

Malte Krüger and Franz Seitz

Study commissioned by the Deutsche Bundesbank

Costs and Benefits of Cash and Cashless Payment Instruments

Overview and initial estimates



Module 1

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Module 1: Overview and initial estimates^{*}

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Abstract

This paper analyses cash and cashless payment instruments in Germany. After a description of developments in a national and international context, we will compile a critical overview of literature on cost calculations and on the importance of payments media for different countries. Against the background of the criticism of these studies, we will present an independent and largely „demand-based“ approach in Section 3 on the economic significance or cost of cash and cashless payments instruments without conducting a survey of our own. It can be interpreted as an addition to the supply-based cost studies which have predominated in literature up to now. All in all, it accounts for somewhere in the region of 2% to 3% of GDP. However, these figures do not take qualitative factors into consideration.

Keywords: Cash, payment transactions, cashless

JEL: D12, D61, E41, G21, O33

„Alas! How deeply painful is all payment!“

(Lord Byron, Don Juan)

*„He may exult in crime and shame,
Who on accomplices depends;
And: Guilty! the verdict they proclaim,
When Innocence her cause defends.
So will the world succumb to ill,
And what is worthy perish quite;
How then may grow the sense which still
Instructs us to discern the right?“*

(J.W. v. Goethe, Faust II)

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Carl-Ludwig Thiele

Member of the Executive Board
of the Deutsche Bundesbank

Dear reader

When I became a member of the Deutsche Bundesbank's Executive Board just over four years ago, with responsibility for both the Cash and the Payments and Settlement Systems Departments, it was clear to me that both areas constitute core elements of a central bank. Everybody uses money in cash or cashless form. Often, however, the central bank's role in this area is not so well-known. That is why I was interested in how economically important cash and payment transactions are. To date, there has been no study on this commissioned by the Bundesbank, which is why we commissioned an external study.

The study on "Costs and Benefits of Cash and Cashless Payment Instruments" presented here discusses an important economic topic. Virtually every transaction in the real economy results in a payment being effected. In making these payments, households and businesses make use of a wide variety of payment instruments, starting with cash and ranging to card payments, direct debits and credit transfers, to name but a few. Each of these instruments fulfils specific user needs, but also generates costs. The size of these costs and the scale of the economic benefit have increasingly become a topic of academic discussions over the last years and, at times, also the focus of general public debate. How high are these costs? Who bears them? Are these costs allocated on a "user pays" basis? Could a change in user behaviour reduce the economic costs, while increasing the benefits? These are all important and exciting questions which the Bundesbank, too, is addressing as part of its statutory mandate for payments in Germany.

Finding the answers to these questions is not easy. The problems associated with recording costs and adequately allocating them to instruments and causes are not trivial. Even more difficult is the monetary assessment of categories of benefit. This is one of the reasons why the Deutsche Bundesbank does not issue any recommendations for or against cash or cashless payment. The Bundesbank monitors and analyses user behaviour. We have found, for instance, a persistent downward trend in cash usage, although cash at the point of sale still accounts for the highest percentage. The decision on which payment instrument the user employs and for what reasons is a matter for the user. The user has freedom of contract and can decide on the form of the payment freely and independently.

The data available to us on the advantages of individual payment instruments are no better than those available to the market participants, which is why we leave it to them to decide on the most suitable payment instrument in a given situation. This is also consistent with our basic regulatory philosophy, that is, to support consumer sovereignty and the principle of contractual freedom.

As part of our statutory mandate, we try to broaden our knowledge of the costs and benefits of payment instruments so as to be in a position to contribute to a factual debate in terms of determining the framework conditions to ensure a smooth settlement of payments. The study will be divided into three parts. The first part, “Overview and initial estimates”, is the part you are holding in your hands right now. This part of the study, which had to be compiled without the collection of data from the payment participants, is based on indirect estimates. It describes the development of cash and cashless payment transactions in Germany and abroad and provides a critical overview of previous cost studies. Finally, the economic importance of payment instruments (in the sense of a readiness to pay for payment services) is estimated through the payment participants’ own resource costs, ie internal costs.

The second part planned, “Costs”, is designed to estimate the respective costs arising from the use of cash and cashless means of payment in Germany. Part three, “Benefits”, plans to describe the benefit categories associated with the use of cash and cashless payment instruments in Germany and to assess their relative importance.

The authors of the study have sole responsibility for the results that they publish. The Bundesbank does not wish to claim either the methods used or the findings as its own and regards the study as a valuable discussion contribution. It thanks the authors for their contributions.

I hope that reading this study will help you find answers to these questions.
Yours,

A handwritten signature in blue ink that reads "Carl-Ludwig Thiele". The signature is written in a cursive style with a large, stylized initial 'C'.

Carl-Ludwig Thiele

1. Introduction, motivation, overview

A modern and specialised economy, which is based on the division of labour, is increasingly dependent on the effective functioning of large networks. Examples of networks with a marked macroeconomic significance are communications networks (landline and mobile phone networks, post), transport networks (roads, railways, aviation), energy networks (electricity, gas) and the water supply. Not least, these networks also include payment networks.

If the functional capability of any one of these networks is ever impaired, this would have serious repercussions for the economy as a whole. Without electrical energy, the production process would be largely crippled, and consumption possibilities for households would be seriously restricted. Malfunctions in other networks would have a similar adverse impact upon economic activity. This also applies, in particular, for disruptions to payment systems because the real flow of goods and services presupposes that money flows in the opposite direction. If the flow of money stagnates, the real flow of goods and services will follow suit. Not only that, financial markets would also be hugely hampered by problems in payment transactions. This, in turn, would have an adverse impact on the real economy.

Ever since the dawn of money, people have explored the advantages and disadvantages of different forms of payment. However, a systematic scientific study of the topic did not take place until the 1980s¹. It would make sense to focus cost-benefit analyses chiefly on finding efficient methods of payment and on finding payment systems which offer efficiency both in microeconomic and macroeconomic terms. Consequently, the derived outcomes are both of relevance to policy-making and are of interest to the parties involved in the payment cycle. It should also be noted that the national payment systems are exposed to change through innovations in finance and payment transactions, as well as through changes in the payment habits of consumers. And that is, as we mentioned above, against the backdrop of an industry which is characterised by network externalities (see Leibbrandt, 2004). An efficient payment system is not an end in itself, but a necessary precondition for fostering national and international

¹ Early studies were conducted by Godschalk (1983), Whitesell (1989), Humphrey & Berger (1990), Boeschoten (1992) and Virén (1993), to name but a few.

trade, as well as for the development of an efficient financial system and, ultimately, for the welfare of the economy as a whole.

In the study on the “Costs and Benefits of Cash and Cashless Payment Instruments” commissioned by the Deutsche Bundesbank, we will seek to explore the significance of (cash and cashless) payment transactions for the national economy and to analyse the costs and benefits of cash and cashless payment instruments. This study is divided into three modules. Module 1 “Overview and initial estimates”, which is the subject of this paper, contains (1) a description of the volume and of the development of cash and cashless payment transactions with specific reference to Germany, (2) an overview of existing studies on the costs and benefits of cash and cashless forms of payment, and (3) an assessment of the significance of cash and cashless forms of payment in Germany².

Following on from the specified task, Section 2 initially chronicles the development of cash and cashless payment instruments in Germany, comparing it with other countries on the basis of some selected examples. This section is largely descriptive in its focus. In some areas, specific patterns for Germany are noteworthy. Section 3 is devoted to a critical overview of existing studies on the costs associated with payment media. It focuses on cash and card payments. We will then try to quantify the significance of payment transactions and payment media for Germany applying a demand-based approach, without having collected any primary data of our own. In this approach, the focus is on the costs incurred by demanders of payment services (payment service users). Firstly, the costs incurred by demanders reflect their willingness to pay, and thus the benefits of the use of payment instruments, and, secondly, these costs represent revenue for payment service providers. This income must ultimately be sufficient to cover the costs. Consequently, such a demand-based approach also allows to indirectly infer the costs of the payment transactions.

The costs incurred by consumers comprise the fees, possible loss in interest income and the cost of providing their own resources (in particular, their own time). In this section, an overall distinction is generally only made between cash and cashless payment instruments. The last chapter summarises the findings and draws some conclusions.

² Modules 2 and 3 will explore the costs and benefits of payment instruments in detail.

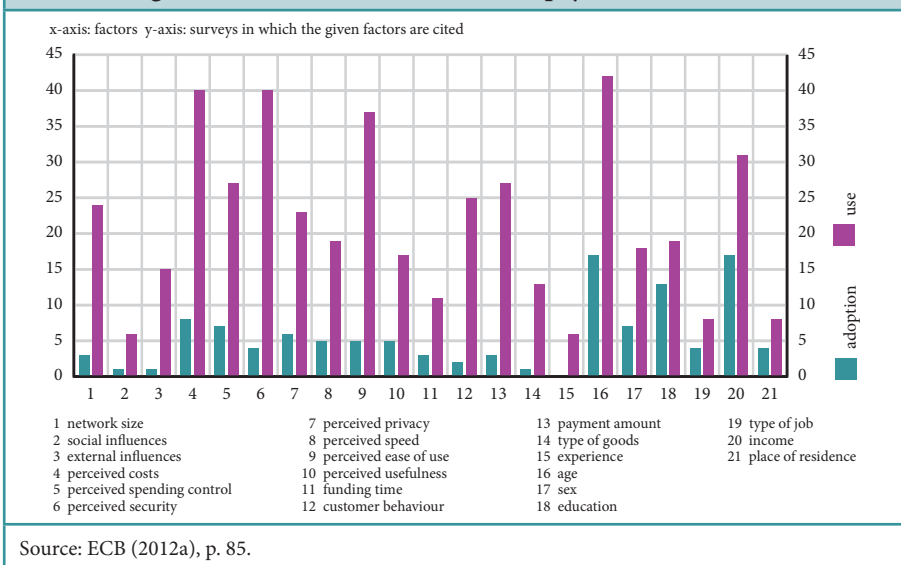
2. Trends in payment methods and in payment transactions

2.1 General observations

Surveys are normally conducted in order to establish the significance of payment media for their potential users. These surveys also frequently examine the characteristics which encourage the use of particular methods of payment.

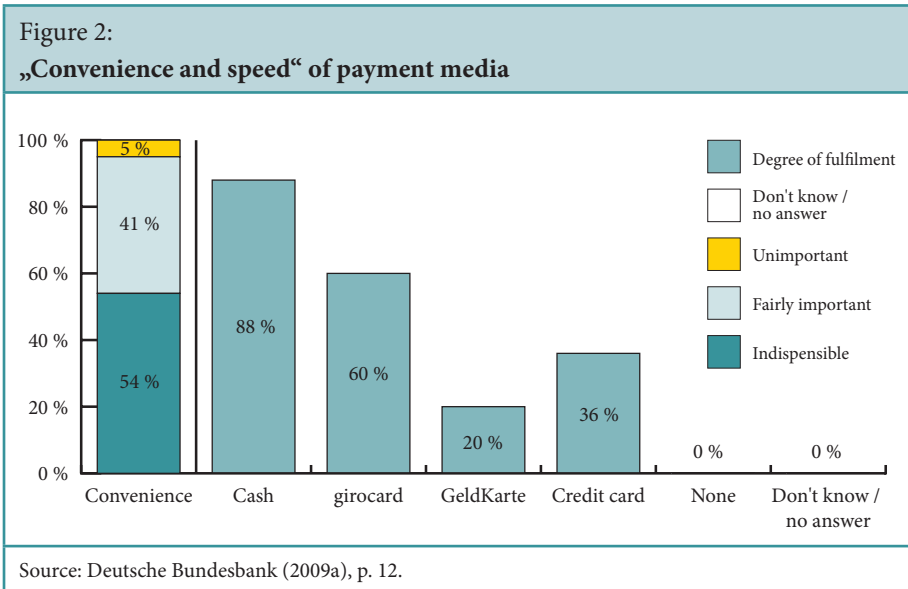
Figure 1:

Determining factors in the selection and use of payment instruments



The ECB (2012a) conducted an evaluation of 130 such studies in the course of a meta-analysis. The findings are illustrated in Figure 1. It is clearly evident that the usage of payment media is dominated by just a small number of factors. Most notably, they include the associated costs, the security of the payment transaction and the age of the user. However, user-friendliness also appears to be very important. Age, income and level of education are key factors in the choice of payment medium. In both decisions, however, less importance is attached to social factors, experience, place of residence and occupation (see also Deutsche Bundesbank, 2012). The criteria which are seen as being pivotal in Germany are “acceptance”, “convenience and speed” and “security

against financial loss” (Deutsche Bundesbank, 2009a). The first two attributes are best met by cash, and the last by debit cards and credit cards. Taking the criterion “convenience” as an example, Figure 2 shows that this characteristic is very important or indispensable to users and is best met by cash in their opinion, followed by debit cards and credit cards. This assessment is likely to change only at an extremely slow pace over time due to ingrained payment habits and persistence in payment behaviour.



In the surveys conducted by the Deutsche Bundesbank (2009a; 2012) on payment behaviour in Germany, the shares of retail trade turnover accounted for by the individual payment instruments are also determined. Tables 1 and 2 illustrate the corresponding findings and compare the values from 2008 with those from 2011.³ They show that private individuals use cash for 53% of their spending in 2011. Compared with 2008, the proportion accounted for by cash has declined by almost 5 percentage points, however. By contrast, payment card usage has risen from 30% to 36%. The card used most

³ The figures relate to the transactions effected by the people questioned (2011: 2,098 people, 2008: 2,204 people) over the course of a week during which they kept a payments diary. The figures can be regarded as representative for Germany.

frequently is the debit card at 28%. Internet payment methods (such as PayPal), which were not yet of any relevance in 2008, made up 1.7% of turnover in 2011. In addition to the cash share, the shares accounted for by direct debits and credit transfers have also fallen. If we turn our attention from shares of turnover to shares of transactions, developments were broadly similar. However, given the fact that cash is particularly commonly used for payments of small amounts, it accounts for a considerably higher proportion of transactions (82% compared with 53%). By the same token, the shares of transactions accounted for by other payment instruments lie below the corresponding shares of turnover as they are often only used for payments above a certain amount.

Table 1:
Shares of payment instruments in retail trade in 2008

Payment instrument	Distribution by turnover		Distribution by number of transactions	
	Turnover in €	Share in %	Number of transactions	Share in %
Cash payment	405,486	57.9%	20,161	82.5%
Credit card	25,538	3.6%	333	1.5%
Debit and other cards	183,956	26.3%	3,112	12.7%
Direct debit	13,024	1.9%	140	0.6%
Credit transfer	62,199	8.9%	447	1.8%
Other	4,886	0.7%	80	0.3%
Cashless without any indication of payment instrument	5,349	0.8%	161	0.7%
Total	700,437	100%	24,433	100%

Source: Deutsche Bundesbank (2009a).

Table 2:
Shares of payment instruments in retail trade in 2011

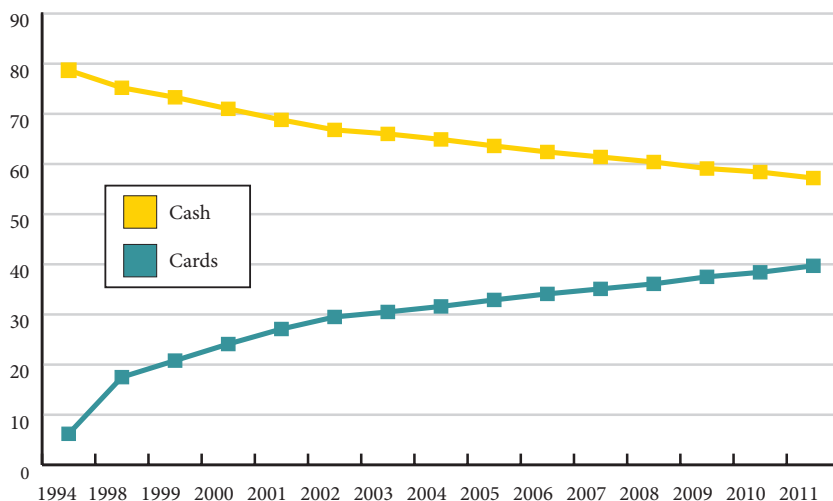
Payment instrument	Distribution by turnover		Distribution by number of transactions	
	Turnover in €	Share in %	Number of transactions	Share in %
Cash payment	317,137	53.1%	16,285	82.0%
Credit card	44,402	7.4%	364	1.8%
Debit and other cards	170,908	28.6%	2,735	13.8%
Direct debit	4,268	0.7%	58	0.3%
Credit transfer	49,181	8.2%	259	1.3%
Other	10,115	1.7%	148	0.7%
Cashless without any indication of payment instrument	1,269	0.2%	21	0.1%
Total	597,28	100%	19,87	100%

Source: Deutsche Bundesbank (2012).

Using data from the EHI Retail Institute, the shares of cash and card payments can be compared over a longer period of time (see Figure 3). The data provided are primary data collected from retailers, who represent over 50% of total retail turnover in the narrower sense. The data cover companies from all sales segments. The retail trade in the narrower sense excludes car dealers, mineral oil companies, pharmacies and mail-order companies, although it does include turnover from filling station shops. The annual surveys conducted by the Institute for Payment Systems in Retail Trade revealed that from 1994 to 2011 the share of payments accounted for by cash fell from 79% to 57%, while card payments rose from 6% to just under 40% in the same period. As illustrated by Figure 3, the two shares are increasingly converging. The rate of convergence is slowing down however, which could mean that, in the long run, the two will have an equal share of sales. EHI forecasts card payments to account for 41% of retail sales in 2015.⁴

⁴ According to calculations in Schmiedel et al. (2012), cash accounts for an average of 69% of retail transactions in the 13 countries which took part in the study on different payment instruments (Denmark, Estonia, Finland, Greece, Hungary, Ireland, Italy, Latvia, Netherlands, Portugal, Romania, Spain, Sweden). This ranges from 27% in Sweden to 95% in Greece and Romania.

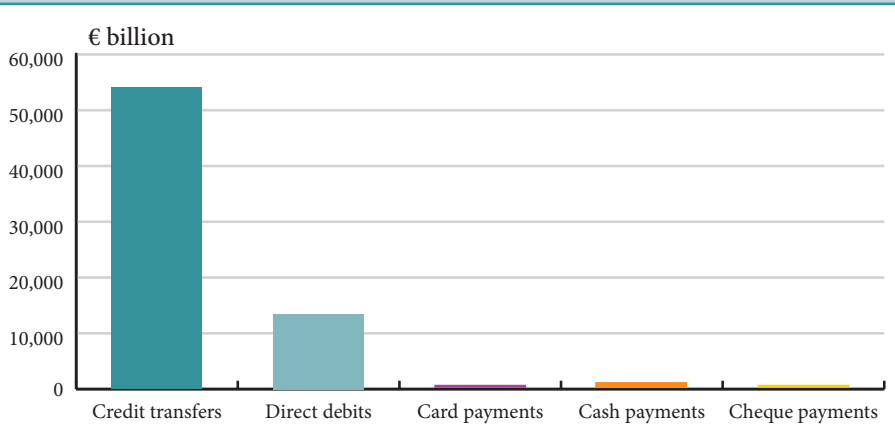
Figure 3:
Share of cash and cards in retail trade according to the EHI



Source: EHI, own chart.

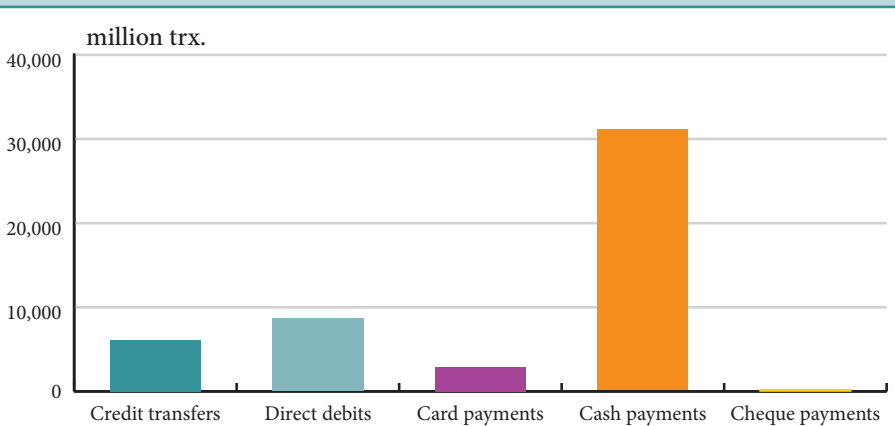
These figures are confirmed if, instead of using survey data, one looks at the total number of transactions in Germany with different payment media. In the case of cashless payment instruments, transaction and value data from payments statistics are available. There are no statistical data available for the extent of cash payments, however. These data have to be derived from other data. Corresponding estimation procedures are set out in the next subsection. The numbers used in Figures 4 and 5 are based on an average of different estimation procedures (see Table 7). While unsurprisingly, credit transfers clearly dominate in terms of value, cash is in first place in terms of transactions.

Figure 4:
Shares of payment media in 2011: Values



Sources: Deutsche Bundesbank and our own calculations.

Figure 5:
Shares of payment media in 2011: Transactions



Sources: Deutsche Bundesbank and our own calculations.

2.2 Cash payments

The nature of cash payments makes collecting statistics on the value and number of transactions difficult. Cash is an “offline” method of payment, and a cash transaction is not separately recorded. Many users feel that it is precisely this that makes cash particularly advantageous.

This means that the extent to which cash transactions are used for payments can only be estimated with the aid of indirect methods or on the basis of data collected by means of surveys. In principle, there are three possibilities:

1. Estimation of purchases that can be generally settled in cash. As payment cards are in principle also used for these transactions, card transactions are deducted from the total volume and the remainder represents the volume of cash transactions.
2. Estimation of the amount of cash withdrawn from automated teller machines (ATMs) and over the counter. As cash is essentially withdrawn to be used to make subsequent payments,⁵ this variable can be used as the upper limit for the volume of payments effected in cash.
3. Surveying of economic agents on their payment and cash procurement habits.

Method 1: Estimating cash purchase transactions

It is assumed that companies and the government only settle a small number of transactions between each other in cash and the vast majority of cash transactions are from households to companies and government. By classifying domestic consumer spending by households according to purpose, it is possible to deduct components that, on account of their regularity or amounts, are settled or financed via credit transfers and direct debits.⁶

⁵ For example, the findings on the share of cash using data from the payments diary (Deutsche Bundesbank, 2009a, Chap. IV) according to which the main determinants are transaction-driven could be interpreted in this sense.

⁶ Schmiedel et al. (2012a, p. 22) also adopt a similar approach.

These include

- housing, water, electricity, gas and other forms of fuel,
- telephone and telefax services, internet,
- vehicle purchases,
- insurance and financial services.

Along with the adjustments within the national accounts, external statistics can further help to identify consumer spending by households. Each year, the German E-Commerce and Distance Selling Trade Association (Bundesverband des deutschen Versandhandels, or bevh) publishes data on household spending on classic mail-order purchases and online purchases (referred to as distance selling). Since purchases in this segment are for the most part paid for via cashless payment procedures, this item can also be deducted from consumer spending by households (see Table 3).⁷

Table 3:
Calculation of cash spending measured according to national accounts data (€ bn)⁸

	2008	2009	2010	2011
Consumption	1,317	1,319	1,360	1,410
Consumption adjusted	759	757	768	807
Card⁹	151	156	169	188
Distance selling	35	35	37	42
Cash payments	573	566	562	578

Sources: Federal Statistical Office, BVH and our own calculations.

⁷ Credit cards are also used to make payments in this segment. However, credit card payments are included under card payments. This implies that some payments are counted twice.

⁸ The figures in Schmiedel et al. (2012, p. 22) relating to the shares of the individual payment instruments imply that cash payments were worth €682 billion in 2009. The authors presumably arrive at a higher figure because car purchases are not deducted from consumption. However, many of those car purchases are financed through credit arrangements (including leasing).

⁹ Alternatively, the higher estimate of card payments by PaySys Consultancy (2013) of the order of €267 billion could be used. In this case, the volume of cash payments in 2011 is €498 billion.

After consumer spending by households has been adjusted, card payments¹⁰ according to payment statistics of the Deutsche Bundesbank are deducted from the remaining variable. In addition to card payments, other non-cash payment instruments (e.g. financed purchases) need to be deducted. However, there are insufficient data to do this. Having said that, the impact of these other cashless payment instruments is negligible: according to the annual survey by the scientific institute of the retail industry (EHI Retail Institute), in 2011 over 95% of point-of-sale payments were made using cash or card.

Table 4:
Calculation of cash spending based on VAT statistics (€ bn)

	2008	2009	2010	2011
Retail trade and hospitality industry	619	636	666	700
Miscellaneous¹¹	224	183	183	190
Total	843	819	849	890
Card turnover¹²	151	156	169	188
Distance selling	35	35	37	42
Sum	657	627	643	660

Sources: Federal Statistical Office, BVH and our own calculations.

Along with the national accounts, VAT statistics can also be used to estimate cash payments (see Table 4). The detailed division by sector can be used to focus on sectors in which cash is normally used to make payments. Again, the point-of-sale turnover paid for by card is subtracted from the gross turnover in these sectors. Since turnover from distance selling is also included, this is also deducted.

¹⁰ According to the statistics on payments and securities trading, clearing and settlement of the Deutsche Bundesbank.

¹¹ Maintenance and repair of vehicles, passenger transport, cinemas, veterinary practices, the „art, entertainment and leisure“ sector, video shops, travel agencies, sports facilities, copy shops, among others.

¹² Alternatively, the higher estimate of card payments by PaySys Consultancy (2013) of the order of €267 billion could once again be used. In this case, the volume of cash payments in 2011 is €581 billion.

While the estimates for cash payments based on the national accounts are below €600 billion, the estimates on the basis of VAT statistics are above €600 billion and have been showing an upward trend since 2009.

Method 2: Total amount of cash withdrawals at ATMs and at bank counters¹³

For the purposes of calculating the total amounts withdrawn from banks in Germany, reports are submitted to the Bundesbank by the banking industry in connection with payment transactions and securities settlement statistics. They contain data on all the amounts withdrawn in Germany over the course of a year. The figures consequently also make reference to cash withdrawn for purposes other than payment transactions (hoarding, transfer abroad) (see Table 5). The levels of net outflows abroad and of hoarding are not statistically recorded. However, they can be estimated (see, for instance, Bartzsch et al., 2011a, b).

Table 5: Determination of cash transactions based on withdrawals (€ bn)				
	2008	2009	2010	2011
ATM	311	317	316	334
Counter	380	369	336	333
Total	691	687	652	666
Hoarded	17	17	17	17
Outflows abroad	10	10	10	10
Payments in cash	664	660	625	640
Notes: Hoarding: Estimated on the basis of data collected on payment behaviour for 2008, whereby the dis-hoarding of cash is not taken into consideration. This estimate was also used for the period from 2009 to 2011 owing to the lack of any further data. Flows abroad: Bartzsch et al. (2011a, b) estimate that some €240 billion left the country at the end of 2009, €80 billion of which flowed to outside the EMU. If this was accrued on a continuous basis, this would amount to €10 billion per year. Assuming that the funds leaving the EMU have primarily been caused by residents of member states spending cash outside the EMU, these €10 billion would have to be deducted from the total volume of spending when calculating the level of domestic cash expenditure.				
Sources: Deutsche Bundesbank, Bartzsch et al. (2011a, b), our own calculations.				

¹³ This approach is also used by Amromin & Chakravorti (2009) in their attempt to differentiate between transaction amounts and amounts hoarded.

Method 3: Survey of payment behaviour

The Deutsche Bundesbank conducted a survey of payment behaviour in Germany in 2008 and in 2011. Among other things, the respondents were asked to keep a payments diary over a period of one week in which they had to record their spending, broken down according to payment location and the payment instrument used. These data can be taken as a basis for extrapolating the entire cash spending in Germany over the course of a year.

The payments diary also includes data on cash savings (hoarding). These figures are not taken into account in the calculation of cash expenditure because hoarding results in money being withdrawn from the economic cycle, meaning that this amount is no longer available for transaction purposes (see Table 6).

Table 6:

Spending according to the payments diary: Extrapolation for 2011

Payment location / occasion	All payment transactions		Cash transactions		All payment transactions		Cash transactions	
	Number (millions)	Share in %	Number (millions)	Share in %	€ bn	Share in %	€ bn	Share in %
Retail for everyday requirements	14,185	42.1	12,259	44.4	324.0	32.0	221.2	41.1
Retail for longer-term purchases	2,018	6.0	1,151	4.2	151.1	14.9	39.8	7.4
Filling station	2,795	8.3	1,313	4.8	123.1	12.1	41.6	7.7
Pharmacy	1,244	3.7	1,125	4.1	22.8	2.3	15.6	2.9
Services external	1,236	3.7	1,029	3.7	78.8	7.8	34.1	6.3
Services in-house	282	0.8	228	0.8	19.9	2.0	12.0	2.2
Vending machines	1,342	4.0	1,243	4.5	8.2	0.8	6.6	1.2
E-commerce	492	1.5	12	0.0	37.0	3.6	0.6	0.1
Mail order	296	0.9	49	0.2	26.4	2.6	1.5	0.3
Restaurant	1,327	3.9	1,112	4.0	50.8	5.0	34.9	6.5
Café, bar, snack bar, fast-food restaurant	4,175	12.4	4,098	14.8	42.9	4.2	41.4	7.7
Leisure activities	1,144	3.4	1,048	3.8	27.6	2.7	20.9	3.9
Hotel, guest house	48	0.1	26	0.1	6.3	0.6	2.9	0.5
Spending on private individuals	939	2.8	922	3.3	28.0	2.8	25.8	4.8
Pocket money for children	615	1.8	610	2.2	13.6	1.3	13.3	2.5
Miscellaneous	1,469	4.4	1,311	4.7	50.4	5.0	24.1	4.5
Unspecified payment location	108	0.3	93	0.3	2.7	0.3	1.8	0.3
Total	33,716	100.0	27,630	100.0	1,013.5	100.0	538.1	100.0

Comments: 2,103 people kept a payments diary for a period of one week. These figures were extrapolated for a one-year period and for the entire population of Germany over the age of 18. Therefore, there is a certain degree of uncertainty about the findings – a comparison with cash spending according to trade statistics reveals clear discrepancies in some sectors (these discrepancies are also due to different statistical definitions in some cases).

Sources: Deutsche Bundesbank and our own calculations.

According to those findings, around €637 billion of cash was spent in Germany in 2008. Extrapolated for 2011 as a whole, this amounts to €538 billion from over 27 billion cash transactions. One advantage of this approach is that it also takes account of payments made between private individuals. As a limiting factor, the extrapolation only relates to people over the age of 18. However, pocket money payments are also recorded in the payments diary. An assumption is made in this regard that the money paid in the form of pocket money is also spent within the economic cycle. Consequently, the only part missing from the statistics is the money which teenagers under 18 receive as income (e.g. in training schemes or from a sideline) and then spend as cash.¹⁴ This figure is likely to be negligibly small. As comprehensive surveys are conducted only infrequently, if at all, they only provide a snapshot of a certain point in time. In addition, the sample selection bias (who keeps a payments diary?) and the problem of obtaining truthful responses to questions about cash have to be taken into consideration.¹⁵

In the Bundesbank's survey on payment behaviour, the amounts regularly withdrawn at an ATM or at the bank counter were also recorded in 2008. According to the extrapolation from the survey about payment behaviour, roughly €558 billion was withdrawn at ATMs and at bank counters in 2008. This value is not only below the volumes reported by the banking sector, it is also below the extrapolated volume of cash payments. It should therefore be considered to be a lower limit.

¹⁴ It is assumed that many of the pocket money payments are made to people under the age of 18.

¹⁵ It is also worth noting that the value of payments per person was lower in the 2011 survey than in the 2008 survey.

Table 7:
**Estimated volume of cash payments:
Comparison between different approaches (€ bn)**

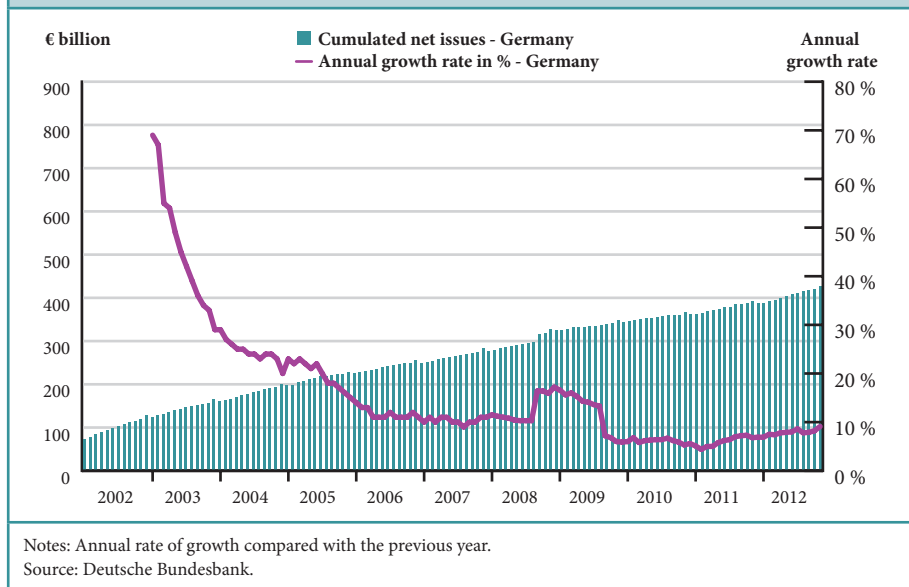
	2008	2009	2010	2011
National accounts	573	566	562	578
VAT statistics	657	627	643	660
Withdrawals	664	660	625	640
Survey (expenditure)	637			538
Survey (withdrawals)	558			
Average	619	635	628	604

Source: own table.

Table 7 provides a summary of the different methods used. The findings based on VAT statistics and on the withdrawals reported by the banking industry are relatively high and suggest that the value of cash payments in 2011 is well over €600 billion. The results based on the payments study conducted by the Bundesbank do not reveal a uniform picture, and the estimate on the basis of the national accounts is well under €600 billion. The average value for 2011 is €604 billion. Consequently, sales transacted in cash continue to be significantly higher than sales transacted by card (in 2011 this was about €188 billion according to the Deutsche Bundesbank's payment statistics and €269 billion according to PaySys Consultancy). This difference is even greater when measured in terms of the number of transactions. However, estimates of the number of cash transactions are less reliable than estimates of cash turnover. The number of transactions can ultimately only be estimated on the basis of the estimated turnover. In addition to turnover, an estimate of the average transaction value is also required. The findings of the Bundesbank's survey on payment behaviour can also be used here. The survey reveals an average amount of just under €20. Consequently, our calculations show that an estimated 32 billion cash payments were made in 2011. This is significantly higher than the number of card payments, which amounted to around 3 billion transactions according to the payment statistics.

The continued importance of cash is also demonstrated by the evolution of cash holdings over time. The very dynamic trend in cumulated German net issues of banknotes since 2002 is striking in the first instance (see Figure 6).¹⁶ The growth rates were in double figures up to the end of 2009 and thus differ significantly from the days of the Deutsche Mark prior to the introduction of euro cash (Bartzsch et al., 2011b, p. 7). If cash holdings in 2012 were divided purely mathematically by the number of German residents, this would give a figure of around €5,000 per capita. This is not in line with experience, however.

Figure 6:
Euro banknotes in circulation: Germany

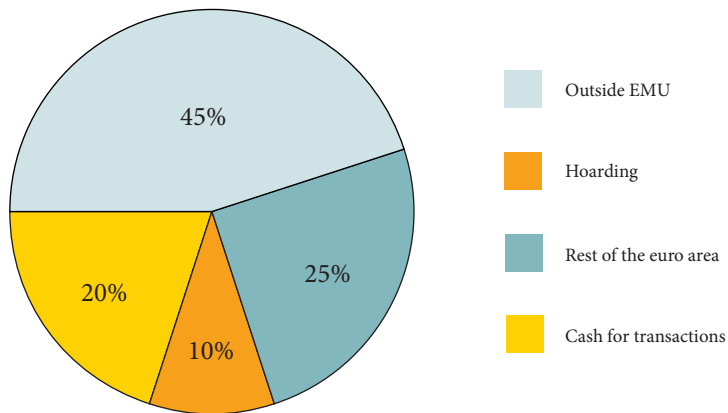


The chart clearly shows how the insolvency of Lehman Brothers triggered a surge in the demand for cash. As we will see shortly, the German situation varies significantly, on the whole, from that in other countries both within and outside the euro area. The reason for the high levels of cash holdings is that all of the motives that create demand

¹⁶ The net issues are not to be confused with the cash in circulation in Germany, which cannot be determined precisely, especially within the framework of a monetary union.

for cash can be seen in Germany (see Figure 7). Cash is used for transaction and hoarding purposes, and considerable proportions of the notes issued in Germany are held in other EMU-countries as well as outside the EMU (see also Bartzsch et al., 2011a, b for a detailed account of this). 70% of the German note issues are held outside the country - for transaction and hoarding reasons - with the majority likely to be outside the euro area. Only a small portion of a *maximum* of 20% is required in Germany for transaction purposes. Hoarding for various reasons accounts for 10%.

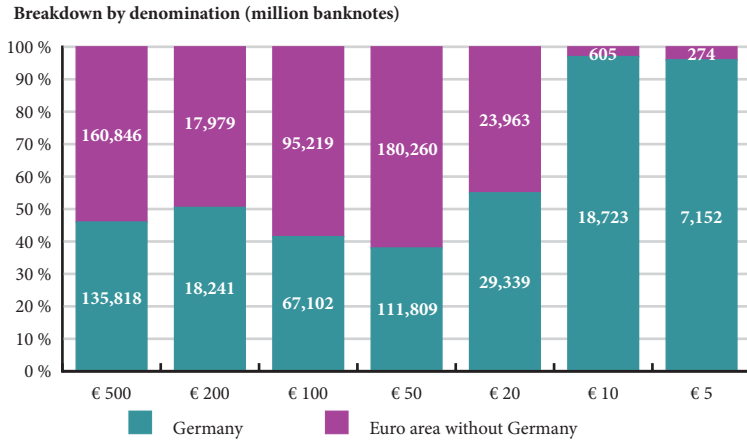
Figure 7:
Cash motives and German net issues



Source: Bartzsch et al. (2011a, b).

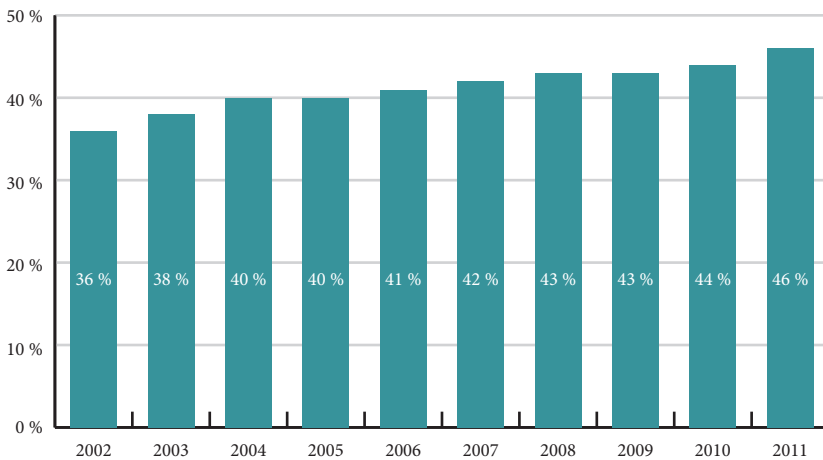
Comparing the situation in Germany with the rest of the euro area, it is noticeable that the German share in cumulative net banknote issuance is greater than the German capital share in the ECB for all denominations in terms of both value (see Figure 9) and quantity (see Figure 8). As shown in Figure 8, the share of small denominations is over 90%; the only value under 40% is with the €50 note. The value data in Figure 9 reveal a steady rise from 36% in 2002 to 46% at the end of 2011. The reasons behind Germany's unusual position in this regard are largely uninvestigated. Initial investigations can be found in Bartzsch et al. (2011a, chap.5).

Figure 8:
Banknotes: German share in terms of quantity



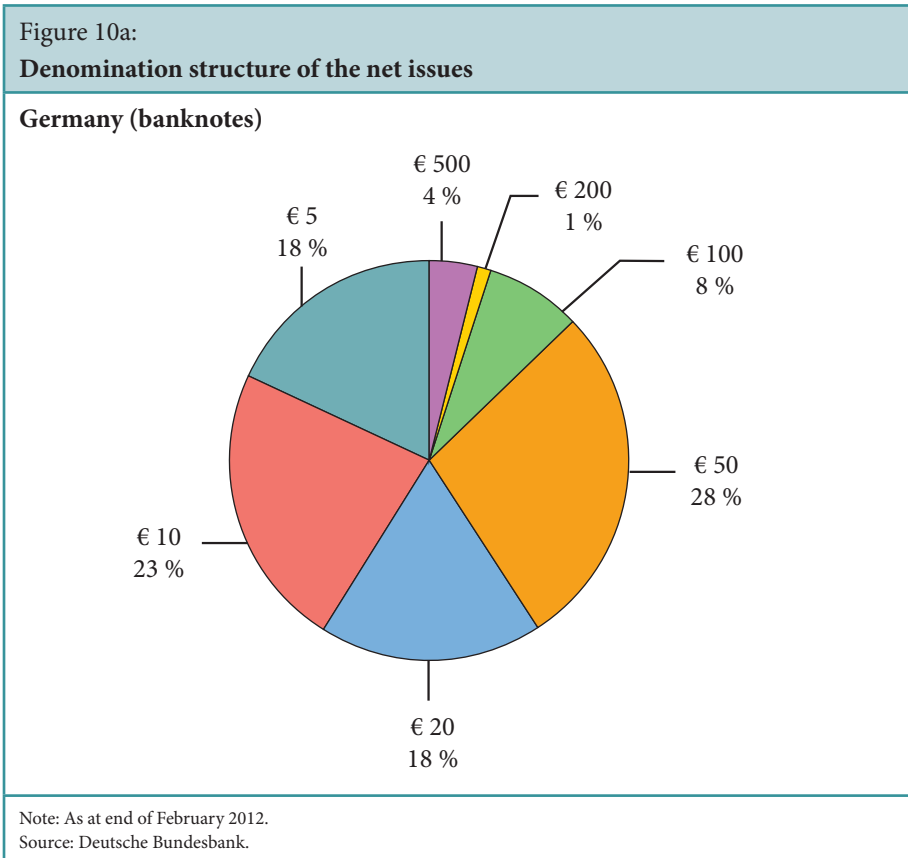
Note: As in February 2012.
Source: Deutsche Bundesbank.

Figure 9:
Banknotes: German share in terms of value



Source: Deutsche Bundesbank.

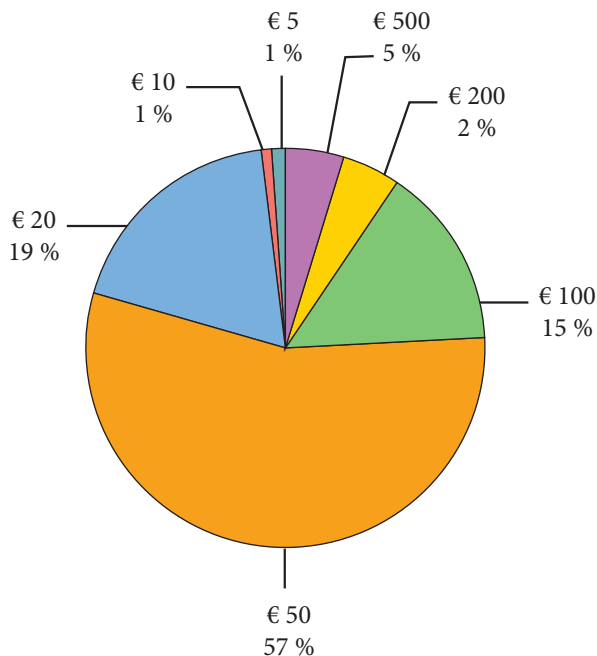
Consequently, if one looks at individual denominations and compares the situation in Germany with that in the rest of the euro area, dramatic discrepancies emerge (see Figure 10). There are evidently similar volumes in terms of shares of €20, €200 and €500 notes. However, Germany has markedly higher shares of the smallest denominations, i.e. €5 and €10 notes, while the shares of €50 and €100 notes are higher in the other euro area countries.¹⁷



¹⁷ These conclusions would not change when looking at value data.

Figure 10b:
Denomination structure of the net issues

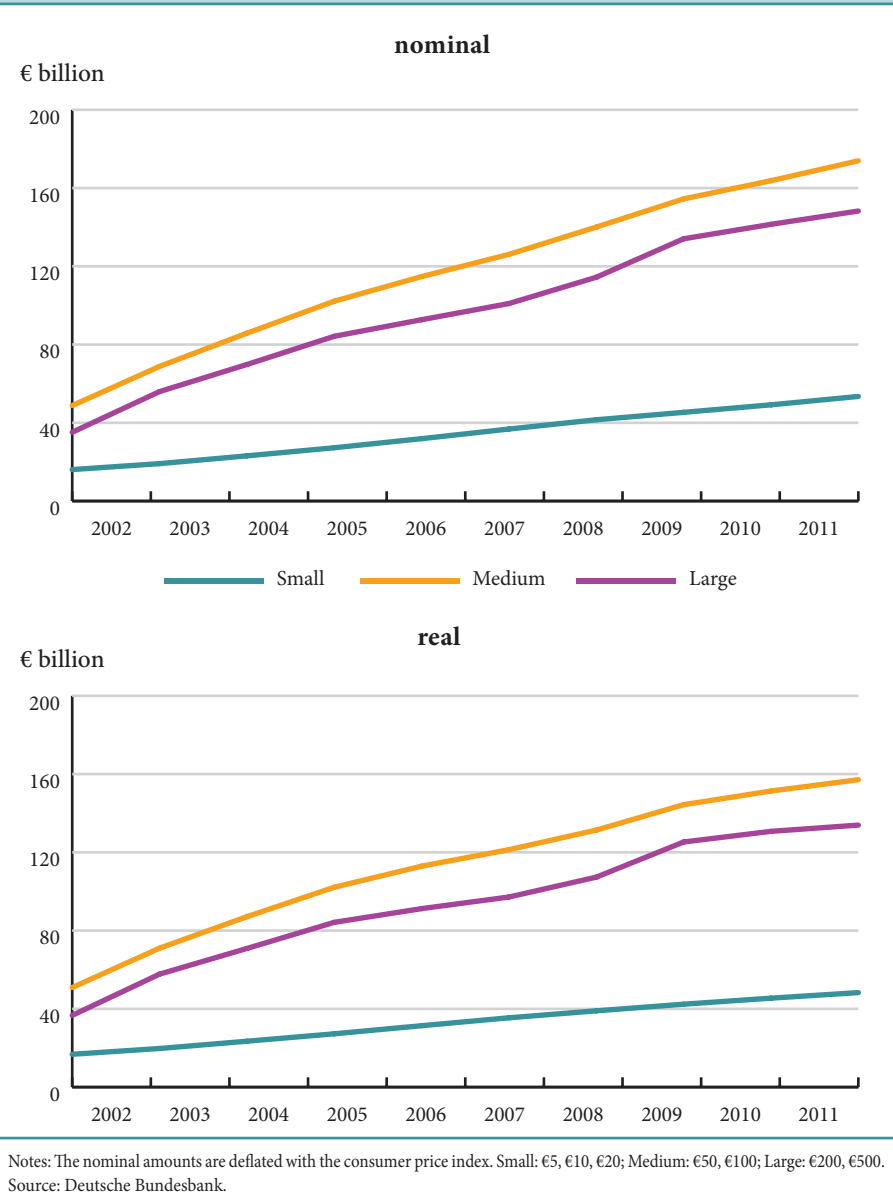
Euro area without Germany (banknotes)



Note: As at end of February 2012.
Source: Deutsche Bundesbank.

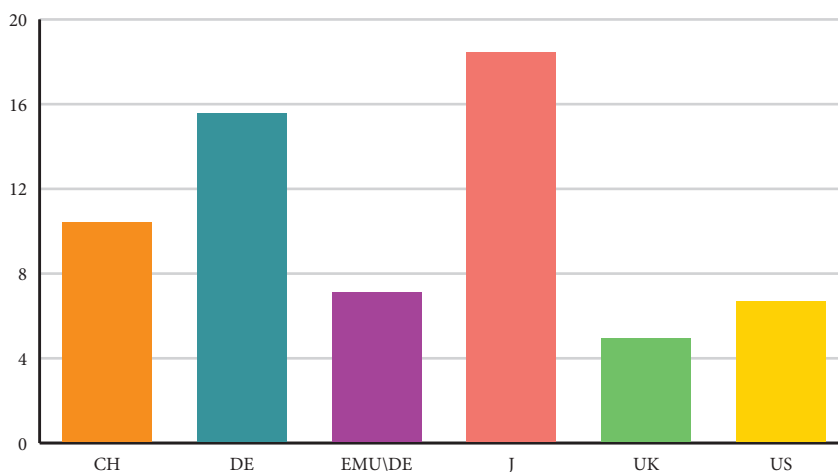
The statements made up to now have been based on nominal values. At least part of the rapid increase in cash issued in Germany may be explained by price increases, whereby greater nominal amounts of cash are required for purchasing given goods and services. Therefore, the price-adjusted, i.e. real, cash development is compared with the nominal cash development in Figure 11. Given the strong growth in nominal cash holdings and the moderate rates of inflation, the real stocks are lower over time, albeit relatively similar.

Figure 11:
Nominal and real cash development (by denomination)



In Figure 12, the cumulative net issue in the euro area relative to GDP is compared with the circulation of cash (which equals the cumulative net issue) in countries outside the EMU (USA, Japan, Switzerland, United Kingdom) in 2011. Surprisingly, this quota is considerably lower in the USA (just under 7%) than in Germany despite the fact that high stocks of dollars are also held outside the country.¹⁸ The highest values are achieved by Germany (over 15%) and Japan (over 18%), even though the Japanese yen is used almost exclusively in Japan. Switzerland is also in double figures at just over 10%. It is likely that all of the motives that create demand for cash also exist for the Swiss franc. At 7%, the figure for the other EMU-countries countries is significantly lower than the German equivalent. Only the United Kingdom, with almost 5%, has a quota that lies within the range that one would more or less expect for transaction-related reasons.

Figure 12:
„Cash in circulation“ in relation to GDP in 2011 (in %)

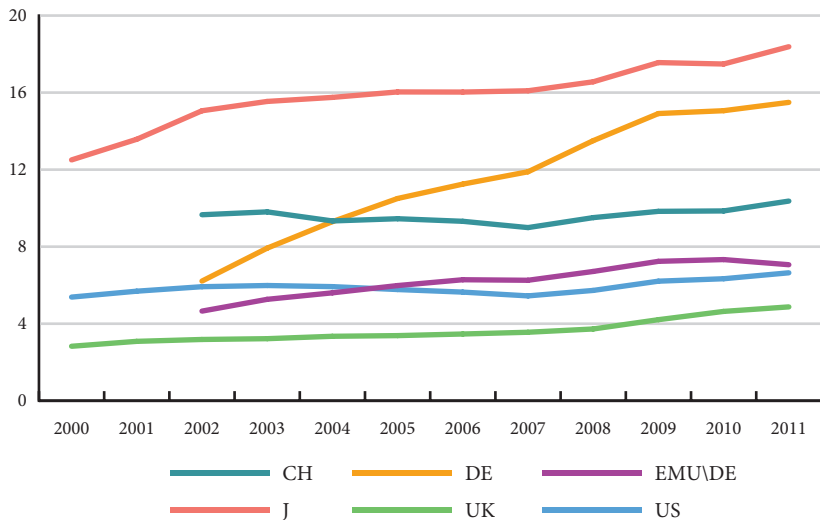


Notes: CH: Switzerland, DE: Germany, EMU\DE: Euro area excluding Germany, J: Japan, UK: United Kingdom, US: USA. The figures for the euro-area countries relate to the cumulative net issue.
Sources: National central banks, ECB.

¹⁸ The Fed estimates that up to 2/3 of dollar banknotes are located outside the country (United States Treasury Department, 2006 and Judson, 2012).

If one considers the development over time in the currency areas under analysis, the dynamic development in Germany is particularly striking (see Figure 13). The values are increasingly approaching those for Japan. However, the figures have not been increasing at their prevailing high level quite as quickly since 2009. There has even been an absolute decrease in the quotas of the EMU partner countries, whereas this quota has otherwise risen everywhere, in some cases even more sharply than in Germany.

Figure 13:
„Cash in circulation“ in relation to GDP over time (in %)



Notes: CH: Switzerland, DE: Germany, EMU\DE: Euro area excluding Germany, J: Japan, UK: United Kingdom, US: United States.

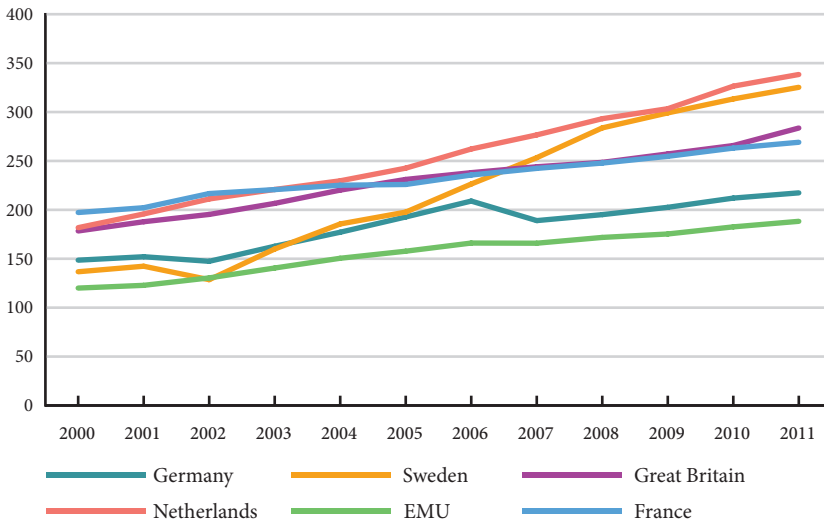
Sources: National central banks, ECB.

2.3 Cashless payments

Let us now turn our attention to cashless payment instruments. In 2011, every citizen made approximately 217 cashless transactions on average. This puts Germany above the euro-area average (see Figure 14). However, cashless payment instruments have been used much more intensively in some countries (most notably in the Scandinavian countries and in the Netherlands). As will be seen later, this is largely due to the fact that Germans use payment cards relatively infrequently.

Figure 14:

Cashless payment transactions per capita in selected EU member states



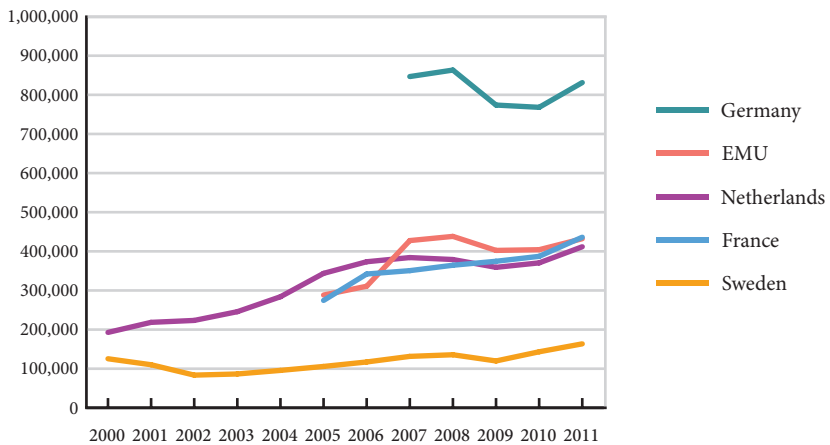
Notes: Values for Germany: Statistical break in 2007.
Sources: ECB Data Warehouse and our own calculations.

Measured on the basis of the per capita value of cashless transactions, Germany is above-average for all the countries considered (see Figure 15). It should be borne in mind, however, that the statistics on the value of non-cash payments are dominated by high turnover in the B2B area and in the settlement of financial market transactions. In addition, the change in values over time and the large differences between similar countries would suggest that the statistics are not always comparable.

Figure 16 compares the number of transactions per capita in the EU in 2002 and in 2010. The values have increased in every country. The highest levels of growth, starting from a low base level, are evidently in the Baltic states and in Poland. In 2010, the Scandinavian member states of the EU were clearly at the top with almost 200 transactions per inhabitant. Greece was at the bottom end of the scale with only seven transactions. With a score of 33 transactions, Germany is on a par with Malta and Lithuania, just ahead of Italy, but significantly behind France, Austria and the Netherlands.

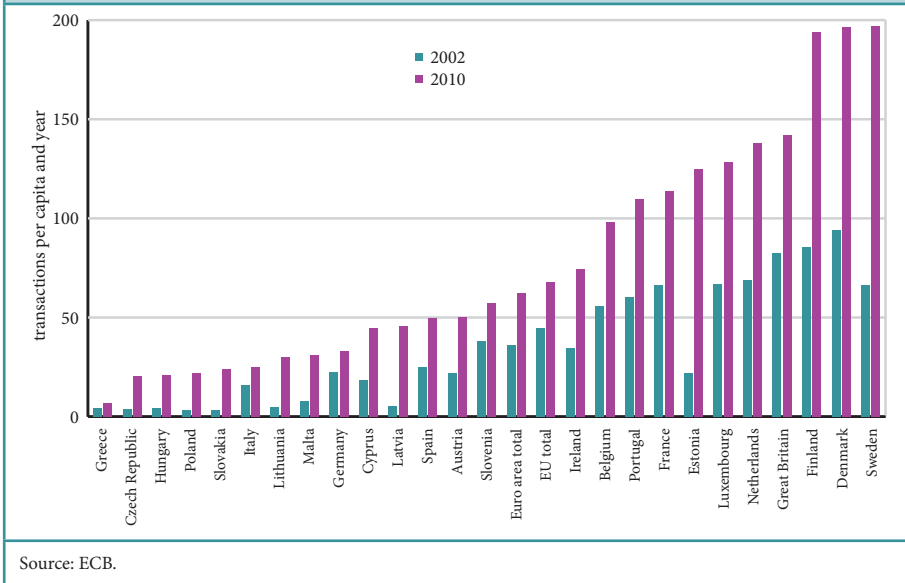
In comparison with the rest of the EU, growth in Germany has been slower. Outside the EU, the number of transactions per capita in 2010 was 211 in the US, 64 in Japan, 77 in Switzerland, and 4 in China. Therefore, according to these figures and bearing in mind the level of development, the value for Germany is relatively low.

Figure 15:
Value of cashless payment transactions per capita
in selected EU member states



Notes: Values for Germany: Statistical break in 2007.
Sources: ECB Data Warehouse and our calculations.

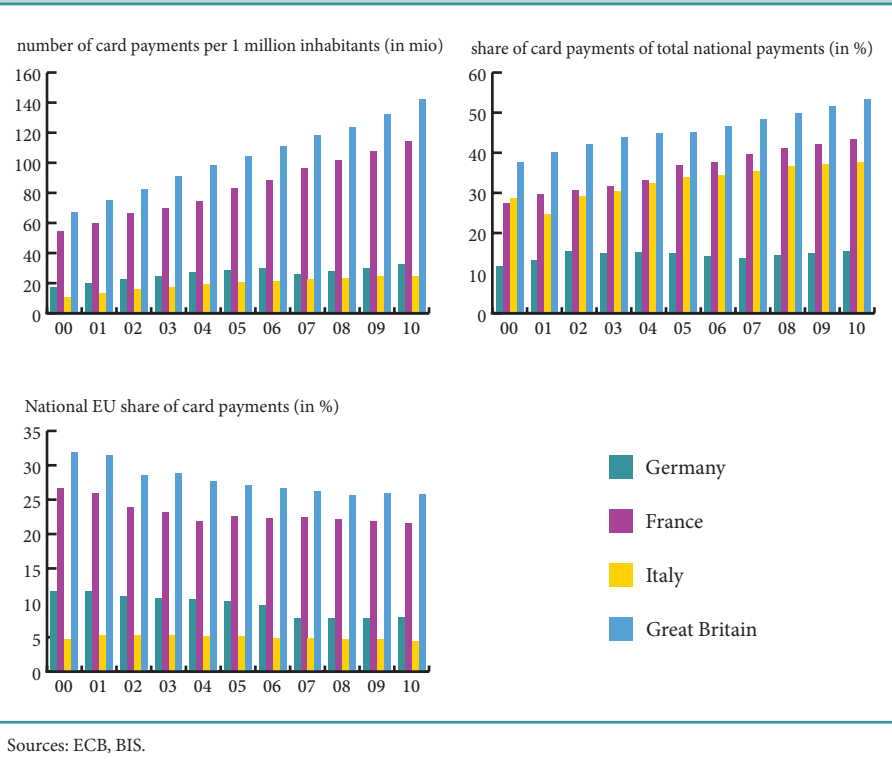
Figure 16:
Card payments in the EU



This statement is underlined if Germany is only compared in detail with the major EU member states, i.e. France, Italy and the UK. Figure 17 relates once again to the number of card payments, in this case from the year 2000. While the number of card payments per 1 million inhabitants and the proportion of card payments in all domestic payments has been tending to stagnate in Germany for a number of years, these figures have risen steadily in the other three countries, in some cases markedly (see the top two charts). The top left chart shows that the number of card payments in Germany is just ahead of Italy but some way behind France and the UK, whereas the share of card payments in Germany (see top right chart) lagged well behind the other three countries in 2010 with only 15% (Italy: 38%; France: 43%; UK: 53%). However, this statement must be seen against the backdrop of the relatively frequent use of direct debits and credit transfers in Germany (see Figures 23 and 24). The vast majority of transactions are carried out using debit cards. The national EU shares of payments with cards have fallen in all the countries under consideration since the beginning of the millennium. However, Germany's share fell to a low 8% in 2010, which puts it marginally above that of the Netherlands. The corresponding figures for France and the UK were about three times as high at 22% and 26% respectively.

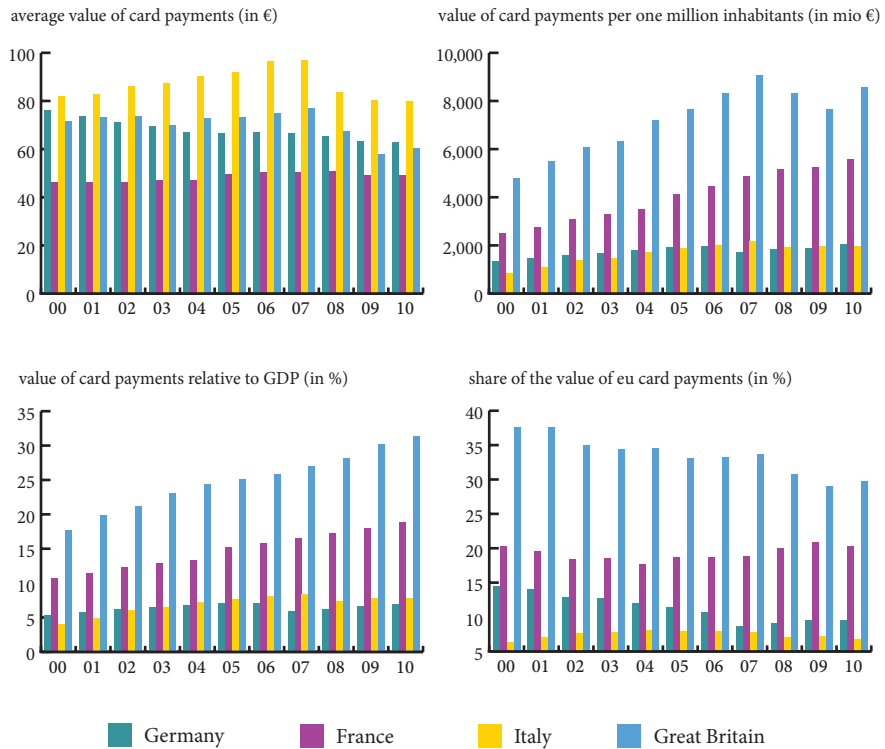
Figure 17:

International comparison of the number of card payments



If we turn our attention to the value of card payments, the first striking thing is the differences in average payments (see Figure 18, top left). In 2010 they ranged from €49 in France, to €63 in Germany, €60 in the United Kingdom and up to €80 in Italy. The figures for Germany were similar to those for Austria and Malta. There has been an apparent downward trend in recent years in all the countries apart from France, where the value was already very low at the start of the new century. More and more, also smaller bills are settled with cards as there is ever greater acceptance of card payments on both the supply and demand sides. The lowest values in the EU are found in the Baltic states with average amounts of below €20.

Figure 18:
International comparison of the value of card payments



Sources: ECB, BIS.

The value of card payments per one million inhabitants in France has risen markedly since the year 2000 (see Figure 18, top right). In Germany this increasing trend was interrupted in 2007.¹⁹ In Italy and Great Britain, on the other hand, there were partly sharp declines in this due to the financial and economic crisis in 2008/09. However, while the real value of card transactions has fallen in Italy almost every year since 2008, this has not been the case in the other three countries. Measured relative to

¹⁹ However, it should be noted in Germany's case that the values prior to 2007 are only comparable to those afterwards to a limited degree on account of changes in methodology.

GDP, the value of card payments in Great Britain and France in 2010 came out at 31% and 19% respectively, with a rising trend; by comparison, the values of 7% for Germany and Italy lag significantly behind where there has been less continuity in development. However, there has been a steady rise since 2007 in Germany's significance in terms of its share of the value of all card payments in the EU, albeit at a low level (9.5% in 2010). That said, Great Britain and France are also well ahead in this regard. All things considered, one has the impression that Germany has a considerable amount of catching up to do in the area of card payments compared with countries with a comparable standard of living.

One market segment in which great use is made of cards for payments in other countries is e-commerce. The proportion of card payments in this segment is frequently above 90%. While cards are also used in this segment in Germany, alternative methods of payment such as credit transfers (before or after delivery of the goods) or direct debits collectively account for a much greater share of the market (see Table 8).

Table 8:
Methods of payment in e-commerce (2010)

	Share of sales
Credit transfer	34%
Direct debit	17%
PayPal²⁰	16%
Credit card	12%
Other	21%

Source: Rodenkirchen & Krüger (2011).

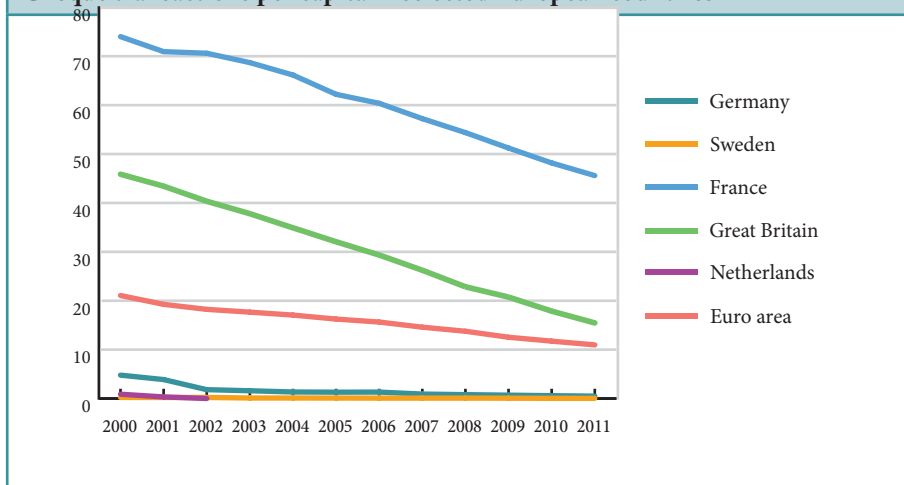
In general, *cheques* are viewed as an inefficient payment instrument (see Wells, 1996, for instance), and the use of cheques has been declining internationally for years. Cheques are practically no longer used by consumers in Germany, although they are

²⁰ In the case of payment by PayPal, there are frequently other payment instruments involved. In order to pay by PayPal, the payer generally has to pay money to PayPal via credit transfer, direct debit or by credit card.

still used when businesses make payments to households or to other businesses. The latter also explains the relatively high amount per cheque. In the EU, cheques are in common usage most notably in France and the GB. That said, there has also been a pronounced decline in their use in those two countries as well (see Figure 19).

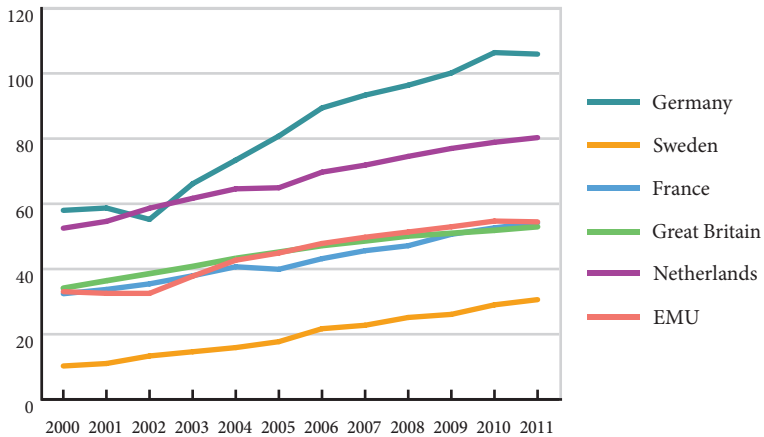
Figure 19:

Cheque transactions per capita in selected European countries



Sources: ECB Data Warehouse and our own calculations.

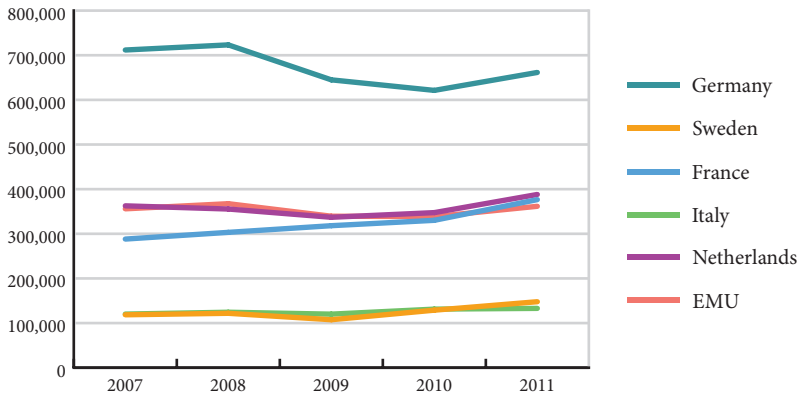
Figure 20:
Direct debits per capita in selected European countries



Sources: ECB Data Warehouse and our own calculations.

Direct debits are particularly popular in Germany, and the trend is rising. Based on the number of transactions, Germany is well ahead of most other countries (see Figure 20). Only the Netherlands and Austria have comparable figures. This is due to the fact that direct debits in these countries are designed to be especially user-friendly. For example, direct debits are not only used in Germany for many regular payments (telephone billing, insurance premiums, etc.); they are also used for payments at the POS (electronic direct debit, or ELV) and for payments on the internet.

Figure 21:
Value of credit transfers per capita (in €)



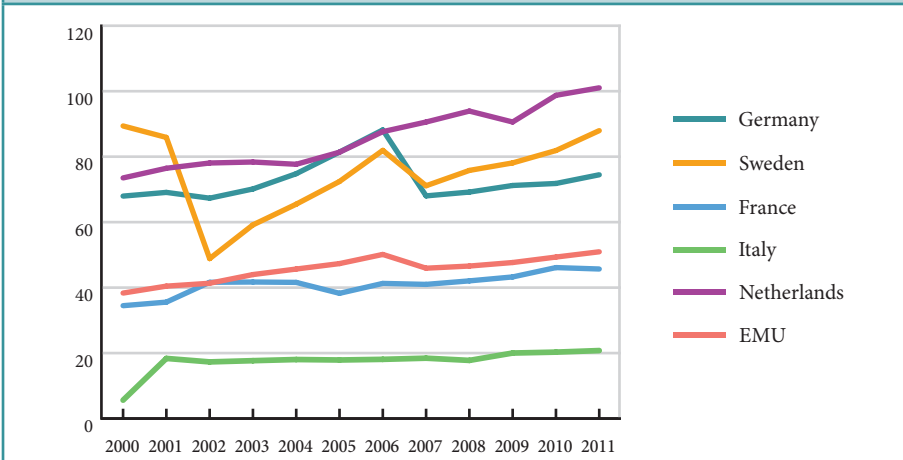
Sources: ECB Data Warehouse and our own calculations.

Any regular payments that are not processed by direct debit in Germany are settled by credit transfer, frequently using a standing order. Besides that, the credit transfer is the most commonly used instrument for making larger one-off or irregular payments. This applies not only to payments by households but also by businesses. In particular, credit transfers are also used for payments arising from financial market transactions. This also explains the high value of the transactions which are effected by credit transfer (see Figure 21). Consequently, Germany is not out in front when it comes to the number of credit transfers (see Figure 22).

The comparative data on the use of the different payment instruments have shown that there are significant differences across Europe. While cash is used relatively frequently in Germany, card use is below the European average. However, that does not mean that cashless payment instruments are generally used less frequently here. Credit transfers are frequently used, and Germany is ahead of the rest in its use of direct debits.

Figure 22:

Credit transfers per capita in selected European countries

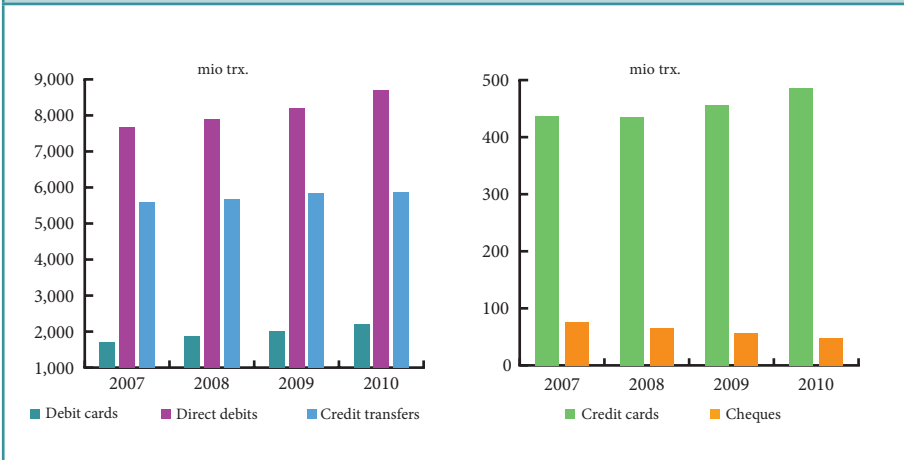


Sources: ECB Data Warehouse and our own calculations.

As far as usage of various cashless payment media (debit and credit cards, cheques, credit transfers, direct debits) in Germany is concerned, direct debits and credit transfers are the dominant options, both in terms of value and quantity (see Figures 23 and 24). Direct debits have increased in both respects since 2007, while credit transfers have declined in terms of value since 2008. Within card payments, debit cards dominate over credit cards, with debit cards becoming more popular over time. Cards only accounted for 0.3% of the value of payments made nationwide in Germany in 2010. France, Italy and Great Britain were considerably higher with corresponding figures of 1.7%, 1.2% and 0.7%, respectively. In terms of quantity, cheques represent the least significant cashless means of payment in Germany. Based on value, cheques still outperform card payments, although they are steadily losing market shares, most notably vis-à-vis debit cards.

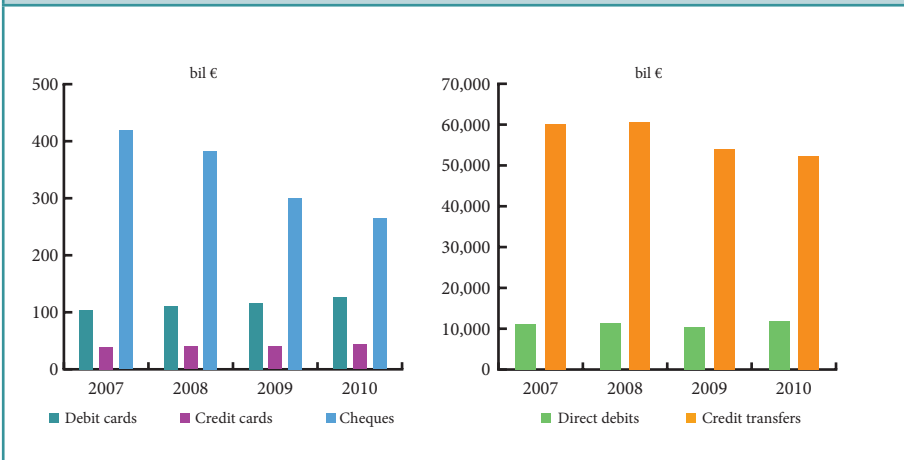
In order to process payments an appropriate infrastructure is required. The payment statistics include data on current accounts, bank branches, ATMs, terminals and payment cards. Once again, there are major differences in this respect between EU countries.

Figure 23:
Cashless payment media in Germany (quantity)



Sources: ECB, BIS.

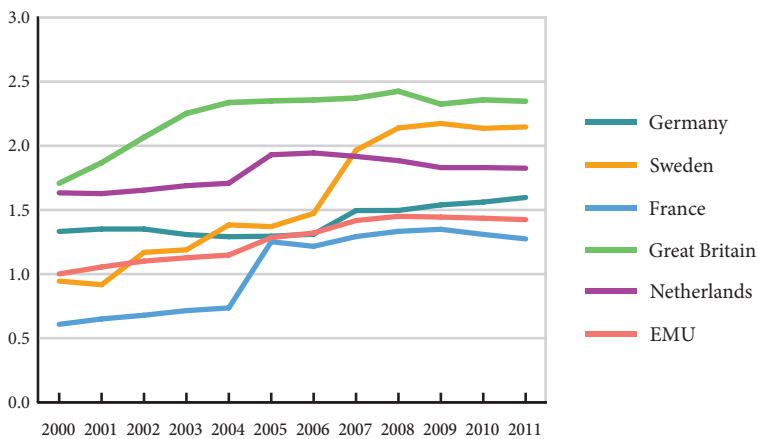
Figure 24:
Cashless payment media in Germany (value)



Sources: ECB, BIS.

A look at the *number of cards* owned by Germans reveals that this is more or less in line with the euro-area average (see Figure 25). Some countries, such as Sweden or the GB, have a higher number of cards per capita. In France, however, where payment by card is much more common, the number of cards per resident is smaller. This suggests that the number of cards held is not the decisive factor in explaining the low usage of cards in Germany.

Figure 25:
Payment cards per capita in selected European countries

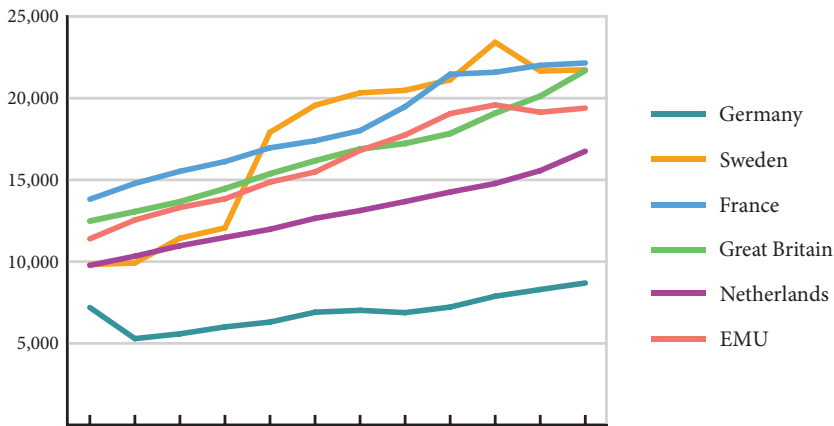


Sources: ECB Data Warehouse and our own calculations.

A card payment system also requires merchants with the necessary technical infrastructure (especially *payment terminals*). A look at the statistics shows that a below-average number of German businesses are equipped with terminals (see Figure 26). That said, it is important to note that recording the number of terminals is a very problematic process. This applies both to the definition of the word “terminal” and to the counting procedure. In Germany, for instance, it is possible to use a debit card to make a payment to merchants who have not entered into an acceptance contract or who do not possess a separate terminal (this is what is known as the Electronic Direct Debit Process, or ELV). These merchants do not appear in the official statistics of the German banking industry. That suggests that the figures for Germany are likely to be too

low. On the other hand, only terminals which are actually used for payments should be recorded. Inactive terminals should not be included in the count. For instance, they include terminals that a merchant has taken out of service in the past or terminals registered to merchants who are no longer trading. However, it is unclear whether, and to what extent, a successful distinction is made between active and inactive terminals. For example, the very high terminal figures in Italy suggest that inactive terminals account for a considerable portion of the data.²¹

Figure 26:
Number of payment terminals per 1 million inhabitants



Sources: ECB Data Warehouse and our own calculations.

The comparability of the figures is also put into perspective by the fact that the retail structure can vary significantly across countries. Geography also plays a role. Countries with high population densities achieve a good acceptance level with a smaller number of terminals than countries whose populations are scattered over a wide area.

²¹ With 25 card payments per person, Italy is still lagging behind Germany (see also Figure 17). At the same time, the statistics show that there are 20,000 terminals for every million inhabitants - a value which is 2.4 times as high as in Germany and roughly equivalent to the figure for Sweden, one of the countries with the most frequent usage of cards in the world (almost 200 transactions per person per annum).

Nevertheless, the relatively low figures for Germany suggest that the limited use of cards is at least partly attributable to the underdeveloped acceptance infrastructure.

Conversely, the low card usage and the relatively high use of cash can also be explained by the fact that access to cash is relatively easy. One indicator of this would be the density of the network of ATMs and bank branches (see Figures 27 and 28).

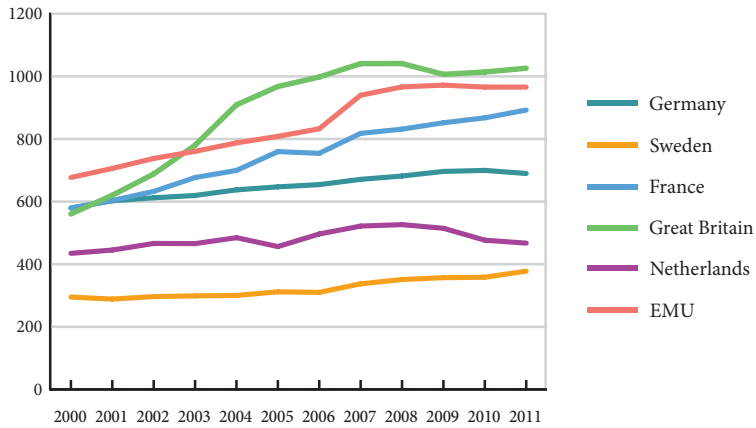
Measured in terms of “ATMs per 1 million inhabitants”, the number of *ATMs* in Germany is below average.²³ In the euro area as a whole, but also in France and the GB, the density of ATMs is much higher. These data should also be interpreted with caution, however. As far as the customer is concerned, it is frequently not the density of the ATM network in general that matters, but rather the density of ATMs that are available to be used free of charge. Charges generally apply in Germany when people withdraw cash from a (bank) network other than the one where they have their account.²² Therefore, the network that a customer generally uses is considerably smaller than the entire network that is at his disposal.²⁴

²² This is not the only measure that can be referred to for comparing the availability of ATMs. „ATMs per unit of area“ is another interesting yardstick. However, the geographical distribution of ATMs also has to be taken into consideration here.

²³ If, for example, a Sparkasse customer wishes to withdraw money from a branch of the Volksbank.

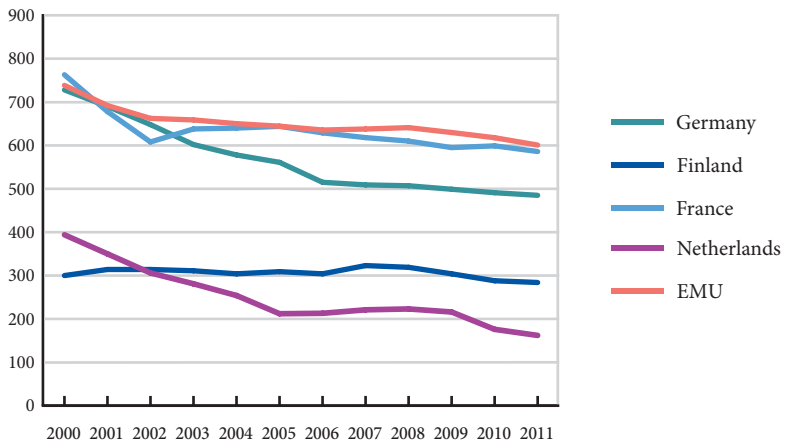
²⁴ The ATMs of all banks may be used free of charge by all customers in Great Britain. However, the ATMs operated by specialist service providers („ISOs“) generally entail charges. The latter have contributed considerably to the strong growth that was apparent in the initial years in Figure 27, see VocaLink (2013).

Figure 27:
ATMs per 1 million inhabitants



Sources: ECB Data Warehouse and our own calculations.

Figure 28:
Bank branches per 1 million inhabitants

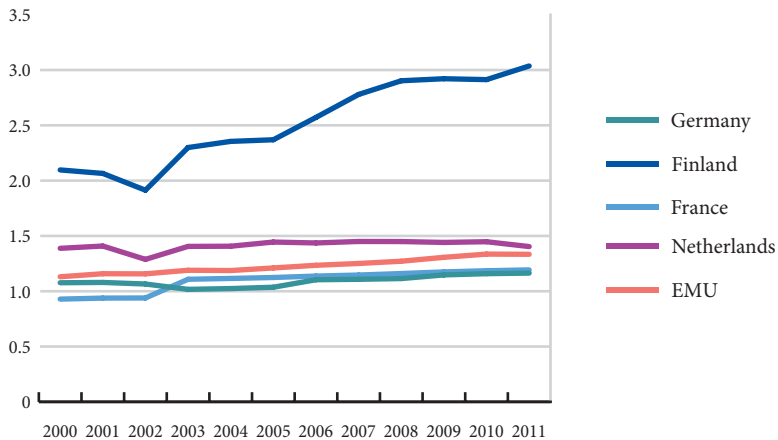


Sources: ECB Data Warehouse and our own calculations.

Together with ATMs, *bank branches* are also of relevance for the supply of cash. First, customers can withdraw cash there, as well as deposit cash. Second, it is precisely small retailers which deposit their cash at a branch or obtain change from there. As shown, the number of branches in Germany is also not particularly high, so branch density cannot explain the relatively high use of cash either. However, in the interpretation of figures for both ATMs and bank branches, it is evident that Germany fares much more favourably than other European countries in terms of distribution over surface area. Together with Italy, Germany comes out on top among the larger countries in the euro area in terms of access to bank counters and ATMs (Deutsche Bundesbank, 2010, chap. 4.2.2).

In most countries, *current accounts* have become the hub for payment transactions. The possibility to send and receive payments and thus take part in economic life is practically no longer possible without a current account. A look at statistics shows that current accounts are held by almost everyone in many countries (see Figure 29).

Figure 29:
Number of current accounts per capita



Sources: ECB Data Warehouse and our own calculations.

In summary, we can conclude the following:

- International and European comparisons show that there are pronounced differences in the development of cash and cashless payment transactions in Germany. Therefore, findings from other countries should only be applied to Germany with caution.
- Even though there have been continuous and clear increases in the banknote issues made by the Deutsche Bundesbank, the share of cash used for retail payments is diminishing. This discrepancy and the trend emerging from the international comparison can be explained primarily by the use of the euro abroad. All in all, the domestic transaction motive for holding cash probably only amounts to 10% to 20%. Estimates of cash transactions are associated here with considerable uncertainty.
- Both in terms of value and quantity, direct debits and credit transfers remain the most common forms of cashless media used in Germany. Cheques, on the other hand, have been on the decline for years. While the availability of cards is in line with the European average, usage of debit and credit cards is below average.

Having provided an overview of national and international developments in cash and non-cash payment methods, together with selected examples and key figures, we will now present a critical review of the literature on their costs.

3. Cost studies: Overview of literature

It is already clear from the different developments shown in Chapter 2 that one should be careful when comparing payment systems internationally. This applies, in particular, with respect to costs of different payment media. Hayashi & Keeton (2012, p. 1f) conclude following an analysis of different cost studies: “The studies have reached different conclusions ..., suggesting that cost rankings can depend on the *specific characteristics of a country’s payments system* and the *scale* at which a payment method is used in the country. (...) These differences suggest a need for each central bank to *conduct its own cost study*.” In a similar vein, Schmiedel et al. (2012, p. 8) state: “The existing literature shows that, in spite of recent efforts, there is still only limited knowledge and

information available for making valid comparisons of the costs of making payments across European countries.”

The more recent studies, many of which incorporate all the parties involved in the payment process, calculate what are known as resource costs.²⁵ An overview of selected studies, including policy recommendations, is provided by Koivuniemi & Kempainen (2007), as well as by Hayashi & Keeton (2012). In addition, there are also analyses which only consider individual parties, mainly retailers and/or banks (for example, Banco de Portugal, 2007; Guibourg & Segendorf, 2007) or which analyse costs without consolidation (e.g., Takala & Virén, 2008).

In determining the *resource costs*, all the costs incurred by the sectors under analysis are added in a first step.²⁶ The costs which represent a source of income for another sector (fees, interest, etc.), i.e. so-called external costs, are then subtracted.²⁷ Therefore, only the actual cost (use of own resources: capital, labour, etc.) is calculated for each sector. Resource costs and other types of costs used in connection with payment media are explained in Figure 30. *A* to *E* represent the entire *private costs* of all the sectors under analysis. They consist of own resource costs (*internal costs*), as well as *external costs* in the form of paid services from third parties. Examples are the time that it takes households to obtain cash; the task of counting cash by retailers and the removal of cash; the costs to the central bank for the production and processing of banknotes, or the cost to commercial banks of cash deposits and disbursements.

²⁵ See Ardizzi & Giucca (2013), Banque Nationale de Belgique (2005), Bergman et al. (2007), Brits & Winder (2005), Danmarks Nationalbank (2012), Gresvik & Haare (2009), Humphrey et al. (2003), Nyandoto (2011), PaySys Consultancy (2006), Schwartz et al. (2008), Segendorf & Jansson (2012), Simes, Lancy & Harper (2006), Turjan et al. (2011), Valverde et al. (2008), as well as the multi-country contributions by Schmiedel et al. (2012) and Retail Banking Research (2010). A general critical assessment, taking due account of qualitative factors, benefit aspects and welfare considerations can be found in Shampine (2007, 2009).

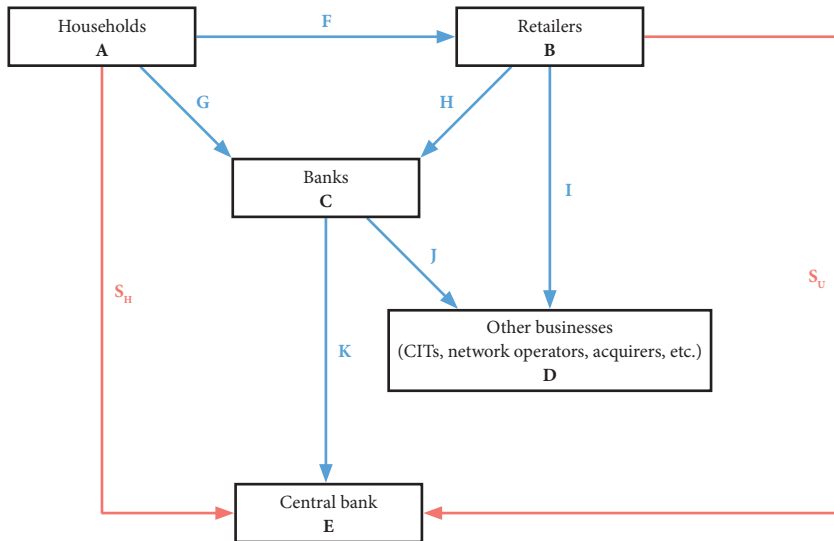
²⁶ The term „social costs“, which is frequently used synonymously for resource costs, is confusing because it has actually been used for over a century as an established term in public finance, specifically in the area of environmental economics and negative external effects.

²⁷ The use of the term „external costs“ contrasts with its use in allocation theory and environmental economics, where it is defined as “negative external effects”.

The blue arrows F to K denote the costs which arise in connection with payment services in the form of charges or other costs which are directly invoiced by other sectors. For example, F covers (explicit and implicit) costs which consumers are charged by retailers for using certain payment instruments,²⁸ G and H cover account management fees for consumers and retailers, I covers the fees which are paid by the merchant to an acquirer for the settlement and acceptance of credit card payments, J covers the costs which banks have to pay for the transport of cash by cash-in-transit (CIT) companies, and K covers the fees which a bank has to pay to the Deutsche Bundesbank for processing national and cross-border SEPA payments.

²⁸ In Germany, merchants may now also request a fee for payments made with the Girocard (see Deutsche Kreditwirtschaft, 2012). These fees are already commonly applied on the Internet. For example, over 20% of Internet shoppers have already had to pay a surcharge for certain payment instruments in e-commerce transactions (Klees et al., 2013, p. 26). Markups are also applied in other countries. Merchants in Denmark, for example, are allowed to charge consumers a fee for credit card payments (Danmarks Nationalbank, 2012, p. 53).

Figure 30:
Costs in payment transactions



	Private costs	External costs	Internal costs
Households	A	F+G	A-F-G
Retailers	B	H+I	B-H-I
Banks	C	K+J	C-K-J
Other businesses	D	-	D
Central bank	E	-	E
<hr/>			
Total		(F+G+H+I+J+K)	(A+B+C+D+E) - (F+G+H+I+J+K)
Seigniorage		S	- S
<hr/>			
Resource costs		(F+G+H+I+J+K) + S	(A+B+C+D+E) - (F+G+H+I+J+K) - S

Source: own chart based on Segendorf & Jansson (2012) and on Schmiedel et al. (2012, p. 15f).

Counterfeits and other acts of fraud come under external costs provided they do not lead to behavioural changes and thus to real consumption of resources because those types of activities entail a transfer of resources from the injured party to the offending party. Similarly, seigniorage $S = S_H + S_U$ also represents external costs which flow from firms and households to the central bank. Correspondingly, they have to be deducted in the calculation of resource costs – at least the part which is attributable to domestic transactions with cash. The provisions of the EU Treaty on the pooling of revenue from seigniorage within the European Monetary Union must be complied with in this regard.²⁹

Different indicators for cash and cashless transactions are calculated in the studies for the purposes of comparison, divided under certain circumstances by sectors. Debit and credit cards are considered most notably in the case of cashless instruments. Other payment media are only included in exceptional cases.

²⁹ Our procedure in subsection 4 is based on the view that the costs or importance of payment instruments can be inferred from the revenue. For example, the costs incurred by banks as a result of payment transactions are determined from G+H, in particular.

Table 9:
Costs of payment instruments: per transaction

	Cash	Cards	Debit	Credit
US 2003 \$54	2.18		1.07	1.16
US 2003 \$11	0.90		1.00	0.95
Austr. 2005 \$A50	1.64		0.80	0.99
Austr. 2005 \$A10	0.96		0.80	0.99
Australia 2007 (\$A)	0.37		0.80	1.22
Germany 2004 (€)	0.36		0.82	2.73
Belgium 1998 (€)	0.56	0.64		
Sweden 2009 (€)	0.78		0.42	1.15
Norway 2007 (€)	1.53	0.74		
Denmark 2009 (€)	0.78		0.36	3.86
Hungary 2009 (€)	0.39		0.33	3.59
Netherlands 2002 (€)	0.30		0.49	3.59
Netherlands 2009 (€)	0.39		0.32	
Italy 2009	0.33		0.74	1.91
EU13 2009 (€)	0.42	0.99	0.70	2.39

Notes: US: Calculation for transactions of 54 and 11 US dollars, respectively; Australia 2005: Calculation for transactions of 50 and 10 Australian dollars, respectively. The annual number relates to the data upon which the study is based. The red numbers indicate the highest and lowest estimates (in €).

Sources: Our own calculations as well as EU13 in Schmiedel et al. (2012)³⁰, Belgium 1998 in De Grauwe et al. (2000), Netherlands 2002 in National Forum on the Payment System (2004), Netherlands 2009 in Jonker (2013) only cash and debit cards, Denmark 2009 in Danmarks Nationalbank (2012), Norway 2007 in Gresvik & Haare (2009), Germany 2004 in PaySys Consultancy (2006), US 2003 in Schwartz et al. (2008), Australia 2005 in Simes et al. (2006), Australia 2007 in Schwartz et al. (2008), Hungary 2009 in Turján et al. (2011), Sweden 2009 in Segendorf & Jansson (2012), Italy 2009 in Ardizzi & Giucca (2012).

³⁰ Countries analysed: Denmark, Estonia, Ireland, Greece, Spain, Italy, Lithuania, Hungary, Netherlands, Portugal, Romania, Finland, Sweden.

The payment costs from which the importance of cash and cashless payments can be inferred can be calculated as

- costs per transaction,
- costs as a percentage of sales,
- costs as a percentage of GDP,
- costs per capita.

Each of these criteria seems plausible at first glance, although they are problematic, most notably in international comparisons. In the case of costs per transaction, for instance, it is important to remember that the transaction amounts vary, which is why it is ultimately not a like-for-like comparison. This inadequacy also affects the costs as a percentage of sales or per euro of sales because the fixed costs per transaction vary between countries and, consequently, the transaction amounts considered also affect the outcome. In order to compare the costs of each payment instrument, it is also necessary to estimate the number or value of transactions. This is extremely difficult with cash, in particular. The costs relative to GDP depend, in their turn, on the degree of development of the respective payment system. And the costs per person and per annum are ultimately markedly determined by the relative usage of each of the payment instruments, as well as by income per person. As Tables 9 to 12 show, the findings vary accordingly between studies and between countries depending on the indicator used. We have only included studies which at least include banks, retailers and, in some cases, consumers, as well as cash and cards as payment instruments.

Table 10:
Costs of payment instruments: as a percentage of turnover

	Cash	Cards	Debit	Credit	Total
US 2003 \$54	4.02		1.97	2.14	
US 2003 \$11	7.85		8.68	8.25	
Austr. 2005 \$A50	3.28		1.60	1.98	
Austr. 2005 \$A10	9.60		8.00	9.90	
Australia 2007	3.16		1.79	2.94	
Germany 2004	1.78		1.33	3.09	1.77
Belgium 1998	9.00	1.23			
Sweden 2009	3.29		1.09	2.38	
Norway 2007	1.67	1.49			
Denmark 2009	3.90	0.99	0.84	5.38	0.85
Hungary 2009	0.39		2.87	9.83	
Netherlands 2002	3.20		1.11	3.12	
Italy 2009	1.07		0.54	1.73	
EU13 2009	2.30	1.70	1.40	3.40	

See Table 9 for notes and sources.

The four tables show quite clearly that there is a very wide range in findings, even in the case of estimates for one country (for example, for Australia in 2003 and 2005). Measured in terms of GDP, the cash costs vary from 0.74% in Belgium and Hungary to 0.15% in Norway (see Table 11). And the per capita costs of the payment instruments as a whole (see Table 12) range from €89 in Hungary to over €400 in Denmark. Even among the 13 EU member states of the ECB study, whose figures were collected applying a standardised methodology, the fluctuation range of the social costs of payment instruments varies from 0.42% to 1.35% of GDP (Schmiedel et al., 2012, p. 35). In addition to differences in methodology, the following factors contribute to this result:

- the intensity with which payment instruments are used,
- the parties to be taken into consideration,
- the types of costs involved,
- specific assumptions made in the calculations (for example, about the extent of cash transactions³¹),
- the valuation of time and
- interest rates used (for measuring opportunity costs).

Table 11:
Costs of payment instruments: as a percentage of GDP

	Cash	Cards	Debit	Credit	Total
US 2000					3.00
Australia 2007	0.50	0.50	0.10	0.20	1.00
Germany 2004	0.61	0.12	0.07	0.05	0.73
Germany 2008 (RBR)	0.63	0.45			1.08
Belgium 1998	0.74	0.10			0.85
Sweden 2009	0.26	0.28	0.19	0.09	0.54
Norway 2007	0.15	0.24			0.49
Denmark 2009	0.27	0.18	0.14	0.04	0.78
Hungary 2009	0.74	0.19	0.11	0.08	1.30
Netherlands 2002					0.65
Netherlands 2009					0.42
EU13 2009	0.50	0.21	0.11	0.10	1.00
Italy 2009	0.53		0.04	0.07	1.00
Europe 2008 (RBR)	0.60	0.57			1.17
Germany 2011	0.31	0.03			0.34

Source: RBR: Retail Banking Research (2010); Germany 2011 based on Kleine et al. (2013); for further comments and sources, see Table 9.

³¹ Determining the share of cash transactions is especially important for Germany because the German net issues are not only used to finance domestic transactions; parts of them are also hoarded and are held abroad, both within and outside the euro area (see Figure 7).

This makes it difficult to perform international comparisons. Therefore, we would strongly advise against extrapolating the findings to a larger group of countries, such as from 13 EU member states to all 27 EU member states, as is done in Schmiedel et al. (2012), for example. Under no circumstances should any conclusions be drawn about the efficiency of a particular payment instrument from one indicator alone. For example, high costs per transaction could actually be attributable to an inherently inefficient method of payment, but could also be due to a high average transaction value or to low usage of economies of scale. In the case of credit cards, for instance, high costs per transaction (see Table 9) combined with high costs per unit of sales (see Table 10) generally indicate that high transaction values are not the only factor that is responsible for this. Network effects and economies of scale are apparent in all payment media which have to be taken into consideration in the determination of costs and, particularly, in simulations and scenario analyses.

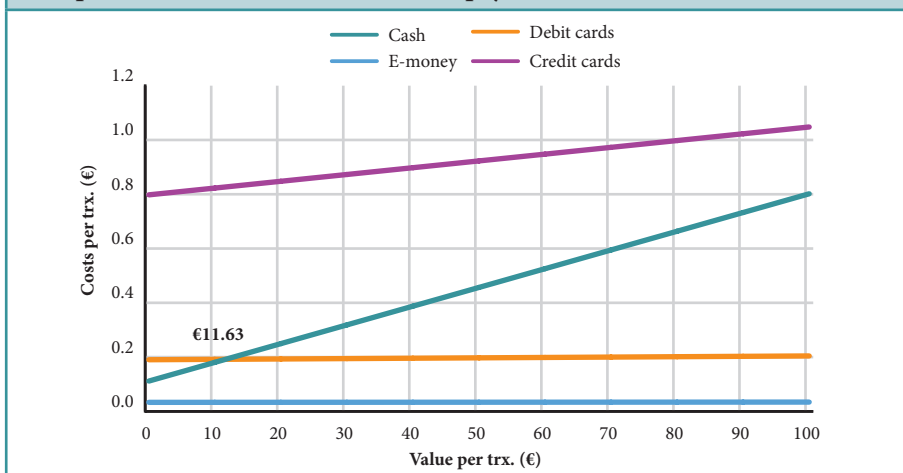
	Cash	Cards	Debit	Credit	Total
Australia 2007	139.00		49.23	69.50	257.72
Germany 2004	161.37		18.34	12.90	192.61
Germany 2008 (RBR)	191.18	136.39			
Belgium 1998	162.91	22.99			185.91
Sweden 2009	87.11		60.34	28.45	
Norway 2007	92.49	141.81	62.37	25.57	295.43
Denmark 2009	141.04	60.79			403.66
Hungary 2009	71.78		10.76	6.96	89.49
Netherlands 2002	131.40		32.20	10.22	
Italy 2009	132.84	117.06	11.15	18.10	250.84
Netherlands 2009					144.88
Germany 2011	97.80	9.78			107.58

Sources: RBR: Retail Banking Research (2010); Germany 2011 based on Kleine et al. (2013); for further comments and sources, see Table 9.

According to the studies, the highest costs of payment instruments as a whole are generally among banks and in the retail sector (see overview in Schmiedel et al., 2012, p. 36). However, figures for the total economy of 3% of GDP for the USA, as reported in Humphrey et al. (2000), could not be confirmed in more recent studies. Where a distinction is made between fixed and variable costs (for example, in Brits & Winder, 2005; Bergman et al., 2007; Segendorf & Jansson, 2012; BNB, 2005), a large portion of the costs for cashless payment media is attributable to setting up the infrastructure and is, thus, of a fixed nature. In order to undo the effects of different transaction values, the US (Garcia-Swartz et al., 2006a, b) and Australian (Simes et al., 2006) studies use specified standard amounts (see Tables 9 and 10). As high variable costs and relatively low fixed costs are estimated for cash, the relative advantages associated with cash diminish as the value of the transaction increases.³² It is also apparent in this procedure that the representative standard amounts vary from country to country.

Figure 31:

Comparison between costs for different payment media: the Netherlands



Source: Brits & Winder (2005).

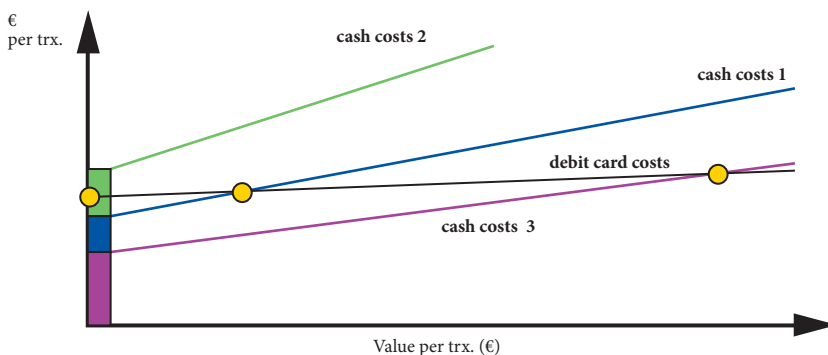
³² Fixed costs include, for example, the acquisition of safes and counterfeit money detectors by retailers, as well as shoe-leather costs for consumers. A distinction is made in the fees for cash-in-transit companies between a fixed and a value-dependent amount. Variable costs would also include interest foregone in the sense of opportunity costs. The classification also depends on the time horizon under consideration.

The problem of the limited comparability of the indicators presented can be countered by the determination of cost functions for payment media which relate costs to transaction values (see, for instance, National Forum on the Payments System, 2004, Brits & Winder, 2005; BNB, 2005; Turján et al., 2011; Bergman et al., 2007; Simes et al., 2006). The aim here is to deduce a break-even point for the transaction value from which a particular payment medium becomes relatively more or less expensive. For that purpose, the costs are divided into fixed and variable costs. The variable costs are subdivided into transaction-dependent and value-dependent costs. In a second step, the variable costs are shown as a function of the transaction value. The case of the Netherlands is illustrated in Figure 31 (National Forum on the Payments System, 2004 and Brits & Winder, 2005). It is apparent that a transaction amount of €11.63 is the threshold from which payment by debit card is more favourable than a cash payment.³³ Irrespective of the transaction amount, the most favourable payment medium would be e-money, which is rarely used. This is the chipcard-based payment function “Chipknip” (comparable to the “GeldKarte” in Germany). Credit cards are clearly the most expensive option up to a transaction value of €100. The results depend upon a number of estimates and the assumption that certain costs are fixed. Consequently, there is a risk that the findings will be sensitive to variations in specification (see Figure 32). For example, the threshold amount in case 3 is fairly high due to the low fixed and marginal costs of cash, whereas debit cards are always the cheaper option in case 2. Or to put it another way: there is a risk that even small errors may have a considerable influence on the break-even point determined. In the case of Germany, Kleine et al. (2013, 10) have calculated that the critical amount from which it is more cost-effective from an economic perspective to pay by card rather than in cash is just under €6.

The resource costs of households are also estimated in some more recent studies (for example, Garcia-Swartz et al., 2006a, b; Gresvik & Haare, 2009; Turján et al., 2011; Danmarks Nationalbank, 2012). Since resource costs do not include fees by definition, these costs essentially comprise the time that households have to spend on the payment process, on procuring cash and on reviewing settlements afterwards. Depending on which of these time costs are taken into account, which time is set, how time is

³³ This value fell to €3.06 in 2009 (Jonker, 2013).

Figure 32:
Cost sensitivity



Source: own chart.

valued, and which other costs of households are considered (e.g. risk-related costs due to acts of fraud and counterfeits), the results vary considerably. For example, the social costs for households amount to 0.05% (of GDP) in Sweden, but to 0.23% in Denmark.³⁴

³⁴ In the study conducted by Segendorf et al. (2012) for Sweden, the time costs of cash for households are estimated with the aid of an inventory theoretic model. Applying a very low rate of interest of 0.27%, this gives rise to time costs of only SEK 20 million in 2009 (approximately EUR 1.9 million). Had the calculation been performed with an interest rate of 2.5% instead, this would have given rise to costs of SEK 170 million (approximately EUR 16 million). According to the study conducted by Danmarks Nationalbank (2012) for the same year, however, the time costs are the key cost drivers at household level. They amount to DKK 1.352bn (approximately EUR 182 million), i.e. almost 100 times higher. These figures were determined by multiplying the time cited by consumers in a survey for withdrawing cash and queuing at POS by an average net hourly wage rate. According to the study, time costs account for almost 85% of the *total* costs incurred by households in Denmark for cash *and* cashless payment media. By contrast, time costs for consumers are completely disregarded in the study conducted by Ardizzi & Giucca (2012) for Italy.

The problem can be explained with great clarity in the case of cash withdrawals at ATMs. Initially, it seems plausible to estimate the time spent at the ATM and then to price it accordingly (in the sense of opportunity costs). However, if these costs for economic agents are actually substantial, it is fairly simple to lower them because higher withdrawal amounts imply fewer trips to the bank. If the same distance is always travelled per withdrawal, the costs depend proportionally on the number of transactions effected at the ATM, and the cost minimisation problem is as follows: by selecting amounts which are as high as possible, the overall distance travelled, and thus the time, can be kept to a minimum. However, this approach disregards the fact that people do not often go specifically to the ATM, but are in the vicinity of an ATM anyway. Still, the revealed preferences of households show that they do not seem to regard the costs associated with withdrawing cash at ATMs as unduly high.³⁵

Accordingly, there are two methods in the valuation of the withdrawal process. In the first (for example, Gresvik & Haare, 2009; Danmarks Nationalbank, 2012), the time taken to withdraw cash is simply multiplied by a representative hourly wage rate and by the total number of ATM withdrawals per year. In the second method, an economic model (such as the Baumol Tobin model) is set up in order to determine the costs per cash withdrawal from the number of ATM transactions per person as a means of trading-off opportunity and transaction costs (see, for example, PaySys Consultancy, 2006). Method 1 generally leads to considerably higher costs than method 2. This can be demonstrated with the aid of a simple stylised example for Germany (see Table 13). Applying method 1, we set the net hourly rate at €20 and the time per withdrawal at 3 minutes. The 2.1 billion ATM transactions in 2011 would then correspond to total costs of the order of €2.1 billion. We use the Baumol Tobin model in method 2. Given an average of €450 withdrawn every month, an annual rate of interest of 3% and three withdrawals per month, the model yields costs per withdrawal of €0.063. With the same number of ATM transactions, i.e. 2.1 billion, this would “only” translate into total costs of €132.3 million.

³⁵ However, depending on the country and region in question, withdrawing small amounts relatively frequently might also be due to fears of loss and theft.

Table 13:
Costs of an ATM withdrawal

Method 1	
Costs per hour	€20
Time per withdrawal	3 minutes
Costs per withdrawal	€1.00
Total costs (€ bn)	2.1
Method 2	
Costs per withdrawal	€0.063
Total costs (€ million)	132.3
Memo item:	
Number of transactions (millions)	2,100
Sources: Our own calculations and chart, ECB, Deutsche Bundesbank.	

The problems which arise in the valuation of time also occur in other sectors. For example, the wage costs for bank employees must actually be allocated to the individual payment media in the calculations. In retail, the time taken to process the payment at the POS must be evaluated. And it has to be decided whether the removal of cash is done during working hours or on the way home. The study by de Grauwe et al. (2000), for example, put cash removal costs for retailers in Belgium at almost €1.2 billion per annum by assuming 1.5 hours per day and per retailer for removal. All in all, a considerable portion of the costs determined for the banking industry and for retail is made up of wage costs. In this regard, a decision also has to be taken on whether time spent is really associated with opportunity costs. This may be the case in a large supermarket because lengthy payment transactions there would mean that more till operators have to be hired. This, however, is not the case in a small shop with rather sporadic visits by customers. Furthermore, the hourly wage rates used in retail and for households have a significant bearing on the results.

Therefore, serious quantification and valuation problems are associated with the cost studies, in particular if all parties that are involved in the payment cycle are incorporated into the analysis. The advantages of individual payment media in the sense of a cost-benefit analysis are normally not taken into account at all (apart from Garcia-Swartz et al., 2006a, b). The lack of transparency of the calculations and of the data basis in some studies is also striking. For instance, the abstract in Retail Banking Research (2009) makes reference to figures for Germany without quoting sources and without any methodological explanations. However, there is no specific reference to Germany in the main text. And in Kleine et al. (2013) reference is made in the majority of cases to unspecified interviews with experts in determining cash costs. In addition, qualitative factors, which often concern the relative advantages (net) of cash, are ignored in virtually all the studies (Garcia-Swartz et al., 2006a, b is once again the exception in some regards). Factors which are generally neglected are

- Questions relating to data protection, anonymity, protection of privacy and “identity theft” with cards (Roberds & Schreft, 2009).
- The role of cash for monetary policy. Banknotes represent an autonomous factor within liquidity management. In addition to minimum reserves, it ties the banks to the central bank. Moreover, cash is part of the demand for money which is analysed within the scope of monetary analysis. It has a particular bearing on narrow monetary aggregates (e.g. M1) and on the demand for central bank money (outside money) (see Görgens et al., 2014, Chap. III).
- Trustworthy cash is likely to be the payment means “of last resort” during crisis phases, in particular financial and payment crises (system risks). The existence of cash may be advantageous in this respect if cashless payment systems fail completely or in part due to technical problems. The developments following the insolvency of Lehman Brothers were also instructive in this regard. The sharp increase in demand for banknotes at the time indicates the advantage of money issued (in physical form) by a credible central bank, irrespective of the motives behind it.
- Questions of implicit and explicit pricing of payment media (see, for example, Krueger, 2009). The decisive question to be answered here is whether the pricing system which is practised leads to efficient outcomes.

- While there may be some reliable information available about counterfeit banknotes, there is a shortage of data about cash robberies and loss and about the damaging effects of debit and credit card fraud (data can be found in, among others, ECB, 2013; European Security Transport Association, 2006; Financial Fraud Action UK, 2012).
- In the case of cash, on the other hand, there is a problem in determining the part which is used for payment transactions. In Germany, the majority of banknotes are probably held abroad, and only a very small portion is used for transactions domestically (see Bartzsch et al., 2011a, b).
- In the vast majority of cases, the cost studies are based on surveys conducted among banks and retailers. However, the bias caused by participants responding strategically is generally not explored in any detail, or the responses are not examined any further. And in the case of surveys among consumers, due account should also be taken of the effect that the design of the survey has on the results. What is particularly evident in this regard is high sensitivity or resistance among consumers to having to answer questions about their cash holdings (see Jonker & Kosse, 2009, for example).
- If the efficiency of individual methods of payment or of the entire range of payment instruments is at the centre of interest, the national macroeconomic angle should dominate the business or microeconomic perspective.

Against the background of this critical overview of literature, we will now present an alternative approach of quantifying the importance of cash and cashless payment instruments *without* conducting an own survey. As the methodology differs from the other studies, the results can only be compared to a limited extent. Therefore, caution is advisable when comparing the figures calculated below for Germany with those for other countries.³⁶

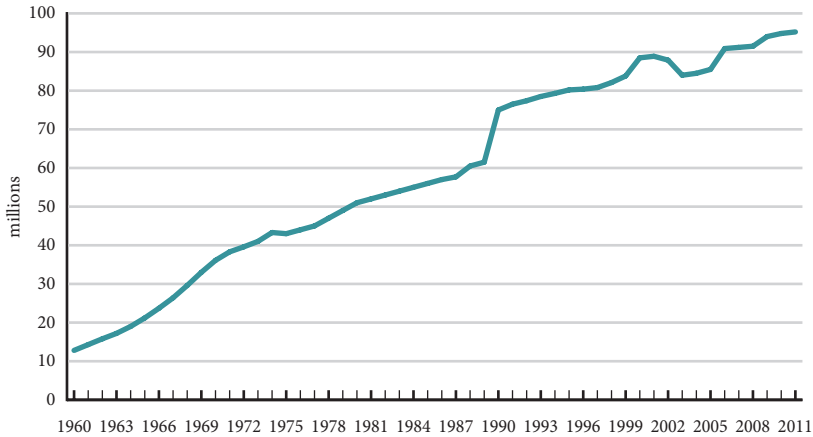
³⁶ One could also attempt to determine the employment share associated with payment transactions, for example, as an alternative to our demand-based approach, although we do not find that it is quite as persuasive.

4. The significance of payment media in Germany

4.1 The central role of banks in payment transactions

In the past, the flow of money was largely self-organised. Money was brought into circulation by central banks and/or mints and was then passed on by other economic entities. Cashless payment transactions were initially of little significance to households and small businesses, and were restricted to larger businesses and wealthy people. However, cashless payment transactions started to make progress as cashless wage and salary payments became more widespread between the late 1950s and the early 1970s in Germany. Having said that, this does not mean that cash payments were displaced completely. But the nature of the cash cycle has been completely transformed in the course of these changes. Cash transactions, and in particular the procurement and removal of cash, have become increasingly intertwined with cashless payment transactions.

Figure 33:
The number of current accounts in Germany



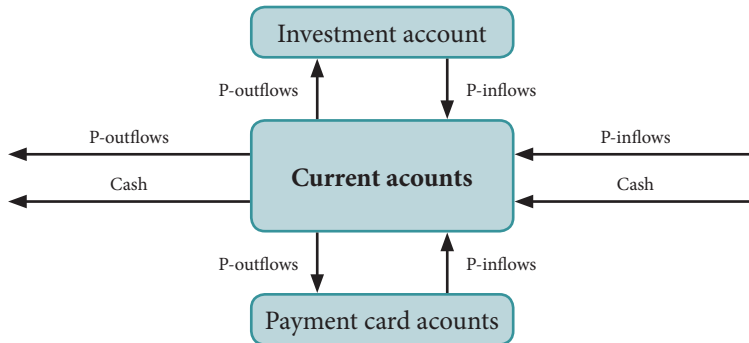
Sources: Deutsche Bundesbank and our own calculations.

The current account is the focal point which payment transactions revolve. There has been a steady rise in the number of current accounts in Germany for five decades (see Figure 33). The key payment flows of households (earnings, transfers, taxes and a large portion of regular expenditure) and of companies pass through this account (see Figure 34). This also applies to the procurement and removal of cash. Any person who requires cash withdraws it from his current account, or anyone who has a high cash inflow pays it into a current account. Therefore, an autonomous, self-organised cash cycle now only exists to a very limited extent.³⁷ Despite the diverse range of payment instruments available, there is essentially one integrated payment system with the current account pivotal to it.

³⁷ An analysis would have to be conducted here to determine to what extent risks can be reduced by supporting or safeguarding the circulation of cash during periods of crisis.

Figure 34:

The current account as focal point of the payment system



P: Payment. Source: Authors' own chart

The special position held by the current account in payment transactions justifies the special role accorded to banks in ensuring that the payment system functions properly. The banks are the most important payment service providers for private and business customers.

4.2 Costs and earnings in the payments system

4.2.1 Principles

As in any market, there is also supply and demand in the market for payment services (see Table 14). The suppliers are banks and “other service providers”, whereby the banks bear the load of the system because of the significance of the current account, which we touched upon above. Remuneration within the payments system represents earnings for the suppliers and costs for consumers. The suppliers, in turn, must meet their expenditure for providing payment transaction services from their earnings. In addition to the fees which they have to pay to payment service providers, consumers are faced with additional expenditure in the form of their own resources of time and real capital (see Table 14).³⁸

³⁸ This is also the case in other markets. For example, when a household goes shopping, it not only has to take account of the end prices, it also has to allow for its travel time.

Consequently, there are two ways of answering the question about costs and about the significance of the payments system.³⁹

- A. Estimates are made about the costs arising in the production of payment services (see, for example, the overviews contained in Schmiedel et al., 2012 as well as in Koivuniemi & Kempainen, 2007). This requires a detailed understanding of the cost accounting practices of banks and specialist service providers. Corresponding data are generally collected through questionnaires (and payment diaries) from banks, consumers and retailers, whereby the results hinge greatly on the quality of the questionnaires (for example, see Jonker & Kosse, 2009). In addition, the surveys are frequently only conducted once or at irregular intervals due to cost constraints.
- B. Estimates are made about the level of expenditure incurred by customers (households, businesses) for payment services. Behind this is the idea of estimating the significance (or costs) of payment media by ascertaining users' willingness to pay for payment services. This information can be obtained from the customers on the spending side or from the producers on the earnings side. An analysis of earnings requires that earnings from payment transactions must be able to be separated from other earnings.

³⁹ Unfortunately, determining the value created by the payment system directly does not work because this value creation is not recorded separately in the national accounts.

Table 14:
Classification of the costs for payment services

Consumers of payment services		
Suppliers	Businesses*	Households
Banks	Explicit prices Implicit prices	Explicit prices Implicit prices
Other service providers	Explicit prices for: Secure transport Network operation Acquiring	
Customers' own resources	Own resources (in particular labour time) for: Cash handling / Cash removal Reconciliation / Control	Own resources (time) for: Cash withdrawal Reconciliation / Control

Remark: * Including state agencies.
Source: authors' own chart.

In both approaches it is also important to consider that the customers, too, incur certain expenses which must also be estimated (for example, the time taken to withdraw cash or the purchase of payment terminals by the retailer). There is great uncertainty and much variation in outcomes in assessing these items.

If banks and other payment service providers only offered payment services, then both approaches would be relatively simple to implement because all revenue streams or all costs would be assigned to the delivery of payment services. However, both banks and the “other” payment service providers generally offer a whole array of services. Therefore, the costs or revenue which relate to the delivery of payment services have to be isolated. The estimation of the associated costs requires detailed data from the cost accounting of the businesses affected. Any such data are normally not made available to the public and must be collected from the banks and service providers.

The estimation of revenue from payment transactions is simpler than estimating costs if market prices exist for the payment services (in the form of a “price per unit of quantity”). Revenue can then be assigned to individual services. In annual reports, revenues are frequently classified according to product groups, facilitating allocation to individual fields of business, such as payment transactions. It is more difficult to estimate revenue if services are offered in packages, and if a form of indirect pricing takes place. This is frequently the case with banks. Many payment services are offered as part of the current account package and are not billed separately. Instead, there is a flat-rate price and/or implicit pricing through the low interest paid on demand deposits (generally at 0%). Customers dispense with the interest which is offered by interest-bearing investments and rather keep deposits in current accounts as that means that they can benefit from other banking services, in particular payment services. Therefore, the customer pays a “price” for payment services (or for liquidity) here in the form of lower interest (liquidity premium).

Consequently, the two most important revenue models in the banking sector are:

- price per service (“commission”)
- implicit fee⁴⁰

Method A has largely been used in cost studies conducted up to now. As we have already mentioned above, it requires relatively extensive knowledge of the cost accounting practices of the companies which offer payment services. This knowledge can only be obtained in detail with the cooperation of the businesses in question. Even if these businesses were prepared to do so, an adequate quality of data is often not available, however. Particularly for banks, it is frequently difficult to allocate costs because many of their services are closely tied to the current account, which is a prerequisite for carrying out cashless payment transactions and for the provision of cash alike.

⁴⁰ This implicit fee could also be referred to as „seigniorage“. Seigniorage is understood to mean gains from money creation. In general, this term is restricted to central bank gains from the creation of central bank money, most notably cash. However, it can also be extended to the money creation gains achieved by commercial banks, which are based on the creation of deposits.

For this reason, we will adopt method B here, which we will refer to as the ‘demand-based approach’. It can place greater emphasis on data which are routinely published in the annual reports of banks and service providers or which are published in sources which are otherwise freely accessible. An approach which is similar to method B can be found in studies to determine the value-added created by the banking sector (for example, Colangelo & Inklaar, 2010 and Wang, 2003). These studies also assume that there are implicit fees for certain banking services contained in the interest margin.

The earnings differ from the costs by any profits or losses which may arise. Therefore, if one were to estimate costs from the revenue perspective, the costs may be over or under-estimated. Only in a situation of perfect competition this problem would not exist. In reality, the conditions for perfect competition are rarely met. Having said that, as long as there is a certain degree of competition present, the profits are likely to level off at something akin to “normal”. In order to estimate the *significance* of the payment transaction in the sense of a willingness to pay for payment services, the approach we have selected is also more suitable than method A.

Recording the revenue at a relatively high level of aggregation implies that revenue then has to be allocated to individual payment instruments. If data on costs are collected directly, to some extent, this allocation frequently occurs automatically. However, in this case larger cost blocks (such as account or debit card-related costs) frequently also have to be allocated to individual cost units using an appropriate distribution key.

4.2.2 Determination of the banks' revenue from payment transactions

– The operational income of the banking sector

Determining the gross profit (respectively net production value) is the point of departure for determining the revenue from payment transactions. This is defined as:⁴¹

Total revenue

+Changes in inventory of finished and unfinished goods from own production

+internally developed assets

= gross value of production (total output)

-material usage

= gross profit (net value of production)

Assuming that changes in inventories and internally developed asset can be neglected in the banking industry, the gross profit can be defined as follows:

Gross profit = total revenue – material usage

Total revenue in the banking industry consists of interest received (net of allowance) and commissions received. The material usage exists of deposits and the expenses are the interest paid.

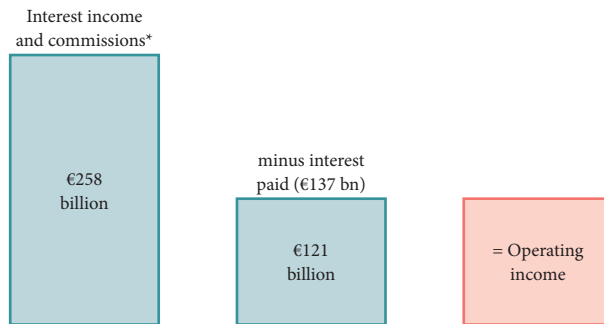
Thus, gross profit ultimately consists of two components:

- Firstly, commission revenue. This is comparable to revenue in the insurance industry, for example.
- Secondly, the interest margin. This corresponds to the mark-up (on purchase prices) in retailing, for example.

⁴¹ For definition of „gross income“ respectively net production value see Statistisches Bundesamt (2007).

Figure 35:

Operating income of payment transaction banks in Germany (2011)



Remark: *adjusted for allowances. Relates to the banking sector, excluding real estate credit institutions, building societies and banks with special functions.

Sources: Deutsche Bundesbank and own calculations.

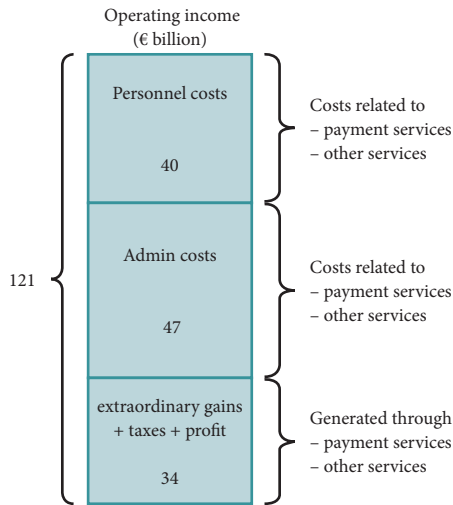
In the Bundesbank statistics, the banking sector also includes the groups “real estate credit institutions, building societies and banks with special functions”. However, these banking groups only offer their customers marginal payment services and have no significant demand deposits on the liability side of the balance sheet.⁴² Therefore, a narrow definition will be used in this study. We will look solely at private commercial banks, state-owned regional banks, savings banks, central cooperative banks and credit cooperatives. They are combined under the term “payment transaction banks” (PT banks).

The total revenue of the PT banks on average in 2011 was €258 billion. €137 billion of this was to be deducted in the form of interest paid, leaving an average of €121 billion. This corresponds to the operational income of the PT banks.

⁴² Measured in terms of balance sheet totals, these three groups account for around 20% of the market. However, they only account for 1% of demand deposits.

Figure 36:

Operating income and offsetting items on the expenditure side (2011)



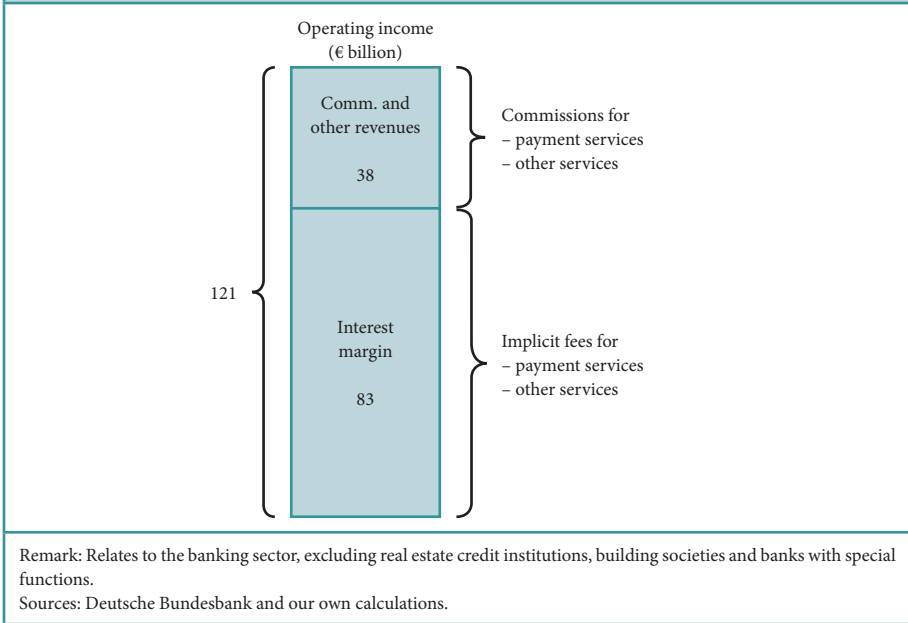
Remark: Relates to the banking sector, excluding real estate credit institutions, building societies and banks with special functions.

Sources: Deutsche Bundesbank and our own calculations.

The operational income indicates the level of the banks' net revenue (after deduction of interest paid). Expenditure for the services offered by the banks has to be financed from the operational income (see Figure 36). They essentially consist of personnel costs, operating expenditure, the outlay for external services, taxes and interest on equity. It may also include profit.

The operational income of €121 billion consists of commission (€38 billion) and the interest margin (€83 billion) (see Figure 37). From the customers' perspective, the operational income thus represents remuneration for services provided by the banking industry. Revenue from commission is generated in payment transactions, as well as in other areas of banking. The interest margin can, thus, be interpreted as an implicit fee for payment services and "other services" (portfolio management, debt management, monitoring, etc.).

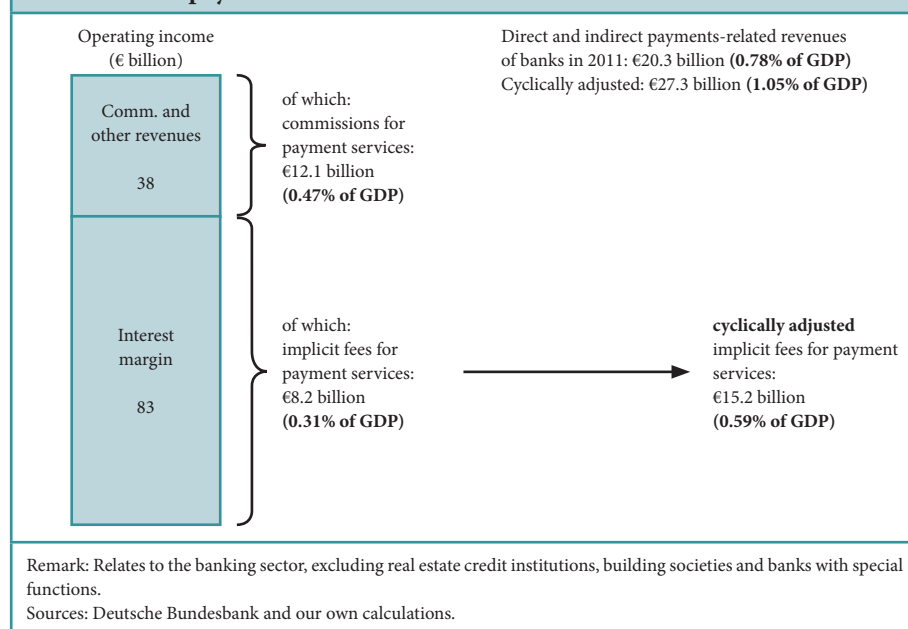
Figure 37:
The composition of operational income (2011)



The sections below will show that payment transactions account for around €20 billion of the entire operational income: €12.1 billion in commission and €8.2 billion in implicit fees (see Figure 38). In other words, businesses and households paid banks €20 billion for payment services in 2011, which equates to 0.78% of GDP. Please note that the implicit revenue fluctuates with the interest level and is thus currently low due to the financial crisis. After adjusting for this cyclical effect, the estimate of implicit fees would be as high as €15.2 billion. Together with commissions, this amounts to cyclically adjusted revenue of €27.3 billion from payment transactions. This equates to 1.05% of GDP.

At a “normal” rate of interest or taken as an average over an interest rate cycle, the banks’ revenue from payment transactions (or the expenditure incurred by their customers) consequently amounts to around 1% of GDP.

Figure 38:
Revenue from payment transactions of PT banks



– The level of revenue from commissions

In principle, it is relatively easy to attribute commissions to particular services. Nevertheless, the banks' system of reporting does not always allow clear allocation to the areas of payment transactions and other services.

The revenues received for payment services include:

- Fees for current accounts
- Fees for payment cards
- Transaction fees (credit transfer, direct debit, cheque, card payments, returned debits, foreign payments, etc.)
- Cash handling fees (disbursement, paying-in)

These items could be determined separately, in theory. This would necessitate estimates of the quantity and value of the transactions. Data are available about transaction volumes, although there is an absence of representative estimates about average fees per transaction (or per account or per card). Therefore, an overall estimate will be made in the first instance about commissions from payment transactions. To this end, we analysed the annual reports of 16 banks from different sectors (savings banks, credit cooperatives, state-owned regional banks, private commercial banks) (see Annex), whose published annual accounts permit commissions from payment transactions to be identified.

Despite the low number of banks, the 16 institutions analysed account for a share of over 23% of the balance sheet total of the PT banks. A look at the structure of the liabilities side (see Table 15) shows that the banks under consideration differ slightly from the average for the market as a whole. For example, the weight of deposits as a whole (37.82%, PT banks 42.5%) and, in particular, of overnight deposits is slightly lower (15.5%, PT banks 18.6%). This is primarily due to the fact that state-owned regional banks are overrepresented.

	Entire banking sector	PT banks	Analysed banks	Sample as a % of PT banks
Overnight deposits	1,261	1,248	242	19.4%
Total customer deposits	3,219	2,847	589	20.7%
Balance sheet total	8,467	6,700	1,559	23.3%
Commissions	39.7	38.1	7.3	19.1%
Overnight deposits as a % of the balance sheet total	14.9%	18.6%	15.5%	83.3%
Total customer deposits as a % of the balance sheet total	38.0%	42.5%	37.8%	88.8%
Commissions as a % of the balance sheet total	0.47%	0.57%	0.47%	82.0%

Remark: € bn unless otherwise indicated.
Sources: Deutsche Bundesbank, annual reports of the banks analysed and our own calculations.

The analysis of the annual reports of the 16 banks reveals commissions from *payment transactions* in the region of 0.9% of overnight deposits. Calculated as a percentage of total customer liabilities, this amounts to 0.38% and as a percentage of the balance sheet total, 0.14%. A look at Table 16 also shows the breadth of variation in these values between the sectors.

Table 16:
Commissions from payment transactions for the analysed banks

	Total (16)	6 credit coopera- tives	4 savings banks	4 state- owned regional banks	2 private commer- cial banks
PT commission (€ m)	2,224	78	120	362	1,664
as a % of overnight deposits	0.92%	0.71%	1.19%	0.66%	1.00%
as a % of total customer deposits	0.38%	0.46%	0.49%	0.23%	0.43%
as a % of the balance sheet total	0.14%	0.37%	0.31%	0.06%	0.19%
as a % of the total commission revenue	30.63%	42.11%	52.64%	28.07%	29.94%
Remark: The values for the individual banks are listed in the Annex. Sources: Annual reports of the 16 banks, our own calculations.					

The extrapolation for the entire range of PT banks was based on the estimated ratio of payment transaction commissions to overnight deposits. Of the three scaling variables applied, overnight deposits are likely to be most closely tied to payment transactions. The measure “commissions as a % of overnight deposits” also offers the advantage that there is no wide variation in the results for the banks analysed. However, since the sectoral structure of the sample does not reflect the actual structure, a weighted average of the ratio between payment transaction commissions and overnight deposits is calculated. The weighting factors are the shares of overnight deposits in a sector relative to the overnight deposits of all PT banks.

Table 17:

Commissions as a percentage of overnight deposits

	PT banks	Analysed banks	6 credit cooperatives	4 savings banks	4 state-owned regional banks	2 private commercial banks
Overnight deposits (€ bn)	1,248	242	11	10	55	166
Commissions from payment transactions (€ bn)	12.10	2.22	0.08	0.12	0.36	1.66
PT commissions as a % of overnight deposits	0.97%*	0.92%	0.71%	1.19%	0.66%	1.00%

Remark: *weighted average of the analysed banks.
Sources: Deutsche Bundesbank, annual reports of the banks under analysis and our own calculations.

On this basis, this gives rise to an estimated value of 0.97% for the PT banks (see Table 17).⁴³ With reference to this figure, the volume of commissions from payment transactions for PT banks can be estimated at €12.1 billion or 0.47% of GDP. This corresponds to a share of 31.8% of commission revenue.

– Estimate of the implicit fees

Businesses and households have deposits in current accounts, even though they do not attract interest (or they generate interest at lower rates than alternative investments). The reason for this is that payment services linked to a current account are not priced or are only explicitly priced in part. The interest loss (= opportunity cost of keeping deposits in current accounts) can therefore be viewed as an implicit fee for payment services. This implicit fee can be estimated by multiplying the deposits held in current accounts (“transferable deposits”) by an alternative rate of interest. In order to determine the deposits held in current accounts, the statistics on “transferable deposits”, which have been kept by the Bundesbank since June 2010, are used. The alternative rate of interest has been estimated on the basis of the interest rate statistics from the Bundesbank.

⁴³ The simple mean for the 16 banks is 0.92%. The 95% confidence interval for the mean estimate is between 0.74% and 1.10%.

– Estimate of transferable deposits

The Deutsche Bundesbank combines “transferable deposits” which can be used to effect payments and any term money due on demand (“overnight term deposit”) in the category “overnight deposits” (sometimes also referred to as “demand deposits”). Since June 2010, there has been a separate estimate of the size of transferable deposits (see Table 18). The transferable deposits are deposits in current accounts. They serve as a means of payment and are also referred to as “deposit money”. The average transferable deposits in 2011 came to €625 billion. This corresponds to about half of the overnight deposits.

	Overnight deposits* (€ bn)	Transferable deposits (€ bn) ("deposit money")	Share of transferable deposits	Share of overnight deposits
2010 (7 months)	1,204	637	52.9%	47.1%
2011	1,245	625	50.2%	49.8%
2012	1,353	680	50.3%	49.7%

Remark: Annual averages. * The overnight deposits are also referred to in the Bundesbank statistics as “demand deposits”.
Sources: Deutsche Bundesbank, our own calculations.

– Estimate of the division of transferable deposits between private individuals and others

As the statistics for the transferable liabilities do not divide private non-banks into households and businesses, the transferable deposits of these two sectors have to be estimated. There are two ways of doing this. In method 1, it is assumed that the businesses divide their transferable deposits in precisely the same way as the public sector and foreign investors.⁴⁴

⁴⁴ The majority of foreign depositors are likely to have been businesses. The public sector is more likely to have traded like businesses rather than like private individuals. Therefore, it is assumed that the split between transferable deposits and overnight term deposits in these sectors is more likely to reflect the split among businesses than the split among households.

Method 2 assumes that households' share of transferable deposits is the same as households' share of overnight deposits overall. According to this method, households have transferable deposits of €373 billion and businesses have €198 billion. In order to estimate the implicit fees (see Table 19), the average of the two results of methods 1 and 2 was calculated for households and businesses. In 2011, the average volume of transferable deposits of €625 billion was split accordingly as follows: domestic private individuals held €408 billion, domestic businesses held €163 billion and other sectors held €54 billion.

Table 19:

Estimate of the transferable deposits holdings of individual sectors in 2011

	Statistics for transferable deposits					Estimate	
	Total	Public authorities	Other EMU countries	Third countries	Businesses + hh.	Businesses	Households
2010	636.5	19.6	10.9	25.2	580.9	163.5	417.3
2011	625.3	18.7	12.2	23.5	570.9	162.7	408.2
2012	679.8	21.0	18.1	25.0	615.8	183.5	432.3

Remark: Annual averages in € billion. The estimated values are based on two different estimates (methods 1 and 2, see text), whose results have been averaged.
Sources: Deutsche Bundesbank, our own calculations.

– Estimate of the alternative interest rate

The EONIA overnight money rate is frequently used as the opportunity cost rate. However, the EONIA is relevant to large businesses at most. Different conditions generally apply to small businesses and households. It should also be borne in mind that the EONIA is currently only a distorted indicator of opportunity costs on account of current monetary policy and the situation on the money market.

As it is generally very easy to move deposits between a current account and a term account, it seems obvious to use the average overnight money rate that the banks grant their customers as the opportunity cost rate instead of the EONIA (see Annex). It should be noted that the average overnight rate for businesses is different to that available to households. Therefore, we determine separate overnight rates for businesses and households as an input for calculating the opportunity costs.

However, the interest for overnight term deposits does not appear separately in the statistics. The Bundesbank only publishes the average interest rate for overnight deposits. This rate averages the interest rate for transferable deposits, which is generally zero, and the interest rate for overnight term deposits, which is normally positive.

As Table 20 shows, there are differences between businesses and households in terms of the average interest yield on overnight deposits. This may be due to the fact that there is a difference in the ratio between transferable deposits and overnight term deposits and/or to the fact that the average interest of overnight term deposits is different.

The rate of interest on overnight term deposits can be estimated with the aid of the relative shares of overnight term deposits and transferable deposits. However, as the transferable deposits are only shown collectively for businesses and private individuals, the respective shares of these two sectors have to be estimated for the time being. This increases the uncertainty of the estimate of overnight rates (see Annex and Table 20).

Table 20:

Short-term interest rates for households and businesses (in %)

	Overnight deposits		Term deposits (<1 year)		Savings deposits	Overnight term deposits (estimated)	
	Hh.	Bus.	Hh.	Bus.	Hh.	Bus.	Hh.
2003	1.14	1.26	2.15	2.20	2.20		
2004	1.15	1.11	1.93	1.95	2.12		
2005	1.19	1.24	1.91	2.01	2.05		
2006	1.36	1.62	2.61	2.79	2.06		
2007	1.74	2.23	3.75	3.88	2.35		
2008	1.95	2.35	4.13	4.04	2.52		
2009	1.05	0.73	1.38	0.80	1.82		
2010	0.72	0.46	1.10	0.56	1.35	1.85	0.82
2011	0.83	0.58	1.42	1.10	1.42	1.92	1.01
2012	0.73	0.36	1.25	0.41	1.22	1.63	0.65

Remark: Savings deposits: redeemable at notice of up to three months.

Overnight term deposits: Average of methods 1 and 2 (see Annex).

Sources: Deutsche Bundesbank, our own calculations.

Table 21:

Savings and term deposits of households and businesses

2011	Households (€ bn)	Non-financial enterprises (€ bn)
Savings deposits redeemable at notice of up to three months	515.6	– ⁴⁵
Term deposits with an agreed maturity of up to one year	73.7	242.8

Remark: Households: Economically dependent persons, other private individuals and non-profit organisations; businesses including self-employed people. End of the year stocks.

Sources: Deutsche Bundesbank, our own calculations.

⁴⁵ The savings deposits redeemable at notice of up to three months are not shown separately for businesses. However, the entire savings deposits in the corporate sector are insignificant. They only amounted to €6.5 billion at the end of 2011.

Therefore, instead of using the estimates based on this method, it is advisable to use interest rates for other short-term investments which can also be used to “park” liquidity (see Table 20).

Savings deposits redeemable at notice of up to three months are particularly popular among households. Businesses on the other hand seem to be more likely to park short-term available funds in term deposit accounts (see Table 21). Therefore, we use a short-term rate for term deposits of up to one year for businesses (including the public sector and abroad), whereas for households we use the interest that is available on savings deposits redeemable at notice of up to three months.

– The implicit bank fee

The implicit fee for payment services is determined on the basis of the estimated volumes of transferable deposits and the estimated alternative interest rates. Applying the savings or term deposit interest rate, this gives rise to a sum of €8.2 billion for 2011 (see Table 22). €5.8 billion of this is attributable to households and €2.4 billion to businesses (including public sector and abroad).

Table 22:

The implicit fee for payment services

	Transferable deposits	Alternative interest rate	Implicit fee
Households	408.2	1.42	5.8
Businesses + rest*	217.1	1.10	2.4
Total	625.3	1.30	8.2

Remark: * including public authorities and foreign non-banks.

Table 23 illustrates how sensitive the results are to the use of different alternative interest rates. The calculations reveal that the level of implicit fees depends considerably on the choice of the opportunity cost rate. Applying the EONIA leads to a relatively low estimated value for 2011.

Table 23:
The implicit fee: variation in opportunity costs

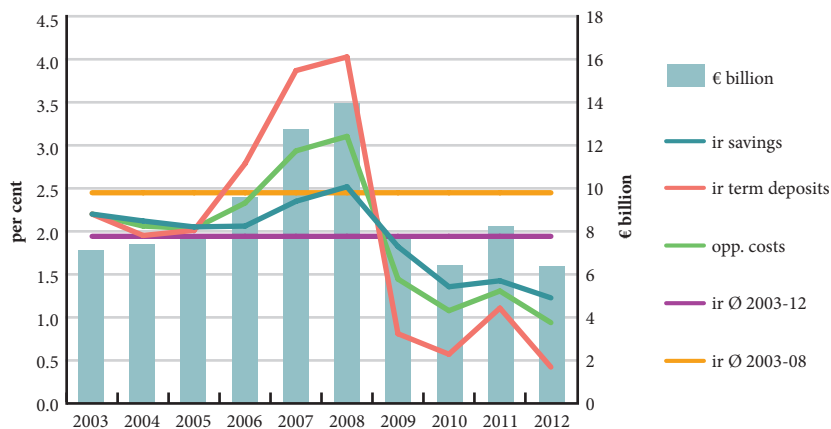
	€ bn	Interest rate households	Interest rate businesses*
Original estimate	8.2	1.42	1.10
EONIA	5.5	0.87	0.87
Overnight term deposits (method 1)	9.2	1.71	1.13
Overnight term deposits (method 2)	11.1	2.13	0.90
Overnight term deposits (Ø methods 1 and 2)	10.0	1.92	1.01

Remark: See Annex for overnight money rates. * Businesses: including public authorities and abroad.

In general, the estimates are shaped by the historically low level of interest rates. Therefore, the level of the implicit fees does not reliably reflect what the banks earn on average over an interest cycle in terms of implicit fees. Figure 39 compares the pattern of interest rates with two multi-year averages. As a consequence of the fluctuations in interest rates, the implicit fee for payment services is also subject to sharp fluctuations (see Figure 39).⁴⁶ As it is not to be assumed that the costs for the provision of payment services fluctuate in the same way, an average rate should be taken as a basis in the calculation of the implicit fees (Table 24).

⁴⁶ Fluctuations of this nature also arise in studies on estimating the value created by the banking sector (e.g. Basu et al. 2008, p. 31).

Figure 39:
The implicit fee for payment services of banks



Comments: ir: interest rate. opp. costs: Weighted average of savings interest rate and term interest rate.
Ø2003-2012: Average of opportunity cost rate 2003-2012. Ø2003-2008: Average of opportunity cost rate 2003-2008.
Sources: Deutsche Bundesbank and our own calculations.

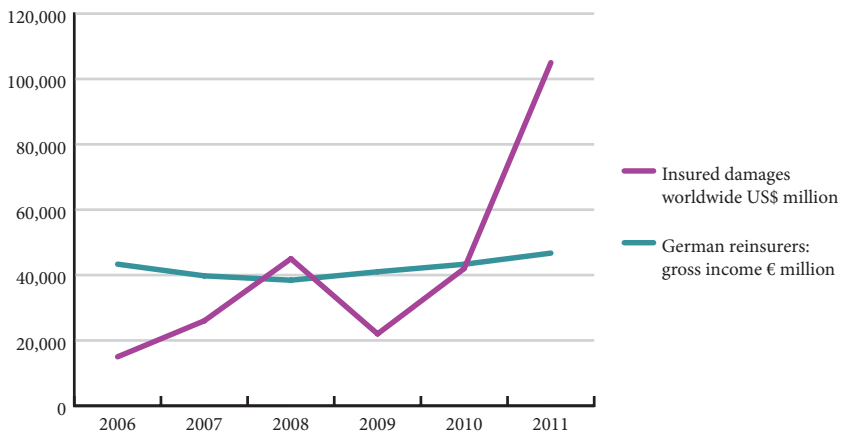
Table 24:
The implicit fee on the basis of average opportunity costs

	EONIA Ø 2003-2008 (%)	Implicit fee (€ bn)	Ø opp. costs 2003-2008 (%)	Implicit fee (€ bn)
Households	2.84	11.6	2.22	9.0
Business + rest	2.84	6.2	2.81	6.1
Both sectors	2.84	17.7	2.42	15.2

Remark: Ø opp. costs 2003-08: Weighted average of the savings interest rate and of the term interest rate between 2003 and 2008. Further information about the opportunity costs can be found in the Annex.
Sources: Deutsche Bundesbank and our own calculations.

While this approach may appear unusual, taking multi-year averages is perfectly natural in other sectors. For example, the volume of premiums is much more stable in the reinsurance business than the outlay caused by claims (see Figure 40). The rule applied here is that the average of the contribution must be sufficient to cover claims and the insurer's own expenditure.

Figure 40:
Example of the reinsurance business



Sources: Federal Financial Supervisory Authority (BaFin) and our own calculations.

In the payment transactions sector, the expenditure is the relatively stable component. However, as far as earnings are concerned, the implicit revenue is of a very cyclical nature. The banks received an implicit fee of 2.4% on transferable deposits on average over the last completed interest cycle (2003 to 2008) (see Table 24). Based on this average rate, the implicit fees in 2011 would have been around €15 billion. Therefore, the implicit fees are clearly distorted downwards as a result of the current low-interest phase. Similarly, they appear too high in high-interest phases. This effect also applies when other opportunity cost rates are used. If, for example, the average EONIA rate for this period is applied, this produces a slightly higher value of around €17 billion.

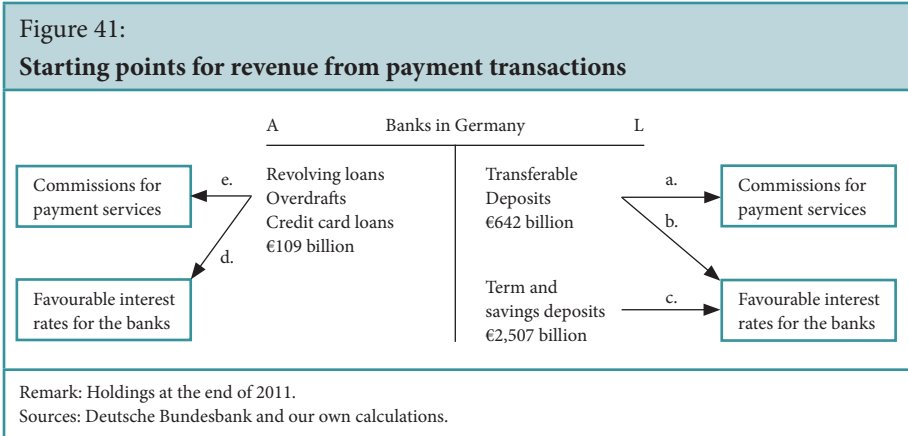
However, if interest rates are consistently low, the banks sustain losses in implied fees. This can only be remedied by lowering costs, adjusting volumes - increased growth of transferable deposits – or by increasing explicit prices.⁴⁷

Given the cyclical nature of interest rates, individual annual values for implicit fees do not provide a reliable basis for an estimate of the cost of payment transactions. Estimates which are based on an average opportunity cost rate over the interest cycle are preferable. If reference is made to this type of rate, our preferred scenario would give rise to “cyclically adjusted” implicit fees of €15.2 billion (see Table 24). Together with commissions from payment transactions, this would produce a value in the region of €27 billion.

– Further revenues that could be accredited to payment transactions

When calculating the revenue which can be accredited to payment transactions, the only factors which have been taken into consideration up to now are that transferable deposits generally do not attract interest, and that the issuers therefore receive a form of seigniorage. However, the provision of payment services absolutely reduces the “elasticity of demand of customers”, whereby the banks are able to increase their interest revenue or reduce their interest costs. This not only applies to current accounts which are usually non-interest bearing; often it is also more convenient for savings and term deposits to be invested with the “house bank”. Therefore, a bank with a broad basis of current account customers can also offer savings and term deposits with relatively low interest rates. The same also applies on the assets side. Customers find credit lines that are linked to the current account (or a payment card account) more convenient. Even if the terms are less favourable, they still avail themselves of these credit lines and will not instantly consider changing banks.

⁴⁷ In Japan, the sustained low interest rate policy of the Bank of Japan led to a very sharp rise in overnight deposits. In 2011, the value of overnight deposits almost reached the value of GDP (about €36,000 per person). The value of overnight deposits in Germany is around 48% of GDP (€19,000 per person).



The analysis above, however, focusses only on commissions for payment services (a. and e.) and revenues due to favourable interest rates on sight deposits (b.). Revenues due to favourable rates for savings and time deposits (c.) and for products on the assets side are not considered.

4.2.3 Determination of the payment transaction revenues from other service providers

– Network operators

So-called “network operators” offer merchants (retailers, hotels, etc.) an array of card payment services. They include transaction services, terminal leasing and related services, risk management in electronic direct debits (ELV), etc.

The analysis of the annual reports of three major network operators (easycash GmbH, InterCard AG and TeleCash GmbH & Co. KG) revealed that they had an average revenue of 8.5 cents per transaction in 2011. This includes revenue from transactions, from terminal business and from the provision of services. This value can be extrapolated for the market as a whole. Based on the transaction statistics for the total market, this produces transaction revenue of €323 million or 0.013% of GDP (see Table 25).

Table 25:
Revenues of the network operators

	2010/11*	2009/10*
Trx. of 3 major network operators (m)	2,417	2,161
Average revenue per Trx. (€)	0.085	0.090
Total market (millions of Trx.)	3,800	3,300
Trx. revenue (€ m)	323	296
% of GDP	0.013%	0.012%
For information only: market share of the three network operators	63.61%	65.48%

Remark: * In some cases, the reporting years differ from the calendar years.
Sources: Annual reports of easycash GmbH, InterCard AG and TeleCash GmbH & Co. KG; PaySys Consultancy GmbH (2013), as well as our own calculations.

– Acquirers

In order to accept cards from international card organisations, merchants must have a contract with an acquirer. While the acquiring function is performed by the banks themselves in many countries, there are specialist service providers (owned by the banks) which perform this function in Germany. Based on annual reports and on market research, the average earnings achieved by acquirers can be put at 0.35% of sales. Overall, this means that acquirer revenue amounts to €211 million or 0.01% of GDP (see Table 26).⁴⁸

⁴⁸ This does not include interchange fees, as they are already contained in the banks' payment transaction commissions. Transaction fees which arise are already factored into the network operator's fees.

Table 26:
Revenues achieved by acquirers (excluding interchange and network operation)

	2011
Acquiring volume (€ m)	59,650
Acquirers' fees (€ m)	211

Sources: PaySys Consultancy GmbH (2013), various annual reports and our own calculations.

– **Cash-in-transit (CIT) companies**

CITs are important service providers for banks and retailers. They transport cash in the course of the distribution and collection of cash. In addition, they offer further services such as cash preparation, filling automatic teller machines and machine services.

However, the array of businesses operating in this segment also offers a large number of other services (on-site security, access control, emergency services, etc.). Therefore, sales in cash and valuables services only account for a small portion of the turnover achieved in this sector. According to estimates by the Federal Association of German Cash and Valuables Services (BDGW), turnover in that sector for 2011 was €525 million (see Table 27). Around two-thirds of that is accounted for by transport and one-third by cash handling. The share attributable to retailers and that attributable to the banking industry are unknown.

Table 27:
Turnover by cash-in-transit companies

	Banks	Retailers	Together	Share
Data from the BDGW⁴⁹				
Transport (€ m)			350	67%
Processing (€ m)			175	33%
Total (€ m)			525	
Data from Wincor Nixdorf				
Transport (€ m)	229	286	515	66%
Processing (€ m)	107	163	270	34%
Total (€ m)	336	449	785	
Share	43%	57%		
Sources: Nattmann (2009) and BDGW, pp. 4-5.				

Wincor Nixdorf International GmbH estimates that turnover in the cash and valuables services sector is approximately 50% higher (see Table 27). This is more or less spread equally between transport and handling. In addition, the estimate also includes division by customer segments.

As we are only interested here in the cost of providing payment services for non-banks, this amounts to a maximum of €450 million (0.02% of GDP).

4.2.4 Internal expenditure of consumers

In addition to explicit and implicit bank fees, households in particular incur costs in the form of time taken for the payment process and to obtain cash. Most studies do not make estimates of the time taken to perform credit transfers and direct debits, as well as for checking payments and for any complaints, and these factors are also difficult to estimate.

⁴⁹ BDGW (pp. 4-5) estimates that the turnover achieved by its members in cash and valuables services amounts to €500 million and puts their market share at 95%.

One item which is frequently estimated is the time taken to obtain cash. There are two methods of doing this (see Chapter 3).

1. Estimate of the required time and valuation of the time based on an average wage rate.
2. Use of an economic model (cash management model) to estimate costs.

The first method seems more plausible, but the drawback with it is that time has to be evaluated “from an external perspective”, so to speak. Therefore, it may be easy to over-estimate these costs because it does not allow for the fact that the economic subjects withdraw cash whenever it is most convenient to do so.⁵⁰

If, for example, one takes a rate of €20 per hour as a basis and assumes that it takes an average of 3 minutes to withdraw cash from an ATM, this means that time costs of €1 are incurred every time cash is withdrawn. Based upon 2.1 billion transactions, this produces macroeconomic costs of €2.1 billion (see Table 13).

On the other hand, applying the cash management method permits us to draw conclusions about costs from behaviour that is observed.⁵¹ It takes account of the fact that it is relatively simple for customers to lower the cost of withdrawing cash. They can simply visit the ATM less frequently and withdraw larger amounts each time. We will apply this second method in the following in order to estimate the internal cost for households of obtaining cash.

According to the payment statistics, people make about two cash withdrawals at ATMs every month. The average value of each transaction is €155. Together with an opportunity cost rate, the two figures are sufficient for calculating the cost per transaction, incurred from a customer’s perspective. The opportunity cost rate measures the costs of holding cash. It may comprise a loss of interest if the bank account is in credit or an interest payment if the bank account is in debit. Therefore, the corresponding cost rates would be a credit or debit interest rate. It should also be noted that cash can get

⁵⁰ This fact is also stressed, too, by Schwartz et al. (2008).

⁵¹ However, this method, too, cannot be used without having to make further assumptions. Refer to Baumol (1952) and Tobin (1956) with regard to the theoretical principles.

lost. Thus, compared to deposits held in a bank account there is an additional negative return in terms of risk (refer to Bergman et al., 2007, pp. 9 f).

Table 28:

Estimate of costs of the time taken to withdraw cash at an ATM

Assumptions (based on payment statistics)

	Per user per month	All users per annum
Number of cash withdrawals	2.5	2,100 (m)
Value per withdrawal	155 €	325.5 €

Assumptions for the different scenarios

Opportunity cost rate (%)	10.17	1.35	20	38.7
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Derived estimate

Transaction costs per withdrawal (€)	0.26	0.03	0.52	1.00
Transaction costs (€ m)	536	71	1,054	2,040
in % of GDP	0.04%	0.01%	0.08%	0.16%

Comments: Number of users: It is assumed that there are 70 million ATM users. Opportunity cost rate: overdraft lending rate (10.17%), rate of interest on savings deposits with the statutory withdrawal notice (1.35%), penultimate column: Opportunity cost rate, including a risk premium which covers the risk of losing cash. Transaction costs per withdrawal: shoe leather costs. Opportunity costs: lost interest revenue.

Sources: Deutsche Bundesbank, our own calculations.

As there is considerable uncertainty regarding the relevant opportunity cost rate, a number of rates are used (see Table 28): on one occasion we used the average overdraft lending rate in 2010 (10.17%), on another the average savings interest rate in 2010 (1.35%), and on another an increased rate of 20% to reflect a possible high risk premium. We ultimately also estimated how high the risk premium has to be to allow for time costs as calculated in method 1 (refer to the final column in Table 28).

The transaction costs per withdrawal are calculated in accordance with the equation below (for example, see Segendorf & Jansson, 2012):

$$b = \frac{Y \cdot r}{2n^2}$$

whereby Y = value of the monthly cash payments, r = opportunity cost rate, n = number of withdrawals per month. The transaction costs for the withdrawal are essentially the time costs from performing the withdrawal operation (shoe leather costs).

As has been shown, the behaviour which is observed would only be reconcilable with costs of €1 per transaction if possession of cash is associated with a very high loss of interest and/or a very high risk. All told, the opportunity costs would have to be almost 40% (refer to the last column in Table 28). This appears completely excessive given the level of interest and the relatively high level of safety in Germany.

It is more difficult to calculate the costs involved when withdrawing cash over the bank counter. Counter transactions occur much less frequently. However, the average amount of a withdrawal over the bank counter is considerably higher (see also Deutsche Bundesbank, 2010). Based on a volume in the region of 286 million counter transactions, this computes to an average of about 3.5 withdrawals per person. This is far in excess of the possible number of irregular large payments. Therefore, the counter presumably continues to be used by some bank customers as their “normal” source of cash (Deutsche Bundesbank, 2010, 6 f).⁵² This means that the calculation which has been used for the purposes of estimating the costs of ATM withdrawals can also be applied to a portion of the counter transactions. But there are also transactions for relatively large amounts which only occur sporadically. In these transactions, the amount withdrawn is either used to

⁵² This is likely to be older people, in particular.

make a payment in the immediate future or to hoard the money for a variety of reasons. Consequently, the cash management model cannot be applied to this scenario.

So as not to lose sight of the costs which households incur when they withdraw cash at the bank counter, an alternative assumption is made that a counter transaction is twice as expensive for the customer as an ATM transaction. This means that costs are increased by about a quarter.

If the average debit interest rate is taken as the opportunity cost rate and counter transactions are also taken into consideration, this produces a value of around 0.03% of GDP for the internal costs incurred by households in obtaining cash (see Table 29). Given the fact that cash is also withdrawn for the purposes of hoarding, these costs cannot be attributed fully to payment transactions.

Table 29:

Estimate of the time costs incurred by households in obtaining cash⁵³

Ratio of counter trx to ATM trx	0.14
Relative costs of counter trx/ATM trx	2
Costs at the counter (€ m)	150
Costs at the ATM (€ m)	536
Total costs (€ m)	686
as a % of GDP	0.03%

Remark: Based on an assumed opportunity cost rate of 10.2%.
Source: Deutsche Bundesbank and our own calculations.

⁵³ The costs for counter and ATM transactions were determined separately for this. Alternatively, a single method could also be applied for all cash withdrawals. This produces slightly higher costs (approximately 0.1% of GDP).

4.2.5 Internal costs incurred by businesses

Businesses use also their own resources to process payment transactions. To a large degree, this is the employees' time. In addition, costs for hardware, software and data transmission also have to be taken into consideration. In the case of cash, this may involve checking and sorting equipment as well as safes; with cashless payment transactions, it may involve terminals or systems for connecting to banking organisations (including card service providers).⁵⁴

Employees' time required are of particular significance in situations where customers effect payment at the POS. This is the case most notably in shops, restaurants and some other sectors. However, estimating the time cost and, more specifically, according a value to it represent another major problem. These costs are difficult to estimate without conducting a detailed data collection. The heterogeneous nature of retail makes this especially difficult. For example, 0.01% of businesses in retail and hospitality account for almost 40% of sales, whereas the three smallest business categories (70% of all businesses) account for less than 7% of sales (see Table 30).

If the costs of the payment transaction are divided into⁵⁵

- fixed costs
- variable costs which are dependent on the number of transactions and
- variable costs which are dependent on the value of the transactions,

the segment for small and medium-sized enterprises is of particular importance for estimating the fixed costs. When it comes to estimating the variable costs, on the other hand, large businesses count almost exclusively.

⁵⁴ Where terminals are leased by network operators to retailers, these costs are included in the network operators' revenue. However, larger retailers, in particular, purchase their own terminals.

⁵⁵ This subdivision was adopted by the Dutch Central Bank and subsequently adopted in many studies (see National Forum on the Payment System, 2004).

Table 30:
Businesses by size classes in 2010: retail trade and hospitality industry

Size classes of sales	Number of businesses	Share	Sales (gross)	Share	Sales per business
from - to under	Quantity	Per cent	€ bn	Per cent	€
17,500 - 50,000	139,601	23.02%	5.2	0.79%	37,473
50,000 - 100,000	125,179	20.65%	10.5	1.57%	83,804
100,000 - 250,000	155,912	25.71%	28.9	4.33%	185,117
250,000 - 500,000	78,931	13.02%	32.0	4.80%	405,039
500,000 - 1 million	47,398	7.82%	38.5	5.77%	811,490
1 million - 2 million	30,400	5.01%	49.3	7.40%	1,622,208
2 million - 5 million	19,753	3.26%	69.5	10.43%	3,516,468
5 million - 10 million	5,536	0.91%	44.0	6.60%	7,946,471
10 million - 25 million	2,320	0.38%	39.7	5.96%	17,099,088
25 million - 50 million	593	0.10%	23.8	3.57%	40,107,131
50 million - 100 million	257	0.04%	20.5	3.08%	79,905,822
100 million - 250 million	212	0.03%	39.3	5.90%	185,363,425
> 250 million	231	0.04%	265.0	39.79%	1,147,175,002
Together	606,323	100.00%	666.1	100.00%	1,098,537

Sources: Federal Statistical Office, our own calculations

In situations where large quantities of cashless payments are processed collectively (for instance, payments for electricity, gas, water, telecommunications) or in the B2B sphere, employees' time is of less significance. However, systems have to be implemented for processing the payments and occasionally have to be updated. Once again, business heterogeneity makes extrapolations difficult. This too is due to the fact that the majority of businesses are small, and that a large portion of sales are achieved by relatively few, large businesses (see Table 31).

Given these uncertainties, existing estimates have to be interpreted with great care, especially since some of the estimated totals are very high (see Table 32).

Consequently, it is difficult to make a reliable estimate of the internal costs incurred by businesses without conducting an extensive data collection.

Table 31:
Businesses by size classes in 2010: all sectors

Size classes of sales of goods and services from to under	Number of businesses Quantity	Share Per Cent	Sales (gross) of goods and services € bn	Share Per cent	Sales per business €
over 17,500 - 50,000	911,925	28.81%	33.6	0.55%	36,867
50,000 - 100,000	638,550	20.17%	53.2	0.87%	83,258
100,000 - 250,000	688,698	21.76%	127.2	2.09%	184,759
250,000 - 500,000	355,419	11.23%	145.7	2.39%	409,937
500,000 - 1 million	236,759	7.48%	193.3	3.18%	816,245
1 million - 2 million	147,241	4.65%	239.2	3.93%	1,624,566
2 million - 5 million	103,215	3.26%	369.7	6.08%	3,581,746
5 million - 10 million	38,563	1.22%	311.9	5.13%	8,088,746
10 million - 25 million	25,184	0.80%	450.2	7.40%	17,877,659
25 million - 50 million	9,280	0.29%	375.1	6.17%	40,418,503
50 million - 00 million	5,172	0.16%	417.5	6.86%	80,719,079
100 million - 250 million	3,136	0.10%	556.8	9.15%	177,555,367
> 250 million	2,144	0.07%	2,810.1	46.19%	1,310,698,221
Together	3,165,286	100.00%	6,083.5	100.00%	1,921,957

Sources: Federal Statistical Office, our own calculations

Table 32:
Estimates of the internal costs of businesses

Study	Region – Year	€ bn	Remarks
Capgemini	EU-16 - 2006	112	Internal costs of businesses (without cash costs)
Derived from Capgemini	DE - 2006	22.4	Estimated share of DE in EU-16: 20%
WincorNixdorf	DE - 2009	8.6	Internal cash costs for retailers
PaySys Consultancy	DE - 2004	3.9	Internal cash costs for retailers
PaySys Consultancy	DE - 2004	6.9	Internal cash costs for retailers (incl. payment time)

Sources: Capgemini (2008), Nattmann (2009), PaySys Consultancy (2006) and our own calculations.

4.2.6 Payments-related costs of the Bundesbank

The estimates of the costs of the payments banks are based on the demand approach. This approach has been chosen because there are hardly any data on payments-related costs of PT-banks. However, in case of the Bundesbank a rough estimate based on published data is possible. Therefore, it is not necessary to analyse payments-related revenues of the Bundesbank.⁵⁶

Table 33:
Total expenses of the Deutsche Bundesbank in 2011 (€ million)

Staff costs	615
Other operating expenses	306
Depreciation on tangible and intangible fixed assets	107
Banknote printing	71
Other expenses	209
Total expenses	1,308

Source: Deutsche Bundesbank (2011).

⁵⁶ Since issuing cash is not a business that is subject to competition, the demand-based approach is likewise not applicable. The Eurosystem, represented in Germany by the Bundesbank, is a monopolist in issuing cash. Therefore, revenues are unlikely to be closely linked to costs.

Total costs incurred by the Bundesbank in 2011 amounted to about €1.3 billion (see Table 33). When looking at the breakdown of costs in the income statement, “banknote printing” is the only category that can be directly counted as costs of cash payments. For all other categories, costs are allocated to payments on the basis of the share of employees in the payments and cash departments.

Estimated costs of cash	375
Estimated costs of non-cash payments	28
Total	403
in % of GDP	0.02%
Sources: Deutsche Bundesbank (2011) and our own calculations.	

Overall, the Bundesbank’s payment-related costs amount to an estimated €403 million. When interpreting this figure it has to be taken into account that a significant share of the banknotes issued by the Bundesbank are circulating abroad (within the euro area and in non-euro-area countries). In fact, the share of cash that is used for transactions within Germany (the local transactions balances) is much smaller than the stock of cash that has been issued. According to recent estimates, in 2010 only about €110 billion was held in Germany. Of this amount, about €73 billion was held as transaction balances (see Bartzsch et al., 2011a, b). This is equal to 20% of the entire stock of banknotes that has been issued by the Bundesbank. However, transactions balances are likely to account for a much larger share of the Bundesbank’s cash-related costs, since banknotes used for payments within Germany are likely to return much more often to the Bundesbank, causing cash handling costs.⁵⁷ So, overall, the estimate of €375 million of cash costs of the Bundesbank can be interpreted as an upper bound.

⁵⁷ It has also to be taken into account that the hoarding of cash (or use of cash abroad) is closely linked to the use of cash as a medium of exchange. After all, it is not conceivable that cash should be used to a substantial degree as a means of hoarding if it could not be used as a means of payment, as well. In this respect, the time horizon of hoarding in Germany becomes important. Sooner or later hoards will be used for payments – thus becoming, once again, transaction balances.

At least some of the Bundesbank's payments costs are covered by payments-related revenues. Fees that the banks have to pay for Bundesbank services are already indirectly included in our estimate of banks' payments costs, if banks pass these costs on to their customers, they are contained in banks' revenues.

Table 35:
Net income from fees and commissions in 2011 (€ million)

Cashless payments	25
Cash payments	15
Total	40

Source: Deutsche Bundesbank (2011).

In addition to revenues based on fees, the Bundesbank also has seigniorage income, based on the ability to issue non-interest bearing banknotes. For cash users, seigniorage constitutes opportunity costs. Again, as far as banks are concerned, opportunity costs are likely to be passed on to customers. Thus, they are included in banks' revenues.

Table 36:
Opportunity costs of the banks in 2011

Banks' cash balances (€ billion)	16.4
Average main refinancing rate (%)	1.25
Opportunity costs (€ million)	205

Sources: Deutsche Bundesbank and our own calculations.

Much more important is seigniorage income based on cash holdings of non-banks. This income covers the Bundesbank's remaining payments-related costs plus all other costs. Moreover, it provides the basis for the profits earned by the Bundesbank in most years. Thus, these payments-related revenues are not closely linked to payments-related costs.

Overall, payments-related costs of the Bundesbank amount to € 403 million. This is equal to 0.02% of GDP. Of these costs, a maximum of € 254 million is already contained in the costs of the payments banks.

5. Summary, conclusions

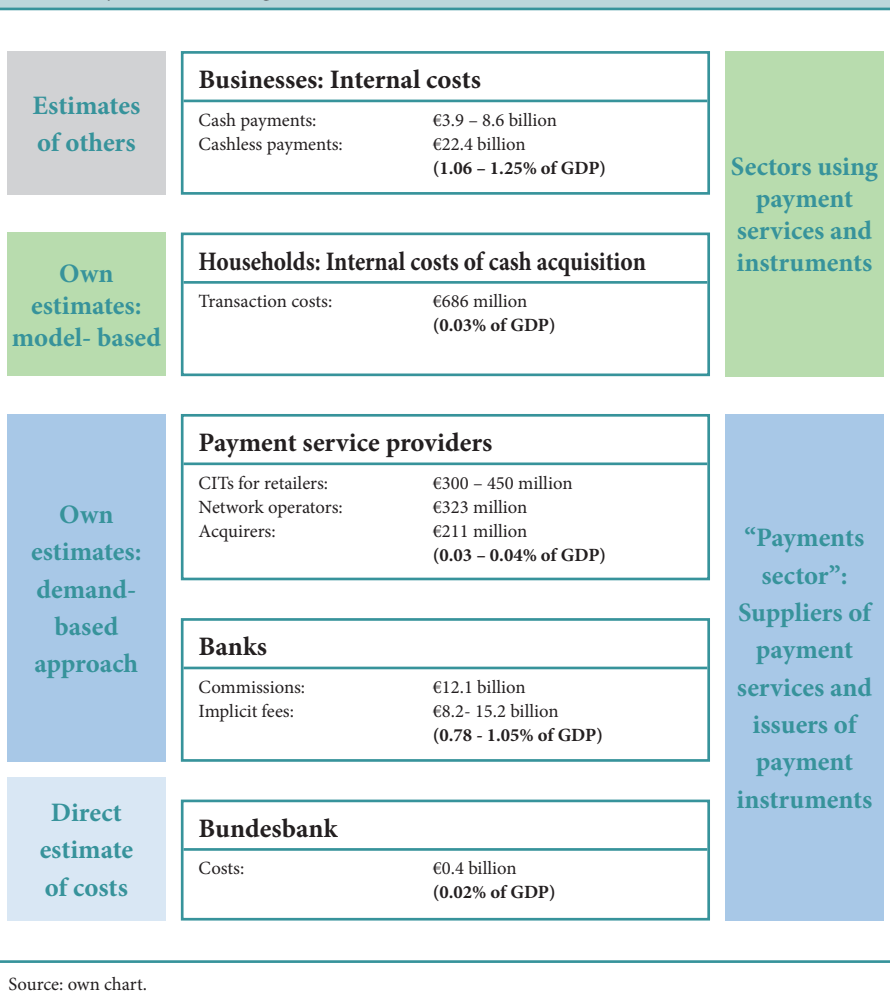
Great uncertainty is attached to estimates of the costs associated with the payment system. Due to the many unique aspects of the different countries, we would especially warn against attempts to apply the findings for one country to another without making adjustments. This study does not alter this either. However, there are some areas which are more readily suited to estimates and other areas which can only be determined with a marked absence of precision. The latter include the internal costs incurred by households and businesses.

Figure 42 once again briefly summarises the figures determined by us. It is easier to make estimates in situations where payment services are offered on the market. The commercial banks are important suppliers of payment services. Depending on whether the current extremely low rates of interest are taken as a basis or the rates are smoothed over an interest rate cycle, the payment services provided by banks are quantified at between €20 and €27 billion (0.78 – 1.05% of GDP). This value is to be regarded as more of a lower limit because payment transactions presumably provide further revenue in the form of preferential loan and deposit terms.

The other suppliers play a much less significant role in our calculation. This is due in part to the fact that they operate as service providers for the banks, and the banks bill the customers for the costs that the former incur. An estimate of the direct revenue achieved with non-banks by service providers in cash and card payments produced volumes of under €1 billion.

Figure 42:

Summary of the findings



Factoring in findings from external estimates of the internal costs of businesses, we can put the macroeconomic significance of cash and cashless payment media at a figure of at least 2% of GDP all in all. However, it is important to tread with caution when interpreting estimates of the internal expenses incurred by businesses and private individuals.

Finally, one should observe that cost estimates also ignore a number of quality-related factors, such as the role of cash in monetary policy, questions of data protection or the importance of different payment media in crisis phases (refer to the end of Chapter 3).

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Annex

List of the 16 banks whose annual reports were analysed	
1	Ostfriesische Volksbank eG
2	Westerwald Bank eG Volks- und Raiffeisenbank
3	Berliner Volksbank eG
4	PSD Bank Hessen-Thüringen eG
5	Volksbank Mittelhessen eG
6	Volksbank Helmstedt eG
7	Sparkasse KölnBonn
8	Sparkasse Vest Recklinghausen
9	Sparkasse Rastatt-Gernsbach
10	Sparkasse Waldeck-Frankenberg
11	Oldenburgische Landesbank AG
12	Landesbank Baden-Württemberg
13	Landesbank Hessen-Thüringen
14	Landesbank Berlin
15	Deutsche Postbank AG
16	Commerzbank AG

Costs and Benefits of Cash and Cashless Payment Instruments

Revenue from payment transactions of the 16 banks under analysis						
	Ostfr. VB	Westerw. VB	Berliner VB	Hessen PSD	VB Mittel-Hessen	VB Helmstedt
revenue from payment transactions in € m	3.36	7.17	41.34	0.20	22.60	3.01
as a % of overnight deposits	0.99%	1.14%	0.62%	0.09%	0.78%	1.23%
as a % of total customer deposits	0.48%	0.42%	0.52%	0.01%	0.48%	0.66%
as a % of the balance sheet total	0.30%	0.34%	0.43%	0.01%	0.38%	0.47%
as a % of commission revenue	42.95%	46.15%	40.12%	16.24%	44.13%	53.56%

	SK Köln-Bonn	SK Vest	SK Rastatt	SK Waldeck	LB Oldenb.
revenue from payment transactions in € m	94.27	15.50	4.50	5.83	37.80
as a % of overnight deposits	1.25%	1.03%	1.27%	0.87%	1.03%
as a % of total customer deposits	0.52%	0.40%	0.45%	0.39%	0.50%
as a % of the balance sheet total	0.32%	0.29%	0.28%	0.28%	0.28%
as a % of commission revenue	53.24%	47.81%	54.55%	56.00%	29.53%

	LBBW	Helaba	LBB 2011	Postb.	CoBa
revenue from payment transactions in € m	165.00	66.00	93.00	361.00	1,303.00
as a % of overnight deposits	0.66%	0.49%	1.24%	0.98%	1.00%
as a % of total customer deposits	0.21%	0.16%	0.55%	0.27%	0.51%
as a % of the balance sheet total	0.04%	0.04%	0.16%	0.19%	0.20%
as a % of commission revenue	23.67%	25.98%	73.81%	24.03%	32.13%

Definitions:

a) Implicit fee

Implicit fee = Transferable deposits (“deposit money”) · (alternative interest rate – Ø-interest rate for transferable deposits). Assuming that the average rate of interest on transferable deposits is almost zero, the calculation can be simplified:

Implicit fee = transferable deposits · alternative interest rate

b) Transferable deposits

The Bundesbank has reported transferable deposits as a separate category since June 2010. These deposits can be used directly for payments. This type of deposits is commonly also referred to as “deposits in current accounts” or “demand deposits”. However, the expression “demand deposits” is used by the Bundesbank for overnight deposits. In addition to the transferable deposits, demand deposits also include overnight term money.

c) Alternative interest rate (opportunity cost rate)

The return lost when an investor holds relatively liquid assets at low rates of interest. As cash attracts zero interest and most of the deposits held in current accounts (transferable deposits) similarly earn no interest, the alternative interest rate is understood to be the interest yield on a common, short-term deposit instrument.

Estimate of overnight money rates for businesses and households

The rates for the following are *sought*

- Overnight term deposits for businesses
- Overnight term deposits for households

Recorded statistically:

- The interest rate for overnight deposits
(overnight term deposits + transferable deposits) for
 - Businesses
 - Households
- The level of overnight deposits of
 - Businesses
 - Households
 - Public authorities
 - Foreign entities
- The level of transferable deposits (deposit money) from domestic businesses and households as a whole.

Not recorded statistically

- The split of transferable deposits between the two sectors, i.e. “households” and “businesses”.

In theory, the overnight money rate can be calculated by applying the following formula:

$$\text{Overnight ir} = \frac{\text{ir on overnight deposits} - \text{ir on transferable deposits} \cdot \text{share of transferable deposits}}{\text{Share of overnight term deposits}}$$

Overnight ir: interest rate on overnight term deposits

If you assume that the average interest rate on transferable deposits is zero, the formula above can be simplified to

$$\text{Overnight ir} = \frac{\text{ir on overnight deposits}}{\text{Share of overnight term deposits}}$$

However, the shares of transferable deposits and overnight term deposits in overnight deposits are unknown and have to be estimated. Depending on the estimation method applied, this produces relatively great variation in the two overnight money rates. The degree to which current accounts attract interest is also unknown; consequently, the assumption that the rate of interest on transferable deposits is zero may distort the estimate upwards. This problem also exists when other rates of interest are applied and is not likely to play any significant role at a low level of interest.

Estimate of the share of transferable deposits accounted for by businesses and households

In **method 1** it is assumed that the businesses divide their overnight deposits in precisely the same way as the public sector and foreign investors.⁵⁸ These two groups accounted for a 35.1% share of the transferable deposits on overnight deposits in 2011. The transferable deposits held by businesses can be estimated on this basis. The transferable deposits held by households account for the rest. This method leads to an estimated value of €443 billion for households and €128 billion for businesses.

Method 2 assumes that households' share of transferable deposits is the same as households' share of overnight deposits overall. According to this method, households have transferable deposits of €373 billion and businesses have €198 billion. In order to estimate the implicit fees, the average of the two results of methods 1 and 2 were calculated for households and businesses. In 2011, the average volume of transferable deposits of €625 billion was split as follows according to this: domestic private individuals held €408 billion, domestic businesses held €163 billion and other sectors held €54 billion.

Transferable deposits: average of estimates of methods 1 and 2			
	Businesses	Households	Businesses+rest
2010	163.5	417.3	219.2
2011	162.7	408.2	217.1
2012	183.5	432.3	247.6

⁵⁸ The majority of foreign depositors are likely to have been businesses. The public sector is more likely to have traded like businesses rather than like private individuals. Therefore, it is assumed that the split between transferable deposits and overnight term deposits in these sectors is more likely to reflect the split among businesses than the split among households.

Transferable deposits: estimates based on method 1			
	Businesses	Households	Businesses+rest
2010	197.6	383.2	253.3
2011	197.6	373.4	251.9
2012	217.4	398.4	281.4

Transferable deposits: estimates based on method 2			
	Businesses	Households	Businesses+rest
2010	129.5	451.4	185.1
2011	127.8	443.1	182.2
2012	149.7	466.1	213.8

Comments: € billion; rest: public authorities and abroad.

Based on these estimates and the statistics for overnight deposits, it is possible to calculate the shares of overnight deposits attributable to transferable deposits and to overnight term deposits.

Transferable deposits: shares of households and others						
	Method 1		Method 2		Average	
	Households	Businesses +rest	Households	Businesses +rest	Households	Businesses +rest
2010	60.2%	39.8%	70.9%	29.1%	65.6%	34.4%
2011	59.7%	40.3%	70.9%	29.1%	65.3%	34.7%
2012	58.6%	41.4%	68.6%	31.4%	63.6%	36.4%

The shares of transferable deposits form the input for calculating the rate of interest on overnight term deposits.

Estimated level of the rate of interest on overnight term deposits						
	Method 1		Method 2		Average	
	Households	Businesses	Households	Businesses	Households	Businesses
2010	1.6	0.9	2.1	0.7	1.85	0.82
2011	1.7	1.1	2.1	0.9	1.92	1.01
2012	1.5	0.7	1.8	0.6	1.63	0.65

Alternative interest rates:		
	Savings interest	Term money (1 year)
2010	1.4	0.6
2011	1.4	1.1
2012	1.2	0.4

It is apparent that the estimated values for the overnight term deposits rate are relatively high and respond sensitively to the estimated split in transferable deposits between the two sectors.

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