration enhances the harmonization of regulations relating to international means of payment and encourages the convergence of payment behaviours with respect to these instruments.

Turning our attention to results relating to the indicators of regulation, it appears that the launching of the single currency in 2002 (REG02) has supported cash use in volume and in value. This result is consistent with our expectations. We also observe that the irrevocable fixing of the exchange rates (REG99) has accelerated the increase in the demand for credit transfer in volume. An unexpected finding is the significantly positive elasticity of the Directive on Credit transfers (REG_CTD) variable with the demand for direct debit in value. This result is not necessarily informative, since international direct debit has so far not been

available. Nevertheless, coefficient of REG_CTD is not significant for credit transfer neither in volume nor in value. Although this finding is disappointing, it might be due to the very long time of CTD implementation (30 months).

On the whole, results are in line with the hypothesis according to which the enhancement of the cross-border use of a payment instrument accustoms the consumers to its usage both nationally and internationally, and therefore promotes the growth of its total demand. This increase is to the detriment of other means of payment whose use abroad is expensive and less effective.

Looking at the technological variables, we do not find a positive relationship between the demand for cash and the accessibility of ATM terminals. This result suggests that cash use is not so much dependent on ATM machines even if they reduce the cost of getting cash. Indeed, the 5 countries that use cash for most transactions are Belgium, Finland, Portugal, Ireland and Greece, in value, and Belgium, Germany, Finland, Ireland and Greece in volume. In addition, the five countries that have the lowest number of ATM per capita are Sweden, Ireland, Finland, Greece and Netherlands. Concerning the relation between EFTPOS and the use of cards, the coefficients are strongly significant and positive both in value and in volume. This result is consistent with our expectations. These technological variables are excluded from the equation of the other payment instruments in order to avoid potential problems of co-linearity.

Concerning the macroeconomic indicators, findings are interesting because the coefficients have the expected signs. First of all, the coefficient of deposit rate is on the one hand strongly negative for cash demand in volume and in value and on the other hand significantly positive for card demand in volume and credit transfer in value. This is in line

with the theory of Baumol (1952) and Tobin (1956) theory according to which interest rate is inversely related to cash holding. Cash is still widely used because the opportunity cost of holding cash in the wallets is very low. We observe that, from 1990 to 2002, the average annual European interest rate of current deposit went down from 8.37% to 2.18% while the share of cash payments rose from 3.65% to 4.57% in value and from 33.03% to 40.72% during the same period. So, the relatively low interest rates have reduced the lost interest earnings from deposit accounts leading to the increasing of cash use. These results suggest that a rise in deposit rate is likely to increase the proportion of cashless payments by reducing cash use. Secondly, the cost of money appears equally to be a key determinant of the frequency of card payments and the value of credit transfer transactions. Indeed, the two interest rates coefficients are significant with different sign. Besides, the lending rate is also significant and negative for card and cash demand at POS. The relation between the use of credit cards and the credit of consumption does not appear. This is logical since the number of transaction per capita with debit card (35.4 in 2002) is still greater than the one of credit card (12.5 in 2002).

The coefficient for the private consumption variable is significant only for the use of direct debit in volume and is positive. Since it is a suitable payment instrument for regular and recurring payments (rent, water, gas, electric, telephone...), this result suggests that an increase in private consumption, which includes both consumer and business spending, has obvious implications on the other subsectors of the retail industry. It is in line with Avery and al (1986) demonstration that, a higher real consumption is supposed to increase cashless transactions. However, the consumption of this kind of services is generally stable and can not rise beyond a certain level. Usually, growth of household final consumption expenditure is primarily used for consumable products and services which are most often paid by cash, card or cheque, such as leisure, travel, entertainment, healthcare and so forth. Unfortunately,

coefficients for these means of payment are not significant and cannot be used to give support to this explanation.

In general, results relating to macroeconomics indicators are very encouraging. Since the integration of EMU economies supposes the nominal convergence of types of interest, we expect the interest rate to speed up more the convergence process in the future. We also expect a similar result with the private consumption, but the impact may be less strong because the achievement of a real convergence of the standard of living, called by the Commission "economic and social cohesion", will require a much longer timescale.

5. CONCLUSION AND DISCUSSION

In this study, we undertook an analysis of the dynamic nature of payment behaviours by assessing the impact of the technological innovation, the banking industry integration and the harmonization of regulations on the demand for payment instruments. We uncovered several interesting results.

The most significant finding is the new insight provided into studies of payment instrument choice. Indeed, we find that payment behaviours are converging within the EMU. Since customers lack a good understanding of the retail market, the convergence process observed reflects more generally the dynamics of product standardization at a European level. In effect, payment instruments are culturally derived needs which are not considered in the choice of a bank account. Furthermore, banks' fee structures have become increasingly complicated, insomuch as consumers cannot understand them nor compare the infinite variety of contract terms and conditions available in the market. Lastly, transaction costs primarily due to the non-portability of account numbers as well as the switching costs do not encourage

customers to change bank just because of more attractive retail payment services. For these reasons, the mobility of customers in the retail market is reduced. Consequently, the convergence of payment behaviours, demonstrated in this study, is resulting from the convergence of the retail banks through standardized products. This standardization process comes both from the intrinsic motivation of providers to take advantage of competitive opportunities arising from increasing banking integration and from regulators' incentives to establish a common legal framework for retail payments. Since regulators and banking industry are stepping up measures to strip out all existing non-market distortions such as price control, taxes or subsidies on payment services, this result suggests that the dynamics of convergence will increase more and more with the achievement of the SPA, all the more so with the fall of the influence of cultural differences on payment behaviours.

In essence, some previous empirical studies have led to the conclusion that "*payment habits are slow to change*". In this paper, we found that changes in payment behaviours can be faster than they usually appear. By including new explanatory variables, which had not been taken into consideration yet, we found other factors than the force of habit, such as the modifications of legislation related to the payment services or the reconfiguration of the retail banking market, that impact considerably on the demand for payment instruments. Moreover this, the estimated half-lives indicate that the convergence process is relatively fast, therefore differences in payment cultures will neither slow down the achievement of the SPA, nor be a step backward for countries with more advanced payment methods standardization.

In the debate between legislator, banking industry and users, which concentrates largely on the role of European regulations and banking agreements in the continuing evolution of retail banking market, it is hoped that this study will provide a realistic assessment and strategic insights on these questions.

REFERENCES

ARELLANO, Manuel and BOND, Stephen « **Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations** » Review of Economic Studies, vol 58, Issue 2, 1991.

AVERY, Robert B., ELLIEHAUSEN, Gregory E., KENNICKELL, Arthur B. and SPINDT, Paul A. « **The use of cash and Transaction Accounts by American Families** » Federal Reserve Bulletin, Board of Governors of the Federal Reserve System, February 1986

BANK FOR INTERNATIONAL SETTLEMENTS « **Statistics on payment and settlement systems in selected countries** » Basle, 1991, 1995, 2002.

BARRO, Robert J. and SALA-I-MARTIN, Xavier « **Convergence** » The Journal of Political Economy, vol 100, n°2, pp. 223-251, 1992.

BARRO, Robert J. and SALA-I-MARTIN, Xavier « **La croissance économique** » McGraw-Hill, Ediscience, 1996.

BAUMOL, William J. « **The Transactions Demand for Cash: An inventory Theoretic Approach** » The Quarterly Journal of Economics, Vol. 66, Issue 4, November 1952.

EUROPEAN CENTRAL BANK « **Payment systems in the European Union** », 1996, 2000, 2003.

GUARIGLIA, Alessandra, and LOKE Yiing Jia « **What determines the value and volume of non-cash transactions? Evidence from a panel of european and North American countries** » Applied Economics, vol. 36, no. 4, March 2004.

HUMPHREY, David B., LAWRENCE, Pulley B. and VESALA, Jukka M. « **Cash, Paper, and Electronic Payments: A Cross-Country Analysis** » Journal of Money, Credit and Banking, Vol. 28, No. 4, Part 2: Payment Systems Research and Public Policy Risk, Efficiency, and Innovation, November 1996.

MARKOSE Sheri, and LOKE Jia Yiing « **Changing trends in payment systems for selected G10 and EU countries 1990-1998** » University of Essex, Economics Department Working Paper n°508, 2000.

MARKOSE Sheri, and LOKE Jia Yiing « **Can cash hold its own? International comparisons: Theory and evidence** » University of Essex, Economics Department, April 2002.

NICKELL, Stephen « **Biases in dynamic Models with fixed Effects** », Econometrica, Vol 49, 1981

PAUNONEN Heli, and HANNA Jyrkönen « **Cash usage in Finland – How much can be explained?** » Bank of Finland, Discussion Papers 10, 2002

QUAH, Danny « **Galton's fallacy and tests of the convergence hypothesis** » Centre for Economic Policy Research, Discussion Paper, n°820, 1993.

SNELLMAN, Jussi, VESALA, Jukka and HUMPHREY, David «**Substitution of noncash payment instruments for cash** » Journal of Financial Services Research, 2001

SNELLMAN, Jussi «**Evolution of retail payments in Finland in the 1990s** » Financial Markets Department, 2000.

TOBIN, James « **The interest-elasticity of transactions demand for cash** » Review of Economics and Statistics, n°38 (3), 1956.