A Comparison of Social Costs and Benefits of Paper Check Presentment and ECP with Truncation

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Each year, about 60 billion checks are collected in the United States. Paper checks account for about 80 percent of noncash transaction volume.[1] While the shares of electronic payments methods such as the automated clearing house and credit and debit cards have been growing in recent years, the volume of checks has grown by more in absolute numbers during the last 20 years than all electronic payments methods combined. Partly because of their convenience, checks remain an extremely popular way to carry out transactions. Since it seems that checks will be around for the foreseeable future, it makes sense to try to improve the process of their collection.

For most checks, the forward collection process occurs roughly as follows: The person or firm to whom the check is made out (the payee) deposits it in his or her bank (the bank of first deposit or the depositary bank). If the check writer's (the payor) account is in the same bank, the check is "on-us" and it stays at that bank. Otherwise, the physical check then travels, often via a financial intermediary, to the payor's bank (the paying bank), and finally to the payor, on a monthly basis. An interbank transit check can be handled by multiple institutions, with several processing steps at each point. If the payor has insufficient funds or the check is not honored by the paying bank for other reasons, the check travels back to the depositary bank and the payee. That so-called return process is much more costly, as it is more labor intensive.

As this description makes clear, considerable costs are incurred at several stages in the collection process for sorting and transporting of physical checks. Collection takes place within tight schedules. The paying bank has only one to one and a half days from the time a check is presented to decide whether to return the check and recover its payment before the check is final. In addition, the payee may lose interest for each day's delay in the collection process. In case of severe weather conditions, the difference between the time of credit and the time of debit could increase and generate additional "float."[2]

Some of these costs could be reduced or avoided entirely by a system of electronic check presentment and truncation. Electronic check presentment is a check collection process whereby a check is cleared based on information contained in an electronic file instead of the actual paper check (also called the physical item). At a minimum, the file includes the account number and the dollar amount. The physical check may or may not follow the electronic file. If the check is stopped before it reaches the paying bank (the check writer's bank, that is, the bank holding the funds against which the check is drawn), the process is called check truncation.[3] Whether the check is truncated or it follows the electronic file, the process is intended to improve on the traditional method of paper check presentment.

Electronic check presentment (ECP) and check truncation have been promoted by the Federal Reserve System and by some financial institutions as a more efficient payments method than the processing of paper checks. However, no estimates are available of costs and benefits of ECP or of truncation relative to paper check presentment. Before any definite recommendations are made, it is important to find out whether ECP with truncation is indeed cost effective. The purpose of this study is twofold. First, it compares the costs and benefits of traditional paper check collection to those of electronic check presentment with truncation. Because very little is known about the costs of the transition to ECP, it is a static analysis that does not include any transition costs, even though they are likely to be significant. Second, the paper addresses the question of why the private market has not so far adopted check truncation.[4]

Since so far only a fraction of checks are processed with ECP and a smaller fraction are truncated, the data sources are very limited in scope and several assumptions had to be made. Therefore, this study should be viewed as a first attempt to quantify the costs and benefits of ECP, and not as the last word on the subject. Given the data limitations, conservative assumptions were made throughout so as not to overstate the benefits.

Previous studies that compared various payments methods have focused exclusively on the cost side.[5] But even though one payments instrument may be cheaper than another, it is more efficient only if its net social benefits are higher than those of the alternatives. To determine whether that is the case, benefits must also be taken into account. For example, even though bicycles are cheaper than cars, one would not recommend that bicycles be substituted for cars without evaluating the relative benefits of each mode of transportation. Omitting consumer preferences from an analysis of the costs and benefits is likely to yield biased results. While comparing consumer valuation across the various payments methods is difficult, the consumer valuation of ECP can be assumed to be similar to that of the paper check—ECP is in many ways a close substitute for traditional checking.

Some evidence suggests that the unit social cost of automated clearing house (ACH) processing is lower than the unit social cost of paper check processing.[6] The ACH results have been generalized to other electronic payments. Unlike ACH, however, ECP is not a fully electronic payments method. Even with check truncation, a transaction originates with a paper check, and only later is the physical item truncated and transformed into an electronic item. Other forms of ECP currently offered by the Federal Reserve—and the majority of checks currently processed with ECP—still involve the costly transport of paper checks to the paying bank and from there to the payor. Since at least some paper processing is involved, ECP is likely to have a higher per-item cost than ACH. On the other hand, it also has the additional benefit that bank customers may continue writing checks as they have before.

Under ECP with truncation, however, check writers would not get their canceled checks back. Many paying banks send canceled checks and a

[1] Humphrey (1996).

[2] Float is discussed in more detail in Section III below.

[3] If the check is forwarded to the paying bank, but not to the check writer, the process is usually called check safekeeping. See the box on page 34 for a list of key terms used in this article.

[4] Throughout the study, it is assumed that ECP would be adopted voluntarily (that is, it would not be mandated).

[5] Previous studies compared the cost of paper check processing to the cost of the automated clearing house (ACH). See Humphrey and Berger (1990) and Wells (1996). No studies have compared ECP or truncation to any other payments method.

[6] The ACH system is an electronic funds transfer system which can be used to make either credit transfers or debit transfers. Humphrey and Berger (1990) estimated the social cost of a check transaction to be $0.79 and the social cost of an ACH transaction to be $0.29 (in 1993 dollars, the numbers are $1.00 and $0.37, respectively). Wells (1996) used 1993 data to estimate the social cost of a check transaction at $2.78 to $3.09 and the social cost of an ACH transaction at $1.15 to $1.47. Although the general result is consistent across the two studies—an ACH transaction costs about one-third to one-half as much as a paper check transaction—the discrepancies in the results show that the estimates of the social costs of each payments method are sensitive to specific assumptions.

monthly statement to their customers without charge.[7] With truncation, the account-holder and the paying bank would have to voluntarily give up canceled checks (which the evidence suggests account-holders value). Some evidence suggests that the paying bank might have to start to charge its customers explicitly for sending them their canceled checks to provide an incentive for giving them up.[8] Indeed, several banks that safekeep checks charge those customers who insist on getting their canceled checks in the mail every month.[9] Without sufficient incentive to convince the account-holder to forgo his canceled checks and to assure the paying bank that it would remain competitive while truncating checks, ECP is unlikely to be adopted voluntarily even if its overall net benefits are positive.

Under the current paper check environment, the depositary bank bears the cost of processing checks by an intermediary (if an intermediary is involved) and of transporting checks to the paying bank. If the paying bank chooses to have its checks truncated by a Reserve Bank (the Federal Reserve truncated 417 million checks during 1996), the paying bank has to bear the cost of truncation. Those costs would be directly or indirectly transferred to check writers. Therefore, not only would the payor have to give up his canceled checks, but his other costs could potentially increase. In other words, voluntary ECP adoption might require a redistribution of any resulting savings.

Redistribution of risk is another reason why voluntary ECP adoption might prove difficult. Under the current legal system, the paying bank is not obligated to release funds if the paper check is not presented. The condition can be modified only by mutual agreement between the paying and the depositary (presenting) banks. When checks are presented electronically, the paying bank may be unable to inspect the check for fraud before it has to decide about paying it (and would never see the check under the early truncation scenario). As a result, the paying bank's risk increases. Thus, ECP may shift some of the risk of fraud onto the paying banks.

This article compares the social costs and benefits of ECP with truncation to those of paper check collection. The study assumes that "on-us" checks are safekept by the paying bank, while "on-others" checks are truncated, either by the bank of first deposit or by an intermediary, such as a clearing house or a Reserve Bank. In each case, costs and benefits for each party involved in the process are itemized. Truncation is assumed to be universal, since under partial truncation fixed costs such as sorting equipment and transport would have to be distributed over a smaller number of checks, leading to higher costs and lower net benefits. In practice it might be difficult to achieve universal ECP with voluntary acceptance by the banks. Partial ECP or truncation would still reduce sorting and transport costs, but the savings may not accrue proportionally to the number of checks. The diagrams (Figures 1, 2, and 3) illustrate the scenarios considered: paper check processing (the basis of comparison), truncation by the bank of first deposit, and truncation by an intermediary.

The study finds that ECP with check truncation would increase social benefits by 2.39 cents per check, or about $1.4 billion per year compared with paper check processing. However, the numbers should be used very cautiously. First, the numbers do not include any transition costs and are based on data that were collected from very limited sources. Second, this analysis assumes that all checks would be truncated. The results may vary under other forms of ECP. On the one hand, at least some of the costs of collection eliminated under truncation would still have to be incurred. On the other hand, the benefits of ECP without truncation would be greater as well, since consumers would continue receiving their canceled checks back. Third, the analysis does not include potential substitution effects—consumers could switch to alternative means of payments if they could not receive their canceled checks.

The next section describes the assumptions used in the study, focusing on some of the details associated with check truncation. The following section presents the study results. Section III analyzes why the private market has not already transformed the check payments system to truncation and describes briefly the policy issues involved. Section IV describes some other possible truncation scenarios, and section V offers conclusions.

[7] Of course, banks do not really provide check services for free. However, the charges often take a form of minimum balances or very low or even zero-interest checking accounts.

[8] Alternatively, the paying bank could share some of its gains from truncation and offer its customers money if they agreed not to get canceled checks.

[9] For example, Bank of America charges its customers $1 per month for the return of canceled checks. Some banks offer check image statements instead of canceled checks. However, some states grant consumers the right to receive their canceled checks, which inhibits banks from providing safekeeping.

Figure 1

Paper Check Processing

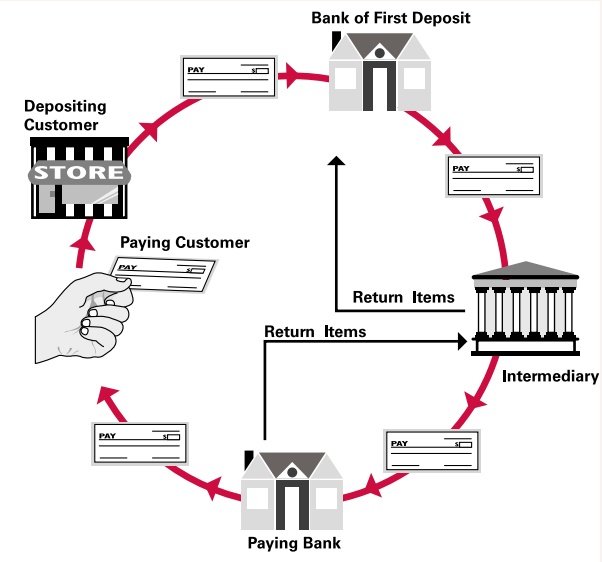
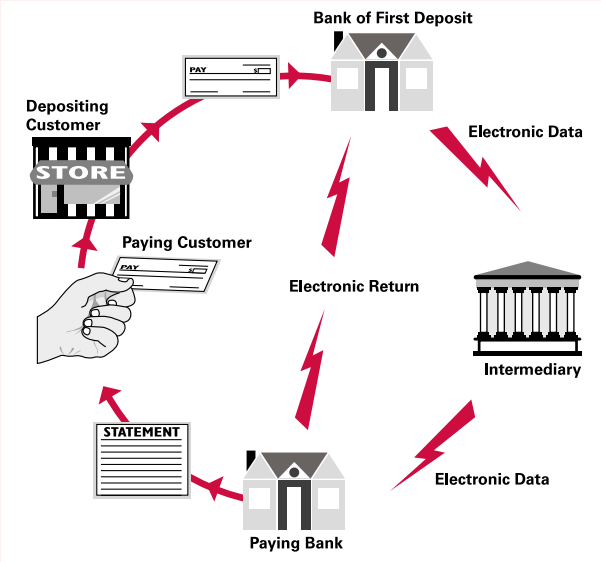


Figure 2

Truncation at the Bank of First Deposit



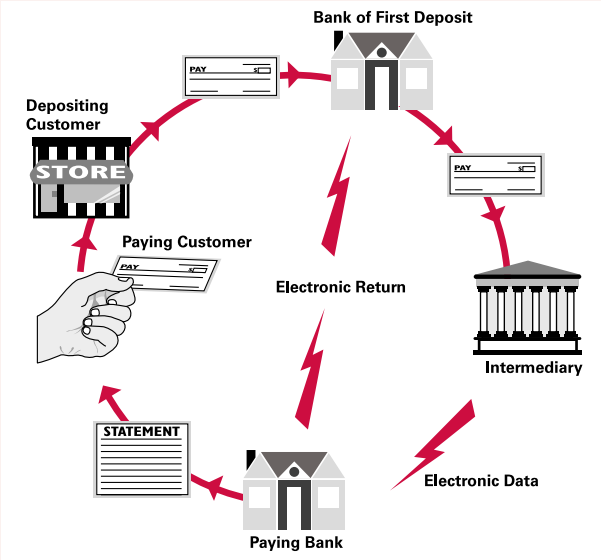
I. Who Truncates the Checks?

With paper check processing, each institution involved in the process handles and sorts checks. The depositary bank bears the cost of the collection process until the checks reach the paying bank. The paying bank, in turn, bears the costs of check handling inside that bank and of preparing and mailing the checks and a monthly statement to the payors. Compared with paper processing, the implementation of ECP and truncation reduces or eliminates the bulk of handling/sorting and transport costs; adds new costs of initiating and transmitting electronic records instead of paper checks; reduces the utility of check writers who like to receive their canceled checks; and, through earlier presentment, accelerates debiting of the payor's account and thus reduces float.

The costs of ECP depend on the specific scenario of payments processing: if and where truncation takes place, who safekeeps the checks, what constitutes presentment, and how return items are initiated.[10] It is assumed that all on-us checks are safekept by the paying bank, but are otherwise processed as usual.

Figure 3

Truncation by an Intermediary



[10] A return item is a check that is not honored by the paying bank.

The remaining (on-others) checks would be truncated. Since the cost savings of ECP arise mainly from fewer handlings and lower transportation costs as compared to paper presentment, an ideal case may be one where truncation of the check takes place at the bank of first deposit (the bank of first deposit scenario).[11] The net benefits of ECP under the bank of first deposit scenario are bound to be higher than the net benefits of ECP where truncation takes place later in the process. For example, if checks were truncated at the paying bank, most of the transport and handling costs would already have been incurred. It makes sense, therefore, to start the analysis with the scenario of truncation at the bank of first deposit.

It is not reasonable, however, to assume that *all* checks are truncated at the bank of first deposit. Smaller institutions may not have the capability to capture and transmit check data electronically,[12] or they may not be willing to undertake the risk of storing the checks while waiting for information about returns and the risk of safekeeping the remaining checks for the statutory retention period. In addition, significant economies of scale in the safekeeping and retrieval process may make concentration of those activities at the intermediary level much more efficient than dispersing them among thousands of banks.[13] Therefore, this study assumes that some banks of first deposit would have the checks that they are collecting truncated by an intermediary, such as a clearing house or a Reserve Bank.[14]

The fraction of on-others checks that are assumed to be truncated at the bank of first deposit is based on the results of a Federal Reserve System (1996) survey. The survey asked, among other things, whether a depository institution was willing to "store checks and retrieve information on behalf of multiple paying institutions." A depository institution that responded "yes" to the question is assumed also to be willing to truncate deposited checks.

In the survey, 13 percent of the depository institutions responded "yes" to the question whether they were willing to store and retrieve checks. However, larger institutions were more willing to store and retrieve checks than smaller institutions.[15] Because larger depository institutions process more checks, this study gives their willingness to store checks greater weight (in proportion to asset size[16]) in projecting the fraction of checks likely to be truncated at the depositary bank. The overall percentage of institutions willing to store and retrieve checks, weighted by the size of the institution, was 25.63 percent. While the volume of checks processed may not be spread proportionally to bank size, it was assumed that 25 percent of checks would be truncated by the bank of first deposit. The remaining on-others checks are assumed to be truncated and safekept by an intermediary, such as a clearing house or a Reserve Bank.

While all the cost and benefit categories are listed, the study measures primarily the costs and benefits to the financial institutions involved. The scenario considered here does not include check imaging.[17] Although imaging may turn out to be crucial for ECP to be widely adopted, imaging represents a separate feature and the benefits and costs of providing check imaging should be estimated separately. Since the study focuses on the costs and benefits of moving from paper check to truncation, the numbers represent deviations from the costs or benefits of traditional paper check processing, and not the absolute costs (or benefits) of ECP processing. Some of the costs remain unchanged under either payments method, such as check printing and payor costs.[18]

When commercial bank cost data are not available, bank costs are approximated using the Federal Reserve's unit costs or fees for Federal Reserve ser-

[11] Truncation could take place even earlier in the process, namely at the point of sale (the POS scenario). Since the POS scenario involves a different processing mechanism, it should be analyzed separately. A close alternative to the POS scenario is the use of a debit card.

[12] Although they would have to be capable of receiving electronic presentment if ECP were universal, even if checks were not truncated.

[13] The extent of scale economies depends on the technology used. For example, scale economies are likely to be more significant in check imaging than in microfilming.

[14] Because of their availability, Federal Reserve cost data are used in this study. Other intermediaries' processing costs may vary from the Federal Reserve's costs.

[15] The respondents were segmented into six categories according to the size of their assets.

[16] The Federal Reserve survey collected no information on the size of deposits for the financial institutions. However, assets and deposits tend to be correlated.

[17] Check imaging is a process whereby a copy of one or both sides of the check is taken. The digitized copies of canceled checks are stored in electronic files that can be delivered via CD-ROM, tapes, diskettes, or paper. Some people consider check images to be acceptable substitutes for canceled checks.

[18] The payor's costs include the time spent on writing and mailing checks as well as the costs of postage. Although ECP would not alter the payor costs, it would require minor behavioral changes by the payors. In particular, payors who use their canceled checks to reconcile their records would now have to record the payee and amount at the time of writing the check.

vices. Below is a summary of the assumptions used in the study:

1. On-us checks (33.3 percent of all checks[19]) are processed the same way as with paper presentment, but are safekept by the paying bank.
2. Of the remaining items (66.7 percent of all checks), 25 percent are truncated by the bank of first deposit, and 75 percent by an intermediary (see above).
3. MICR (Magnetic Ink Character Recognition) line data are transferred and presented electronically to the paying bank. The average cost of sending an ACH TRX record is used as a proxy for the cost of ECP data transmission.[20]
4. For the approximately 10 percent of checks that currently are collected in more than one day, ECP and truncation speed up the collection process by one day. In other words, ECP speeds up collection by 1/10 of a day.[21]

II. Results

On-Us Items

On-us items comprise 33.3 percent of all checks. Table 1 presents a summary of the costs and benefits of safekeeping of on-us checks by the financial institution as compared to paper check processing.[22] The major additional cost in this case is the paying customer's loss of canceled checks. However, that cost is also reflected in the key benefit, namely the paying bank's lower handling and postage costs in not having to mail those checks to the paying customer. Note that the depositing customer is not affected by check safekeeping. The overall net benefit is positive and amounts to less than 1 cent per item. See Appendix A for detailed cost and benefit calculations.

Table 1
ECP: Per-Item Costs and Benefits for On-Us Items Safekept by the Financial Institution, Compared to Paper Check Processing

	Additional Costs (¢)	Additional Benefits (¢)	Net Benefits (Costs) (¢)
Depositing Customer	0	0	0
Paying Bank	.18	4.55	4.37
Paying Customer	3.50	0	(3.50)
Total	3.68	4.55	.87

Items Truncated by the Bank of First Deposit

One-quarter of on-others items (16.7 percent of all checks) are assumed to be truncated by the bank of first deposit. Table 2 presents a summary of the costs and benefits of truncation by the bank of first deposit as compared to forwarding the paper check for collection. Note that the net benefits are positive and significantly higher than for on-us items. However, the distribution of costs and benefits varies. As with on-us items, paying customers experience the loss of their canceled checks. They also lose from the earlier debiting that ECP makes possible (that is, reduction in float). The depositing customer gains a similar amount from the reduction in float. The other major gains come from lower handling, transport, and postage costs at each stage of the collection process since the physical checks stop at the bank of first deposit. See Appendix B for detailed cost and benefit calculations.

Table 2
ECP: Per-Item Costs and Benefits for Truncation by the Bank of First Deposit, Compared to Paper Check Processing

	Additional Costs (¢)	Additional Benefits (¢)	Net Benefits (Costs) (¢)
Depositing Customer	0	1.60	1.60
Bank of First Deposit	.87	1.04	.17
Intermediary	.30	1.90	1.60
Paying Bank	.30	7.12	6.82
Paying Customer	5.22	0	(5.22)
Total	6.69	11.66	4.97

[19] Based on Federal Reserve estimates.

[20] The TRX is designed to resemble a paper check cash letter. It allows for transmission of multiple items at once, thereby reducing the per-item delivery costs significantly relative to the cost of transmitting an individual ACH item.

[21] Most checks are already cleared overnight under the current paper environment (see Bank Administration Institute 1994 and American Bankers Association 1994). Estimates of the fraction of checks collected overnight vary from around 80 to 90 percent. It is assumed here that with ECP, 10 percent of checks would be cleared one day earlier.

[22] In the case of on-us checks, the depositary bank is also the paying bank. Here, the bank costs and benefits for on-us checks were included in the amounts for the paying bank.

Items Truncated by an Intermediary

Three-quarters of on-others items (50 percent of all checks) are assumed to be truncated by an intermediary such as a Reserve Bank or a clearing house. Table 3 presents a summary of the costs and benefits of truncation by an intermediary as compared to collecting the paper check. Note that the social cost of truncation is almost identical whether a check is truncated by the bank of first deposit or by an intermediary, but the social benefit is greater when a check is truncated earlier in the process. The paying bank and the intermediary are better off if truncation takes place at the bank of first deposit. Neither depositing nor paying customers are directly affected by where the checks are truncated. See Appendix C for detailed cost and benefit calculations.

Table 3
ECP: Per-Item Costs and Benefits for Truncation by an Intermediary, Compared to Paper Check Processing

	Additional Costs (¢)	Additional Benefits (¢)	Net Benefits (Costs) (¢)
Depositing Customer	0	1.60	1.60
Bank of First Deposit	0	.52	.52
Intermediary	.83	.78	(.05)
Paying Bank	1.00	6.69	5.69
Paying Customer	5.22	0	(5.22)
Total	7.05	9.59	2.54

All Checks—A Summary of Costs and Benefits

Table 4 summarizes the overall social costs and benefits per check, including on-us as well as on-others checks, truncated by the bank of first deposit or by an intermediary. The costs and benefits are weighted according to the share of checks in each category: 33.3 percent on-us (safekept), 16.7 percent truncated by the bank of first deposit, and 50 percent truncated by an intermediary.

Several conservative assumptions were made: Benefits to the bank of first deposit are likely to be undervalued, as the benefits of decreased risk and fraud are assumed to be zero; and the costs to the paying bank are probably overestimated, because the paying bank costs of processing ACH items are assumed here to be as high as the costs of paper check handling. On the other hand, the cost to the paying customer of not receiving canceled checks may be over- or undervalued, as it is estimated based on limited experience with individual consumers, with no data available on business customer preferences. Because of the lack of data, the one-time costs of transition to ECP are not included in this study.[23]

Table 4
ECP with Truncation: Weighted Average Per-Item Costs and Benefits, Compared to Paper Check Processing

	Additional Costs (¢)	Additional Benefits (¢)	Net Benefits (Costs) (¢)
Depositing Customer	0	1.07	1.07
Bank of First Deposit	.14	.43	.29
Intermediary	.47	.71	.24
Paying Bank	.61	6.05	5.44
Paying Customer	4.65	0	(4.65)
Total	5.87	8.26	2.39

The overall net benefits are positive. If the on-us checks were safekept and the on-others checks were truncated either by the bank of first deposit or by an intermediary, society would save 2.39 cents per check. Approximately 60 billion checks are collected each year.[24] If all the checks were truncated, the total annual savings would amount to 60 billion $\times$ 2.39¢ = \$1.434 billion. Note, however, that the paying customer loses as a result of truncation. Without redistribution, the depositing customer (and possibly his or her bank) captures the bulk of the social gains realized in moving from paper check processing to ECP with truncation.[25] While the paying bank would also ben-

[23] The transition costs are likely to be significant, but the per-item cost, taking into account all the future volume of truncated checks, may well be very small.

[24] Some checks are already presented electronically. However, only a very small fraction are truncated.

[25] The results indicate that universal ECP with truncation is not Pareto superior (that is, some parties could be made worse off by a transition to full truncation). However, the analysis is based on the Kaldor-Hicks criterion (N. Kaldor, *Economic Journal* 1939, and J.R. Hicks, *Economica* 1940), a standard approach to carrying out welfare comparisons in a comparative static context. The essence of the Kaldor-Hicks criterion is that state A is preferred to state B if those who gain from a move to A can compensate those who lose and still be better off. Obviously, compensation is hypothetical and the criterion suggests that A is preferable to B even if compensation does not actually take place. Hence, the Kaldor-Hicks test strives to separate efficiency considerations from distributional considerations.

Key Terms

Automated Clearing House (ACH): An electronic payment system that allows for debit or credit transfers of funds without the use of paper checks.

Check Float: The amount generated when the payee gets credit before the payor of the check is debited.

Check Imaging: A process whereby a copy of one or both sides of a check is taken to produce a digitized picture of the canceled check that can be stored in an electronic file and delivered via transmission, CD-ROM, tape, or diskette.

Check Safekeeping: Stopping checks at the paying bank without forwarding them to the check writer.

Check Truncation: Stopping a check during electronic check presentment at some point before it reaches the check writer's bank, so that the paper check no longer follows the electronic file.

Depositary Bank: The bank where the check is first deposited, typically the bank that collects the payment. Also the collecting bank.

Electronic Check Presentment (ECP): A check collection process whereby a check is cleared based on the information contained in an electronic file instead of the actual paper check.

Intermediary: A financial institution (for example, a Reserve Bank or a clearing house) that provides payments services, such as check processing or check truncation, to other financial institutions.

MICR Line: Magnetic Ink Character Recognition, a line of characters included at the bottom of a check and readable by check sorters. The MICR line includes the bank and account numbers and the dollar amount of the check.

On-Others Checks: Checks that are drawn on a different bank from the one where they are deposited.

On-Us Checks: Checks that are drawn on and deposited at the same bank.

Paper Presentment: A check collection process whereby a check is cleared using the physical paper item.

Paying Bank: The bank holding the funds against which the check is drawn.

Return Item: A check that is not honored by the paying bank.

efit, the paying bank could accrue most of its gains just with safekeeping, that is, without having its checks stopped earlier in the collection process.

III. Why Are We Not There Yet?

According to the Coase theorem (Coase 1960), market forces will always lead to an optimal allocation of resources if the following conditions hold: perfect information, no transaction costs, and no externalities affecting third parties. Since none of these conditions is met in the market for check truncation, it is not surprising that market forces have not yet taken us there. Neither paying banks nor their customers are certain that they can see a copy of a check whenever they want and that they will never be required to give a canceled check to a creditor on demand. Likewise, transaction costs associated with setting up another infrastructure for processing checks are likely to be significant. And network externalities (see below) are also present. The above may or may not constitute a reason for some form of government intervention.[26] While this study does not attempt to design an optimal form of government involvement, it is worthwhile to spend some time analyzing the obstacles that prevent the market from reaching universal check truncation.

Benefit/Cost Distribution

For the market to ensure the socially optimal solution, the recipients of the benefits should also bear the costs. Even though Table 4 above shows that the paying bank would benefit most from a transition to truncation, most of the benefit to the paying bank arises from check safekeeping, a process that can be introduced without ECP or truncation. Adding ECP brings only small incremental savings to the paying bank and higher costs to its customers. For universal ECP to be adopted voluntarily, the gross benefits would have to be redistributed among the participants to buy the consent of the payors. In particular, the depositary bank might have to pay the paying bank

[26] Even if the government has the same information as the consumers and cannot eliminate the transaction costs, the government may subsidize the acquisition of information or correct inefficiencies arising from incomplete contracts that may result from transaction costs. See Tirole (1989). The government can also redistribute gains and losses to shift incentives, or mandate changes that would eliminate banks' worries that their competitors will lure away their customers by returning canceled checks.

in order to induce the paying bank to accept check truncation early in the process.[27]

The current distribution of costs and benefits from check collection is an obstacle to a socially optimal shift to ECP with truncation, because the current allocation does not reflect social costs and benefits that result from individuals' decisions. In particular, check writers are not charged directly for the cost of check collection. Instead, that cost is buried in other costs of the depositary or the paying bank and their use of checks is subsidized by the other participants in the process. Such subsidies are likely to induce people to write more checks than is socially optimal, instead of switching to less socially costly options, such as ACH or truncation. Paying customers (check writers) would clearly lose with the new arrangement. If the loss to paying customers from check truncation caused them to switch away from checks to other payment instruments, the benefits to the society could be even greater than the estimates above.

Float

Check float is generated when the payee gets credit before the payor of the check is debited. Float is mainly an income transfer from the recipient of the check to the check writer (or from the depositary bank to the paying bank, depending on each bank's crediting system). However, float may also constitute a tax on transactions and as such may raise the social costs.[28] Even ignoring the effect of float on the overall social cost, float affects various parties involved in the process in different ways and can therefore change incentives for transition towards ECP. Depending on the bank's crediting system, electronic presentment could give depositing customers earlier availability of funds. By the same token, paying customers and their banks lose float as a result of earlier debiting. They are also the ones who have to accept the loss of their physical checks. Incentives to compensate for their loss of float may be necessary to induce paying banks and paying customers to accept check truncation, or to switch to any form of electronic presentment.[29]

This study makes some conservative assumptions regarding float. In general, it assumes that float does not represent a net social cost and therefore its elimination would not raise the social benefit. More specifically, the Federal Reserve System currently spends significant resources to reduce the float associated with serving institutions located in remote locations. Those resources would not have to be spent if ECP was implemented, leading to additional savings. Again, those savings are not included here, but if they were, they would add to the net benefit, thereby reinforcing the overall results of this study.

Check Safekeeping

The paying bank could save a significant amount with check safekeeping alone (stopping canceled checks at the paying bank without forwarding them to the check writer) even if checks were not truncated earlier in the collection process or not presented electronically. Check safekeeping by the paying bank without truncation also avoids some of the obstacles associated with truncation. With truncation, the paying bank cannot see the check when deciding whether to pay or not, cannot verify the payor's signature (although that option is rarely exercised by banks), possibly raising the risk of fraud. In order for the paying bank to accept truncation by other institutions, image capabilities might have to be available. Safekeeping also presents less uncertainty about check retrieval.

At the same time, however, safekeeping also seems to confront many of the same obstacles as check truncation. Some individual consumers and corpora-

[27] In most other systems where several institutions are interconnected in a network, parties involved in a transaction pay each other for performing a transaction (for example, credit cards or ATMs). Checks, however, are cleared without a fee being paid by the depositary bank to the paying bank for the collection of payment (known as par presentment). In the past, non-par checking involved a payment by the depositary or presenting bank to the paying bank.

[28] Several authors have argued that costs such as float serve as a tax on transactions and therefore impose real welfare costs. The argument has been applied to inflation (Bailey 1956). The argument here is that when interest rates are positive, the depositary bank and/or its customers have to raise some fees to compensate for the lost availability of funds. Since there is no consensus as to what the true cost of such taxes are, they are not included here. Their inclusion would only reinforce the results of this study, however, since ECP would reduce float and hence these associated costs.

[29] Again, according to the Coase (1960) theorem, market forces should allow for any costs associated with a given payments system to be passed onto the end-users and affect their decisions. For example, the depositary bank would pass on the costs of delayed availability (float) to its retail customers, who in turn would impose charges for check payments and would discourage payors from using checks. It is argued here, however, that the Coase theorem conditions are not satisfied in this market. High transaction costs associated with charging different fees for using different payments instruments prevent banks from passing on float costs to their customers and/or prevent retailers from passing on those costs to the end users. For example, gasoline stations used to charge more for using credit cards, but most have retracted the policy, most likely because of transaction costs.

tions are opposed to check safekeeping and demand their canceled checks back. The most efficient solution might be to charge customers for the incremental cost of receiving their canceled checks.[30] Some banks have already implemented such policies.[31] But even though some banks charge their customers for canceled checks and others provide check images instead, safekeeping is not yet common, mainly because of customer resistance. Note that the results of this study are sensitive to the specific assumption about the distribution of consumers' valuation of (willingness to pay for) receiving canceled checks.

Network Externalities

In the presence of network externalities, a product's value increases, the more widespread the use of the product. For example, the more people who own a fax machine, the more valuable my fax machine is to me, since I can communicate with a larger network of people. In the case of ECP, network effects are likely to be present as well.

The costs and benefits of ECP are likely to be affected by the number of financial institutions truncating checks and receiving electronic files. The more banks have truncation capabilities, the more likely banks are to "communicate" directly with each other to avoid sorting and shipping paper, and the higher the benefits to each paying bank.[32] In other words, the bigger the network of participating banks, the lower the costs and the higher the benefits to other participants. If a centralized storage and retrieval system were established, it might give rise to significant network economies. Intermediary processing costs will also decrease as more banks truncate checks and accept electronic files instead of paper checks. While the conversion of a single bank to electronic presentment might save some check processing costs, it would not eliminate the need for transport. But if all banks converted to electronic presentment, there would be no need for transport, leading to much larger savings. With universal truncation, an intermediary might not have to do any paper handling or distribution, and banks might be able to avoid the cost of having two parallel infrastructures (that is, one for paper and one for electronic check processing).[33] Therefore, truncation of the last paper check will bring the highest marginal benefit. Because of network externalities, electronic presentment has attributes of a public good: Each bank's investment in the transition to ECP benefits other banks.

Dynamic Considerations

There is some evidence that scale economies exist in electronic data processing (Bauer and Hancock 1995; Bauer and Ferrier 1996). Scale economies are also likely to exist in the case of ECP, since some of the required fixed costs are likely to be the same for a small bank as they are for a big bank. The scale economies will likely lower the per-item cost of ECP processing as the volume increases. At the same time, scale economies in paper check processing have been largely exhausted (Bauer and Ferrier 1996). Moreover, at any level of volume both the fixed and the variable costs of ECP are likely to decline over time. For example, hardware, software, data compression, and data transmission will most likely get cheaper. At the same time, the cost of paper check processing has been relatively constant over time and is likely to remain constant or rise in the near future.

These factors and the network externalites mentioned above suggest that the per-item cost of truncation relative to the cost of paper check collection is going to decline over time, and that the net benefits of truncation as compared to paper check presentment will increase (see Figure 4). Banks may be waiting for cheaper technology. In addition, many banks have recently been involved in structural changes (such as mergers or acquisitions), which pushed the transition to electronic check payments down their priority lists.

Transition Costs

No information is available about the magnitude of the costs that would be involved in the transition

[30] That scenario may not be feasible if network externalities exist. In the presence of network externalities, a customer's request for canceled checks affects the cost of serving other customers. For example, sending canceled checks to even one customer involves a fixed cost of transport and sorting equipment.

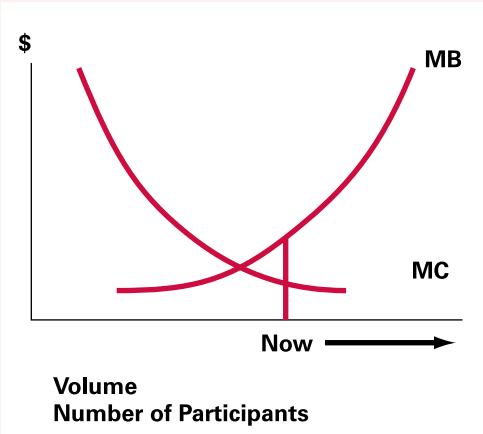
[31] About 56 percent of banks participating in the American Bankers' Association's 1996 Check Processing Survey offer "price or other incentives to customers for participation in check safekeeping program," and about 29 percent "charge customers for not using the check safekeeping option." (The fraction of banks varies by size category; both numbers are weighted averages.) Typical charges involve set monthly fees if a consumer wants to receive canceled checks.

[32] Currently, many smaller banks do not know how to set up ECP and are not even considering the process. The more widespread ECP becomes, the more likely is the information about the process to be widely available to other banks.

[33] The cost of maintaining the two infrastructures has been mentioned by banks as one of the main obstacles to ECP adoption.

Figure 4

Increasing Marginal Benefit and Decreasing Marginal Cost of ECP



from the current paper-based environment to universal check truncation. Besides the costs associated with setting up initial processing infrastructure and storage facilities, there would possibly be other, second-order costs. For example, if checks were truncated and stored by the depositary bank, the depositary bank would be a "monopoly" provider of processed checks. The fees that the depositary bank would charge the paying bank for requested check retrievals might need to be regulated. For checks truncated by the Federal Reserve, start-up costs would likely be lower, but might include additional space and equipment.

Even though the start-up costs are likely to be significant, the per-item cost could well be small when the total cost is allocated over the life of the investment. The problem, however, is that banks have made large investments in paper check infrastructure and can now process checks at a relatively low marginal cost. Even though transition to ECP would save them money in the long run, the interim period involves significant and uncertain fixed setup costs, followed by the cost of maintaining a dual infrastructure for some time.

IV. Selected Item Truncation

This study has focused on universal check truncation, where all the interbank checks would be truncated. Some of the options considered by the financial institutions involve truncation of selected items only. In particular, several members of the banking industry have supported truncation of low-dollar items only (that is, checks below a certain dollar amount). The advantage of low-dollar truncation is that it would introduce relatively little risk. Since check truncation makes signature verification more difficult, collecting high-dollar checks the "old-fashioned" way would minimize the risk of forgery on those items. Low-value checks are rarely inspected anyway. At the same time, however, all the banks would have to lay out the initial transition costs that are necessary to start truncation, with limited benefits in return. In particular, transportation arrangements could not be changed, because high-dollar checks would still have to be delivered to paying banks. Thus, the per-item cost would be higher than with universal truncation. Any selected-item truncation would possibly require additional passes through a sorter, which would also raise the overall processing costs.

Other options include truncation of high-dollar items, of returns, or of checks written by a selected group of customers. High-dollar truncation would eliminate most of the float (since float is directly proportional to the check value) but would possibly exacerbate the risk issues. As mentioned above, the probability of check forgery would be higher with truncation, and the potential loss is larger, the higher the check value. Truncation of return items only would require that all physical items be transported to the paying bank, thereby eliminating most of the savings from truncation. These scenarios would have to be analyzed separately in detail. The approach outlined above can be used for the various scenarios by altering individual components of the cost and benefit lists.

V. Conclusions

This article has compared the social costs and benefits of electronic check presentment with truncation to those of paper check processing. The study has assumed that all on-us checks are safekept by the paying bank, while all on-others checks are truncated, either by the bank of first deposit or by an intermediary, such as a Reserve Bank. Even though ECP with check truncation was found to raise the net social benefits by 2.39 cents per check, or around $1.4 billion per year, several obstacles may prevent the private market from reaching universal truncation in the near

future. The obstacles include transition costs, network externalities, uneven distribution of savings, an interim period of dual check processing (paper and electronic), and uncertainty surrounding check or image retrieval by paying banks. Attainment of voluntary and universal truncation means that all banks would have to accept it. And even if truncation were universally accepted, it is not yet clear whether the Federal Reserve check processing system is capable of handling universal ECP.

Despite these obstacles, there are reasons that it might be socially desirable to encourage ECP (through pricing policies, for example). It has been shown that in the presence of network externalities, the market may provide a smaller network than is socially optimal.[34] Both the dynamic effects and the network externalities suggest that the higher the volume of truncated checks, the lower the marginal cost and the higher the marginal benefit of ECP. As a result, the net benefit of ECP will increase over time (see Figure 4). Even if financial institutions do not view ECP as cost-effective today because their short-run benefits do not outweigh their initial costs, there may be reasons for some price incentives that would induce truncation until the service becomes profitable and truncated checks become widely accepted by the paying customers. That may be true especially because the benefits from truncation are nonlinear—with only partial truncation, fixed costs of transportation would have to be distributed over a smaller number of checks. However, the results presented here are too preliminary to specify any exact policy recommendations.

APPENDIX A

On-Us Items Safekept by the Paying Bank (Table 1)

I. COSTS
  A. DEPOSITING CUSTOMER
     Total Additional Costs for Depositing Customer: unchanged
  B. BANK OF FIRST DEPOSIT/PAYING BANK
     1. Microfilm and storage of paper checks for 60 days. The cost of microfilm is 0.6¢ per item,[35] but the bank microfilms checks under paper presentment as well. The cost of physical item storage and destruction is assumed to equal 0.07¢.[36]
     2. Retrieval and return of requested items. The paying customer may request selected physical items from his or her bank. The cost of retrieving and sending an item is $1.12.[37] Assuming that 0.1 percent of items are requested under check safekeeping,[38] that yields 0.11¢ per safekept item.

     Total Additional Costs for Financial Institution = 0.18¢
  C. PAYING CUSTOMER
     1. Loss of canceled checks. Market research surveys show that consumers lose utility as a result of not getting their checks back. An average consumer's willingness to pay to get canceled checks back is assumed to be $1 per month.[39] Assuming that the value is distributed symmetrically around the mean, and that an average household writes 30–40 checks per month, the per-check loss from not receiving canceled checks is assumed to be 3.5¢.[40, 41]

     Total Additional Costs for Paying Customer = 3.5¢

[34] See, for example, Economides (1996).

[35] Based on the 1996 fees charged by the Federal Reserve for microfilm. The fees range from 0.02¢ to 1.0¢ per item, with an average fee of 0.6¢.

[36] Based on a survey of Reserve Bank costs of physical item storage and destruction, conducted by the Federal Reserve's Check Pricing Strategy Group.

[37] Based on the average 1996 fees charged by the Federal Reserve for MICR enhancement and truncation retrieval.

[38] Based on Federal Reserve Bank of Atlanta (1979).

[39] A market research study conducted by Abt Associates, Inc. found that "[a] significant percentage of customers will accept not receiving their checks back (safekeeping) when offered $1.00 to $1.50 as a trade-off" (Abt Associates, Inc. undated, p. 3). Several banks that safekeep checks charge their customers $1 per month for the option of receiving canceled checks. When Bank of America introduced the charge, one-half of their individual and small business customers chose safekeeping, the other half chose to pay $1 per month to avoid it.

[40] According to Abt Associates, Inc. (undated), households write 8–10 checks per week. Small commercial customers write about 60 per week, while large corporations write over 6,000 per week. The 30–40 checks per month is based on the number for households and may therefore be an underestimate. Business customers are likely to be willing to pay more per month to get their canceled checks back, but since that amount would be divided by a much larger number of checks, the per-item amount could be higher or lower than that for individual consumers.

[41] How consumers value getting canceled checks depends in part on whether images are substituted for checks. Images are sometimes considered viable substitutes for paper checks, in part because the payee information has to be included for an acceptable legal proof. For example, the Internal Revenue Service accepts a bank statement as a sufficient proof of payment, as long as the name of the payee is included. Alternatively, the taxpayer may show a paid invoice or other evidence. Although including payee information under ECP is currently too expensive, it might be possible to include the image of the payee line only. In the POS scenario, the payor receives his or her check back at the point of sale (then the transaction is electronic and the payee information is included).

II. BENEFITS
  A. DEPOSITING CUSTOMER
     Total Additional Benefits for Depositing Customer: unchanged
  B. BANK OF FIRST DEPOSIT/PAYING BANK
     1. Lower handling and postage costs. There are no paper checks to be mailed to customers, although a statement has to be printed and mailed. Postage and handling savings from check safekeeping are assumed to equal 4.55¢.[42]

     Total Additional Benefits for Financial Institution = 4.55¢
  C. PAYING CUSTOMER
     Total Additional Benefits for Paying Customer: unchanged

APPENDIX B

Items Truncated by the Bank of First Deposit (Table 2)

I. COSTS
  A. DEPOSITING CUSTOMER
     Total Additional Costs for Depositing Customer: unchanged
  B. BANK OF FIRST DEPOSIT
     1. One-time costs of transition to ECP (hardware, software, staff training, and the like). Banks can use existing sorters, but may need to get equipment that would transfer MICR data into their computers. Some banks might need to invest in new technology to be able to receive electronic returns. Personnel costs may be significant. While the implementation costs may be high, no estimates of those costs are available. Because of the lack of data, the one-time costs of ECP adoption are not included in this study.
     2. Operating costs, including MICR line data formatting and preparing it for transmission. Most banks processing electronic payments through the Federal Reserve already pay for a Fedline connection or a dedicated leased line, so there is no incremental cost of transmission (although a high increase in volume may generate a need for another line or for an upgrade). There is no information about the cost of connection to other intermediaries. The cost of creating an electronic file is assumed to equal 0.04¢.[43]
     3. Microfilm and storage of paper checks for 60 days. The cost of microfilm is 0.6¢ per item,[44] but the bank of first deposit microfilms checks under paper presentment as well. The cost of physical item storage and destruction is assumed to equal 0.07¢ (see Appendix A, item I.B.1).
     4. Transmission of electronic data. The costs of transmission are assumed to be approximately the cost of ACH TRX. The Federal Reserve per-item fee for TRX processing is 0.3¢.[45] The cost of transmitting and settling of electronic checks is assumed to equal 0.3¢.[46]
     5. Research adjustment costs: higher under truncation, because it is more difficult to verify a mistake (for example, $23 could be mistaken for $32). Estimated to equal 0.4¢ for paper check processing and 0.6¢ for truncation.[47] Additional cost 0.2¢.
     6. Reject repair reentry. Rejected checks always require additional handling. With truncation, more of the MICR line information has to be read in. Estimated to equal 0.15¢ for paper check processing and 0.3¢ for truncation.[48] Additional cost 0.15¢.
     7. Return items. The physical items stay at the depositary bank. If the paying bank requests to see the returns, it is assumed to pay for sending those return items. Savings accrued by the depositary bank are in item II.B.3 below.
     8. Retrieval of requested items from the depositary institution to be sent to the paying bank. The paying bank may request selected physical items from the bank of first deposit. The cost of retrieving an item is $1.12.[49] Assuming that 0.1 percent of items are requested under check safekeeping,[50] that yields 0.11¢ per truncated item.

     Total Additional Costs for Bank of First Deposit = 0.04¢ + 0.07¢ + 0.3¢ + 0.2¢ + 0.15¢ + 0.11¢ = 0.87¢
  C. INTERMEDIARY
     1. One-time costs of ECP adoption (development costs). Not included in this study.[51]

[42] Berger (1985) estimated a per-item saving from check safekeeping to equal 3.124¢ in 1985 dollars. Using the U.S. Bureau of Labor Statistics' monthly CPI, that amount is equivalent to 4.55¢ in March 1996 dollars, or a 45 percent increase. Postal service rates have also increased by 45 percent since 1985 (*Statistical Abstract of the United States*, 1996). Other sources are consistent with Berger's updated estimate. American Bankers Association (1996) specified annual savings from check safekeeping by bank size category. A weighted average of the annual savings (using the number of checks processed by banks in each category) yields savings of $9.22 per year, or 3.84¢ per check. According to NACHA's (1996) results, the average savings to the paying bank from check safekeeping are $0.50 to $1.50 per account per month. That amounts to approximately 2¢ to 5¢ per check. According to the *Functional Cost Analysis* (1995, p. 8), the average cost per check for credit unions was 4.56¢ to 6.23¢ lower than the average cost per check for commercial banks, depending on the size of the institution. Most of these savings arise from safekeeping.

[43] The estimate is based on the Report of the Economic Model and Value Chain Working Group, presented before the ECP Industry Advisory Group (October 29, 1996).

[44] Based on the 1996 fees charged by the Federal Reserve for microfilm. The fees range from 0.02¢ to 1.0¢ per item, with an average fee of 0.6¢.

[45] A TRX holds 2 to 5 checks, with an average of about 3 items (based on information provided by the Federal Reserve Bank of Minneapolis). Using the current fees charged by the Federal Reserve, the average cost per item equals about 0.3¢.

[46] Economies of scale in ACH processing may lower the current average cost when large volume is processed. It is difficult to estimate the exact cost decrease.

[47] See footnote 43.

[48] See footnote 43.

[49] Based on the average 1996 fees charged by the Federal Reserve for MICR enhancement and truncation retrieval.

[50] Based on Federal Reserve Bank of Atlanta (1979).

[51] The cost of ECP adoption could be approximated by the cost of adopting electronic cash letters (ECLs) by Federal Reserve Banks, estimated to equal about $100,000 per Reserve Bank (according to

2. Editing and processing of the transmission from the bank of first deposit, data transmission to the paying bank, and settlement. Assume the per-item cost equals the per-item cost of ACH TRX processing, or 0.3¢.

Total Additional Costs for Intermediary = 0.3¢

D. PAYING BANK

1. Receiving and editing of electronic data. The cost of receiving the electronic transmission is assumed to equal the cost of sending the transmission and can be approximated using the cost of an ACH TRX. The average cost of receiving and posting electronic checks is assumed to equal 0.3¢.
2. Outgoing returns. Assume that returns are determined on the basis of electronic presentment, without seeing the physical items. Since the physical items will not be transported, the cost of return item processing is equal to the cost of transmitting the information about return items from the paying bank to the depositary bank electronically (the cost of item retrieval by the depositary bank is included in item II.B.3). The only additional cost is the marginal cost of the electronic information transmission to an intermediary or directly to the bank of first deposit. Assume 0.3¢ for 1 percent of the items (since 1 percent are returned on average), or 0.01 × 0.3¢ = 0.003¢ per item.
3. Higher risk. Signature verification would be more difficult, especially if check images are not provided. The paying bank would have to decide whether to pay or not without being able to examine the physical item. However, it is common knowledge that few check signatures are ever verified. Performance standards for ECP would also have to be established. No estimates of those costs are available.
4. Return items. If the paying bank requests to see the returns, it is assumed to pay for sending those return items. However, the paying bank would request the returns only if its marginal valuation of that service was at least as high as the marginal cost of the returns. Since the paying bank would both bear the cost and accrue the benefits of each return it requests, that cost category is not included.

Total Additional Costs for Paying Bank = 0.3¢ + 0.003¢ = 0.3¢

E. PAYING CUSTOMER

1. Loss of float. Assume truncation saves 1/10 day of float, the average value of a check is $1,150,[52] the 3-month T-bill rate is 5.14 percent,[53] for an average float loss due to earlier debiting of $1,150 × (0.0514/365/10) = 1.6¢.

   In addition, loss of float on checks in weather emergencies (snow or fog). The annual 1995 total float cost for the Federal Reserve System was $19 million on an annual volume of 15.465 billion checks (Federal Reserve's 1995 *Annual Report*). The average float cost was therefore 0.12¢ per item. Although some float exists with electronic processing (such as ACH), that float is negligible on a per-item basis.[54]
2. Loss of canceled checks. Cost equals 3.5¢ (see Appendix A, item I.C.1).

Total Additional Costs for Paying Customer = 1.72¢ + 3.5¢ = 5.22¢

II. BENEFITS

A. DEPOSITING CUSTOMER

1. No loss of float.[55] Assume that earlier availability under truncation saves 1/10 day in the average check presentment. Average float gain equals 1.6¢ (see item I.E.1).

Total Additional Benefits for Depositing Customer = 1.6¢

B. BANK OF FIRST DEPOSIT

1. Risk and fraud reduction. The bank of first deposit finds out about return items sooner and knows sooner not to make funds available. Less likely to miss deposit deadlines due to weather. Lower probability of fraud losses. On the other hand, MICR line presentment may increase fraud, since there is no signature or physical item as proof. Despite the added risk, ECP is believed to lower the overall risk;[56] any increased risk due to the inability to verify signatures is more than offset by reductions in risk due to faster presentment and return.[57] Since the risk reduction has not been quantified, assume that truncation does not lower risk.
2. Lower transport costs, from two sources of savings: (1) physical items are not sent to an intermediary, and (2) the intermediary's charges for the transport of physical items to the paying bank are eliminated.[58] Using the Federal Reserve's transport fees, save 0.4¢ on the average local item for each of the two sources, and 0.8¢ on the typical Interdistrict Transportation Service (ITS) charge. The total savings are 0.8¢ per local item (0.4¢ + 0.4¢), and 1.6¢ per interregional item (0.4¢ + 0.8¢ + 0.4¢). Assuming 70 percent of checks are local

Kerry Webb, Federal Reserve Bank of San Francisco). However, most Reserve Banks are already capable of processing ECP. Sunk costs should not affect future decisions.

[52] The average check value is from Wells (1996).

[53] As of 12/95, from *Federal Reserve Bulletin* (March 1996), p. A26.

[54] In 1995, the ACH float costs for the Federal Reserve System amounted to $95,490. Dividing that amount by the total ACH volume of 2.125 billion yields 0.004¢ per item.

[55] The depositing customers benefit from float only if the bank of first deposit passes on the float savings to them. Otherwise the bank keeps the float or the benefit could be shared between the customer and the bank.

[56] Based on conversations with representatives of financial institutions and based on the experience of the Electronic Check Clearing Service provided by the Federal Reserve Bank of Minneapolis.

[57] The information is based in part on the results of the Electronic Check Clearing Service carried out by the Federal Reserve Bank of Minneapolis.

[58] Note that the savings can be accrued only if all the items are truncated. In particular, high costs of local transportation in some Districts would not be decreased by partial truncation.

and 30 percent are interregional,[59] the weighted average benefit is (0.70 × 0.8¢) + (0.30 × 1.6¢) = 1.04¢.

3. Incoming returns. Lower cost under truncation, because it is cheaper to process electronic returns. Estimated cost 0.65¢ for paper check returns and 0.33¢ for electronic returns.[60] Benefit 0.32¢ per return, or 0.0032¢ per check (since 1 percent are returned on average).

Total Additional Benefits for Bank of First Deposit = 1.04¢ + 0.0032¢ = 1.0432¢

C. INTERMEDIARY

1. Fewer reader/sorter passes. The average item pass ratio is 1.44.[61] For items truncated at the bank of first deposit, truncation saves 2.88 passes on an interregional item (1.44 at the local intermediary and 1.44 at the non-local intermediary) and 1.44 passes on a local item (at the local intermediary). The cost of an average pass equals 0.75¢,[62] for total savings of 0.75¢ × 2.88 = 2.16¢ per interregional item. For local items, the total savings equal 0.75¢ × 1.44 = 1.08¢. Assuming that 70 percent of the items are local (including direct sends, which are billed as local) and 30 percent are interregional, the average per-item savings amount to (0.30 × 2.16¢) + (0.70 × 1.08¢) = 1.40¢.

   However, an average bank of first deposit item is handled by 2.35 commercial banks (including the bank of first deposit and the paying bank, but not Reserve Banks).[63] Check truncation would eliminate item handling and sorting by the other commercial banks, further increasing the benefits by 0.75¢ × 1.44 × 0.35 = 0.38¢ per item, for a total benefit of 1.78¢.
2. No loss of float on rejects or in weather emergencies. The average per-item float gain is 0.12¢ (see item I.E.1).
3. Return item savings. The paying bank would send an electronic message to the bank of first deposit (the bank of first deposit holds the physical item). Return items would not have to be transported to the paying bank and back to the bank of first deposit. However, those savings are accrued by the paying bank.

Total Additional Benefits for Intermediary = 1.78¢ + 0.12¢ = 1.90¢

D. PAYING BANK

1. Lower sorting costs. Only on-us items would be processed. Sorting of all the on-others items would be eliminated, for the savings of 1.44 passes per item at 0.75¢, for an average per-item saving of 1.44 × 0.75¢ = 1.08¢.
2. Reject repair reentry. Cost eliminated under truncation. Benefit 0.15¢.[64]
3. Reconcile balance. Lower cost for electronic data. Estimated cost 0.2¢ for paper check and 0.1¢ for electronic data.[65] Benefit 0.1¢.
4. Research adjustment. Lower cost for electronic data. Estimated cost 0.4¢ for paper check and 0.2¢ for electronic data.[66] Benefit 0.2¢.
5. Lower handling and postage costs. The paying bank has to process the electronic file. There is no conclusive evidence that the bank's unit cost of electronic payments processing (as approximated with the unit cost of ACH processing) is lower than the unit cost of paper check processing.[67] Despite the lack of evidence, however, the incremental cost of ACH is likely to be lower than the cost of check processing. For a conservative estimate of the savings, no benefit from electronic processing is assumed here. Postage and handling savings are the same as under check safekeeping and assumed to equal 4.55¢ (see Appendix A, item II.B.1).
6. Avoided cost of microfilm and storage of physical items: 0.6¢.[68]
7. Return item savings. Since returns are initiated based on electronic presentment and physical items are held by the bank of first deposit, savings arise from eliminated costs of qualifying and transporting return items. Using the Federal Reserve's charges for transport of physical items, the paying bank saves 0.4¢ on an average local item and 0.8¢ on a typical Interdistrict Transportation Service (ITS) charge. The total savings are 0.8¢ per local item (0.4¢ to the intermediary plus 0.4¢ from the intermediary to the bank of first deposit), and 1.2¢ per interregional item (0.8¢ for ITS plus 0.4¢ for local delivery to the bank of first deposit). Assuming 70 percent of checks are local and 30 percent are interregional, the weighted average benefit is (0.70 × 0.8¢) + (0.30 × 1.2¢) = 0.92¢. In addition, the paying bank saves the Federal Reserve per-item fee of 42.8¢ on each return item.[69] Since 1 percent are returned on average, the pay-

[59] Of the 15.5 billion forward items processed by the Federal Reserve System in 1995, approximately 30 percent were drawn on an institution in another Federal Reserve district.

[60] See footnote 43. The depositary bank would have to retrieve the return items. The numbers take into account the additional cost of return item retrieval.

[61] The average item pass ratio is based on Federal Reserve 1996 PACS data.

[62] See footnote 43.

[63] Federal Reserve Bank of Atlanta (1979), p. 67.

[64] See footnote 43.

[65] See footnote 43.

[66] See footnote 43.

[67] According to the Federal Reserve System's *Functional Cost Analysis 1994*, "National Average Report for Commercial Banks," the average cost per ACH transaction for banks with deposits over $200 million is 14.6¢ (total operating expense divided by volume, p. 44). The average cost per transit check (that is, a check drawn on any bank other than the subject bank) is reported to be 14.66¢. Wells (1996) also shows that bank processing costs for the two payments instruments are similar. However, representatives from large banks have stated that their cost of ACH processing is lower than their cost of paper check processing. It is also likely that increasing ACH volume would lower the average cost of ACH processing because of economies of scale.

[68] Based on the 1996 fees charged by the Federal Reserve for microfilm. The fees range from 0.02¢ to 1.0¢ per item, with the average fee of 0.6¢.

[69] Based on the average 1996 Federal Reserve per-item fee for qualified sorted Remote Check Processing Center (RCPC) premium items. Most of the returns are handled by a Reserve Bank.

ing bank saves 0.01 × (0.92¢ + 42.8¢) = 0.44¢ per item.

8. Lower fraud costs (early identification of return items). This benefit may be outweighed by a higher risk of fraud if presentment is defined as receipt of the MICR line. Assume no benefits.

Total Additional Benefits for Paying Bank = 1.08¢ + 0.15¢ + 0.1¢ + 0.2¢ + 4.55¢ + 0.6¢ + 0.44¢ = 7.12¢

E. PAYING CUSTOMER

Total Additional Benefits for Paying Customer: unchanged

APPENDIX C

Items Truncated by an Intermediary (Table 3)

I. COSTS

A. DEPOSITING CUSTOMER

Total Additional Costs for Depositing Customer: unchanged

B. BANK OF FIRST DEPOSIT

Total Additional Costs for Bank of First Deposit: unchanged

C. INTERMEDIARY

1. One-time costs of ECP adoption (development costs). Not included in the study.[70]
2. Data transmission to the paying bank. Assume the per-item cost equals the per-item cost of ACH TRX processing, or 0.3¢.
3. Physical item storage and destruction, assumed to equal 0.07¢ (see Appendix A, item I.B.1).
4. Forwarding of return items to the bank of first deposit and settlement of return items. Unchanged from traditional check processing.
5. Research adjustment costs. Higher under truncation, because it is more difficult to verify a mistake (for example, $23 could be mistaken for $32). Estimated to equal 0.4¢ for paper check processing and 0.6¢ for truncation.[71] Additional cost 0.2¢.
6. Reject repair reentry. More of the MICR line information has to be read in. Estimated to equal 0.15¢ for paper check processing and 0.3¢ for truncation.[72] Additional cost 0.15¢.
7. Retrieval of requested items from the intermediary to be sent to the paying bank. The paying bank may request selected physical items from the intermediary. The cost of retrieval is borne by the intermediary: 0.11¢ (see Appendix B, item I.B.8).

Total Additional Costs for Intermediary = 0.3¢ + 0.07¢ + 0.2¢ + 0.15¢ + 0.11¢ = 0.83¢

D. PAYING BANK

1. Receiving and editing of electronic data. The costs of receiving the electronic transmission can be approximated by the cost of ACH TRX. The average cost of receiving and settling of electronic checks is assumed to equal 0.3¢.
2. Check truncation fee. Even though an intermediary truncates checks, the paying bank is charged for truncation. The average per-item cost of truncation, including MICR data preparation and formatting, is assumed to equal 1.3¢.[73] However, that amount includes the cost of microfilming that the paying bank does anyway. The incremental cost of truncation is 1.3¢ − 0.6¢ = 0.7¢.
3. Outgoing returns. Cost equals 0.003¢ (see Appendix B, item I.D.2).
4. Higher risk. Signature verification would be more difficult, especially if check images are not provided. Paying bank would have to decide whether to pay or not without being able to examine the physical item. However, recent analyses of risk associated with check collection showed that very few check signatures are ever verified. Performance standards for ECP would also have to be established. No estimates of those costs are available.

Total Additional Costs for Paying Bank = 0.3¢ + 0.7¢ + 0.003¢ = 1¢

E. PAYING CUSTOMER

1. Loss of float. Cost equals 1.72¢ (see Appendix B, item I.E.1).
2. Loss of canceled checks. Cost equals 3.5¢ (see Appendix A, item I.C.1).

Total Additional Costs for Paying Customer = 1.72¢ + 3.5¢ = 5.22¢

II. BENEFITS

A. DEPOSITING CUSTOMER

1. No loss of float.[74] Assume truncation saves 1/10 day in the average check presentment relative to the physical item presentment. Average float gain equals 1.6¢ (see Appendix B, item I.E.1).

Total Additional Benefits for Depositing Customer = 1.6¢

B. BANK OF FIRST DEPOSIT

1. Risk and fraud reduction. Benefit assumed to equal 0 (see Appendix B, item II.B.1).
2. Lower transport costs. Intermediary's charges for the transport of physical items from the intermediary to the paying bank are eliminated.[75] Using the Federal Reserve's transport fees, save 0.4¢ on the average local item and 0.8¢ on the typical Interdistrict Transportation Service (ITS) charge. Assuming 70 percent of checks are local and 30 percent are interregional, the weighted average benefit is (0.70 × 0.4¢) + (0.30 × 0.8¢) = 0.52¢.

Total Additional Benefits for Bank of First Deposit = 0.52¢

C. INTERMEDIARY

1. Fewer reader/sorter passes. The average item pass ratio is 1.44 (see Appendix B, item II.C.1). Based on

[70] See footnote 51.

[71] See footnote 43.

[72] See footnote 43.

[73] Based on the 1996 electronic check presentment fees charged by the Federal Reserve. The average per-item fee for truncation MICR capture is 1.3¢. The service includes the electronic capture and delivery of the full MICR line.

[74] The depositing customers benefit from float only if the bank of first deposit passes the float savings to them. Otherwise the bank keeps the float or the benefit could be shared between the customer and the bank.

[75] Note that the savings can only be accrued if all the items are truncated. In particular, high costs of local transportation in some Districts would not be decreased by partial truncation.

the Federal Reserve structure, for items truncated by the first Reserve Bank, truncation saves 1.44 passes on an interregional item (at the other Reserve Bank), but no passes are saved on local items. The cost of an average pass equals 0.75¢, for total savings of 0.75¢ × 1.44 = 1.08¢ per item. Assuming that 70 percent of the items are local and 30 percent are interregional, the average per-item savings amount to 0.30 × 1.08¢ = 0.32¢.

However, an average bank of first deposit item is handled by 2.35 commercial banks (including the bank of first deposit and the paying bank, but not Reserve Banks).[76] Check truncation would eliminate item handling and sorting by the other commercial banks, further increasing the benefits by 0.75¢ × 1.44 × 0.35 = 0.38¢ per item, for the total benefits of 0.70¢.

2. No loss of float on rejects or in weather emergencies (snow or fog). The average per-item float gain is 0.12¢ (see Appendix B, item I.E.1). However, since checks have to be transported from the bank of first deposit to the intermediary, some float will remain. Assume two-thirds of the savings, since truncation by an intermediary eliminates transportation to the non-local intermediary and from the intermediary to the paying bank. Per-item savings are 0.08¢.
3. Return item savings. The paying bank sends an electronic message to the intermediary (the intermediary holds the physical item). Return items would not have to be transported to the paying bank and back to the intermediary. However, those savings are accrued by the paying bank.

Total Additional Benefits for Intermediary = 0.70¢ + 0.08¢ = 0.78¢

D. PAYING BANK

1. Lower sorting costs. Only on-us items would be processed. Sorting of all the on-others items would be eliminated, for the total savings of 1.44 passes per item, each at 0.75¢, for an average per-item saving of 1.44 × 0.75¢ = 1.08¢.
2. Reject repair reentry. Cost eliminated under truncation. Benefit 0.15¢.[77]
3. Reconcile balance. Lower cost for electronic data. Estimated cost 0.2¢ for paper check and 0.1¢ for electronic data.[78] Benefit 0.1¢.
4. Research adjustment. Lower cost for electronic data. Estimated cost 0.4¢ for paper check and 0.2¢ for electronic data.[79] Benefit 0.2¢.
5. Lower handling and postage costs. The paying bank has to process the electronic file. There is no conclusive evidence that the bank's unit cost of electronic payments processing (as approximated with the unit cost of ACH) is lower than the unit cost of paper check processing (see footnote 67). Despite the lack of evidence, the incremental cost of ACH is likely to be lower than the cost of check processing. For a conservative estimate of the savings, no benefit is assumed from electronic file processing. Postage and handling savings are the same as under check safekeeping and assumed to equal 4.55¢ (see Appendix A, item II.B.1).
6. Avoided cost of microfilm and storage of physical items: 0.6¢.[80]
7. Return item savings. Since returns are initiated based on electronic presentment and physical items are held by the intermediary, savings arise from eliminated costs of transportation. Using the Federal Reserve's charges for transport of physical items, the paying bank saves 0.4¢ on an average local item and 0.8¢ on a typical Interdistrict Transportation Service (ITS) charge. Assuming 70 percent of checks are local and 30 percent are interregional, the weighted average benefit is (0.70 × 0.4¢) + (0.30 × 0.8¢) = 0.52¢. However, the paying bank does not save the Federal Reserve per-item return fee, since the Federal Reserve has to handle the physical item. Since 1 percent are returned on average, the paying bank saves 0.01 × 0.52¢ = 0.01¢.
8. Lower fraud costs (early identification of return items). This benefit may be outweighed by a higher risk of fraud if presentment is defined as receipt of the MICR line. Assume no benefits.

Total Additional Benefits for Paying Bank = 1.08¢ + 0.15¢ + 0.1¢ + 0.2¢ + 4.55¢ + 0.6¢ + 0.01¢ = 6.69¢

E. PAYING CUSTOMER

Total Additional Benefits for Paying Customer: unchanged

[76] Federal Reserve Bank of Atlanta (1979), p. 67.
[77] See footnote 43.
[78] See footnote 43.
[79] See footnote 43.
[80] Based on the 1996 fees charged by the Federal Reserve for microfilm. The fees range from 0.02¢ to 1.0¢ per item, with the average fee of 0.6¢.

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