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Research Discussion Paper

The Evolution of Payment Costs in Australia

Chris Stewart, Iris Chan, Crystal Ossolinski,
David Halperin and Paul Ryan

RDP 2014-14

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Abstract

This paper examines the costs borne by financial institutions, merchants, and consumers in making, facilitating and accepting consumer-to-business payments. It examines the resource costs incurred by these sectors, how these have changed since 2006, and how fees and other transfers determine which sectors ultimately bear these costs. It also examines how resource costs vary at different transaction sizes and, for merchants, how costs differ between small and large entities.

The results suggest that the resource costs of the payments system have fallen as a per cent of GDP since 2006. On a per transaction basis, direct debit remains the lowest-cost payment instrument while cheques remain the most expensive. At the point of sale, payments using cash, eftpos and contactless MasterCard & Visa debit cards have broadly similar costs for transactions under about \$20; above \$20, eftpos is the lowest-cost payment method. The results indicate that the relationship between resource and private costs varies significantly across instruments. The greater share of the overall cost is borne by merchants. The consumer undertaking a transaction typically pays a small proportion of its cost; consumers face a similar cost for credit card payments as for debit card payments despite the higher cost of credit cards to the economy. Finally, the results suggest that small businesses incur higher costs than large merchants.

JEL Classification Numbers: E4, G2, L2

Keywords: banks, consumers, financial institutions, merchants, retail payments, surcharging

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1. Introduction

This study provides comprehensive estimates of the costs borne by merchants, financial institutions and individuals in the use of different retail payment methods. The absolute and relative costs involved in making and receiving payments are important as they influence the decisions of these sectors and, therefore, the mix of payments in the economy. They are also important considerations for policymakers when trying to understand the efficiency of the payments system. These costs are typically not transparent to policymakers or end users of payment systems.

This study follows earlier work on payments costs by the Reserve Bank and the Australian Competition and Consumer Commission (Schwartz *et al* 2008; RBA and ACCC 2000). These studies helped to inform subsequent policy deliberations, although it should be kept in mind that policy deliberations take into account a wider range of considerations than just costs as measured by these types of studies.

Given the significant changes in technology, payment functionality, issuing arrangements, pricing and payment use patterns that have occurred in recent years it is timely to refresh this work with new cost data. This study extends the earlier work in a number of directions. In particular, it:

- explores both the resources used (resource costs) and the fees and other transfers (which contribute to private costs) associated with different payment instruments¹
- captures the payments costs of a wider range of merchants, including small businesses

¹ The distinction between resource costs (the economic resources that are expended to 'produce' a payment, see Schwartz *et al* (2008)) and private costs (the combination of resource costs plus the transfer payments paid or received by parties) is discussed in more detail in Section 2.

- collects information on a wider range of payment instruments, for example so-called ‘companion credit cards’ (American Express credit cards issued by the major banks to customers alongside a MasterCard or Visa credit card)
- separately identifies the costs of contactless card transactions given their rapid growth and implications for tender times and other costs.

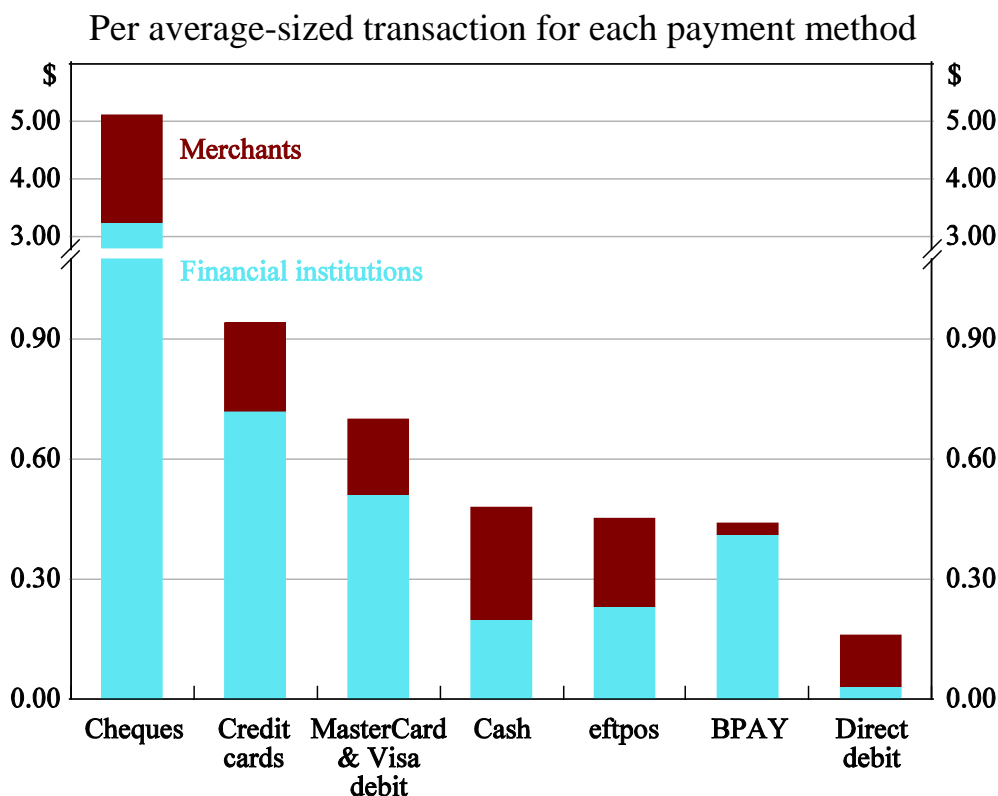
As with the earlier Reserve Bank work, the study has benefited from close cooperation with a wide range of financial institutions and merchants. These entities helped determine what information could be reliably obtained, provided a large amount of data to the Reserve Bank for analysis, and worked with the Reserve Bank to improve the accuracy and consistency of these data.

The key findings of the study include:

- The aggregate resource cost incurred by merchants and financial institutions in receiving payments from consumers is estimated to be about \$8.4 billion in 2013, or about 0.54 per cent of GDP. Financial institutions incur the majority of these costs. Around one-third of costs are incurred by merchants, with tender time (the time taken at the till to process the payment) being the most significant component.
- The aggregate costs associated with consumer-to-business payments are estimated to have changed little in nominal terms since the 2007 study, and to have fallen as a per cent of GDP. The fall primarily reflects that per transaction costs have fallen across most instruments. Marginally offsetting the fall, the shift towards greater use of more expensive instruments has worked to raise the cost of the payments system.
- To conduct a comparison of the cost across instruments, the cost of maintaining accounts (which may facilitate payments made with multiple instruments) is excluded and only the direct cost of making a payment using that method is considered. On this basis, cash, eftpos and contactless MasterCard & Visa debit transactions have broadly similar resource costs for transactions of under about \$20. Above \$20, eftpos is the lowest-cost payment method. At the average transaction size for each instrument, MasterCard & Visa debit card payments are

more resource intensive than eftpos, while credit card transactions are the most resource-intensive card payment method even when excluding the costs of credit and rewards (Figure 1). Of all methods considered in the study, direct debit remains the lowest cost, while cheques remain the most expensive.

Figure 1: Direct Resource Costs



Note: Payment function only

Source: Authors' calculations based on survey data

- The aggregate and relative costs associated with card payments are changing considerably with the advent of contactless payments. Contactless card payments are estimated to incur 10 to 20 per cent lower resource costs than a comparable contact-based card transaction.
- Once fees and other transfers between sectors are included, the burden of private costs across sectors differs from that of resource costs and varies significantly across instruments. The majority of private costs are incurred by merchants and consumers who typically pay a net transfer to the financial sector to use payment services, although merchants may pass these costs on to consumers in general via the prices on their goods and services. Across instruments, the private cost to

consumers is relatively similar despite large differences in resource costs. On average, the private cost to consumers of using a credit card is similar to that for a debit card despite the higher resource costs incurred for credit card transactions. Although consumers pay fees to hold credit cards, they also receive significant incentives to use them to make purchases, due to rewards points and the interest-free period.

- Results from a survey of small and medium enterprises (SMEs) suggest that while the ranking of the private costs of instruments is similar to that for large businesses, the private costs faced by SMEs are higher. In part, this is because SMEs do not benefit from the economies of scale that can be achieved by large merchants due to their larger payment volumes. In addition, merchant service fees are higher for small businesses.

The rest of this paper proceeds as follows. Section 2 discusses the literature on payment costs. Section 3 outlines the scope of this study and details the estimation methodology. Section 4 presents resource costs of payments in Australia, both in aggregate and by instrument. This is supplemented in Section 5 by a discussion of how these costs are borne by different sectors. Section 6 examines how resource costs vary at different transaction sizes and Section 7 focuses on the private (gross) costs to SMEs of accepting payments. Section 8 concludes.

2. Related Literature and Scope

The Bank's 2007 study (Schwartz *et al* 2008) was among the first to use data collected directly from financial institutions and merchants to estimate the costs of making retail payments. Earlier studies had instead tried to estimate costs indirectly or focused on a narrower set of instruments (e.g. Food Marketing Institute 2000; Gresvik and Øwre 2003). The indirect measurement of costs – often via information on fees – arose because of the difficulties of obtaining commercially sensitive cost information. While fees are a reasonable proxy for costs in some situations, there are other instances where they are not sufficient given that profit margins are not separately identified and so are also captured in this measure of costs.

Since the Bank's 2007 study, payment cost studies using proprietary data have been conducted almost exclusively by central banks as part of their role overseeing the efficiency of payments systems. These include a comprehensive study by Gresvik and Haare (2009) in Norway and a study coordinated by the European Central Bank (ECB) published in 2012 (Schmiedel, Kostova and Ruttenberg 2012).² Results across different countries estimated the cost of consumer-to-business payments at between 0.42 per cent and 1.35 per cent of GDP. Most of this dispersion arises from differences in underlying costs between countries rather than sectoral coverage.

In general, studies undertaken since the Bank's 2007 cost study are similar in scope and methodology. In all cases, estimating the benefits of payments has been beyond the scope of these studies given the difficulties of defining and measuring these benefits. Any differences in scope or coverage have generally reflected national circumstances. For example, most countries participating in the ECB study did not include costs associated with cheques given they are generally not used extensively for retail payments in most of Europe.

2.1 Measurement of Costs

Studies of payment costs have focused almost exclusively on measures of long-run costs, which includes both the cost of the infrastructure required to support payments and the cost of making payments using that infrastructure.³ For example, when applied to card payments, this long-run cost concept covers both the cost of point-of-sale terminals as well as the cost of conducting card transactions using this equipment. In practice, the average cost of making payments has been used as an estimate for long-run costs given the difficulty of measuring infrastructure costs that may be fixed in the short term but variable in the long term.

² For more discussion on the benefits and limitations of cost studies for central banks, see Hayashi and Keeton (2012).

³ Arango and Taylor (2008) is one exception, looking at the marginal costs of different payment methods for merchants in Canada, along with merchant perceptions of costs, reliability and risk. Another is the paper by Garcia-Swartz, Hahn and Layne-Farrar (2006), which looks at benefits and costs.

One respect in which the measurement of costs differs across studies relates to how prescriptive each study has been around the allocation of costs that might be common to payment instruments and other business functions. Allocation is required because much of the infrastructure that supports payment transactions also facilitates other functions for financial institutions and merchants, such as managing statements and invoicing. To address this, some studies have taken a prescriptive approach as to the types of costs to allocate to payments in order to improve consistency across respondents, while others – including this study – have left these allocations to responding institutions to better account for differences in the structure of each.

2.2 Resource Costs, Private Costs and Transfers

When considering costs incurred by financial institutions, merchants and consumers in facilitating and making payments, most studies distinguish between resource costs and private costs. Resource, or social, costs are the economic resources expended by the various participants to ‘produce’ a payment (Schwartz *et al* 2008). Additionally, participants may also incur or receive transfer payments from other parties; combining these with the resource costs incurred by a participant generates the net private cost for that participant. These transfers are not resource costs as they are merely a redistribution between participants in the payments system rather than ‘real’ resources spent on the system as a whole. For example, a transaction fee paid by a merchant to its bank represents a transfer and a private cost to the merchant, but not a cost for society as a whole. Estimates of private costs are particularly useful in gauging the incentives for different parties to provide or use different payment services.

While resource costs have been the primary focus of international studies, analysis of institutions’ private costs has also been considered in a number of studies (e.g. Brits and Winder 2005; National Bank of Belgium 2006). Some studies have also combined this with an analysis of fixed and variable costs, thereby allowing for a consideration of how private incentives may change at different payment values and how these compare to socially optimal outcomes (Danmarks Nationalbank 2012; Segendorf and Jansson 2012).

2.3 Fixed and Variable Costs

Payment costs can be categorised into fixed and variable components. Fixed costs are generally infrastructure-type costs that would be incurred regardless of the number of payments made, while variable costs are those that depend on the number or value of transactions undertaken. The ability to distinguish between fixed and variable costs permits comparison of the cost of particular payment types as the transaction value varies. It can also inform the extent to which different payment instruments benefit from economies of scale.

The categorisation of costs as fixed or variable will differ to some extent between different institutions. This study asked financial institutions and merchants to indicate whether different cost items are fixed or vary with transaction volumes and values. Different cost items were then allocated as fixed or variable using this information.

2.4 Institutional Coverage and Data Collection

Institutional coverage is broadly similar across different studies of payment costs. Studies conducted by central banks tend to rely on direct surveys of the costs of financial institutions and merchants. Some studies collect additional data directly from companies that provide services to these entities, such as cash-in-transit companies, to examine more detailed aspects of resource and private costs (Segendorf and Jansson 2012). This paper follows the same approach as the Bank's 2007 study by directly surveying financial institutions and merchants, and proxying the resource costs of their service providers by using the fees paid to them, paying careful attention to avoid double counting between resource costs and transfers.

Participation by financial institutions across other studies is typically quite high and the major banks of each country are generally represented. Merchant coverage is more varied, ranging from a handful of firms to over 1 000. For studies with a smaller number of respondents, merchant samples are usually focused on larger merchants. Even for studies involving a wider range of merchants, the cost information from larger merchants has tended to be more complete and up to date (Schmeidel *et al* 2012) and certain industries appear to have been more responsive

(for example, see comments by Gresvik and Haare (2009)). This study includes 17 large merchants, and has used a survey of small merchants (with around 260 respondents) to better understand any differences in costs faced by these businesses.

Estimates of the costs incurred by consumers in using payment instruments are often included in payment cost studies as extensions. Studies that consider the cost to consumers include Gresvik and Haare (2009) for Norway, and Danmarks Nationalbank (2012), Turján *et al* (2011) and Segendorf and Jansson (2012) for Denmark, Hungary and Sweden, respectively (as part of country-specific analyses of the data collected for the ECB study). This type of analysis relies on estimates of the number and value of transactions undertaken by consumers and the time taken to conduct these transactions to estimate the opportunity cost of payments activity. In line with these European studies and the Bank's 2007 study, the current study has collected cost data directly from financial institutions and merchants, and has estimated consumer costs based on estimates of the time that consumers take to make payments. Therefore, consumer cost estimates are less robust than estimates of financial institutions' and merchants' costs and are not included in the reported estimates of total resource costs for the economy. More details on the construction of these estimates can be found in Appendix C.

2.5 Payment Instruments

The particular payment instruments included in each cost study have been determined by their relative importance to that country's payments system. For example, cheques tend to be excluded from studies conducted by countries in which cheque use is low. Additionally, some studies focus solely on point-of-sale payments to the exclusion of billing and remote payments. Due to the wide variety of payment instruments used in Australia, this study's coverage is in line with the most inclusive overseas studies. In particular, this study considers the costs associated with cash, debit and credit cards, cheques, direct debit and BPAY

payments.⁴ It also considers some of these individual payment methods in more detail, including the costs for different methods of cash withdrawal, as well as different types of card and remote payments.

Reflecting recent developments in the Australian payments landscape, the study also examines the costs of new products and new methods of authorisation and/or authenticating retail payments. Recent innovations have included:

- The transition from using the magnetic stripe on cards to using chips for the storage of card details and transmission of these details to the terminal.
- The introduction of contactless payments functionality, which allows the wireless transmission of card details.
- The move from signature authentication to PINs for American Express, Diners Club, MasterCard and Visa cards (eftpos has always been PIN-only). In addition, lower-value payments often no longer require PIN authentication.
- The increased issuance of dual-network debit cards by the major banks.
- An increase in the number of institutions offering companion American Express cards.

These innovations will have directly altered the costs of accepting and making payments. For instance, some of these developments will have directly affected terminal and tender time costs for merchants, while others will have altered card production and fraud costs for financial institutions. These innovations may also have indirectly altered costs by affecting both the economies of scale for system participants and potentially the nature of competition.

⁴ The study also collected information on payments made through agency arrangements. Agencies handle payments on behalf of merchants. This can be electronically, such as PayPal, or physically, such as at Australia Post branches. Merchants directly incur low resource costs of a few cents per transaction when employing an agent. However, the agent can charge relatively high fees – often of up to 2 per cent of the transaction value – for providing this service. Market concentration prevents the disclosure of further results.

3. Methodology

This study estimates the resource cost of consumer payments in the Australian economy in a manner similar to the Bank's 2007 study and international studies. Financial institution and merchant costs were directly surveyed by the Bank and consumer costs are estimated based on the cost of a consumer's time to make payments. This study focuses on average costs, which take into account the cost of infrastructure supporting payment instruments. The results shown are for weighted-average costs across entities, although the use of median costs leads to the same conclusions about the relative cost of instruments.

3.1 Data Collection and Sample

Consistent with previous studies, the current study focuses on payments by individuals to merchants rather than on business-to-business payments and/or person-to-person payments. The payment instruments covered by the study are estimated to account for nearly all of the number and more than 95 per cent of the value of consumer payments to businesses (Ossolinski, Lam and Emery 2014).

The majority of costs are measured directly by surveying financial institutions, merchants and, in the case of the costs of currency production, the Reserve Bank and the Royal Australian Mint. In a few cases, costs are estimated indirectly based on publicly available information or the fees that survey participants pay (non-surveyed) third parties for payment-related services. For example, the resource costs of transporting cash was not directly collected from cash-in-transit companies but instead proxied by the fees paid for this service. While estimating some costs based on fees will overstate the cost of these payment services given that the profit margins of these third parties will also be captured, the size of these indirectly estimated costs is generally small in both absolute size and relative to other payment costs.

The detailed study included participation by 16 financial institutions and 17 large merchants, with around another 260 small merchants answering a separate small- and medium-sized business survey.⁵

- Financial institutions ranged in size from large banks to specialist service organisations. In aggregate, they reported nearly 30 million transaction accounts and 10 million personal credit card accounts, capturing the vast majority of all such accounts in Australia.
- Merchants were selected to cover a wide range of consumer expenditure categories. Ten large merchants were retailers predominantly collecting payments at the point of sale, whether in a supermarket, department store or general retail environment. Over the twelve-month sample period, these retailers reported total sales of \$109 billion, about a third of the value of retail sales in Australia over 2013. The other seven merchants were billers that predominantly receive payments remotely – with little point-of-sale activity – for insurance, telecommunications and utilities. These billers reported total sales of \$46 billion during the sample period, which represents a significant share of total household consumption on insurance, telecommunications and utilities of about \$120 billion.
- Small merchants were recruited through a number of merchant associations, with more details provided in Section 7 and Appendix D.

Survey forms were distributed in April 2014. To reduce reporting burden, respondents were given flexibility in selecting the twelve-month period for which they reported costs. Financial institutions typically provided figures for the year to September 2013, while merchants provided somewhat more recent figures. The data were subjected to a number of validation checks following submission, including internal consistency checks, querying responses with participants, benchmarking against responses from other participants and comparison with other

⁵ Around half of financial institutions and merchants that were asked to participate in the study accepted. Those that declined cited competing demands on their time or an inability to provide sufficiently detailed payment cost information.

sources such as the Reserve Bank's Retail Payments Statistics and responses to the 2007 study.

For financial institutions' costs, personal and business transactions were identified separately. This allowed the estimation of costs *per transaction* to account for potential economies of scale and common costs across both personal and business transactions.

To obtain economy-wide estimates of the cost of consumer-to-business payments, estimates of costs *per transaction* for non-cash payments were scaled up by the number of these payments measured in the Retail Payments Statistics and information on the share of consumer-to-business transactions from the study. The per transaction cost estimates for cash transactions were scaled up by the number of consumer cash payments per person (Ossolinski *et al* 2014) and the population estimate for 2013. Following the 2007 study, minors between 9 and 17 years of age were assumed to make half the number of transactions of adults.

3.2 Caveats

A number of the caveats are worth bearing in mind. Like all such studies, the focus is on measuring resource costs (and some financial flows between parties). The study does not measure the benefits associated with different payment instruments nor whether the structure of the market promotes innovation. Both these factors need to be considered when drawing policy implications from these numbers; increased use of the lowest-cost payment system or less use of the higher-cost systems does not necessarily imply better outcomes.

A second issue is that while a comprehensive approach to identifying costs and the number of transactions has been used, coverage is not exhaustive. The study does not attempt to measure, for example, any costs arising from: the 'cash', 'informal' or 'black' economies; arguments that costs that might arise if cash is less hygienic

than cards (MasterCard 2014); or the costs to individuals experiencing credit stress from credit cards. These costs, by their very nature, are difficult to quantify.⁶

A third issue is the ability of financial institutions and merchants to separately identify costs and transactions across payment instruments. A number of financial institutions reported difficulty identifying subcomponents of costs, particularly overhead costs and the amortised share of previous investment expenditure. Further, some financial institutions reported that it was difficult to allocate costs across the different types of card payments. Similarly, some merchants were unable to distinguish between the costs of different types of card payments in the information provided to them by their acquirers. However, in most cases respondents were able to provide an estimate of total costs which were then apportioned across different cost items or instruments using the Reserve Bank's understanding of the Australian payments industry and the costs incurred by similar institutions in the sample.

The final issue involves the choice of costs that are included when measuring the resource costs used in making credit card payments. Credit cards generally have three aspects – a mechanism by which consumers can pay a merchant, an interest-free loan for up to 60 days, and reward points tied to the value of the purchase. While each of these aspects is measured, the main results of this study focus on the payment aspects, and do not include the costs associated with the interest-free period or rewards. Including the costs of providing the rewards or the interest-free period would increase the cost of credit cards, particularly to financial institutions, although they remain less expensive than cheques.

⁶ For example, there is no reliable way to estimate the number of informal or black economy transactions that would cease if different payment options, particularly cash, were not available. In addition, the tax revenue forgone because of undocumented income and sales, which Chakravorti and Mazzotta (2013) identify as a large cost associated with the informal economy, could generally be considered – in the framework of cost studies as – an (illegal) transfer.

4. Resource Costs of Payments

4.1 Overall Resource Costs

The aggregate resource costs incurred by large merchants, financial institutions and the public sector in facilitating consumer-to-business payments are estimated to have been about \$8.4 billion per annum in 2013, or about 0.54 per cent of GDP (Table 1). Payment resource costs of consumers are estimated at an additional \$2.6 billion, the equivalent of about 0.17 per cent of GDP or 0.41 per cent of household expenditure; these are not included in the estimate of aggregate costs as they are considerably less reliable than costs for merchants and financial institutions.⁷ Detailed results for the resource costs associated with each payment instrument can be found in Appendix A.

Table 1: Aggregate Resource Cost of Payment Systems

Payment instrument	Number of transactions (millions)	Per transaction resource cost (\$)	Total cost (\$ billion per annum)	Per cent of GDP (%)	<i>Memo item: per transaction resource cost (2006)</i>
Total	11 945	0.70	8.4	0.54	0.72
Cash ^(a)	6 100	0.51	2.9	0.19	0.41
eftpos	2 388	0.70	1.7	0.11	1.02
MasterCard & Visa debit cards	895	0.94	0.8	0.05	1.36
Credit cards	1 661	1.34	2.2	0.14	1.81
Cheques	53	5.37	0.3	0.02	5.79
Direct entry	512	0.41	0.2	0.01	0.75
BPAY	336	0.73	0.2	0.02	1.01
<i>Memo item: total (2006)</i>	<i>11 023</i>	<i>0.72</i>	<i>8.0</i>	<i>0.80</i>	<i>na</i>

Notes: Based on estimates from financial institutions and large merchants

(a) Includes costs incurred by public sector

Sources: ABS; Authors' calculations based on survey data; RBA

⁷ Consumer costs are discussed in more detail in Appendix C.

The results suggest that the aggregate resource cost of the payments system is little changed in nominal terms since 2006, although it has fallen as a share of GDP (Schwartz *et al* 2008). The per transaction cost of almost all instruments has fallen since 2006, which has worked to reduce the overall resource cost. At the same time, however, a change in the mix of payments since 2006 has worked to increase costs. In particular, the share of payments made using cash has fallen, while the share of payments made using cards, which typically require more resources per payment, has increased. Furthermore, growth in the total number of payments in the economy is estimated to have been slightly slower than growth in real GDP.⁸

It is worth noting that these estimates are likely to be somewhat sensitive to sample coverage. While, as noted above, the coverage of financial institutions is very good, the coverage of merchants is narrower, with detailed information focused on larger merchants that are likely to experience lower costs per transaction for payment services. Augmenting these results with indicative cost numbers from the small business survey (see Section 7) would increase the total costs to the economy to around \$10 billion or 0.64 per cent of GDP.⁹ Such an augmentation is, however, imprecise.¹⁰ Regardless of whether the base or augmented measure of aggregate cost is considered, these aggregate estimates suggest that the cost of ‘producing’ a

8 The number of electronic transactions is measured directly from the population of financial institutions through the Retail Payments Statistics, while the number of cash transactions is estimated from survey data and is subject to a margin of error. Details of the preferred estimate of cash transactions are in Appendix B. If the higher estimate of cash transactions in Appendix B is used, the aggregate cost increases by 0.03 percentage points of GDP.

9 Australian Taxation Office data for sole traders, partnerships, and small- and micro-sized companies in consumer-facing industries suggest that they account for around \$177 billion in sales, or 29 per cent of total sales in these industries. The costs incurred by SMEs was not estimated in the 2007 study.

10 There are a number of caveats: the SME cost estimates primarily focused on private costs (resource cost estimations are inferred); a much smaller share of SMEs responded to the survey; the industry coverage may not be representative; it was not possible to implement the same quality assurance processes around data from these institutions; and the scaling of payments made to SMEs is less certain.

payment in the Australian payments system is towards the lower end of estimates for other economies for which studies have been undertaken.¹¹

The per transaction resource costs presented in Table 1 are the sum of both the direct costs of each payment and the costs of managing the accounts from which payments are made or received; Table 2 shows these costs separately. In this paper, the comparison of costs across instruments focuses on differences in direct costs because these costs are incurred in the chain of events required to make a payment; the costs of maintaining accounts are excluded because these costs can be common costs across a number of payment instruments. Account keeping costs are discussed separately to direct costs in more detail in Section 4.2.

Focusing on total direct costs, the least costly options that are typically available at the point of sale are cash and eftpos at \$0.48 and \$0.45 per transaction (Table 2). MasterCard & Visa debit and credit cards use around 1½ to 2 times the level of resources per transaction than either cash or eftpos. Of the remote payment options, direct debit is considerably less resource intensive than BPAY, debit and credit cards. Finally, cheques are the most resource intensive of the payment methods considered by the study by a considerable margin, costing over \$5 per transaction. These rankings of cash, debit cards, credit cards and cheques are broadly consistent with overseas studies and the 2007 study.

A number of factors are relevant when considering the relative resource costs of these instruments. First, for the purpose of comparing the overall resource intensity of different instruments it is relevant to consider how they are actually used in the economy, and so the costs are measured at the average transaction size for each instrument. Section 6 explores in more detail how transaction size and cost are related. One implication of that analysis is that while cash is reasonably cheap for

¹¹ A thirteen country study of payment costs in Europe found that resource costs associated with payments accounted for an average of about 1 per cent of GDP, with results for individual countries ranging from 0.42 per cent to 1.35 per cent of GDP (Schmiedel *et al* 2012). A recent estimate for Norway suggests costs of about 0.48 per cent of GDP (Norges Bank 2014). The extent to which international studies have been able to incorporate small business costs is not entirely clear, but the results of these studies are likely to reflect the costs of large businesses which are better able to provide accurate data on costs and payment volumes (Scheidel *et al* 2012, p 12).

the small-value payments for which it is used (\$26 on average, based on data from the RBA's 2013 Survey of Consumers' Use of Payment Methods), it is not necessarily a low-cost instrument at larger transaction sizes.¹²

Table 2: Per Transaction Direct Costs and Account Overheads

Dollars per average-sized transaction

Payment instrument	Direct costs			Account overheads of financial institutions	Total
	Merchants	Financial institutions	Total		
Total	0.24	0.31	0.55	0.15	0.70
Cash ^(a)	0.28	0.20	0.48	0.03	0.51
eftpos	0.22	0.23	0.45	0.24	0.70
MasterCard & Visa debit cards	0.19	0.51	0.70	0.24	0.94
Credit cards ^(b)	0.22	0.72	0.94	0.41	1.34
Cheques	1.85	3.26	5.12	0.25	5.37
Direct entry	0.13	0.03	0.16	0.25	0.41
BPAY	0.03	0.41	0.45	0.28	0.73
<i>Memo item: total (2006)</i>	<i>0.27</i>	<i>0.25</i>	<i>0.52</i>	<i>0.21</i>	<i>0.72</i>

Notes: (a) Direct costs to financial institutions for cash transactions include costs incurred by the public sector

(b) Does not include the costs of the credit function and rewards

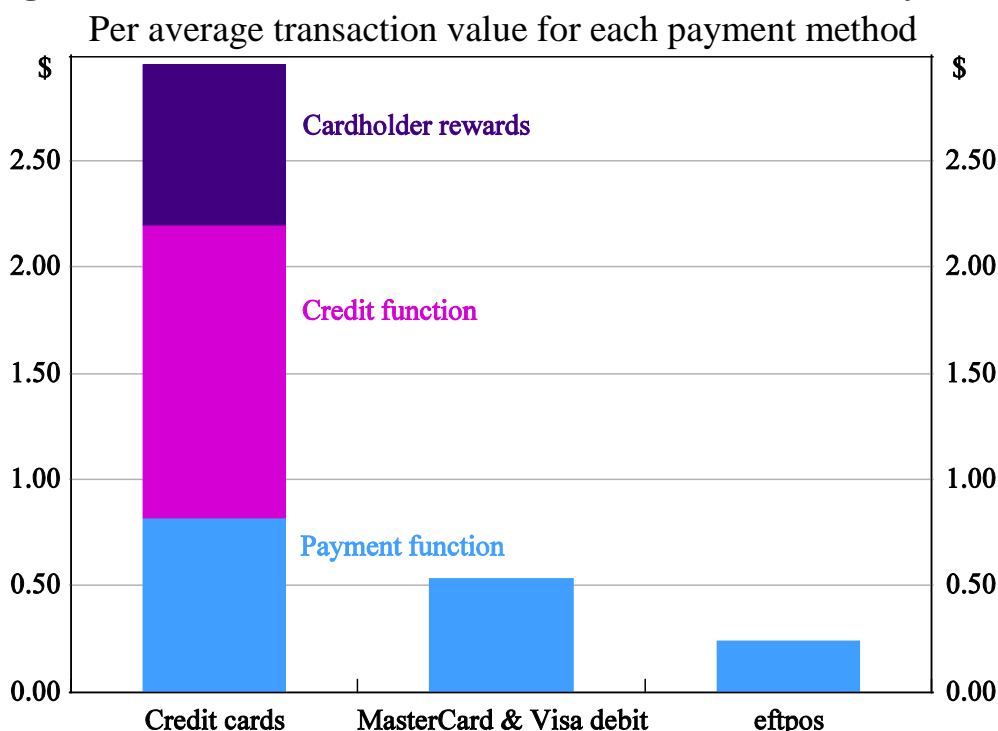
Sources: Authors' calculations based on survey data; Schwartz *et al* (2008)

Second, relative resource costs also reflect the features of the different products. For example, the fact that eftpos did not offer card-not-present or international payments at the time of the study is likely to be one reason why the average resource cost per transaction is estimated to be significantly lower for eftpos transactions than for MasterCard & Visa debit card transactions or credit card transactions. It is also important to restate that the costs of credit provision and rewards, the differentiating features of credit cards, are not included in the payment costs calculated above. Including the cost of resources used for these functions and the transfers to consumers, the average total private cost of a credit card payment

¹² Some indicative transaction sizes for consumer-to-business payments are: eftpos \$52, MasterCard & Visa debit cards \$69, credit cards \$128, cheques \$3 533, direct debit \$510 and BPAY from a transaction account \$540 (Table B1).

for financial institutions is estimated to be \$2.95 per average transaction (Figure 2). The effects of fees and transfers are discussed in Section 5.

Figure 2: Financial Institutions' Private Costs of Card Payments



Note: Excludes account overheads

Source: Authors' calculations based on survey data

Third, economies of scale in the provision of payment services also influence costs per transaction. The ranking of cash and debit card costs in overseas studies provides some support to the idea that there are economies of scale. Countries with high cash use relative to debit card use (like Hungary and Portugal) report that cash is cheaper than debit cards on a per transaction basis, while studies for those countries which make greater use of debit cards (Denmark, Norway and Sweden) report that debit cards are cheaper (Schmiedel *et al* 2012). However, the costs per transaction across countries may also reflect greater use of lower-cost instruments within countries.

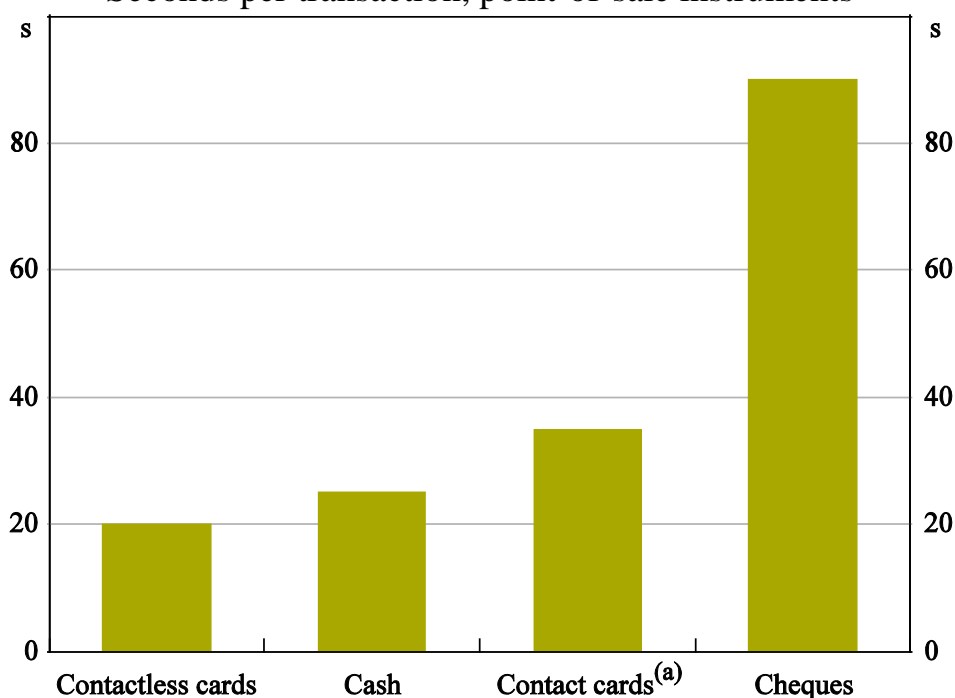
Fourth, differences in tender time – the time between the customer being informed of the transaction amount and the time the payment is completed – can play an

important role in determining costs per transaction.¹³ For point-of-sale payments, figures obtained from a number of large merchants suggest, for example, that tender time for a cash transaction is about 25 seconds (Figure 3). Overseas research suggests broadly similar times, of about 20–30 seconds per cash payment (Bradford 2005; Borzekowski and Kiser 2008). Cheque transactions are found to be the slowest, taking somewhere between one and two minutes. Signature- and PIN-based card transactions are reported by merchants to be slower than cash but considerably quicker than cheques. Contactless card transactions are estimated to be slightly quicker than cash transactions, although different merchants in our sample reported contrasting experiences.¹⁴ Polasik *et al* (2013) report broadly similar transaction times between cash and contactless transactions in Poland. The difference in tender time between contactless and contact transactions does not affect the ranking of instruments at their average transaction sizes, but can affect the ranking of instruments at low transaction values (see Section 6).

13 Some studies define tender time more broadly, potentially including the time taken in queuing at the point of sale or the time taken to ‘ring up’ the total sale price from individual items. Such costs are not, however, explicitly estimated in this study. In the first case, queuing time will be influenced by a range of factors beyond the payment method choice. In the second case, the time taken to ‘ring up’ sales is not a time cost that arises from a particular payment method but rather part of the wider sales and inventory management process.

14 For the purposes of this study, ‘contactless card payments’ refers to transactions using contactless technology and which are under \$100 (and hence do not need a PIN). Contactless card payments can be made for values over \$100 with the use of a PIN, at which point tender time could be assumed to be the same as a contact-based card transaction. A few factors seem to influence whether cash or contactless card transactions are reported to be quicker. These include such factors as the technology in the PIN pad used by the merchant, the transaction size (with payments around the same size as currency denominations more likely to be made with cash), whether the contactless transaction can be processed ‘offline’, etc. A number of merchants also noted that the occasional failure of a contactless transaction increases tender time as the consumer has to retry their card or switch payment types.

Figure 3: Tender Time
Seconds per transaction, point-of-sale instruments



Note: (a) Weighted average of PIN and signature authorisation; including only PIN-authorised transactions reduces this by four seconds

Source: Authors' calculations based on merchant estimates

Most resource costs are incurred by financial institutions (\$5.4 billion), although sizeable costs are also incurred by merchants (\$2.9 billion).¹⁵ Financial institutions' costs largely consist of the costs incurred to directly support payments being made, in particular the costs of building and maintaining information technology (IT) networks, the cost of processing payments (particularly the manually intensive processes surrounding cash processing and distribution) and customer service costs. In addition, the costs associated with running transaction and credit card accounts, which provide the capacity to make payments, are considerable.

The overall resource cost to financial institutions is estimated to be little changed since 2006, reflecting a range of developments that have affected resource costs in

¹⁵ Resource costs are also incurred by the public sector, which produces and distributes notes and coins, and runs some of the centralised components of the payments system. However, these are very small on a per transaction basis.

offsetting ways. On a per transaction basis, costs of running accounts are lower for all payment methods. In part, this reflects the fact that the intervening years have seen efficiency gains, such as those associated with the greater use of the internet to offer services. It also reflects the fact that the fixed costs are now spread across a greater number of electronic payments. Costs directly related to payment activities are also lower, with the exception of MasterCard & Visa credit cards. Investment in payment infrastructure by the financial and public sectors since 2006 is another factor that has reduced per transaction costs for many instruments in 2013.¹⁶ Offsetting these cost savings, consumers have been making greater use of more expensive instruments.

Since 2006, merchant resource costs are largely unchanged in aggregate, although there have been changes in some cost components. For example, costs have been lowered by initiatives that speed up tender time (including the move from signature to PIN verification and the introduction of contactless payments). Concurrently, costs have been boosted by higher staff wages and investment expenditure associated with terminal upgrades in order to process chip-and-PIN and contactless transactions.

4.2 Account Maintenance Costs

With the exception of cash transactions, all payment options covered in this study require a consumer to establish a transaction or credit card account at a financial institution. The establishment and maintenance of these accounts involves a number of costs for financial institutions. Examples include the cost of staff time used in processing applications and customer requests, the building and upkeep of IT systems and the marketing of new products.

Annual costs per account are estimated to have fallen since the 2007 study. Part of the decline in the per account costs can be explained by economies of scale. However, there has also been a broad-based decrease in the costs of many different

¹⁶ For example, the Community of Interest Network (COIN) has worked to reduce the number of physical network connections in the direct entry, eftpos and ATM systems. The Reserve Bank has also overseen the linking of the COIN and the SWIFT network for the exchange of bulk files, thereby simplifying the process of sending settlement instructions. Developments specific to each instrument are discussed further below.

components – such as systems and IT, application processing, general customer service and statement production costs (Table 3). This is likely to reflect both changes in the way that customers interact with their financial institutions as well as operational efficiencies from previous upgrades to core banking and customer systems (Stewart, Robertson and Heath 2013). That is, customers are undertaking more of their banking business through relatively inexpensive online channels, rather than through bank branches or telephone banking, while the costs associated with online channels have also fallen. For example, in 2006, respondents reported that telephone banking calls – often answered by staff – comprised close to 30 per cent of telephone- and internet-based connections. By 2013, telephone banking calls comprised only 5 per cent of these connections and rarely involved staff interaction.

Table 3: Financial Institutions’ Account Maintenance Costs

Dollars per annum per account, weighted-average issuer costs

	Credit card accounts		Transaction accounts	
	2006	2013	2006	2013
Total costs	109	70	77	68
Product development and marketing	21	16	5	9
Systems and IT	27	17	14	19
Application processing and set-up	16	12	13	13
General customer service	9	9	17	15
General account management	10	6	7	5
Other (including receipt of deposits, statement production, etc)	26	11	21	6

Sources: Authors’ calculations based on survey data; Schwartz *et al* (2008)

Sections 4.3 to 4.6 cover the costs of each instrument excluding these account maintenance costs.

4.3 Cash

While cash is the most widely used payment method in Australia for consumer transactions there are some challenges in measuring the costs of cash payments. Its widespread use means that measuring the ‘end-to-end’ cost of a cash payment involves estimating the costs incurred by a large number of entities, including financial institutions, merchants, consumers and the public sector. For example,

financial institutions incur costs running branch and ATM networks that allow customers to withdraw and deposit cash; merchants incur costs in handling cash, both at the point of sale and during the performance of back-office functions; the public sector incurs costs producing the physical notes and coins; and consumers incur costs – mainly their time – in obtaining and using cash. Furthermore, some of cash’s characteristics – such as the ability to withdraw a large amount to make multiple payments and the absence of a centralised ledger or record keeping – mean that estimating the total number of cash transactions in the economy, and hence costs per transaction, is particularly difficult.

Addressing these issues in a broadly similar fashion as Schwartz *et al* (2008), this study estimates the total resource costs (excluding consumer costs) associated with cash payments to be \$2.9 billion in 2013. The resource cost of cash transactions arise almost entirely from the costs associated with withdrawing and accepting cash, with little cost incurred in its production or in other activities, such as maintaining accounts to support cash transactions. Based on an estimated 6.1 billion consumer-to-business cash transactions per annum, the average direct cost of using cash is about \$0.48 per transaction (Table 2).¹⁷ This is somewhat higher than estimated at the time of the 2007 study.¹⁸

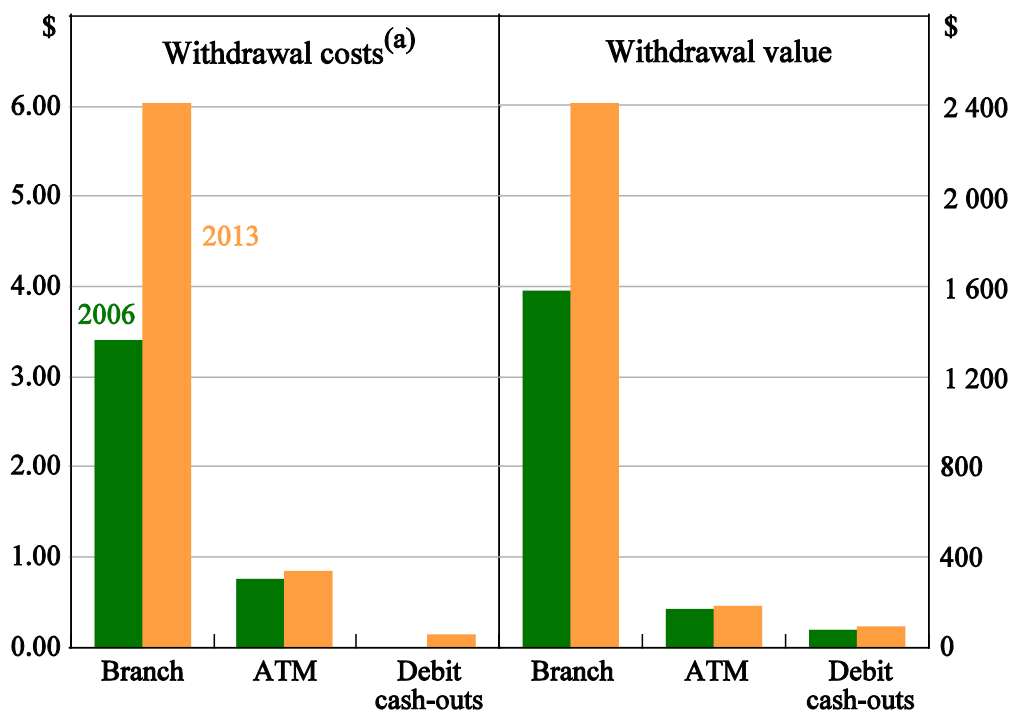
In regards to cash *withdrawals*, financial institutions are estimated to incur costs of about \$0.91 (the average value of a personal cash withdrawal is about \$280). The majority of cash withdrawals occur through ATMs, which involve an average cost of \$0.85 per transaction (Figure 4). Costs associated with the maintenance of branches – including their staffing and location rental – mean that withdrawals

¹⁷ Information on the methodology used to calculate the number of cash transactions can be found in Appendix B.

¹⁸ The approach to cash in the 2014 study is slightly different to the 2007 study. In line with the approach taken for other payment instruments, the costs of cash considered in this study include only costs directly relevant to consumer payments to businesses: the costs of consumers withdrawing cash, and the cost to merchants of accepting cash payments and making deposits. In contrast to the 2007 study, the costs to financial institutions of consumer cash deposits and business cash withdrawals have been excluded, as the majority of these costs are likely to relate to transactions outside the scope of this study, such as person-to-person, business-to-consumer or business-to-business payments. The total cost of cash for 2006 in Table 4 is calculated using the 2014 methodology and so differs from the number presented in the 2007 report (\$0.44 per transaction).

through this channel are particularly costly, at around \$6.00. This difference has become increasingly stark since 2006 as a diminishing number of withdrawals at branches has reduced the scope to spread the fixed cost of branches.¹⁹ The total resource cost of a debit cash-out withdrawal – whether a stand-alone transaction or combined with the purchase of goods or services – is estimated to be about \$0.44 per withdrawal. Merchants incur the majority of this cost, about \$0.30 per withdrawal, mainly in tender time, with financial institutions incurring the remaining costs.²⁰

Figure 4: Financial Institutions' Costs of Cash Withdrawals



Note: (a) Costs for debit cash-outs were not estimated for 2006

Source: Authors' calculations based on survey data

¹⁹ Discussions with some banks suggest that the diminishing number of cheque transactions has made it harder to accurately measure the separate costs of cash and cheque acceptance at branches, implying that the estimate of the costs of branch cash withdrawals are potentially overstated while financial institutions' costs of cheques may be understated.

²⁰ Resource costs associated with purchase-only eftpos transactions are discussed in Section 4.5.

It is also worth noting that the costs of ATM withdrawals differ markedly across ATM owners. For example, while the average ATM-based cash withdrawal is estimated to cost ATM owners about \$0.77 (with card issuers incurring the extra \$0.08 per transaction), a few entities reported average costs of between \$1 and \$2.50. This is potentially a function of the ATM owner's size and is heavily influenced by whether the entity's ATM locations are owned or rented from other parties. In the latter case, for example, the ATM owner often pays high rent to the site owner to install and run a machine in a 'convenience' location (such as a store, petrol station or licensed venue).

Overall, the average cost of a cash *payment* is estimated to be around \$0.48 (Table 4). Around \$0.20 of these costs are incurred by financial institutions and merchants in the course of distributing cash (given the cost *per withdrawal* discussed above is spread over multiple transactions). Merchants incur costs per transaction of approximately \$0.27 in accepting cash, with the largest single component – about two-thirds – being tender time. The cost of tender time has increased somewhat since 2006, reflecting higher staff wages. To some degree tender time costs will have been reduced as more retailers offer self-serve checkouts. This has, however, shifted some of the costs to consumers and increased merchants' spending on point-of-sale equipment.

Table 4: Cash Transaction Costs

Dollars per average size cash transaction, weighted average

	2006 ^(a)	2013
Total resource costs	0.37	0.48
Cash distribution costs ^(b)	0.13	0.20
Merchants' cash acceptance	0.24	0.29
Resource costs	0.23	0.27
Tender time	0.13	0.17
Other	0.10	0.10
Transfers (fraud and fees)	0.01	0.02
Public sector	<0.01	<0.01

Notes: (a) Two methodological changes around the exclusion of consumer deposit and business withdrawal costs to financial institutions have resulted in the aggregate costs per transaction in 2006 reported above (\$0.37) being lower than was reported in 2007 (\$0.44)

(b) Includes merchants' costs of providing cash-outs

Source: Authors' calculations based on survey data

The cost of cash and coin production for the public sector is estimated to be less than \$0.01 per transaction. This includes the costs associated with the production process (including equipment, materials and labour), research and development, the distribution of the currency (including storage and security), and note quality testing and counterfeit prevention. The low cost of cash production is consistent with a range of international evidence. For example, for Canada, Switzerland and the United States, banknote costs were below \$0.36 cents per banknote²¹ (Williams and Anderson 2007), with a banknote only having to be used around 20 times for its costs to average around \$0.01 per payment.

4.4 Personal Cheques

The total resource costs associated with cheque payments by consumers are estimated to be \$0.3 billion (Table 1), lower than in 2006. Each cheque is estimated to impose resource costs of \$5.12 per transaction, making cheques the most expensive retail payment method covered by the study (for more detail, see Table A6).

The change in the cost per transaction of cheques over the past decade is uncertain. Schwartz *et al* (2008) estimated total resource costs of about \$5.30 per transaction, but noted that this might be overstated given alternative estimates (Centre for International Economics and Edgar, Dunn and Company 2006) and that estimating these costs was particularly challenging. The difficulty in estimating cheque costs remains, especially given these instruments now make up less than 1 per cent of consumer payments. Again, difficulties in separating cheque and cash costs might potentially result in some overstatement of the costs of cash transactions and an understatement of the costs of cheque transactions.

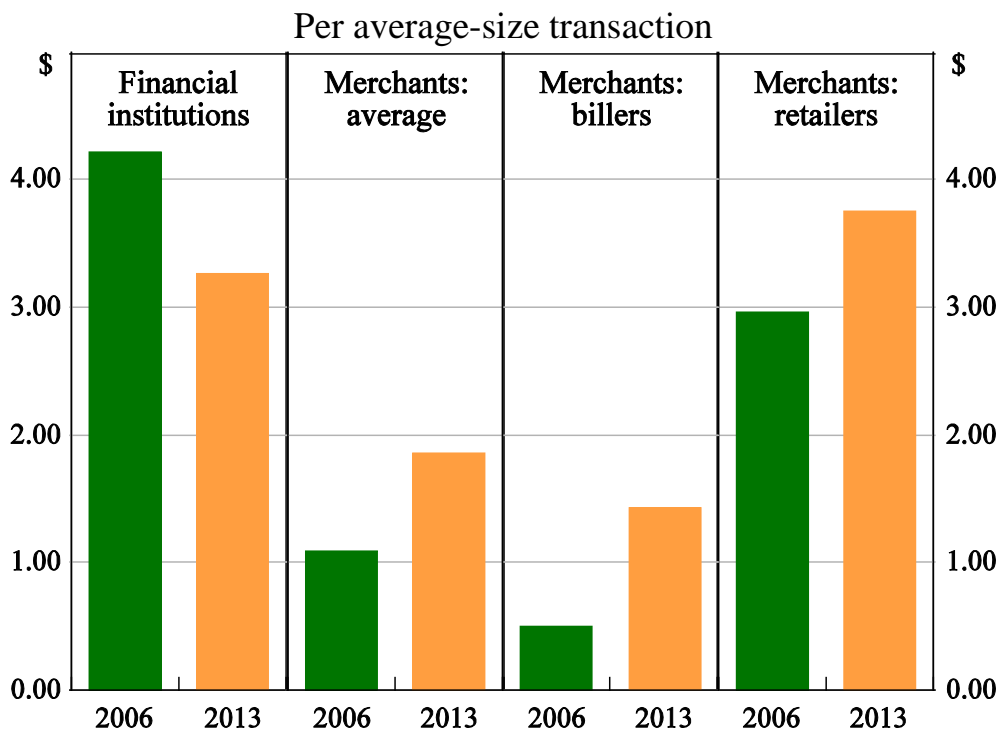
Notwithstanding these difficulties, there are a number of reasons why the costs for financial institutions' of cheques may have fallen since 2006, with the point estimates suggesting a fall from \$4.22 to \$3.26 per transaction. These include the major banks outsourcing their cheque processing arrangements around the time of the earlier study, reorganising and consolidating the processing of cheques, and

²¹ Range calculated from local currency estimates converted to Australian dollars on 11 August 2014.

investing in systems that image cheques to help reduce costs associated with customer inquiries (and in the future, the transporting of cheques).

The cost of cheque usage varies significantly for merchants across and within sectors (Figure 5). This is influenced by a number of operational differences across merchants. For example, billers bear no tender time costs as they do not have a physical presence. Also, the ability to attach additional information to a cheque payment (e.g. stapling a cheque to the bill and sending them together in the post) means that these payments remain more prevalent for billers than retailers, and hence billers can still benefit from some economies of scale. Although a private cost and not a resource cost, retailers can also pay a fee of up to 10 per cent to guarantee receipt of funds even if the cheque bounces. Given the high cost, a number of larger merchants noted during the study that they have now stopped accepting cheques.

Figure 5: Resource Costs of Cheque Payments



Source: Authors' calculations based on survey data

4.5 Credit and Debit Cards

Both credit and debit cards offer consumers the ability to pay electronically for goods and services as well as to obtain cash using either cash-out or cash advance facilities. As well as enabling consumers to pay at the point of sale, credit and debit cards allow transactions to be conducted over the internet and phone.

A number of credit card networks operate in Australia – most notably American Express, MasterCard and Visa – allowing cardholders to undertake transactions using funds borrowed from their financial institution. Beyond offering cardholders the use of these funds – often on an interest-free basis for up to 60 days – these cards often also provide rewards on amounts spent. The three debit card networks operating in Australia – eftpos, MasterCard and Visa – offer cardholders similar payment functionality; consumers pay using their own funds and generally do not receive any rewards. Different credit and debit card networks can incur different costs, potentially reflecting differences in the efficiency of parties in the transaction and the features offered by the networks.

In aggregate, the study indicates that consumers' use of the credit and debit card systems for payment-related purposes (as opposed to credit and rewards functions) consumed resources of about \$3.0 billion (excluding account overheads), with the majority of this comprised of resources used in credit card transactions (Table 1). On a per transaction basis, both eftpos and MasterCard & Visa debit card transactions continue to involve lower resource costs than credit card transactions (Tables 5 and 6).

Table 5: Financial Institutions' Card Costs
Dollars per average-sized transaction

	Credit cards	Debit cards	
	Total ^(a)	eftpos	MasterCard & Visa
Total costs	2.95	0.24	0.53^(b)
Total resource costs	1.73	0.23	0.51 ^(b)
Payment function	0.72	0.23	0.51 ^(b)
Issuer	0.43	0.07	0.31 ^(b)
Authorisation and transaction processing	0.06	0.01	0.04
Scheme fees	0.21	0.01	0.12
Fraud prevention	0.03	0.00	0.00
Other issuer costs	0.14	0.05	0.15
Acquirer	0.28	0.16	0.20
Scheme fees	0.12	0.01	0.06
Other acquirer costs	0.16	0.15	0.13
Credit and rewards functions	1.01	na	na
Credit collections and write-offs	0.78	na	na
Cost of capital (credit risks)	0.22	na	na
Cardholder rewards programs (operating costs)	0.01	na	na
Transfers	1.22	0.01	0.02
Issuer	1.21	0.01	0.02
Chargebacks and issuer fraud losses	0.09	0.01	0.02
Cardholder rewards	0.74	na	na
Cost of funds	0.38	na	na
Acquirer	0.01	0.00	0.01

Notes: (a) For confidentiality reasons, American Express acquirer data are not included

(b) In April 2019, a transcription error was identified in the original publication that was inconsistent with Table A5. The figure for (total) 'Issuer' costs has been corrected from 0.24 to 0.31, and the figures for 'Payment function', 'Total resource costs' and 'Total costs' corrected accordingly

Source: Authors' calculations based on survey data

Table 6: Merchants' Card Costs
Dollars per average-sized transaction

	Credit cards	Debit cards	
	Total ^(a)	eftpos	MasterCard & Visa
Total costs	0.66	0.24	0.32
Total resource costs	0.22	0.22	0.19
Card present			
Total costs	0.52	0.24	0.25
Total resource costs	0.21	0.22	0.17
Tender time	0.17	0.19	0.14
Contactless	0.11	na	0.12
Contact-only	0.20	0.19	0.22
Other POS	0.03	0.03	0.02
Other (including back-office processing)	0.01	0.01	0.01
Transfers	0.32	0.02	0.08
Fees to acquirers	0.32	0.02	0.08
Other transfers (including fraud)	0.00	0.00	0.00
Card not present			
Total costs	2.07	na	1.28
Total resource costs	0.38	na	0.45
Transfers	1.69	na	0.83
Fees to acquirers	1.63	na	0.75
Other transfers (including fraud)	0.06	na	0.08

Note: (a) Includes American Express, MasterCard and Visa

Source: Authors' calculations based on survey data

The lower resource costs of debit card transactions for financial institutions partially arise from differences in scheme fees – which are used as a proxy for the resource costs incurred by the schemes (Table 5).²² Scheme fees within the eftpos network average only \$0.02 per transaction, well below the \$0.19 average for MasterCard & Visa debit transactions and the \$0.32 average for MasterCard &

²² For example, schemes may incur costs of clearing, marketing and centralised governance and product development.

Visa credit transactions.²³ Other costs of eftpos cards – including card production, transaction processing and fraud prevention – are also lower than the equivalent costs for the MasterCard & Visa debit and credit networks. These differences in cost are, in turn, partially influenced by differences in card characteristics. At the time of the study, for example, eftpos transactions could only be authorised with the use of a PIN while other debit and credit cards allowed both PIN and signature authorisation at retailers and could be used online, resulting in higher fraud-related costs.²⁴ Likewise, eftpos cards had lower costs of production than contactless-enabled MasterCard & Visa debit and credit cards as they did not have chip or contactless functionality.

For merchants, the lower resource costs of debit card transactions largely reflect differences in tender times (Table 6). In particular, credit card transactions generally have higher transaction amounts than debit cards – making it more likely that the consumer will have to use a slower signature or PIN authorisation rather than being able to use contactless functionality. Indeed, the study suggests that tender time costs for a contact transaction are about \$0.20 per transaction, relative to \$0.11 per transaction for a contactless payment. (This also explains why contact-only eftpos transactions involve more resource costs for merchants than MasterCard & Visa debit transactions, which include a significant proportion of contactless transactions).

Since 2006, the resource costs associated with eftpos transactions have fallen on a per transaction basis, reflecting lower costs to merchants (Table A5).²⁵ The largest contributing factor is that the reported tender time cost of eftpos transactions has fallen; although eftpos did not offer contactless transactions in 2013, merchants reported that processing speeds have increased. Other costs of eftpos transactions have also fallen, presumably driven by economies of scale as the number of eftpos transactions has doubled.

²³ Interchange fees are not a resource cost and are excluded from this calculation; see Section 5 for private cost calculations.

²⁴ Signature authorisation was phased out subsequent to the study period.

²⁵ The evolution of MasterCard & Visa debit card costs is not presented owing to the small number of entities able to provide costs on this item in the 2007 study.

In contrast, the costs of credit cards have increased slightly since the previous study (Table A3). The small increase primarily arises from higher scheme fees. Furthermore, the costs of ‘acquiring’ credit card transactions have also increased marginally for financial institutions, as more advanced terminals have needed to be installed at merchants to take advantage of contactless cards. These implementation costs have only been partially offset by lower fraud losses from the improved security.²⁶

Resource costs of credit cards faced by point-of-sale merchants have fallen, reflecting a decrease in tender time costs and other point-of-sale transaction costs (Table A4). However, the resource costs faced by merchants accepting card-not-present transactions have increased, driven by spending on scheme initiatives to improve the security of customer card details.

Finally, within credit cards, the resource costs of transactions using American Express and MasterCard or Visa cards are similar where data are available (Tables A3 and A4; note that acquiring data for American Express are excluded to maintain confidentiality). Regardless of which card network is used, credit cards are more resource intensive than debit card transactions.

4.6 Direct Debit and BPAY

Direct debit payments involve the automatic debiting of funds from a customer’s transaction or savings account. These are initiated by merchants who have obtained prior authorisation from their customer.²⁷ There is no scheme involved in direct debit payments; direct debits are facilitated by the set of bilateral relationships between financial institutions.²⁸ BPAY, in contrast, is a scheme that financial institutions can join. BPAY allows a customer to pay a bill or invoice using the

²⁶ The majority of fraud costs now arise from card-not-present (online) transactions (APCA 2014). Discussions at the time that the scope of this study was being determined indicated that financial institutions did not consider there to be a significant difference in fraud losses between contact and contactless transactions.

²⁷ Authorisation may also be obtained by the merchant to debit payments from the customer’s credit card account. These are processed and settled through the relevant credit card network and so treated as a credit card payment in this report.

²⁸ Clearing rules have been established by the Australian Payments Clearing Association.

billers' unique BPAY identifier and the customer's unique customer number (generated by the merchant).

Both direct debits and BPAY have relatively low resource costs. They involve the lowest resource cost to merchants of all the payment methods considered, primarily because both are remote electronic payment options involving no tender time and few manual processing tasks. As for other instruments, the per transaction costs associated with these payments have fallen since 2006 (Tables A6 and A7); the economies of scale generated by continued growth in transaction volumes have more than offset an increase in the aggregate costs incurred by merchants and financial institutions.

Merchants incur higher back-office costs for direct debits than for BPAY; the authorisation process can involve manual processes and merchants may incur costs chasing failed payments as there is no guarantee that funds are available in the customer's account at the due date of the automated payment. In contrast, financial institutions incur higher costs for BPAY transactions than direct debits; financial institutions incur costs setting up and servicing BPAY biller accounts (which offer billers more services than are built into direct entry payments) and pay scheme fees to BPAY for clearing, marketing, centralised governance and product development services.²⁹ In total, direct debit payments involve the least resource cost across all payment methods, reflecting the very simple service they provide, which uses the long-standing direct entry system with no other built-in features.

5. Private Net Costs

The discussion so far has focused on the resources used by each sector to produce a given payment. However, the cost borne by each participant in the payment chain – the private net cost – depends on both the resources used and the transfers between the participants in the form of fees or implicit charges. Analysis of net private costs demonstrates how total resource costs for society are distributed across the participants and is more relevant in the private decision-making of consumers,

²⁹ Costs relating to BPAY View were excluded as this is an invoicing function of BPAY, not a payment function (although it may lower costs relating to exceptions management).

merchants and financial institutions.³⁰ For example, consumers' choice of which method to use at the check-out is influenced by a range of factors, one of which is the price they face for using the instrument (Simon, Smith and West 2010). It should be noted, however, that the incentives discussed in this section ignore some of the potential benefits for merchants and consumers of different payment methods. For example, non-cash payment methods are often said to provide consumers the benefit of a greater feeling of security as they reduce the need to carry large cash holdings, a benefit that is difficult to measure and likely to vary across individuals.

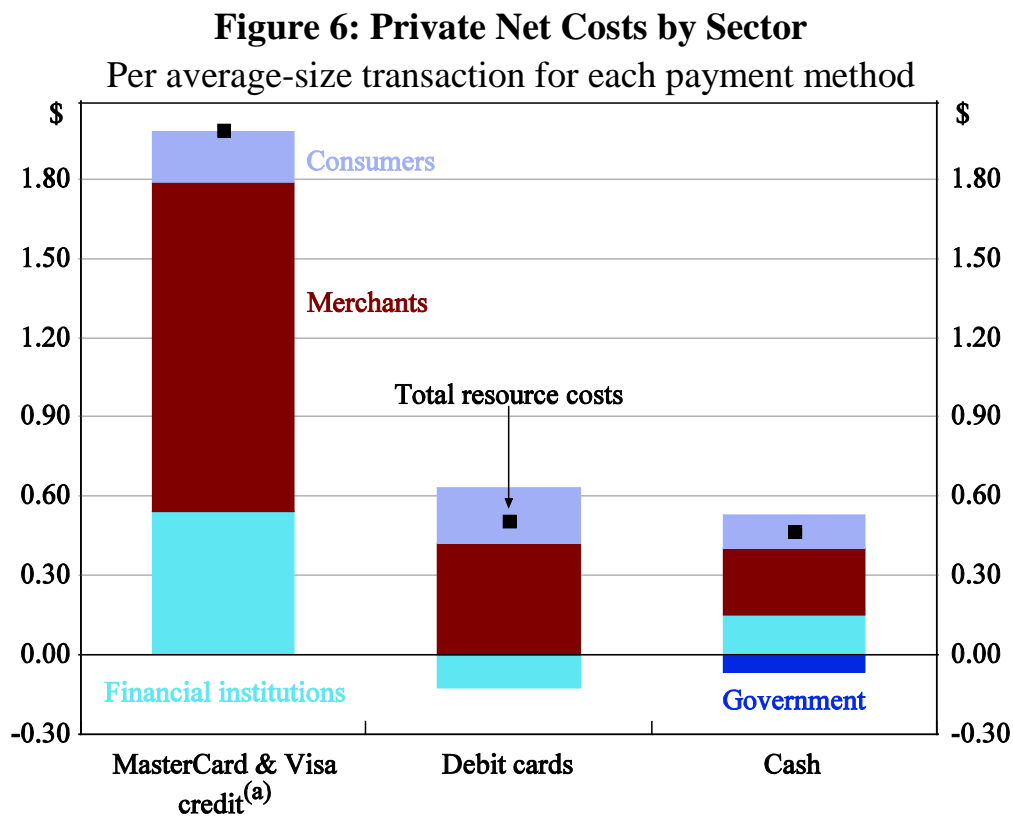
As a stylised example of private costs, assume that in processing a payment for a consumer, a financial institution incurs \$0.80 in internal resource costs, pays \$0.20 to other payment system participants and receives \$1 in fees from its customer. Examining only the internal resource costs incurred (\$0.80), would result in an incomplete picture of the costs borne by the financial institution. That is, the financial institution's resource costs have been fully offset by the \$0.80 net inward transfer that it receives and the institution actually bears no private net cost. Likewise, a merchant will typically face a net outward transfer for a transaction – through, for example, paying their financial institution to process payments on their behalf – so that the merchant's net private costs will typically exceed the cost of the internal resources used in accepting that payment. In turn, however, the merchant may cover their costs by surcharging the payment instrument in question.

The study estimates private net cost for different sectors for the most common point-of-sale payment methods – cash, credit cards and debit cards. As with the previous sections, this analysis is implicitly undertaken at the average size for each payment method.³¹

³⁰ Net transfers for all participants sum to zero since all outward flows from fee payers are corresponding inflows for the payees. Thus, adding together the participants' net private costs for a particular transaction yields the total resource cost incurred for that transaction.

³¹ A range of data sources, in addition to data collected directly from survey participants, are used to estimate transfers and hence private costs. Additional data sources include: the RBA's Retail Payments Statistics collection; the RBA's Survey of Banking Fees (Craig 2014); Ossolinski *et al* (2014); Payments Consulting Network (2014); and RFi Consulting (2014).

The majority of the cost of payments is borne by merchants and consumers (Figure 6 and Tables 7 and A8). This pattern is expected; consumers and merchants are the end-users of the payment services and consequently have to compensate the providers of these services. The greater share of the overall cost is borne by merchants, who recoup this cost from consumers in the prices charged for goods and services. Although credit cards have a higher social cost than debit cards, the private net cost to consumers is similar; credit card costs being greatly reduced by the interest-free period, reward points and other services (e.g. complimentary insurance) that credit cards offer (although this is before taking into account interest payments for customers who carry a balance on their credit card). As has been outlined by the Bank in previous regulatory work, the rewards and services offered on credit cards imply more favourable pricing of credit card transactions to consumers at the point of sale, this is likely to raise the share of payments made using credit cards relative to other methods (RBA 2008).



Note: (a) Does not include interest payments from consumers to financial institutions

Sources: Authors' calculations based on: survey data; Craig (2014); Ossolinski *et al* (2014); Payments Consulting Network (2014); RBA; RFi Consulting (2014)

Table 7: Private Net Costs by Sector
Dollars per average-sized transaction

	Financial institutions			Merchants	Consumers
	All	Issuers	Acquirers		
MasterCard & Visa credit cards^(a)					
Resource costs incurred	1.76	1.47	0.28	0.22	na
Net transfer paid	-1.22	-0.93	-0.29	1.03	0.19
Total private net cost	0.54	0.55	-0.01	1.25	na
Debit cards					
Resource costs incurred	0.29	0.13	0.17	0.20	na
Net transfer paid	-0.43	-0.22	-0.20	0.22	0.21
Total private net cost	-0.13	-0.10	-0.04	0.42	na
Cash					
Resource costs incurred	0.19	0.10	0.09	0.27	na
Net transfer paid ^(b)	-0.04	0.07	-0.13	-0.02	0.13
Total private net cost	0.15	0.17	-0.04	0.25	na

Notes: Negatives correspond to transfers received

(a) Does not include interest payments from consumers to financial institutions

(b) Includes seigniorage-related transfers to the Reserve Bank of Australia

Sources: Component estimates are authors' calculations based on: survey data; Craig (2014); Ossolinski *et al* (2014); Payments Consulting Network (2014); RBA; RFi Consulting (2014)

5.1 MasterCard & Visa Credit Cards

Of all the payment methods considered, credit card payments have the largest transfers between participants, with the result that net private costs to different sectors are more a reflection of these transfers than the resource cost incurred by each participant. For MasterCard & Visa credit card payments, the net transfer paid by consumers is around \$0.19 per transaction, around the same as for debit cards and only a little above that for cash (see Section 5.3) despite the considerably higher overall cost of credit cards compared to these other methods. The low private cost of credit cards to consumers reflects sizeable and largely offsetting gross transfers. To hold a credit card, consumers typically pay annual and other fees; on average, these fees are equal to around \$0.84 per transaction. Then at the time of the transaction, consumers receive a sizeable inward transfer from financial institutions at a cost of \$0.77 to use the credit card due to the interest-free period and reward points typically offered on some credit card payments. Consumers may

also pay a merchant surcharge at the point of sale (of around \$0.12 per transaction on average, see Table A8).

Merchants bear considerably higher private costs for credit cards than other methods. Merchants pay large net transfers to acquirers mostly in the form of merchant service fees, although they recoup a small proportion of the cost by surcharging consumers using these instruments.

For merchants, the private costs of credit cards are lower for card-present transactions than for card-not-present transactions. The fees charged by financial institutions for providing card-not-present functionality to merchants are higher than those charged on card-present transactions (Table A4). This is true – although less stark – even after controlling for differences in average transaction sizes between these two different types of transactions.³² To some degree the higher fees may reflect the fact that card-not-present payments may be more resource intensive for financial institutions (for example, due to greater fraud risks); however, it may also reflect price differentiation across industries rather than across payment channels.

Financial institutions receive a net transfer as the fees received are greater than the transfers paid to consumers. However, there is variation in the net private cost across issuing and acquiring functions due to their different roles in the transaction process. Acquirers receive a net transfer as only part of the fees received from merchants is paid to card issuers through the interchange fee. For issuers, the net inward transfer is less than the resource costs of providing their services. In practice, of course, issuers profit also through the provision of credit; interest revenue on credit card balances has not been included in this analysis.

5.2 Debit Cards

The net transfers recorded for debit cards are much smaller than for credit cards. This partly reflects the fact that debit cards have a lower resource cost than credit

³² The sample of merchants covered in this study pay, on average, interchange fees below the economy-wide average. Controlling for differences in interchange fees between our sample and the population of merchants increases the level of fees.

cards and so the fees and charges used to cover the financial institutions' costs are lower. In addition, the interchange fees in debit card systems have been capped at a lower level than the regulated credit card systems. As is the case for credit cards, merchants bear the majority of the cost (although again, this is likely to be passed on to consumers in the form of higher prices for goods and services).

The gross transfers to and from consumers resulting from a debit card payment are also smaller compared with those arising from credit card payments; consumers do not gain from interest-free periods, do not generally earn rewards and pay smaller account fees than on credit cards. Another difference is that the financial sector as a whole receives a positive net gain (i.e. pays a negative cost) for debit card transactions.

Across debit card schemes, the net private costs are distributed similarly across the sectors, although the net private cost to merchants for eftpos payments is lower than that for MasterCard & Visa debit payments (Table A8).

5.3 Cash

The private costs of cash are similar to the resource costs of cash for most sectors given the relatively small transfers between participants. To the extent to which transfers take place, consumers pay a net transfer made up of fees to financial institutions (to cover financial institutions' costs arising from cash withdrawals) and seigniorage to the public sector. These are equivalent to about \$0.13 per transaction (Table 7). Merchants incur insignificant transfers in the use of cash, resulting in merchants' private net costs aligning with their resource costs.

6. Influence of Payment Size

The preceding sections have compared resource and private costs across payment instruments at the average transaction size for each instrument. It is also useful to compare the resource costs of different payment instruments at different transaction sizes. Across instruments there will be differences in the proportion of costs that are fixed (and, therefore, independent of the size of the payment) and those that vary with transaction size.

This section considers how resource costs vary by transaction size across the most common payment methods used at the point of sale – cash, debit cards and credit cards. Higher value cash transactions, for example, generally require a greater quantity of notes and coins to be exchanged; accordingly, the cost of handling and safeguarding cash is likely to be higher for these transactions. Card costs often do not depend on transaction size, but some costs, such as credit risk and scheme fees, increase as transaction values rise.

The estimates that follow focus on the resource costs incurred by financial institutions for the payment function of each payment method (i.e. excluding account maintenance, and the credit and rewards functions of credit cards), together with the resource costs of merchants. Costs have been classified as either fixed, variable by number of transactions or variable by transaction value based on the cost component and information provided by financial institutions and merchants. This classification is most uncertain in the case of the costs of cash.³³ Varying the assumption about which components are sensitive to transaction size provides a range of cost estimates for cash (Figure 7).³⁴

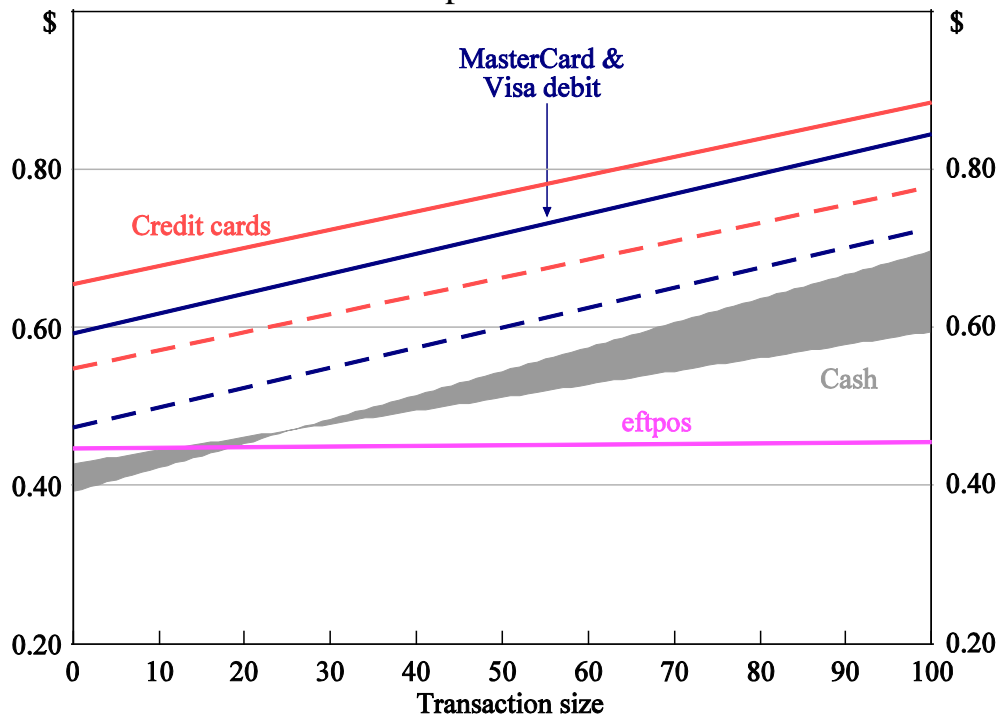
The analysis suggests that cash, eftpos and contactless MasterCard & Visa debit transactions have broadly similar costs under about \$20. To the extent to which they differ, cash appears to be the lowest-cost instrument up to this point. Above about \$20, eftpos transactions involve the lowest resource costs. This ‘cross-over point’ between cash and eftpos has fallen from about \$60 in 2006, primarily due to the continued decline in the cost per transaction of eftpos payments, although the cost of cash payments has also increased (Section 4).³⁵

33 Certain costs were consistently identified by responding financial institutions as fixed or variable with respect to the size of the transaction. For example, the costs associated with float and fraud are reported to be largely variable, while site rental costs for bank branches are reported to be fixed. Respondents provided differing views as to how other costs – such as cash handling, storage and transaction processing – behave as transaction size changes.

34 The range of cost estimates are the same at the average value of a cash transaction (\$26).

35 The 2007 study reported this ‘cross-over point’ to be \$50. Using the data from that study, but modifying the treatment of consumer deposit and business withdrawal costs of cash (as outlined in Section 4.3) results in a cross-over point of around \$60.

Figure 7: Resource Costs by Transaction Value
Dollars per transaction



Note: Dashed lines are contactless transactions under \$100

Source: Authors' calculations based on survey data

At low transaction values, the cost differential between cash, eftpos and contactless MasterCard & Visa debit transactions is sensitive to tender time assumptions. The cost estimates for cash are based on a tender time of about 25 seconds per transaction (Figure 3). In reality, cash transactions not requiring change may be quicker and potentially cheaper than eftpos even beyond \$20, while those that involve change may be slower and more expensive than eftpos for all transaction values. As a 2 second change in tender time implies a one cent (\$0.01) change in merchant costs, small efficiency gains or delays can make a large difference to the total resource cost of the instrument.

As transaction size increases, MasterCard & Visa debit and credit card (including contactless) transactions incur increasingly higher resource costs than eftpos transactions. This is mainly because, as reported by participants, scheme fees (which are used to approximate scheme costs) in the MasterCard & Visa systems increase with transaction size, but eftpos scheme fees do not.

Including the costs of the credit and reward functions of credit cards in addition to the cost of the payment function (not shown in Figure 7), the cost of a credit card transaction increases and the rate at which the cost varies with transaction size also increases. The costs of the credit and rewards functions are not only large but also vary almost proportionately with transaction values. These additional features are estimated to add \$0.15 in variable costs for every \$10 spent.

7. Small Businesses Costs

SMEs are likely to face different costs to larger businesses. First, the time spent in back-office processing, costs associated with fraud prevention, etc are spread across fewer transactions so the economies of scale are less favourable. Second, SMEs may face different prices for payment services compared to large businesses due to their different bargaining positions and payment needs.

This section focuses on SMEs' *gross private* costs (i.e. excluding inward transfers, such as surcharges) of receiving payments. To gauge how these compare with the costs of large businesses, a concurrent survey of SMEs was undertaken. Details of the survey methodology and sample are in Appendix D. The resulting sample provides valuable information on SME costs, but was small relative to the number of such businesses in Australia and is therefore unlikely to be fully representative. Accordingly, the cost estimates should be treated as having a higher degree of uncertainty than for large businesses. However, the estimates clearly show that the costs of small businesses are higher per transaction than those of large merchants.

7.1 Acceptance

SMEs typically accept at least as wide a range of payment methods as large merchants and, in some cases, wider; around half of SMEs reported that they accept five or more methods. The bulk of payments accepted by SMEs appear to be made using cash, eftpos, and MasterCard & Visa credit and debit cards (Table 8). Other payment methods account for a relatively small proportion of revenue. For example, although cheques are accepted by a majority of the sample, cheques typically account for less than 10 per cent of revenue. One reason that SMEs would accept a wide range of payment instruments is to provide customers with payment flexibility.

Table 8: Acceptance of Payment Instrument by SMEs

Per cent

Payment instrument	Share of respondents who accept that method	Share of sales value for respondents who accept that method	
		Median response	Most common response
Cash	97	10–20	0–10
eftpos	90	20–30	20–30
MasterCard & Visa debit or credit cards	92	20–30	10–20
American Express or other card	36	0–10	0–10
Cheques	75	0–10	0–10
Direct debit/direct credit	63	0–10	0–10
BPAY	9	0–10	0–10
PayPal	8	0–10	0–10
<i>Memo item: cash-out</i>	<i>14</i>	<i>na</i>	<i>na</i>

Source: Authors' calculations based on survey data

7.2 Costs

The ranking of private costs across payment instruments is broadly the same for SMEs as for large businesses (Table 9).^{36,37} American Express cards are the most expensive instrument measured in terms of the private (gross) cost per transaction, followed by MasterCard & Visa cards and then eftpos transactions.³⁸ However, small businesses reported cash to be the lowest-cost instrument, whereas large businesses reported that debit transactions cost less than cash. MasterCard & Visa debit transactions are found to cost more than eftpos transactions. However, the breakdown between the cost of debit and credit transactions for MasterCard &

³⁶ The resource and gross private costs to SMEs shown in Table 9 can be compared with the total cost estimates for large merchants provided in Tables 2 and A1. Transfers for card transactions are comparable to those found in Tables 6, A4 and A5.

³⁷ Each merchant's resource costs of card payments are allocated according to the number of transactions of each card type. Discussions with small business associations prior to running the survey suggested that their members would find it difficult to allocate overhead costs across different card types.

³⁸ Cheque costs were not able to be measured for SMEs.

Visa is somewhat uncertain; only around one-third of SMEs that provided card cost data were able to provide a further breakdown between debit and credit transactions. In part, this may owe to some SMEs receiving blended rates for these products from their acquirers. However, even when merchants are offered differential fees, these costs can be difficult to calculate from merchant service fee statements.

Table 9: Per transaction Costs of Accepting Different Instruments

Median, dollars per average-sized transaction

Payment instrument	Resource costs	Transfers (fees and float)	Total private cost	<i>Memo item: median transaction size^(a)</i>
Cash (including cheques)	0.66	0.05	0.71	33
eftpos	0.91	0.53	1.45	88
MasterCard & Visa – total	0.91	1.73	2.64	175
Debit cards	0.89	0.86	1.75	178
Credit cards	0.93	1.85	2.78	223
American Express	0.96	3.14	4.10	126

Notes: The median cost is calculated at the component level and then summed across components to give totals

(a) Median of estimated average transaction size for SMEs that provided data

Source: Authors' calculations based on survey data

The results clearly suggest that resource costs are higher for SMEs than for large merchants. While the resource costs of card transactions for large merchants are around \$0.20 per transaction, for SMEs this cost is closer to \$0.90 per transaction. Similarly, cash costs are higher for SMEs, at \$0.66 per transaction, compared to \$0.28 for larger merchants. As noted, one factor driving higher costs is that back-office costs are spread across a smaller number of transactions. This effect is apparent between SMEs and large businesses, yet it is also noticeable even between SMEs of different sizes. For example, although the time taken for back-office cash processing tasks tends to increase as the annual revenue of the business increases, the time spent per transaction falls; the median back-office cost per cash transaction is \$0.29 for businesses with annual revenue above \$1 million but around \$0.73 for businesses with annual revenue below \$1 million. In addition, given their size, small merchants are less likely to have invested in payments processing automation or use specialised processes in order to reduce costs.

Transfers are estimated to be higher for SMEs than for large merchants, particularly for card transactions. The transfer of \$0.53 associated with each eftpos transaction at SMEs is significantly higher than the \$0.02 transfer reported for large merchants. Transfers related to other card transactions are all above the level reported by large merchants. Again, fixed fees, such as monthly fees for terminal rental, are likely to be spread over fewer transactions for smaller merchants. Another factor is likely to be the differential pricing of per transaction fees. For instance, purchases at larger merchants are more likely to qualify for ‘strategic’ or ‘preferred’ interchange rates that are set much lower than the economy-wide average rate. This difference flows through to lower merchant service fees for larger merchants.³⁹

7.3 Surcharging and Discounting of Payment Methods

Surcharging can be used to offset merchants’ cost of accepting payments. According to both the Bank’s survey and a survey run by the NSW Business Chamber (see Appendix D for more information), surcharging is not particularly widespread among SMEs, with only around 20 per cent of respondents indicating that they surcharge one or more methods (Table 10).

The two surveys show a relationship between the cost to the merchant of accepting the instrument and the decision to apply a surcharge to that instrument. For SMEs, the most expensive instrument to accept on a per transaction basis is American Express, which has the lowest acceptance rate across the card payment methods and is also the most likely to be surcharged. MasterCard & Visa credit cards are the next most expensive card payment method; while these are accepted widely, they have the second highest rate of surcharging.

³⁹ For each card type, the median size of the transactions reported by SMEs was 50 per cent to 150 per cent greater than the mean transaction size at large merchants. The larger transaction size implies that per transaction costs of SMEs should be higher than for large merchants. However, even controlling for this influence on costs, the costs of SMEs are higher than for large merchants. An alternative means of comparison is the cost as a percentage of the sales value. On this basis, the private cost to SMEs of card payments remains around two to three times that of large merchants.

Table 10: Discounting and Surcharging of Payment Instruments by SMEs

Payment instrument	Per cent of respondents who accept that method	
	Discount	Surcharge
Cash	5	0
eftpos	1	3
MasterCard & Visa – total	1	17
Debit cards ^(a)	1	5
Credit cards ^(a)	1	12
American Express	1	30
Cheques	1	1
Direct debit or BPAY	1	2

Notes: Based on 220 respondents to the RBA survey and 508 respondents to the NSW Business Chamber survey

(a) Results of the RBA survey only

Sources: Authors' calculations based on survey data and data provided by NSW Business Chamber

Cash more often attracts a discount than a surcharge. On a per transaction basis, cash appears relatively inexpensive compared to other payment methods and this may explain why the use of cash is encouraged. However, the cost of cash is not trivial; measured as a proportion of the sales value at the average transaction size, the cost of a cash transaction is around 2.5 per cent. There may, of course, be other motivations for encouraging cash payments; the business may need cash on hand to offer cash-out at the point of sale or to pay staff wages, or may prefer cash as it facilitates tipping. Cash is also favoured in the 'informal economy', where businesses may prefer cash to keep transactions or revenue from being detected. Further, the cost of cash to merchants, which comprises mainly of costs such as time and wages, may be less visible than the costs of fees paid to payment providers.

8. Conclusion

In 1997, the Wallis Inquiry noted that the Australian payments system was characterised by relatively high overall costs and that there was scope for substantial efficiency gains, including greater use of electronic payments (Financial System Inquiry 1997, pp 223–233). One of the recommendations stemming from the Inquiry was the creation of the Payments System Board with a mandate to promote efficiency in the payments system. This study represents part

of the Reserve Bank's work on assessing the efficiency of the payments system, focusing on the cost of providing payment services to households.

Our results suggest that the costs involved in providing payment services to households have fallen from 0.80 per cent of GDP in 2006 to 0.54 per cent of GDP in 2013. Based on the most recent estimate, it appears that Australia now has a relatively low cost payments system by international standards. With greater choice in payment methods, including wider access to, and acceptance of, electronic payment methods, today's payments system also serves its users better than it did at the time of the Wallis Inquiry.

The decline in costs between 2006 and 2013 has been due to cost savings across most payment instruments. In particular, overhead cost savings have been realised through greater use of new technology, and tender times have been reduced through the adoption of PIN and contactless technology. Economies of scale are also likely to have reduced the per transaction cost of electronic payment methods that rely on networks with large fixed costs.

Measured on a per transaction basis and at the average transaction size for each payment instrument, the ranking across instruments by resource costs is mostly unchanged from 2006. BPAY and direct debit, which are electronic payment methods typically used for remote bill payments, remain the least resource intensive. Debit cards remain cheaper than credit cards, and cheques remain more expensive to society than any other payment method. However, cash has become slightly more expensive as its use has declined, while eftpos has become less expensive; these two methods are estimated to be the least costly of the methods available at the point of sale, with very similar per transaction costs. While cash has traditionally been the least costly payment method available for small payment values, developments since the previous study indicate that electronic payments are increasingly able to offer a low-cost alternative to cash. The point at which cash is no longer lower cost than eftpos has fallen from about \$60 in 2006 to about \$20 in 2013. Contactless debit transactions are also relatively low cost at very low payment values.

Decision-making by consumers and merchants, however, is not driven by the costs to society, but rather the private costs and benefits that these groups face.

Regulation recommended in the Wallis Report and put in place since 2001 by the Reserve Bank has worked to reduce the incentives for consumers to use high-cost options such as credit cards (RBA 2008). However, consumers continue to receive incentives in the form of rewards and interest-free periods to use credit cards, so that the private cost to consumers of credit cards is no different from debit card payments despite their higher social cost. Merchants continue to bear higher costs for credit card payments than debit card payments, and small merchants face significantly higher costs than large merchants.

The coming years will see further innovation – boosted by the current initiative for real-time payments – and ongoing change in consumer preferences. In such a climate, it may be worth considering whether relatively frequent updates of payment cost estimates might be useful to policymakers and the payments industry. Future studies will also need to consider carefully the scope of their investigation; cost estimates may be required for an even broader set of payment instruments or for other segments of the payments system, such as person-to-person payments.

Appendix A: Additional Detailed Results

This appendix contains a number of tables providing more details on the cost components associated with different payment instruments. Tables A1 to A7 provide additional information on resource costs for account overheads, cash withdrawals, credit cards and debit cards. Table A8 provides additional information on private costs by sector.

Table A1: Overall Costs to Financial Institutions and Merchants					
Dollars per average-sized transaction					
Payment instrument	Financial institutions		Merchants	Total cost	2006 comparison
	Account overheads	Direct			
Resource costs					
Cash	0.03	0.20	0.28	0.51	0.41
eftpos	0.24	0.23	0.22	0.70	1.02
MasterCard & Visa debit cards	0.24	0.51	0.19	0.94	1.36
Credit cards	0.41	0.72	0.22	1.34	1.81
Cheques	0.25	3.26	1.85	5.37	5.79
Direct entry	0.25	0.03	0.13	0.41	0.75
BPAY	0.28	0.41	0.03	0.73	1.01
Private costs					
Cash	0.03	0.20	0.29		
eftpos	0.24	0.24	0.24		
MasterCard & Visa debit cards	0.24	0.53	0.32		
Credit cards	0.41	0.82	0.66		
Cheques	0.25	3.26	3.01		
Direct entry	0.25	0.03	0.19		
BPAY	0.28	0.41	0.53		
<i>Memo item: credit cards including rewards and credit function</i>					
<i>Resource costs</i>	<i>0.41</i>	<i>1.73</i>	<i>0.22</i>	<i>2.36</i>	<i>2.68</i>
<i>Private costs</i>	<i>0.41</i>	<i>2.95</i>	<i>0.66</i>		

Source: Authors' calculations based on survey data

Table A2: Cost of Cash WithdrawalsDollars per withdrawal, at average withdrawal value (*continued next page*)

	2006	2013
Total costs	na	0.99
Total resource costs	na	0.92
ATM withdrawals		
Total costs	0.86	0.93
Total resource costs	0.75	0.85
ATM owner/acquirer	0.63	0.77
ATM owner equipment	0.18	0.20
Cash handling and storage	0.14	0.11
ATM owner centre management	0.09	0.11
Site rental – on-site	0.03	0.03
Site rental – off-site	0.10	0.21
Other (incl theft and fraud mitigation and the cost of capital)	0.10	0.11
Card issuer ^(a)	0.12	0.08
Transfers		
Float (transfer to govt)	0.11	0.08
Fraud and theft – net losses ^(b)	na	0.00
Interchange fees (issuers to acquirers)	0.49	0.04
<i>Memo item: average withdrawal value^(c)</i>	<i>170</i>	<i>184</i>
Branch cash transactions		
Total costs	3.70	6.41
Total resource costs	3.40	6.02
Transaction processing	1.77	2.93
Rent	0.57	1.12
Technology	0.35	0.59
Wholesale cash handling	0.39	0.79
Fraud – monitoring, mitigation and investigation	0.12	0.17
Other branch costs	0.20	0.41
Transfers		
Float (transfer to govt)	0.30	0.35
Fraud and theft – net losses ^(b)	na	0.03
<i>Memo item: average withdrawal value^(c)</i>	<i>1 578</i>	<i>2 412</i>

Table A2: Cost of Cash Withdrawals		
Dollars per withdrawal, at average withdrawal value (<i>continued</i>)		
	2006	2013
Debit cash-outs		
Total costs	na	0.45
Total resource costs	na	0.44
Card issuer	0.11	0.05
Card acquirer	0.11	0.10
Merchants	na	0.30
Of which: tender time	na	0.19
Transfers		
Issuers fraud and theft – net losses ^(b)	na	0.01
Issuers – interchange fees (to acquirers)	0.16	0.22
Acquirers – fee rebates (to merchants)	na	-0.14
<i>Memo item: average withdrawal value</i> ^(c)	76	89
Notes:	(a) Estimates not strictly comparable between the 2007 and 2014 studies given ATM-related issuing costs were separately identified in 2014 but otherwise incorporated into eftpos costs in 2007	
	(b) The 2007 study did not separately identify the net losses from fraud and the costs of fraud monitoring, mitigation and investigation	
	(c) Consumer withdrawals only	
Source:	Authors' calculations based on survey data	

Table A3: Financial Institutions' Credit Card Costs
Dollars per transaction, at average transaction value

	2006	2013	
	Weighted average	Weighted average	MasterCard & Visa
Total costs	2.40	2.95	2.68
Total resource costs	1.46	1.73	1.76
Payment function	0.59	0.72	0.72
Issuer	0.40	0.43	0.43
Authorisation and transaction processing	0.08	0.06	0.07
Scheme fees	0.11	0.21	0.20
Fraud prevention ^(a)	0.11	0.03	0.03
Other issuer costs	0.10	0.14	0.14
Acquirer	0.19	0.28 ^(c)	0.28
Scheme fees	0.02	0.12 ^(c)	0.12
Other acquirer costs	0.17	0.16 ^(c)	0.16
Credit and rewards functions	0.87	1.01	1.04
Credit collections and write-offs	0.64	0.78	0.83
Cost of capital (credit risks)	0.19	0.22	0.19
Cardholder rewards programs (operating costs)	0.04	0.01	0.01
Transfers	0.94	1.22	0.93
Issuer	0.92	1.21	0.93
Chargebacks and issuer fraud losses	0.01	0.09	0.04
Cardholder rewards	0.62	0.74	0.56
Cost of funds	0.30	0.38	0.31
Acquirer	0.02	0.01 ^(c)	0.01
<i>Memo items:</i>			
<i>Interchange fees</i>	<i>0.69</i>	<i>0.86</i>	<i>0.86</i>
<i>Average transaction value^(b)</i>	<i>132</i>	<i>139</i>	<i>131</i>

Notes: (a) The 2007 study did not separately identify the net losses from fraud and the costs of fraud monitoring, mitigation and investigation

(b) Of underlying transactions

(c) Data only include costs for MasterCard and Visa; for confidentiality reasons, American Express acquirer data have been suppressed

Source: Authors' calculations based on survey data

Table A4: Merchants' Credit Card Costs
Dollars per transaction, at average transaction value

	2006	2013		
	Weighted average	Weighted average	MasterCard & Visa	American Express
Total costs	1.00	0.66	0.56	1.06
Total resource costs	0.41	0.22	0.22	0.22
Card present				
Total costs	0.94	0.52	0.45	0.82
Total resource costs	0.42	0.21	0.21	0.21
Tender time	0.31	0.17	0.17	0.18
Contactless	na	0.11	0.11	na
Contact-only	0.31	0.20	0.22	0.18
Other point of sale	0.09	0.03	0.03	0.02
Other (including back-office processing)	0.02	0.01	0.01	0.01
Transfers	0.53	0.32	0.24	0.62
Fees to acquirers	0.52	0.32	0.24	0.61
Other transfers	0.01	0.00	0.00	0.00
<i>Memo item: average transaction value^(a)</i>	<i>68</i>	<i>61</i>	<i>61</i>	<i>62</i>
Card not present				
Total costs	1.76	2.07	1.72	3.93
Total resource costs	0.23	0.38	0.38	0.39
Transfers				
Fees to acquirers	1.53	1.63	1.27	3.53
Other transfers	0.00	0.06	0.07	0.01
<i>Memo item: average transaction value^(a)</i>	<i>146</i>	<i>240</i>	<i>242</i>	<i>228</i>

Note: (a) Differences in average value of underlying transaction between merchants and financial institutions are due to narrower merchant sample coverage

Source: Authors' calculations based on survey data

Table A5: Debit Card CostsDollars per transaction, at average transaction value (*continued next page*)

	2006	2013		
	eftpos	eftpos	MasterCard & Visa debit	Debit
Financial institutions				
Total costs	0.27	0.24	0.53	0.31
Resource costs	0.22	0.23	0.51	0.29
Issuer	0.11	0.07	0.31	0.13
Transaction processing	0.05	0.01	0.04	0.02
Scheme fees	na	0.01	0.12	0.04
Other (including theft and the cost of capital)	0.05	0.05	0.15	0.07
Acquirer	0.11	0.16	0.20	0.17
Scheme fees	na	0.01	0.06	0.03
Other acquirer costs	0.11	0.15	0.13	0.14
Transfers				
Issuer	na	0.01	0.02	0.01
Acquirer	0.05	0.00	0.01	0.00
<i>Memo item: interchange fees</i>				
<i>Issuer to acquirer</i>	0.18	na	na	na
<i>Acquirer to issuer</i>	na	0.02	0.10	0.04
<i>Memo item: average transaction value^(a)</i>	59	51	67	55
Merchants				
Total costs	0.34	0.24	0.32	0.27
Total resource costs	0.32	0.22	0.19	0.19
Card present				
Total costs	0.34	0.24	0.25	0.24
Resource costs	0.32	0.22	0.17	0.20
Tender time	0.24	0.19	0.14	0.17
Contactless	na	na	0.12	0.12
Contact-only	0.24	0.19	0.22	0.19
Other point of sale	0.07	0.03	0.02	0.03
Other (including back-office processing)	0.01	0.01	0.01	0.01
Transfers	0.01	0.02	0.08	0.04
Fees to acquirers	0.01	0.02	0.08	0.04
Other transfers	0.01	0.00	0.00	0.00
<i>Memo item: average transaction value^(a)</i>	73	57	40	54

Table A5: Debit Card CostsDollars per transaction, at average transaction value (*continued*)

	2006	2013		
	eftpos	eftpos	MasterCard & Visa debit	Debit
Merchants				
Card not present				
Total costs	na	na	1.28	1.28
Resource costs	na	na	0.45	0.45
Transfers				
Fees to acquirers	na	na	0.75	0.75
Other transfers	na	na	0.08	0.08
<i>Memo item: average transaction value^(a)</i>	<i>na</i>	<i>na</i>	<i>193</i>	<i>193</i>

Note: (a) Differences in average value of underlying transaction between merchant and financial institutions are due to narrower merchant sample coverage

Source: Authors' calculations based on survey data

Table A6: Cheques and BPAY CostsDollars per transaction, at average transaction value (*continued on next page*)

	Cheques		BPAY	
	2006	2013	2006	2013
Financial institutions				
Total costs	4.22	3.26	0.51	0.41
Total resource costs	4.22	3.26	0.51	0.41
Overheads	1.13	1.03	0.19	0.15
Processing	0.40	0.64	0.13	0.06
Exceptions	0.22	0.06	0.03	0.00
Receipt of deposits	2.27	1.14	na	na
Scheme fees	na	na	0.10	0.13
Other (including the cost of capital)	0.20	0.39	0.06	0.07
<i>Memo items:</i>				
<i>Interchange fees</i>	<i>na</i>	<i>na</i>	<i>0.40</i>	<i>0.42</i>
<i>Internet and phone banking costs</i>	<i>na</i>	<i>na</i>	<i>0.17</i>	<i>0.14</i>
<i>Average transaction value^(a)</i>	<i>3 159</i>	<i>5 946</i>	<i>597</i>	<i>701</i>

Table A6: Cheques and BPAY Costs				
Dollars per transaction, at average transaction value (<i>continued</i>)				
	Cheques		BPAY	
	2006	2013	2006	2013
Merchants				
Total costs	1.20	3.01	0.56	0.53
Total resource costs	1.09	1.85	0.02	0.03
Point-of-sale payments				
Total costs	3.37	9.36	na	na
Total resource costs	2.96	3.76	na	na
Tender time	1.14	0.80	na	na
Other point of sale	1.61	1.14	na	na
Other (including back-office processing)	0.21	1.82	na	na
Transfers				
Losses	0.25	0.00	na	na
Fees paid to financial institutions	0.16	5.60	na	na
<i>Memo item: average transaction value^(a)</i>	<i>357</i>	<i>239</i>	<i>na</i>	<i>na</i>
Remote payments				
Total costs	0.51	1.58	0.56	0.53
Total resource costs	0.50	1.43	0.02	0.03
Back-office processing	0.48	1.42	0.02	0.03
Exceptions processing	0.01	0.00	0.00	0.00
Transfers – Fees to financial institutions	0.01	0.15	0.54	0.50
<i>Memo item: average transaction value^(a)</i>	<i>1 098</i>	<i>591</i>	<i>136</i>	<i>176</i>
Note:	(a) Differences in average value of underlying transaction between merchants and financial institutions are due to narrower merchant sample coverage			
Source:	Authors' calculations based on survey data			

Table A7: Direct Entry Costs
Dollars per transaction, at average transaction value

	Direct debit		Direct credit	
	2006	2013	2006	2013
Financial institutions				
Total costs	0.10	0.03	0.08	0.02
Total resource costs	0.10	0.03	0.08	0.02
Overheads, set-up and servicing	0.05	0.01	0.04	0.01
Processing	0.03	0.01	0.03	0.01
Exceptions and fraud	0.01	0.00	0.00	0.00
Other (including the cost of capital)	0.01	0.01	0.01	0.00
<i>Memo item: average transaction value^(a)</i>	<i>4 008</i>	<i>7 383</i>	<i>4 781</i>	<i>5 258</i>
Merchants				
Total costs	0.24	0.19	na	na
Total resource costs	0.19	0.13	na	na
Overheads	0.04	0.00	na	na
Back-office processing	0.14	0.12	na	na
Exceptions	0.01	0.01	na	na
Transfers				
Fees paid to financial institutions	0.05	0.06	na	na
<i>Memo item: average transaction value^(a)</i>	<i>106</i>	<i>129</i>	<i>na</i>	<i>na</i>

Note: (a) Differences in average value of underlying transaction between merchants and financial institutions are due to narrower merchant sample coverage

Source: Authors' calculations based on survey data

Table A8: Private Net Costs by Sector
Dollars per average-sized transaction

	Financial institutions			Merchants	Consumers
	All	Issuers	Acquirers		
MasterCard & Visa credit cards^(a)					
Resource costs incurred	1.76	1.47	0.28	0.22	na
Net transfer paid to:	-1.22	-0.93	-0.29	1.03	0.19
Issuers			0.86		0.07
Acquirers		-0.86		1.15	
Merchants			-1.15		0.12
Consumers		-0.07		-0.12	
Total private net cost	0.54	0.55	-0.01	1.25	na
MasterCard & Visa debit cards					
Resource costs incurred	0.51	0.31	0.20	0.17	na
Net transfer paid to:	-0.67	-0.28	-0.39	0.46	0.21
Issuers			0.10		0.18
Acquirers		-0.10		0.49	
Merchants			-0.49		0.03
Consumers		-0.18		-0.03	
Total private net cost	-0.16	0.03	-0.19	0.63	na
eftpos					
Resource costs incurred	0.23	0.07	0.16	0.22	na
Net transfer paid to:	-0.34	-0.20	-0.15	0.14	0.21
Issuers			0.02		0.18
Acquirers		-0.02		0.16	
Merchants			-0.16		0.03
Consumers		-0.18		-0.03	
Total private net cost	-0.12	-0.13	0.01	0.36	na
Cash					
Resource costs incurred	0.19	0.10	0.09	0.27	na
Net transfer paid to:	-0.04	0.07	-0.13	-0.02	0.13
Issuers			-0.10		
Acquirers/ATM owners		0.10		-0.02	0.05
Merchants			0.02		
Consumers		-0.03	-0.05		
Central bank and mint	0.02			0.00	0.05
Total private net cost	0.15	0.17	-0.04	0.25	na

Note: (a) Does not include interest payments from consumers to financial institutions

Sources: Authors' calculations based on: survey data; Craig (2014); Ossolinski *et al* (2014); Payments Consulting Network (2014); RBA; RFi Consulting (2014)

Appendix B: Payment Activity in the Sample

Sixteen financial institutions (including ATM operators) provided information on both their costs and transactions relating to a twelve-month period. About three-quarters of personal credit and debit accounts in Australia were covered.⁴⁰

ATM withdrawals and eftpos transactions continue to account for about 60 per cent of the total number of debits to *transaction accounts*; with a 10 percentage point fall in the share of withdrawals from ATMs since 2006 being offset by a similar increase in the share of withdrawals using eftpos (Table B1). MasterCard & Visa debit transactions account for just over 15 per cent of the number of debits, with a similar number made through electronic forms of payment such as BPAY and direct entry. The number of withdrawals (debits) from transaction accounts through cheques now makes up less than 1 per cent of the total number of debits to these accounts. Cheque payments, however, continue to have the largest transaction size, at over \$3 500 per cheque, on average. Given the nature of the income and expenditure patterns of most households, the number of debits to transaction accounts continues to far outweigh the number of credits; with most credits coming through the direct entry system, consistent with salary payments. Australian households use *credit card accounts* for about 200 transactions per annum. The average value of total purchases on credit card accounts was just over \$25 000 per annum.

Seventeen large merchants provided information on both their payments system costs and transactions. During the twelve-month period these merchants were the recipients of about 2½ billion payments worth about \$230 billion (Table B2). Purchases made at retailers comprised close to 90 per cent of the number of transactions, but about half the value of payments. This reflects the fact that the average size of a purchase at a retailer was about \$50, while the average payment to a biller was about \$700. Overall, the implied use of payment instruments is broadly comparable with the consumer payment patterns in Ossolinski *et al* (2014).

⁴⁰ Personal and business transactions were separately identified. Identification of business transactions allowed accurate per transaction costs to be calculated and these to be scaled up to an economy-wide estimate of the cost of consumer-to-business transactions using the number of personal transactions.

Cash accounted for about 45 per cent of the number of payments to merchants, although the share is skewed between retailers and billers at about 49 and 1 per cent of payments. Direct debit and BPAY, not accepted by retailers, make up about 70 per cent of billers' transactions. The mix of credit and debit cards in the sample is similar to the aggregate card payment statistics for Australia as measured in the Retail Payments Statistics.

Table B1: Payment Activity via Financial Institutions

Transactions from household accounts

	Number	Value	Average size	Transactions per account
	Millions	\$ million	\$	Number
Transaction accounts				
Cash withdrawals				
ATM withdrawals	608	112 092	184	32
Branch withdrawals	29	70 678	2 412	2
eftpos				
Purchase only	1 802	93 593	52	93
Combined purchase/cash-out	198	19 249	97	10
Cash-out only	30	2 652	89	2
MasterCard & Visa debit	703	48 866	69	35
Cheques	31	108 094	3 533	2
Direct entry	454	231 328	510	24
BPAY	142	76 807	540	8
Total	3 997	763 360	191	208
Credit card accounts				
Credit cards				
Purchases	1 586	202 697	128	198
Cash advances	22	7 240	325	3
BPAY	13	8 335	640	2
Total	1 622	218 272	135	202

Source: Authors' calculations based on survey data

Table B2: Payment Activity at Large Merchants

	Number of payments (millions)			Value of payments (\$ million)		
	Merchants	Retailers	Billers	Merchants	Retailers	Billers
Cash	1 147	1 145	2	31 722	31 534	188
Debit cards	824	807	17	54 848	52 009	2 839
Card present	806	805	1	51 874	51 698	176
Card not present	18	2	17	2 974	311	2 663
Credit cards	421	389	31	35 352	24 932	10 420
Card present	385	385	0.2	23 535	23 413	122
Card not present	35	4	31	11 817	1 519	10 298
Cheques	3	0.3	3	12 901	57	12 865
Point of sale	0.5	0.3	0.3	82	57	46
Remote	3	0	3	12 818	0	12 818
Direct debit	43	0	43	11 118	0	11 118
BPAY	82	0	82	89 505	1	89 505
Total	2 520	2 341	179	235 446	108 532	126 935

Source: Authors' calculations based on survey data

The number of cash transactions for the entire economy can be hard to estimate. Schmiedel *et al* (2012) outlines seven estimation methods, which can be grouped into two broad approaches: surveys of end-users' payment patterns (consumers or businesses) and modelling cash transactions from established data sources (e.g. from cash withdrawals, or the difference between consumption and electronic transactions). Our preferred method for Australian data – as fewer assumptions are necessary – is to use Ossolinski *et al* (2014) and scale up the estimate of cash transactions per person to match the population. This gives a similar estimate to scaling up the ratio of cash to card payments in Ossolinski *et al* with the number of card payments in the economy from the Bank's Retail Payments Statistics (5.8 billion cash transactions). Information on the number of cash withdrawals and the average transaction size provide a slightly higher estimate (about 6.9 billion). These estimates are considerably lower than RFi Consulting (2014) of 11.7 billion cash transactions, although some of this will reflect the wider scope of this estimate (which goes beyond consumer-to-business payments).

Appendix C: Costs for Consumers in Making Payments

Following Schwartz *et al* (2008), the resource cost incurred by consumers in making payments is the cost of consumers time. The fees paid by consumers to financial institutions and the surcharges paid to merchants are not resource costs, but transfers in the system (and discussed in Section 5).

C.1 Payment Time

There are two aspects to the time devoted by consumers to undertake payments – the time used to actually make a payment, the tender time, as well as the time for payments-related activities. The tender time results are discussed in Section 4.1. These figures were obtained from a number of large merchants that were able to capture this information automatically through their point-of-sale payment devices or through their own time-use studies by process engineers.⁴¹ Consumers' time costs for non-point of sale payments are based on the time estimates used in Schwartz *et al* (2008).

The time associated with other payment-related activities are harder to measure but are unlikely to be as important as tender time.⁴² Activities can include, for example, the time taken to obtain cash from an ATM or branch before making a cash payment to a merchant, as well as the time taken to monitor payments, such as the time used in reconciling debit and credit card statements with purchases.

The current study follows Schwartz *et al* (2008) in modelling the time devoted to other payment-related activities. In particular, only one-third of ATM trips are considered to require a special trip. This is supported by more recent research

41 A number of the study's broader merchant sample also provided tender time figures based on the judgement of their payment or treasury professionals. These numbers were not used.

42 At a broad level, the American Time Use Survey (Bureau of Labor Statistics 2014) suggests that American consumers spent less than 20 minutes a month on banking- and insurance-related activities in 2013. Only a fraction of this time will be devoted to payments, with the rest devoted to a wider range of financial activities, such as arranging loans, insurance and superannuation. This estimate could, however, understate the amount of time devoted to payments issues given it only captures the 'main' activities in which the consumer engages; a consumer that undertakes some banking activities while focusing primarily on non-banking activities will not be counted as having done any banking.

suggesting that consumers change their preferred payment instrument as the amount of cash in their possession changes (Eschelbach and Schmidt 2013), and withdraw precautionary amounts of cash when uncertain about future transactions (Alvarez and Lippi 2009). Data from Ossolinski *et al* (2014) also indicate that consumers who make more cash payments have higher cash withdrawal amounts with only a small increase in the number of withdrawals. Combined with an estimate that the average ATM withdrawal supports about seven cash transactions, the average time associated with obtaining cash for each cash payment is estimated to be about 11 to 20 seconds.

In line with the 2007 study, the time taken to perform other payment-related tasks, such as checking account statements and paying credit card bills, remains the same; at either 5 or 10 seconds per payment based on the instrument. Other time costs, such as establishing accounts and interacting with financial institutions to deal with billing, fraudulent transactions, etc are not modelled. In these cases, few interactions may be recorded per person, but each interaction would have a high time cost.⁴³

C.2 Value of Time Devoted to Payments

Following Schwartz *et al* (2008), the cost attributed to consumers' time is set at \$17.50 per hour, essentially half the average hourly wage rate. This helps improve the consistency of consumer cost estimates between the 2007 and 2014 studies although, as discussed in the 2007 study, it is recognised that there is no consensus on how to value consumers' time. Segendorf and Jansson (2012), for example, use an inventory model to calculate the value of consumers' time, but note that their results are sensitive to the level of interest rates, while Nevo and Wong (2014) find that the value people place on their time varies significantly over the business cycle.

⁴³ These costs may be higher for card-based systems given higher fraud levels (and hence procedures) and the greater variety of potential queries, such as late payment fees.

C.3 Overall Consumer Costs

Combining the total time consumers use to make payments with estimates of the value of this time suggest that the opportunity cost for consumers in making payments is about \$2.6 billion per annum. Per transaction, BPAY and cheque payments are estimated to be the most expensive payment instruments, at \$0.60 per transaction. At the other end of the spectrum, the relative speed of contactless debit transactions mean that MasterCard & Visa debit transactions are only estimated to impose a cost of \$0.13 per transaction on consumers. Cash and credit card transactions are estimated to cost \$0.18 and \$0.19 per transaction. The ranking of payment instrument resource costs for financial institutions, merchants and consumers is robust to plausible assumptions.

Appendix D: Description of Survey of SMEs

The survey was designed by Reserve Bank staff – in consultation with advice from a number of industry associations and the Australian Bureau of Statistics – to be answered by SMEs who receive payments directly from consumers; instructions and a link to the survey questions were available on the Bank’s website. The survey could be answered anonymously and was open between 2 June and 11 July 2014.

Businesses in a large range of sectors were approached to participate by their industry associations. The final sample consisted of around 260 entities, with 40 per cent from the goods retail sector, about half from professional and personal services firms and the remainder from the food and hospitality sector. The vast majority of the sample reported annual revenue of between \$100 000 and \$10 million. The sample was not stratified to be representative across industries or business size and so the results are only indicative of how the payment acceptance costs incurred by SMEs can differ from those for larger businesses.

The survey covered two main topics: acceptance and surcharging of various payment methods; and the costs of acceptance. Three cost areas were considered: the cost of time spent on various tasks; the cost of fraud; and the cost of fees paid to financial institutions. Information on the average wage was also collected and combined with information on tender times from the large business survey to calculate the costs related to tender time. Questions were designed to be answered using information from bank statements and fee statements from acquirers or other service providers. Questions about fees were staggered to first gather total fees, which are easier to identify on statements, and then component fees, where possible.

The response rate to individual components of the survey varied, affected both by the level of complexity of the specific question and attrition through the 20–30 minute survey. Results relating to acceptance and surcharging were based on 234 responses (close to the full sample), the component costs of cash were calculated using 123–194 responses, the component costs of eftpos, MasterCard & Visa transactions using 94–146 responses and the component costs of American Express from around 38 responses. The detailed split between

MasterCard & Visa debit and credit transaction costs was based on a smaller sample of 31 responses. Due to both lower rates of acceptance and low response rates to these questions, the costs for direct debit/credit and BPAY were not presented.

Supplementary data on acceptance and surcharging were collected for the Reserve Bank by the NSW Business Chamber in its quarterly survey of economic conditions. This sample consisted of over 900 responses, from a broad range of businesses. The NSW Business Chamber sample may include large businesses and businesses that receive payments from other businesses rather than from consumers. To limit the sample to only consumer-facing businesses, respondents in industries that are likely to service other businesses (rather than consumers) were excluded from the NSW Business Chamber sample leaving 508 respondents.

References

Alvarez F and F Lippi (2009), 'Financial Innovation and the Transactions Demand for Cash', *Econometrica*, 77(2), pp 363–402.

APCA (Australian Payments Clearing Association) (2012), 'The Decline of Cheques: Building a Bridge to the Digital Economy', Final Report on the APCA Public Consultation 'The Role of Cheques in an Evolving Payments System', 15 May.

APCA (2014), 'Payment Fraud Statistics', 2013 Calendar Year Sheet.

Arango C and V Taylor (2008), 'Merchant Acceptance, Costs, and Perceptions of Retail Payments: A Canadian Survey', Bank of Canada Discussion Paper No 2008-12.

Borzekowski R and EK Kiser (2008), 'The Choice at the Checkout: Quantifying Demand across Payment Instruments', *International Journal of Industrial Organization*, 26(4), pp 889–902.

Bradford T (2005), 'Contactless: The Next Payment Wave?', Federal Reserve Bank of Kansas City *Payment System Research Briefing*, December.

Brits H and C Winder (2005), 'Payments are No Free Lunch', De Nederlandsche Bank Occasional Studies, 3(2).

Bureau of Labor Statistics (2014), 'American Time Use Survey — 2013 Results', News Release USDL-14-1137, 18 June.

Centre for International Economics and Edgar, Dunn and Company (2006), *Exploration of Future Electronic Payments Markets*, Department of Communications, Information Technology and the Arts, Canberra.

Chakravorti B and BD Mazzotta (2013), 'The Cost of Cash in the United States', International Series of Studies by The Institute for Business in the Global Context, The Fletcher School, Tufts University.

Craig A (2014), 'Banking Fees in Australia', *RBA Bulletin*, June, pp 37–41.

Danmarks Nationalbank (2012), 'Costs of Payments in Denmark', Survey, April.

Eschelbach M and T Schmidt (2013), 'Precautionary Motives in Short-Term Cash Management – Evidence from German POS Transactions', Deutsche Bundesbank Discussion Paper No 38/2013.

Financial System Inquiry (1997), *Financial System Inquiry Final Report*, (S Wallis, chairperson), Australian Government Publishing Service, Canberra.

Food Marketing Institute (2000), 'It All Adds Up: An Activity-Based Cost Study of Retail Payments', Conducted for the Food Marketing Institute by PricewaterhouseCoopers.

Garcia-Swartz DD, RW Hahn and A Layne-Farrar (2006), 'The Move Toward a Cashless Society: A Closer Look at Payment Instrument Economics', *Review of Network Economics*, 5(2), Online article.

Gresvik O and H Haare (2009), 'Costs in the Norwegian Payment System', Norges Bank Staff Memo No 4/2009.

Gresvik O and G Øwre (2003), 'Costs and Income in the Norwegian Payment System 2001. An Application of the Activity Based Costing Framework', Norges Bank Working Paper 8/2003.

Hayashi F and WR Keeton (2012), 'Measuring the Costs of Retail Payment Methods', Federal Reserve Bank of Kansas City *Economic Review*, Second Quarter, pp 37–77.

MasterCard (2014), 'Cash is a Dirty Habit', Press Release, 6 May.

National Bank of Belgium (2006), 'Costs, Advantages and Drawbacks of the Various Means of Payments', *Economic Review*, June, pp 41–47.

Nevo A and A Wong (2014), 'The Elasticity of Substitution Between Time and Market Goods: Evidence from the Great Recession', Paper presented at 2014 Annual Meeting of the Society for Economic Dynamics, Toronto, 26–28 June.

Norges Bank (2014), 'Kostnader i det norske betalingssystemet' (Costs in the Norwegian Payments System), Norges Bank Memo 5/2014.

Ossolinski C, T Lam and D Emery (2014), 'The Changing Way We Pay: Trends in Consumer Payments', RBA Research Discussion Paper No 2014-05.

Payments Consulting Network (2014), '2013 Australian ATM and Branch Automation Market Study', Report sponsored by Wincor Nixdorf, May.

Polasik M, J Górka, G Wilczewski, J Kunkowski, K Przenajkowska, N Tetkowska (2013), 'Time Efficiency of Point-of-Sale Payment Methods: Empirical Results for Cash, Cards and Mobile Payments', in J Cordeiro, LA Maciaszek and J Filipe (eds), *Enterprise Information Systems: 14th International Conference, ICEIS 2012, Wroclaw, Poland June/July 2012, Revised Selected Papers*, Lecture Notes in Business Information Processing, LNBIP 141, Springer-Verlag, Berlin, pp 306–320.

RBA (Reserve Bank of Australia) (2008), *Reform of Australia's Payments System: Conclusions of the 2007/08 Review*, Reserve Bank of Australia, Sydney.

RBA (2014), *Submission to the Financial System Inquiry*, Reserve Bank of Australia, Sydney, March.

RBA and ACCC (Reserve Bank of Australia and Australian Competition and Consumer Commission) (2000), *Debit and Credit Card Schemes in Australia: A Study of Interchange Fees and Access*, Reserve Bank of Australia, Sydney.

Rfi Consulting (2014), 'The Evolution of Cash: An Investigative Study: Summary of Findings July 2014', Report commissioned by the Australian Payments Clearing Association (APCA).

Schmiedel H, G Kostova and W Ruttenberg (2012), ‘The Social and Private Costs of Retail Payment Instruments: A European Perspective’, European Central Bank Occasional Paper Series No 137.

Schwartz C, J Fabo, O Bailey and L Carter (2008), ‘Payment Costs in Australia’ in *Payment System Review Conference*, Proceedings of a Conference, Reserve Bank of Australia, Sydney, pp 88–138.

Segendorf B and T Jansson (2012), ‘The Cost of Consumer Payments in Sweden’, Sveriges Riksbank Working Paper Series No 262.

Simon J, K Smith and T West (2010), ‘Price Incentives and Consumer Payment Behaviour’, *Journal of Banking & Finance*, 34(8), pp 1759–1772.

Stewart C, B Robertson and A Heath (2013), ‘Trends in the Funding and Lending Behaviour of Australian Banks’, RBA Research Discussion Paper No 2013-15.

Turján A, E Divéki, E Keszy-Harmath, G Kóczán and K Takács (2011), ‘Nothing is Free: A Survey of the Social Cost of the Main Payment Instruments in Hungary’, Magyar Nemzeti Bank Occasional Paper 93.

Williams MM and RG Anderson (2007), ‘Currency Design in the United States and Abroad: Counterfeit Deterrence and Visual Accessibility’, Federal Reserve Bank of St. Louis *Review*, 89(5), pp 371–414.

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