

Takala, Kari; Virén, Matti

Working Paper

Efficiency and costs of payments: some new evidence from Finland

Bank of Finland Research Discussion Papers, No. 11/2008

Provided in Cooperation with:

Bank of Finland, Helsinki

Suggested Citation: Takala, Kari; Virén, Matti (2008) : Efficiency and costs of payments: some new evidence from Finland, Bank of Finland Research Discussion Papers, No. 11/2008, ISBN 978-952-462-439-8, Bank of Finland, Helsinki,
<https://nbn-resolving.de/urn:nbn:fi:bof-20140807253>

This Version is available at:

<https://hdl.handle.net/10419/212102>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

Kari Takala – Matti Viren

Efficiency and costs of payments: some new evidence from Finland




EUROJÄRJESTELMÄ
EUROSYSTEMET

Bank of Finland Research
Discussion Papers
11 • 2008

**Suomen Pankki
Bank of Finland
PO Box 160
FI-00101 HELSINKI
Finland
☎ +358 10 8311**

<http://www.bof.fi>



Kari Takala* – Matti Viren**

Efficiency and costs of payments: some new evidence from Finland

The views expressed in this paper are those of the authors and do not necessarily reflect the views of the Bank of Finland.

* E-mail: kari.takala@bof.fi

** Corresponding author. E-mail: matti.viren@bof.fi

Viren thanks the Yrjö Jahnsson Foundation for financial support. Useful comments from Heiko Schmeidel and other participants of the Conference on Economics of Payment Systems in October 2007 (organized by Telecom Paris) are gratefully acknowledged. We also acknowledge valuable comments from Kari Kemppainen and Harry Leinonen.

<http://www.bof.fi>

ISBN 978-952-462-438-1
ISSN 0785-3572
(print)

ISBN 978-952-462-439-8
ISSN 1456-6184
(online)

Helsinki 2008

Efficiency and costs of payments: some new evidence from Finland

Bank of Finland Research
Discussion Papers 11/2008

Kari Takala – Matti Viren
Monetary Policy and Research Department

Abstract

This paper deals with optimal payment systems. The issue boils down to how large are the costs of different payment media, which can be interpreted as a question of the efficiency of the means of payment. However, there are other qualifications related to the choice of payment media. Here, at least three issues can be distinguished. First is the question of optimal payment medium for each individual payment (size, location, EFTPOS etc.). This choice is not independent of the individual characteristics of the payer and payee. Secondly, there is the question of cost effectiveness of payments for different institutions and sectors. The final issue concerns the social optimum for each payment medium. These issues have been particularly controversial in the case of cash, which is still the dominant payment medium in most euro countries. Part of the controversy arises from the fact that the costs and benefits of different payment media affect different market participants in quite different ways, so that a possible social optimum might not correspond eg to the optima for different firms. The paper contains a short review of calculation methods and empirical results for a sample of countries. It also provides new evidence from Finland, which is to an extent one of the front-runners in payment technology and institutional design in payment systems. This shows up in relatively low overall costs of payments. Our estimate of total costs of payment media is 0.3 per cent of GDP, which is very low by international standards.

Keywords: payment media, cash, payment systems, costs of payments

JEL classification numbers: G21, E42

Maksujen tehokkuus ja kustannukset: uusia tuloksia Suomen aineistolla

Suomen Pankin keskustelualoitteita 11/2008

Kari Takala – Matti Viren
Rahapolitiikka- ja tutkimusosasto

Tiivistelmä

Tutkimusraportin aiheena on optimaalinen maksujärjestelmä. Tämä aihe liittyy kysymykseen, miten suuret ovat eri maksuvälineiden kustannukset, mitä voidaan tulkita kysymyksenä maksuvälineiden tehokkuudesta. Maksuvälineisiin liittyy kuitenkin muitakin ominaisuuksia. Niistä puhuttaessa voidaan erottaa ainakin kolme kysymystä. Ensinnäkin voidaan kysyä, mikä on optimaalinen maksuväline kullekin yksittäiselle maksulle (ottaen huomioon koon, paikan, elektroniset ominaisuudet jne.). Tämä valinta ei ole välttämättä riippumaton maksajan ja maksun saajan ominaisuuksista. Toisaalta voidaan esittää kysymys maksujen kustannustehokkuudesta eri sektoreiden ja instituutioiden osalta ja viimein myös kysymys siitä, mikä on koko maksujärjestelmän sosiaalinen optimi. Nämä kysymykset ovat olleet erityisen kiistanalaisia käteisrahan tapauksessa, joka on yhä dominoiva maksuväline useimmissa euroalueen maissa. Erilaiset mielipiteet johtuvat ainakin osin siitä, että eri maksuvälineiden kustannukset ja hyödyt koskevat eri markkinaosapuolia hyvin eri tavoin ja siten mahdollinen yhteiskunnallinen optimi ei välttämättä vastaa esimerkiksi eri yritysten optimia. Tutkimusraportti sisältää lyhyen katsauksen laskentamenetelmiin ja empiirisiin tuloksiin eräiden muiden maiden osalta. Mukana on myös uusia tuloksia Suomesta, joka on tietysti määrin edelläkävijä maksuvälineteknologiassa ja maksujen välityksen instituutionalisessa kehityksessä. Tämä näkyy myös verraten alhaisissa maksujen kustannuksissa. Oma arviomme on, että maksujen välityksen kokonaiskustannukset ovat noin 0.3 prosenttia suhteessa kokonaistuotannon arvoon, mikä on hyvin alhainen luku kansainvälisen mittapuun mukaan.

Avainsanat: maksuvälineet, käteisraha, maksujärjestelmät, maksujen kustannukset

JEL-luokittelu: G21, E42

Contents

Abstract.....	3
Tiivistelmä (abstract in Finnish)	4
1 Introduction	7
2 Conceptual framework	9
3 Choice between different payment media.....	16
4 A scrutiny of costs and pricing payment services in Finland.....	25
4.1 Description of the costs of cash calculations.....	25
4.2 Costs of cash estimates	32
4.3 Comparison of cash and card payments costs	34
5 Concluding remarks.....	41
References.....	43
Appendix 1.....	45
Appendix 2.....	46
Appendix 3.....	47
Figures A1 and A2	48

1 Introduction

The payment industry is in a constant flux. New technological innovations change the supply side but also the demand patterns change due to urbanization, education and an increase in income and wealth. Payment habits are also subject to change over time as payment habits have strong individual persistence. Currently heavy cash users are mostly elderly people and as these cohorts will gradually pass away, the number of cash users will diminish. The change in payment patterns in Finland is illustrated in Figure 3.1 below.

The key issue from the economic point of view is, of course, the question whether the current system is somehow optimal for each user group: whether it is the most efficient from the social point of view as a whole. That is obviously not the only relevant question: we might also be interested in the distribution of costs and benefits between different market players. Even if some system is socially optimal it might not be operative if the key market players had no incentive to support it. In the payments industry, it is not exactly clear what the exact costs for different payment media are and how different fees or royalties cover them.

The most striking and interesting example is the use of cash. Cash is provided by the central banks which makes it a legal tender. In this sense cash carries some characteristics of a public good. The costs of cash distribution are mainly covered by banks and merchants, as both banks and merchants are responsible for the retail distribution and handling costs of cash. Of course eventually the cost of cash is passed on to the consumers. Banks are in a position in which they can charge part of the costs of cash from consumers and merchants while merchants are typically in a position in which they cannot find any (direct) compensation for their payment costs.¹

It has been argued that cash is cross-subsidized and made to look like a free product for the customers, which of course is not the case. Here banks have the key role in using pricing for different means of payment and to bring transparency into the costs of payment media, since the purchasing power of the consumers is stored in (overnight) deposits and basically there are two ways to use this liquidity either by cash withdrawals or by electronic payments like cards. However, banks have not been especially keen in increasing transparency into payment systems or to introduce for instance ATM withdrawal fees. In fact this pretty much characterizes banking as a business altogether. Anyway, there seems to be a lot of

¹ In Finland, similar to most countries merchants do not want to differentiate the costs of different means of payment to customers. In fact, this could be also tricky in practice as the unit prices of different means of payment vary heavily depending on the payment situation. Even between different types of cards, where the provisions of card payments are known, merchants are not willing to differentiate these costs to customers. Only in rare cases (eg with discounts) some price discrimination in terms of payment media may take place but these practices varies a lot over countries.

interest on behalf of the banks to reduce the cash payments, as they are regarded costly, but single banks have been cautious in starting these types of measures. This is probably due to some ‘prisoner’s dilemma’ type considerations: when acting alone, a bank may loose markets but when acting together with other banks, as some sort of cartel, competition authorities may intervene.

Although the central banks obtain the revenue from providing cash only a part of the revenue is used to cover the costs of cash services (printing banknotes, fitness and authenticity sorting and wholesale distribution of cash). Otherwise the revenue goes to the government and to the central banks’ other operations (say, to the lender-of-the-last-resort type activities). From this point of view cash is really heavily taxed as opposed to most other means of payment.² On the other hand, the opportunity cost of holding cash (seigniorage) is distributed back to the public in the form of public services or income transfers as central banks return (a part of) their profits to the state. In this sense the income effect of cash for the society may be small, but the substitution effect may be significant. By contrast, the fees and royalties of the banking sector are tax-free in the sense of VAT or excise taxes. When evaluating the societal costs and benefits of different payment media these tax considerations are usually ignored although they might have at least an indirect effect on payment media.³

Currently the watershed between different means of payment lies between cash and various kinds of cashless (electronic) payment media. These two groups of payment media have certain distinctive properties which also affects their popularity in different kinds of payment situations. Banknotes have to be used in fixed nominal amounts and therefore ‘change money’ (smaller banknote denominations or coins) is often needed. Partly for this reason cash is mostly used in small payments only. Electronic means of payment are more flexible in this sense, and especially large sums could be paid more easily as credit transfers from one bank account to another.

For cash the payment costs are mostly variable, while for electronic means of payment (debit and credit cards, credit transfers, mobile payments, e-purses etc.) costs are mainly fixed system establishment and maintenance costs (cf. Table 2.1). Electronic means of payment requisite equipment in the point-of-sales (POS) which are usually taken care by the merchants. Usually these persons are also cashiers that take care of the cash payments as well. Therefore, it is not always clear which costs can be linked to cards or cash. The costs of cash are accrued mainly from transporting, counting and sorting cash that may involve many

² Thus, only part of the revenues from cash is used to provide better cash services (more ATMs, more secure notes, availability of changing machines and so on).

³ Thus, typically, interest income from deposits is taxed (in Finland source capital taxation) but other services that a bank provided are never taxed. Partly this is due to measurement problems but partly this surely reflects genuine choice from the part of government.

professional cash handlers. There are also few counterparts involved in the card payments like the merchant, acquirer, the credit company and the banks.

If we want to fully analyse and study the costs of different means of payment, we should have a full description of the costs of each of the institutional sectors involved in each payment process. These costs are not usually publicly available. However, in Finland the costs of cash are known accurately since there are only a few stakeholders in the cash cycle and banks have outsourced most of their cash activities to private (cash-in-transit) companies. There exists currently one ATM network company owned by banks to govern ATM network and cover the costs of this system. The production costs of the ATMs are available from their financial statement of the ATM company (Automatia Ltd). We also know accurately the central bank's costs of cash, so the only problem is to estimate the costs of cash for the retail sector. Another weak link in the analysis of societal costs is the costs of consumers. Although various surveys have produced a lot of data of consumer attitudes towards different payment media, we know relatively little on the cost side. Most of costs are non-pecuniary and very difficult to measure, at least from the social point of view they are equally relevant than, say, the transportation costs. For comparison, we also address the costs of cards in Finland. Direct costs of cards are paid mainly by consumers in form of annual card fees and merchants in form of transaction costs and payment provisions.

Very shortly the structure of the paper is following: We start by explaining our conceptual framework, which basically explicates the cost items that we include into our comparisons of the total costs for different payment media. As pointed out above, one difficult problem still remains and that is how to take into account the costs that are left to consumers. It was already mentioned that eventually consumers pay all the costs from different payment systems and in most cases they actually make the decision of the choice of payment medium. Therefore societal cost comparisons should not be irrelevant for them.

Some idea of these costs can be obtained by summarizing different surveys that reflect consumer attitudes towards different payment media. Assuming that consumers make their payment medium choice on the basis of some sort of cost-benefit analysis consumer's answers should also reflect the cost side elements.

2 Conceptual framework

A relatively large number of studies in different countries have focussed on the costs of making payments. A wide range of estimates have also been produced. Thus, for instance, Humphrey et al (1996) estimated the social cost of a country's payment systems cash to be of the magnitude of 1–3 per cent of GDP, while the social costs of cash alone (for Belgium) have been estimated to be 0.6 per cent of

GDP (eg Van Hove, 2000, Brits and Winder, 2005).⁴ Very high numbers (like the above mentioned three per cent) surely motivate the research activity but there are also motivating factors for cost reduction as well. Perhaps the prime factor is the fact that costs and benefits of payments systems seem to be distributed quite unevenly between different market players creating incentives either to change tariffs, costs or availability of different services. In this sense we can pay attention on the facts, who makes the decision about the means of payment and who pays the costs from the actual operations. If the market participants cannot compare transparently the costs of each means of payments, they do not necessarily have the incentive to change their cost-inefficient ways to behave. We may also speculate about the reasons for this kind of (non-)transparency.

Recently the banking groups in Europe (eg EPC) have started campaigns against cash, as it has been felt to be more expensive than electronic payment media. This issue has also been subject to a number of more informal calculations and assessments which are not reported or reported only at a summary level. It is also true that only recently there has been a proposal in the Eurosystem for a harmonised methodology to calculate the costs of central banks.⁵

A useful summary of calculation of different cost and benefit concepts is provided by Brits and Winder (2005). They also compute the costs and benefits for the Netherlands. However, they disregard consumers. A wider perspective is provided in the McKinsey (2006) report. For data reasons, this could be understood but this choice implicitly assumes that from the consumer point of view all means of payment are equivalent. The final decision about the payment media used in a particular payment situation is almost without exception made by the consumer, although banks can try to guide this decision with pricing as they have used with cheques and bill payments over the banks' counters. Changes in payment habits are slow and individually persistent. Even though cash transactions clearly still dominate common payments, card payments are conquering more ground as the convenience of card payments is increasing. However, cash shows no sign of disappearing altogether. Banks in Europe have relatively recently attracted the customer away from bank branches to ATMs, so they have not been particularly keen in introducing ATM withdrawal fees, as customers may start to return back to branches. If a withdrawal fee would be introduced to branch withdrawals, this may most likely start discussions about the role of banks in intermediating payments in general.

Different means of payment are used quite differently in different countries as payment media has usually a long history in each country and also for different groups of consumers. This is true even if there are typically no fees for consumers

⁴ Later on, Humphrey et al came out with an estimate of 1 per cent or more of GDP as the potential gain from better choice of payment media.

⁵ Several research reports exist eg within the ECB and Eurosystem system, but these are confidential so that their results cannot be directly reviewed here.

for using cash, debit or even credit cards. Why do people use cash to pay for tram ticket even if they could use different cards, e-purse, mobile payments or even direct transfers? Sometimes the answer lies in the usability in the means of payment, in other cases in the habits or universality or some other reason. Consumers do not necessarily want to have several different means of payments for each purpose, and there is an advantage for the dominant payment media.

We may answer that this is a matter of easiness, convenience and controllability, but such an answer is not particularly informative. However, if we make surveys among people about the choices of payment media in different situations, we will find out often partly contradicting or overlapping replies. Both cash and card users say that their choice of payment media is the most convenient for them. Therefore, we may conclude that individual payment instrument choices have an important idiosyncratic dimension as well. It also tells us that the optimal payment media cannot be chosen only based on the point-of-sale connection. For consumers this results tells that it is often good to have at least a couple of alternatives in each payment situation to preserve competition and low unit transaction prices. Electronic payments, like card payment, invention of the banking sector, but it cannot be said that eg, in the credit card payment free competition prevails. Therefore, there seems to be some room for cash as well. Quite likely the popularity of euro cash is partly related to the high costs of cross-border payments, high cash withdrawal costs outside the home country and poor banking competition within this payments regime.

One has to acknowledge that there are important transaction costs with all the payment medium even if they are seemingly free of charge. With cash, these costs are obvious: a customer has to walk to the nearest ATM cash point (or bank office) to get the money, and he/she has to be careful with the money holdings and to be careful also with the change.

The case of debit cards also looks simple; once the customer has it, it is relatively easy to carry with and no recharge is needed (unless we deal with an e-purse). Moreover, no change is needed. It looks like there are no transaction costs. But things are, of course, not that simple. A customer must have an account and the developments of the account have to be monitored relatively frequently, and relatively large sums of money have to be kept in this account. The transaction process itself is a bit complicated because the validity of your card has to be checked. Finally, the payment (or first the reservation of it) will be registered on the account even though you would not mind having all very small transactions on your payment register (very small frequent payments create some sort of spam on your account). Moreover, merchants have introduced their own credit cards (retail cards) to increase customer loyalty or lower credit costs.

We could continue our story with security considerations, deficiencies in transaction systems especially in the case of transactions between households. This is not only a problem of paying the plumber, it is equally well a problem

with intra-household payments (it is not easy to give an allowance to wife, husband or children with the debit or credit card unless they have accounts and access to terminals as well). Thus, if the use of debit and credit cards in points-of-sale are restricted to merchants only. Hence one may prefer a means of payment which can be used on all occasions. Cash as the legal tender has also the benefit that it is (at least in principle) accepted everywhere: thus the consumer does not need to acquire prior knowledge on the payment facilities of the merchant, or in general the other partner in transactions. Thus, there is no transaction (technology) uncertainty which is, or at least has been, an important thing (see survey results in the next section). And the risk for having a counterfeit is very low as banknotes are mainly distributed from ATMs.

After having discussed the conceptual framework, we next briefly describe the results of different costs studies to get some background for our own estimates.

Table 2.1 **Summary of Brits and Winder (2005) results on Dutch data**

	Cash	Debit cards	E-purse	Credit cards	Total
Total number of transactions	7066	1069	87	46	8268
Average amount	60263	42177	236	5300	118976
Average transaction	9.37	44.13	2.72	115.22	14.39
Total costs	2122	520	81	165	2888
– fixed	878	310	78	115	1381
– variable – transactions linked	789	203	3	37	1032
– variable – sales linked	455	7	0	13	475
Costs to the retailer sector	1157	252	13	11	1433
Cost to banking sector	896	268	68	154	1385
Costs to Central bank	70	-	-	-	70
Variable cost per average transaction	.1764	.1965	.0333	1.0859	
Costs of 1 additional transaction	.1117	.1903	.0333	.7978	
Costs for EUR 1 in additional sales	.0069	.00014	.00001	.0025	

Brits and Winter (2005) divide all costs to fixed and variable costs and the latter costs further to transactions-linked and sales-linked. In principle, four sectors are taken into account: the central bank, the banking sector, the retail sector and consumers. (although in practice the consumer sector is not included). Costs are then compared using three different criteria: costs of a single additional transaction of size, costs per transaction, and, finally costs per euro of sales. To illustrate the general flavour of the results, we may here reproduce some representative results from the Brits and Winder (2005) study that ended up with the following sets of numbers for the Netherlands.

Similar studies have been done in several other countries (eg for Belgium, see Quaden, 2005), but here we reproduce only the results from a Norwegian survey

that among other things presents a quite detailed account of the costs of banks for different payment services (Table 2.2). The Norwegian results were derived using the so-called Activity Based Costing (ABC) method. The ABC method is useful to measure the use of resources for producing different services. This is done using a detailed allocation pattern, based on activities that the employees or machinery really perform. When computing the costs it is essential to distinguish the support functions: the costs of these support functions are indirect costs and these indirect costs are allocated with a certain allocation key to each product. In the ABC analysis the allocation key is the activities performed in producing the products.

Table 2.2 **Summary of Gresvik and Owre's (2003) results on Norwegian data**

	Transactions, Millions	Total costs, Million NOK	Unit cost NOK	Price NOK
Mail giro	74	543	7.50	5.14
Giro, account debits	38	564	15.00	18.59
Giro cash payments	12	161	13.00	27.37
Company terminal giro sent as money order	7	182	24.50	30.14
Phone giro	29	167	6.00	2.45
Internet giro	66	527	8.00	1.89
Direct debit	33	162	5.00	1.42
Company giro – electronic	144	657	4.50	2.78
Cheques	3	65	22.50	21.06
Payment terminal	412	996	2.50	2.24
Own bank's ATM	66	562	8.50	2.14
Other bank's ATM	39	283	7.50	4.41
Withdrawals/deposit	37	558	15.00	0.00
Transfers	4	116	28.00	0.00
Night safe	6	318	55.50	-
Total	968	5867
Average (excl. night safe)	5.80	..

Numbers are in Norwegian kronas.

These numbers clearly indicate that some services (night safes or money orders) are quite expensive to the extent that they affect the overall cost of payments. Cheques that have a long time been considered the most expensive means of payment have almost completely disappeared from the Nordic countries but in a few countries they still have some role. As for the choice between the two main rivals: cash and debit cards, there is a clear difference in favour of debit cards but still it is unclear whether the difference is big enough for policy reaction on behalf of the users.

In addition to the Norwegian results we also produce some estimates from Sweden made by Guiborg and Segendorf (2004). Their estimates provide data on some key payment operations within the banking sector (Table 2.3).

Table 2.3

Summary of Guiborg and Segendorf (2004) results with Swedish data

	Unit cost	Volumes (1000)
Cash withdrawals: own card/own terminal	5.87	38301
Cash withdrawals; own card/foreign terminal	5.69	30841
Cash withdrawal; over the counter	11.04	11170
Cheque	20.02	932
Card; debit	0.65	98834
Card; credit	3.46	13419
Acquirers; debit	1.18	98834
Acquirers; credit	1.18	13149
Credit transfer, out; paper based	2.01	51228
Credit transfer, out; over the counter	6.62	644
Credit transfer, out; electronic	1.21	66353
Credit transfer, out; direct debit	0.24	27405
Credit transfer, in	0.90	118225
Credit transfer, in; direct debit	1.17	27405
Data-clearing; internet	0.57	31473
Data-clearing; received	0.23	17123

Source: Guiborg and Segendorf (2004). Numbers are in Swedish krona.

The problem with all of the above reviewed results is the fact that they only deal with banks and maybe merchants but not all players. More fundamental problem is related to the benefits which are not all considered or measured.

In this respect the efforts of Garcia-Swartz et al (2006) and Simes et al (2006) are noticeable advances. The first study makes use of the US data while the second study deals with Australian data. Here we do not go into details of the computation methods (a useful summary is also provided by Koivuniemi and Kemppainen, 2007), but briefly summarize the finding in two tables (Tables 2.4 and 2.5).⁶ In both cases, we cannot really give exact results because the values crucially depend on the size of transaction. Hence, we have to provide some alternative values which in the Australian data are just some representative even numbers (10, 50 and 100 \$) while with the US data the alternative values are average transaction sizes with cash or cheque purchases.

⁶ The results of Garcia-Swartz et al (2006) are criticized by Shampine (2007). Garcia-Swartz et al (2007) provide a response to this criticism. The critical issues seem to be the time that is used to visit an ATM and the treatment of overhead costs. The debate between these two sets of authors suggests that the estimates have a quite wide range of confidence intervals and it is not all clear how some of the very basic measurement issues should be solved.

Table 2.4 **Summary of the US (2006) results on net benefits**

	Cash	Cheque	Cheque	Credit card	Debit/signature	Debit/PIN
Merchant marginal cost	0.30	0.42	0.44	0.61	0.68	0.57
Consumer Marginal cost	0.65	0.70	.65	0.46	0.46	0.55
CB marginal cost	0.004	0.03	0.03	0.00	0.00	0.00
Com bank marginal cost	0.07	0.12	0.12	0.34	0.27	0.27
Sum of marginal costs	1.02	1.27	1.24	1.41	1.42	1.40
Social marginal cost	0.99	1.18	1.05	0.99	0.92	0.86
Merchant marginal benefit	0	0	0	0	0	0
Consumer marginal benefit	0.12	0.19	0.19	0.18	0.16	0.16
CB marginal benefit	0.07	0.03	0.03	0.00	0.00	0.00
Com bank marginal benefit	0.03	0.06	0.16	0.42	0.50	0.54
Sum of marginal benefits	0.22	0.28	0.38	0.62	0.66	0.57
Net marginal costs (\$12)	0.80	0.99	0.87	0.80	0.76	0.70
Net marginal costs (\$54)	1.11	1.21	0.89	0.72	0.83	0.78

Source: Garcia-Swartz et al (2006)

Table 2.5 **Summary of Australian (2006) results on net benefits**

	Cash	Cheque	Credit 4 party	Credit 3 party	Debit signature	Debit PIN
Merchant costs	0.39	0.81	0.37	0.49	0.35	0.33
Consumer marginal cost	0.57	0.93	0.65	0.65	0.65	0.59
CB marginal costs	0.02	0.04	0.00	0.00	0.00	0.00
Com. Bank marginal cost	0.03	0.16	0.19	0.22	0.15	0.06
Social marginal cost	0.99	1.82	1.09	1.12	1.05	0.86
Merchant marginal benefit	0.00	0.00	0.00	0.00	0.00	0.00
Consumer marginal benefit	0.00	0.06	0.09	0.09	0.17	0.17
CB marginal benefit	0.08	0.04	0.00	0.00	0.00	0.00
Com. Bank marginal benefit	0.01	0.08	0.12	0.23	0.09	0.12
Sum of marginal benefits	0.08	0.18	0.21	0.33	0.15	0.17
Net marginal costs (\$10)	0.93	1.76	0.99	1.02	0.99	0.80
Net marginal cost (\$50)	1.63	1.77	0.99	1.02	0.98	0.80
Net marginal costs (\$100)	2.50	1.77	0.99	1.02	0.95	0.80

Source: Simes et al (2006).

From an economic point of view, the net (social) marginal costs are obviously of most interest. And they are indeed interesting. It looks like there is very little difference between marginal net costs with small transactions – only cheques are some sort negative outliers. With the growth of transaction size, debit cards and direct debit become the best alternatives while cash is less advantageous. Basically, this is no surprise given the frequency in which different payment media are used in transactions. The results give some support to the claim that overall welfare can be improved by developing the payment media but the numbers hardly lend support to the idea that the payoff could be of the size of 1–3 per cent of GDP.

3 Choice between different payment media

Even though the usage of cash has been decreasing slowly in relative terms in comparison to electronic means of payment, it is still the dominant retail means of payment in the euro area. Currently about 75 per cent of retail payments on average are made with cash in the euro area, but the dispersion among countries is wide.

As cash is typically used in smaller payments than cards, the share of payment value for cash is lower than in the transactions. The closest rival for cash in Finland has been bank and debit cards that are based on national agreements between banks and a credit card company (Luottokunta Ltd), where also retail merchants have been represented. In Finland it has been possible to outsource all the banks' back-office services of cards to Luottokunta.⁷ This has been seen to be one of the major reasons for low tariffs that have on the other hand sponsored the use of cards. For the customers, banks have also provided combined international credit cards and bank debit cards to cover both domestic and foreign uses. Banks also introduced ATMs already at an early stage in the 1980s to distribute cash more efficiently and cheaply and started to close down bank branches in the beginning of 1990's and during a severe banking crisis. Pricing guidance (heavy services fees) has also been used by banks to eliminate cheques and move customers paying bills away from branches. Most recently internet payments have increased rapidly in paying bills.

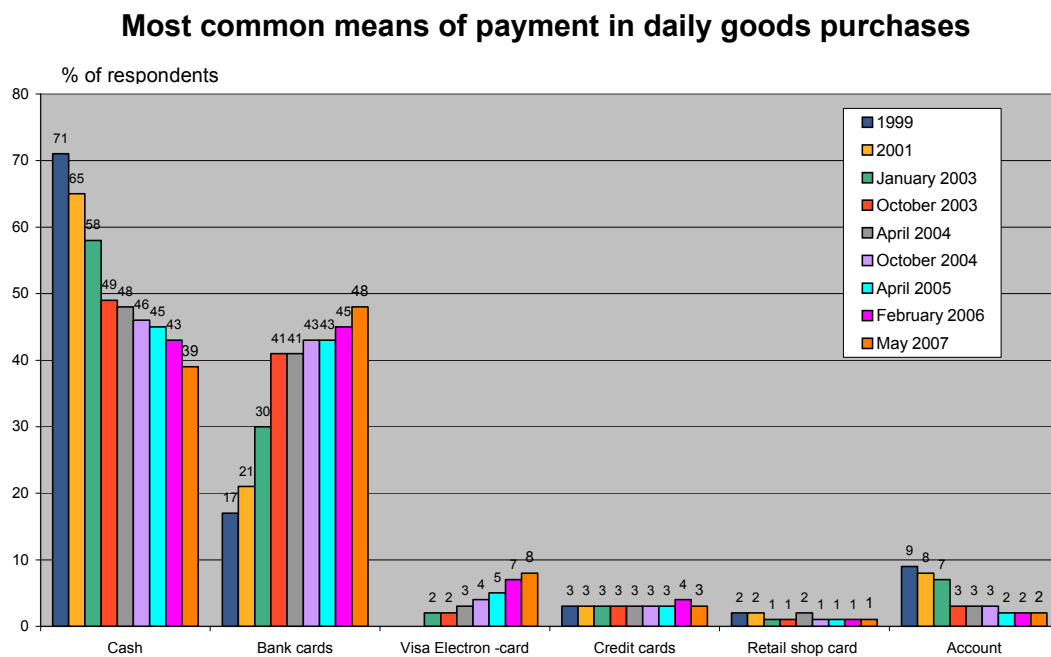
For these reasons in Finland card payments have been very popular and overcame recently cash payments as the most popular payment media (Figure 3.1). The total euro value of card payments in Finland was 31.1 billion euros in 2006. The total value of the cash payments is not known exactly, but it can be estimated to be close to 25 billion euros.⁸ The euro cash or more precisely banknotes put into circulation from Finland are currently also widely used in other euro countries.

⁷ The Luottokunta Company is jointly owned by retailers and banks and it is basically a credit card service company, offering services related to non-cash payment and credit card systems. It also manages the national luncheon voucher system in Finland. Luottokunta has about 65 000 point-of-sales places that cover around 4 million Finnish debit or credit cards. The merchant provisions charged by Luottokunta from Visa and Maestro debit and online cards are regarded to be quite inexpensive ranging from 0.31% to 1.35%. Luottokunta is the acquirer to Visa, Visa Electron, MasterCard and Maestro Cards plus in addition it's routing Amex and Diners' transactions. For instance American Express and Diner's provisions are much higher, and in Finland it has not been possible to combine these cards with the national bank card property.

⁸ This estimate can be approached from different data sources. The ATM withdrawals summed up to (accounting for about 80 per cent of the dispensed cash) 16.6 billion euro in 2006. If this figure is then inflated by 1.2, we get about 20 billion euros. However, this figure does not count for all cash payments. For example cash back withdrawn from shop counters is not accounted for. Cash is also passed between individuals that cannot be accounted for by any means.

It has been estimated that the usage of cash in the Finnish total retail payment is close to 20 billion euro, but we have to remember that cash is also used widely outside retail business for interpersonal payments or income transfers that cannot be all accounted for and are hard to evaluate.

Figure 3.1 **The most common means of retail payment in Finland 1999–2007**



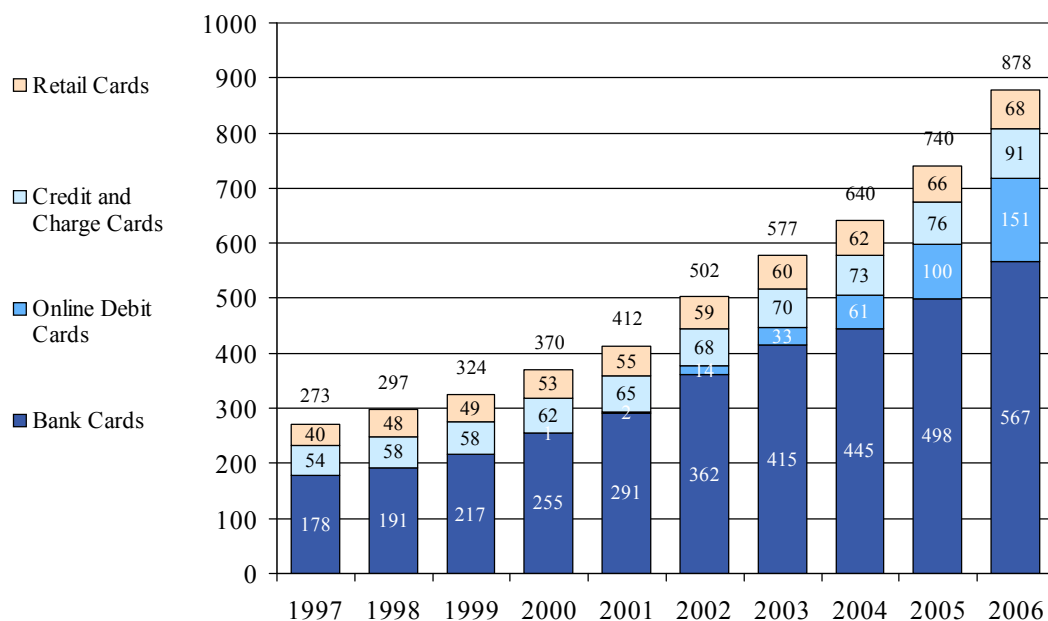
Source: Federation of Finnish Financial Services, Saving and use of credit, May 2007

Cash and card payments have quite distinct properties that have kept up their popularity among different user groups. Cash is used commonly among elderly persons eg pensioners and also among youngsters who have not had access to cards and may also frequently receive income transfers in form of cash eg from their parents. Visa Electron type of online debit cards that provide charging without the credit facility have increased their popularity after 2002 among younger age groups.⁹ As the usage of cash is pretty much U-shaped with respect to age and there seems to be clear individualistic habit forming into payment media choices, we may expect that in the near future the share of card payments will conquer even more cash users. However, the share of cash used in payments seems to be also converging toward some asymptotic minimum, and therefore cash does not seem to vanish altogether.

⁹ Partly this change is supply-driven in the sense that banks have been reluctant to offer combine debit/credit cards to young customers or people who have had some payment default problems in the past.

However, the trend of increasing card payments is very clear. Bank cards and online Visa Electron payments account for alone 55% of the total payments value. This information is in line with the assessments received from the largest retail shop chains. The situation contains also many other characteristics. Eg in smaller shops the usage of cash has higher propensity, when the bigger super market is considered, the average sum spent per transaction increases and also the probability that it is paid with cards. Average transaction sizes are illustrated in the Appendix (Figures A1 and A2). One can immediately notice that the average amount of cash withdrawals has been increasing gradually from mid 1990's partly as a reaction to the reducing number of ATMs available and partly due to an increasing number of electronic POS sites and use of card payments. On the other hand, the introduction of online VISA payments has clearly lowered the average value of card payments after 2002. Thus, card and cash payments have come closer to each other.

Figure 3.2 **Payment card transactions in Finland 1997–2006, million**



Source: The Federation of Finnish Financial Services.

The choice between cash and cards was recently also reviewed in a Bank of Finland questionnaire in February 2007.¹⁰ Consumers were asked to tell which payment media they regard as their most common means of payment or do they use cash and cards equally depending on the payment situation. Respondents were also asked in a telephone questionnaire to mention the main reasons for using that

¹⁰ The questionnaire was made to 5000 households in 2007.

particular means of payment. The results from this questionnaire can be seen from the attached Table 3.1 below.

A somewhat surprising feature in these responses is that reasons for choosing either cash or cards seem to be quite close to each other. Cash is thought to be very handy in small payments, but then almost a third of card users regard cash as being troublesome and inconvenient means of payment. Cash is generally also regarded to be quick and fluent means of payment, although receiving back the change money is certainly reflected in card users' answers.

It is also quite peculiar that the unique property of cash being anonymous does not receive practically any weight in the selection. This is also true when we use a logit model to predict the use of cash as the main payment instrument. Then, the anonymity motive has absolutely no predictive power in a model which includes all the motives listed in Table 3.1.

This also shows up if we estimate simple predictive models for the cash usage. Here we have two alternative dependent variables: *Pay* that indicates the case in which cash is used as the dominant means of payment (the alternative being cards) and *cash* that corresponds to the size of cash holdings. The list of independent variables consists of conventional background variables (age, gender and occupation), but also of the values of purchases that are made by cash. In addition to these variables we have a long list of dummies indicating a positive response to various motives of using cash instead of cards.

Table 3.1

Reasons for using cash or cards as most common personal payment media

Why do you use cash payment media? (in order of importance)		
	Responses	%
Cash is more handy in small payments	1169	24.7
Cash usage is more fluent/quicker than card payments	895	18.9
Cash can be used in more frequent places than cards	611	12.9
Cash usage is more controllable than card payments	596	12.6
Other than listed reasons	550	11.6
Cards cannot be used everywhere	336	7.1
Habit or manner	294	6.2
Cash can be transferred to other people (like children)	113	2.4
Using cash is more secure	103	2.2
Cash withdrawals are free of charge in ATMs	39	0.8
Cash could be used unanimously	30	0.6
All together	4736	100.0

Why do you use card payments? (in order of importance)		
	Responses	%
Cash usage is more troublesome (eg taking back change)	1332	30.6
Withdrawal of cash from ATMs and banks is troublesome	3413	9.5
I use cards for larger purchases / sums	403	9.2
Other than listed reasons	403	9.2
I do not have cash	358	8.2
For easiness sake	353	8.1
I do not want to keep cash in my wallet	290	6.7
Paying with card is safer than by paying with cash	266	6.1
ATM network is too scarce	194	4.5
I want to monitor my spending eg from bank statement	122	2.8
For gasolien purchases / filling up the car	109	2.5
Credit and charge cards (debit and credit cards) can be used abroad also	58	1.3
By paying with credit card I receive time to pay	35	0.8
Confirming a payment with a chip card is faster than cash	21	0.5
All together	4357	100.0

Source: Bank of Finland's Consumer questionnaire February 2007.

The results cannot be easily interpreted because in some cases where the response favours cash (for instance, when the respondent is motivated to use of cash by the fact that cards cannot be used everywhere) cash is not, in fact, used as the main means of payment. Similarly, when the advantages of cash in small payments and the wider acceptance of cash are emphasized they do not show in actual use of cash. By contrast, more consistent answers are obtained in asking the importance of safety, (no) fees, cash using habits, and the speed of transaction. It also shows up the people who travel a lot seem to use cash less than the others. All in all, we may conclude that some motives of using cash or cards are good predictors of

actual use cash while other not. How robust our findings are is a bit difficult to judge at this point of time.

As for the background variables, it turns out that cash usage increases over time and men use/have more cash than women. White collar workers rather use cards than cash while students, blue-collar workers, pensioners and also entrepreneurs are typical cash users. The results also show the (almost trivial) results that large cash holdings and large cash payments (purchases) predict that the respective person uses cash as the dominant means of payment. Large cash holdings can be 'explained' by the fact that the respective person says that he or she mainly uses cash and that his or her cash payments are large. Still, less than 30 per cent of cash holdings can be explained by these variables (cf. column 7 in Table 3.2). In this respect, at least, our findings seem to be consistent with findings from other studies (cf. eg Stavins, 2001). Also, the fact that opinions expressed in surveys are not very useful predictors of payment choice, seem to be common for most studies.

In Finland the chip card readers are not yet widely spread, which probably explains why chip cards are not regarded to be faster than cash. However, major retail shop chains will start to introduce these terminals rapidly within a couple of years.

If we consider the choice of means of payment from the viewpoint of a consumer, we can notice that the choice is effectively put quite indifferently, as the consumer does not face any direct transaction cost in either case. ATM withdrawals are not usually charged (excl. VISA withdrawals in Finland) and transaction fees are not collected in retail shops from either cash or cards. The cards have annual fees, but this is not related to the number of uses for the cards either for cash or cards.

Even though the above-referred answers do not suggest that the cost of payments is very important in selecting the payment media, it is the big issue in banks' attempts to lower their costs and develop new pricing schemes. In Finland, banks and services sector have for a long time favoured electronic means of payment and debit cards, as cash is regarded to be a more expensive means of payment. In payments of bills households have been subsidized to move to internet payments. This has indeed succeeded very well as banks have been able cut down the number of branches quite heavily. The majority of customers using bank branches are currently pensioners. From the beginning of 2000, the use of cheques has ceased to be the real alternative for payments – and that has mainly happened by imposing quite heavy tariffs on cheques.

Imposing similar tariffs to the use of cash (eg to ATM withdrawals) looks like a quite remote alternative for reasons that are discussed later. In spite of that, there is growing interest in analysis of cost conditions both within the banking sector and within the whole economy. Creating an efficient and well-functioning

payment system would, of course, be an important asset in overall competitiveness and economic growth.

Table 3.2 **Estimation results with Finnish survey data**

	1	2	3	4	5	6	7
Log(cash)						.309 (2.20)	
Log(cash-spending)						.876 (8.68)	.124 (3.92)
Pay							.121 (2.25)
Age	.432 (3.95)	.173 (5.60)	.276 (2.91)	.496 (3.303)	.174 (5.66)	.217 (2.09)	.156 (5.24)
Male	.168 (1.09)	.125 (2.70)	.258 (1.84)	.454 (1.90)	.127 (2.75)	.290 (1.95)	.102 (2.31)
Student	1.419 (2.90)	.166 (1.09)	1.096 (2.47)	2.026 (2.53)	1.72 (1.13)	2.039 (3.82)	.141 (0.95)
Worker blue-collar	.607 (1.45)	-.017 (0.13)	.310 (0.81)	.638 (.091)	-.016 (0.12)	.654 (1.39)	-.068 (0.54)
Worker white-collar	-.408 (0.95)	-.070 (0.54)	-.515 (1.31)	-.846 (1.16)	-.068 (0.52)	-.094 (1.19)	-.085 (0.67)
Pensioner	.090 (0.20)	-.111 (0.81)	.085 (0.21)	.191 (0.26)	-.109 (0.79)	.613 (1.27)	-.111 (0.83)
Entrepreneur	.487 (1.02)	.393 (2.65)	.255 (0.59)	.521 (0.67)	.385 (2.60)	.222 (0.45)	.322 (2.26)
Unemployed	.742 (1.51)	-.218 (1.44)	.393 (0.89)	.753 (0.96)	-.219 (1.45)	1.014 (1.97)	-.268 (1.87)
Cash is safe	1.202 (2.42)	.068 (0.50)	1.408 (2.89)	2.419 (2.86)	.090 (0.67)		
No fees for cash	-.071 (.09)	.253 (1.17)	.451 (0.54)	0.852 (0.63)	.260 (1.21)		
Habit of using cash	1.027 (6.44)	.197 (2.07)	1.601 (4.89)	2.679 (4.52)	.211 (2.31)		
Handy in small payments	-1.293 (6.44)	-.041 (0.77)					
Cash is faster	.773 (4.36)	.020 (0.34)	1.002 (6.07)	1.691 (6.00)	.035 (0.61)		
More places where cash is accepted	-.735 (3.53)	.043 (0.73)					
Frequent traveler	-.418 (2.73)	-.060 (1.27)	-.443 (3.16)	-.776 (3.24)	-.061 (1.29)		
Cards cannot be used everywhere	-2.117 (4.22)	-.112 (1.33)					
R ²	0.369	0.213	.243	.0244	0.208	0.288	0.263
SEE	0.379	0.471	0.414	0.416	0.471	0.399	0.443
Dependent var	Pay	Log(cash)	Pay	Pay	Log(cash)	Pay	Log(cash)
Estimator	Probit	LS	Probit	Logit	LS	Probit	LS

Numbers in parentheses are t-ratios. Number of observations is 451. In the case of probit/logit estimation, R² denotes the McFadden R-squared.

It is interesting to compare the results from the Finnish survey to the recent Dutch survey (Table 3.3). The Dutch survey also shows close correspondence between the motives of using cash and debit cards. Perhaps the only important exceptions are arguments for ‘exact payment’ and ‘short of cash’. When we deal with cash we have to deal with different denomination of notes and coins which clearly complicate the use cash in cases where we have only automats/machines available.

Table 3.3 **Most-cited reasons for choosing payment instrument in a Dutch survey**

	Cash as most used payment instrument	Debit cards as the most used instrument
Bar/restaurant	Fastest	Short of cash
	Expense monitoring	Fastest
Public transport	Fastest	Fastest
	Expense monitoring	Exact payment
Parking meter	Fastest	Fastest
	Only possibility	Exact payment
Vending machine	Fastest	Fastest
	Expense monitoring	
Supermarket	Fastest	Fastest
	Expense monitoring	Short of cash
Filling station	Fastest	Fastest
	Expense monitoring	Short of cash
Shops (food)	Fastest	Fastest
	Only possibility	Short of cash
Shops (non-food)	Fastest	Short of cash
	Expense monitoring	Fastest

Source: Jonker (2005).

Cash is usually perceived to be cheap or cost-free means of payment partly due to its label as an official payment media. In Finland the costs of cash are currently wrapped into service or payment packages that depend on the type of account or client properties (‘package pricing’). Likewise costs of cards are paid indirectly either by the merchant for transaction fees or commissions, while the card owner usually pays only the annual fee to the card issuer.

The questionnaire performed in February 2007 indicated that 90 per cent of consumers have not faced any problems in using cash, but 25% thought that the ATM network is not as dense as it should, while none regarded it to be too dense. However, only about 15% of card users could be using cards as ATMs are not

easily available or ATM withdrawals are troublesome.¹¹ These kinds of questions may however show how sensitive changes between different means of payment could be, if characteristics of payment media are adjusted.

If we look at competition between cash and card payments in retail payments we can see that cards have most likely exceeded cash payment at least based on euro value of payments. As noted the euro value of card payments is known for certainty and that was 31.1 billion euros in Finland 2006 based on Federation of Financial Services statistics. The total value of cash payments was estimated to be roughly 25 billion euros of which retail shops make close to 20 billion (according to estimates of the Federation of Finnish Commerce).¹² Cash is also used in paying other private consumption items like housing rents, traffic tickets, cultural, entertainment and health services etc. plus personal income transfers.

However, since cash is mostly used in small payments, the balance of these two means of payment is not known by the number of transactions, but in this respect cash and cards are probably quite equal rivals at the moment. The trend between the two rivals is anyway clear, cash is giving way to card payments, even though the use of cash has been reviving during the euro regime due to increased possibilities to use cash freely especially in the euro area.

As there seems to be clear dependence between the size of payment and the optimality of the means of payment, several studies have presented break-off points indicating the payment value, when cash becomes more expensive than card payments. This level has been estimated usually close to 10 euros.

This can be seen from the questionnaire (Table 3.1) and also by classifying private expenditures and following their shares over time (Figure 3.3). This exercise is purely based on classification of private expenditure items into cash and non-cash payments. For example, rents are nowadays almost entirely paid as credit transfers or network payments. On the other hand a large share of food and beverages payments is still made with cash. The purpose is just to show the overall trend between these means of payment over time. It seems clear that gradually a larger share of payments is shifting into the electronic means of payment.

A related study made in Austria showed that cash payments dominated clearly the following consumer expenditure items; restaurants and hotels (94.7%), food

¹¹ The number of ATMs translates to transaction costs in spatial demand for money model. The longer is the distance to the nearest ATM the higher are the costs of getting cash which implies two conflicting things: cash is replaced by substitute means of payment and individual cash withdrawals become larger which in turn tends to increase average cash holdings. It is a bit difficult to say what is the net effect on the demand for cash and also empirical analyses have produced somewhat mixed results. By contrast, it is quite clear that from banks' point of view the optimal ATM density is rather smaller than larger. See eg Snellman and Viren (2007).

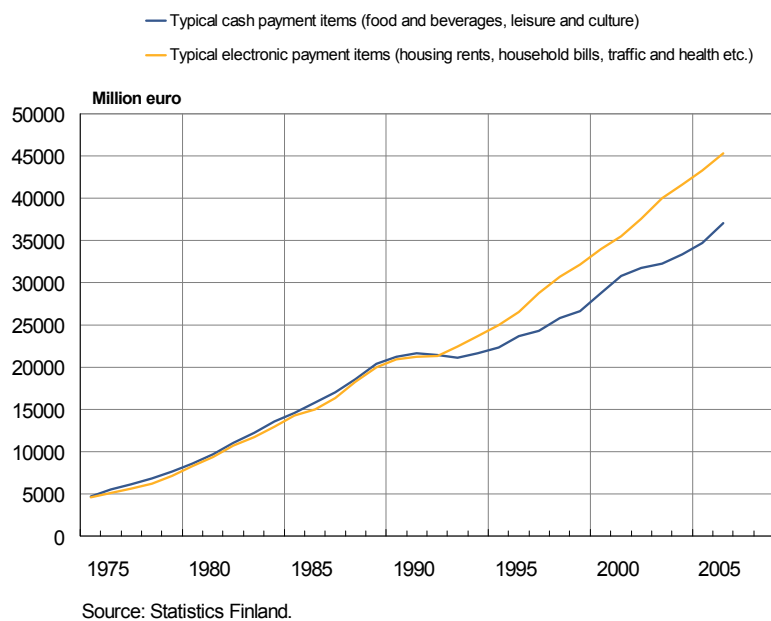
¹² Similar estimates can be received by calculating the banknotes in circulation and using the return frequency of the banknotes to the central bank and taking into account the recycling share of the professional cash handlers.

store and supermarkets (78.8%), household appliances (85.1%), cars and accessories (67.5%), newspaper and tobacco shops (95.1%), pharmacies, drugstores and cosmetics stores (81.9%), florists (93.1%) and art, entertainment and sports (84.8%) (see Mosenlechner, Stix and Wagner, 2006, Annex). These expenditure items comprised already about 55 per cent of total payment value in Austria.

Figure 3.3

Private expenditure division for cash and card payment items

Typical cash and electronic payment expenditure items



4 A scrutiny of costs and pricing payment services in Finland

4.1 Description of the costs of cash calculations

In Finland the overall costs of cash can be calculated rather accurately by investigating the costs of professional cash handlers by means of statistical reports of these institutions. This is possible because Finland is a small country and thus there are only a few market players. In addition, banks have already co-operated for a long time and outsourced their cash activities widely to one ATM company and a few CIT companies. Currently there is only one ATM network in Finland, and the ATM company (Automatia Pankkiautomaatit Ltd) is owned with equal shares by three major banks and it takes care of most cash activities of the

banking sector (calculation and sorting of cash, orders and transports of cash and so on). It also organises these with the CIT companies.¹³ We also know the costs of cash for the central bank (Bank of Finland) because all of these costs have been separated in the Bank of Finland to a cash department.

These costs provide a measure of the production costs of cash prior the delivery of cash to consumers. Obviously we do not have data on the costs that consumers have to carry when acquiring cash. We do not even have a good idea of the magnitude of these costs vis-a-vis other payment instruments. Obviously these costs vary a lot depending on the density of cash points and bank branches, availability of cash-back facilities and frequency of theft and other security problems.

Otherwise, we face major uncertainty only in the (production) costs of cash services in the retail sector. To overcome this uncertainty, we have estimated a range of values for these costs by different calculation methods. For simplicity, we however present here only one set of representative numbers.

Starting from *the central bank*, the costs of cash include the following items¹⁴

1. procurement costs of new banknotes and coins
2. transport costs between NCB branches
3. costs from issuing, sorting and destroying unfit banknotes
4. costs from the NCB's other cash operations and vault costs
5. other costs like for example real estate rents, IT-services' costs and depreciation of sorting machines.

These costs are directly available from the NCB's annual budgetary statement. The cash department expenditure include the real estate rents, investment allowances for sorting machines and also itemised IT-costs (as in the Bank of Finland costs have been divided into each function department separately). Bank of Finland is also the official issuer of euro coins in Finland and all the cost related to the issuance and circulating coins have been included. The Bank of Finland also buys coins from the state based on their nominal value.

On balance, the central bank gets the monetary (seigniorage) income from the issuance of banknotes, but that income is not taken into account here. In fact the

¹³ Automatia Pankkiautomaatit Oy is currently the only ATM company owned jointly by the OP Bank Group, Nordea Bank Finland and Sampo Bank plc Automatia ATMs are available to customers of not only the owner banks but also all other full-service banks operating in Finland.

¹⁴ For other NCBs in the eurosysteem, the division of labour can be somewhat different, eg some NCBs deliver cash to CIT centres, some NCBs do not handle coins at all, and some provide and charge for additional cash (sorting) services.

Bank of Finland buys the coins with their nominal value and monetary income goes directly to the state as coins are in the states' financial debt to the public.¹⁵

The costs of *the banking sector* (and their subcontractors in cash operations (like CIT and ATM companies etc)) can be listed as including the following items

1. Logistics system related to orders and deliveries of cash plus customer lodgements to bank branches, including night boxes and cash processing within the bank offices
2. Maintenance of ATM networks (ordering and lodgement of ATM banknotes)
3. Over-the-counter (OTC) services for customers making cash deposits and withdrawals
4. Back office functions, including cash processing (counting, sorting, fitness and security checking of cash) in bank branches
5. Storage and vault operations in bank branches related to cash handling
6. Security for cash handling in banks with cash operations
7. Cash dispensing costs related to cards used for cash withdrawals in ATMs.

During the euro regime, the Bank of Finland has had only two clients in cash services. The most important one is the ATM Company (Automatia) that has been governing almost all cash related activities on behalf of the banks. The Automatia Company was formed by the three largest banking firms that on the balance sheet level account for about 95 per cent of the banking industry. Automatia also own the ATMs in the united network. Since the formation of this company had a dominating impact on the market, special permission was required from the Finnish competition authorities. Their decision included, however, a requirement that Automatia has to offer the same services for all the other (small) banks as well with the same tariffs.

Automatia governs the ATM network plus calculation and sorting of cash in cash centres that are operated by the two cash-in-transit (CIT) companies (G4S or Loomis). CIT companies also take care of the local cash transports from retail shop and other companies that use cash. The market structure of the retail shops is also rather centralised in Finland. There are 2–3 major retail shop chains (S-group, K-group and Tradeka) that make up over 90% of the ordinary groceries plus other private retail merchandize business. It should be noted that as these CIT companies are responsible for most of the retail sorting and calculating, these

¹⁵ For obvious reasons, we cannot present here the full itemised statement including eg banknote procurement costs, but we can show the aggregate annual costs of the cash department for 2000–2005 as it can be seen the euro changeover increased heavily the NCB's costs as well for years 2000–2002.

costs are already included into the CIT centres operations and should not be calculated twice into the overall social costs of cash.¹⁶

The other professional cash handling client of the central bank is Rekla Company, which is owned by the largest retail cooperative chain, the S-group.¹⁷ It takes care of the banknote sorting and coin rolling of the S-group in the surroundings of four NCBs branches. The Rekla Company operates currently with the NCB by using one of the private banks' cheques account, but its owner, the S-group, is also starting the banking business of its own before the end of 2007. S-Bank is also taking over Rekla's client operations towards the central bank as Target2 starts in February 2008. In cash transports, the Rekla Company is using the same two CIT companies as Automatia.

Almost all the bank branches cash traffic runs through Automatia's cash order and delivery system. During the euro regime in Finland about 80–85% of the cash has been distributed to public (private consumers and companies) from ATMs and therefore only a fifth from bank branches. As only 20 and 50 euro banknotes are available from ATMs, the large denominations have to be distributed to the public from bank branches over-the-counter. It has been calculated that about 5.5% of 50 euro banknotes and about 2% of 20 euro banknotes are distributed from bank branches. Retail shops are the main users of smaller denomination, which are mainly used as change money. Recycling of ATM banknotes has been increasing slowly along time, and currently over half of the sorting of banknotes is operated by private cash handlers. A questionnaire performed in bank branches showed that cash distributed from branches goes mainly to private persons, while companies use mostly credit transfers in their payments. Only occasionally companies use large amounts of cash. Based on these studies larger amounts and large denominations of euro banknotes are used for used car purchases, large durable purchases, real estate deals and for several miscellaneous other uses.

Within this institutional set-up, most of cash handling operations in Finland have been outsourced by banks and the merchants. Because the above mentioned cash handling companies concentrate on cash operations only and because their annual financial statements are publicly available we can easily sum up the total costs of the cash operations. In addition, we get an estimate for the total professional personnel working in cash operations in Finland.

¹⁶ Almost one third of the Automatia annual cost is incurred from the CIT companies costs and should be reduced from the total costs of professional cash handlers for not to be calculated twice. The ATM network maintenance costs can be roughly seen from Automatia's total annual costs (about 50 million euro), whereof about a half is incurred from ATM loadings. However, if a unit price of 0.4–0.5 euro per ATM withdrawal is combined to the total number of ATM withdrawals, we end up total costs close to 100 million euro.

¹⁷ The S-Group, a major cooperative chain of supermarkets, department stores, service stations, hotels and restaurants, set up a subsidiary, S-Bank Ltd, which was granted a licence in February 2006. The new bank started banking in October 2007.

The biggest three banks have made some assessments of the costs of cash in their branches that have been used in estimating their total costs of cash. Even though these costs may seem to be slightly overestimated, we have used these since they represent the banks 'official' views about the costs of cash. In the end of 2006 there were 1646 banks branches of 338 banks and almost the same amount of ATMs with a cash withdrawal function in Finland.

Part of the card system costs are related also to cash, as cash is mainly distributed to the public via ATMs. In this sense cash withdrawal in an ATM is similar to other payments made with cards eg in retail shops. In Finland this transaction payment cost for the bank is 3 cent per withdrawal. In 2006, the total number of ATM withdrawals was 197 million, and therefore the cash withdrawal costs at ATMs can be estimated to be 5.9 million euro. It is much harder to decide what card system costs should or could be accrued as costs of cash as we do not have detailed information of this. This is also partly a methodological question, since cash can be withdrawn also without ATMs either from bank branches or as cash back in retail stores, although not as cheaply and conveniently like from ATMs.

As pointed out earlier, the major uncertainty in terms of the costs of cash is related to the retail sector. Because precise estimates cannot be produced we have made a set of alternative estimates, which ought to give us a pretty good idea of the range of these costs at least.

Basically the costs of the retail sector include the following types of costs

Retail sector and subcontractor's costs of cash items can be listed as follows:

1. Cash deposits and withdrawals in bank branches
2. Point of sale cashier operations to handle cash from customers
3. Back office functions, including processing of cash from cash payment transactions (counting, sorting, preparation of change floats, cash registers for cash etc.)
4. Storage and transport of cash to the banks or to the cash centers
5. Security for cash operations.

One obvious difficulty in the calculations of these costs is that they may overlap with those listed already in the banking sector costs, especially if we look at the costs based on financial statements. In practice CIT companies financial statements include their own (cash handling production) costs, but they have clients on both sides ie they provide cash services to the retail sector and banks. Both of these clients have outsourced a large amount of cash operations to the CIT companies, therefore the costs of these sectors overlap with each other. CIT companies charge on their services also based on the workload from each retailer.

It was almost impossible to get any direct information on the different cost items of cash from the retailers or even the volume of cash payments. Likewise we could not estimate true unit transaction prices for different types of payments. However, these figures could be partly revealed from the cash centre statistics and costs. Basically, for instance retailers can return cash for counting and sorting using three ways. Retailers can return cash direct themselves through banks, they can return cash by using night safe boxes or pick-up containers or they can make an agreement with CIT companies of fetching service. The total transportation costs aggregated from these services is approximately 10 million euro annually. The total aggregate costs caused from counting, sorting and handling the cash in CIT centres including handling of bank branches costs is close to 25 million euro. Therefore the production costs for retailers must be lower than this. In addition retailer and other merchants have point-of-sales and back office costs related to the handling of cash. Since we could not get more exact figures than this and due to variability caused by the euro changeover and for comparability with other euro countries, we decided to use the EU area average share of costs of cash as basis for retail sector costs of cash. Even though these figures could be slight overestimate the figures have been close to 50 million euro annually (see Table 4.1).

In most countries the retail sector carries the main bulk of the costs of cash. In Finland the outsourcing of cash handling operations is relatively large. The lack of exact information on the retail sector costs and the uncertainty thereafter could be addressed by varying the share of the retail sector in contrast to that of other stakeholders.

Another issue that would have to be dealt with is the question of the payment delays and the related loss of interest income. Here, we have not calculated these costs partly because they are hard to calculate and because their value is after all of secondary importance.

For consumers, the use of cash involves transaction time and other nonpecuniary costs related to deposit, withdrawal, storage of notes and coins and the payment transaction itself. These private, non-paid costs are not usually included in cost estimates. They are also difficult to quantify as it is difficult to get reliable data on the use of time and on the relevant opportunity cost wage. Costs for consumers are therefore not usually considered and we do not consider them either.

Consumers' costs of cash can be classified arising from few different sources. Alike in Sweden (see Bergman, Guibourg and Segendorf, 2007) consumers in Finland also rarely pay direct fees for withdrawals on cash as on ATM, as so called bank withdrawals are free of charge and only VISA withdrawals are charged explicitly. On the other hand banks have to pay a transaction fee to the ATM company for each withdrawal. Consumers pay for cash services mostly in the form of payment service packages that are charged by banks mainly monthly. In Finland consumers receive around 80 per cent of their cash through ATMs that

currently include only 20 and 50 euro banknotes. Larger amounts of cash and high denominations (100–500 euro banknotes) have to be taken out from bank branches. Consumers face also personal ‘nuisance’ costs in form of time costs going to the nearest ATM or bank branch and the cost of time spent in withdrawing cash either from ATMs or over the counter at banks. In addition to these two forms of costs, consumers can be regarded to pay most of the seigniorage. From the euro banknotes put into circulation about 10 percent is held by professional cash handlers (banks, ATMs, cash centres and in CIT transportation), so the rest is in the hands of the public and presumable the major part in the hands of consumers as firms actively try to minimize their cash holdings.

As described above the *consumers’ costs of cash* can be listed as follows

1. Fees paid from the cash withdrawals (currently only ATM withdrawals are charged)
2. Consumers personal costs from getting cash in their possession
3. Seigniorage (interest rate costs from holding liquidity).

In assessing these costs, we may first notice that most of the issued cards in Finland include the service for making ATM withdrawals. A limited number of ATM cards apply only for taking cash out of ATMs and these cards will not be issued anymore after 2010, partly because there is no annual fee paid to the banks on these cards. Cards issued in Finland contain nowadays mostly combined ATM, bank debit and international credit properties.¹⁸

Some part of banks’ services package costs could be allocated to cash to count for cash cycle maintenance costs. Banks often argue that the cost of cash is cross-subsidized from returns from other income sources in banking (mainly lending and bank services), and banks have not been eager to place fees on cost of cash or be transparent in other parts of their payment operations. The non-monetary costs for the consumer from getting cash from ATMs is surely difficult to assess, but we can assume a suitable unit price for this operation, even though in many cases this nuisance could be diminished by combining ATM visits to shopping activities.¹⁹

We can make a comparison exercise for calculating the monetary income of the seigniorage for the total cash put into circulation in Finland. Here we must emphasize that the hoarding motive for holding cash is totally different from the

¹⁸ In the end of 2006 there were 830 000 pure ATM cards, which was 12.3% of the total number of payment cards issued via banks (6.753 million).

¹⁹ In 2006 the total amount of ATM withdrawals was 197 million. If for example we assume 0.46 euro cost for a single withdrawal (along with Garcia-Swartz et al, 2006), we get the 91 million euros imputed cost for the nuisance from withdrawing cash. However, if we follow Champine (2007) and assume the cost to be only something like 0.10 euro, the total costs remain at an almost trivial level.

transaction motive for holding cash and making purchases, and therefore it is an open question should we ignore these costs altogether. Hoarding is related to the motive for holding wealth in a liquid form for precautionary and other reasons. Of course, we can also relate some part of the holding cash into shadow market activities, which may be hard to distinguish from the hoarding motive. It should be reminded also that seigniorage is finally returned back to the general public through the government budget after the costs of the central bank have been reduced as central banks return their profit to the state. The profits from private banking go to shareholders, so this tax incidence is not equivalent.

However, if we are interested in calculating the cost of this cash for Finnish people, we must take into account that around a third of this cash has likely migrated outside Finland. It has been estimated that approximately 4 billion euros is in circulation in Finland. If we assume further that 80% of this cash is in the hands of consumers, we get that 3.2 billion euro in cash holdings of consumers. The closest substitute for holding cash is overnight deposits rate that has been around 1 per cent during the last few years. The interest loss based on this cash is amounted therefore to 32 million euro, which is much larger than the interest cost on cash held in wallets calculated above (7.7 million euro).

4.2 Costs of cash estimates

Table 4.1 provides a summary of the aggregated costs by branch for year 2000–2005. The professional cash handlers' (Bank of Finland, Automatia Ltd, the two CIT companies and S-Group's cash handler ie the Rekla company) costs are based on their financial statements, and therefore they ought to be pretty accurate. The banking sectors' costs of cash handling over-the-counters have been estimated likewise the retail sectors' and private companies costs on cash handling.

The most difficult sector is of course the retail business costs, and according to our knowledge no systematic calculation of costs has been done so far. These costs can be estimated however by various different calculations to give range for this part.

For instance, we know that the sum of cash purchases in the retail sector is close to 20 billion euro. By using the average value of retail transactions, we can get an estimate for the total cost. Another option that we use below is based on an idea that retail sector costs can be evaluated on the basis of the costs that are known for certain. Here, we can use the European Payment Council's (EPC)

disaggregation of the total costs of cash by sector. EPC calculations ended up to a figure that retail sector costs account for 35.1 per cent of the total costs of cash.²⁰

A third way to calculate the costs of cash would be to calculate directly the costs items listed above for the retail sector from the financial statements of the largest merchants and aggregate them to market level data.

The costs of cash should also include the costs of the Finnish Mint to produce euro coins. We have calculated the minting costs of euro coins based on unit costs of producing each euro coin and if that information is combined with the amount of coins produced we end up with 15.5 million annual costs for years 1999–2006. Even though the euro coins were put into circulation from 2002 onwards, the main bulk of euro coins were produced between years 1999–2001.

Table 4.1 provides combined results from the (production) costs of cash for different market players in the Finnish cash cycle for years 2000–2005.²¹ Total costs are compared to the GDP and private consumption. Clearly, the costs of cash are very low compared to many other countries even in the euro area. This is true even if we adopted an upper bound in the estimate-type numbers. This is true, in particular, with the costs of merchants which can be computed in different ways (and using different data sources). One obvious explanation to the low overall level of costs is simply the fact that the use of cash in Finland is among the lowest in the world. On balance, the overall costs of cards must therefore be higher.

The maximum costs of cash estimated against GDP was about 0.18% of the GDP during the euro changeover in 2001, which was also an exceptional period as old national currency payment instruments had to be gathered away from the market and new euro banknotes and coins had to be issued in place. Since that the costs of cash with respect to GDP has slightly declined. The amount of banknotes and coins used actively in Finland is presumably still close to 2 per cent of the GDP, although the banknotes put into circulation from the NCB has doubled since the euro changeover. It has been estimated however that about one third of the banknotes has moved outside Finland or is hoarded into cash stocks and is not in active use as a means of payment. Euro banknotes have become popular in tourism, in purchases across the euro countries and most likely replaced dollar as a saving for the rainy day assets. Costs of cash calculation include also estimate

²⁰ A related study on the costs of cash in Austria for 2005 estimated that the share of the retail sector from the total costs of cash accounted for 36.5% of the total costs of cash. In Austria the total costs of cash accounted for around 0.4% of GDP in 2005, but it should be noted that the in Austria cash payments made up 70 per cent of the total payment value and 86.1% of total transaction volume (Mooslechner, Stix and Wagner, 2006). This is much higher than in Finland, which only seems to indicate that overall share of cash correlates clearly with the overall costs of cash.

²¹ It is interesting to compare the costs of Automatia (that is running the ATMs) to the number of ATM withdrawals. The number of withdrawals in 2005 was 209 million (in 2007, 190 million) which would suggest that an average unit cost is 0.24 euros. The number is quite small compared eg with the Swedish estimates (Table 2.3).

for the costs of consumers, but they can be interpreted more closely as production or resource costs of cash rather than the overall societal costs.

4.3 Comparison of cash and card payments costs

When we approached the questions of the costs of cards, we could not apply the sector cost accounting that was used in the case of cash. The system costs of cards are largely historical embedded development costs that mostly cannot be separated from the account maintenance and credit transfer costs. These costs are merely fixed costs, which makes them even harder to separate. In addition, banks were reluctant to calculate and pass this information. Therefore the only way to proceed was to change the methodology and calculate the costs of cards by means of charges.

Table 4.1 **Total costs of cash in Finland 2000–2005**

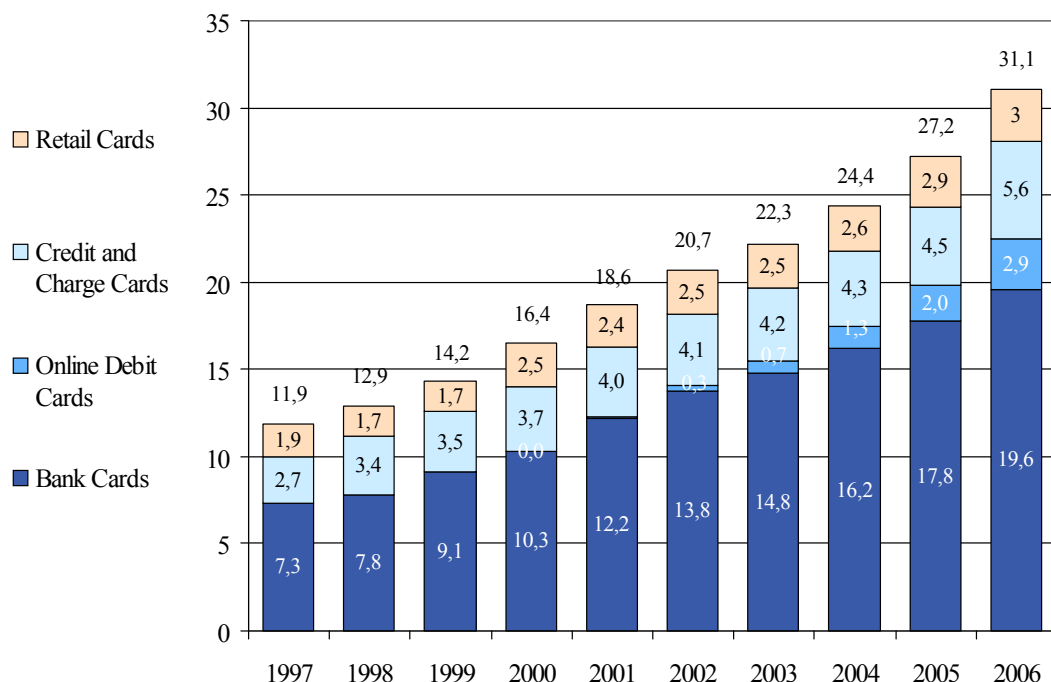
Agent\Year	2000	2001	2002	2003	2004	2005
Central Bank	50.534	68191	31.265	14.549	13.633	15.657
ATM company (Automatia Ltd)	42.745	63.151	59.070	56.789	50.907	51.338
Cash transit companies						
– Falck services Ltd	24.351	27.997	35.452	29.853	30.340	26.695
– Securitas Ltd	5.500	6.387	14.911	14.039	14.332	14.474
– Rekla Ltd	0	0	0	0.611	3.165	3.345
Cost of professional cash handlers	123.2	165.8	140.7	115.8	112.4	111.5
Bank branches	23.0	25.0	36.0	25.0	21.6	27.0
Retail sector	40.7	55.6	53.8	48.2	46.9	46.6
Total costs	186.9	246.3	224.5	189.0	185.3	185.1
Total costs/GDP, %	0.141	0.176	0.156	0.129	0.122	0.117

Total costs include wages and bonuses, pension costs, other personal costs, banknote procurement costs, real estate rents, depletion, business costs, interest costs from financing, costs from subcontracting. The estimate for the retail sector costs is based on the EPC study. The costs of minting the coins are included in the Central Bank's costs. Consumer costs on acquiring cash, withdrawal costs or the opportunity cost for having cash instead of interest bearing financial instruments have been excluded from the table due to their arbitrary nature. We have also excluded counterfeit and fraud costs of cash and cards that are not generally very large. Eg the number of euro banknote counterfeits found in circulation has been among the lowest in the euro area and on average less than thousand (774 pieces) per year during 2002–2007.

As already discussed, the use of cards is slowly but clearly crowding out the use of cash as the main means of payment which also shows up in Figure 3.1, and in the transaction values of cards displayed in Figure 4.1. Obviously this has to be related to the costs of payments. Even if we are able to get reasonably reliable information about the total costs of cash it is much more difficult to get comparable data on card payments as card payment provisions tell only the variable costs which are a not so important in terms of cards, for instance. Moreover, provisions do not, of course, correspond to the ‘resource’ costs which would be relevant in computing the social costs.

It is important even to try to evaluate either the unit costs of cash and card payments per transaction or per one euro spent, since it can give us some idea of the need for possible policy action. Should, for instance the cross-subsidization of cash in the form of free withdrawals from banks’ branches and ATMs be changed somehow, or should some affirmative action be taken in terms of the over efficiency of the payment system? For some banks (eg Handelsbanken and Ålandsbanken) the ATM withdrawals are not free of charge. Ordinary ATM withdrawals can be also made as Visa euro cash withdrawals, which are charged by 1 EUR per transaction plus provision of 2% by the cash sum. In 2006 the charges of these ATM services were 10.1 million euros in total.

Figure 4.1 **Total value of card payments in Finland, billion euro**



Source: The Federation of Finnish Financial Services.

In Finland the costs of using payment cards are also available more easily, since there is only one company (Luottokunta Ltd) governing the use of international payment cards. Luottokunta is jointly owned by banks and retailers to offer credit card services.²² Luottokunta's card services comprise payment card-issuing services, card-scheme management and processing services and the related customer service tasks. Merchant acquiring services include card payment transactions, settlement and payment terminal services and the related customer services.

Finland has currently the highest frequency of card use in Europe per capital. Within a couple of years payment cards have consolidated their dominant position as the most popular payment method in Finland based on value of payments.

There are many different types of costs in the process of card payments, like

- Luottokunta licencing fee for International Card Companies (eg Visa and Mastercards)
- Entrepreneurs and corporations which use payment and credit card system services are entitled to join the co-operative. All members are obliged to pay a co-operative fee of EUR 100.
- Merchants pay transaction costs and provisions based on the value of the card payments according to Luottokunta fees.²³
- Card holders pay annual fees for holding either internal credit cards (like Visa and Mastercard to Luottokunta, Visa Electron to banks), or to banks on bank debit cards, ATM cards etc. or retail credit cards
- ATM cash withdrawals using Visa cards either in Finland or outside Finland on euro withdrawals are paid based on the combination of delivery fee (currently 1 euro) plus provision of 2 percent on the cash value
- For some banks (eg Ålansbanken, Handelsbanken) also ordinary ATM withdrawals are charged a fee.

The entire card process between the retailer and card holder includes the different services of issuing of cards (usually banks or Luottokunta in Finland) and acquiring processing services provided mostly by Luottokunta.

The most important ones are the merchants' payments on card payments based on transaction fees and card provisions based on value of purchase and the card holders' annual fees. The heaviest duties are paid on credit cards (see Appendix 2 and 3).

²² Luottokunta argues that it has 0.5 percentage points lower merchant provisions than Finnish neighboring countries.

²³ For comparison in 2006 Luottokunta earned gross commission income total EUR 124.0 million, which mainly came from items including annual card fees and merchant commissions. Income from management and routing services was EUR 10.7 million. Some examples of Luottokunta's fees are provided in Appendix 3.

We have not calculated the costs of teller terminals in retail shops and other points-of-sales as costs of card payments, also because this is quite a difficult task.

Table A1 shows the calculations about transaction costs and card provisions paid by merchants on card payments in Finland during 2002–2006. The bank cards payments do not contain any provision, only a 3 cent transaction fee. Online debit card payments (ie Visa Electron payments) are paid based on 0.31 per cent provision. However, the role of domestic bank cards may drastically change along with SEPA (the Single European Payments Area) even so that they could be replaced by international bank card systems. The fact that national bank cards account for two thirds of the total volume of card payments in Finland helps illustrate the size of this change.

To have some estimate for the costs of card payments for comparison, we must make some simplifying assumptions. Using the overall value of card payments and the number of card transactions, we can calculate the average amount of a card payment. We may also calculate a rough estimate of the cost of cards and even an estimate of the corresponding unit cost.

A set of calculations are presented in Table 4.2. They show the costs for merchants from the use different sort of cards. The total sum corresponds roughly 0.05 per cent of GDP which says that the number is also quite small being something like one half the cost of cash/GDP figure presented in Table 4.1. However, if we add the costs of card holders for holding debit and credit cards we end up to figures close to 150 million a year in 2006 (see Table 4.3). Even if these figures are not exactly accurate, they give an indication about the size of costs of cards as payment media for card users.

Table 4.2

**Transaction and provision cost for merchants
in Finland**

Year	Bank cards	Online debit cards	Credit and charge cards	Retail cards	Bank cards	Online debit cards	Credit and charge cards	Retail cards
Transaction, millions					Card payments, Mill euro			
2002	362	14	68	59	13800	300	4100	2500
2003	415	33	70	60	14800	700	4200	2500
2004	445	61	73	62	16200	1300	4300	2600
2005	498	100	76	66	17800	2000	4500	2900
2006	567	151	91	68	19600	2900	5600	3000
Transaction cost per type of card					Provision by type of card, %			
2002	0.03	0	0	0.03	0	0.31	0.90	0
2003	0.03	0	0	0.03	0	0.31	0.90	0
2004	0.03	0	0	0.03	0	0.31	0.90	0
2005	0.03	0	0	0.03	0	0.31	0.90	0
2006	0.03	0	0	0.03	0	0.31	0.90	0
Transaction cost per type of card					Provision costs to merchants by type of card			
2002	10.86	0	0	1.77	0	0.9	36.9	0
2003	12.45	0	0	1.80	0	2.2	37.8	0
2004	13.35	0	0	1.86	0	4.0	38.7	0
2005	14.94	0	0	1.98	0	6.2	40.5	0
2006	17.01	0	0	2.04	0	9.0	50.4	0
Total cost for cards for merchants					Together			
2002	10.86	0.9	41.0	1.77	50.5			
2003	12.45	2.2	42.0	1.80	54.2			
2004	13.35	4.0	43.0	1.86	57.9			
2005	14.94	6.2	45.0	1.98	63.6			
2006	17.01	9.0	56.0	2.04	78.4			

Data source: The Federation of Finnish Financial Services and Luottokunta Ltd. Online debit cards consist of Visa Electron and Master Cards.

Table 4.3

Annual fees paid by card holders, euro

Number of cards distributed via banks, million						
Year	Bank cards	Combination cards	Visa and EC/MC cards	Online debit cards	ATM cards	Together, million
2002	2.011	1.054	0.265	0.814	2.162	6.306
2003	1.961	1.117	0.469	1.058	1.930	6.535
2004	1.845	1.311	0.507	1.318	1.556	6.537
2005	1.668	1.551	0.636	1.525	1.139	6.519
2006	1.442	1.779	0.975	1.727	0.830	6.753
Estimated average annual fees per card, euro						
Year	Bank cards	Combination cards	Visa and EC/MC cards	Online debit cards	ATM cards	Together, euro
2002	7	30	30	30	5	14.1
2003	7	30	30	30	5	15.7
2004	7	30	30	30	5	17.6
2005	7	30	30	30	5	19.7
2006	7	30	30	30	5	22.0
Annual fees for cardholders, million euro						
Year	Bank cards	Combination cards	Visa and EC/MC cards	Online debit cards	ATM cards	Together, million euro
2002	14.077	31.620	7.950	24.420	10.810	88.9
2003	13.727	33.510	14.070	31.740	9.650	102.7
2004	12.915	39.330	15.210	39.540	7.780	114.8
2005	11.676	46.530	19.080	45.750	5.695	128.7
2006	10.094	53.370	29.250	51.810	4.150	148.7

Currently online debit cards consist in Finland only of Visa Electron cards.

The annual fees for ordinary bank cards vary between 4.8 euro to 12 euro per year, and their weighted average cannot be calculated from aggregated data, so we have simply assumed that average fee is 7 euro per year.

The fees for combined Bank and Visa & MasterCard are not similarly known as their are mostly part of a service package and also vary depending on bank. Also the type of card (classic or gold) affects the annual fee. The annual fees for these cards vary between 0–75 euros per year. Here, we have cautiously assumed that on average customers pay for 30 euro per card per year.

Table 4.4

Indicators of totals costs of card payments

	Transaction costs of merchants	Provisions paid by merchants	Annual fees of cardholders	Total costs of payment cards	GDP	Costs/DGP %
2002	12.6	37.8	93.2	143.7	143974	0.100
2003	14.3	40.0	106.6	160.8	145938	0.110
2004	15.2	42.7	117.9	175.8	152345	0.115
2005	16.9	46.7	131.0	194.6	157162	0.124
2006	19.1	59.4	150.3	228.8	167062	0.137

From Table 4.4, we can have some rough idea about the costs of card payments in Finland although we have to keep in mind that the numbers are not true social costs but only fees which are paid by customers and merchants. Moreover, not all possible cost items are included. The number may still give some rough idea of the total costs of cards and also the corresponding unit costs. The overall level of total costs does not seem to differ very much from those of cash presented in Table 4.1. These figures may also explain why banks, in particular, are in favor of card payments. The costs of card payments are mainly paid by card holders in form of fixed annual card fees and hence banks and retailers have smaller costs. We must remember however that annual fees of credit and charge cards include the interest costs of extended payment period while in the case of cash settlement is, at least in principle, immediate.

If we sum up the total costs of cash and card payments together (which is, of course, somewhat dubious given the nature of costs from payment cards) we end up to values of the magnitude of 0.3% of GDP, which is somewhat less than the recent figure from Sweden (0.36–0.40% of GDP for 2002) by Bergman et al (2007) even though cash is used more (both in absolute and relative terms) than in Finland. The Swedish study covers only POS-costs of payments. Not so surprisingly also the unit costs of cash and card transactions appear to quite similar in Finland and Sweden. Thus, in Sweden the unit (social) cost of cash transaction is 0.46 euro and the unit (social) cost of card payment 0.30. The corresponding Finnish numbers are 0.30 euro and 0.26 euro.

One might try to estimate the total costs of payment media also by computing the total number of man-years in the payment industry in relation total employment. In doing so we could come close the social cost of payment media because then we could get a measure of the amount of resources that is used in the payment industry (and, at the same time, the possible income transfers between sectors could be netted out). Professional cash handlers' and card companies employment is quite well known; similarly the payments related employment of banks (see Appendix 1). The problem is related to estimation of labour input that is needed to take care of payments within the merchants sector. Here we have to rely on some alternative values which give us a range of estimates for the total labour share starting with a conservative estimate of 0.12 per cent and going up to 0.20 per cent.

If the total costs of payment media are indeed of the magnitude of the above presented numbers for Finland and maybe also for Sweden, we could readily conclude that the total cost payments is much less than proposed by Humphrey et al (1966) and therefore the benefits of the changing the payment technology are much less than suggested in Humphrey et al (2006). Of course, there are great cross-country differences which mean that in some countries benefits are considerable but even then we have to keep in mind that great efficiency gains could already be obtained by changing the way different payment systems operate

in different countries. If the most efficient way of producing payment services is reached (in other words, the system is at the efficient frontier) changes in the market shares of different payment media may not produce great large social efficiency gains.

The average cost of cash transaction appears to be about 30 cents which quite well in line with the recent Swedish estimates (Bergman et al, 2007). It is somewhat higher than the average cost computed on the basis of Table 4.4. Given the nature of numbers in Table 4.4, we cannot really make a genuine comparison of unit costs of cash and cards. This applies, in particular, to the size of transaction with which the unit costs are equal. A very rough estimate would be something like 15 euros but that is more like an educated guess than an exact number. It is quite interesting, however, that the average size of cash transactions corresponds quite well to this 'estimate'.

5 Concluding remarks

This analysis has focussed mainly on costs and efficiency of payment. Thus, benefits and returns are not considered in detail even though it is clear that all market players (consumers, merchants, banks) are interested in the net return from each payment media. This point of view is typically adopted in the banking community where the pros and cons of different payment media are quite intensively scrutinized. Even so pricing of payment services has not, at least thus far, followed conventional marginal cost rules. Usually total and variable costs of cash or card payments are not known or faced for consumers, who nevertheless make the choice upon the payment method.

As pointed out by eg Guibourg and Segendorf (2004) there are several reasons for this failure. One is 'prisoner's dilemma' type setting which banks face vis-a-vis consumers. If one bank moves independently in increasing tariffs it may face a strong market reaction (both because of high price sensitiveness and 'moral' outcry) while in the case banks could co-operate market reactions could be minimal and all banks would benefit. So long banks' role in payments is different (and competition authorities have some influence on pricing) a co-operative solution is less probable. Another possible reason is the fact that banks consider some payment services as complements with their other products. Partly because of that there will be bundling in pricing these products. A prime example is deposits and loans. In general banking fees for different means of payment are characterised more likely by non-transparency than transparency. One has also to acknowledge that pricing of payment products is not comparable to all other products due the basic nature of 'two-sided markets'. Under those circumstances pricing rules would not always be intuitively obvious.

In addition to these two reasons, some additional arguments can be put forward. One may refer to banks 'social responsibility' and to the fact that banks were originally quite active in acquiring some transaction services. Thus, banks pursued employers to move the payment of wages to bank accounts opposite to old system of providing cash directly to employees. The use of accounts was that time free of any fees and this could be seen as some sort of social contract which cannot so easily be breached. One may also argue that the part of the seigniorage revenue that is de facto collected from banks is some sort of price for the central banks services (like the *lender of last resort* facilities) that banks time to time have to use.

Irrespective of developments in pricing, one could expect developments in payments systems. The cost differences between different payment media and the differences between different countries clearly motivate increased effort in increasing efficiency in providing different services. In the case of cash, we have already witnessed a lot of developments which point to the same direction: more and more work has been delegated to specialized companies that allow banks and merchants to concentrate on their proper duties. This has facilitated full use of economies of scale and scope and thereby allowed lowering cost pressures.²⁴

Our Finnish example clearly indicates that it is possible to arrive at very low values of economy-wide payment costs indicating that earlier estimates of the 'burden of payment systems' do not seem to be representative for Finland, at least. The total costs for providing retail payments in Finland sum up only to around 0.3 percentage point from GDP. It should be noted that in accordance with the studies performed in eg Belgium, Netherlands and Sweden, the unit costs of cash and cards appear to be of the same magnitude and follow the same pattern in the terms of the transaction size. Social costs of cash and cards seem to be (very roughly) of the same magnitude but the incidence of cost burden between different sectors are quite unevenly distributed and that surely gives rise to controversies and debate in the future. Hopefully, that also motivates further analysis.

Quite soon, the introduction of the SEPA will change European payment systems quite a lot. It may also affect the tariff system. Right now, it is very difficult to make an assessment of the consequences of this change and it is, no doubt, one of the most compelling research agendas for the future.²⁵

²⁴ See eg Bohn et al (2001) US estimates of scale economies in currency operations.

²⁵ The possible impact of SEPA on costs is analyzed by Boit and Humphrey (2007). The study deals with banks' (total) operating costs and does not provide explicit answer to question of how the costs of different payment media will evolve in the future.

References

APACS (2006) **UK Cash and Cash Machines.**

Bohn, J – Hancock, D – Bauer, P (2001) **Estimates of Scale and Cost Efficiency for Federal Reserve Currency operations.** Federal Reserve Bank of Cleveland, Economic Review 2001:4, 2–26.

Bergman, M – Guibourg, G – Segendorf, B (2007) **The Costs of Paying – Private and Social Costs of Cash and Card Payments.** Sveriges Riksbank Working Paper Series, No. 212, September 2007.

Bolt, W – Humphrey, D (2007) **Payment Network Scale Economics: SEPA, and Cash Replacement.** Review of network Economics 6(4), 453–473.

Brits, H – Winder, C (2005) **Payments are no free lunch.** The Nederlandsche Bank. DNB Occasional Studies 3, No. 2.

Garcia-Swartz, D – Hahn, R – Layne-Farrar, A (2006) **The move toward cashless society: A closer look at payment instrument economics.** Review of Network Economics 5, 175–198.

Garcia-Swartz, D – Hahn, R – Layne-Farrar, A (2007) **Further Thoughts on the Cashless Society: A Reply to Dr. Shampine.** Review of Network Economics 6(4), 509–524.

Gresvik, O – Owre, G (2003) **Costs and income in the Norwegian payment system 2001: An application of the activity based costing framework.** Norges Bank. Working Paper 2003/8.

Guibourg, G – Segendorf, B (2004) **Do prices reflect costs? A Study of the price and cost structure of retail payment services in the Swedish banking sector 2002.** Sveriges Riskbank Workig Paper 172.

Humphrey, D – Pulley, L – Vesala, J (1996) **Cash, paper and electronic payments: A cross-country analysis.** Journal of Money Credit and Banking 33, 216–234.

Humphrey, D – Willeson, M – Bergendahl, G – Lindholm, T (2006) **Benefits from changing payment technology in European banking.** Journal of Banking and Finance 30, 1631–1652.

- Humphrey, D – Willeson, M – Lindbolm, T – Bergendahl, G (2003) **What does it cost to make a payment?** Review of Network Economics 2, 2003:2, 159–174.
- Koivuniemi, E – Kemppainen, K (2007) **On cost of payment methods: A survey of recent studies.** Bank of Finland, Financial Markets and Statistics Department Working Paper 6/2007.
- Jonker, N (2005) **Payment Instruments as Perceived by Consumers – A Public Survey.** De Nederlandsche Bank, DN B Working Paper 53.
- Mosenlechner, P – Stix, H – Wagner, H (2006) **How are payments made in Austria?** Monetary Policy & the Economy (Austrian Central Bank) No. 2, 111–134.
- Larsen, K – Skagemo, S (1997) **The role of cash as means of payment.** Economic Bulletin (Norwegian Central Bank).
- McKinsey (2006) **Payment Ssrvices in the Netherlands: An analysis of revenues and costs for banks.** McKinsey & Company.
- Quaden, G (2005) **Costs, Advantages and Drawbacks of Various Means of Payment.** National Bank of Belgium. December, 41–47.
- Shampine, A (2007) **Another Look at the Payment Instrument Economics.** Review of Network Economics 6(4), 495–508.
- Snellman, H – Viren, M (2007) **ATM networks and Cash Usage.** Forthcoming in Applied Financial Economics.
- Simes, R – Lancy, A – Harper, I (2006) **Costs and benefits of alternative payments instruments in Australia.** Centre for Business and Public Policy, Melbourne Business School.
- Stavins, J (2001) **Effect of consumer characteristics on the use of payment instruments.** New England Economic Review 3/2001, 19–30.
- Van Hove, L (2000) **Zijin betaalmilddelen publieke goerden? Over overheidsinternvente en tarifiering.** Financieel Forum, Bank en Financiewezen 2000:1, 15–23.
- Van Hove, L (2006) **On the War on Cash and its Spoils.** Unpublished mimeo.

Appendix 1

Number of employees working with Finnish professional cash handling operators, 1999–2006

	1999	2000	2001	2002	2003	2004	2005	2006
NCB (Bank of Finland)								
Currency Department	160	168	172	137	111	65	61	59
ATM company (Automatia)	25	27	30	31	31	31	34	33
CIT companies								
G4S (Falck Cash Services)	744	775	806	856	735	652	625	655
Loomis (Securitas Arvokuljetus)	n.a.	n.a.	337	418	268	270	282	289
Other cash handlers								
Rekla Ltd	0	0	0	0	40	58	65	65
Total employees, persons	929	970	1345	1442	1185	1076	1067	1101
Population in Finland (million)	5.171	5.181	5.195	5.206	5.219	5.253	5.255	5.277
Other related indicators								
Number of bank branches	1545	1801	1789	1770	1727	1719	1616	1646
Number of cash ATMs	2181	2134	2132	2110	2001	1729	1689	1669
Inst. offering payment services		1554	1628	1635	1619	1587	1617	
Employees in deposit banks	24300	24600	24800	24500	23400	22800	23600	24700

Numbers exclude persons working in bank branches and in retail shops and other points of sale (POS).

Appendix 2

Example of banks' fees in Finland

Payment service	Unit cost in euro
Debit card payment	0.03
Cash withdrawal at the merchant's cashier	0.03
Manual payment order	7.00
Automatic payment order	4.50
Incoming payment (EU)	0.46
Cheque	Min (16.00, 0.30%)
Direct debit; basic fee	840.00
Direct debit; monthly fee	35.00
Incoming direct debit	0.03
E-payment service: basic fee	20.00
Outgoing E-debit	0.25
Incoming E-debit	0.25
Manual report of E-payment	0.90
Text message report of E-payment	0.40
Payment with a reference code	0.12
Payment with a reference code with report	0.46

Source: OKO Bank Helsinki.

Appendix 3

Selected credit card fees for merchants in Finland

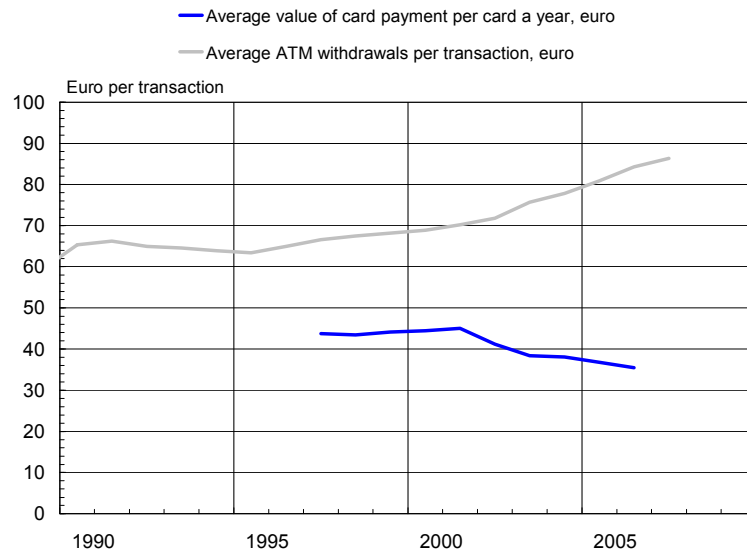
Payment service	Unit cost
Opening fee	50.00 euro
EFT-POS payment; Visa & MasterCard	0.90%
EFT-POS payment; Visa Electron	0.31%
Paper receipt payment, EU area	1.10%
Paper receipt payment; outside EU	1.35%

Source: Luottokunta Finland.

Figures A1 and A2

Figure A1

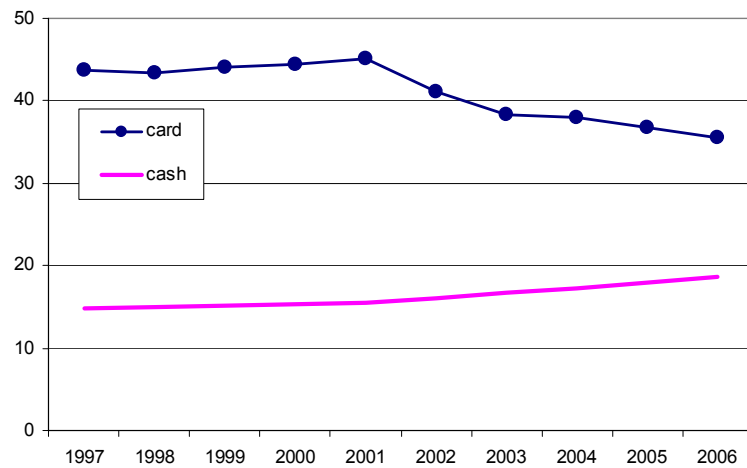
Average ATM withdrawal and card payment per transaction



Source: Federation of Finnish Financial Services.

Figure A2

Average size of transactions with cash and cards



**BANK OF FINLAND RESEARCH
DISCUSSION PAPERS**

ISSN 0785-3572, print; ISSN 1456-6184, online

- 1/2008 Peik Granlund **Regulatory choices in global financial markets – restoring the role of aggregate utility in the shaping of market supervision.** 2008. 36 p. ISBN 978-952-462-416-9, print; ISBN 978-952-462-417-6, online.
- 2/2008 Ari Hyytinen – Tuomas Takalo **Consumer awareness and the use of payment media: evidence from Young Finnish consumers.** 2008. 34 p. ISBN 978-952-462-418-3, print; ISBN 978-952-462-419-0, online.
- 3/2008 Patrick M Crowley **One money, several cycles? Evaluation of European business cycles using model-based cluster analysis.** 2008. 47 p. ISBN 978-952-462-420-6, print; ISBN 978-952-462-421-3, online.
- 4/2008 József Molnár **Market power and merger simulation in retail banking.** 2008. 26 p. ISBN 978-952-462-422-0, print; ISBN 978-952-462-423-7, online.
- 5/2008 Heli Huhtala **Along but beyond mean-variance: Utility maximization in a semimartingale model.** 2008. 29 p. ISBN 978-952-462-426-8, print; ISBN 978-952-462-427-5, online.
- 6/2008 Mikael Juselius **Cointegration implications of linear rational expectation models.** 2008. 25 p. ISBN 978-952-462-428-2, print; ISBN 978-952-462-429-9, online.
- 7/2008 Tuomas Takalo – Tanja Tanayama – Otto Toivanen **Evaluating innovation policy: a structural treatment effect model of R&D subsidies.** 2008. 59 p. ISBN 978-952-462-430-5, print; ISBN 978-952-462-431-2, online.
- 8/2008 Essi Eerola – Niku Määttänen **On the importance of borrowing constraints for house price dynamics.** 2008. 40 p. ISBN 978-952-462-432-9, print; ISBN 978-952-462-433-6, online.
- 9/2008 Marko Melolinna **Using financial markets information to identify oil supply shocks in a restricted VAR.** 2008. 35 p. ISBN 978-952-462-434-3, print; ISBN 978-952-462-435-0, online.
- 10/2008 Bill B Francis – Iftekhar Hasan – James R Lothian – Xian Sun **The signalling hypothesis revisited: Evidence from foreign IPOs.** 2008. 41 p. ISBN 978-952-462-436-7, print; ISBN 978-952-462-437-4, online.

11/2008 Kari Takala – Matti Viren **Efficiency and costs of payments: some new evidence from Finland.** 2008. 50 p. ISBN 978-952-462-438-1, print; ISBN 978-952-462-439-8, online.

Suomen Pankki
Bank of Finland
P.O.Box 160
FI-00101 HELSINKI
Finland



.2343