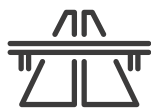


MARCH 2019  
SERIES: COSTS OF PAYMENTS IN DENMARK 2016

# Payments involve considerable economies of scale



**Economies of scale reduce the social costs of popular methods of payment**

Payments involve considerable fixed costs. Therefore, the average social costs are lower for methods of payment that are used frequently.



**The spread between the efficiency of payment cards narrows at the margin**

The social costs are kr. 2.4 for a Dankort payment compared with kr. 4.1 when an international debit card is used. For one additional payment, the spread is smaller, the costs being kr. 1.3 and 1.7, respectively.



**It is in the interest of the Danes to have a choice of payment methods**

Despite the economies of scale in relation to payments, it is positive that the Danes have access to several different methods of payment. That stimulates competition and innovation in the payments market.

## The Danish Payments Council surveys the social costs of payments in Denmark

The Danish Payments Council<sup>1</sup> surveys the social costs of payments in Denmark. This analysis is part of a series of analyses and considers the *marginal* social costs of payments – i.e. the cost of one additional payment – for domestic consumer-to-business, C2B, payments<sup>2</sup>. The Danish Payments Council has previously calculated the *average* social costs of payments.<sup>3</sup>

Social costs express the aggregate use of resources by all the parties involved in a payment, i.e. payment intermediaries, payers and payees, cf. Box 1. Social costs do *not* comprise transfers between the parties, as they constitute an expense for one party and income for the other. For example, the acquirer fees payable by businesses in connection with card payments are *not* included in the calculations. Consequently, social costs do not reflect the private payment-related expenses of the individual parties.

The Danish Payments Council's survey of the costs of payments gives payment market participants and other stakeholders insight into the social costs of various types of payment. The survey is based on data from 2016, as data collection and processing are time-consuming.

### **Making payments involves considerable economies of scale**

Before a payment can take place, an underlying infrastructure must be in place. The overall infrastructure comprises a common and a specific infrastructure. The common infrastructure ensures that

## ! Marginal costs

are the costs of making one additional payment.

### **Social costs**

Box 1

Payments are made every day all year round. The calculation of the social costs of making a payment includes elements from households, businesses and payment intermediaries. Payment intermediaries are banks and cash-in-transit (CIT) companies, among others.

Each party incurs costs when executing a payment. These costs are either internal resource costs, such as the time it takes the payer to complete a payment, or transfers to other parties, such as a bank's transfer to a CIT company.

This analysis reviews the social costs, i.e. the aggregate use of resources by the parties involved in a payment. Transfers between the parties have been excluded.

For payment intermediaries and businesses, the resource costs relate to payroll costs for employees such as cashiers, as well as expenses for equipment, e.g. IT systems.

For households, the resource costs of a payment relate to the opportunity cost of the time a payment takes. This means that the cost is not money to be paid by the households, but rather a reflection of the value of the time the households spend making payments.

The basis for the survey is an extensive data collection from households and businesses via questionnaire surveys, as well as direct collection from selected banks and other payment intermediaries. For details, see the website of the Danish Payments Council ([link](#)), where a description of the method and the other analyses in the series can be found.

1 The Danish Payments Council is the framework for collaboration on the payments of consumers and businesses. The Council was set up by Danmarks Nationalbank and includes representatives of a broad range of stakeholders in the Danish payments infrastructure.

2 Businesses include both businesses and retailers.

3 See Danish Payments Council, The costs of consumer-to-business payments have decreased considerably, *Analysis from the Danish Payments Council*, September 2018.

## ! Fixed costs

are the costs that do not increase with each additional payment.

all accounts can reach each other and is a prerequisite for secure and efficient payments.<sup>4</sup> The specific infrastructure is linked to the individual method of payment.

For example, the specific infrastructure for card payments includes a card issued by a bank, a retailer's card terminal and IT systems for processing the payment. Cash payments involve production of cash by Danmarks Nationalbank and a cash handling infrastructure that allows secure transport of cash from retailers to banks.

The costs for the specific infrastructure are *fixed costs*, and this is why payments involve economies of scale. Once the fixed costs have been paid, and the infrastructure is in place, an additional payment is less expensive.

To achieve the greatest possible return on the fixed investment, it is an advantage for society that each method of payment is used for many payments. But having several competing methods of payment also offers advantages in terms of innovation and efficiency.

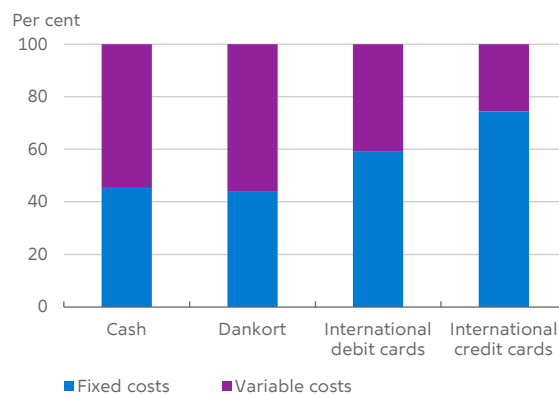
### **Especially electronic payments involve large fixed costs**

The Danish Payments Council's survey confirms that payments involve large fixed costs, cf. Chart 1.

At around 45 per cent of the total social costs of the payment methods, the fixed costs were lowest for cash and the national card scheme, Dankort. At 60 and 75 per cent, respectively, the fixed costs of international debit and credit cards were somewhat higher.

Payments involve large fixed costs

Chart 1



Note: The chart comprises the social costs of payments in physical trade only.

Source: The Danish Payments Council.

Cash had a relatively low share of fixed costs because many of the activities linked to cash payments depend on the number of payments. This applies e.g. when a retailer counts the cash or when cash is withdrawn.

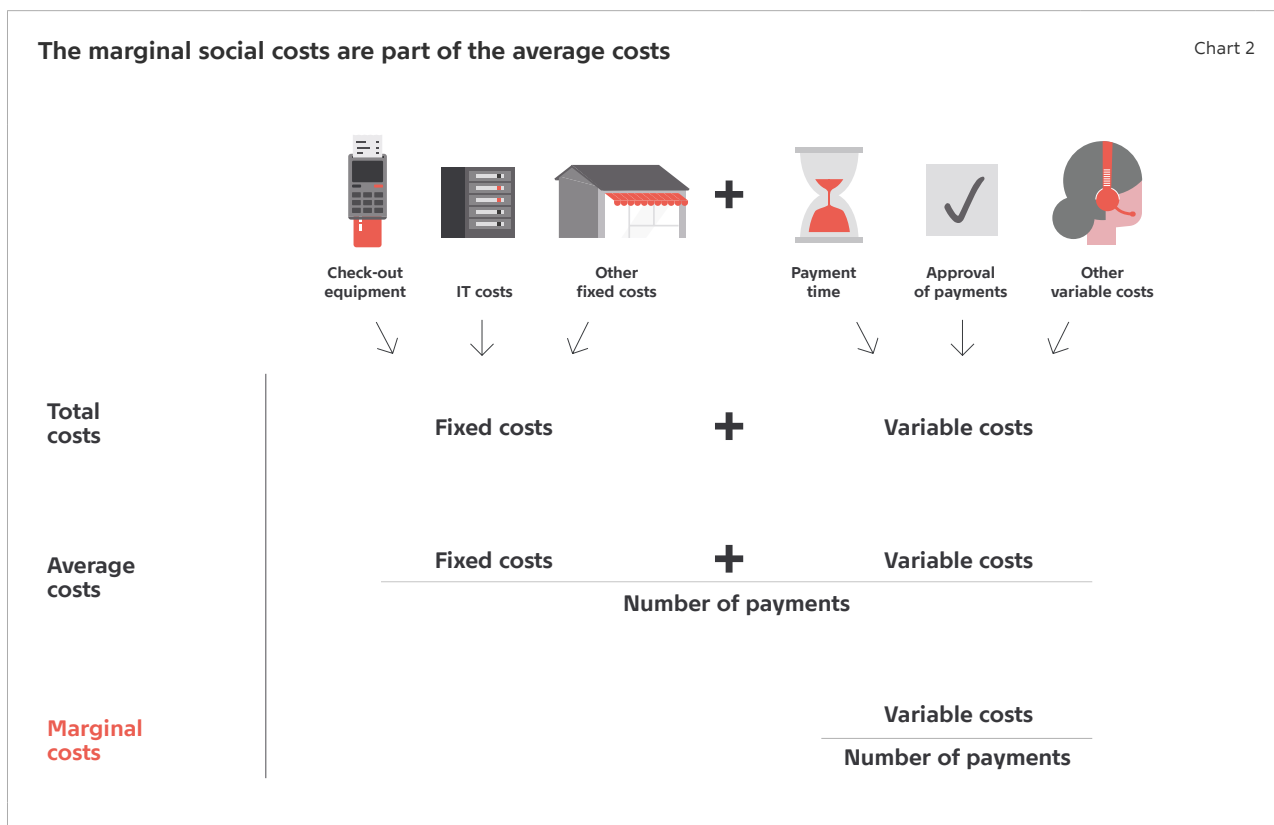
Dankort has a lower share of fixed costs than the international payment cards. This is because each of the many Dankort payments adds a little to the variable costs, so that, all else equal, the variable costs account for a larger share of the total costs.

Conversely, international payment cards have a higher relative share of fixed costs. Payment cards involve major investments in e.g. IT systems and card terminals, which must be in place before payments can be made. The higher fixed costs and the lower prevalence of the international payment cards mean that the fixed costs make up a larger share of the total costs.

### **Marginal costs are not the same as average costs**

The marginal cost of a payment is an expression of the cost of making one additional payment once the fixed costs have been paid.

<sup>4</sup> The common infrastructure comprises, inter alia, Danmarks Nationalbank's settlement system, Kronos, and Finance Denmark's retail clearing systems and other support systems.



The average cost includes both fixed and variable costs, while the marginal cost includes variable costs only, cf. Chart 2. So the marginal cost will always be lower than the average cost, and the spread will depend on the share of fixed costs relative to the total costs.

A characteristic of fixed costs is that, basically, they do not increase with the number of payments. This could be e.g. a retailer's cash register, which costs the same irrespective of whether the number of daily payments is 10 or 100. However, the fixed costs are fixed only if the change in the number of payments is relatively small. If the number of payments increases to many thousands, it may be necessary to invest in more cash registers.

Variable costs, on the other hand, increase every time an additional payment is made using the relevant method. This could be e.g. the time it takes to make a payment. In this case a higher number of payments will require longer time, thereby increasing the social costs. Some costs also rise with the size of the payment. This is particularly true of cash, for which larger payments require procurement and handling of more cash.

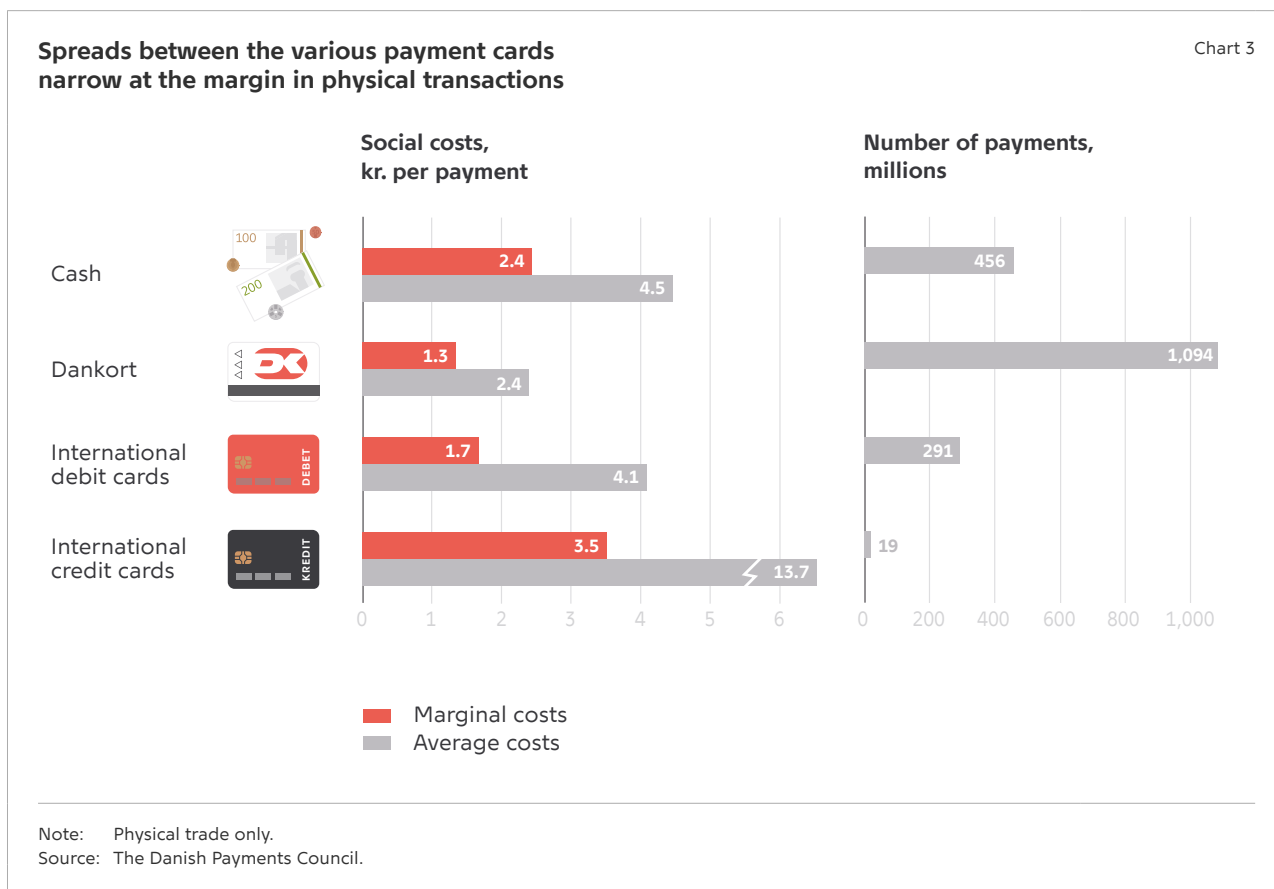
Only the variable costs are included in the calculation of the marginal cost of payments – i.e. what it costs to make one additional payment using a given method. This is because only the variable costs increase with the number of payments.

**The spreads between the various payment cards narrow at the margin**

The spread between the social costs of the various payment cards narrows when the marginal costs, rather than the average costs, are considered. This is seen from Chart 3, which shows the social costs of payments in physical trade. The reason is that the fixed costs are large, cf. above.

At kr. 1.3 per additional payment, Dankort involved the lowest marginal social costs for physical trade

**! Variable costs**  
 are the costs that increase with each additional payment.



in 2016. The marginal costs for international debit cards were also low – kr. 1.7 per additional payment – while the costs for international credit cards and cash were somewhat higher. As previously explained, the higher marginal costs of cash are attributable to a large share of variable costs. The same applies to international credit cards, for which especially costs for approving, settling and rejecting payments play a significant role.

At the same time it is important to keep in mind the prevalence of the methods of payment. Large differences in the number of payments have an impact on the marginal costs in that economies of scale make it profitable to invest in e.g. streamlining of manual processes. So it is not surprising that Dankort involves the lowest social costs, both on average and marginally, as this is by far the most frequently used method of payment.

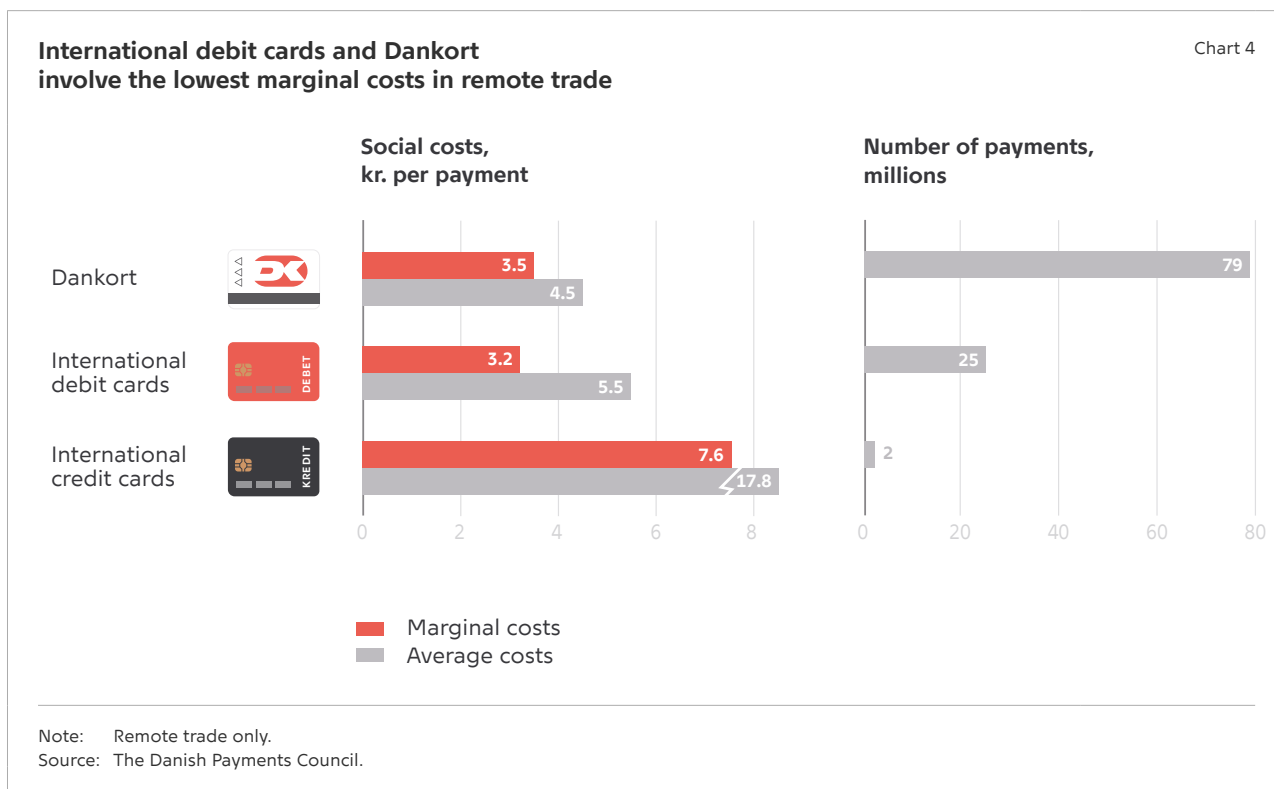
**The spread between the cards also narrows at the margin in remote trade**

The same pattern whereby the spread between the cards narrows is seen in remote trade. Remote trade is when the payer and the payee are not both present at the business premises, e.g. online shopping.

In remote trade, international debit cards involve the lowest marginal social costs at kr. 3.2 per payment, closely followed by Dankort, cf. Chart 4. International credit cards are approximately twice as expensive for society as Dankort and international debit cards.

The main reason why the marginal social costs are slightly lower for international debit cards than for Dankort in remote trade is that the volume of fraud with Dankort in remote trade was relatively high in 2016.<sup>5</sup> Losses in connection with fraud are char-

5 As losses in connection with fraud with cards and cash robberies are deemed to be linked to the structure of the payment methods, such losses are included in the social costs of C2B payments.



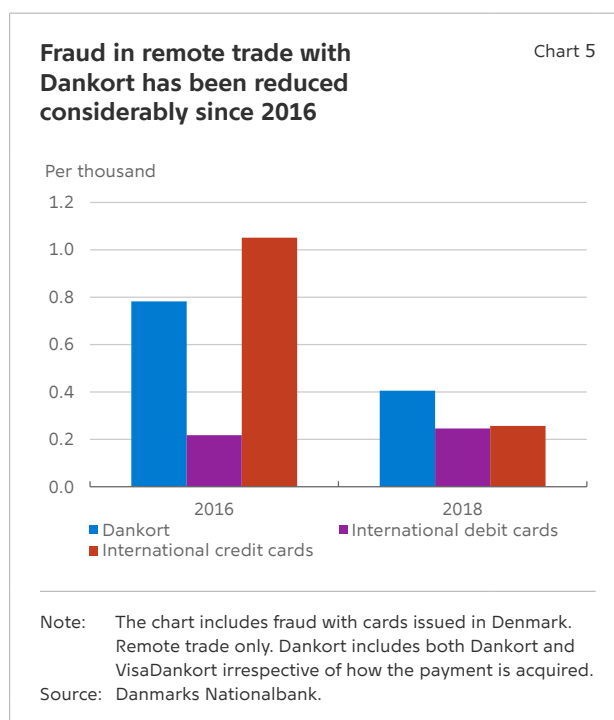
acterised as variable costs, thereby affecting the marginal cost. Since fraud relative to the value of payments was several times higher for Dankort than for international debit cards in 2016, this has a substantial impact on the marginal costs. But the relative difference in fraud has narrowed considerably since 2016, and all else equal this has reduced the costs of Dankort, cf. Chart 5. The same applies to international credit cards, for which fraud has also been reduced considerably during this period.

In 2016, '3D-Secure' security features existed for the international cards, providing an extra security layer in remote trade. This was introduced for Dankort in 2017 and has contributed strongly to reducing fraud with Dankort in remote trade.

#### For cash the marginal costs depend on the value of the payment

When the social costs of payments are broken down into fixed and variable costs, the variable costs can be further broken down into those that vary with the number of payments and those that vary with the value of the payments.

The costs that vary with the value of payments relate mainly to cash. This is because larger cash



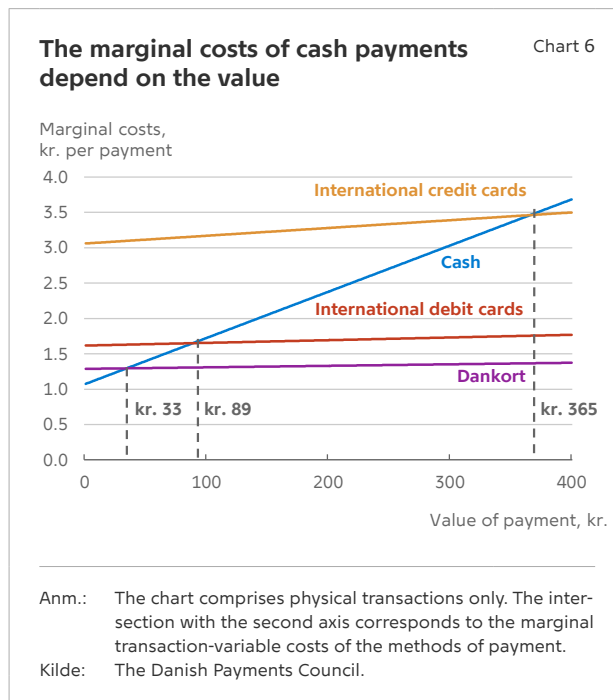
payments require physical handling of more cash. This applies to households, which must procure more cash, and to retailers and banks, which incur higher costs for handling the cash. For both cash and payment cards, fraud-related losses vary with the size of the payment – if the transaction involved is larger, the losses are also larger. Note that in this context fraud is considered a loss and hence a social cost.

Chart 6 illustrates how the marginal costs of making one additional payment depend on the amount paid. It is seen that the costs of cash payments increase with the size of the payment to a greater extent than the costs of card payments do. Only in connection with very small amounts of less than kr. 33 does cash involve lower social costs than Dankort, while this threshold is higher for international debit and credit cards, for payments at kr. 89 and 365, respectively. This result is in line with the most recent survey of the costs of payments, from 2009, in which the threshold between Dankort and cash was approximately the same.<sup>6</sup> This indicates that both methods of payment have become more efficient since 2009.

Thus, for larger payments, cards involve lower social costs than cash. The reason is that the marginal cost of adding one krone to the amount paid is very small for electronic methods of payment, while for cash the costs for physical handling of the banknotes and coins increase, as described above.

### The relationship between costs and number of payments is complex

Given that the Danish Payments Council's survey shows that Dankort payments involve the lowest social costs, both on average per payment<sup>7</sup> and at the margin in physical trade, it is tempting to draw the conclusion that only Dankort can be an efficient method of payment. However, that would not be a fair conclusion as the composition of the social costs is complex. Payments involve economies of scale, so



the number of payments made using each method has a large impact on the costs. And the number of payments varies considerably for the different methods of payment, cf. Charts 3 and 4 above.

If cash is disregarded and focus is purely on payment cards, which are most comparable, Dankort involved the lowest average social costs in 2016. But the distribution of fixed and variable costs and the narrower spread at the margin show that caution should be exercised when concluding whether international debit or credit cards would be more or less expensive than Dankort if they were used just as much.

The fixed costs of payments can be regarded as fixed only if the change in the number of payments is relatively small. In connection with larger changes, the fixed costs may also change. For example, it might become profitable for a bank to invest in an IT system for processing customer complaints against card

6 Cf. Johan Gustav Kaas Jacobsen and Anders Mølgaard Pedersen, Faste og variable omkostninger ved betalinger i Danmark (Fixed and variable costs of payments in Denmark – in Danish only), *Danmarks Nationalbank Working Paper*, no. 79, June 2012.

7 Cf. Danish Payments Council, The costs of consumer-to-business payments have decreased considerably, *Analysis from the Danish Payments Council*, September 2018.

payments if the number of payments shows a strong increase.<sup>8</sup> In that way, the fixed costs may gradually increase as the number of payments rises.

In the same way, the variable – and thus marginal – costs may also change if, say, the number of payments soars. For example, a bank investing in an IT system for processing complaints will be able to reduce its variable costs because manual processing of complaints is reduced. That is why the investment is profitable: a fixed investment can reduce the variable costs.

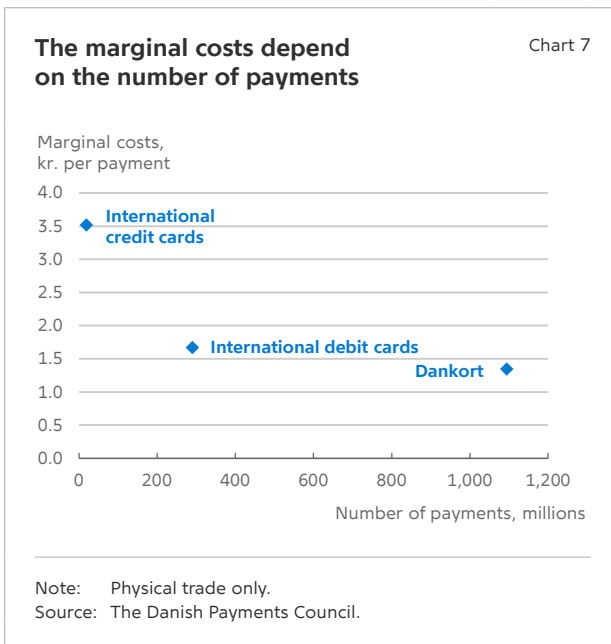
The relationship between marginal costs and number of payments for the three types of payment cards is illustrated in Chart 7, which is a graphic representation of the numbers from Chart 3. International credit cards have the lowest number of payments and the highest marginal costs. They are followed by international debit cards with more payments and lower marginal costs, and finally Dankort has by far the highest number of payments and the lowest marginal costs.

**It is in the interest of the Danes to have access to several methods of payment**

Payments involve costs, and the social costs vary, depending on the method of payment, as illustrated by the Danish Payments Council’s survey. Payments also involve economies of scale, but this does not necessarily mean that it is in the interest of society to have only one method of payment for all situations. There are two main reasons for this:

Firstly, competing private sector payment methods promote efficiency and innovation. A public sector or regulated monopoly entails a risk of inefficiency and lack of innovation. A private sector monopoly on payments also entails a risk of lack of innovation, as well as a risk of high fees.<sup>9</sup> To the extent that the private sector can provide competing methods of payment, this is in the interest of society.

Secondly, all methods of payments are not identical. Depending on the payment situation and personal preferences, various methods may be preferable.



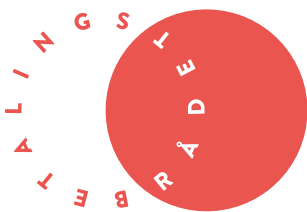
For example, some people prefer the tangibility of cash.<sup>10</sup> Likewise, the payment cards also have different characteristics that are more convenient in various payment situations. Therefore, from society’s perspective it is useful to have a selection of payment methods that meet the requirements of the households in different payment situations.

<sup>8</sup> It is assumed that there is a linear relationship between the number of payments using a given method and the number of complaints.

<sup>9</sup> Note, however, that such fees are not included in this analysis, as the fees are not included in the Danish Payments Council’s survey of the social costs of payments.

<sup>10</sup> Cf. Victor Gørtz Smestad, Danish households opt out of cash payments, *Danmarks Nationalbank Analysis*, no. 24, December 2017.





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