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Government Intervention in Emerging Networked Technologies

Some innovative technologies catch on, while others fail.[1] There is a temptation to view such failures as simply the operation of markets: good innovations thrive and bad innovations die. But in the real world, a success story (or failure) is not always so simple, and adopting new technologies is not always simply a matter of improved efficiencies. Seemingly superior technologies can fail in the marketplace for any number of reasons. Perhaps the most important of these is the need for social acceptance of the technology, particularly in markets characterized by network effects.

Network effects exist where a product's value turns on how many others use it. One classic example is the fax machine: such a machine is far more valuable when there are many users as opposed to only a few users. Many modern technologies have this same characteristic. High-definition (HD) television sets are only worthwhile to viewers if there are others broadcasting programs in HD. Consumers cannot use cell phones to make payments unless merchants adopt the technology to allow such payments. Because the value of the product to the user

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[1] *See* G. Pascal Zachary, *The Risk of Innovation: Will Anyone Embrace It?*, N.Y. TIMES, Jan. 20, 2008, § 2 (Business), at 4.

turns on whether other people use it, social acceptance plays a large role in markets with network effects.

Network effects are even more complicated in what are known as multi-sided platforms: in these markets, the product is used by two different types of users, say Group A and Group B. The product's value to users in Group A turns not on how many others are in Group A, but instead on how many are in Group B—and vice versa. HD televisions and cell phone payments are multi-sided platforms, as are dating clubs like e-Harmony. For the club ("platform") to be successful, it needs both male and female members: the value of the club to male members (Group A) depends on the number of female members (Group B). In multi-sided platforms, as in other networks, social acceptance is crucial to a new product's success. Here the challenge is more difficult, however, because the product can only succeed if adopted by groups on opposite sides of the platform.

Given the importance of getting others to buy into a new product, innovators have a strong incentive to take steps to obtain early adoption of a new technology. This problem is even more complicated in multi-sided platforms where innovators need to obtain adopters on both sides of the platform. Providers of such new technologies have an obvious incentive to seek government support in their goal of obtaining social acceptance; this is no doubt even more true for products in which innovators have made large investments. If an entrepreneur can get the government to help ease the costs of adopting the technology, or even mandate its acceptance, the network effects problem can be minimized or even eliminated.

Governments, of course, will always intervene in markets. For our country's entire history, government action—both direct and indirect—has affected what technologies will be adopted. Whether—and, if so, how and when—the government should intervene in a particular market is a tricky question.

In this Article, we use examples from the payment industry to argue that the government usually should not intervene to aid new technologies. Payments provide a particularly rich lens through which to examine the question of government intervention. All payment systems are in essence a multi-sided platform. Even a gold or silver coin—what the Framers would have called specie—is of no value to a purchaser unless a seller is willing to exchange her goods or services for that coin. The U.S. government has long acted in ways designed to make us accept or reject certain kinds of payments. For example, although we now consider Federal Reserve notes (dollar

bills) a legitimate medium of exchange, consumers and merchants were reluctant to accept such notes and their predecessors for much of our nation's history. As we will discuss, the government solved this problem during the Civil War by mandating that creditors accept U.S. notes.[2] Today Title 31, § 5103 of the U.S. Code provides that Federal Reserve notes "are legal tender for all debts, public charges, taxes, and dues."[3] As a result, all public and private creditors are required to accept federal currency in payment of debts, subject to reasonable limits on the time and means of payment.[4]

The government also indirectly supports other payment systems. For example, extensive legislation and regulation supports the checking system. Articles 3 and 4 of the Uniform Commercial Code, along with an array of federal laws and regulations, set the basic terms for most check transactions, while the Federal Reserve itself has long acted as a cornerstone in the check collection process. These kinds of government actions make checks more attractive to use. For both payments and other technologies, government support for the implementation of, or the infrastructure for, a particular technology may shift consumer choices toward that system.

Payments are also useful for examining the question of government intervention. Over the past few decades the number of new products has been staggering. Not only have financial institutions introduced credit cards and debit cards, but also stored value cards, payroll cards, electronic money, electronic checks, and automated clearing house transactions, all of which have lessened the need for cash and checks. Recently, cell phone payments have become the subject of marketing experiments in places like Atlanta. In Japan, this technology is already used every day by hundreds of thousands of people. Other payment providers have begun to push systems that would operate through small electronic transmitters kept on key chains. Some providers have even started to introduce payment through biometric devices that would identify payers through fingerprints or other

2 *See infra* notes 104–06 and accompanying text.

3 31 U.S.C. § 5103 (2002).

4 *See, e.g.*, *Nemser v. New York City Transit Auth.*, 530 N.Y.S.2d 493 (1988) (holding that, although the Transit Authority was required to accept fare payments in U.S. currency, the Transit Authority could impose reasonable restrictions on when and where it would collect such currency and that, therefore, requiring the use of a token to pay a fare was permissible). In fact, the current understanding of the legal tender statute is that it applies only to preexisting debts and that parties to an exchange need not agree to take cash. James Steven Rogers, *The New Old Law of Electronic Money*, 58 SMU L. REV. 1253, 1276 (2005).

physical characteristics. Some experts predict that cell phone payments alone will grow from $3.2 billion in 2003 to $37 billion in 2008.[5]

Of course, the open question is whether these new payment methods will become as ubiquitous as credit cards or whether they will go the way of the two-dollar bill. The answer depends on whether users can be convinced to adopt the new systems. For that to happen, the new systems must be both more profitable for merchants than their existing systems and preferable to consumers over old systems.[6] Many new technologies, when faced with network effects, are unable to satisfy both conditions. The crucial questions we investigate are whether, and when, it is appropriate and possible for the government to help tilt the scale in favor of new technologies.

We begin in Part I by describing and modeling how merchants and consumers decide whether to adopt and use a particular payment technology and then introduce the complications of network effects and multi-sided platforms. In Part II, we describe the various roles that the government may assume vis-à-vis any new technology, namely, legislator, fiduciary, or seller. Part III then discusses the tools that the government has available to influence public preferences. Part IV argues that despite the availability of these tools, the government generally should not act to promote particular technologies.

I

MERCHANT AND CONSUMER PREFERENCES

To decide *whether* and *how* the government should attempt to alter the choices that the public makes about new technologies, we must first consider how the public is likely to make such choices. As we discussed in the introduction and as we show below, these choices are complicated by the problems of multi-sided platforms. For instance, merchants are much more likely to adopt a new technology where a large number of consumers have shown a willingness to use that innovation, and consumers are much more likely to adopt the new technology when there are already a large number of merchants who

[5] *A Cash Call*, ECONOMIST, Feb. 17, 2007, at 71, 71.

[6] In recent years, much literature has discussed satisfaction and maximization of preferences. Most of that discussion falls well outside the scope of this Article. For our present purposes, we accept that preferences are malleable.

have adopted it. This gives rise to the *chicken-or-the-egg problem*:[7] unless both sides of the transaction can be convinced that they are better off with the new technology, it will not be adopted.

To show why this is so, we must first present a model of how individuals make such decisions. To make this discussion more concrete, we will focus primarily on payment systems. As with other technologies, the decision to adopt and use a payment system occurs in two stages. First, the consumer and merchants must both choose to adopt a payment system, or other technology, as an option. Second, the consumer must decide whether to use the new payment system.[8]

A. Merchant Decision Making

For a merchant, the decision to adopt a particular technology depends on whether doing so will maximize profits.[9] This should occur when the new technology allows the merchant to maximize the return on its investment. In the context of payments, this means that the merchant's investment in a new payment system must exceed the return on other opportunities. As an example, consider a restaurant owner who has to choose between spending $100 on additional advertising or on adopting a credit card system in which a three percent charge on credit card purchases will be imposed.[10]

The restaurant's profit (*P*) from adopting any particular payment system (*X*) is a function of both the additional revenues (*AR*) that the system will generate and the new system's costs (*C*). The new costs can be further subdivided into two types: start-up costs (*SC*), such as the initial fees to buy credit card processing terminals, and per-

[7] This exists whenever payors and payees must simultaneously adopt a new technology for it to be successful, "otherwise there is little incentive for consumers or merchants to embrace the new instrument." Sujit Chakravorti & Emery Kobor, *Why Invest in Payment Innovations?* 7 n.12 (Fed. Res. Bank of Chi., Emerging Payments Occasional Papers Series No. 2003-1B, June 2003); *see also* DAVID S. EVANS & RICHARD SCHMALENSEE, PAYING WITH PLASTIC xiii (2d ed. 2005).

[8] There are exceptions to this general rule that the choice of the particular payment system will be in the hands of the consumer. For instance, as a matter of practice, it is merchants rather than consumers who choose whether to convert a check to an ACH payment. For an explanation of ACH payments, see RONALD J. MANN & JANE K. WINN, ELECTRONIC COMMERCE (2d ed. 2005).

[9] STANLEY FISCHER ET AL., ECONOMICS 129 (2d ed. 1988).

[10] We will treat the three percent fee as a discount on revenue rather than as an additional cost because the merchant never expends the fee; it is just a reduction in the payments the merchant receives from the credit card company.

transaction costs (*TC*),[11] such as the cost of a phone call to verify a credit card. This leads to the following profit function:

$$P(X) = AR - SC - TC \qquad (1)$$

The owner should adopt a particular new payment system over an alternative technology (*Y*) when the new system's profit exceeds the old system's profit. Because we are discussing alternative uses of the same investment, we can assume for our present purposes that the total costs of the alternative uses are the same. Therefore, the owner should adopt a new payment system when the new system's additional revenues will exceed the additional revenues that would have been generated by an alternative use of the investment:

$$AR(X) > AR(Y) \qquad (2)$$

Using the example above, now assume that a patron's ability to use a credit card will increase the restaurant's business by $1000 and that the alternative investment in advertising will generate $950 in business.[12] Finally, assume that the marginal cost of producing the additional food is zero. On this account, the restaurant owner should invest in the credit card system because the additional revenues from that system exceed the additional revenues from advertising, even after we account for the three percent fee paid to the credit card company.[13]

Of course, the quantity of both the start-up and per-transaction costs will still matter to any merchant's decision on whether to adopt a new technology. The larger those costs are, the greater the additional revenues have to be in order to justify the investment. If

[11] By "per-transaction costs" we mean not just those costs that are charged on each particular transaction, but also those costs that are charged on a periodic basis, so long as the merchant continues to use the payment system, such as a monthly access fee. Many vendors of credit card payment systems have such fixed charges associated with the payment system. *See, e.g.*, PayPal, https://www.paypal.com/cgi-bin/webscr?cmd=_display-pro-fees-outside (last visited Jan. 11, 2009) (noting standard thirty-dollar monthly fee).

[12] The claim here is that adding a credit card option for a *particular* merchant might increase sales, not that credit cards or any other payments system increases the number of total sales, which is a different question. *See* Edmund W. Kitch, *The Framing Hypothesis: Is It Supported by Credit Card Issuer Opposition to a Surcharge on a Cash Price?*, 6 J.L. ECON. & ORG. 217, 223 (1990).

[13] That is because *AR(X) = $1000 – $30 = $970*, which is obviously greater than $950.

the start-up cost for our restaurant to adopt the new system was $200 instead of $100, and if $200 in additional advertising would generate $1500 in additional revenue, then it would be quite clear that the restaurant should invest in advertising rather than a payment system.

In the real world, however, we believe that a new payment system's start-up costs are relatively small for many merchants, and therefore the additional revenue needed is also relatively small. For instance, a merchant who elects to start accepting charge cards has to pay almost nothing to buy the technology.[14] Most of the costs for charge card acceptance consist of monthly maintenance and rental fees, which we categorize as per-transaction costs.[15] Thus, for merchants interested in a new payment system, the question is really whether the additional revenues of the new payment system, minus the per-transaction costs, exceed the alternative profits that could have been generated by those same costs.

There are two final caveats we should mention. First, in many cases, a new payment system will not increase revenues to the same extent that it might initially appear. Returning again to our restaurant example, while the restaurant may generate an additional $1000 in business, its consumers may all begin paying with credit cards. If so, the actual amount of additional revenue is only $820, and the restaurant should instead spend the money on advertising, which would generate $950 in revenue. This is obviously true of other technologies as well. For instance, broadcasters contemplating increased revenues from HD have to discount for decreased revenue from analog or other traditional broadcasts.

Second, and more importantly, we need to emphasize that not all costs—and perhaps not all "revenue"—may be financial or even quantifiable. For example, one such potential nonfinancial cost is the hassle cost associated with adopting and using any new technology.[16]

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[14] Professor Ronald Mann estimates that the equipment costs are at most a few hundred dollars. *See* RONALD J. MANN, CHARGING AHEAD: THE GROWTH AND REGULATION OF PAYMENT CARD MARKETS 30 (2006).

[15] There are also, of course, the per-transaction fees, but as we noted above, *see supra* note 10, we view these as a discount on additional revenues, rather than as a cost.

[16] *See* Dan Ariely & José Silva, *The Macro-Effects of Micro-Pricing: Behavioral Effects of Payment Methods and the Effectiveness of Micro-Pricing* (Mar. 30, 2005) (unpublished manuscript, on file with author) (noting the existence of hassle). Hassle costs, as we are using the term, are similar to switching costs, but the two are not the same. *See, e.g.*, CARL SHAPIRO & HAL R. VARIAN, INFORMATION RULES: A STRATEGIC GUIDE TO THE NETWORK ECONOMY 104 (1999). We are assuming here that investment in one

In the case of payment systems, merchants have to account for the time and effort that employees have to spend learning a new payment system (a start-up hassle cost) in addition to the time and effort they spend using the system, for example, running a credit card through a reader and then printing out the receipt (a per-transaction hassle cost). This investment of time and effort on the part of employees is a real cost to merchants because they could have spent the time and effort on training employees to provide better service (in the case of the start-up cost) or on providing more timely delivery of another patron's meal to her table (in the case of the per-transaction cost).

More speculatively, a merchant may adopt a new technology not just because of the revenues that will result, but because of the status that she thinks it will bring her; the restaurant might start accepting credit cards because the owner wants to be seen as "high-end." Similarly, a television network may begin broadcasting in HD not just because of additional revenues, but to be seen as "cutting edge." This obviously requires departing from the assumption of the merchant as a simple profit-maximizer, but we believe such a departure may be warranted for at least some subsets of merchants.[17]

B. Consumer Decisions to Adopt a Technology

Consumers' decisions about whether to adopt a new technology—such as HDTV or a payment system—are similar, but not identical, to those of merchants. One difference is that consumers, unlike merchants, may not view the start-up costs associated with the adoption of a new technology as trivial, particularly when they are unfamiliar with it. Consider E-ZPass, a form of payment used on highways in the Northeast and the Midwest. In the E-ZPass system, a customer sets up an account with an E-ZPass member organization. Customers usually fund and periodically refill the account with a credit card, although some customers use cash or checks. Assuming that the account has money, the customer may pay her tolls on any E-

payment system technology does not preclude investment in another such technology; therefore, no switch needs to be made.

[17] At least one commentator suggested to us that a merchant may need to offer a credit card option not to increase revenues, but to maintain revenues when competitors start to accept credit cards. We believe that this is a distinction without a difference. At any given time, the question for the restaurant is whether the additional revenues from adding a credit card option, *discounted to present value*, exceed the discounted additional revenues that would be generated from an alternative investment. When a merchant offers a credit card payment option to stave off defections by customers, this is additional revenue because without the credit card option there would be lower revenues in the future.

ZPass participating highway by an automatic signal from a radio frequency identification ("RFID") transponder. Adopting E-ZPass involves a good deal of hassle start-up costs: the customer must fill out an application, mail it in or submit it online, receive back the RFID transponder, and then attach the transponder to the car.[18] Furthermore, if the customer does not use a credit card, the funding of the E-ZPass account with cash or checks involves some additional hassle costs.[19]

Just as a merchant seeks to maximize profits in its investment decisions, a consumer seeks to maximize her expected utility (*EU*), which is a function of the benefits (*B*) and costs (*C*) of any particular decision she makes:

$$EU(A) = B(A) - C(A) \qquad (3)$$

Assuming that *n* and *f* are alternative payment systems, a consumer should pick the new system (*n*) when the expected utility of that system exceeds the expected utility of the former system (*f*) such that:

$$EU(n) - EU(f) > 0 \qquad (4)$$

Or

$$B(n) - C(n) > B(f) - C(f) \qquad (5)$$

As we saw in the previous section, costs for payment systems consist of both the start-up costs and the per-transaction costs. Furthermore, consumers need not adopt a new payment system for *all* transactions; a consumer can choose to obtain a credit card but still pay for most transactions with cash or check. Therefore, what really matters to a consumer is whether there is some subset of transactions (*i*) for which Equation 5 is true:

[18] *See* E-ZPass – Sign Up Now!, http://www.ezpassnj.com/static/signup/ind_plans.shtml (last visited Jan. 11, 2009).

[19] For consumers who pay by check, they must replenish the account by sending in a check in a timely fashion. For those consumers who have neither a credit card nor a checking account, they must make these payments either by money order or in cash at an E-ZPass facility.

$$B_i(n) > B_i(f) + SC(n) + TC_i(n) - TC_i(f)^{20} \qquad (6)$$

Unlike benefits and per-transaction costs, we do not limit start-up costs to those for *i* transactions on the theory that the start-up costs are the same regardless of the size of the subset of transactions. For instance, the costs of obtaining a debit card are the same regardless of whether the consumer will use it only to get cash from an ATM or will use it for all of her purchases. In addition, we ignore the start-up costs associated with the preexisting payment option because those costs are sunk. However, as we will note below, sunk costs in some circumstances may play a role in decision making about payment systems.

As an example, consider a consumer's decision to obtain a new credit card. As with the E-ZPass example above, there will be some start-up hassle costs in obtaining the card and perhaps even a small fee associated with the card. The real question for the consumer, given these start-up costs, is whether there is a set of transactions for which the consumer's additional benefits from having the card exceed the additional costs of having the card:

$$B_i(n) - TC_i(n) - B_i(f) + TC_i(f) > SC(n)^{21} \qquad (7)$$

Assume that in the past the consumer has paid for her gasoline purchases using cash, but that her service station's owner, whom we will call Gas Co., is offering her a credit card with which to purchase gasoline in the future. We will assume that the consumer receives no benefit from using cash and that the costs of obtaining cash are quite

[20] Professors Jean-Charles Rochet and Jean Tirole hypothesize that a customer should purchase a payment card only if the expected benefit exceeds the expected fee. Jean-Charles Rochet & Jean Tirole, *Cooperation Among Competitors: Some Economics of Payment Card Associations*, 33 RAND J. ECON. 549, 553 (2002). Our analysis here is similar, but with some modifications. First, we make clear the distinction between start-up costs for a system and per-transaction costs, and we assume that the costs that really drive decision making by consumers are not financial, but rather temporal and psychic. (Rochet and Tirole describe the fee as the "customer's yearly fee," *id.*, and not as a per actual transaction fee, suggesting it is just meant to cover up-front fees.) Second, our version recognizes that the benefit available to the consumer is limited to those circumstances where the benefits of a particular payment system are greater than those of other systems. In other words, the benefit that Rochet and Tirole identify can only be calculated as a net against the existing benefits from other payment systems.

[21] Admittedly, in theory we need to account for the lost opportunity cost on alternative investments of the start-up costs, as we did in Part I.A. We do not do so here because we believe that such costs are generally quite low.

low. Furthermore, there are no actual financial costs for using cash because she has ready access to her bank's ATMs, which charge her no fees. Also, the marginal hassle cost of getting cash for such transactions is quite low: say the discounted present value of such costs is $100. Filling out the application and obtaining the card from Gas Co. involves no financial fee, but assume that there is a real hassle cost involved, and that this can be quantified as the equivalent of fifty dollars. Furthermore, we will assume that Gas Co. offers her no benefit for using the card, although the transaction costs are reduced to seventy-five dollars.[22] On this account, the consumer ought to decline the card because it results in an expected net decrease in her utility: $SC(n) = \$50$, while $B_i(n) - TC_i(n) - B_i(f) + TC_i(f) = \$25$.

To remedy this problem, Gas Co. might introduce a rebate program that gives the consumer five percent cash back on all purchases made with the Gas Co. card over a calendar year. If the discounted present value of that rebate is, say, fifty dollars, now the consumer should adopt the card because the start-up costs (fifty dollars) are outweighed by the net gain on the other side of Equation 7: seventy-five dollars.

Two difficulties with consumer decisions about new technologies are that many of the costs are unquantifiable, such as hassle costs, and that consumers will tend to be quite heterogeneous in how they value these costs. Return again to our Gas Co. example. We hypothesized that the consumer faced lower transaction costs for a credit transaction than for a cash transaction. If such costs are limited to hassle costs, this may strike most readers as intuitively correct because they usually pump their own gas and can pay with a credit card right at the pump, whereas cash payments may require going into a store and may even require prepayment. The assumption does not strike us as intuitively correct, however, because we both work in New Jersey, where we cannot pump our own gas, and payments with cash are both quicker and generally friendlier (particularly in winter, gas station attendants do not relish trudging back and forth with credit cards while we sign). A New Jersey consumer, therefore, may need a greater benefit to adopt the Gas Co. card than a consumer across the river in New York where consumers pump their own gas. Furthermore, the willingness of New Jersey consumers to adopt the card will vary with how much they disvalue the cost of paying with

[22] Even assuming that the consumer can be sure that she will never pay credit fees for running a revolving balance on the card, she still has the hassle of making monthly payments to Gas Co. and any financial fees involved in making such payments, such as the purchase of additional checks.

credit; some of us are simply less sensitive both to the time loss and the unfriendliness of the attendants.[23]

Another problem is that the unquantifiable costs are, we believe, quite diverse. So far we have focused on the hassle of engaging in any particular transaction, but there are other potential costs. For instance, consumers might be concerned not just with the hassle of using a credit card, but with the potential loss of privacy as well. One "benefit" of cash transactions is that they generally leave no record, whereas credit card payments can generate a paper trail of exactly where a consumer has spent her money. For instance, a person who wants to hide certain transactions from a spouse has a powerful reason to pay with cash rather than credit.[24]

In addition, there is a risk of both money and identity theft. When a consumer adopts cash as a payment system, she obviously takes the risk that she will be robbed at some point and lose the cash in her possession. The risk of this type of theft is lower with the adoption of a credit card or even a debit card system: in both cases, a consumer's liability for unauthorized transactions is capped both by statute and by card company practice. However, adoption of credit cards and debit cards may open up consumers to the possibility of identity theft, which can impose both financial and nonfinancial costs.

Furthermore, there is the problem of sunk costs. As Professor Richard Thaler has noted, "only incremental costs and benefits *should* affect decisions."[25] But in reality, historical costs appear to affect the decisions that consumers make in the future. Consider again the consumer who has gone through the hassle of setting up an E-ZPass account and obtaining the RFID transponder. Once the consumer has E-ZPass, the hassle becomes a sunk cost that the consumer ought to ignore (as a normative matter) in making decisions about how she will pay for particular tolls.[26] Indeed, the consumer will inevitably

[23] The same observation can be made about HD television sets, where there may be costs in learning the new technology well enough to make the initial purchase, in setting up the set itself, and in obtaining HD service from a cable or dish provider. Again, all consumers will value these costs differently.

[24] This remains true even in an age when cash transactions—to the extent they involve an ATM withdrawal—generate some form of record. It is a lot safer to pay $1000 for jewelry for your mistress using cash rather than using the credit card at Tiffany's. Somewhat plausible stories for the $1000 withdrawal are easier to generate than stories about who received the jewelry.

[25] Richard Thaler, *Toward a Positive Theory of Consumer Choice*, J. ECON. BEHAV. & ORG. 39, 47 (1980).

[26] *See id.*

encounter situations where the cash alternative is superior to E-ZPass, such as when the driver has coins readily available and the E-ZPass lines are *longer* than the others. But because ours is a positive model, we assume, in accord with the experimental evidence, that such sunk costs do affect consumer decisions about payment systems such that previous costs incurred to obtain access to a payment system will make the consumer more likely to use the system.[27] For instance, consumers who have paid for access to a charge card may be more willing to use that card in the future than they otherwise would be.[28]

The benefits to consumers from various payment services can also be unquantifiable and quite diverse. The most obvious examples of financial benefits to adopting a payment system are reward or affinity systems: either a small rebate on the purchase or a credit toward a reward (such as a free airline ticket).[29] As for nonfinancial benefits, a consumer might value the payment system's ability to generate a record of the transaction (the flip-side of our privacy cost point above). Prestige or social standing is another potential benefit of some payment systems. For instance, some people may pay with a "platinum" credit card instead of another credit card, not because the rate is cheaper or the hassle costs lower, but simply to gain the prestige that they believe is associated with having and using the card—the same being no doubt true of HD televisions.[30] In other contexts, some consumers may wish to use a payment system to indicate that they are "tech-savvy." For instance, when the New York City Transit Authority introduced the Metrocard, it believed that early

[27] *See id.*

[28] There are other transaction costs that may appear to be sunk costs but are not. For example, say a consumer is deciding whether to pay in cash or write a check for a purchase. In order to write a check, the consumer would have first had to decide to purchase checks, which often costs the consumer money. Although this prior purchase of checks might be seen as a sunk cost, it is not. The consumer will correctly intuit that writing a check brings her closer to having to buy more checks: the price of a check is properly a cost of writing one. This is actually—in our terminology—a per-transaction cost for the consumer. *See supra* note 11 and accompanying text.

[29] MANN, *supra* note 14, at 167.

[30] *See, e.g.*, Kirk Johnson, *Spending in Gilded Style*, N.Y. TIMES, June 26, 1983, at F12; Carole Gould, *Personal Finance: In Credit Cards, All that Glitters . . .* , N.Y. TIMES, Feb. 2, 1986, at F9; Jane Wolfe, *Vicarious Consumption: Beyond the Glow of Platinum*, N.Y. TIMES, Dec. 5, 1999, § 3, at 10.

users would be just such individuals.[31] Of course, consumers may have completely idiosyncratic reasons for liking the older payment form. Think, for instance, of the forty-year-old who still eats Kraft Macaroni and Cheese. We can be fairly certain that he would choose something else if he were tasting it for the first time, but the whole point is that the taste is not his first. As with food, familiarity and tradition may provide much of a payment system's appeal. For example, checks have proven remarkably persistent despite the many electronic alternatives, particularly for payment from remote locations. The most common explanation for this persistence is that individuals are simply wedded to tradition.[32] The comfort that comes from maintaining the tradition weighs in any decision to maintain the status quo.

Finally, because ours is a descriptive model, we focus in both this Part and the next on how consumers *actually perceive* the costs and benefits we are describing, not on the "real value" of these costs and benefits, even when they are easily quantifiable. For example, to the extent that consumers fail to account for some real costs—for instance, not taking into account the full costs of using a credit card—we accordingly discount them.[33]

C. Consumer Decisions to Use a New Technology

This brings us to the second-stage decision: the consumer's choice among new technologies for a particular transaction. Our basic postulate is that a consumer will decide to use a new technology over an old technology where the expected utility from the new technology exceeds the utility that would be derived from using the old technology. This can again be seen by focusing on payment systems: a consumer will pick payment system *n* (say, a credit card) over payment system *f* (say, cash) for a particular transaction *j* when the expected utility for using the credit card exceeds the expected utility of using cash. To calculate the expected utility of a particular

31 *See* Matthew L. Wald, *Fare Card Plan in the Subways Exceeds Goals*, N.Y. TIMES, Feb. 20, 1994, § 1, at 39 (noting that it was unclear if such people had actually adopted the Metrocard).

32 Sujit Chakravorti & Carrie Jankowski, *Forces Shaping the Payments Environment: A Summary of the Chicago Fed's 2005 Payments Conference* 1–2 (Fed. Res. Bank of Chi., Chi. Fed. Letter No. 219a, Oct. 2005), *available at* http://www.chicagofed.org/publications/fedletter/cfloctober2005_219a.pdf.

33 *See generally* Oren Bar-Gill, *Seduction by Plastic*, 98 NW. U. L. REV. 1373, 1395–1408 (2004) (giving a positive account of consumer choice within the credit card market).

payment system, consumers weigh the benefits and per-transaction costs of the competing payment options. Because the start-up costs for both systems are now sunk, system *n* should be selected over system *f* where:

$$B_j(n) - TC_j(n) > B_j(f) - TC_j(f) \qquad (8)$$

An important conceptual difference between Equation 7 and Equation 8 is that, here, the consumer is selecting a new technology not on the anticipated benefits and costs for a hypothetical set of transactions, but instead for a particular transaction. In other words, at this stage the consumer– generally– will have better information about the actual value of the costs and benefits of a particular payment system.

As an example, return to a consumer's choice to adopt the card from Gas Co. and now assume that our consumer lives in New York and works in New Jersey. In making the decision whether to adopt the credit card, she faces uncertainty as to where she is going to make her gasoline purchases. On the one hand, if she makes all of them in New York (where again she pumps her own gas), it makes sense to get the card because the transaction costs for credit are less than the transaction costs for cash. On the other hand, if she makes all of her gasoline purchases in New Jersey, where we hypothesize that the transaction costs of credit outweigh the transaction costs of cash, she then should not adopt the card. For the consumer in this situation, the likelihood of gasoline purchases in New York or New Jersey drives the decision whether to adopt the card.

At the point of the decision to *use* the card, however, this uncertainty is obviously removed. If she is purchasing gasoline in New York, it makes sense to use the card because the marginal benefits of using credit over cash likely outweigh the marginal transaction costs.[34] If she is in New Jersey, however, the marginal costs of using the card may outweigh the benefits such that the consumer will not use the card. The point is that at the time of the actual decision to *use*, the uncertainty has been removed.

[34] This may not always be true, even in New York. The marginal benefits from using a card, if they are limited to the rebate, are likely to be constant. The marginal transaction costs could, however, vary.

D. Network Effects and Multi-Sided Platforms

Up to this point, we have modeled consumer and merchant decisions based upon an implicit assumption that the benefits and costs to the parties are independent of the choices made by other parties. But as we have noted above, that assumption is clearly wrong. Many new technologies are subject to *network effects*: the benefits to both consumers and merchants of adopting the innovation turn, in large part, on the willingness of other market participants to adopt or use that innovation.[35] Consider again Equations 2 and 7. The decision by a merchant to invest in a new technology (Equation 2) depends directly upon the additional revenue to be generated by the system. For there to be additional revenue, there must be consumers who have both adopted the new system and who will use it if the merchants offer it. So if no potential customers of our hypothetical restaurant have adopted the credit card, nor are likely to do so, then the restaurant is unlikely to see any additional revenue, and it is fairly certain that an alternative investment would make more sense. Similarly, if few broadcasters are providing programming in HD, then the value of an HDTV is much lower than if all broadcasters are doing so.

A consumer's decision to adopt a new technology (Equation 7) is similarly dependent upon merchants adopting the system. The greater the number of transactions in which a new system can be used, the more likely it is that we can identify some subset of such transactions for which Equation 7 will be true. For instance, we suggested in our Gas Co. example that using a five percent rebate might be enough to get a consumer to adopt the card, depending upon the hassle costs. We also hypothesized a scenario in which using the card made sense in New York, but not in New Jersey. However, if not all Gas Co. stations take the card, or she also buys gasoline at other companies' stations that do not accept the card, then her benefit from using the card will be lower and perhaps insufficient to overcome the start-up costs of adopting the card. On the other hand, if she can use the card not just to make gasoline purchases at Gas Co., but also food purchases at Fast Food Co., then her benefits from the card may be even greater, making the card's adoption much more likely. The

[35] Of course, the decision to *use* the payment system is *not* dependent in this way upon the willingness of merchants to adopt the system. The ability to make a decision about use depends in the first instance upon the merchant's decision to have adopted that payment system.

point is that merchant decisions to adopt a payment system increase the set of possible transactions in which the conditions of Equation 7 for consumer adoption will be met.

Not only are new technologies subject to network effects, but they are also often *multi-sided platforms*. David Evans and Richard Schmalensee define such markets as having three basic characteristics: (1) there are at least two distinct types of customers for the product; (2) there is some benefit to be obtained from coordinating members of the groups; and (3) there is an intermediary that, through coordination, can make the members of the groups better off.[36] Examples of such multi-sided platform networks include operating systems (which make both software developers and computer users better off), television manufacturers (which make both broadcasters and viewers better off), and payment systems (which have the potential to make both consumers and merchants better off).[37] Because they are multi-sided platforms, the benefits to a party of the network do *not* depend upon the number of similar parties that are on the network, but instead upon the number of parties there are on the *other side of the platform*. For instance, a video game user traditionally did not care about how many other players use a particular gaming system; what she really cared about was how many video games were developed for the system.[38] Of course, sometimes the existence of other users on the same side of the platform will be an additional benefit to a network, but the key to any such network is having enough users on both sides of the platform. For instance, if your colleagues are watching your favorite television show, water cooler talk might enhance your enjoyment of it. But regardless of how much viewers enjoy a show, it will be cancelled unless sufficient numbers of advertisers are interested in the program.[39]

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[36] EVANS & SCHMALENSEE, *supra* note 7, at 134–35.

[37] *See id.* at 136–38.

[38] This may be less true now as more gaming systems have remote multi-player games.

[39] As a recent example, consider the demise of the CBS show *Joan of Arcadia*. While the show was plagued by declining ratings, the real factor leading to cancellation in 2005 seems to have been the age of its average viewer: 53.9. *See* Tony Esparza, *Fans Demand 'Joan', Fight CBS over Cancellation*, USA TODAY, May 30, 2005, *available at* http://www.usatoday.com/life/2005-05-30-joan-arcadia -fans-petition_x.htm. That average age number made the show very unattractive to advertisers, who prefer younger viewers.

A multi-sided platform network presents the *chicken-or-the-egg problem*:[40] unless both sides of the transaction can be convinced that they are better off with the new system, it will not be adopted. Furthermore, the presence of network effects means that a consumer's willingness to adopt the new technology will depend on merchants also adopting it. The result, as commentators have noted in the context of payments, is that "[t]o gain critical mass in the marketplace, payment providers have to convince simultaneously a large number of participants of the benefits of new payment mechanisms."[41] Thus, the consumers and merchants whose behavior we model above are not isolated from each other; rather, a merchant considering whether to adopt a new technology considers whether consumers are likely to adopt the same technology, and vice versa.[42]

E. The Difficulty of Achieving a Critical Mass

The rub, however, is that groups on the opposite side of a platform are unlikely to be easily convinced that they have the same interest in adopting (and using) a new technology. As Equations 2 and 7 illustrate, the conditions under which consumers and merchants are likely to adopt a technology are often different. In the context of payment systems, we predict that a merchant will adopt a payment system whenever the additional revenues gained from the system's adoption outweigh the additional revenues that could be generated from another investment of those resources. For their part, consumers will adopt a new payment system only where the start-up costs for adopting the system are outweighed by the increase in net benefits and costs from moving to the new system for some set of transactions.

Not every new payment system, however, will satisfy *both* Equations 2 and 7. As an example, consider the introduction of stored value cards on the Upper West Side of New York City in the 1990s. The cards, which were rolled out by four leading financial institutions, failed spectacularly because only merchants, and not

40 This exists whenever payors and payees must adopt a new technology simultaneously for it to be successful. *See supra* note 7 and accompanying text; *see also* EVANS & SCHMALENSEE, *supra* note 7, at xiii.

41 Chakravorti & Jankowski, *supra* note 32, at 2.

42 A recent example of this is the battle over the format for high-definition DVD players. The recent success of the Blu-ray format in obtaining the support of most movie studios of course makes the alternative HD DVD technology worthless to consumers. *See* Josh Levin, *I'm the Idiot Who Bought an HD-DVD Player*, SLATE, Feb. 28, 2008, http://www.slate.com/id/2185365.

consumers, adopted them.[43] In other words, Equation 2 for merchants appears to have been satisfied, but not Equation 7 for consumers. Merchants appear to have had quite limited start-up costs, which suggests that the additional revenues from the cards need not have been great for merchants to be willing to offer them. Furthermore, to the extent some consumers converted from cash to using the stored value cards, merchants presumably would have seen additional revenues in the form of a reduced risk of theft of the funds by robbers or employees.

Consumers, however, did not have adequate reason to adopt the card. The stored value cards were distributed as microchip-based smart cards placed onto debit cards, which were then sent to customers who lived on the Upper West Side.[44] In the payments universe existing at the time, stored value cards competed with cash and, to a lesser degree, debit cards.[45] From the consumer's perspective, it is hard to see *any* set of transactions in which the stored value card was better than either cash or a debit card. Consumers had to load the stored value card at an ATM, so the card had just as much hassle cost as getting cash and no other lowered costs or added benefits. Indeed, the cards were not safer than cash because, assuming a consumer was robbed of her cash, her cards were likely to be taken as well, and the stored value would be lost.[46] Stored value cards also did not improve the consumer's position as compared to debit cards because both could be used for the same kind of transaction, and most merchants who were wired to accept stored

43 *See* Lisa W. Foderaro, *A Test in Cashless Spending Turns Out to Be a Hard Sell*, N.Y. TIMES, July 27, 1998, at B4 (quoting a merchant who commented, "It's a dud. I have maybe three steady customers who use it, and they're in the Hamptons now.").

44 *See id.*

45 The experiment was initiated in 1997. At the time, debit cards were a fast-growing subset of payments, but still a fraction of what they are today. *See* Fumiko Hayashi et al., *A Guide to the ATM and Debit Card Industry* 41–43 (Fed. Res. Bank of Kansas City, 2003), http://www.kansascityfed.org/publicat/PSR/ BksJournArticles/ATMPaper.pdf.

46 Professor Leo van Hove suggests that stored value cards may be better for consumers than cash because transaction time is similar and consumers do not have to worry about exact change, do not have to carry a bulky wallet or purse containing bills and coins, and may be able to reload the device at home, which removes the need to reload by phone. Leo van Hove, *Electronic Purses in Euroland: Why Do Penetration and Usage Rates Differ?* 11–12 (SUERF, Working Paper, on file with author). All but the last of these benefits applied to the New York trial. Professor van Hove's analysis—which was not aimed at the New York trial—ignores that, at least for an initial adopter, some of these benefits did not exist because not all merchants accepted the cards. Furthermore, to the extent cash had been downloaded to the card, it then became unavailable to use at cash-only merchants.

value cards would presumably also accept debit cards. In addition, debit cards, which required the use of a PIN, had additional security. The "cash back" feature of debit cards also allowed greater access to funds. In sum, no set of transactions existed for which consumers would prefer stored value cards. Thus, even if the start-up costs associated with the cards were quite low, consumers simply had no incentives to adopt them.

Despite the absence of benefits to one side of the transaction, a new technology can still thrive if the provider can internalize some of one party's gains and the other party's costs, and thereby make the system's adoption more likely. One way to do this is for the platform provider to give a benefit to one side of the platform to stimulate adoption. For instance, in our Gas Co. example we imagined the consumer being given a five percent rebate as a way of encouraging adoption. Similar examples exist in the real world. For instance, while general use stored value cards have not succeeded in the market, proprietary stored value cards have had more success. In such transactions, the merchant and the platform are the same entity (as they are in our Gas Co. example), and therefore the merchant/platform can internalize the costs to the consumers by directly offering other benefits to the consumer to entice use of the card. For instance, Starbucks has heavily promoted its Starbucks Card, which is a stored value card that consumers can use to make store purchases. Between October and the end of December 2005, consumers placed more than thirty-five percent more value on Starbucks Cards than they had a year earlier.[47] At first glance, such increased usage is perplexing, given that consumers can use cash or offline debit cards at most Starbucks locations. However, a large portion of the loaded value in the quarter represented money placed on gift cards, and almost seventy-five percent of the value placed on the cards occurred during just one of the three months during the quarter: December.[48] The question, of course, was whether individuals who received the gift cards would reload them with their own funds. To this end, Starbucks undertook an initiative to get consumers to use the Starbucks Card by tying the Starbucks card to a credit card, the "Duetto" card. At the end of each month, the consumer automatically received a reward in the amount of one

[47] *See* Press Release, Starbucks Corp., Starbucks Announces Record First Quarter Fiscal 2006 Results (Feb. 1, 2006), *available at* http://www.starbucks.com/aboutus/pressdesc.asp?id=640.

[48] *Id.*

percent of the purchases made on the Duetto credit card over that month.

Another complication for initiating a new technology is the fact we noted in Part I.B: the benefits from using the technology are quite varied and they include potentially substantial nonfinancial benefits to a particular system. Furthermore, some of these benefits may tend to lock a consumer into an existing technology in a way that does not lock in merchants. Continuing with the Starbucks example, some consumers may tend to keep using a store-branded stored value card out of loyalty: being seen by others as a regular Starbucks consumer may bring them some value. For many other consumers, though, there will be no such value, and this consideration will play no role in their decision to use—or more likely not use—the card.

This heterogeneity in the value of technologies to consumers is a problem when it comes to gaining a particular innovation's widespread acceptance. Many of the benefits offered to entice one set of consumers will have no value to most other users. As a result, even if the providers of new technologies succeed in attracting a small number of consumers, they will not obtain a critical mass.

The history of charge and credit cards provides an example of this phenomenon.[49] Charge cards, particularly the American Express card, experienced substantial growth through the 1950s, '60s, and '70s. The overall penetration of charge cards nonetheless remained quite low by our present standards: by 1977, American Express—which was by this time the dominant pure charge card—had merely eight million cardholders.[50] Indeed, the peak penetration of charge cards into American households between 1970 and 2001 occurred in 1989, when thirteen percent of Americans had such cards.[51] The difficulty for charge cards was, and is, that their benefits as a payment system are limited.[52]

[49] The term *charge card* means any card that permits the cardholder to make a payment using the card, with the amount charged to a third party who then collects the funds from the cardholder. They are different from credit cards, in which the third party permits the cardholder to defer payment of the funds and instead allows the cardholder to finance the charge through a revolving line of credit.

[50] EVANS & SCHMALENSEE, *supra* note 7, at 67.

[51] *Id.* at 89.

[52] Of course, we are not trying to suggest here that charge cards have been a failure. Charge cards continue to be an important part of the electronic payments universe. Our point is simply that, compared to credit cards and debit cards, charge cards have been relatively unsuccessful. This lack of success is particularly noteworthy given that charge cards existed before credit cards.

Credit cards, by comparison, have experienced far greater market penetration. In 1970, the percentage of American households holding a credit card was only sixteen percent– roughly the same percentage at which charge cards reached their peak.[53] By 2001, the market penetration of credit cards had exploded to almost seventy-three percent.[54] Credit cards have done so much better than charge cards over the last thirty-five years because they offer a wider range of benefits to consumers, leading to wider acceptance of the cards by merchants, leading in turn to even greater use by consumers.

What differences between charge cards and credit cards led to these wildly divergent outcomes? The most important is the ability of credit cards to extend a revolving line of credit to consumers. This is, in itself, a benefit that may often lead consumers to use a credit card over other options. Furthermore, changes in both technology and the law made it easier to offer revolving credit to consumers in the 1970s and '80s. With the development of computer technology and information processing, credit card issuers were better able to identify consumers who would be both interested in adopting a card and profitable for the credit provider. Furthermore, after the Supreme Court decided that local usury laws would generally not restrict the interest rates charged by credit card companies,[55] credit providers were able to profit by lending to consumers who had previously been deemed too risky.[56] The increased profits available from these lines of credit allowed credit card issuers to draw in still more consumers through reward and affinity programs. The net result was a wide range of benefits that enabled credit cards to vastly increase their market share.[57]

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53 EVANS & SCHMALENSEE, *supra* note 7, at 89.

54 *Id.*

55 Marquette Nat'l Bank of Minneapolis v. First of Omaha Serv. Corp., 439 U.S. 299, 313–14 (1978).

56 The actual holding in *Marquette National Bank* was that a "national bank" was only restricted by the usury laws of the state in which it was located, not by the laws of the state in which its customer was located. *Id.* at 313–14. The practical effect of the decision, though, was that most large banks established legal residence in jurisdictions such as South Dakota and Delaware where there were no caps on interest rates. *See* EVANS & SCHMALENSEE, *supra* note 7, at 69–70.

57 The same basic logic applies to merchants, of course. But because we assume that merchants, as a whole, are more driven by pure financial concerns in picking payments systems than consumers, we assume that they are *less* heterogeneous than consumers. However, there are certainly circumstances in which the benefits of a particular payment system are insufficiently attractive to particular merchants that at least one subset of merchants refuses to adopt the new payment system.

The importance of satisfying the heterogeneous interests of potential users raises a broader point about efficiency. An emerging technology will often hold the promise of net financial gains for users on both sides of the platform. But if the innovator does not find a means of satisfying or overriding the disparate interests of potential users, the system will not be widely adopted. For example, because emerging payment forms often have lower service costs than their preexisting competitors, improvements in payment systems can create clear economic benefits. But the market, left to itself, will not always adopt the most efficient system. That is, the technology with the lower service cost may not be able to obtain a critical mass of users without government intervention. The next Part describes the multiple hats that government may wear as it seeks to influence technologies.

II
GOVERNMENTAL ROLES

When it comes to influencing consumers' technology use, the government can play three separate—and, in some cases, overlapping—roles. "Legislator" is the most familiar role; that is, government enacts laws or regulations that make the social acceptance of a particular technology more likely. When the government acts purely in its law-making role, it has no direct stake in whether the technology thrives. Instead, the government believes that society at large will benefit from the technology, primarily because of efficiency gains. For example, the U.S. government has long been interested in ensuring that adequate public airwaves are available for wireless telecommunications services. As we discuss below,[58] it has taken regulatory measures to ensure this result. The government has taken these actions not because it has a direct financial interest in companies selling wireless services, but rather because of the productivity gains that result from such services. Productivity gains benefit the economy, so the government has reason to legislate in ways that promote such gains.

In discrete areas of the economy—most notably transportation and postal service—the government functions like a seller. Here the government either acts as the sole provider of a service whose practical requirements make it unattractive to private industry (like

[58] *See infra* notes 115–24 and accompanying text.

highway systems or large-scale public transportation), or the government competes with private companies that offer some overlapping services (as with the Postal Service and Federal Express). When the government acts as a seller, it has a direct interest in whether its customers adopt particular technologies, as failure will adversely affect the government's bottom line.

Finally, the government can act as a fiduciary or guardian of the public interest. For example, the now-familiar technologies of movies, television, and radio raised concerns about the suitability of some content for young or sensitive audiences. The government has acted to protect these interests in a variety of ways, such as adopting standards that limit the hours during which indecent or profane programming can appear[59] and pressuring the entertainment industry to adopt rating systems.

Payments are particularly useful for elucidating the various roles that government plays because payments are an area in which the government acts as fiduciary, seller, and lawmaker. Government is probably most visible in its fiduciary role where it has two closely related goals: (1) to ensure that payees will accept coins and currency, and (2) to increase the demand for coins and currency by encouraging consumers to use new currency forms. These goals are intimately connected because if payees refuse particular coins and currency, then payors are unlikely to use them. For instance, the Treasury Department introduced new colors on the twenty-dollar bill in 2003, the fifty-dollar bill in 2004, and on the ten-dollar bill in 2006. Between 1996 and 2000, the Treasury introduced updated versions of the $5, $10, $20, $50, and $100 bills.[60] In support of many of these changes, the Treasury Department undertook substantial advertising campaigns to ensure both payee acceptance and payor use of the new bills. Less successfully, the Treasury Department has also attempted to gain support for dollar coins on several occasions.[61]

While "fiduciary" is the government's most well-known role with regard to payments, it is increasingly common for government to act

[59] For the full scope of the Federal Communications Commission's content regulations, see Fed. Commc'ns Comm'n, Obscene, Indecent, and Profane Broadcasts, http://www.fcc.gov/cgb/consumerfacts/obscene.html (last visited Jan. 11, 2009).

[60] History of U.S. Currency – U.S. Bureau of Engraving and Printing, http://www.moneyfactory.gov/newmoney/main.cfm/currency/history (last visited Jan. 11, 2009).

[61] John P. Caskey & Simon St. Laurent, *The Susan B. Anthony Dollar and the Theory of Coin/Note Substitutions*, 26 J. MONEY, CREDIT & BANKING 495 *passim* (1994).

as "seller" by designing a payment system for a service it purveys. Governmental agencies have long created payment systems for collecting fares connected with both public and private transportation. In particular, they have encouraged and in some cases even required using tokens to pay fares on toll roads, buses, and trains.[62] In the electronic age, governmental agencies have strongly pressured riders and drivers to cease paying fares and tolls in cash and instead to adopt new, electronic forms of payment. For instance, drivers all along the East Coast have been encouraged to adopt E-ZPass by the liberal use of toll discounts.[63] Similarly, when the New York City Transportation Authority first introduced Metrocards, discounts were considered essential to obtaining consumer acceptance of the cards.[64]

Finally, the government acts as lawmaker with respect to various payment forms. As noted in the introduction, complex legislation and regulation underlie the American checking system. In recent years, Congress has adopted legislation to make it easier for banks to exchange electronic copies of checks instead of physical hard copies.[65] Of course, the government has only a small financial interest in the existence of a robust check collection system, and therefore little direct interest in whether substitute checks succeed or fail.[66] When the government acts as seller, it has a much larger financial stake in the success of enterprises such as Metrocard and E-ZPass. The government's interest in the checking system also is qualitatively different than when it acts as fiduciary: the acceptance of

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[62] *See, e.g.*, *Nemser v. New York City Trans. Auth.*, 530 N.Y.S.2d 493, 494–95 (1988) (noting and upholding the NYCTA's requirement that fares be paid using tokens).

[63] *See* Joe Malinconico, *Turnpike Targeting E-ZPass Discount*, STAR-LEDGER (Newark, N.J.), Nov. 11, 2004, at 19 (noting discounts given in New York and New Jersey); Joe Malinconico, *Will It Be E-ZCome, E-ZGo?*, STAR-LEDGER (Newark, N.J.), Nov. 29, 2004, at 13. Similar tactics have been used in Illinois to get drivers there to adopt the similar I-Pass. *See* Gene Amromin et al., *Inducing More Efficient Payment on the Illinois Tollway* (Fed. Res. Bank of Chi., Chi. Fed. Letter No. 225, Apr. 2006), *available at* http://www.chicagofed.org/publications/fedletter/ cflapril2006_225.pdf.

[64] Douglas Martin, *Fare Cards: A Glimpse of the Future Underground*, N.Y. TIMES, Jan. 7, 1994, at B3; James C. McKinley Jr., *Despite Big Push, New Yorkers Snub Transit Card*, N.Y. TIMES, Aug. 17, 1994, at A1; Richard Perez-Pena, *Transit Agency Plans Its First Volume Discounts*, N.Y. TIMES, Oct. 26, 1996, § 1, at 1.

[65] 12 U.S.C. § 5003 (2008).

[66] Indeed, the Federal Reserve generally attempts to set its check collection fees so as to cover the associated costs. *See* Appendix 2 to testimony of Vice Chair Alice M. Rivlin Before the Subcommittee on Domestic and International Monetary Policy of the Committee on Banking and Financial Services, U.S. House of Representatives, http://www.federalreserve.gov/Boarddocs/testimony/1997/ 970916a2.htm (last visited Jan. 11, 2009).

substitute checks is not vital to the continued functioning of the economy in the way that the acceptance of United States currency is.

But the government does have a general interest in payment systems. As we noted in Part I, some payment systems are more efficient than others. Efficiency is generally good for society, so the government has reason to promote it. The government might also have an interest in being responsive to the subjective preferences of consumers and merchants, even when these preferences are in tension with efficiency. After all, efficiency is not—nor should it be—the only criterion by which to judge governmental action. In the next Part, we assume that the government has a legitimate interest in changing endogenous preferences about technology in pursuit of efficiency and perhaps other goals. We thus proceed to examine and evaluate the tools government has at its disposal.

III
AFFECTING PREFERENCES AND NETWORK EFFECTS

Whether and how the government affects our technology preferences depends on the government's precise goal, the role it has assumed, and the particular sort of technology at issue. Depending on the situation, the government may (a) provide information that allows individuals to coordinate their behavior, (b) pass legislation or adopt policies aimed at reducing or eliminating concerns about a particular technology, (c) provide incentives to induce individuals to adopt a new technology, or (d) force change by eliminating or curtailing the older technology. The next section examines these options, each of which represents an incremental increase in the amount of pressure placed on potential users of the new technology.[67]

A. Focal Points and Information

As our earlier discussion of network effects suggested, most technology requires coordination. For instance, a business cannot send a fax unless the intended recipient also has a fax machine, and a man will not have any luck using e-Harmony to find his future spouse unless women are also using the service. Payment systems require this sort of coordination: in order for a consumer transaction to occur, the seller needs to accept the payment form that the buyer tenders.

[67] *Cf.* Lawrence Lessig, *The Regulation of Social Meaning*, 62 U. CHI. L. REV. 943 (1995).

The most innocuous means of facilitating coordination is for the government simply to provide information about different payment forms. For example, Check 21—the federal legislation that enables banks to return electronic copies of checks to their customers instead of physical hard copies—requires that electronic checks bear the legend, "This is a legal copy of your check. You can use it the same way you would use the regular check."[68] This sort of government action helps ensure that the public recognizes electronic copies of checks and makes it easier for banks and those who use and receive checks to coordinate their behavior.

The ability to coordinate, however, by no means guarantees that a person will choose to use a particular technology. With payments, for example, government informational efforts should ensure that a seller accepts particular methods, at least when doing so requires no additional seller investment. As a very simple example, a buyer may offer an updated twenty-dollar bill when purchasing groceries. If the seller does not know that the bill is legitimate and the buyer does not have any alternative means of payment, the coordination failure could result in a lost sale. But if the government has informed the seller through advertising the bill's legitimacy, she is likely to accept it. Similarly, a seller who demands proof of payment is likely to accept a substitute check, provided she knows it is the legal equivalent of a traditional cancelled check. At the very least, then, government-supplied information helps ensure that individuals will *accept* one form of payment when they really prefer another.

As previously suggested, however, the success of a new payment form—or most technologies—depends on overcoming the chicken-or-the-egg problem. For payments, this means that not only do consumers have to be willing to *adopt* the new form, but merchants must be willing to *accept* it, which in turn depends on merchants anticipating that a sufficient number of users will be on the opposite side of the platform. Government-provided information may influence use when it emphasizes the benefits of one payment form over another. For instance, when the U.S. Mint launched the Sacagawea one-dollar coin, it purchased a commercial that featured a vending machine repeatedly rejecting a frustrated individual's one-dollar bill.[69] The Mint ultimately decided against the segment,[70] but

[68] 12 U.S.C. § 5003(b)(2) (2008).

[69] U.S. GEN. ACCOUNTING OFFICE, NEW DOLLAR COIN: MARKETING CAMPAIGN RAISED PUBLIC AWARENESS BUT NOT WIDESPREAD USE 11 (2002) [hereinafter MARKETING CAMPAIGN].

we can easily imagine how the commercial demonstrating the coin's consumer advantages would encourage use. Consumers would be initially attracted to the coin, vendors would anticipate this attraction, and consumers would similarly anticipate that vending machines would accept the coin. In other words, informational campaigns suggesting that one payment form is superior to another might influence network effects by both affecting the willingness of people to consider using the payment form in the first instance and by influencing the predictions people make about the behavior of individuals on the other side of the platform.

Particularly when government is acting as fiduciary and seller, however, it may want to do more than just ensure use and acceptance of a technology. Instead, it might desire that a particular technology dominates. The government introduces the dollar coin, the Metrocard, or some other payment method because it sees an opportunity to increase efficiency and correspondingly reduce costs. As such, the government may try to make a particular technology the focal point around which individuals will voluntarily coordinate their behavior.[71]

As used in the economics literature, "focal point" refers to the place where individuals who need to coordinate their behavior gravitate. In Thomas Schelling's famed example, for instance, two parachutists who are unexpectedly separated must find each other. Schelling illustrates how one point on their maps may be focal, or the place where each would expect the other to go in order to meet up.[72] Richard McAdams uses Robert Sugden's Crossroads game to illustrate how government speech can create focal points.[73] In the Crossroads game, two cars approach an intersection on different roads. Both drivers prefer to maintain their respective speeds and have the other driver yield. Each driver's paramount interest, however, is in avoiding the collision that would occur if they both maintained speed. McAdams discusses how the state can erect signs that, independent of any legal sanction, act as focal points that allow drivers to coordinate whether to yield or continue forward.[74] Note

[70] *Id.* at 11–12. The Treasury had an informal restriction against comparing the dollar coin to the dollar bill or otherwise negatively comparing the two forms of payment. *Id.*

[71] *See generally* Richard H. McAdams, *A Focal Point Theory of Expressive Law*, 86 VA. L. REV. 1649 (2000).

[72] THOMAS C. SCHELLING, THE STRATEGY OF CONFLICT 55 (1970).

[73] McAdams, *supra* note 71, at 1704–05.

[74] *Id.* at 1706.

that in both the parachutist and Crossroads examples, what is dominant or focal may not reflect an individual's personal preference. That is, the parachutist who is many miles away from the focal bridge may prefer to meet elsewhere, just as the driver whom the sign instructs to yield would prefer to continue forward. In each example, however, the individual subverts his own subjective preference because the need to coordinate is paramount.

Government-provided information most likely creates a focal point when the government acts as either fiduciary or seller. Richard McAdams has posited that the law influences behavior because it creates expectations about how others will behave, and that people then coordinate their behavior around these expectations.[75] McAdams argues that the law is particularly effective at creating focal points because (a) new laws often receive publicity, which helps create expectations; (b) legal expression is unique, and thus stands out from competing expressions; and (c) legal officials have a reputation for correctly predicting future behavior.[76] All of these factors make the legal message louder, and thus more focal, than alternative messages. While McAdams is careful to note that loudness does not depend on the morality that is often associated with the law, he concedes that the legitimacy of the law matters because it further helps distinguish the legal message from the rest.[77] Similarly, when the government is wearing the hat of fiduciary or seller, the public is likely to perceive its message as having particular legitimacy.

Again, take payments as an example. The U.S. government is universally perceived as the fiduciary of the national monetary system. As such, its words have special import when the message is about payment methods. While this is most obviously true when the message concerns U.S. coins and currency, the authority spills over to matters that are not directly connected to what constitutes legal tender. Moreover, the message should be highly salient when the government is selling a service like transportation; the message, after all, informs the buyer which sort of payment the seller prefers.

The Crossroads and parachutist examples, however, should illustrate the difficulty of convincing individuals to coordinate around

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[75] *Id.* at 1651.

[76] *Id.* at 1666–71. As McAdams points out, this reputation is a byproduct of the publicity and uniqueness of the legal message. These two factors make the law an effective focal point. Legal officials may appear to simply be predicting future behavior, when in fact the law they promulgate actually shapes behavior. *Id.* at 1672.

[77] *Id.* at 1670.

a payment form or any sort of technology that runs counter to their own preferences. Both examples offer only one opportunity to coordinate, which stands in stark contrast to the realities of many technologies. That is, the parachutists' maps may show many possible meeting spots, but unless each parachutist independently decides to go to the same place, they will not survive. Similarly, one driver has to yield and the other has to go, or else the cars will crash or indefinitely stall.

Many technologies, however, operate in areas that present myriad alternatives for coordination. For instance, most sellers will accept more than one form of payment; if a seller does accept only one form, it usually will be currency and coins, which everyone uses to some extent. Individuals can exchange a contract via fax, e-mail, or the U.S. postal system. People can meet a prospective spouse online, at a bar, or at church. Increasingly, television shows can be viewed on standard television sets, HDTVs, and computer screens. Government-supplied information may influence expectations about how many users will be on the opposite side of the platform, and therefore may affect the willingness of parties on both side of the platform to *adopt* a particular technology. To illustrate, in Equations 2 and 7, merchants and consumers are attempting to make predictions about the likelihood of increased utility from adopting the new system, and information supplied by the government about use by parties on the other side of the transaction can naturally alter these calculations. But information alone is unlikely to lead to increased use.[78] When the customer chooses among the technologies she has already adopted, she knows which of her options the other side has adopted. Coordination thus is beside the point. The question, then, is what else the government can do to influence decisions to *use* a particular technology.

B. Gently Addressing Particular Concerns

Sometimes refusing to use a new technology may result from a particular concern about one or more aspects of the new method. For example, as credit cards became increasingly popular in the 1960s, the possibility of theft and unauthorized charges received similar

[78] We acknowledge that focal-point information may generate increased use through the mechanism of sunk costs: if the information provided led to the consumer adopting the payment system, those costs may become sunk costs that then lead the consumer to use the system more. *See supra* text accompanying notes 25–28. Otherwise, information about coordination should have no effect on decisions to use a system.

attention that identity theft receives today.[79] Congress responded to this concern in 1970, when it amended the Truth in Lending Act to provide that credit card holders are responsible for no more than fifty dollars of fraudulent charges.[80] At about the same time, Congress established specific criminal penalties for fraudulent credit card use.[81] As another example, in 1978, Congress noted that while "the use of electronic systems to transfer funds provides the potential for substantial benefits to consumers," it was nonetheless problematic that the "rights and liabilities of consumers" were undefined.[82] Thus, as part of its Electronic Funds Transfer Act, the federal government limited an account holder's liability for unauthorized electronic fund transfers to fifty dollars.[83]

In all of these examples, the government spoke to consumers in its legislative role. These statutes simultaneously reassure consumers and endorse the controversial technology. The statutes limiting liability directly address a source of consumer reticence by ensuring that the financial institution, not the consumer, bears the risk of fraud. The statutes thus actively and visibly eliminated one barrier to widespread use, thereby underscoring governmental support for the new payment system. As for the statute imposing criminal liability, it also sent the message to consumers that the government took credit card theft seriously and was taking steps to prevent it. Some consumers may have believed that a criminal statute in place specifically addressing credit card fraud ensured fewer individuals would engage in fraud in the first instance. Collectively, these statutes illustrate an approach in which the government behaves more proactively than when it simply provides information and attempts to create focal points around which individuals can coordinate.

In addition to addressing particular concerns about fraud, the statutes influence network effects, albeit gently. Because these statutes remove a barrier to use, they make both consumers and merchants more confident that a particular technology will become widespread. With this increasing confidence, more consumers, merchants, and institutions will invest in the new technology. Thus,

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[79] *See, e.g.*, *He Who Steals My Purse Steals My Credit Cards*, TIME, June 19, 1964, *available at* http://www.time.com/time/magazine/printout/0,8816,871192,00.html.

[80] 15 U.S.C. § 1643 (2008).

[81] *Id.* § 1644.

[82] *Id.* § 1693(a).

[83] *Id.* § 1693g.

their actions will have a feedback effect: as others become aware of this investment, they too will adopt the new technology, and so forth.

C. Providing Incentives or, Alternatively, Imposing Sanctions

Sometimes, however, no particularized concern animates an individual's decision to eschew a new technology. Instead, the reticence is purely the result of the—perhaps irrational—preferences of individuals. When preferences are particularly strong, effective government action must make the new technology's benefits either larger or more tangible, or, alternatively, must make the nonuser internalize the cost that her preference imposes on third parties. In other words, effective governmental action must incentivize use of the new technology, or—depending on one's perspective—sanction use of the old technology.

Such incentives can be quite effective. For example, Metrocard did not become popular with New York City subway riders until the transit authority offered free bus transfers to Metrocard users.[84] Likewise, discounted tolls often contribute to a highway driver's decision to use electronic payment. As another example, the federal government—which stands to gain millions by auctioning off public airwaves after television viewers switch from analog to digital technology[85]—has started to offer forty-dollar vouchers that can be used toward the purchase of digital converter boxes.[86] Indirect incentives may be effective as well. For instance, highway authorities can increase the number of lanes dedicated to electronic payment and decrease the number dedicated to traditional payment. After such tinkering, nonelectronic users will experience the "cost" of even longer lines. Indeed, some highway authorities have gone so far as to reserve certain freeway entrances for electronic payers. Each of these incentives, whether direct or indirect, magnifies the costs of sticking with the old payment method.

In each of these examples, the government acts as seller. This is unsurprising because incentives are often expensive, at least in the short-term. When the government acts as seller, it may have good reason to internalize the costs of incentives because the long-term

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[84] Andy Newman, *Hop On, Hop Off: The Unlimited Metrocard Arrives*, N.Y. TIMES, July 3, 1998, at B1.

[85] *See infra* notes 115–24 and accompanying text.

[86] *See* Fed. Commc'ns Comm'n, The Digital TV Transition: FAQ's—Customer Corner, http://www.dtv.gov/consumercorner.html (last visited Jan. 13, 2009).

benefits from a switch in technology will outweigh the short-term costs. The problem is that it is not always possible to find a party to internalize the network externalities of the new system because the availability of profit opportunities may be limited. This is particularly true when the government acts as fiduciary.

The story of the Susan B. Anthony dollar coin illustrates this difficulty. John Caskey and Simon St. Laurent have argued that the coin failed because the government did not understand the importance of network effects or the economic theory underlying coin/note substitutions.[87] When the government launched the Susan B. Anthony in 1979, it was confident that the public would accept the coin and predicted widespread circulation within three to four years. The coin, however, was a colossal flop:

> Despite the Mint's emphasis on designing a coin suitable for vending machines, most machines were not recalibrated to accept it. Vendors had begun updating their machines before the law passed, but only 250,000 of four million [vending] machines accepted the coin by July 1979. The cost for updating old coin acceptors ranged from $25 to $350 per acceptor. Given these costs and doubts about the coin's success, most vendors preferred to wait to see if the coin would become widely used before converting their machines.
>
> The media, the public, and retailers criticized the coin for looking like a quarter, making it hard to distinguish rapidly.[88] . . . Consumers and retailers complained of the coin's similarities to the quarter in size, color, reeded edge, and thickness. Because many customers did not want the coin, cashiers rarely offered it as change. . . . Consumers declined to accept the coin from retailers as change, merchants returned the coins to the banks, and the banks, unable to redistribute them to merchants and facing high storage costs, sent them back to the Federal Reserve and did not order resupplies.
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> . . . .
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> By January 1980, only 291 million of the 750 million dollar coins produced were in circulation. In March 1980, the Mint stopped production as a "temporary measure."[89]

The obvious problem with the Susan B. Anthony coin was network externalities. Merchants deciding whether to accept the Susan B.

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[87] John P. Caskey & Simon St. Laurent, *The Susan B. Anthony Dollar and the Theory of Coin/Note Substitutions*, 26 J. MONEY, CREDIT & BANKING 495 (1994).

[88] This was a questionable criticism at best. The Susan B. Anthony "weighs 43 percent more than the quarter, has almost the same size relation to the quarter that the quarter has to the nickel, and has distinctly different engraving than the quarter." *Id.* at 501.

[89] *Id.* at 501 (citations omitted).

Anthony were aware of the accompanying costs, which included retooling vending machines or creating space in the cash register drawers and the risk that employees would confuse the coin with a quarter. From the merchant's perspective, accepting the coin made sense only if a large number of consumers would be presenting the Susan B. Anthony and if the merchant would likely lose sales if she did not accept the coin.

As we have discussed previously, however, consumers had an incentive to adopt the coin only if a sufficiently large number of transactions existed where the coin's benefits overcame the costs imposed by adopting the coin.[90] In this particular context, such situations were limited. The main benefit of the coin was that it weighed less than the equivalent amount of quarters and would facilitate purchases in vending machines under then-existing technology. The costs came in two forms: first, the hassle of learning to identify the Susan B. Anthony as readily as other coins, and second, having to forgo transactions with vending machines or other merchants that did not yet accept the coin. Because few vending machines initially accepted the coins, the costs generally outweighed the benefits.[91] The resulting equilibrium was such that neither merchants nor consumers had an incentive to begin using the coin, and, unsurprisingly, the Susan B. Anthony dollar was a flop.

In contrast to the Susan B. Anthony, credit cards managed to overcome a similar initial challenge. As S.J. Liebowitz and Stephen Margolis have noted more generally as to network externalities, the failure to adopt a new, superior standard represents "a profit opportunity for someone who can figure out a means of internalizing the [network] externality and appropriating some of the value made available from changing to the superior standard."[92] In other words,

[90] *See supra* text accompanying notes 18–33.

[91] Of course, this is a generalization and does not speak to all consumers or vendors. It is plausible that for some consumers, the coin's benefits outweighed its costs. This could be either because (a) they disproportionately had access to machines and merchants that accepted the coins; and/or (b) they *liked* the coin, or in other words, they obtained some sort of psychological benefit from having the coin. The existence of such a core of consumers will overcome the network externalities, however, only when it leads to what Professors Shapiro and Varian refer to as a virtuous cycle of positive feedback: a situation where other consumers and merchants adopt the product—here the coin—because they believe that others are also adopting the product. *See* SHAPIRO & VARIAN, *supra* note 16, at 173–77.

[92] S.J. Liebowitz & Stephen E. Margolis, *The Fable of the Keys*, 33 J.L. & ECON. 1, 4 (1990).

in some cases, an entrepreneur who can innovate a way to profit from the creation of a platform will find ways to internalize the network externalities in order to facilitate adoption of the technology.[93] An example of this, again, is the growth of both the charge card and the credit card industries over the past fifty years. In the first part of the story, charge cards went through a period of rapid growth following the creation of the Diners Club card because the founders of that card realized they could make profits by extracting a high merchant discount fee averaging seven percent and giving the card to consumers at a fairly low cost, including a five-dollar annual fee.[94] In other words, Diners Club, and then American Express, was able to internalize the costs of getting the cards into the hands of consumers by extracting higher profits from merchants.[95]

In the second part of the story, credit cards became one of the dominant U.S. payment forms when credit card issuers learned that they could profit from the credit function of a credit card, allowing the company to offer the payment service of the card at a lower price. This bundling of products—the payment product and the credit product—was not enough, however. The second important innovation was the improvements in the revolving credit industry allowing credit card issuers to make greater profits from the issuance of such credit. Essentially, this created what might be seen as a three-sided platform market involving merchants and two types of consumers: those who are only transacting and those who are financing. Credit card issuers also became more sophisticated in marketing their credit products and in their ability to decide to whom they should extend credit and under what terms.[96] These innovations allowed them to nearly eliminate annual fees, cut the costs charged to merchants, and expand the contexts in which such cards could be used.[97] In other words, credit cards grew as a payment system because card issuers could extract more profits from consumers using

93 *See* EVANS & SCHMALENSEE, *supra* note 7, at 136.

94 *Id.* at 54–55, 59 (noting that the fee in 1958 dollars was five dollars). At the time, Diners Club earned roughly seventy percent of its revenues from merchants. *Id.* at 54–55.

95 *Id.* at 150.

96 *See* Bar-Gill, *supra* note 33, at 1388–94 (describing methods card issuers use to market cards to consumers).

97 For instance, in the 1990s, Visa and Mastercard each revoked their long-standing rule that a credit card could only be used in transactions where the card was physically present. John D. Muller, *Selected Developments in the Law of Cyberspace Payments*, 54 BUS. LAW. 403 n.26 (1998) (citing Esther Shein, Credit Card Companies SET to Charge, PC WEEK ONLINE (Apr. 20, 1998), http:// www.zdnet.com/pcweek/news/0420/20set.html).

the cards for financing services and thereby cut the costs of the cards to purely transacting parties, which led to more merchants accepting the cards.[98]

The obvious question that arises, then, is why did the market not solve the problem for the Susan B. Anthony dollar in the same way it did for credit cards? The answer, at least in the case of the Susan B. Anthony dollar, is that the profit opportunities for overcoming the network externalities were close to nonexistent. There were no widely available additional products that could be bundled with the coin to underwrite its adoption.[99] Moreover, the government—the supplier of this particular multi-sided platform—could not subsidize one side of the platform by extracting extra payments from another side. Of course, the government could have paid merchants or consumers to use the coin, but the complete absence of discussion on that possibility suggests that it is beyond the pale.[100]

The strategy adopted by the credit card issuers is not the only way for a party to try to overcome network externalities and promote a new technology. As Professors Shapiro and Varian point out, there are two basic ways to internalize switching costs. The first is to reduce those costs by making it easier to switch products. This was the method used by the charge card industry to get consumers to adopt the cards in the 1950s and '60s. The second way is to increase the benefits available from the new network, thereby making the

[98] In their book, Evans and Schmalensee ignore this second story because—we assume—they see the financing function as separate from the transacting function of credit cards. *See, e.g.*, EVANS & SCHMALENSEE, *supra* note 7, at 150. While we agree with Evans and Schmalensee that charge cards arose initially in reaction to the platform created by Diners Club and that the financing function was separate from the transaction function, we reject the implicit notion that bundling the financing and transaction function has had no effect on the industry. We remain convinced that the growth of credit cards over the past twenty-five years has been a direct result of the credit function helping to subsidize the transaction function. *See* MANN, *supra* note 14, at 86–92.

[99] It is not impossible to imagine a hypothetical product that might do this. Say, for instance, that a vendor stood to make significantly more profits if consumers switched from using quarters to the Susan B. Anthony coin. Imagine a soda company whose products cost one dollar. Also suppose that the soda company, by fostering use of the Susan B. Anthony dollar, might save large amounts in the collection and transportation of coins from vending machines such that it is willing to give consumers a discount for purchasing with a dollar coin rather than with another assortment of change. Under these circumstances, the soda vendor's decision might give consumers sufficient incentive to adopt the coin that it initiates a cycle of positive feedback leading to widespread adoption of the coin, particularly if other vendors did the same thing.

[100] In truth, the government already subsidizes all forms of currency in its role as fiduciary. *See* EVANS & SCHMALENSEE, *supra* note 7, at 30 (noting that "many of the costs of cash are hidden in the government's budget").

benefits of the switch outweigh its costs.[101] Increased benefits may make a technology essentially irresistible to one side. For instance, restaurants and hotels accepted charge cards despite the quite high initial discount fees because the cards attracted well-heeled customers. Similarly, DVD providers have included all sorts of additional features to make DVDs more attractive to consumers than the VHS tapes they replaced. Thus, in our example of the Susan B. Anthony coin, the government might still have succeeded *if* it was putting forth a product that had much greater benefits for both consumers and merchants. But in reality, the coin was not a radical improvement from the perspective of either group and therefore was doomed to failure.

D. Withdrawing Alternative Technologies

When government is unable to provide strong incentives or the technology does not offer comparatively greater advantages for both consumers and merchants, the government can ensure a particular technology's success by eliminating or severely curtailing its competition. For instance, several G-7 countries have succeeded in introducing high-denomination coins by withdrawing the competing currency.[102] As another example, the euro became the currency of many European Union countries after each country withdrew its national coins and notes at a time when many citizens in the twelve-member countries would have preferred not to have the euro in the first instance.[103] The United States itself has—for all practical

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[101] Professors Shapiro and Varian refer to these approaches as (a) the evolution strategy of compatibility and (b) the revolution strategy of compelling performance. SHAPIRO & VARIAN, *supra* note 16, at 190–91. They later clarify, however, that the evolution strategy "centers on reducing switching costs so that consumers can gradually try your new technology," *id.* at 192, and that the revolution strategy focuses on "offer[ing] a product so much better than what people are using that enough users will bear the pain of switching to it," *id.* at 195.

Evans and Schmalensee similarly suggest that two ways to solve the problem are to cut the price for one side or to "invest in one side of the market." EVANS & SCHMALENSEE, *supra* note 7, at 143. Obviously, cutting the financial costs or even paying a party to adopt a new system is a way to reduce the switching cost, whereas we see decisions to invest in the market as a way for a system supplier to offer a better product to that side of the market.

[102] MARKETING CAMPAIGN, *supra* note 69, at 20. These countries include Canada, the United Kingdom, and Japan. *Id.*

[103] *See generally* GALLUP EUROPE, FLASH EUROBAROMETER 115: Euro Attitudes (wave 6) – Euro Zone (2001), *available at* http://ec.europa.eu/public_opinion/flash/fl115_en.pdf.

purposes—eliminated competing payment forms at least twice in its history. The passage of the legal tender provision in 1862 meant that creditors had to accept greenbacks in satisfaction of a debt, even though they preferred to be paid in coin.[104] Similarly, in 1863, the United States issued national bank notes, which faced stiff competition from state bank notes. Congress countered the competitive threat by placing a ten percent tax on the issuance of the state notes.[105] The tax made issuance of state notes virtually prohibitive, and they quickly disappeared from circulation.[106] As these examples illustrate, eliminating the competing payment system ensures that the new alternative will flourish; consumers and merchants simply have no choice but to use the alternative.

Withdrawing or severely curtailing the competing technology carries particular risks for the government. These sorts of actions are what the social norms literature calls "hard shoves."[107] That is, rather than using a series of incremental measures to gradually convince individuals about the merits of the new payment form, the government simply forces the public's hand. When it comes to hard shoves, social norms literature has focused on the risk that individuals will react by either declining to follow or enforce the law that is the subject of the hard shove. This in turn creates a "self-reinforcing wave of resistance" that solidifies whatever preferences the government is attempting to change.[108] Once a government withdraws or severely curtails a technology, however, no self-reinforcing wave of resistance is possible. Individuals cannot insist on using the technology that the government has—for all practical purposes—eliminated. In effect, the government has achieved 100% compliance with and enforcement of its own preferences.

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[104] Gold quickly rose to a premium against greenbacks during the inflationary period of the Civil War, at one point reaching a high of 185%. Thus, creditors who were forced to accept greenbacks received less than the market equivalent in other goods or monies. *See generally* Farley Grubb, *The U.S. Constitution and Monetary Powers: An Analysis of the 1787 Constitutional Convention and How a Constitutional Transformation of the Nation's Monetary System Emerged* 5–6 (Nat'l Bureau of Econ. Research, Working Paper No. 11783, 2005).

[105] HARRY D. HUTCHINSON, MONEY, BANKING, AND THE UNITED STATES ECONOMY 51 (4th ed.)

[106] *Id.*

[107] Dan M. Kahan, *Gentle Nudges vs. Hard Shoves: Solving the Sticky Norms Problem*, 67 U. CHI. L. REV. 607, 619–20 (2000).

[108] *Id.* at 608.

A government that uses heavy-handed measures to promote a particular technology does not have to worry about preference backlash, but it does have to concern itself with political consequences. This is the perfectly obvious observation that politicians are held accountable by their constituents. Former German Chancellor Helmut Kohl, for instance, writes in his memoir that he forced the euro on the German people against their will and that they voted him out of office because of it.[109] Similarly, many commentators believe that the Netherlands voted to reject the European Constitution in part because of widespread dissatisfaction with the euro.[110] As another example, in the next section we discuss congressional efforts to replace analog television with digital. After the public failed to embrace digital TV, the government decided to legislate a date on which it would shut down the analog signal, thereby causing all TVs without digital technology to go black. As the blackout date approached and few Americans had adopted the requisite technology, Congress extended the date by three years.[111] As one newspaper put it, "[f]ew politicians want to be blamed if viewers can't watch TV."[112]

Governments engaging in hard shoves have the heavy burden of demonstrating that the promoted innovation genuinely benefits either the country as a whole or significant numbers of its citizens, or that the innovation is necessary to serve some larger purpose. The architects of the legal tender provision, for example, may have perceived it as necessary to preserve the solvency of big commercial banks, which would in turn allow for the sale of government bonds to help finance the Civil War.[113] The European governments that adopted the euro believed a common currency would result in economic strength; in time, their citizens will learn whether these governments were right.

Because withdrawal or curtailment of a competing technology steamrolls over public preferences, it is the most heavy-handed measure that government can take. Whether the government is

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109 HELMUT KOHL, MEIN TAGEBUCH 178 (2000).

110 Marlise Simons, *Dutch Expected to Vote No on European Charter Today*, N.Y. TIMES, June 1, 2005, at A8.

111 *See infra* notes 115–24 and accompanying text.

112 Amy Schatz, *Crossing the Digital Television Divide—As Congress Seeks Deadline for Mandate, Some Viewers Could Be Left in the Dark*, WALL ST. J., July 6, 2005, at A4.

113 *See* Kenneth W. Dam, *The Legal Tender Cases*, 1981 SUP. CT. REV. 367, 408–10 (explaining why the legal tender provision was advantageous for commercial banks).

willing to use this strategy—or to instead choose one of the others outlined in this section—depends largely on whether it is acting as fiduciary, seller, or lawmaker. Because every government entity would prefer not to anger or alienate its constituents, it seeks to spark change by the gentlest possible means. But when providing information or addressing particular concerns proves ineffective, government has to do more. As our discussion of the Susan B. Anthony illustrates,[114] when government is acting as fiduciary, it lacks the profit opportunities that enable it to effectively incentivize use of the new payment form. Thus, withdrawal or severe curtailment of the competing form is the only available strategy. In contrast, when the government is acting as seller, it will directly realize the cost-savings associated with a particular technology. These savings allow the government to offer incentives aimed at overcoming strong individual preferences and network effects. Finally, when government is acting as lawmaker, it is most likely to provide information, address particularized concerns, and leave the incentivizing to third-party institutions that stand to gain from the public making a switch. Moreover, when third-party institutions will be the biggest winners, politicians are likely to be most reticent about hard shoves that risk angering their constituents.

IV
GOVERNMENT ACTION AND THE FUTURE OF AMERICAN PAYMENT SYSTEMS

Although predicting what is on the horizon for new technologies is a tricky endeavor, we are confident that inventors will continue to create and that entrepreneurs will continue to bring those innovations to market. We are also confident that some of these innovators will seek government support. The critical question is whether the government should make this support available.

As Parts II and III illustrate, the government can use a number of tools to promote the adoption and use of a particular technology. But government intervention tends to be inadvisable for three reasons. First, technology moves quickly and the government usually moves slowly. As such, by the time the government intervenes, the "new" technology it seeks to support might already be on its way out. Second, with a bit of time, technologies that are sufficiently

[114] *See supra* notes 87–91 and accompanying text.

advantageous to the consumer are likely to flourish, and thus governmental intervention is ultimately unnecessary. Third, and finally, such intervention may have the unintended consequence of undermining the incentive to invest in new technologies in the first instance.

A. Plodding Governments and Rapidly Moving Technologies

The United States's thirty-year-long foray into digital TV illustrates the political process point. Terrestrial broadcasters—in contrast to cable and satellite providers—traditionally have used an analog signal. Technology has existed since the 1980s that would allow terrestrial broadcasters to replace this analog signal with a digital one. The United States has always been acutely interested in this switch. With the passage of time, some of the reasons for this interest have faded,[115] but one continues to loom large: a digital signal requires much less spectrum than an analog signal. The liberated spectrum—that is, the freed-up public airwaves—will be auctioned off by the U.S. government, most likely for use in wireless telecommunications services.[116] Digital TV thus promises to help raise vast sums of public dollars and ease the spectrum shortage that has emerged with the spread of wireless communications.

Since its creation, however, digital TV has faced the same sort of chicken-and-egg problem that the Susan B. Anthony and credit cards faced, albeit on a much more complicated scale. Digital TV requires different equipment than analog in both the broadcasters who send the signal and the televisions that receive it. The government initially thought that both consumers and broadcasters would readily make the switch, because doing so would allow consumers to watch television in HD, which has substantially better picture quality than other alternatives. But before broadcasters can transmit in HD and consumers can watch it, networks have to produce shows in an HD format. Herein lies the problem, because

> [n]etworks have balked at producing high-definition programming, arguing that there aren't enough outlets that transmit such shows or enough viewers with the necessary technology to watch them.

115 In the 1980s, the United States saw digital TV as a means to revitalize its consumer electronic industry and promote other high-tech industries. HERNAN GALPERIN, NEW TELEVISION, OLD POLITICS 13–14 (W. Lance Bennett & Robert M. Entman eds., 2004). In the 1990s, digital TV became part of "wide-reaching policy agenda" to "turn the TV set into a home gateway for digital services" in nations across the world. *Id.* at 14.

116 *Id.* at 15.

> Local affiliates and viewers, meanwhile, have been reluctant to invest in the necessary technology, on the grounds that there isn't enough quality programming. And cable and satellite carriers, which already carry broadcasters' analog programming, have been reluctant to provide additional space for the broadcasters' digital programming, which often is merely a digitized version of their analog shows.[117]

In other words, the move to digital TV stalled because of collective inaction within this particular multi-sided platform.

Because the U.S. government has an interest in auctioning a freed-up spectrum and because the Federal Communications Commission (FCC) regulates "who can broadcast what, to whom, at what prices, and using which technology, particularly in the terrestrial . . . sector,"[118] one might have expected the FCC to use a few hard shoves to speed the move to digital TV. In fact, however, government initiatives have been "either absent or ineffectual."[119] Most notably, legislation passed in 1997 set a deadline of December 31, 2006, for shutting down all analog television channels but allowed a television station to receive an extension if fewer than eighty-five percent of households in its market had access to digital signals.[120] By mid-2005, less than four percent of households had TVs that were capable of receiving such a signal. In February 2006, Congress acknowledged that the move to digital had floundered and passed new legislation that set a hard deadline of February 17, 2009.[121] The new law also provided up to two forty-dollar coupons per household to be used toward purchasing digital to analog signal converters.[122] Then, only two weeks before the February 17 deadline, Congress postponed the switch for another four months, to June 2009.[123] As this Article goes to press, television viewers are being bombarded by public service announcements about how to prepare for the switch to digital.

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117 Kathy Chen, *FCC Lays Out Plan to Facilitate Digital TV*, WALL ST. J., Apr. 5, 2002, at B5.

118 GALPERIN, *supra* note 115, at 6.

119 Joel Brinkley, *Digital TV Era Still Remains Out of Reach*, N.Y. TIMES, Aug. 7, 2000, at C1.

120 Evan Kwerel & Jonathan Levy, *The DTV Transition in the US*, *in* DIGITAL BROADCASTING: POLICY AND PRACTICE IN THE AMERICAS, EUROPE AND JAPAN 25, 25–26 (Martin Cave & Kiyoshi Nakamura eds., 2006).

121 47 U.S.C. § 337 (2008).

122 Kwerel & Levy, *supra* note 120,. at 34.

123 Brian Stelter, *Switch to Digital TV Wins a Delay to June 12*, N.Y. TIMES, Feb. 5, 2009, at B8, *available at* http://www.nytimes.com/2009/02/05/business/media/05digital.html?scp=2&sq=digitaltelevision&st=cse.

Whether Congress is able to stick with the June 2009 deadline remains to be seen.

The American experience with digital TV sharply contrasts with that of other countries, most notably the United Kingdom, where the transition to digital TV is nearly complete.[124] Professor Hernan Galperin has identified a number of reasons why the United Kingdom was able to succeed where the United States has failed. Among them is a basic point about the American political system:

> The organization of the state . . . militates against regime change and policy innovations. The system is devised to curb discretionary government behavior through structural division of power and formalized checks. . . . Such fragmentation offers organized interests a myriad of access points into policymaking, and each of them represents a potential veto. . . . Gridlock and poor coordination are thus commonplace in American regulatory politics. This does not rule out the possibility of regime change, but such change is likely to be slow and politically contentious.[125]

Because technology changes quickly, the American system may be particularly ill-equipped to meaningfully promote particular applications.

Check 21,[126] the 2004 legislation allowing banks to substitute electronic copies of checks for paper originals, is a case in point. This legislation aimed to tilt consumer preferences toward electronic checks in three ways. First, as with the legal tender statute, Check 21 overrides consumer preferences: even if a bank or consumer would prefer to receive the original check, they cannot insist upon it.[127] Second, the law provides a special procedure that allows a consumer to request a refund for any loss that occurs if a substitute check is incorrectly posted to her account.[128] Third, and finally, Check 21 requires that electronic substitute checks contain the legend, "This is a legal copy of your check. You can use it the same way you would use the original check."[129] Check 21 therefore uses several of the tools discussed in Part III: it provides information, addresses particular

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124 *See generally* GALPERIN, *supra* note 115, at 129–226 (describing the United Kingdom's aggressive approach to digital TV).

125 *Id.* at 255–56.

126 12 U.S.C. § 5003 (2008).

127 *Id.* § 5003(a).

128 *Id.* § 5006(a)(1)(B)(i).

129 *Id.* § 5003(b)(2).

concerns, and employs the hard shove of requiring the acceptance of substitute checks.

As a legal matter, of course, no law was necessary to allow banks to exchange electronic checks. Prior to the passage of Check 21, no statute said that banks *had* to present paper checks to other banks for collection. Even in the wake of Check 21, the law is silent on the form of technology used to exchange checks. Check 21 simply provides that banks can no longer require that the original check be returned to them. Instead, they have to accept some sort of electronic substitute.

Congress aimed the legislation at remedying a variant on the classic network effects problem. Before a bank would be willing to invest in electronic truncation, other banks also had to invest in the technology; the technology would be useless unless other banks were using it as well. Presumably, given the billions of dollars that electronic truncation was expected to save the banking industry, the technology would have eventually caught on. But there was one additional complication: consumers who like receiving back their original checks.[130] Banks, left to themselves, might have quickly migrated to electronic truncation. But some banks were concerned that they would lose customers if they, but not their competitors, switched to electronic truncation. The problem was thus that the entrenched preferences of some consumers gave banks little incentive to move to the new system, even though it promised large savings. Furthermore, at least at the time that Check 21 passed, no intermediary had emerged to internalize the switching costs.

Into this quagmire came Congress. In Check 21, the government solved the consumer preferences problem by applying what amounted to a hard shove. No matter where a consumer banked, she could not be guaranteed the return of her original checks because her bank could not insist upon the return of the original from other financial institutions. In addition, through the use of the legend, Congress attempted to educate consumers about the legal status of electronic checks and their printouts. The key, however, was the hard shove.

What is complicated about this story is that the hard shove does not appear either necessary or successful. Even without Check 21, a significant percentage of check payments were likely to migrate to

[130] One further complication was that in the two states in which Revised Articles 3 and 4 have not yet been adopted—New York and South Carolina—consumers retained a statutory right to receive their paper checks back.

electronic payments as a result of accounts receivable check conversion ("ARC"). In the ARC process, a creditor takes a check written by a consumer and uses it as an authorization to initiate an electronic direct debit from the consumer's account (in other words, a payment flowing in the opposite direction of a direct deposit). Consumers are given some form of notice that the company will be engaging in the practice and the opportunity to opt out, but very few do.[131] In 2004, more than a billion checks were converted to ARC payments,[132] and in 2005, the amount was more than 1.6 billion.[133] In addition, another 160 million checks were converted to electronic payments at the point of sale in what are known as point of purchase ("POP") transactions. In POP transactions, the consumer presents a check to a merchant, who then uses the check to initiate a direct debit from the consumer's checking account using the bank routing number and the account number found on the bottom line of the check. The merchant then returns the check to the consumer as a receipt.[134] Given the explosive growth in such alternatives to check truncation, it is far from clear that Check 21 was necessary.

In fact, to date, the scant evidence suggests that Check 21 has been particularly unsuccessful. For instance, in an April 2005 Federal Reserve Bank of Kansas City publication, the authors conceded that widespread electronic clearing of checks had not yet occurred and that, under existing conditions, electronic truncation was *more expensive* than paper check processing.[135] Another report by the Federal Reserve Bank of Chicago suggested that, nine months after passage, only one percent of the checks processed by the Federal Reserve Banks were substitute checks.[136] Assuming this number is

131 *See* NACHA, *Consumers Have More Protection with Check Conversion, NACHA Reports to Congress*, Apr. 20, 2005, http://www.nacha.org/news/news/pressreleases/2005/Pr042005/pr042005.htm.

132 *Id.*

133 *See* NACHA statistics releases, *available at* http://www.nacha.org/news/Stats/stats2005/2nd%20Quarter%202005.pdf (first and second quarters); http://www.nacha.org/news/Stats/stats2005/4th%20Quarter%202005.pdf (third and fourth quarters).

134 MANN & WINN, *supra* note 8, at 559–60.

135 Larry Taft & Nathan Halmrast, *Early Experiences with Check 21*, PAYMENT SYSTEM RES. BRIEFING 2 (Fed. Res. Bank of Kan. City, Apr. 2005), *available at* http://www.kansascityfed.org/publicat/PSR/Briefings/PSR-BriefingApril05.pdf.

136 *See* Tara Rice, *Implementing the Check 21 Act: Potential Risks Facing Banks* 3 (Fed. Res. Bank of Chi., Chi. Fed. Letter No. 217, Aug. 2005), *available at* http://www.chicagofed.org/publications/fedletter/cflaugust2005_217.pdf.

Apparently, the few checks that are presently converted are of particularly high value, for they account for ten percent of the total value of checks. *Id.* This development is in

correct, only about 130 million checks were converted. That number obviously pales in comparison to the number of ARC transactions. To date, it seems that Congressional efforts to push electronic truncation have failed. Check 21 may have been important when the legislation was first proposed, but by the time it actually passed, alternative technologies emerged that made electronic truncation far less important than banks had predicted.[137]

B. Advantageous Products Do Not Need Government Help

As Check 21 illustrates, the technology that government seeks to promote may be significantly less relevant by the time government actually acts. Another possibility is that the technology the government seeks to promote will remain important, so much so that it will eventually take off on its own. An example from Europe, again in the payments arena, illustrates this point.

A giro is the European equivalent of a check.[138] Getting consumers and merchants to switch from paper-based transactions, such as checks or giros, to electronic payments results in significant social economic benefits.[139] As such, a switch to electronic payments is to a country's economic advantage. In addition, we can assume that most merchants prefer electronic payment systems because they

itself somewhat disconcerting. As the author notes, banks are probably converting larger-value checks rather than lower-value checks because the bank can obtain "the float earned off the earlier availability of funds." *Id.* Because the banks have no obligation to pass these savings on to customers, *see id.* at 4 n.5, Check 21 simply presents banks with an opportunity to gain additional profits with no improvement in services for customers.

137 A Wall Street Journal article suggests that Check 21 is facilitating the use of ATM machines that can create a digital image of a check, thereby enabling the consumer to use a "no envelope" deposit. There is no indication, however, that Congress foresaw this development, which underscores the point that the government is usually ill-suited to predict how technologies will develop. Robin Sidel & Ian McDonald, *The Envelope-Free ATM; Banks Are Testing Versions to Read Checks, Count Cash; Twizzlers Wrapper is Rejected*, WALL ST. J., May 8, 2006, at B1.

138 A giro is a transaction in which the consumer issues a directive to her bank to pay a particular creditor. It is frequently distinguished from a check as a "push" rather than a "pull" transaction: whereas a check requires the creditor to go to the consumer's bank and request payment (i.e., pull funds from the consumer's account), in a giro transaction, the money is sent to the creditor's account as a result of the consumer directing her own bank to make the payment (i.e., the consumer has pushed funds from her account to that of the creditor). A giro transaction bears a great deal of similarity to the direct deposit transactions through which many employees are now paid.

139 David Humphrey et al., *Benefits from a Changing Payment Technology in European Banking*, 30 J. BANKING & FIN. 1631, 1632–33 (suggesting possible savings of up to 1% of national GDP, and documenting average savings of 0.38% of national GDP).

receive their money more quickly. But European countries vary widely in the extent to which consumers make electronic payments. For instance, in the Netherlands, the vast majority of noncash payments (by value) are made by electronic "credit transfers," which are essentially electronic giro payments.[140] Such payments are rarer in Greece[141] and Portugal.[142] Instead, Greeks have continued to use checks and paper-based giros for the vast bulk of payments and have adopted credit cards in large numbers for small-value transactions. In Portugal, the data suggests that checks, but not paper-based giros, compete with electronic giros for payments. These national differences are no doubt the result of both historical patterns of making payments as well as the price structure of various payment forms.

With regard to the price structure of payments, the story is familiar: banks expect that consumers will respond to price incentives. That is, banks anticipate that consumers will use electronic alternatives if they are cheaper than the paper equivalent. But consumers rarely pay directly for such services. Instead, they pay indirectly through the loss of the "float" on paper checks or through lower interest on account balances. No bank wants to be the first—and possibly only—institution to start directly charging customers for services they had previously perceived as free.[143] Again, the issue is a variant of the classic network effects problem. So how can one country make the switch more quickly than another?

Between 1990 and 2004, Norway and the Netherlands experienced significant changes in the way that consumers paid for point-of-sale transactions.[144] Electronic payments, however, took off more quickly in Norway than in the Netherlands because Norwegian customers were charged a per-transaction fee for using both electronic and paper payment systems, with electronic transactions being generally cheaper.[145] Norwegian banks overcame the risk of losing customers

140 EUROPEAN CENTRAL BANK, BLUE BOOK: PAYMENT AND SECURITIES SETTLEMENT SYSTEMS IN THE EUROPEAN UNION AND IN THE ACCEDING COUNTRIES 245–46 (2006) (26% of payments and 85.6% value of payments in 2004), *available at* http://www.ecb.int/pub/pdf/other/bluebook2006addenden.pdf.

141 *Id.* at 155–56 (7.5% of payments and 11.8% of value of payments in 2004).

142 *Id.* at 271–72 (6.2% of payments and 54.3% of value of payments in 2004).

143 *See* Wilko Bolt et al., *The Effect of Transaction Pricing on the Adoption of Electronic Payments: A Cross-Country Comparison* 2 (Fed. Res. Bank of Phila., Working Paper No. 05-28, 2005), *available at* http://www.phil.frb.org/files/wps/2005/ wp05-28.pdf.

144 *Id.* at 3.

145 *Id.* at 2, 4 tbl.1.

by coordinating the timing of when per-transaction fees would begin.[146] While ordinarily this sort of collusion would draw the attention of antitrust officials,[147] Norwegian officials decided to do nothing to prevent it. Indeed, Norway's central bank *encouraged* per-transaction fees. Not surprisingly, Norwegian consumers reacted to the price incentive by moving away from the old system to the new.

But while change did not happen quite as rapidly in the Netherlands as in Norway, it still occurred. In other words, even without a price incentive and the coordination that made the incentive possible, Dutch consumers eventually adopted the new payment systems. For instance, per-person use of electronic giro payments in Norway grew twelve percent annually between 1990 and 2004; per-person use of electronic giro payments grew seven percent annually in the Netherlands during the same time period.[148] But in both countries, paper checks had almost entirely disappeared by 2004. Dutch and Norwegian consumers had replaced them with electronic giros payments, debit cards, and cash that was usually withdrawn through an ATM.[149]

The similarity of the check replacement rates in Norway and the Netherlands suggests that, in some instances, the technology the government seeks to promote would have taken off without any legislative push, particularly if the technology is sufficiently advantageous to consumers and merchants. If the legislation prompts no change beyond what the market would have accomplished in its own time, then government resources are better spent elsewhere.

C. Stifling Competition

There is a third reason why government should refrain from promoting particular technologies: intervention may stifle industry competition and thereby decrease innovation and the offering of special incentives. Market competition leads to useful innovation. For example, although the United States has not yet been able to switch from analog to digital, it did win the race to create the first digital TV system. This success stems from the approach the United States took toward the technology: rather than mandate an HDTV

146 *Id.* at 2.

147 The banks did not coordinate the amount of per-transaction fees, which could be zero. *Id.*

148 *Id.* at 5.

149 *Id.* at 3–4.

standard like many of its industrial counterparts did, the United States took a more flexible approach that promoted research into new ways of compressing HD signals.[150] When the government enacts legislation relating to technology, it risks decreasing innovation.

Consider the market for payments by cell phone, which have already taken hold in parts of Asia. Providers are immensely interested in convincing consumers to use their cell phones to make payments and have begun to experiment with such services.[151] A lack of interoperability, however, could prevent consumers from migrating toward cell phone payments. Issues could arise at two different levels. First, different cell phone companies may develop different transaction technologies, with the result that only some cell phones will work in one location to make a payment, while other cell phones will work in another location. Second, cell phone companies may differ in what payment services they are willing to offer to customers. One company might allow its customers to select among accounts from which to make payments, while another company may require that customers only make payments through a credit card, perhaps even a particular bank's credit card. As a result, payment providers are likely to seek that the government require new payment systems operators to increase interoperability.

Just as the Federal Reserve and banking interests sought congressional aid in mandating the acceptance of substitute checks, payments industry parties may seek assistance in gaining consumers' acceptance of a particular cell phone technology. In Hong Kong, for instance, nearly ninety-five percent of the population carries the Octopus card, which is a stored-value card that, like E-ZPass, uses RFID technology.[152] One of the main factors in the phenomenal success of the Octopus card was the formation of a joint venture by the five largest public transportation providers to support the creation of a card that would work on all of their lines.[153] Similarly, the success of smart cards[154] in Europe has been tied to the willingness of

150 GALPERIN, *supra* note 115, at 246.

151 *A Cash Call*, *supra* note 5, at 71–73.

152 *See* Carol L. Clark, *Shopping Without Cash: The Emergence of the E-Purse*, ECON. PERSP. (4th Quarter 2005), at 34, 36.

153 *Id.* at 37. In contrast, Carol Clark notes that two similar systems launched by competing bus companies in Macau failed to succeed because of the lack of interoperability. *Id.*

154 A "smart card" generally refers to any payment card that has a microchip containing a consumer's information embedded in the card. In Europe, smart card technology has

state telephone companies to mandate the use of smart cards for pay phones.[155] For cell phone payment schemes to work in the United States, interoperability is similarly likely to be crucial. Only interoperability can provide sufficient benefits to satisfy the heterogeneous preferences of a critical mass of consumers, which will in turn induce merchants to accept cell phone payments.

An effective means of increasing the possibility of a critical mass is for the government to mandate a particular payment technology.[156] Such a move would, of course, limit consumer choice among possible products. For instance, Cingular has tested a product in Atlanta that uses special RFID chips in cell phone handset covers to allow customers to make payments at Philips Arena.[157] In this product, the chip connects the cell phone with the customer's "existing Chase credit card accounts."[158] Paypal encourages consumers to use their cell phones to send money from their Paypal accounts to friends and relatives.[159] A similar product is Obopay, which provides consumers with software that allows them to receive and make various payments via their phone.[160] Given such an abundance of mutually exclusive systems, smaller existing payment providers might pressure the government to ensure that these new services provide access to not just particular accounts, but to all of a consumer's credit and/or deposit accounts.[161] On its face, such governmental intervention is appealing because it would make such products attractive to a wider variety of consumers and thereby increase the likelihood of adoption.

primarily been used to embed a PIN on a microchip located on a credit card, which the consumer then confirms when making a purchase with the card.

155 SHAPIRO & VARIAN, *supra* note 16, at 244.

156 Note that the other possibilities for government action we discussed in Part III are unlikely to be useful in this context.

157 Eric Dash & Ken Belson, *Ring Up My Bill, Please: Mobile Payment via Cellphone*, N.Y. TIMES, Mar. 21, 2006, at C1.

158 *Id.*

159 For information on the service, see Paypal.com, Send Money By Phone – Anytime, From Anywhere, https://www.paypal.com/us/cgi-bin/webscr?cmd=xpt/mobile/MobileSend-outside (last visited Jan. 15, 2009).

160 In the Obopay system, the phone itself is not used to make retail payments. Instead, the customer uses a special debit card that is linked to the Obopay account. S*ee* Press Release, Obopay, Obopay Unveils First Comprehensive Mobile Payment Service in U.S. (Mar. 30, 2006), *available at* http://www.obopay.com/corporate/press_releases/pr_33006.shtml.

161 *Cf.* Dash & Belson, *supra* note 157 (noting that big card issuers would prefer to limit access to accounts).

The rub is that the success of such systems is likely to require not just attractive services, but also the use of incentives.[162] For example, Obopay presently gives new users ten dollars in their account just for signing up. Incentives are costs, which need to be internalized by someone, most likely the existing payment providers. And if those providers are not guaranteed exclusive access to customers, they may decide not to invest in the first place. In this context, government interference may not increase consumer choice, but instead undermine it.

Moreover, the stronger the governmental shove toward a particular technology, the greater the risk that the government will stifle competition within the industry. For example, because cell phone payments currently are not a necessity, there is competitive pressure for payment providers to entice consumers and merchants with special incentives and services. Payment providers also have an impetus to continue to develop new technologies that expand the appeal of their products. Any governmental action that forces a particular technology upon consumers and merchants is likely to stifle these innovations and incentives because they will no longer be necessary to ensure the technology's widespread adoption and use. The potential for stifling competition, then, is another reason why government should rarely intervene to promote a new technology.

CONCLUSION

In a digital world, the number of networked technologies will increase dramatically. Beyond the examples we discuss in this Article, there are operating systems for computers and other devices and network standards for cell phones, to name just a few. The success of such technologies will turn on the ability of their promoters to gain adoption from a wide variety of users. Given the large investments at stake, businesses are likely to put a great deal of pressure on the government to take a role in assisting or even promoting particular technologies.

As we have argued, however, the government generally should do nothing. Market participants are usually better positioned than the government to bring about the necessary coordination for a technology to succeed. Even when the market may have trouble coordinating for a particular technology, there is still good reason to

[162] *See also* Clark, *supra* note 152, at 37, 38 (noting the importance of incentives).

be skeptical that the government will decide to invest in the right technology, move in a timely enough fashion, or act without causing collateral damage.

None of this is to say that the government should have no role. Clearly, government support in the form of legislation that clarifies the rules for already-dominant technologies can create additional efficiencies for society. But even here, the government must be careful not to prop up failing technologies (for example, electronic checks) at a time when more efficient technologies (for example, direct deposits and withdrawals) are taking over. Government power can just as easily distort the market by entrenching an old and failing technology as it can aid the adoption of a new technology. In March 2008, more than a year shy of the government-engineered switch to digital television, newspapers began to report that many Americans are abandoning traditional television sets for programming that is streamed to their computer screens.[163] Hindsight is always 20/20, but the accompanying lessons should also be clear: government usually is not well-suited to help the public decide which technologies should take off and which should fail.

[163] Brian Stelter, *Serving Up Television Without the TV Set*, N.Y. TIMES, Mar. 10, 2008, at C1.