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LEUVEN

NON-CONFIDENTIAL VERSION

THE COSTS OF CASH AND CARDS COMPARED.

THE CASES OF ICELAND AND BELGIUM

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PART 1: COSTS OF CASH AND CARD PAYMENT SYSTEMS COMPARED

- 1. INTRODUCTION**
- 2. SOME DEFINITIONS**
- 3. ECONOMIC AND FINANCIAL BACKGROUND IN ICELAND.....**
- 4. ECONOMIC AND FINANCIAL BACKGROUND IN BELGIUM.....**
- 5. COSTS AND REVENUES OF CASH AND CARD BASED SYSTEMS:
THE CASE OF ICELAND**
 - 5.1 The cash payments system in Iceland.....
 - 5.2 The card based payments system in Iceland
 - 5.3 Costs and revenues of the payments systems in Iceland.....
 - 5.4 The sectoral allocation of the resource costs
- 6. COSTS AND REVENUES OF CASH AND CARD BASED SYSTEMS:
THE CASE OF BELGIUM**
 - 6.1 The cash payments system in Belgium.....
 - 6.2 The card based payments system in Belgium
 - 6.3 Costs and revenues of the payments systems in Belgium.....
- 7. COMPARING ICELAND AND BELGIUM**
- CONCLUSION**

NON-CONFIDENTIAL VERSION
Introduction

1

**PART 1: COSTS OF CASH AND CARD PAYMENT SYSTEMS
COMPARED****1. INTRODUCTION**

The advent of the "cashless society" has long been foretold. The pace with which the transition to a cards-based payment system is proceeding, however, differs from one country to the other. In some countries this transition proceeds slowly, in others progress towards a card payment system has reached an advanced stage.

In this study we contrast two countries. One is Iceland, the country in the world that comes closest to being a card payment system. The other is Belgium, a country that belongs to the group of industrialised countries least advanced on the road to a card payment system. The contrast between the two countries is shown by the following numbers. According to some estimates, cards are used in 78 % of retail payments in Iceland whereas only 14% of transactions are based on cash. The remaining 8 % mainly refer to cheques and transfers¹. In contrast, the number of cash payments accounts for a full 75 % of all transactions in Belgium while cards take up only 9% of the total number of transactions.

The international positions of Iceland and Belgium on the road to a card payment system are very well illustrated in Figures 1 and 2. Figure 1 shows the share of banknotes and coins as a percent of GDP in Iceland, Belgium and in a number of representative industrial countries. Figure 2 shows the amount of cash per capita in the same countries. It can be seen that, compared to the other industrialised countries, the use of cash in Iceland has dropped to very low levels. The UK and the US, which come closest to Iceland, still use more than twice as much cash as a means of payments. Belgium (and to a lesser degree Germany), on the other hand, are characterised by a large use of cash, five to six times more than in Iceland².

¹ Visa Iceland (1998).

² It should be noted that a large part of the currency held in Belgium is held for hoarding purposes. Estimates about hoarding in Belgium range from 30 to 40% (see Van Hove and Vuchelen (1999)).

Figure 1: Notes and coins as % of GDP (1996)

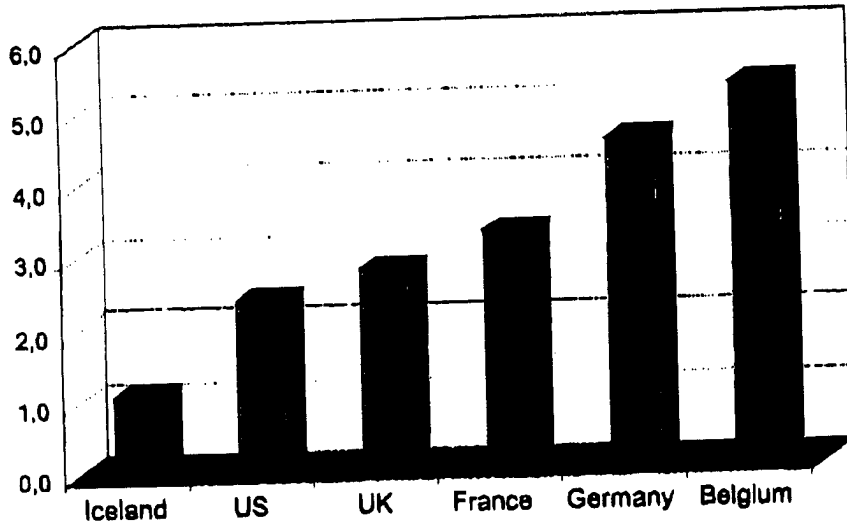
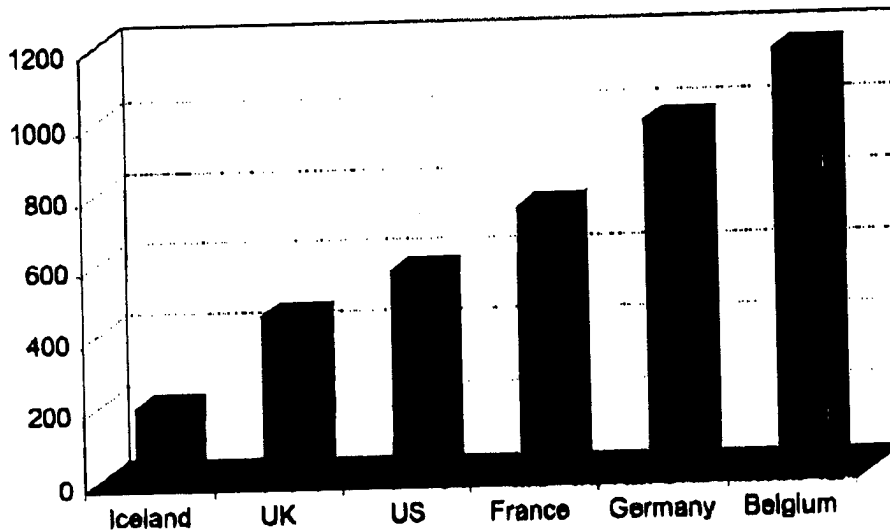


Figure 2: Notes and coins: dollars per inhabitant (1993)



Note: The US and German data have been corrected to take into account the fact that a large part of the currency issued by these countries is held abroad. For the US these foreign holdings have been estimated to be 55% of the total stock of US dollars, while for Germany the estimate is 35%. (See Deutsche Bundesbank, 1/95, The circulation of Deutsche Mark abroad, Discussion paper of the Economic Research Group, May 1995 and Federal Reserve, The Location of U.S. Currency How much is Abroad, FED Bulletin, October 1996, p.896).

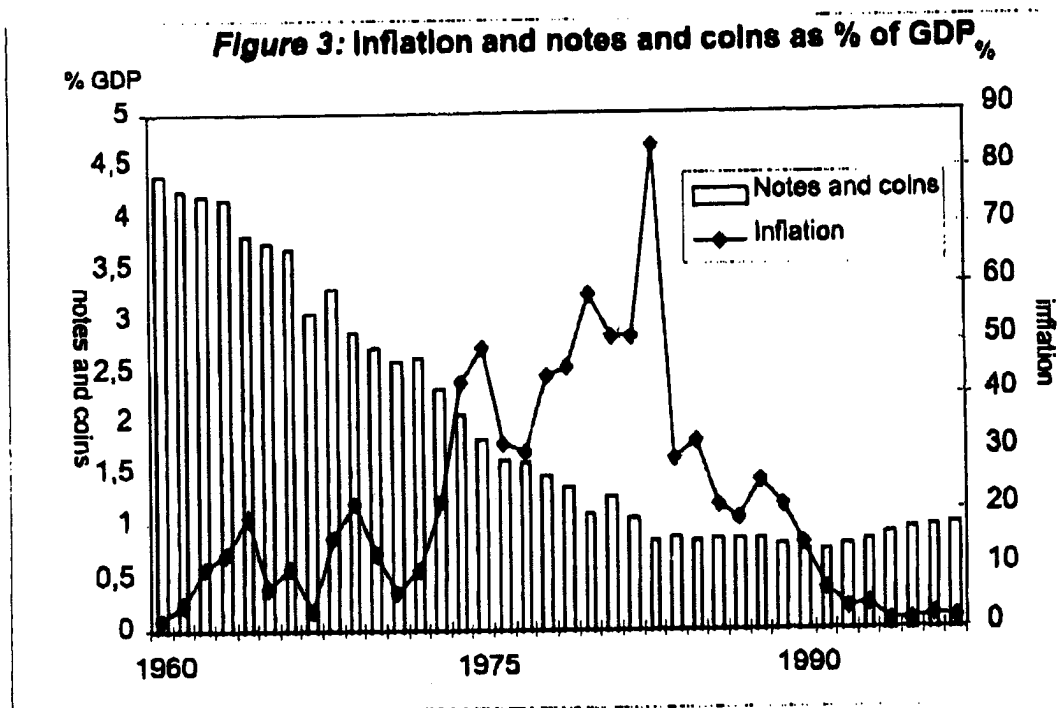
There are certainly many reasons why some countries have reached a more advanced stage of cashless spending habits than others. Inflation is one of these variables and it helps to explain the Icelandic process towards a card payment system. From the 1960s on, Iceland was caught in a process of accelerating inflation, increasing from

NON-CONFIDENTIAL VERSION
Introduction

3

an average of 11% a year during the sixties, to 30% in the 1970s and, 40% in the 1980s. Iceland was quite unique in the industrial world to experience such high and accelerating inflation rates. As a result, Icelandic consumers and producers were induced to limit the use of cash (which was loosing its value at an accelerating rate) and to find substitutes for cash.

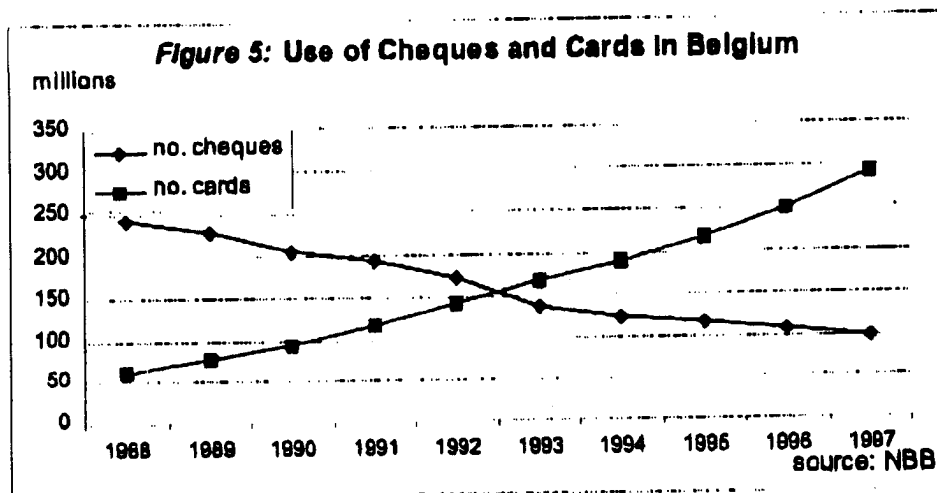
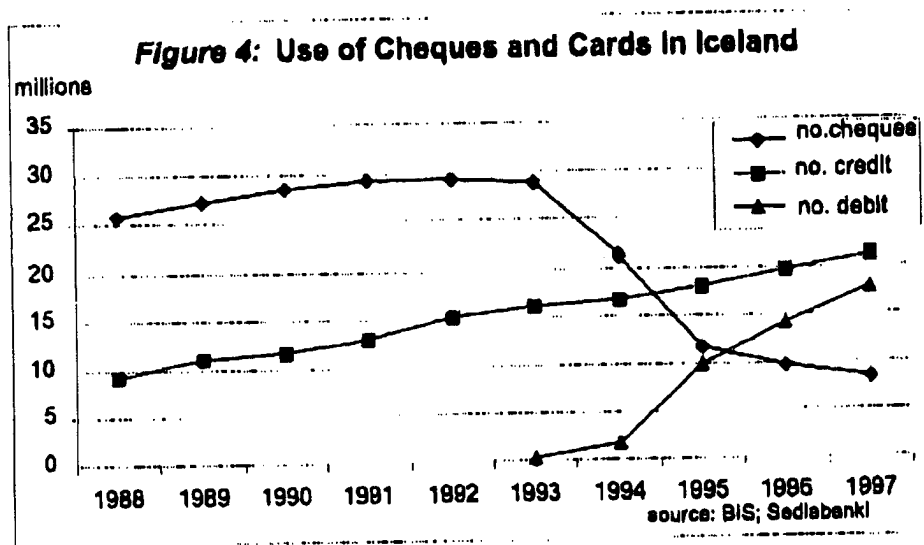
The relation between accelerating inflation and a declining use of cash is illustrated in Figure 3. This shows the evolution of the declining use of banknotes and coins (as a percent of GDP) and inflation in Iceland since 1960. It confirms that, broadly speaking, there was an inverse relation between inflation and the use of cash in Iceland.



Despite the differences between Iceland and Belgium, the two countries experience the same ongoing dynamics of increasing use of cards. This is shown in Figure 4 and 5. In both Iceland and Belgium the decline in the use of cheques has been pronounced and has been matched by an increasing use of cards (debit and credit).

NON-CONFIDENTIAL VERSION
Introduction

4

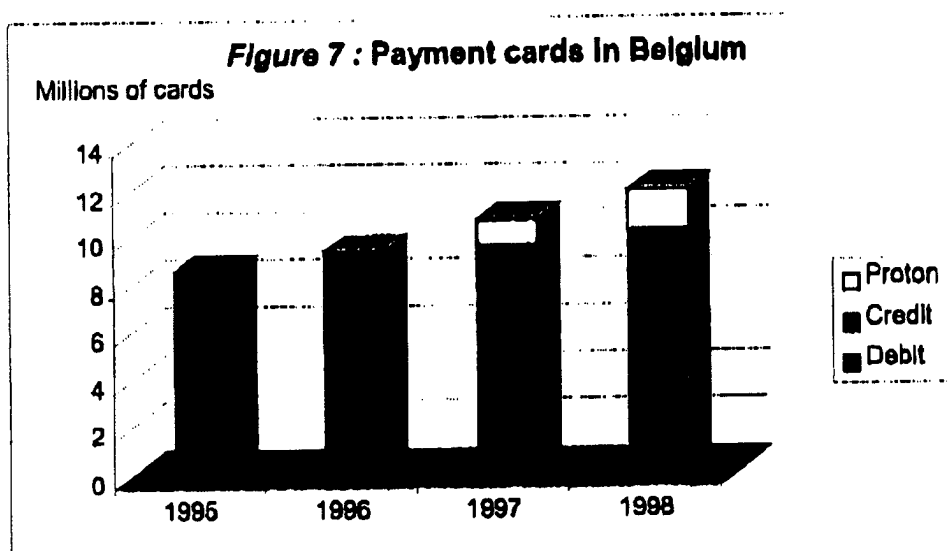
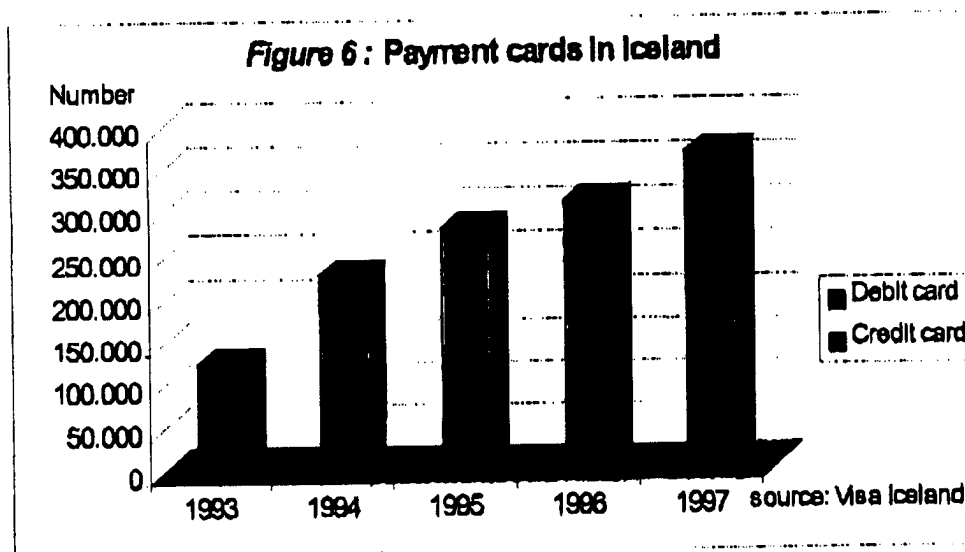


Visa has a market share of 70% of the card business in Iceland for both the debit and credit card segment of the market. In Belgium, Visa is only active in the credit card segment and has a market share of 74%. Other payment cards, such as Diners Club and American Express are much less important, being used mainly for travel and entertainment purposes.

The market is constantly changing, with the addition of many new fields of application. At this moment there are no electronic purses being used in Iceland. Nevertheless, a project already exists, and will be implemented soon, probably in the year 2000. In Belgium the electronic purse (Proton) has taken off and is now the fastest growing segment of the card business (see Fig. 6 and 7).

NON-CONFIDENTIAL VERSION
Introduction

5



In this study we compare the costs of using cash with the costs of using cards in the payments system. More specifically we study the following questions (taking Iceland (1997) and Belgium (1998) as examples):

- What are the relative costs of using cash and cards in modern economies today?
- How are these relative costs distributed over the different participants in the payment system (consumers, merchants, banks, and the central bank)?

In order to answer these questions we will use Iceland and Belgium as case studies. The reason for selecting these countries is obvious. Iceland and Belgium are at opposite poles (among industrialised countries) in their development towards a card

NON-CONFIDENTIAL VERSION
Introduction

6

payment system. This will allow us to obtain relatively reliable estimates of the cost savings arising from a movement from cash to cards. In addition, it will shed some light on the dynamics of this movement.

The use of cards provides a convenience gain for the consumers. This gain is quite important to explain the increasing substitution of cash by cards. It is difficult to quantify, however. In this study we will not try to do so. Instead we quantify the cost side of the provision of cash and cards, and calculate the costs incurred by each category of participants in the payments system and the revenue it receives directly from its participation in the system.

The report is organised as follows. In section 2 we give some definitions of terms that will be used throughout this report. In section 3 and 4 we present a brief overview of the economic and financial environments in Iceland and Belgium. In sections 5 and 6, we present and discuss our main results about the cost savings involved from a move towards a cards-based payment system in both countries. In the next section we compare Iceland and Belgium and formulate our conclusions.

In the second part of this report we give a detailed analysis of how we arrived at the cost and revenue numbers of Iceland and Belgium, and spell out the assumptions made.

NON-CONFIDENTIAL VERSION
Some definitions

7

2. SOME DEFINITIONS

We define a **card-based payment system** as a system in which the payments are based on the use of (debit, credit and electronic purse) cards at the point of sale (POS).

We call a **card transaction**, a direct retail payment with a card and not a withdrawal of money from a cash machine. Similarly a **cash transaction** concerns a purchase at the point of sale paid with notes and coins.

A **debit card** is a card enabling the holder to have purchases at the POS directly charged to funds on his account. The card is also used to withdraw money at Automated Teller Machines (ATMs) to the current account, but we do not take into account this additional function. A **credit card** is a card indicating that the holder has been granted a line of credit. It enables the holder to make purchases and/or withdraw cash up to a prearranged ceiling. The credit granted either can be settled in full by the end of a specified period (as deferred debit card) or can be settled in part, with the balance taken as extended credit (offering credit-revolving facilities). An **Electronic Purse (EP)** is a reloadable, multi-purpose stored-value card. It normally has a computer chip.

A **card company** is a company, which owns the trademark of a particular credit/debit/EP card, and may also provide a number of marketing, processing or other services to institutions issuing its credit/debit card. In our study, in the case of credit cards we will only use the statistical information involving **Visa** and **MasterCard**. Diners Club and American Express are neglected as their market share is very small and their products are mostly Travel and Entertainment cards.

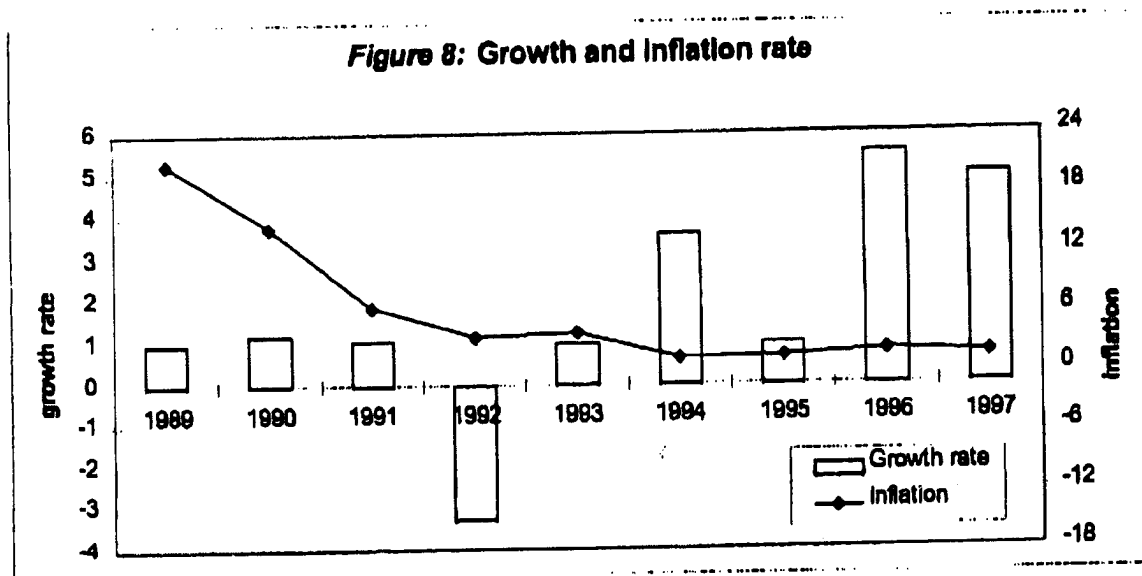
The **card issuer** is the bank or other entity that issues cards to cardholders, receives funds from the cardholder and, in principle, is obliged to pay or redeem the customer's transactions which are presented to it. The **acquirer** is the entity that signs up merchants (cards acceptors) and holds the deposit account for the merchants and to whom the merchant transmits the data relating to the transaction. The acquirer is responsible for the collection of the transaction information and the settlement with the merchant.

NON-CONFIDENTIAL VERSION
Economic and Financial Background in Iceland

8

3. ECONOMIC AND FINANCIAL BACKGROUND IN ICELAND

After a period of relatively low growth during the early 1990s, the Icelandic economy started growing at a brisk pace (see Figure 8). Since 1996 the Icelandic growth rate has exceeded 5% a year, a significantly higher growth rate than in the rest of Europe³.



Consumer confidence and an investment boom have driven this strong growth performance. This turnaround is especially strong for investment activity, which for years remained depressed⁴.

After having experienced a long period of high inflation, the first objective of the Icelandic Central Bank has become the maintenance of price stability. As can be seen from Figure 8, the Icelandic monetary authorities were quite successful in bringing down inflation during the 1990s. According to the Central Bank, price stability is a precondition for innovation and growth.

The Central Bank implements its monetary policy chiefly by guiding money market rates, by setting its own rates and by intervening in the money market. During most of the 1990s, the Central Bank has pursued a tight monetary policy in the form of relatively high money market rates. This led to an appreciation of the exchange rate

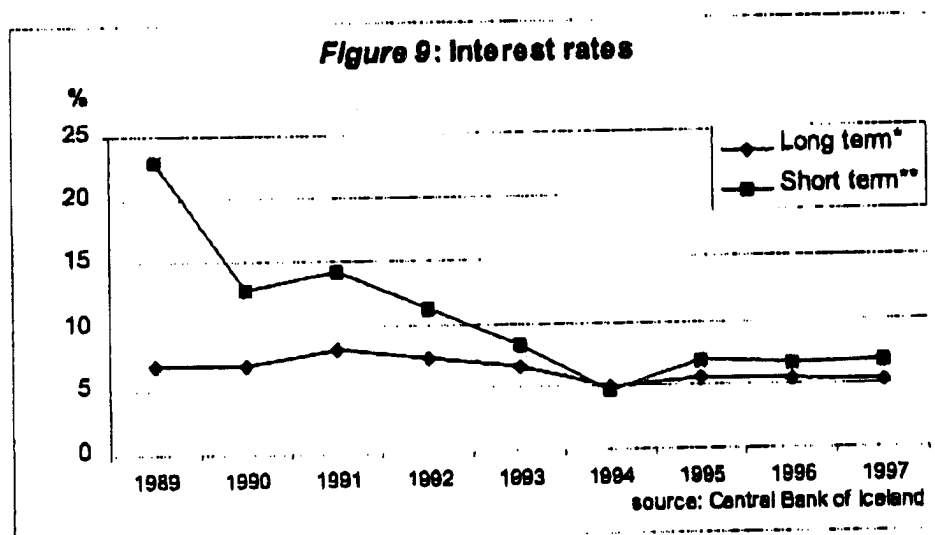
³ The average growth rate for the European Union was 1,8 in 1996 and 2,7 in 1997.

NON-CONFIDENTIAL VERSION
Economic and Financial Background in Iceland

9

and restrained the growth of credit. During 1996 and 1997, the growth of monetary and credit aggregates has reflected the rising level of activity in the economy, and the exchange rate of the króna strengthened in pace with the economy and with the Central Bank monetary measures.

Looking at the financial environment, interest rates are determined in the money market and in the bond market. The money market is the market for Treasury bills and bank bills, obligations of short duration. As Figure 9 shows, in 1997 the average yield on 1-3 month Treasury bills was 6,9%. The yield on government bonds with maturity of five years or longer was 5,3%. The differential between Icelandic money market rates and those of the main trading partners was about 3 percentage points at the beginning of 1997⁵. This differential has narrowed steadily during last year.



- * Average yield of Treasury bonds with maturity of 5 years or longer on the ISE.
** Average yield on 1-3 month Treasury bills on the ISE.

The financial sector is characterised by a high degree of cooperation concerning its technical infrastructure. Commercial and saving banks handle the bulk of all payments. In 1973 the *RB Data Centre*⁶ was established, for payments clearing. The Centre is owned by the banks and by *Sedlabanki Islands* (the Central Bank of Iceland). The net positions resulting from the daily clearing are settled on

⁴ Central Bank of Iceland, Annual Report 1997, p.11.

⁵ Central Bank of Iceland, Annual Report 1997.

⁶ This is the Banks' Data Centre, which takes care of the clearing and settlement for all inter-banking operations in Iceland.

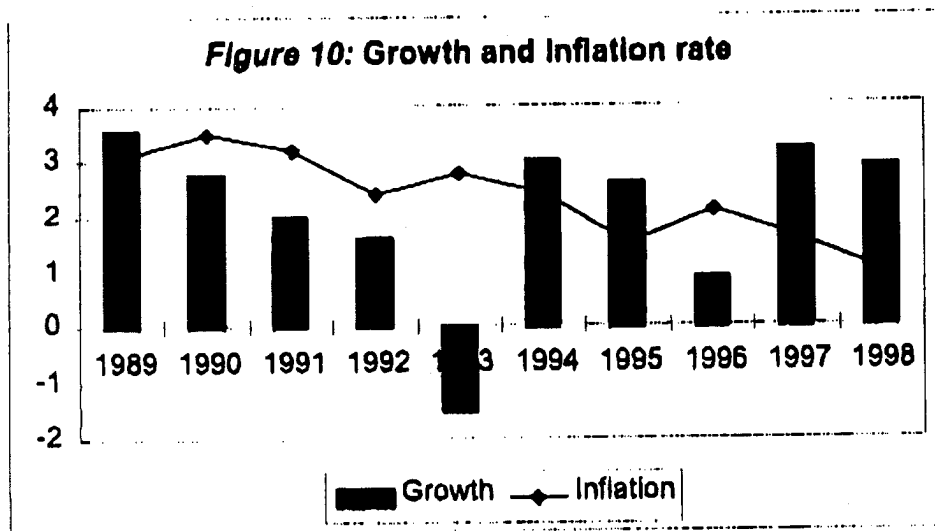
NON-CONFIDENTIAL VERSION
Economic and Financial Background in Iceland

10

participants' accounts with Sedlabanki the same day. The Centre operates various computer systems on behalf of the banks. One of these is the on-line connection of the joint ATM card system for bank customers enabling them to carry out certain routine operations. It also collects information from the Eftpos terminals of the credit card companies and partly processes it.

4. ECONOMIC AND FINANCIAL BACKGROUND IN BELGIUM

In order to meet the criteria agreed on in the Maastricht Treaty Belgium pursued a tight budgetary and monetary policy during most of the 1990s. As a result, Belgium's growth performance was far from impressive during most of the decade (see Figure 10). The 1993 recession was unusually deep and the subsequent recovery rather slow. In the late 1990s economic growth accelerated again driven by consumer confidence and - to a lesser degree - private investment.



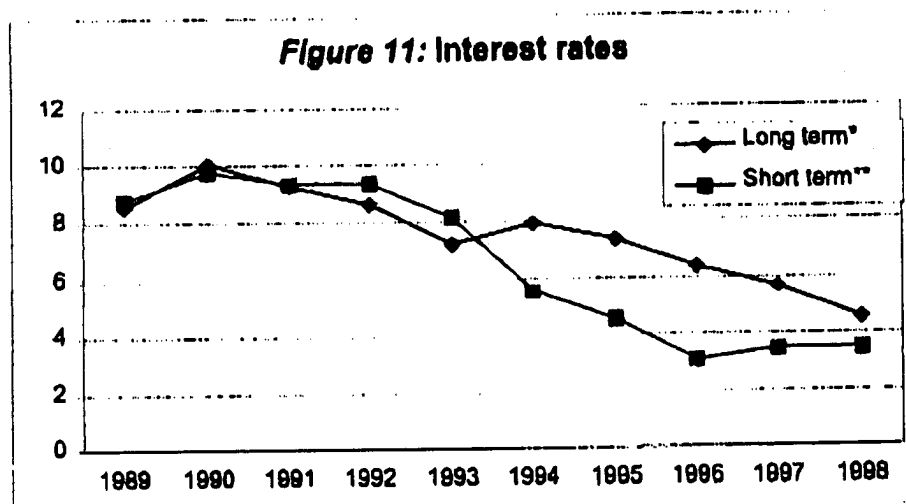
Since 1990 the first objective of the National Bank was to peg the Belgian franc to the German mark. Consequently, Belgium had to mirror closely Germany's restrictive monetary policy. This was reflected in relatively high (real) money market rates, especially during the monetary crisis of August-September 1993. It restrained the growth of credit, so that inflation remained low in the 1990s. By the end of the decade price stability in Belgium was virtually realised.

During most of the 1990s the National Bank implemented its monetary policy through open market operations and weekly allocations of credit to financial institutions using a tender system. On 1 January 1999 the National Bank joined the European System of Central Banks (ESCB). At the same time, the Belgian franc's

NON-CONFIDENTIAL VERSION
Economic and Financial Background in Belgium

12

parity vis-à-vis the newly created Euro was fixed irrevocably, and the National Bank's monetary powers were transferred to the European Central Bank (ECB). As a result of the pegging of the Belgian franc to the German mark, interest rate differentials between Belgium and Germany usually remained very small in the 1990s. A major exception was the ERM crisis of August-September 1993. In order to defend the franc's pegging to the German mark, Belgian money market rates were for a short while pushed up to double-digit levels. As soon as the exchange rate markets calmed down again, Belgium's interest differential with Germany declined rapidly. Figure 11 indicates that the average yield on 3 month Treasury certificates in 1998 amounted to about 3,5 %. The yield on ten-year government bonds declined very slowly over the decade and reached in 1998 some 4,5 %.



*1994-1998: Average yield of 10 years OLO; 1989-1993: Average yield of government bond with maturity of 6 years or longer.

** Average yield on 3 month Treasury Certificates.

In Belgium commercial banks handle the bulk of all payments. Payments clearing is the responsibility of the National Bank in co-operation with the commercial banks. Two systems are used: UCV settles the small payments, and ELLIPS the payments of BF 20 million and more. On 1 January 1999 TARGET (Trans-European Automated Real Time Gross Settlement Express Transfer) was launched. TARGET is the payments clearing system of the ESCB, and facilitates and speeds up payments

NON-CONFIDENTIAL VERSION
Economic and Financial Background in Belgium

among member states of the European Union. Since TARGET became operational ELLIPS is linked to TARGET.

5. COSTS AND REVENUES OF CASH AND CARD BASED SYSTEMS: THE CASE OF ICELAND

In this section we present our main results concerning the cost-revenue structure of each of the two payment systems: one system using cash, and the other using cards. In the second part of this report we present the detail of the computations and the assumptions used to arrive at our results for Iceland and Belgium.

We proceed as follows. We first show an idealised flow chart of the cash and the card-based payments systems. We then present and analyse the costs and revenues of the cash and the card sectors of the Icelandic payments system.

5.1 The cash payments system in Iceland

In Figure 12 we present a simple flow chart of the payments system using cash. The cash system involves four main agents.

- ◆ The *Central Bank* produces and puts into circulation the currency (banknotes and coins). The costs it incurs are related to the printing and minting of the banknotes and coins, to their security, and to a regular control of their quality. The revenues it obtains come from the fact that the currency in circulation (the liability side of the Central Bank's balance sheet) does not carry interest, while the assets in which the Central Banks invest earn a market-related rate of interest.
- ◆ *Commercial banks* have as main costs the safe storage and transport of currency, the handling (counting and manipulating), the ATMs, and the opportunity cost on their holdings of currency.
- ◆ *Consumers* who use currency, face an opportunity cost in the form of the interest forgone on their holdings of currency.

The interest forgone of banks and consumers represent the counterpart of the revenues of the Central Bank.

- ◆ The *merchants* face a cost of handling the currency, i.e. counting the money and bringing it to the bank. They also bear the cost of forgone interest on their cash balances, but unfortunately the information on this subject was not available.

5.2 The card based payments system in Iceland

The card payments system is represented in the flowchart of Figure 13. All the different parties involved are depicted: not only the four ones intervening directly, but also those having a functional role in the typical card's transaction cycle.

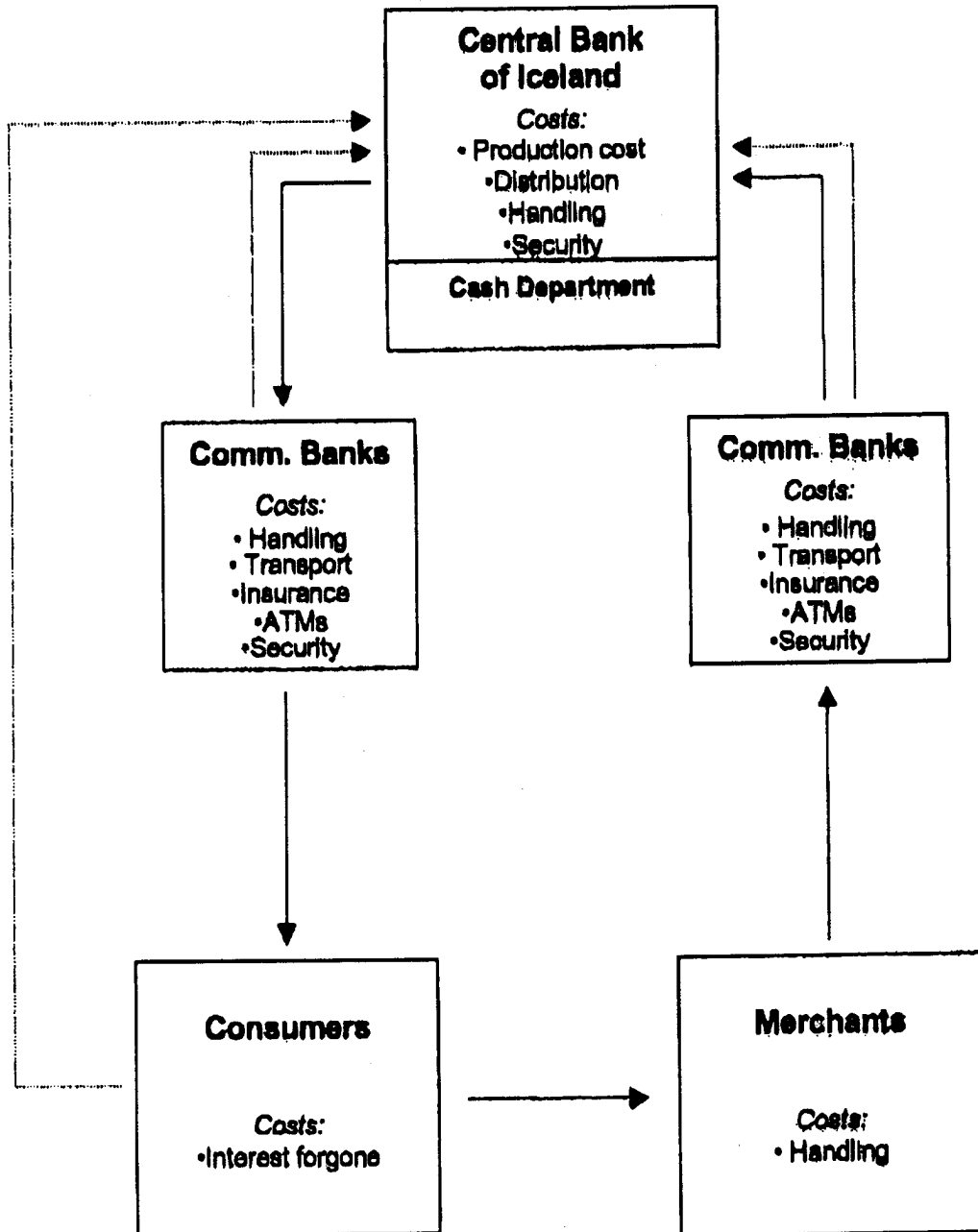
◆ *The Card Companies* deal with:

- the licensing, the franchise, the promotion and the brand trademark;
- the provision of telecommunication infrastructure;
- the provision of the authorisation and settlement (information) services;

In addition, in the Icelandic and Belgian case, card companies also operate as acquirers, who take care of the contractual agreement with merchants.

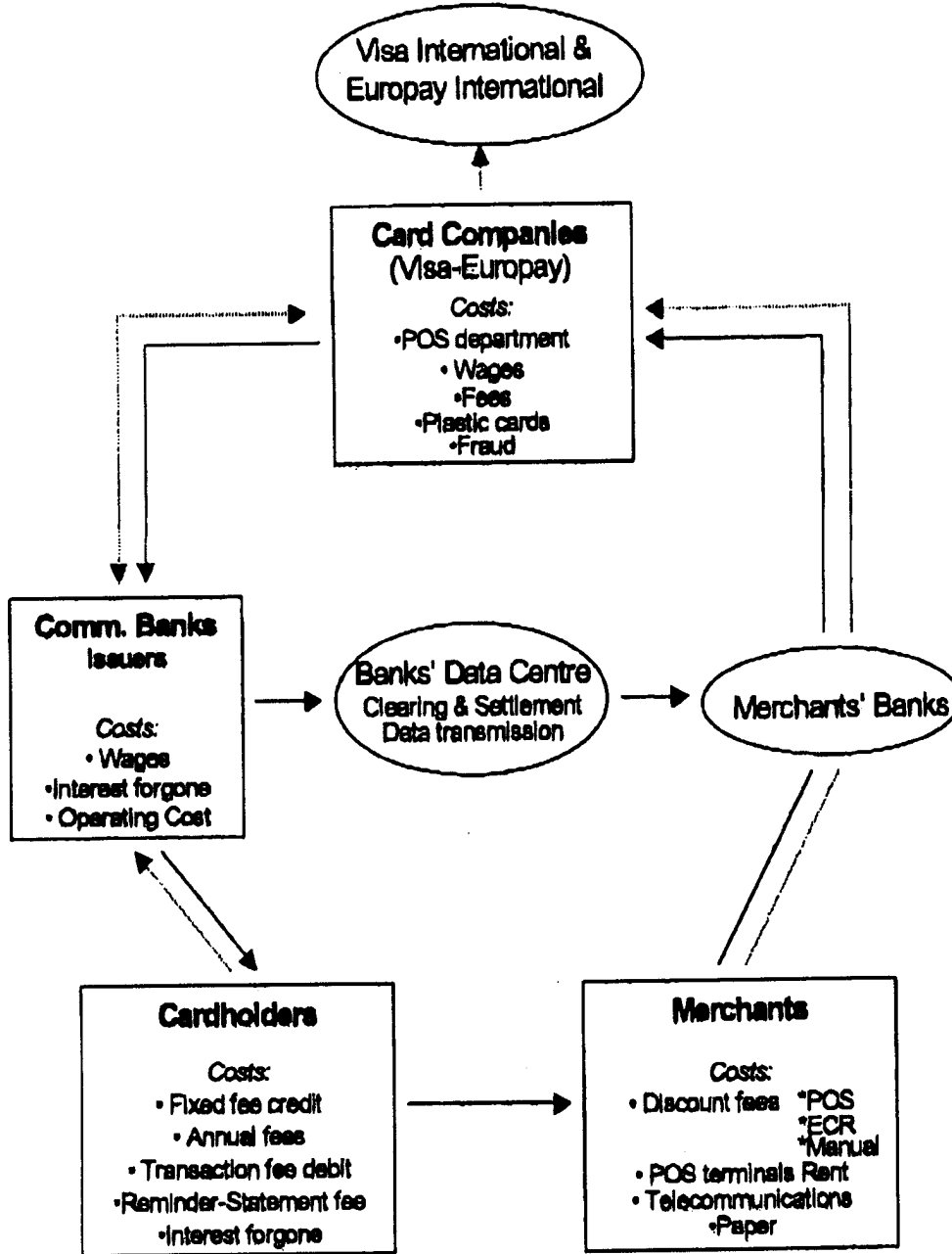
- ◆ *Commercial and saving banks* issue cards to their customers, and have the contractual relationship with cardholders.
- ◆ *Cardholders* receive the card based on a current account from their bank; every purchase is charged on their account immediately or later on.
- ◆ *Merchants* operate the transaction via the POS network and, later on receive the payment from their bank.
- ◆ *The Banks' Data Centre* intervenes for the clearing and settlement, between the cardholder's bank and the merchant's bank. The merchant's bank acts as an intermediary between the merchant and the cardholder's bank.

Figure 12: The Cash Payment System in Iceland



— : Transaction flow
- - - : Income flow

Figure 13: The Card Payment System in Iceland



— : Transaction flow
 ---- : Income flow

5.3 Costs and revenues of the payments systems in Iceland

Tables 1 and 2, show the costs and revenues of the participants in the two payments systems, i.e. the cash respectively the card-based systems. We list the main cost and revenue items for each participant. Note, however, that some costs borne by one participant are revenues of another participant. For example, the interest forgone on cash holdings by consumers (a cost for the consumers) is a revenue of the central bank. Similarly, the fees paid by the cardholder are a revenue of the bank and the card company. (As a matter of convention we give a minus sign to revenues). As a result, these costs matched by revenues cancel out when we compute the total cost of running the two payment systems. This is as it should be since they only involve transfers from one participant to another. When we add the costs and revenues of all participants we obtain the net cost which should, therefore, be interpreted as the cost of the real resources needed to run the payments system. We will call these the resource costs of running the system.

Note that this cost and revenue accounting does not take into account the intangible benefits the participants in the payment system obtain from the fact that the existence of such a system greatly facilitates their transactions needs. These benefits are to be considered as a collective good. The purpose of the present exercise is to find out, first, the resource cost of this collective good, and second, the contribution made by each category of participants.

A comparison of Tables 1 and 2 leads to the following conclusions.

- ◆ First, the total *resource cost of operating the cash system* in Iceland amounts to **ISK 1,7 billion** compared to **ISK 2,2 billion** for the *card-based system*. Remembering that only 14% of all transactions in Iceland use cash, while 78% use cards, these numbers suggest that the operation of the cash payments system is very costly compared to the card-based system. In order to provide a better comparison of the cost of the two systems we computed the *cost per transaction* in the two systems (see Tables 1 and 2). We find quite strikingly that, on average, a *transaction using cash* costs **ISK 237**, while a *transaction using cards*

NON-CONFIDENTIAL VERSION
Conclusion

19

only costs ISK 56 on average. In other words, the use of cash costs more than four times as much as the use of cards per transaction⁷. Running a cash system has a substantially higher resource cost than running a card-based payment system.

Table 1: Costs and Revenues of the Cash Payment System (1997).million ISK⁸

Central Bank⁹		
Costs	Production	47,5
	Distribution	6,0
	Cash department	20,0
	Total	73,5
Revenues	Interest earned	295,8 ¹⁰
Total		-222,3
Commercial Banks		
Costs	Handling	
	Transport	
	Insurance	
	ATMs	
	Total	694,5
Revenues		0
Total		694,5
Merchants		
Costs	Handling	928,4
Revenues		0
Total		928,4
Consumers		
Costs	Interest forgone	258,8
Revenues		0
Total		258,8
Total Resource Costs of operating cash		1659,4
Cost per transaction (14% retail transactions)		ISK 237,1

(SOME FIGURES REMOVED FOR CONFIDENTIALITY)

⁷ We also computed the cost of using cards as a percent of the transaction value. This turns out to be 1.6%. Unfortunately we could not do a similar calculation for cash, as we do not know the average value of cash transactions.

⁸ All the costs in this study are expressed in nominal amounts.

⁹ These costs and revenues concern the only function of producing notes and coins and not the general activity of the Central Bank.

¹⁰ This revenue comes from the interest forgone for consumers (258,8 million) and from the banks' interest forgone on the money stored in ATMs (37 million). This second cost is included in the figure concerning the total cost of ATMs.

NON-CONFIDENTIAL VERSION
Conclusion

20

**Table 2: Cost and Revenues of the Card Payment System (1997),
million ISK¹¹**

Card Companies			
Costs	POS department		
	Personnel		
	International fees		
	Plastic and sales slips		
	Fraud and bad losses		
	Operating costs		
	Total		
Revenues	Fees		
Total			
Commercial Banks			
Costs	Personnel		
	Interest forgone		
	Other operating costs		
	Total		
Revenues¹²	Fees and interest revenues		
Total			
Merchants			
Costs	Fees		
	Rent for POS terminals		
	Telecommunications		
	Paper		
	Total	1608,4	
Revenues		0	
Total			1608,4
Cardholders			
Costs	Fixed once (credit)		
	Annual fees (credit-debit)		
	Transaction fee (debit)		
	Reminder-Statement fees		
	Interest forgone	405,5	
	Total	1366,8	
Revenues		0	
Total			1366,8
Total Resource Costs of operating cards			2171,8
Cost per transaction (78% retail transactions)			ISK 55,7
Cost as percentage of the transaction amount			1,6%

(SOME FIGURES REMOVED FOR CONFIDENTIALITY)

¹¹ All the costs in this study are expressed in nominal amounts. The detail about the fees earned by banks and card companies is given in the second part of this study.¹² Cfr. supra.

NON-CONFIDENTIAL VERSION
Conclusion

21

The high resource cost of running the cash system is also evident from the following numbers. The total stock of currency in circulation in 1997 amounted to ISK 6,9 billion, while the cost of operating this stock of currency was ISK 1,7 billion. Thus, the cost of operating the cash system in 1997 represented 25% of the outstanding stock of currency in circulation. This means that the cost of using, say, an ISK 1000 banknote during a year was ISK 250. With these numbers of the cost of cash it is not surprising that a card based system is much cheaper.

NON-CONFIDENTIAL VERSION
Conclusion

22

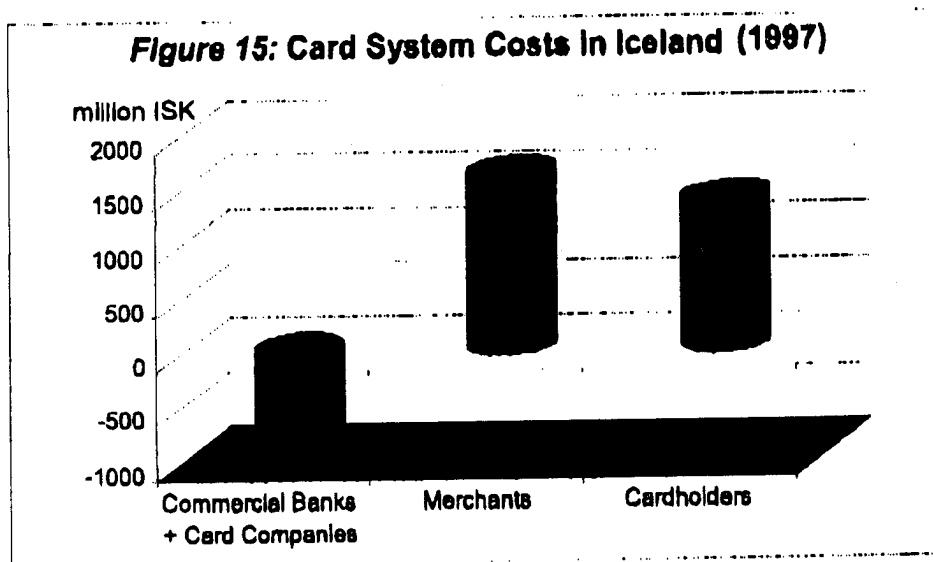
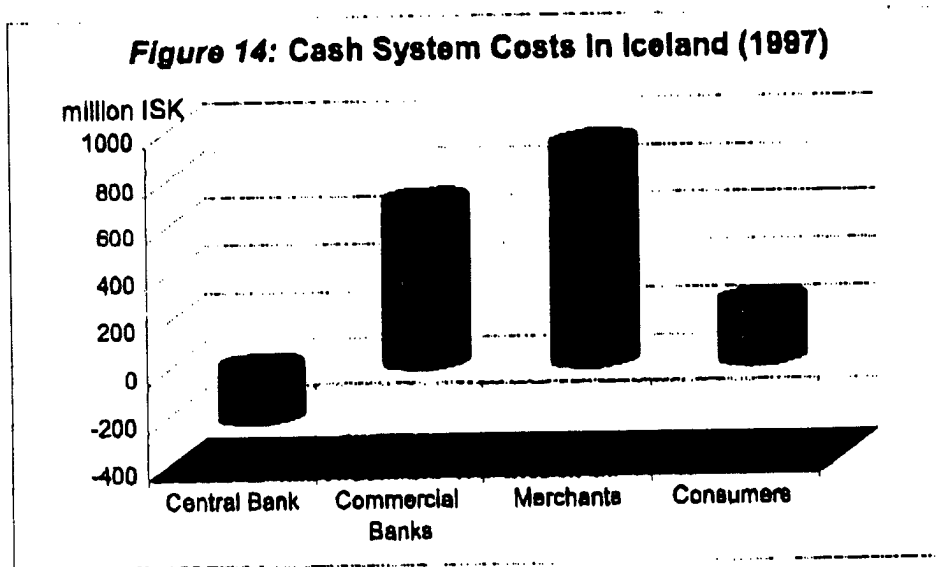
- ◆ A second difference between the two payments systems has to do with the distribution of the costs (and revenues). In order to highlight these differences we summarise the information contained in Tables 1 and 2 in Figures 14, 15 and 16. A comparison of Figures 14 and 15 makes clear that the *cash system* is a profitable activity for the central bank. The counterpart of the profit of the central bank is the cost borne by the consumers in the form of the interest forgone on their cash holdings.

In order to highlight some other aspects of the different distribution of costs and revenues, we have computed the costs and revenues per transaction for the different participants in the payments system. The information is presented in Figure 16 where we have consolidated the banks and the card companies, as the banks are shareholders of the card companies.

It should be stressed that merchants and consumers may not always perceive the cost savings of a card system correctly. The reason is that the cost of using cash is often hidden, and therefore not always correctly imputed, whereas the cost of using cards is most often an explicit cash outlay. The merchant, for example, who spends half an hour per day counting his cash and another half hour running to the bank, often does not add this as a cost in his bookkeeping, while he does book the fees he pays for operating the card system. Similarly, the consumer is not always aware of the cost represented by the interest forgone on his cash holdings.

As a result, merchants and to a lesser extent consumers, perceive the card system to be expensive for them compared to the "free" use of cash. Our exercise demonstrates, however, that when proper account is taken of the resource cost of using cash, even for consumers and merchants (especially for the latter) the use of the card system is substantially cheaper than the use of cash.

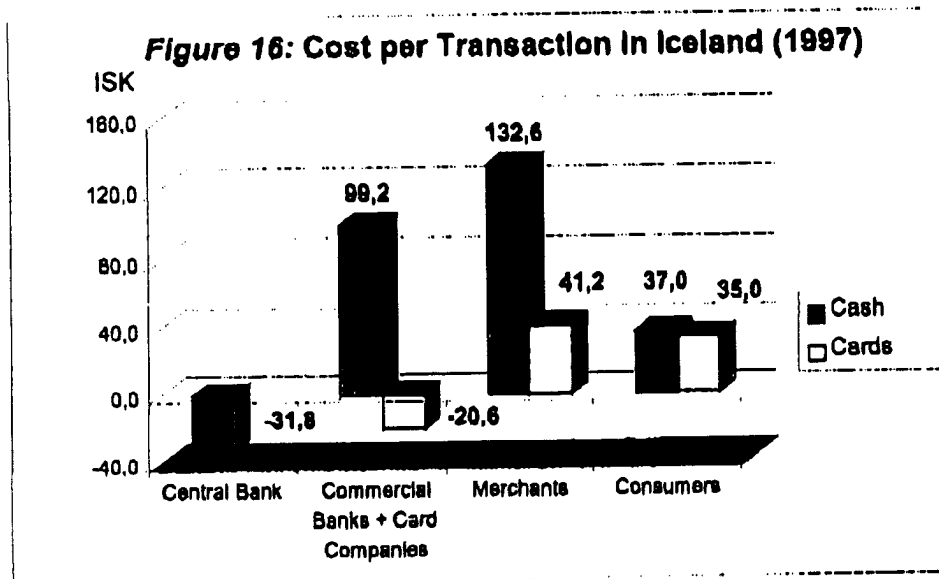
NON-CONFIDENTIAL VERSION
Conclusion



A final comment should be made here. The distribution of the costs of the two payments systems as shown in Figures 14 to 15 does not tell us anything about the ultimate incidence of these costs. For example, the cost borne by the merchant is likely to be passed to the consumer (fully or partially) in the form of higher prices. This will be the case both for cash and cards. As a result, the lower resource cost made possible by cards will be reflected in lower prices for the consumer.

NON-CONFIDENTIAL VERSION
Conclusion

24



It is not surprising that the banking sector is the motor behind the development of a still larger card market. The banking sector has the incentives to promote the use of cards. Banks will continue to do so for several reasons¹³:

- *Cost Reduction.*

The debit and credit cards are a key ingredient within a bank money transmission strategy and they are designed to displace expensive cheques and cash with a more secure and greater information component.

- *Revenue per Transaction.*

Unlike the majority of bank payment instruments, plastic card transactions bring with them a revenue stream that can offset the cost of transmission (e.g. cardholders' transactions).

- *Merchant Business.*

Both credit and debit card processing provide the commercial instrument to sell corporate services to retailers.

- *Value Added Features.*

Credit and debit cards and their equivalent (smart cards) offer the potential of new value added services to the consumer and the retailer. Potentially these can generate substantial new revenue streams. In addition, as cards are not anonymous, banks could take advantage of a wide range of information

¹³ Jones, P., 1993, "Pricing and Card Payments, Economics for Bankers and Retailers", Payment System Europe.

concerning spending habits of their customers, using them for commercial purposes (direct mailing, offer tailor-made forms of credit, etc.).

5.4 The sectoral allocation of the resource costs

In the previous section we analysed the costs and revenues of the different sectors in the cash and card payments systems. In this section we concentrate on how the *resources costs* are distributed over the different sectors. This is a rather different exercise than the one performed in the previous section. In the present section we ask the question where the real resources (labour, capital) are employed to run the payments system. An example illustrates the difference of focus. The merchant who pays a fee to the acquirer considers this to be a cost of operating the card system. In fact he pays a price for the real resources that are employed by the card companies and the banks in the production of these payment services. The merchant himself does not use up many real resources to operate the card payment system.

In order to obtain the resource costs per sector we start from Tables 1 and 2, and net out all cost items in one sector that are revenues for another sector. For example, the fees paid by the merchant to the acquirer, or the interest forgone on cash holding by the consumer (a revenue of the central bank). This leads to tables 3 and 4. We summarise the results in figures 17 and 18.

The most striking differences between the cash and card payments systems are the following. The resource costs of operating the cash payments system are borne overwhelmingly by the merchants (69% of the total) and to a lesser extent by the commercial banks (28% of the total). Surprisingly, it is not the central bank that uses up many resources to produce cash. The resource costs of the central bank are almost irrelevant (3% of the total). The merchants and (to a lesser extent) the banks are the agents who employ labour and capital to operate the cash system.

Things are very different in the card payment system. In this system most of the resources (96%) needed to run the system are employed in the banking sector (card companies and commercial banks). The merchants contribute very little in terms of real resource use.

NON-CONFIDENTIAL VERSION
Conclusion

26

**Table 3: Resource Costs of the Cash Payment system in Iceland (1997),
million ISK**

Central Bank	
Production	47,5
Distribution	6,0
Cash department	20,0
Total	73,5
Commercial Banks	
Handling	
Transport	
Insurance	
ATMs	
Total	657,5
Merchants	
Handling	928,4
Total	928,4
Total	1659,4

[SOME FIGURES REMOVED FOR CONFIDENTIALITY]

NON-CONFIDENTIAL VERSION
Conclusion

27

**Table 4: Resource Costs of the Card Payment system in Iceland (1997),
million ISK**

Card Companies	
	POS department
	Personnel
	Marketing
	International fees
	Plastic and sales slips
	Fraud and bad losses
	Other costs
Total	1230,6
Commercial Banks	
	Personnel
	Interest forgone
	Other operating costs
Total	858,1
Merchants	
Costs	Telecommunications
	Paper
Total	83,1
Total Cost	2171,8

[SOME FIGURES REMOVED FOR CONFIDENTIALITY]

Figure 17: Resource Costs of Cash in Iceland

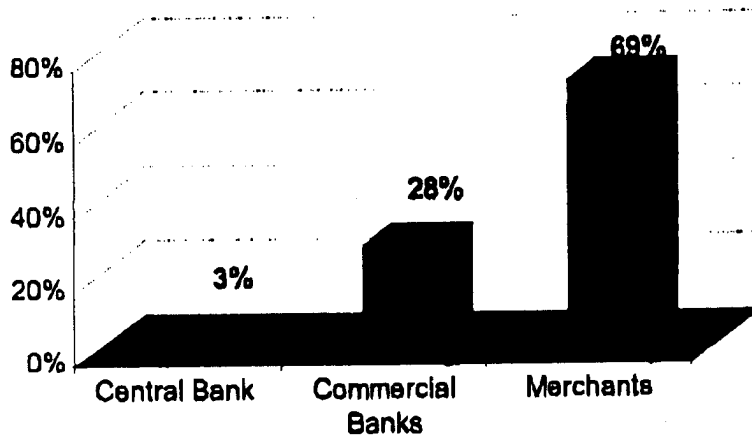
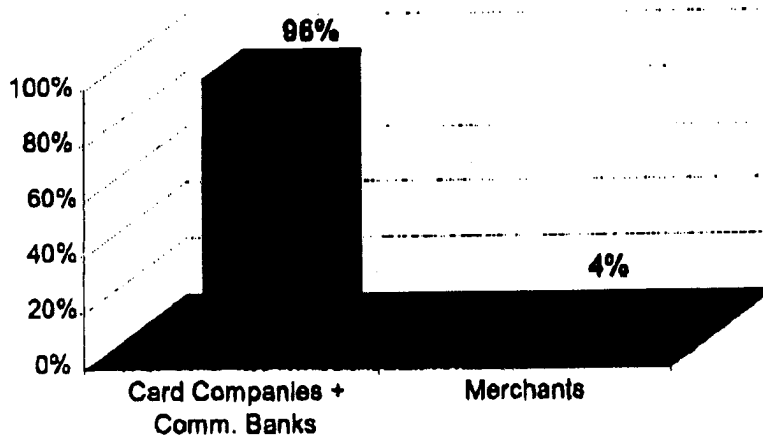


Figure 18: Resource Costs of Cards in Iceland



6. COSTS AND REVENUES OF CASH AND CARD BASED SYSTEMS: THE CASE OF BELGIUM

In this section we present our main results for Belgium. In the second part of this report we go into the detail of how the cost and revenue numbers were arrived at.

We follow the same structure as in the case of Iceland. We first present the flow charts of the cash respectively the cards based payments systems. We then analyse the main components of the costs and benefits of the two payments systems in Belgium.

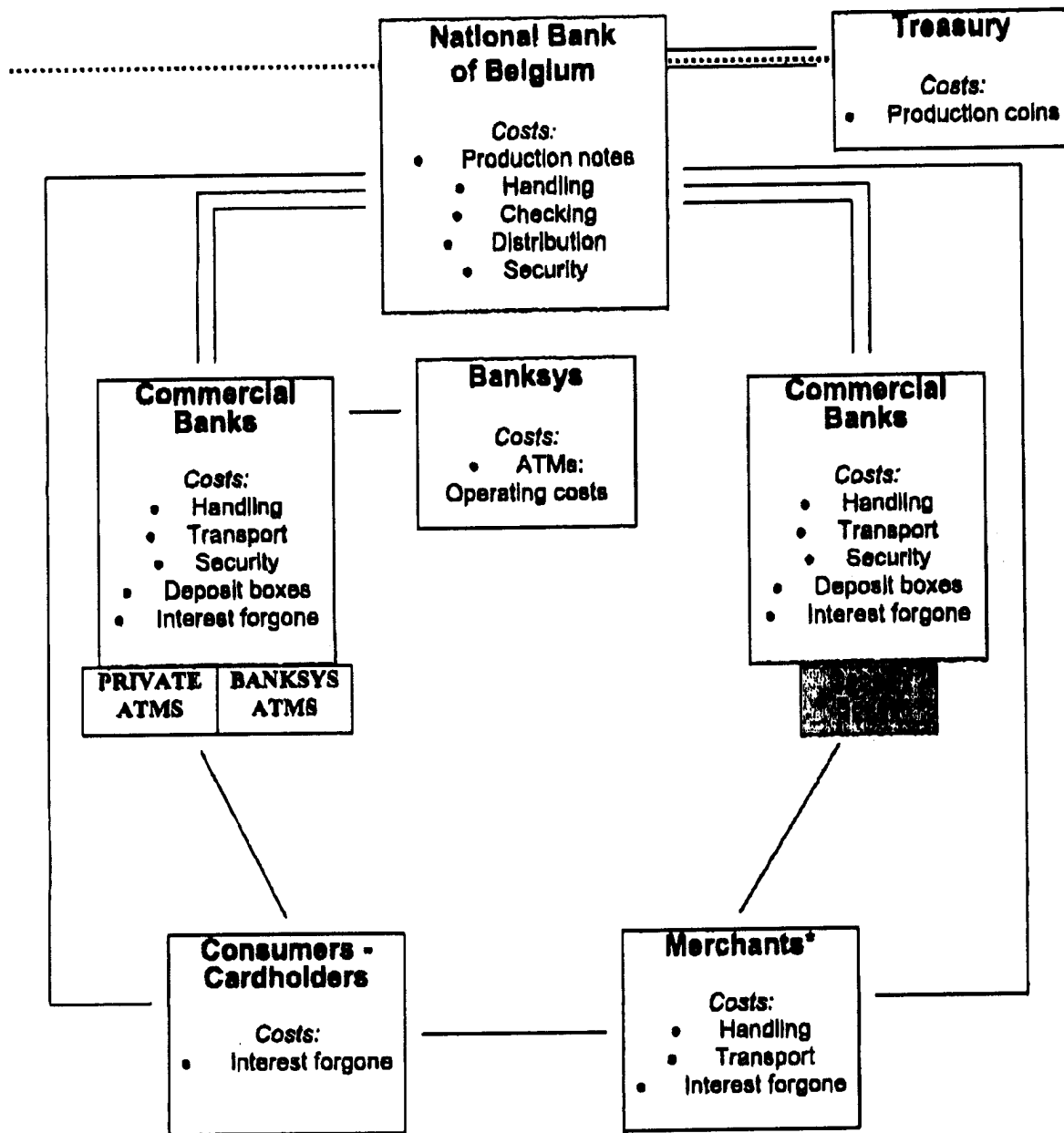
6.1 The cash payments system in Belgium

In Figure 19 we present the flow chart of the cash payments system in Belgium. There are only small differences with the Icelandic flow chart. We concentrate on these differences here. (The reader is referred to the Icelandic chapter for a general discussion of this flow chart). First, in Belgium the Treasury plays a role in the provision of cash in that it is responsible for the supply of the coins, while the National Bank takes care of the banknotes. However the National Bank puts in circulation both notes and coins. Second, ATMs are operated by the banks and by a separate company Banksys.

6.2 The card based payments system in Belgium

Figure 20 presents the flow chart of the card-based payments system in Belgium. The structure is more complex than in Iceland, because there are two separate networks for card transactions: one for debit and electronic purse (Proton) cards, and the other, for credit cards. Banksys is the company dealing with debit and Proton cards for the entire banking sector. Bank Card Company (BCC) manages the credit cards business. The Belgian banks (the five biggest Belgian banks holding the 80 percent of the shares) own both Banksys and BCC.

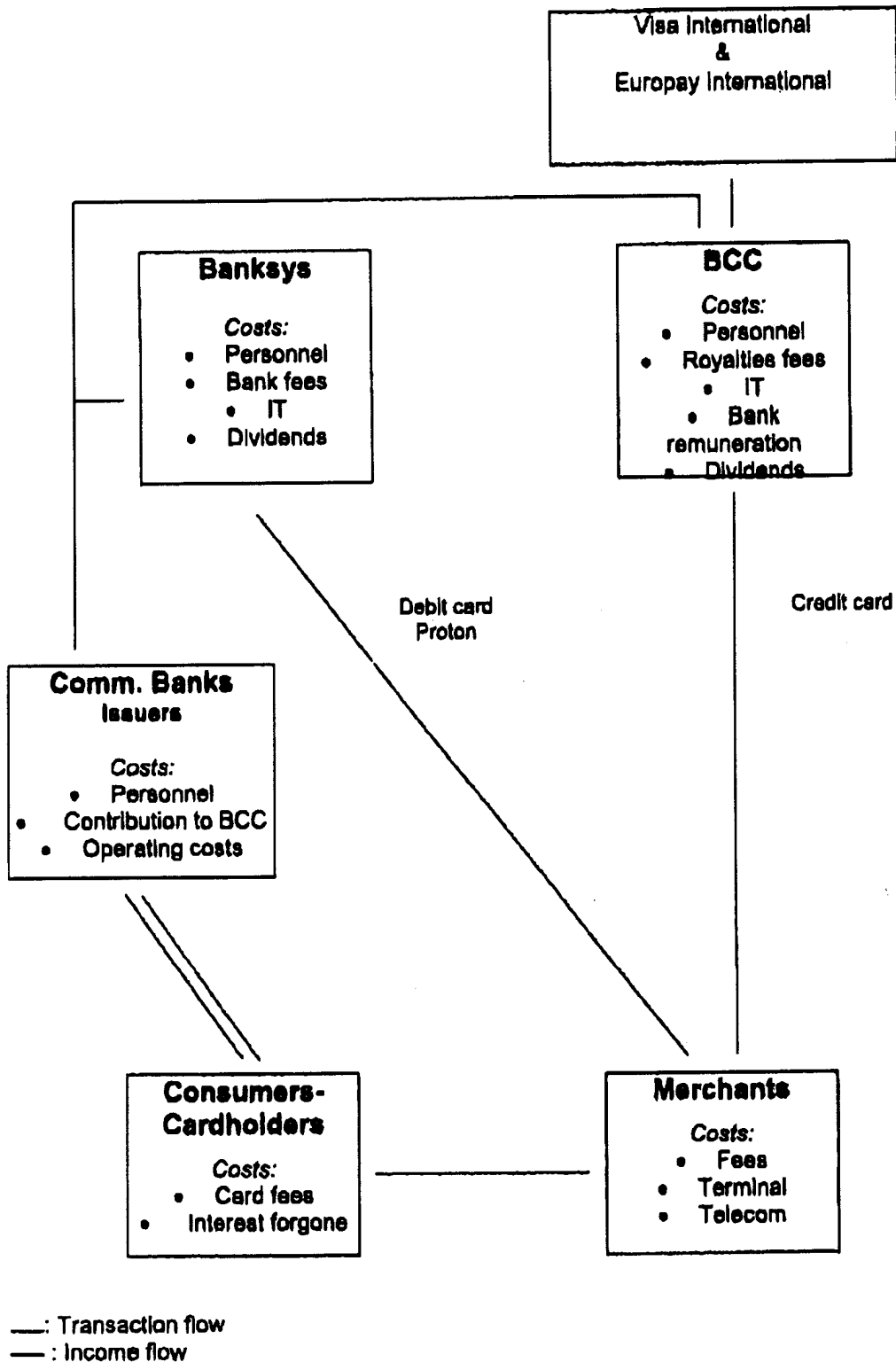
Figure 19: Cash Payment system In Belgium



— Transaction flow: notes & coins
- - - Income flow

* In the Belgian case there is an estimate of the part of cash held by merchants, therefore we could compute their interest forgone. In Iceland there is not any similar study. In this case we assume that cash is held only by consumers and commercial banks.

Figure 20: Card Payment system In Belgium



6.3 Costs and revenues of the payments systems in Belgium

We present the summary of costs and revenues of the two payments systems in Belgium in Tables 5 and 6. The general comments formulated in the Icelandic case study apply here too (see page 17). We will not repeat them here.

A comparison of the two tables leads to the following conclusions.

- First, the total resource cost of operating the cash payment system in Belgium amounts to **BF 68 billion** compared to **BF 10 billion** for the card-based system. It is useful to express these numbers in terms of average cost. This is shown in Table 5, where we present the cost per transaction and the cost as a percent of transaction value. The cost per transaction is defined as the total cost divided by the number of transactions. This yields a cost of **BF 22,6 for cash** and of **BF 26 for cards per transaction**. (The number of cash transactions in Belgium amounts to 3 billion a year versus only 370 million for cards. These numbers reflect the fact that Belgium is still very much a cash payment system).

The cost as a percent of transaction value gives a totally different picture. We find that the use of cash has an average cost that represents 9% of the value of cash transactions, whereas the use of cards costs 1,3% of the value of the card transaction (see Table 5). The reason for this large difference has to do with the fact that the average value of cash transaction is only BF 250 versus BF 2053 for card transactions.

The second measure of average cost seems to be the more appropriate one. It tells us that the use of cash adds 9% to the cost of goods and services (that are transacted by cash). The use of cards, on the other hand adds only 1,3% to the cost of goods and services (transacted by cards). These are certainly spectacular differences illustrating the relative inefficiency of the cash payment system.

NON-CONFIDENTIAL VERSION
Conclusion

33

Table 5: Measures of average cost

	Cost per transaction (In BF)	Cost as % of transaction value
Cash	22,6	9,0%
Cards	26	1,3%

Table 6: Costs and Revenues of the Cash Payment system (1998), million BF

Central Bank¹ - Treasury		
Costs	Production-notes	366,00
	Production-coins	250,00
	Handling	750,00
	Machines	30,00
	Distribution & Transport	50,00
	Security	448,57
	Total Costs	1894,57
Revenues	Interest earned	14337,31
Total		-12442,74
Commercial Banks		
Costs	Handling	
	Transport	
	Insurance and security	
	Fraud	
	ATMs	
	Banksys	
	Interest forgone	1840,30
	Total Costs	
Revenues	Fee on ATM withdrawals	
Total		
Banksys		
Costs	Investment	
	Operating costs	
	Total Costs	
Revenues	Bank fees	
	Maintenance	
	Total Revenues	
Total		

¹ See footnote no.9.

NON-CONFIDENTIAL VERSION
Conclusion

34

Merchants		
Costs	Handling	46440,00
	Transport	942,50
	Interest forgone	7239,00
	Total Costs	54621,50
Revenues		0
Total		54621,50
Consumers		
Costs	Interest forgone	
	Fixed fee for ATM withdrawal	
	Total Costs	5501,01
Revenues		0
Total		5501,01
Total Costs of operating cash		67500,32
Estimated number of cash transactions:		2,99 billion
Cost per transaction		BF 22,6
Cost of the cash payment system as % of GDP		0,745
Cost as a % of the Transaction Value		9%

[SOME FIGURES REMOVED FOR CONFIDENTIALITY]

Table 7: Costs and Revenues of the Card Payment system (1998), million BF

Banksys	
Costs	Personnel
	Banks fees
	IT & Telecommunications
	External Services
	Depreciation & Financial costs
	Dividends
	Total Costs
Revenues	Merchant fees
	Terminals sale, rent & maintenance
	International sale
	Miscellanea
	Total Revenues
Total	

NON-CONFIDENTIAL VERSION
Conclusion

BCC

Costs Personnel
 Dispatching & Marketing
 Royalties Fees
 IT & Processing
 Interest cost
 Banks remuneration
Total Costs

Revenues Sales revenues
 Cash fees
 Exchange rate
 Banks' Invoicing
Total Revenues

Total

Commercial Banks

Costs Personnel
 Operating costs & Fraud
 Participation to BCC
 Fees
 Security
Total Costs

Revenues Cardholders fees
 POS return - Banksys
 Return from BCC
 BCC + Banksys dividends
 Interest earning on C/A
Total Revenues

Total

Merchants

Costs Per-transaction Fee
 POS terminals' Rent/Buy
 Cost of Telecommunication 116,97
Total Costs 7341,20

Revenues 0

Total 7341,20

Consumers

Costs Fees for debit card
 Fees for credit card
 Fees for proton card
 Interest forgone 1352,58
Total Costs 6258,78

Revenues 0

Total 6258,78

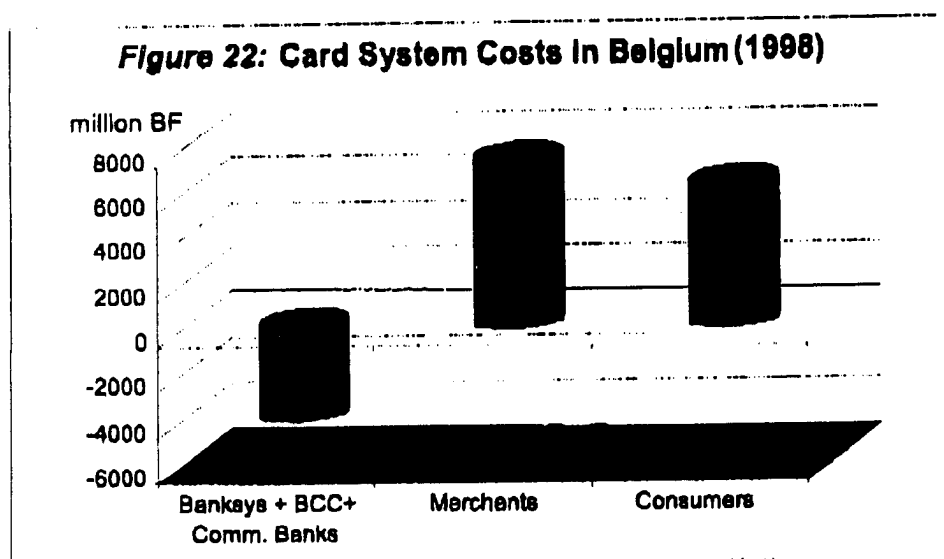
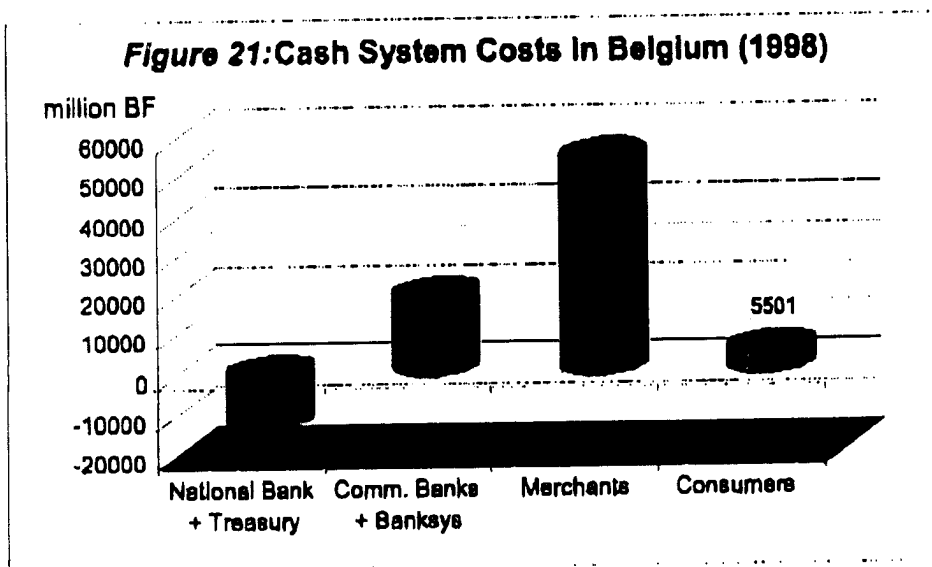
Total Costs of operating cards 9567,81

NON-CONFIDENTIAL VERSION
Conclusion

Estimated number of cash transactions:	369 million
Cost per transaction	BF 26
Cost of the card payment system as % of GDP	0,106
Cost as a % of the transaction amount	1,3%

[SOME FIGURES REMOVED FOR CONFIDENTIALITY]

- As in the case of Iceland, we also analyse the distribution of the costs and revenues of the two payment systems. We represent these in Figures 21 and 22. We find results very similar to Iceland. The beneficiary of the cash payment system is the National Bank. The banks and the merchants incur most of the costs. As in the case of Iceland, most of these costs result from the transport, distribution and manipulation of cash, a very labour intensive activity.



NON-CONFIDENTIAL VERSION
Conclusion

38

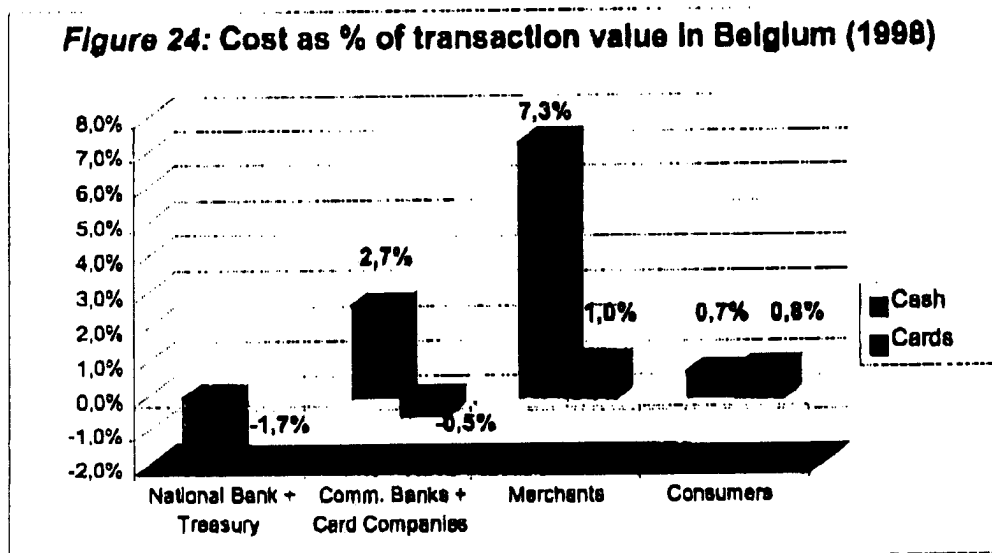
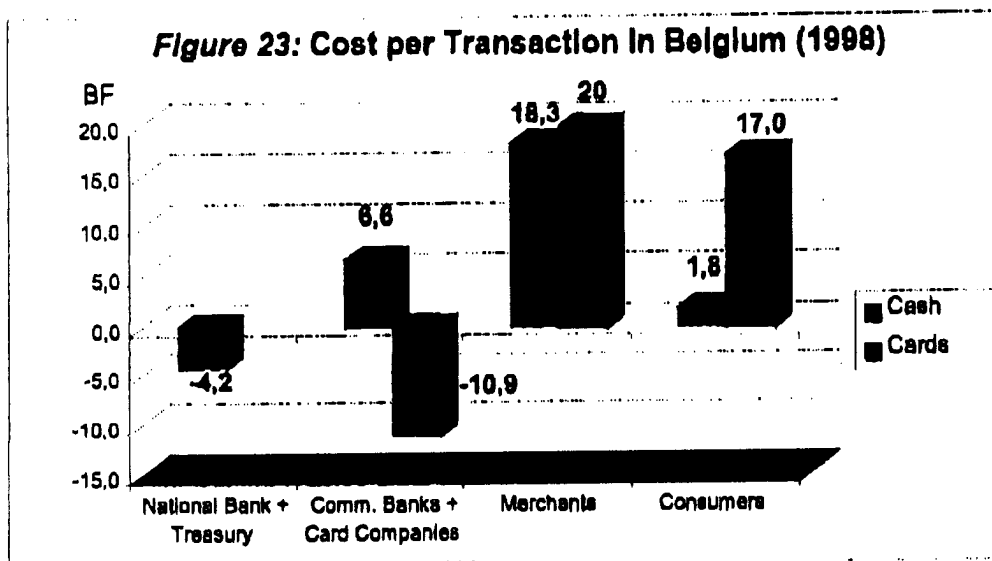
As in the case of Iceland, it should be stressed that the imputations of the costs of cash and cards to the different participants does not tell us anything about the ultimate incidence of these costs, i.e. about the question who bears the burden of these costs. For example, the fact that the merchants' imputed costs of cash are high does not mean that the merchants bear the full cost of cash transactions. Presumably a substantial part of this cost is translated in the price of the goods and services so that the consumer bears a substantial part of these costs.

We have also computed the average costs and revenues of cash and cards (both per transaction and as a percentage of the value of transactions) for the different participants. These are shown in Figure 23 and 24.

The two definitions of average costs produce very different results for merchants and consumers. Let us look at the merchants first. Using the cost per transaction we find that cash and cards cost about the same for the merchants. When we express the cost as a percentage of transaction value, however, the costs of the two payments systems are very different. In this case, cash transactions cost the merchant 7,3% of the transaction value against only 1% for card transactions. This large difference has to do with the much larger average value of card transactions (BF 2.053) as compared to cash transactions (BF 250). Thus, when we express the costs as a percent of sales, cash sales involve much higher costs than card sales for the merchant. We believe that this is the right measure of the average cost for the merchant.

A similar phenomenon occurs for the consumer. Measured by the cost per transaction the use of cards appears to be much higher for the consumer than the use of cash. When measured as a percentage of the value of the purchase, the cost for the consumer is about the same.

Again one should add here that the distribution of the costs as represented in Figures 21 and 22 do not tell us who effectively bears the cost and who effectively enjoys the benefits of the two payments systems. For example, in a competitive environment, the consumers should reap a significant part of the savings in resource cost that a card-based system makes possible. The greater efficiency of banks and the lower costs of merchants will be passed on (at least partly) to consumers in the form of lower prices.



NON-CONFIDENTIAL VERSION
Conclusion

40

6.4 Sectoral Allocation of Resource Costs

As in the case of Iceland we analyse the resource costs per sector. These are shown in Tables 8 and 9. They are obtained from Tables 5 and 6 after netting out the transfers between sectors (e.g. the fees paid by the consumers and merchants to the banking sector). We summarize the results in Figures 25 and 26.

We find broadly the same results as in the case of Iceland. In the cash system the merchants and to a lesser extent the banks (70% and 27% respectively) provide the real resources in the operation of the system. Like in Iceland very few resources are used up by the central bank in the operation of the cash system. In the card system the banking sector employs the bulk (88%) of the resources needed to operate the system, a proportion similar to the Icelandic case, while merchants use up the rest of these resources.

NON-CONFIDENTIAL VERSION
Conclusion

41

**Table 8: Resource Costs of the Cash Payment system in Belgium (1998),
million BF**

Central Bank - Treasury	
Production-notes	366,00
Production-coins	250,00
Handling	750,00
Machines	30,00
Distribution & Transport	50,00
Security	448,57
Total	1894,57
Commercial Banks	
Handling	
Transport	
Insurance & Security	
Fraud	
ATMs	
Total	17352,25
Banksys	
Investment	
Operating costs	
Total	871,00
Merchants	
Handling	46440,00
Transport	942,50
Total	47382,50
Total Cost	67500,32

[SOME FIGURES REMOVED FOR CONFIDENTIALITY]

NON-CONFIDENTIAL VERSION
Conclusion

42

**Table 9: Resource Costs of the Card Payment system in Belgium (1998),
million BF**

Bankays	
Personnel	
IT & Telecommunications	
Depreciation & Financial costs	
Total	2544,04
BCC	
Personnel	
Dispatching & Marketing	
Royalties Fees	
IT & Processing	
Interest cost	
Total	2173,52
Commercial Banks	
Personnel	
Operating costs & Fraud	
Fees	
Security	
Total	3733,27
Merchants	
Telecommunications	1118,07
Total Cost	9567,80

[SOME FIGURES REMOVED FOR CONFIDENTIALITY]

Figure 25: Resource Costs Cash In Belgium

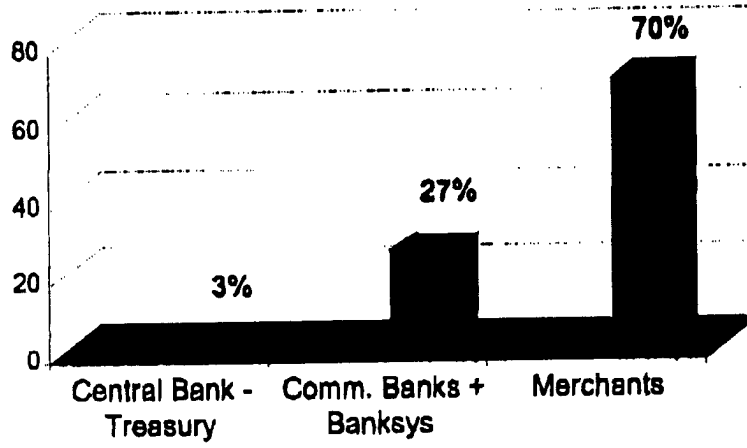
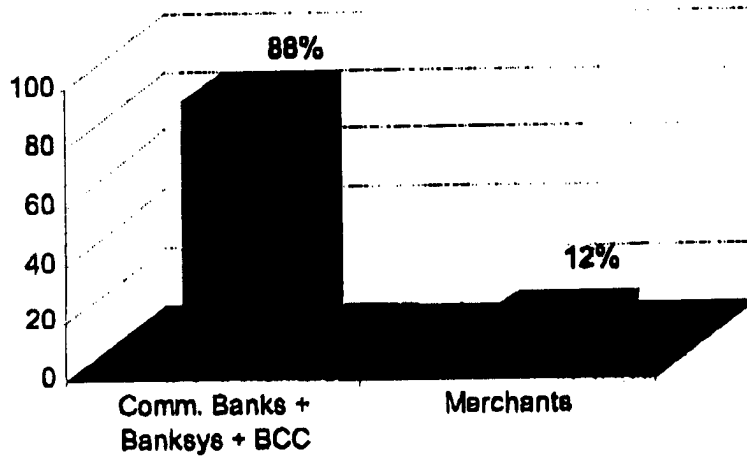


Figure 26: Resource Costs of Cards In Belgium



7. COMPARING ICELAND AND BELGIUM

In the following table we compare the average costs of cash and card payments in Iceland and Belgium. Unfortunately, our comparison is incomplete, as we did not obtain information on the average value of cash transactions in Iceland. As a result, we could not compute the cost of cash as a % of transaction value in Iceland. Nevertheless, the numbers in Table 10 allow us to derive interesting conclusions. First, we observe that the estimates of the average cost of card use in Iceland and Belgium is of the same order of magnitude. In fact, the average cost measures appear to be a little higher in Iceland than in Belgium. This may seem surprising as the card use is much more developed in Iceland than in Belgium so that economies of scale can be more fully exploited in Iceland. However, since Iceland is a very small country, this may limit the full exploitation of economies of scale in that country. The net effect is that card use is more costly in Iceland than in Belgium.

Second the big differences in the two countries is in the average cost of cash. Measured as a cost per transaction, cash use is about five times more expensive in Iceland than in Belgium. Our only explanation is economies of scale. As cash has almost disappeared in Iceland there are large diseconomies of scale in that country. Conversely, in Belgium, the large use of cash leads to relatively large economies of scale. Put differently, in order to run a cash payments system an infrastructure of distribution of cash must exist. This is a fixed cost component. The small use of cash in Iceland implies that an average cash transaction must be very costly.

Another way to contrast the relative inefficiency of the provision of cash in Iceland is to divide the total resource cost of the cash system to the outstanding stock of cash. We then find that in Iceland this ratio is 25% versus 13% in Belgium. In other words in Iceland the use of a banknote of ISK 1000 during a year costs on average ISK 250 while in Belgium the use of a BF 1000 note during a years costs only BF 130. The contrast between Iceland and Belgium is interesting because it shows how large the average cost of cash use can become as one gradually moves in the direction of its extinction.

Third, the Belgian results shed some light on an interesting phenomenon, which can be described as follows. The progression of cards as a means of payment starts with high

NON-CONFIDENTIAL VERSION
Conclusion

45

value payments and gradually invades the low value segment of the payments system. In this process cash is increasingly reduced to a payments medium for low value transactions. As a result, the average cost of cash as a percent of the transaction value has a tendency to increase. This is confirmed by the Belgian result. We see that the average cost of cash (cost per transaction) is approximately the same as for cards. However, the average cost of cash as a percent of transaction value is dramatically higher than the average cost for cards mainly because cash is increasingly reduced to a low-value payments instrument. (In box we analyse these relationships in more detail).

**Table 10: Average costs of cash and card payments
in Iceland and Belgium**

	Cash payments		Card payments	
	Iceland	Belgium	Iceland	Belgium
Cost per transaction (in BF)	125	23	29	26
Cost as % of transaction value	?	9%	1,6%	1,3%

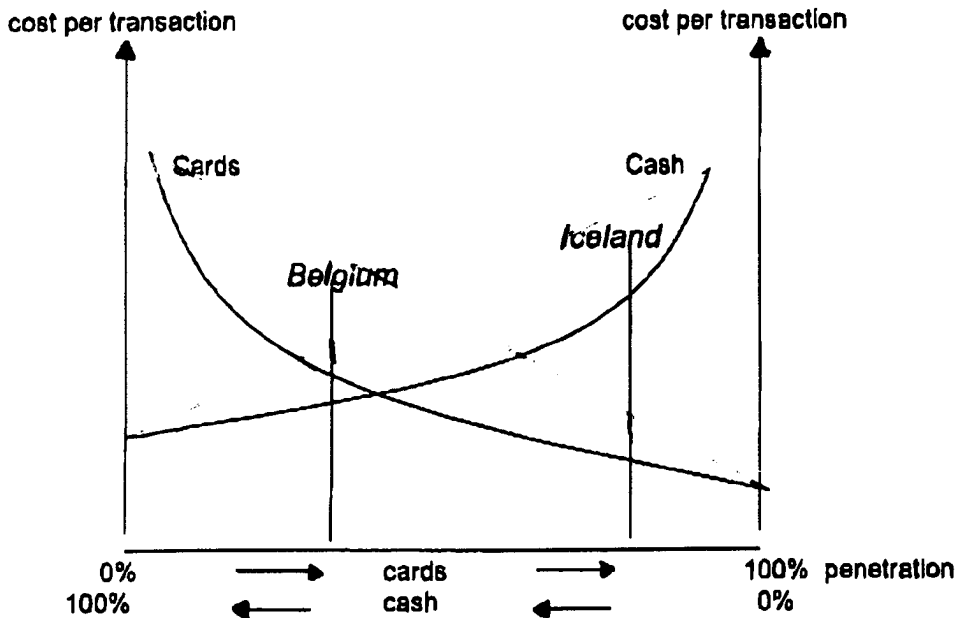
Box 1: Average costs and economies of scale

The results for Iceland and Belgium can be represented graphically (see Figure B1). On the horizontal axis we set out the market shares of cards and cash in the total payments system (measured by the number of transactions). The cards market share is increasing from left to right. Thus, when it reaches 100% all payments use cards. The cash market share is increasing from right to left. Thus, when the card market share is 100% the cash market share is 0% and vice versa. The average cost curve of cards is declining when the number of transactions increases reflecting economies of scale. Similarly the average cost curve of cash (measured from right to left) is declining for the same reason.

Belgium is a heavy user of cash. As a result, the cards market share is still small. The effect is that the cost per transaction for cards exceeds the one for cash. Iceland has moved far in the direction of card use. As a result, the average cost of cards is very low compared to the average cost of cash. The latter exhibits strong diseconomies of scale. (Note that we have assumed that the average-cost curves of both countries are identical. This is unlikely to be the case. The small size of Iceland is likely to result in average cost curves for both cards and cash located higher than in Belgium. This then

explains why the average cost of cards in Iceland exceeds the average cost of cards in Belgium).

Figure B1: Cost per transaction



We would now like to express the average cost as a percent of the transaction value. In order to do so, we start from a micro-economic analysis of the average cost curves. In Figure B2 we set out the average cost (per transaction) as a function between the transaction value. The figure illustrates a fundamental difference of the cash and the card technology. The cash payments system is a physical system: coins and notes are circulating physically. Real resources are used to organise this circuit. Consumers who use cash to make payments use up part of this flow of cash (and thus of resources). The higher the value of the payment the more consumers use these resources. As a result, the average cost of using cash increases with the transaction value. (Note that we assume this relation to be linear. This is a simplification. In reality this relation may be non-linear. In addition we assume a fixed cost component measured by the intercept of the cost curve with the y-axis).

Things are very different with cards. The card payments system is in essence an information system. This also requires real resources. However the consumer does not use more resources when the value of his payments increases. As a result, the average cost of cards does not increase with the value of the transaction.

An example makes this difference clear. A consumer who makes a cash payment of BF 50.000 uses more resources than when he makes a cash payment of BF 500. In the former case more cash has to be transported, manipulated and distributed than in the latter case. A consumer making a card payment of BF 50.000 or one of BF 500 uses exactly the same amount of resources. In the cards payments flow only the information differs. But this information can be transported at the same cost.

The insight provided by Figure B2 allows us to derive the average cost as a percent of the transaction value. This is shown in Figure B3. Since the average cost of cards (per transaction) is constant, the average cost as a percent of transaction value must

NON-CONFIDENTIAL VERSION
Conclusion

47

necessarily decline as shown in Figure B3. By the same token, since the average cost (per transaction), increases linearly with the transaction value, the average cost as a percent of transaction value converges to a constant number. Note that for small transaction values the average cost curve for cash must lie below the average cost curve for cards.

The process of increasing use of cards can be described as follows. Technological changes together with increasing economies of scale shift down the average cost curve of cards (in both Figures B2 and B3). As a result, cash is increasingly relegated to the small-value-transactions segment of the payments system. This process reduces the average cost of cash per transaction. This can be seen in Figure B2 by the fact that the downward shift of the card line brings us to lower point on the cash line. Note that as cards displace cash in the payments system, the provision of cash will exhibit diseconomies of scale, i.e. a smaller amount of transactions must bear the fixed cost of the cash network. In Figure B2 this leads to a shift of the cash line to the left. This shift, however, does not affect the cost of cash per transaction.

Figure B2: Average cost per transaction

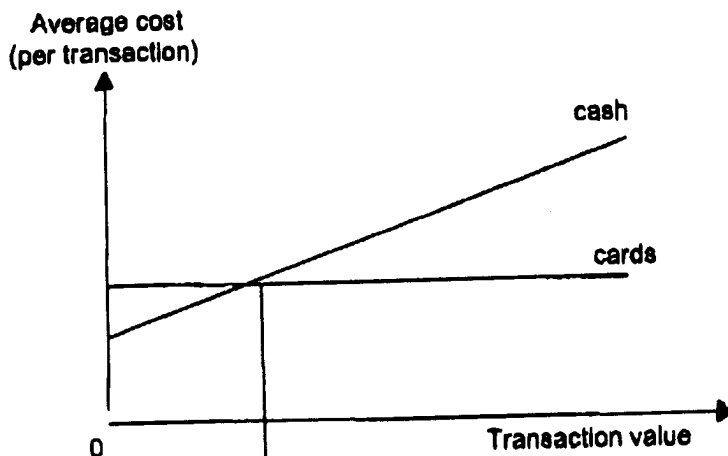


Figure B3: Average cost as a percentage of the transaction value

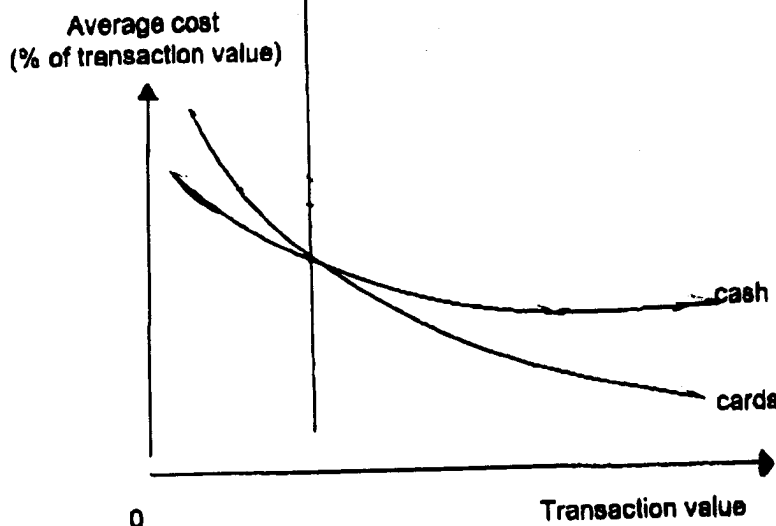


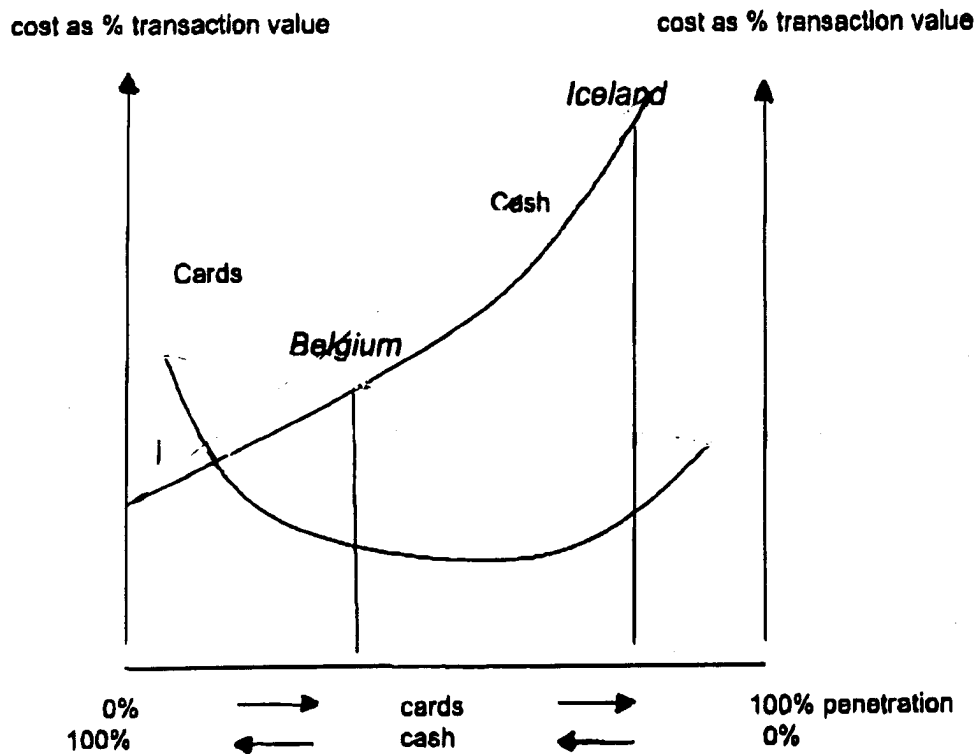
Figure B3 can be used in a similar way to illustrate how the cost of cash and of cards (as a percent of transaction value) are affected by the progress of cards. As one can see from Figure B3, a downward shift of the card line moves the intersection point with the cash line upwards. In addition, the diseconomies of scale in the provision of cash shifts the cash line upwards. The two effects reinforce each other, resulting in an increase in the cost of cash as a percent of transaction value.

We can translate these insights into Figure B4, which is similar to B1. We now relate the average costs as a percent of transaction value to market shares. From the previous discussion it is clear that the cash cost curve must be steeper than in figure B1. As a result, Belgium is located to the right of the intersection point. This means that the market share of cards is already large enough to have increased the average cost of cash expressed as a percent of the value of transactions. This phenomenon has to do with the two phenomena stressed earlier: first, the "invasion" of cards pushes cash into

the corner of small value transactions; second, it leads to diseconomies of scale in the provision of cash. This sharply increases the average cost of cash (as a percent of the value of transactions).

Note that when the process of increasing market shares of cards goes on, this may lead to increasing average cost of cards (as a percent of transaction value). The reason is that as cash is eliminated cards are increasingly used for small transaction value. This tends to increase the average cost of cards as percent of transaction value.

Figure B4: Cost as a percentage of the transaction value



7. CONCLUSION

The main conclusions of this research can be summarised as follows.

- The cost efficiency of the cash payments system is low compared to a payments system based on cards. For Iceland we found that the cost of the use of cash (per transaction) is about five times higher than the cost (per transaction) of the use of cards. No such difference was found in Belgium, where the cost per transaction of cash and cards is of the same order of magnitude. (It is even somewhat higher for cards than for cash). However, when we express this cost as a percentage of the transaction value we find that (in the Belgian case) cash is about five times more expensive than cards.
- Comparing Iceland (a low cash user) with Belgium (a high cash user) we infer that in the process towards a card payment system, the average cost of cash increases relative to cards. We identified two reasons for this phenomenon. One is that the increasing displacement of cash by cards leads to diseconomies of scale in the provision of cash, while the opposite holds for cards. Second, the same displacement of cash by cards relegates cash to the payments of low transaction values. This second effect, however, is only temporary because cards are increasingly taking over this segment of the payments system.
- The distribution of the costs and revenues changes dramatically in the progression towards a system based on cards. The big loser is the central bank, which increasingly loses its source of revenue.
- We also find that the use of cards is significantly less costly from the point of view of merchants than the use of cash. This may not correspond to the perception of many (small) merchants. The reason is that the latter often fail to take into account the resources used to manipulate and transport cash. Given the labour-intensive nature of these activities these are very costly in terms of resource use.
- Finally, consumers also gain. The source of the gains for the consumers comes mainly from the fact that the card based system lowers the resource cost of the payments

NON-CONFIDENTIAL VERSION
Conclusion

51

system. This has the same effect as any reduction in the cost of inputs in the production system. It lowers the price of goods and services for consumers.

- The resource costs are very differently allocated in the cash and card payment systems. In the cash system most of the resources needed to operate the system are employed by the merchants and to a lesser extent by the banks. The central bank employs very few resources to operate the cash payments system. In the card system, the banking sector contributes most of the resources to operate the system, while the merchants use almost no resources for that purpose.
- As already explained (page 17), we have not attempted here to estimate the value to merchants and consumers of the intangible benefits that the participants in the card payment system obtain from a system that greatly facilitates their transactions needs.

PART 2: DETAILED ANALYSIS OF THE COSTS AND REVENUES

- 1. INTRODUCTION**
- 2. ICELAND: COSTS AND REVENUES OF A CASH PAYMENT SYSTEM.....**
 - 2.1 The Central Bank of Iceland
 - 2.1.1 *Cost analysis of the Central Bank*.....
 - 2.2 Commercial banks
 - 2.3 Merchants.....
 - 2.4 Consumers.....
- 3. ICELAND: COSTS AND REVENUES OF A CARD BASED PAYMENT SYSTEM.....**
 - 3.1 Introduction: some background information
 - 3.2 Bank Card Companies
 - 3.3 Commercial Banks.....
 - 3.4 Merchants.....
 - 3.5 Cardholders
- 4. BELGIUM: COSTS AND REVENUES OF A CASH PAYMENT SYSTEM.....**
 - 4.1 The National Bank of Belgium
 - 4.2 Commercial Banks.....
 - 4.3 Banksys
 - 4.4 Merchants.....
 - 4.5 Consumers.....
- 5. BELGIUM: COSTS AND REVENUES OF A CARD BASED PAYMENT SYSTEM.....**
 - 5.1 Banksys
 - 5.1.1 *Debit Cards*
 - 5.1.2 *Proton*.....
 - 5.2 Credit Cards: BCC.....
 - 5.3 Costs and revenues of the card based payment system.....
 - 5.3.1 *Card Companies: BCC*.....
 - 5.3.2 *Card Companies: Banksys*
 - 5.3.3 *Commercial Banks*
 - 5.3.4 *Merchants*.....
 - 5.3.5 *Consumers-Cardholders*
- APPENDIX.....**

NON-CONFIDENTIAL VERSION
Iceland: Costs and Revenues of a Card based Payment System

1

PART 2: DETAILED ANALYSIS OF THE COSTS AND REVENUES

1. INTRODUCTION

In this second part we analyse very closely the cash and cashless societies in respectively Iceland and Belgium.

In particular for each one of the two countries we investigate first the cash and then the card based system, reviewing the organisation and the relationship between the agents involved. Furthermore we pay a particular attention to the assumptions we made to reconstruct the cost analysis and show which costs every agent of the cash and of the card based payment system faces.

This second part is organised as follows. In the first two chapters we consider respectively the cash and the card based payment system in Iceland. Similarly, in the latter two we deal with the cash and the card based payment system in Belgium.

2. ICELAND: COSTS AND REVENUES OF THE CASH PAYMENT SYSTEM

Cash is still the more common and preferred method of personal payments in many European Countries, especially in Germany, Spain and Italy¹. Even if systems in all countries vary in some ways (for example the number of commercial banks, the role of the central bank, etc.), in their fundamentals the problems are the same. Cash is expensive to count, sort and store, and flows through the same basic cycle between purchasers, businesses and the banking system.

There are a number of reasons why the cash handling system is costly. The first is that it is manually intensive in:

- Counting, aligning and sorting by hand;
- Feeding into machines;
- Shifting sacks or bundles of notes and coins.

The system is also very repetitive: i.e. counting is required at every hand-off.

Lastly, security is expensive and leads to inflexible working practices, due to the need for:

- Physical protection;
- Audit trails at every stage.

Let us now consider more specifically the tasks and costs for the four agents involved in the cash cycle.

2.1 The Central Bank of Iceland

The role of the Central Bank (CB) in the payment system is mostly confined to the issuing of bank notes and coins as legal tender and providing settlement facilities for banks and other parties. In addition, the CB operates the clearing system and a clearinghouse in cooperation with the banks in the form of the RB Data Centre. Moreover, Sedlabanki has the responsibility of the supervision of most of the financial sector, through its Bank Inspectorate department. The commercial banks, the Treasury

¹ The Boston Consulting Group, 1993, "European Money Handling System".

NON-CONFIDENTIAL VERSION
Iceland: Costs and Revenues of a Card based Payment System

3

and various parties such as Visa Iceland and state institutions hold accounts with the Central Bank.

We consider now, more specifically, the function of the CB as the supplier of money. In Iceland the quantity of currency in circulation is very small compared with other countries. At the end of 1997, the total volume of notes and coins issued by the Central Bank amounted to ISK 6,9 billion, i.e. about 1% of GDP (see Table 1). This value is smaller than in any G10 country. To give some examples, in the UK, the European Union country with the lowest level of currency in circulation, notes and coins represent 2,8% of GDP and, in Belgium 5,3% of GDP².

Table 1 shows the share of notes and coins in Iceland. Over last six years, notes amounted for about the 86% of total currency. Actually these figures also include the currency held by financial institution that is not really in circulation³.

Table 1: Notes and coins in circulation in Iceland *

	1992	1993	1994	1995	1996	1997
Notes	3.549.678	3.816.152	4.673.350	5.171.570	5.602.190	5.941.050
Coins	456.103	495.778	527.815	793.741	919.483	989.212
Currency	4.005.781	4.311.930	5.200.965	5.965.311	6.521.673	6.910.262
% of GDP	1	1	1,2	1,3	1,3	1,3

*Values in thousand ISK.

Source: Central Bank of Iceland.

The lifetime of a note, that is the time before the note needs to be replaced by a new one, is much longer for the higher value notes. Table 2 shows that the lifetime of the 5000-ISK note is double than the 2000- one. The lifetime of the 1000- and 500-ISK is still shorter. This is not surprising as, in general, lower-value notes are more often used than larger-value ones.

² BIS, 1997, "Statistics on Payment Systems in the Group of Ten Countries", Basle.

³ In 1996 notes in circulation have increased by more than 300 million ISK. Coins have grown by 50 million ISK, with the 100-ISK coin representing about one half of all coins. This growth of notes and coins in circulation may largely be attributed to new note and coin issues in November 1995, when the note of 2000-ISK was introduced and when a 100-ISK coin replaced the old note of the same denomination. The value of notes and coins in circulation has increased a little more than ISK 120 million but their number has decreased by 600 thousand.

NON-CONFIDENTIAL VERSION
Iceland: Costs and Revenues of a Card based Payment System

4

Banknotes also are periodically checked by the Central Bank in the Cash department and are then resorted. In 1997 this department received notes with a value of ISK 29 billion, a similar volume to the one of 1996, excluding the 100-ISK notes that are only counted and then destroyed. Thus, notes in circulation transit on average six times a year through the cash department.

Table 2: Notes in circulation by denomination in 1997

Notes	Lifetime of notes (number of months)	Times that the note came back to the CB	% of total notes in circulation
5000 ISK	30,9	4,8	66,4
2000 ISK	15,6	6,7	5,4
1000 ISK	11,3	6,4	19,2
500 ISK	10,7	5,3	7,0
Coins			
100/ 50/10 ISK	-	-	2,0

Source: Central Bank of Iceland

2.1.1 Cost analysis of the Central Bank

The Central Bank bears costs related to the money issue. These are principally linked to the production and the physical control of the currency.

- *Production*

The production cost of money includes the printing and minting costs (currency is not produced by the CB itself, but is bought in the UK), as well as the transport (from the UK). This cost does not include the cost of inland distribution of currency. Table 3 shows the unit cost of printing/minting notes and coins. We notice that the unit cost is closely linked to the value of the note or coin⁴.

As shown in Table 4, the production costs vary a lot over the six years considered. These costs increased between 1993 and 1995. They declined in 1996 and

⁴ Since 1996 the mint of smallest coins is 14% lighter, and their production cost is reduced by 35%. For instance, the minting cost of a 10-ISK coin was ISK 4 in 1994 and, ISK 2.6 in 1996. That can partly explain the drop in producing costs (Table 4).

NON-CONFIDENTIAL VERSION
Iceland: Costs and Revenues of a Card based Payment System

5

especially in 1997 when they nearly halved. During the same period, the amount of both coins and notes increased (see Table 1)⁵.

Annual-based production costs of currency are not a good indicator of the cost of cash. The amount of currency printed or minted is not based on the annual needs but on an estimate for the coming two to three years. That is to say, currency is produced and then stocked before being put into circulation. For this reason, we consider an average of the annual production cost, which is ISK 47,5 million.

Table 3: Unit cost of printing for notes and coins (ISK)

	5000-kr Note	1000-kr Note	500-kr Note	100-kr Note	10-kr Coin	5-kr Coin	1-kr Coin
Cost per unit*	9,8	7,4	7,5	6,2	2,6	2,3	1,7

Note. These amounts refer to 1997 for notes and 1998 for coins.
Source: Central Bank of Iceland.

Table 4: Cost of printing and transport (million ISK)

	1992	1993	1994	1995	1996	1997
Cost of notes and coins issue*	41,1	37,4	50,3	57,7	52,8	29,2

Source: Central Bank of Iceland.

- *Distribution*

The cost of the distribution of money to the commercial and savings banks is estimated at ISK 6 million⁶.

- *Handling*

The cost of handling cash in the cash department consists of the wage cost of employees working in that department. It amounted to ISK 20 million⁷.

⁵ In 1997, the production cost was ISK 29.2 million and only notes were issued. The printing cost of only 2 million 5000-ISK notes was about 19.6 millions krónur. In 1996, the cost of notes and coins issue amounted to ISK 2.8 million. The printing cost was 44.7 million: a half for coins and half for notes.

⁶ The central bank has no additional transport cost as commercial banks bring the notes at their own expense to the Central Bank for the recurring monitoring. Source: Central Bank of Iceland.

⁷ Source: Central Bank of Iceland.

NON-CONFIDENTIAL VERSION
Iceland: Costs and Revenues of a Card based Payment System

6

Other expense items related to cash are equipment for the computerised note recognition system and packaging of new sets of coins, but those are hardly separable from global operating costs of the CB.

In Table 5 we can see all cash-related costs of the Central Bank for 1997. The total costs are negative as the CB also obtains important revenues from the money issue. Since cash does not pay interest for its holder, the CB obtains resources freely that are then invested in financial assets. This generates a profit amounting to ISK 296 million. We will return to this source of revenue in more detail in the section concerning consumers.

Table 5: Cash-related Costs of the CB (1997)

	Million ISK
Production (average)	47,5
Distribution	6,0
Cash Department	20,0
Interest gain	- 295,8
Total	- 222,3

Source: Central Bank of Iceland.

2.2 Commercial banks

There are four commercial banks in Iceland. The National Bank of Iceland Ltd (*Landsbanki Islands*) and the Agricultural Bank Ltd (*Búnadarbanki Islands*) are state owned, while the *Islandsbanki Ltd* and the *Icebank Ltd* are privately owned. Icebank is owned by the 27 Icelandic savings banks and functions on their behalf.

Banks have a very important role in the cycle covered by cash. They allow currency to go from consumers to merchants, from the merchants to the CB and again to consumers. Every time the cash transits through the bank it has to be counted, audited, and stored. Those are repetitive and labour intensive tasks.

For this reason cash takes up an important part of banks' operating costs. Here we consider the three major cost items: wages for personnel working full time to deal with cash, the cost of transport and the cost of operating the cash dispenser machines, i.e. the ATMs.

NON-CONFIDENTIAL VERSION
Iceland: Costs and Revenue of a Card based Payment System

7

• *Handling*

Estimates concerning one of the twenty-six savings banks [NAMED SOURCE REMOVED FOR CONFIDENTIALITY]⁸, show that the cost of cash handling amounts to almost 20% of personnel costs. Of their 139 employees, 24,5 (the number of cashiers) deal full time with cash. Assuming a similar cost for all banks, the handling cost for banks amounts to ISK [CONFIDENTIAL] million.

• *Transport*

The cost of transporting currency in Iceland is relatively modest. The main reason is the near absence of safety risks (see Table 6). As a result, there is no need of cost-enhancing police escorts, "intelligent boxes" and the like.

We have obtained two sources for estimating the transport costs. For the first bank [NAMED SOURCE REMOVED FOR CONFIDENTIALITY]⁹ annual transport costs are estimated to be ISK [CONFIDENTIAL] million, (i.e. four employees and two cars for the transport of money between the central bank and 14 branches). The cost of sending money to branches is not included here, because in most branches there are money storage rooms from the Central Bank. Nevertheless, they sometimes have to send currency by mail; in such a case they pay for the expedition and for the insurance. These costs are not included in the above figures.

Our second source comes from the savings bank mentioned before [NAMED SOURCE REMOVED FOR CONFIDENTIALITY]. The transport cost of this bank is substantially higher. For its five branches, it uses two people full time and one car for the transport. The total cost is ISK [CONFIDENTIAL] million per year.

We assume that the transport costs of the savings banks are similar to the one of this one, while the commercial banks have costs similar to the first bank. With

⁸ This bank represents the [CONFIDENTIAL] of the Icelandic banking market. All savings banks together represent about the [CONFIDENTIAL].

⁹ This commercial bank holds a share of [CONFIDENTIAL] percent in the Icelandic banking market.