

The Impact of ATM Surcharges on Large Versus Small Banks: Is There a Customer Relationship Effect?

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This paper uses a unique data-base to test the effect of ATM surcharges on large versus small banks. Specifically, we examine the impact of ATM surcharges on bank customer incentives to switch accounts, from smaller banks to larger banks, in order to avoid ATM surcharges. We find that ATM surcharges increase the market share of deposits of large banks and decrease the market share of the smaller bank. ATM surcharges also positively impact the profitability of larger, but not smaller, banks. Overall, there appears to be a positive customer relationship effect for larger banks resulting from ATM surcharges.

I. Introduction

In 1996 member banks of shared ATM networks (e.g. Cirrus, Plus etc) were allowed by these networks to impose surcharges on nonbank (“foreign”) customers using their ATMs¹ (see, Prager, (2001), Hannan, Kiser, Prager, McAndrews (2002)). This regulatory change has resulted in a public policy debate over whether the ability to impose ATM surcharges benefits large banks and hinders small banks. Several consumer interest groups (e.g. Public Interest Research Group, 1999) have argued that ATM surcharges create an incentive for bank customers to switch from smaller banks with smaller ATM networks to larger banks with larger ATM networks. This is because only nonbank (foreign) consumers pay the ATM surcharge so that a customer belonging to a large bank with many ATMs would be less likely to have to pay ATM surcharges due to “free” access to this larger network. For example, the Public Interest Research Group (2001) has made the argument, regarding the period following the 1996 liberalization, that “large banks in particular were eager to take advantage of their size ... when competing against smaller banks. The new fees gave the large banks the golden opportunity to advertise that they had far more ATMs than smaller banks, which meant that their customers would have to pay fewer fees for using “foreign” banks’ ATMs.” (Public Interest Research Group, 2001, p 1)

The response of the American Bankers Association (1997) --a banking lobbying group in favor of ATM surcharges-- has been to acknowledge that larger banks are usually more in favor of ATM surcharges than smaller banks. However, they claim that, “smaller banks are not all agreed that surcharging is bad, and in at least one instance, a large bank is part of a non-surcharging alliance” (American Bankers Association”, 1997, p. 3)².

The issue of whether customers will prefer larger banks with larger ATM networks, in order to avoid paying ATM surcharges also forms a central element of recent theoretical work on

¹ Other fee revenues include a fee charged to a bank’s own customer who uses another bank’s ATMs (a so-called foreign fee) as well as interchange fees paid by the customer's bank to the ATM owner when the banks own customer uses the owners ATM. The latter fee is usually set by the network and is constant across all banks in a network. Other fees that may be paid or charged include: own-bank ATM fee (which is rare), POS fee, card fee and switch fee (see Stavins, 2000 p. 15). It should be clarified that the ATM network of importance in this paper is the bank’s own ATMs, since switching can take place either by depositors at other banks in the same ATM network (e.g. Cirrus or Plus) or banks at another ATM network. Foreign users either in the same network or other networks are subject to the same surcharge for using another bank’s ATMs.

² A public policy concern has also been raised about the negative effects of bank merger policy liberalization on small banks. However, Berger *et al.* (1998) find no support for this in the case of small business lending. On the other hand, it has also been argued that branching and merger restrictions have often favored smaller banks (see Economides, Hubbard and Palia (1996) and Palia (1994) for example).

ATMs (e.g. Massoud and Bernhardt (2002a, 2002b) McAndrews (2002)). All of these papers consider the possibility that ATM surcharges can impact banks profitability, both directly as well as indirectly through a so-called customer relationship effect³. This indirect effect results from a customer at a small bank with relatively few ATMs switching his/her deposit account to a larger bank with a larger number of ATMs in order to avoid paying ATM surcharges. If switching occurs then higher ATM surcharges should result in an increase in the market share of bank products (e.g. deposits) and profitability of larger banks and a decrease in the market share of deposits and profitability of smaller banks.

While this issue has been extensively discussed in the theoretical literature as well as in the public policy arena there has been, until now, only limited research on the impact of ATM surcharging on larger versus smaller banks.

We first motivate the importance of the issue by using an event study to examine the announcement effect of surcharge liberalization (on April 1st, 1996). We find that on the day of the announcement large banks had significantly positive abnormal returns while smaller banks had significantly negative returns. This result implies that the market expected a relatively favorable effect on large bank returns and profitability in the post-1996 period from ATM surcharge liberalization.

We then use a unique panel data-base for individual bank ATM surcharges over the 1996-2001 period to examine the impact of an increase in surcharge levels. While the direct effect of high surcharges on a bank's revenues, profits, and market share will depend on the price elasticity of demand of customers to using ATMs of another bank,⁴ the overall effect of a surcharge increase on a bank's deposit market share and profitability will reflect the degree of switching that occurs by customers who move their accounts (and related bank product demands) to the surcharge increasing bank, in order to avoid paying the higher ATM surcharges imposed on "foreign" users. We find that bank ATM surcharges increased the market share of deposits of larger banks while decreasing the market share of smaller banks -- consistent with bank customers switching accounts from smaller to larger banks to avoid surcharges. We also find that higher surcharges increase the profitability of large banks relative to small banks. This result

³ For detailed discussion of customer relationship effects in a different context see, Ongena and Smith (2001) and Bae, Kang and Lim (2002). Mester, Nakaumura and Renault (2003) also show that there is a link between customer checking accounts and the information they generate and other services (such as the provision of loans).

⁴ If the demand function is inelastic an increase in surcharge will have a positive direct effect on bank revenues. If the demand curve is elastic it will have a negative effect on bank revenues.

suggests a favorable effect of surcharge increases on large versus small banks overall profitability consistent with a customer relationship effect.

Section 2 of this paper briefly provides an overview of ATM growth and pricing. Section 3 reviews the previous literature on ATM pricing. Section 4 assesses the ex-ante materiality of the April 1st 1996 liberalization of ATM surcharges announced by Cirrus and Plus. Section 5 presents a model that shows how ATM surcharges impact a bank's profitability through both a direct and indirect effect. Section 6 discusses our hypotheses. Section 7 describes the methodology and Section 8 discusses the empirical results. Finally, Section 9 is a summary and conclusion. An Appendix to the paper describes in detail the ATM data employed in this study provided by Dove Consulting group (1999) and (2002) – henceforth Dove.

2. ATM Proliferation and Pricing

The number of ATMs have grown significantly since being introduced in the late 1960s. For example, the number of ATMs stood at 324,000 in 2001 versus 83,000 in 1991. There have been at least three phases of growth identified (see Dove (2002)). The first phase was pre-1996, *i.e.*, pre-independent surcharging, when there was a relatively modest growth in ATMs. The second phase was 1996 to approximately 1998 when there was rapid ATM growth following the relaxation of restrictions on individual bank surcharges in April 1996. The most recent period (*i.e.*, post 1998) has reflected slower growth again.

When a customer uses ATMs of banks other than his or her own (a so-called foreign customer) he or she is charged at least two separate fees: (i) a surcharge fee by the bank which owns the ATM and (ii) a foreign fee by his or her own bank for using ATMs of other banks.⁵

Prior to April 1st 1996, banks were generally restricted by ATM shared networks from imposing surcharge fees on foreign customers who used ATMs in the shared network other than those of their own bank. On April 1st 1996 Cirrus and Plus announced that they were willing to let members of their networks determine their own surcharge fees. Since that time the number of banks charging such fees to foreign users has increased rapidly. By 1998 (only two years later) 78% of US banks were imposing surcharge fees (Stavins (2000)). Consequently, the surcharge fee has been a focal point of much of the prior ATM literature --discussed next in Section 3.

⁵ Stavins (2002) discusses other ATM related fees such as the foreign and interchange fees paid by banks. We do not examine foreign fees or others here since bank specific fee charges other than ATM surcharges were not available from the Dove database.

3. Previous Literature on ATMs and ATM Pricing

Following the dramatic increase in the number of banks applying a surcharge to their foreign customers, there has also been an increase in research on this issue. Massoud and Bernhardt (2002a and 2002b) and McAndrews (2002) have developed theoretical models, which introduce and analyze the idea of the customer relationship (or indirect) effect of ATM surcharging on bank profitability. Other research, e.g., by Hannan *et al* (2002), Prager (1999), Stavins (2000) Prager (2001) have examined empirically various elements of ATM pricing.

Prager (2001) examines whether small banks are disadvantaged by ATM surcharges, but she uses state and market (MSA) level data rather than the bank level data used here. Furthermore, Prager's study covers a period prior to the liberalization of ATM surcharging (and the dramatic growth in ATMs) that occurred after 1996.

Other empirical papers in the literature (e.g., Hannan *et al* (2002)), aim to identify factors that determine whether a bank sets a surcharge or not.⁶ The empirical questions posed by Hannan *et al* (2002) --the factors determining whether or not a bank imposes a surcharge-- were clearly of importance in the context of their 1997 database, when only about half of the banks in their survey imposed ATM surcharges⁷. However, the very large increase in the proportion of banks using independent surcharges since then leads us to ask a different question in this paper – what has been the impact of the surcharge level on bank outcomes and, in particular, on market share of deposits and on bank profitability of small versus large banks post surcharge liberalization?

4. The April 1st 1996 Announcement

Before tracing the long term impact of the April 1st 1996 liberalization of surcharges on bank profitability it is important to establish the materiality of the news of this liberalization on both large and small banks. Specifically, what were the market's (and equity investors) ex-ante expectation regarding the potential impact? To the extent that the market (investors) factored in

⁶ Hannan *et al* (2002) discuss in some detail the direct effect (“direct revenue generation”) and the indirect effect (“strategic motive of attracting customers who wish to avoid paying surcharges”). However, given the nature of their data they are unable to directly test these hypotheses. They do find, for example that the rate of in-migration to the local banking market has significantly positive effects on surcharges. This is consistent with an indirect effect being present *i.e.*, surcharges can induce switching by depositors.

⁷ Hannan *et al* (2002), use information about surcharges collected by Moebs Services in 1997 (on behalf of the Federal Reserve Board) by telephone survey.

both direct and customer relationship (indirect) effects the more likely it is that the announcement had a material effect on bank stock returns.

To examine this question we conduct a standard event study of the impact of the April 1st 1996 announcement on bank returns and, in particular, the relative impact of this announcement on large versus small banks. A review of the Wall Street Journal Index reveals that the April 1st 1996 announcement was a relatively clean (unexpected) announcement and that no other major bank-specific news events occurred on that day.

Abnormal returns were calculated for three portfolios of banks: (i) an all bank portfolio containing equally weighted returns on all banks in the Compustat data file who had event day returns available from the CRSP data set (370 banks), (ii) a portfolio of big banks (142 banks with asset size in April 1996 exceeding \$1 billion) and (iii) a portfolio of small banks (228 banks with asset size in April 1996 of less than or equal to \$1 billion).

The parameters of the market model were estimated over one year (255 day) period ending 46 days before the event day using the EVENTUS software on WRDS⁸. To test the significance of the announcement day abnormal returns ($AR(0)$) we used the Patell Z test. As can be seen from Table 2, the market expected a very different impact for large versus small banks. For large banks the abnormal return on April 1st 1996 was positive 0.64% and significant at the 0.01% level, while for small banks the return was negative -0.09% and significant at the 10% level. For banks overall, the abnormal return was positive 0.19% and significant at the 5% level. Thus there is evidence to suggest that the market believed that the news of the surcharge liberalization would have a material effect on (future) bank profitability and that the principal beneficiaries would be large banks.

A 0.19% abnormal return when multiplied by the market capitalization of all banks in the event study (all traded banks on April 1 1996) results in a dollar value of approximately of \$1 billion. That is, the market viewed the liberalization of surcharges as resulting in a present value *increase* in profits for these banks of approximately \$1 billion. The approximate order of magnitude of this amount can be compared with the total revenue from all ATMs in 2001 of 2.1 billion (US. PIRG 2001)⁹.

⁸ This is the standard window length option on Eventus.

⁹ While the number of banks not traded in the US is large their share assets in the whole banking industry is very small. For example 6,047 of US banks out of a total of 9,308 in 1997 accounted for just 5.7% of total US banking

In Section 8 we examine the extent to which the market's expectations were correct, by employing Dove data and Call report data over the 1996-2001 period.

5. The Theoretical Model: Indirect versus Direct Effects of Surcharges

To establish a framework for empirical analysis and hypotheses testing we utilize the theoretical framework of Massoud and Bernhardt (2002a and 2002b) to show the direct and indirect effects of surcharges on bank profitability.

In Massoud and Bernhardt (2002b) a spatial game is considered between two banks, A and B . Each bank is associated with a distinctive spatial line of length Q and each bank chooses the density of its ATM network on a distinctive line where ATM services can be obtained.

There is a measure n of bank customers. Customers are distinguished by how much they value one bank intrinsically. The relative valuation for *bank A* is uniformly distributed over the range $[-m, m]$. In addition to providing bank deposits and other products, banks provide ATM services for members and non-members (so called foreign users). First, customers establish a bank account at a local bank. Customers are then hit with a bank-specific location shock that is uniformly distributed over the range $[0, Q]$. Each customer receives incremental utility M from consuming bank services. The transportation cost of acquiring a service is Td where d is the distance traveled to the closest ATM and T is an incremental transportation cost. Each Bank chooses an ATM service fee to members and non-members, $P^j(\delta)$, where $\delta = 1$ for members and $\delta = 0$ for non-members¹⁰. Here bank product charges (P^j) are bROADly defined to include returns from investing in assets (e.g. making loans) backed by relatively low cost deposits. Stavins (2002) among others argues that the fee banks charge their own customers for using their own ATM machines is invariably zero, so that ATM fees, here, are isomorphic to bank's ATM surcharges on foreign users.

5.1. Timing of the game

Stage 1, *banks* maximize profits by choosing the density of their ATM locations and the prices charged for different services (e.g. ATM surcharge to foreign users).

assets (FDIC Quarterly Banking Profiles, September 1997). In other words, the quoted banks employed in our event study account for a very large proportion of US bank assets.

¹⁰ Here members are the depositors who hold deposit accounts at the bank.

Stage 2, each *customer* chooses a bank at which to establish an account.

Stage 3, *each customer* receives a bank-specific location¹¹ shock and chooses where to obtain his/her ATM service¹².

The expected profit function of Bank *A* is

$$\pi_A = N_A F^A + N_B y^A(0)(p^A(0) - C_{ATM}) - \alpha_A C_\alpha, \quad (1)$$

Where N_j is the number of bank j 's customers, C_{ATM} is the marginal cost of providing ATM services to non-members, C_α is the cost of installing each ATM machine, $y^A(0)$ is the proportion of foreigners as customers, (*i.e.* bank *B* customers in this game using bank *A*'s ATMs) and $p^A(0)$ is the ATM surcharge fee bank *A* charges bank *B* customers. The first term in equation (1) is the bank's profit from members use of bank products such as deposits and loans, the second term is the profit from non-members (*i.e.* foreigners) who use bank *A*'s ATM services and the last term is the cost of installing the ATM network.

When a bank chooses its optimal ATM surcharge it takes into consideration how that surcharge would directly impact its profitability --which depends on foreign customers demand elasticity, as well as the indirect effects on its profitability as a result of switching. That is, the effect of ATM pricing on a bank's profitability can be decomposed into two effects: a direct effect and an indirect effect.

5.2. Bank Surcharge: The Direct and Indirect Effects

The effects of a marginal change in the ATM surcharges on a bank's profitability is shown by the following first order condition:

$$\frac{\partial \pi_A}{\partial p^A(0)} = \frac{\partial N_A}{\partial p^A(0)} F^A + \frac{\partial N_B}{\partial p^A(0)} y^A(0)(p^A(0) - C_{ATM}) + N_B \left(\frac{\partial y^A(0)}{\partial p^A(0)} (p^A(0) - C_{ATM}) + y^A(0) \right) \quad (2)$$

Where $\frac{\partial N_A}{\partial p^A(0)} > 0$, $\frac{\partial N_B}{\partial p^A(0)} < 0$ and $\frac{\partial y^A(0)}{\partial p^A(0)} < 0$

¹¹ A location shock introduces mobility into the game, as a representation of real-life conditions faced by bank customers.

¹² This is a simple one-shot game.

¹³ For simplicity, we consider a reduced form of the profit function where the in-branch service fee and the ATM service fees for members are set equal to their marginal cost.

The first two terms in equation (2) show the indirect effect of ATM surcharges on bank A's profitability, where $\frac{\partial N_A}{\partial p^A(0)} F^A$ is the increase in bank-account membership and bank service purchases induced by a marginally higher surcharge times the bank product charges or profit extracted from other bank product provision, and $\frac{\partial N_B}{\partial p^A(0)} y^A(0)(p^A(0) - C_{ATM})$ is the loss in surcharge revenues from those foreign customers (*i.e.* bank B customers in this model) who switch bank-membership to bank A, due to the increase in ATM surcharges¹⁴. The last term in equation (2), $N_B \left(\frac{\partial y^A(0)}{\partial p^A(0)} (p^A(0) - C_{ATM}) + y^A(0) \right)$, shows the direct effect of ATM surcharges on bank A's profitability which is the impact of increasing ATM surcharges on surcharge profits from (foreign) customers who continue to establish bank accounts at competing bank B.

The third and last term in equation (2), or the direct effect, can be rewritten in terms of non-members ATM demand elasticity, ξ : $y^A(0)N_B \left(-\xi \frac{(p^A(0) - C_{ATM})}{p^A(0)} + 1 \right)$. The sign of this term depends on $\text{sign} \left(-\xi \frac{(p^A(0) - C_{ATM})}{p^A(0)} + 1 \right)$. If this term is non-negative, $\left(-\xi \frac{(p^A(0) - C_{ATM})}{p^A(0)} + 1 \right) \geq 0$, then it implies that $\xi \leq \frac{p^A(0)}{p^A(0) - C_{ATM}}$ and $\frac{p^A(0)}{p^A(0) - C_{ATM}} > 1$. Given that in general an oligopoly operates in a price region such that the elasticity exceeds one¹⁵, then this inequality $1 < \xi \leq \frac{p^A(0)}{p^A(0) - C_{ATM}}$ should hold which implies that ATM profits are positively related to ATM surcharges.

Note also that, $\frac{\partial N_A}{\partial p^A(0)} > 0$, shows that an increase in the ATM surcharge increases a bank's customer base because of switching, that $\frac{\partial N_B}{\partial p^A(0)} < 0$ shows that an increase in the ATM surcharge reduces a rival bank's customer base and $\frac{\partial y^A(0)}{\partial p^A(0)} < 0$ shows that an increase in the ATM surcharge reduces a bank's market share of non-member (foreign) customers.

6. Testable Hypotheses

¹⁴ The bank does not charge a surcharge to its own members (depositors).

¹⁵ Tirole (1988), page 66, shows that when the elasticity of demand is less than one, the monopolist's revenue -- and his profits -- are decreasing in quantity. Our model is one of oligopoly, *i.e.* Bank A and bank B, but the results will hold for any non-perfectly competitive market for banking services. Given barriers to entry into the US banking industry, it is not unreasonable to view the US banking industry as non-perfectly competitive.

Based on the discussion in sections 1 to 5 above, regarding the direct and indirect effects of ATM surcharges we examine three testable hypotheses:

Hypothesis 1:

The higher is a bank's surcharge the lower the proportion of foreign users.

Hypothesis 2:

The higher are ATM surcharges the larger the market share of deposits of large versus small banks.

Hypothesis 3:

The higher are ATM surcharges the greater the profitability of large versus small banks.

These three hypotheses are discussed in more detail in sub-sections 6.1 to 6.3 below.

6.1. The Impact of ATM Surcharges on Foreign Usage.

Our initial hypothesis relates to the impact of ATM surcharges on the percentage of foreign users of ATMs – who are the only customers that have to pay the surcharges. Standard economics indicates that the higher the price of this service, the lower will be the proportion of surcharge-paying consumers who use the service relative to customers who don't pay. Thus we predict a negative relationship between the level of the ATM surcharge and the percentage of foreigners who use ATMs at a particular bank.

It should be noted that a negative coefficient on the relationship between ATM surcharges and foreign percentage is only an indication that customer's behavior does indeed respond when prices (ATM surcharges) are adjusted. This initial result is unable to indicate why foreign customer use of ATMs decline as the surcharge increases. Specifically, this could either be because customers switch or move to banks with larger ATM networks, or because they simply do not access foreign ATMs as frequently as they did prior to surcharge increases.

We measure the foreign percentage variable both in terms of its level as well as its growth rate. Thus we test whether a higher ATM surcharge results in a lower foreign percentage, as well as whether a higher ATM surcharge results in a decline in the foreign percentage in year

$t+1$ as compared to year t . In both cases we predict that surcharge will have a negative effect on foreign usage.

6.2 The Impact of ATM Surcharges on Market Share for Deposits

Our second testable hypothesis examines the relationship between the level of ATM surcharges and the market share of deposits. The customer relationship hypothesis argues that if surcharges are higher, it is more likely that some customers will switch their deposit accounts and current and future demand for bank products from smaller banks with smaller ATM networks to larger banks with larger ATM networks. Thus, higher ATM surcharges should result in an increase in the market share of deposits of larger banks and a reduction in the market share of deposits of smaller banks.

Once again we can measure the market share of deposits both in terms of levels as well as in terms of growth rates. In terms of the levels, we examine the impact of the ATM surcharge on the market share of deposits (level) in the following year ($t+1$). In this way we aim to capture switching behavior, which may occur with a lag. We also examine the impact of ATM surcharge on the growth rate in market share in year ($t+1$) relative to year t (growth rate is defined as $((t+1)-t)/t$). Our prediction is that if both larger and smaller banks impose a higher ATM surcharge, this will result in a higher market share of deposits for larger banks in the following year, and a smaller market share of deposits in the following year for smaller banks. Thus in both the level as well as the growth rate of market share specifications, we predict a positive effect of ATM surcharge for larger banks, and a negative effect for smaller banks.

6.3 The Impact of ATM Surcharges on Bank Profitability

The third hypothesis relates to the effects of ATM surcharges on large versus small bank profitability. ATM surcharges can impact bank profitability either through the direct effect (*i.e.* foreigners paying higher ATM surcharges leading to more direct revenue from ATMs) or the customer relationship (or indirect) effect (*i.e.* higher ATM surcharges cause customers to switch their deposit accounts and related product transactions from smaller to larger banks). Thus an empirical test of the impact of ATM surcharges on bank profitability cannot be considered a specific test of the customer relationship hypothesis alone. However such a test is useful in the context of the policy debate described in the Introduction where it has been proposed by

consumer groups that ATM surcharges have benefited large banks and harmed small banks. If the net impact of both the direct as well as the customer relationship effects on large banks is positive then we would expect to see a positive effect of the ATM surcharge variable on a measure of bank profitability for large banks. Similarly we would expect to see a negative effect in such a test for small banks.

We use two different measures of profitability commonly used in the banking literature – return on assets (*ROA*) as well as return on equity (*ROE*).¹⁶ Once again we examine the impact of ATM surcharges on both the level of *ROA* and *ROE* as well as the growth rate of *ROA* and *ROE*. Given that there may be a lag between the imposition of a higher ATM surcharge and the impact on profitability, we examine the impact of surcharge on profitability in the following year and the growth rate in profitability in year $t+1$ relative to year t .

7. Empirical Methodology

An Appendix to this paper provides a detailed description of data used in this study. As discussed there the empirical tests of the effects of ATM surcharges over the period 1996-2001 are based on survey data generated by Dove Consulting of Boston in two reports on ATM deployment and pricing -- the first in 1999 and the second in 2002. These data provide specific details by bank and year regarding level of ATM surcharge, ATM network size, percent use of a bank's ATM network by foreigners as well as other pertinent ATM related data. As discussed in the Appendix not every variable was available each year and the sample of banks differed over the 1999 and 2002 surveys. Nevertheless, these data are sufficiently rich to allow us to examine the impact of ATM surcharges on the foreign ATM percentage, bank market share of deposits and bank profitability.

To gain insights into these effects we employ bank Call Report data and Federal Reserve generated bank market share data in addition to Dove data. The Call Reports used were those that most closely matched the dates of the Dove surveys. The variables derived from Call Reports were *ROE* and *ROA* as dependent variables representing profitability. As independent or control variables, we also derived from the Call Reports a measure of bank risk (the bank capital-

¹⁶ Many of the banks in the Dove data set are not publicly traded, hence we could not use a stock return measure of profitability.

asset ratio) and size (bank assets). The market share variable used here is the Federal Reserve's measure of the percent of a bank's total deposits in the State in which the bank is located.

As additional control variables we also included Dove data on the number of ATMs a bank has as well as a measure of geographic dispersion of a bank's ATM network. Dove consulting divides the U.S. into seven regions and identifies whether a bank has ATMs in each region and outside the U.S. (internationally) --making eight possible regions in all. The geographic dispersion variable takes a value between one and eight, where the value of this variable reflects the sum of the regions over which a bank locates its ATMs. The Appendix to the paper discusses in more detail the different regions identified in the Dove surveys.

In testing the hypotheses described above we employ both fixed and random effect tests of the impact of ATM surcharges on the various dependent variables of interest (foreign percentage, market share of deposits and bank profitability). To determine the most appropriate model we employ the Hausman test statistic. The null hypothesis under the Hausman test statistic is whether the random effects model is appropriate. Where the Hausman test indicates that the random effects model is appropriate, we report the random effects model. If not we report the fixed effects model. For each panel model test we report the R^2 within, which measures the proportion of the variance explained by variation within groups (here banks over time), R^2 between, which measures the proportion of the variance explained by variation between groups (banks), and the total R^2 for the panel.

One important issue that may impact the interpretation of our results is the issue of endogeneity -- particularly in the case where our dependent variable is market share of deposits. It could be argued, for example, that a high market share of deposits may cause a bank to increase its ATM Surcharge. There are a variety of reasons why we believe that the econometric specifications we use here are able to control for endogeneity.

Firstly, we use as a dependent variable either the growth rate in market share for year $t+1$ relative to year t (growth rate equals $((t+1)-t)/t$), or the level of market share in year $t+1$. It is not evident why a bank should increase its ATM surcharge in year t because of the *growth rate* in its market share of deposits in time $t+1$ relative to time t , or the level of market share at time $t+1$. Thus, our specifications capture the impact of an ATM surcharge imposed in time t on growth and level of market share and profitability at time $t+1$.

The second reason concerns the fact that we split our sample into larger and smaller banks, and hypothesize and test that there are different signs on the coefficients in the models for larger versus smaller banks. The argument that higher market share in deposits will lead to higher ATM surcharges is monotonic, *i.e.*, -- it should impact both large and small banks with a coefficient of the same (positive) sign. The hypothesis that we are testing here is that if both large and small banks increase their ATM surcharge by the same amount, the market share of deposits of large banks should increase in the following year, while the market share of deposits of small banks should decrease in the following year. Our empirical results -- described in detail below -- show that there is a significantly *negative* relationship between ATM surcharge and the market share of deposits for small banks (for both the growth rate and $t+1$ levels specifications), a result that is predicted by our hypotheses but is inconsistent with the market share causing surcharge argument.

8. Results

8.1 The Impact of ATM Surcharges on Foreign Percentage.

Tables 3A and 3B report the results of the foreign percentage equations -- 3A reports the levels results, while 3B reports the growth rate results. Hypothesis 1 developed above indicates that a higher ATM surcharge should reduce the proportion of customers who pay the surcharge (foreigners) -- *i.e.* we expect a negative coefficient on the relationship between ATM surcharge and foreign percentage. This should apply to both large and small banks -- and indicates that ATM surcharge does affect customer behavior.

Table 3A reports the relationship between the current year's foreign percentage and ATM surcharge. The surcharge coefficient for the full sample, and for large banks is significant and negative as predicted while being negative and insignificant for smaller banks. We report the contemporaneous results (foreign percentage at time t) since customer ATM usage should respond quite quickly to changes in surcharge levels.¹⁷

¹⁷ The results for the dependent variable foreign percentage at time $t+1$ are similar, with the coefficient on surcharge being negative and significant for all banks as well as for large banks.

Table 3B reports the relationship between the growth (decline) in foreign percentage in year $t+1$, relative to year t , and ATM surcharge. We find that for big banks the coefficient is negative and significant as predicted.

Our results indicate that for large banks at least, a higher ATM surcharge will result in a reduction in the proportion of foreigners using their ATMs -- indicating that ATM surcharges affect customer behavior.

8.2 The Impact of ATM Surcharges on the Market Share of Deposits

The results of the impact of ATM surcharges on the market share of deposits are reported in Table 4A (market share levels at $t+1$) and 4B (market share growth rate from time t to $t+1$). These results test hypothesis H2. The results in Table 4A indicate that if the level of surcharges for both small and large banks is higher, it will lead to the larger banks having a significantly higher market share of deposits in the following year, while smaller banks will have a significantly smaller market share of deposits in the following year. (The coefficient for the full sample is insignificant.). These results are consistent with the switching or customer relationship hypothesis.

Table 4B reports the results of the relationship between ATM surcharge and the growth (decline) in market share of deposits for year $t+1$ compared to year t . The coefficient on ATM surcharge for small banks is significant and negative, indicating that if small banks increase their ATM surcharge from year t to year $t+1$ they will face a reduction in market share in deposits. The coefficient on surcharge for big banks is positive but insignificant. Overall, these results appear to be consistent with the predictions made by public policy advocates (e.g., PIRG) that small banks will lose market share when individual bank's ATM surcharge is unconstrained.

8.3 The Impact of ATM Surcharges on Profitability

We test the impact of ATM surcharges on profitability -- see hypothesis 3 -- using two measures of profitability, return on assets (Tables 5A and 5B) and return on equity (Tables 6A and 6B).¹⁸ The dependent variable is either the *ROA* or *ROE* level at $t+1$, or the growth rate at time $t+1$ relative to t . The estimated coefficient on the ATM surcharge variable in these equations captures the net effect of both the direct effect as well as the customer relationship

¹⁸ We could not use stock returns since many banks in the Dove sample are not publicly traded.

effects of ATM surcharges on bank profitability. We are thus able to test the public policy prediction that ATM surcharges will benefit large banks relative to small banks.

Our results for large banks are quite robust across all four profitability specifications (in Tables 5A, 5B, 6A and 6B). We find a positive and significant coefficient on the ATM surcharge variable in both the lead level and the growth rate models for *ROA*, and in both of these models for *ROE*. Our results for small banks are not significant in any of the four profitability specifications that we report. These results are consistent with the predictions of the public policy advocates who argued that ATM surcharges would benefit large banks but not small banks.

8.4 Robustness Checks

A number of robustness checks were also conducted with respect to the results in Tables 3 to 6. In order to control for possible colinearity between surcharge and the number of ATMs, we derived an instrument for the surcharge variable by regressing surcharge on the number of ATMs and using the residual of this regression as an independent variable (surcharge hat). We found our results to be robust to this alternative specification. We also attempted to examine if interactive terms were of importance in our specifications. In particular, we interacted the surcharge term with the number of ATMs, in order to examine if there is a positive relationship between the size of the ATM network and the surcharge variable. In our hypotheses above we predicted that the impact of surcharges on large and small banks should have opposite signs in the market share and profitability equations. Because of the non-monotonic nature of surcharge between large and small banks, we should find that a term, which interacts surcharge and ATM network size is insignificant over the whole sample of banks. When we included this term in all of our specifications we find that it was always insignificant. Thus, our results are also robust to the inclusion of this interactive term.

9. Summary and Conclusion

This paper has examined whether allowing banks to set their ATM surcharge in an unconstrained fashion benefits large banks relative to small banks. The issue of whether consumers may switch their accounts from smaller banks to larger banks, in order to avoid paying ATM surcharges at the larger banks, has been central to much of the policy discussion on

ATM surcharges as well as the theoretical discussion on this topic. This paper is the first to empirically address this issue using disaggregated bank level data on ATM surcharge pricing. We are able to conduct this study because of our access to a newly available data source on ATMs, made available by Dove Consulting Inc.

We show firstly, that on the day of the announcement that banks were free to set their own ATM surcharge level, publicly traded large banks experienced a significantly positive abnormal stock return reaction, while the market valuation of small banks had a significantly negative abnormal return reaction. This is an indication of the market's expectations regarding the impact of allowing ATM surcharges to be liberalized

Using our panel data-base, we show, firstly, that a higher ATM surcharge will result in a lower percentage of (surcharge paying) foreigners using ATMs. This is an indication that ATM surcharges can affect customer behavior and ATM usage. Secondly, if the level of surcharges is higher for both large and small banks, it will result in larger banks having a significantly higher market share of deposits in the following year, and smaller banks having a significantly smaller market share in deposits in the following year. We interpret this finding to be consistent with a customer relationship effect, implying that customers will shift their deposits from smaller to larger banks in order to avoid paying ATM surcharges. Finally we show that the higher the ATM surcharge the greater will be the profitability of large banks. This implies that the net impact of both the direct as well as the customer relationship (indirect) effects of ATM surcharges on large bank profits is significant and positive.

The empirical findings reported here are of importance from a public policy perspective since they provide the first bank level evidence that the post-1996 liberalization of bank surcharges benefited large banks relative to small banks. Moreover, from a banking theory perspective they provide additional support for a customer relationship effect in banking.

Appendix

Data

An important aspect of this paper lies in the uniqueness of the ATM data set employed in our tests. This data set was purchased from Dove Consulting Inc., Boston, and includes bank level data on a range of variables that have not previously been used in the empirical ATM literature. In particular, the data includes a measure of the percentage of ATM users for different banks who are foreigners – *i.e.*, those who pay ATM surcharges. This variable, in conjunction with other data such as surcharge level and ATM network size, allows us to test the hypotheses discussed in the paper. The Dove Survey data is used in conjunction with a variety of other publically available sources of bank level data, including Call Reports (Report of Condition and Income) taken from the Federal Reserve’s web site as was Market Share data.

The data base provided by Dove Consulting is taken from two separate surveys of ATM providers --one taken in 1998 and the second in 2001(The Dove Reports themselves were published in 1999 and 2002 respectively). In each case data were collected from each bank in the sample for the preceding three years generating a 6-year sample that spans 1996-2001. The two surveys are not identical across the two time periods, thus some data are available for some subset of the time period only. For example, while each of the two Dove surveys asked respondents for information on a variety of variables for each of the preceding three years, this was not the case for the foreign percentage variable. The first survey conducted during 1998 did ask for this data for each of the preceding 3 years, however, the second survey only asked the respondents for this data for the final year of that survey *i.e.*, 2001. In other words, in some of our empirical tests, e.g. those which require the use of the foreign percentage variable, we use a data set made up of a given set of banks for each of 1996, 1997 and 1998 and different banks in 2001.

A further issue with our data concerns how the banks were asked to report their ATM surcharges over the preceding three years. In the case of both the 1998 and 2001 surveys, banks were asked to provide data on their ATM surcharges at the time of the survey. They were also asked to provide the date of the last change of the surcharge and how much that change was (in dollars and cents). This information is enough to create a partial historical record of surcharges charged by each bank. For example, if the date of the previous surcharge change occurred prior to the three-year period covered by the survey, then we are able to use the value of the surcharge

in the final year of the survey for all of the previous three years. Similarly, if the most recent surcharge change occurred during the preceding three years we are able to infer surcharges after that date. However, we would not be able to infer surcharges outside the three-year window of each data set. In cases where we are not able to infer the surcharge amount from the data, we do not use the data.

Another variable employed is the measure of geographic dispersion of a bank's ATM network. Dove divides the U.S. into 7 regions and identifies whether each bank (in each year) has an ATM in one of those regions plus whether ATMs are held internationally (making 8 regions). The 7 U.S. regions identified were New England, Mid-Atlantic, Southeast, South, Midwest, Mountain and Pacific (see Dove, 1999, p. 27). The geographic dispersion variable takes a value between one and eight, where the value of the variable reflects the sum of the regions where a bank locates its ATMs. For example, if geographic dispersion is equal to one, it indicates an ATM presence in only one region and if it is higher than one it indicates presence in more than one region.

In Table 1 we provide a summary table of the data used in the paper:

Table 1: Descriptive Statistics:				
Variable	Obs	Mean	Median	Std Dev
Foreign Percentage (%) <i>(a)</i>	204	37.75	35.00	16.33
Market Share of Deposits (%) <i>(c)</i>	355	5.53	1.24	8.26
Return on Equity (%) <i>(b)</i>	359	8.32	7.81	5.22
Return on Assets (%) <i>(b)</i>	359	0.68	0.68	0.49
ATM Surcharge (\$) <i>(a)</i>	329	1.22	1.50	0.49
Number of ATMs <i>(a)</i>	357	554.85	68	1,571.36
Geographic Dispersion (1 to 8 regions) <i>(a)</i>	362	1.69	1.00	1.39
Capital Ratio (%) <i>(b)</i>	359	9.33	8.28	5.24
Assets (\$Million) <i>(b)</i>	359	20,000	1,780	68,200
Sources: <i>(a)</i> Dove Consulting Inc. – ATM Surveys <i>(b)</i> Call Reports - Bank Balance Sheets <i>(c)</i> Federal Reserve – Market Share Data				

**Table 2:
Abnormal Return on Event Day (Day Zero) of Cirrus/Plus
Announcement Freeing constraints on ATM Surcharges (April 1, 1996)**

The event study test examines how equity prices for all publicly traded banks responded to the announcement that banks would no longer face restrictions on imposing ATM surcharges. The results indicate that the market believed *ex-ante* that large banks would benefit from this regulatory change, and that small banks would lose.

	All Banks	Big Banks (Assets > \$1B)	Small Banks (Assets < \$1B)
Abnormal Return (Day Zero)	0.19%	0.64%	-0.09
Patell Z Test	2.233**	5.442*****	-1.407*
Number of Banks	370	142	228

* indicates significance at 10%
 ** indicates significance at 5%
 *** indicates significance at 1%
 ***** indicates significance at 0.01%

Data taken from all banks in Compustat Bank File who have event day returns data available from CRSP Dataset. Asset size determined from Compustat as of 1996. Return on Market Model with Equally Weighted Index. Market Model estimated over 255 days in length, ending 46 days before event day. Estimation conducted using EVENTUS software.

**Table 3A:
The Relationship Between ATM Surcharge and Foreign Percentage (current), 1996-2001**

The dependent variable, foreign percentage, measures the percentage of ATM users who have to pay the ATM surcharge because they are non-members (non-depositors) of the bank. Members of the bank do not have to pay the ATM surcharge. A negative coefficient on the surcharge variable indicates that the higher the surcharge, the lower is the proportion of ATM users who pay the surcharge. The foreign percentage variable is measured in the same year as the surcharge variable.

	All Banks	Std Error	Big Banks (Assets> \$1B)	Std Error	Small Banks (Assets< \$1B)	Std Error
Surcharge	-5.99175***	2.111089	-14.9134***	3.197899	-1.15506	4.507949
Number of ATMs	-0.00114	0.001793	0.000403	0.003797	0.000498	0.084093
Geographic Dispersion	-0.32816	1.357409	-9.46528**	2.907182	NA	
Bank CapitalRatio	0.113605	0.261748	-3.84005**	1.579646	0.412698	1.657367
Bank Assets	-8.75E-12	3.17E-11	8.28E-11	6.58E-11	1.41E-08	2.05E-08
Constant	44.0807***	4.509057	101.5126***	15.86613	34.04047	20.69629
Sample Size	188		114		74	
R^2 Within	0.11		0.49		0.01	
R^2 Between	0.07		0.02		0.04	
R^2 Overall	0.07		0.03		0.04	
Hausman Test χ^2	5.70(0.33) <i>re</i>		23.99(0.00) <i>fe</i>		2.26(0.68) <i>re</i>	

*** Indicates p value of 1%

** Indicates p value of 5%

* Indicates p value of 10%

(.) Indicates p value

re indicates use of Random Effects and *fe* indicates use of Fixed Effects – Based on Results of Hausman Test

NA: Geographic Dispersion variable could not be estimated because of lack of dispersion among small banks.

**Table 3B:
The Relationship Between ATM Surcharge and Growth in Foreign Percentage 1996-2001**

The dependent variable, growth in foreign percentage, measures the change in foreign percentage from year $t+1$ minus year t divided by year t . A negative coefficient on surcharge indicates that a higher surcharge will result in a decrease in the foreign percentage in the following year relative to the current year.

	All Banks	Std Error	Big Banks (Assets > \$1B)	Std Error	Small Banks (Assets < \$1B)	Std Error
Surcharge	-0.01475	0.069526	-0.10005***	0.038532	0.070683	0.184309
Number of ATMs	-1.4E-05	8.58E-05	1.03E-05	4.22E-05	-0.00076	0.001105
Geographic Dispersion	-0.05249	0.048412	-0.01175	0.022692	0.051189	0.311705
Bank CapitalRatio	0.000656	0.005367	0.037788**	0.012772	-0.00192	0.008715
Bank Assets	1.54E-12	2.62E-12	-9.88E-14	1.60E-12	-1.84E-10	2.95E-10
Constant	0.04896	0.1231	-0.25849*	0.133371	NA	
Sample Size	84		47		37	
R^2 Within	0.02		0.05		0.01	
R^2 Between	0.03		0.40		0.04	
R^2 Overall	0.02		0.34		0.05	
Hausman Test χ^2	0.56(0.96) <i>re</i>		2.51(0.64) <i>re</i>		0.31(0.98) <i>re</i>	

*** Indicates p value of 1%

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re indicates use of Random Effects and *fe* indicates use of Fixed Effects – Based on Results of Hausman Test

NA: variable could not be estimated because of lack of dispersion.

**Table 4A:
The Relationship Between ATM Surcharge and Market Share of Depositors (lead), 1996-2001**

The dependent variable, market share of deposits, is measured as a percentage deposit market share that a bank has in the state where a bank is located. A positive (negative) coefficient on the surcharge variable indicates that the higher the ATM surcharge, the higher (lower) will be the market share of deposits in the following year.

	All Banks	Std Error	Big Banks (Assets > \$1B)	Std Error	Small Banks (Assets < \$1B)	Std Error
Surcharge	-0.15491	0.526147	1.531909**	0.627918	-1.66967**	0.771972
Number of ATMs	0.001113*	0.00064	0.00059	0.00058	0.182793***	0.041451
Geographic Dispersion	0.34723	0.509578	0.125854	0.489658	NA	
Bank CapitalRatio	-0.05071	0.053856	-0.10421	0.149141	0.081633	0.062127
Bank Assets	-4.76E-12	1.06E-11	4.08E-14	9.42E-12	-3.15E-08***	5.81E-09
Constant	5.39433***	1.317892	7.153481***	2.024884	7.524847***	2.03538
Sample Size	315		196		119	
R^2 Within	0.04		0.14		0.42	
R^2 Between	0.13		0.04		0.01	
R^2 Overall	0.11		0.05		0.01	
Hausman Test χ^2	4.36(0.49) <i>re</i>		1.98(0.86) <i>re</i>		46.28(0.00) <i>fe</i>	

*** Indicates p value of 1%

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re indicates use of Random Effects and *fe* indicates use of Fixed Effects – Based on Results of Hausman Test

NA: Geographic Dispersion variable could not be estimated because of lack of dispersion among small banks.

Table 4B:
The Relationship Between ATM Surcharge and Growth in Market Share of Depositors, 1996-2001

The dependent variable, growth in the market share of deposits, measures the change in market share from year $t+1$ minus year t divided by year t . A positive (negative) coefficient on surcharge indicates that a higher surcharge will result in an increase (decrease) in the market share in the following year.

	All Banks	Std Error	Big Banks (Assets > \$1B)	Std Error	Small Banks (Assets < \$1B)	Std Error
Surcharge	-1.99208	1.544243	0.217488	0.171468	-13.3318**	5.745894
Number of ATMs	0.000573	0.001027	-0.00021	0.000173	2.093642****	0.309433
Geographic Dispersion	-0.12747	0.815513	0.740549***	0.162154	NA	
Bank CapitalRatio	0.105803	0.206948	-0.03041	0.044335	0.489339	0.463121
Bank Assets	-1.01E-11	2.19E-11	-3.46E-12	2.80E-12	-2.23E-07****	4.28E-08
Constant	2.792734	3.025647	-1.02519	0.51494	37.82361**	15.15886
Sample Size	309		194		115	
R^2 Within	0.01		0.18		0.52	
R^2 Between	0.01		0.01		0.12	
R^2 Overall	0.00		0.01		0.08	
Hausman Test χ^2	2.86(0.72) <i>re</i>		53.62(0.00) <i>fe</i>		66.23(0.00) <i>fe</i>	

**** Indicates p value of 1%

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* Indicates p value of 10%

(.) Indicates p value

re indicates use of Random Effects and *fe* indicates use of Fixed Effects – Based on Results of Hausman Test

NA: Geographic Dispersion variable could not be estimated because of lack of dispersion among small banks.

Table 5A:**The Relationship Between ATM Surcharge and ROA (Lead), 1996-2001**

The dependent variable return on assets (lead) measures the *ROA* as a percentage. A positive coefficient on the surcharge variable indicates that banks imposing a higher ATM surcharge will have a greater *ROA* the following year.

	All Banks	Std Error	Big Banks (Assets > \$1B)	Std Error	Small Banks (Assets < \$1B)	Std Error
Surcharge	0.099696	0.072298	0.258287***	0.056365	-0.01898	0.137853
Number of ATMs	-6.37E-06	0.000105	-7.10E-06	3.66E-05	-0.00248	0.007437
Geographic Dispersion	0.13128	0.090853	0.034694	0.030132	NA	
Bank CapitalRatio	0.032975***	0.007578	0.030178***	0.010762	0.038891***	0.010919
Bank Assets	4.48E-14	1.68E-12	3.30E-13	6.53E-13	-6.08E-10	6.89E-10
Constant	0.059998	0.170319	0.105304	0.128066	0.445842	0.303512
Sample Size	316		195		121	
R^2 Within	0.12		0.13		0.15	
R^2 Between	0.00		0.26		0.03	
R^2 Overall	0.00		0.16		0.03	
Hausman Test χ^2	17.74(0.00) <i>fe</i>		7.20(0.20) <i>re</i>		19.81(0.00) <i>fe</i>	

*** Indicates p value of 1%

** Indicates p value of 5%

* Indicates p value of 10%

(.) Indicates p value

re indicates use of Random Effects and *fe* indicates use of Fixed Effects – Based on Results of Hausman Test

NA: Geographic Dispersion variable could not be estimated because of lack of dispersion among small banks.

Table 5B:**The Relationship Between ATM Surcharge and Growth in ROA, 1996-2001**

The dependent variable, growth in the return on assets, measures the change in ROA from year $t+1$ minus year t divided by year t . A positive (negative) coefficient on surcharge indicates that a higher surcharge will result in an increase (decrease) in ROA in the following year.

	All Banks	Std Error	Big Banks (Assets > \$1B)	Std Error	Small Banks (Assets < \$1B)	Std Error
Surcharge	1.680229*	0.95603	2.698341*	1.577398	0.085562	0.737662
Number of ATMs	-0.00022	0.000686	-0.00042	0.000889	-0.00431	0.039796
Geographic Dispersion	0.483396	0.526438	0.588873	0.739115	NA	
Bank CapitalRatio	-0.00264	0.086581	0.299655	0.30002	-0.22262	0.058429
Bank Assets	-3.21E-12	1.37E-11	-2.86E-12	1.75E-11	4.20E-09	3.69E-09
Constant	-2.01496	1.721632	-5.8103	3.473777	1.415542	1.624112
Sample Size	316		195		121	
R^2 Within	0.01		0.03		0.17	
R^2 Between	0.02		0.03		0.01	
R^2 Overall	0.01		0.02		0.00	
Hausman Test χ^2	1.09(0.95) <i>re</i>		1.87(0.86) <i>re</i>		11.48(0.02) <i>fe</i>	

*** Indicates p value of 1%

** Indicates p value of 5%

* Indicates p value of 10%

(.) Indicates p value

re indicates use of Random Effects and *fe* indicates use of Fixed Effects – Based on Results of Hausman Test

NA: Geographic Dispersion variable could not be estimated because of lack of dispersion among small banks.

**Table 6A:
The Relationship Between ATM Surcharge and ROE (Lead), 1996-2001**

The dependent variable return on equity (lead) measures the ROE as a percentage. A positive coefficient on the surcharge variable indicates that banks imposing a higher ATM will have a greater ROE in the following year.

	All Banks	Std Error	Big Banks (Assets > \$1B)	Std Error	Sml Banks (Assets < \$1B)	Std Error
Surcharge	1.510534**	0.620654	2.909921***	0.885217	-0.11503	0.717362
Number of ATMs	-0.00014	0.000518	-0.00025	0.000539	-0.00846	0.007308
Geographic Dispersion	0.226305	0.390976	0.204224	0.443934	-0.42873	0.840588
Bank CapitalRatio	-0.21115***	0.058481	-0.47727***	0.165995	-0.0989*	0.052167
Bank Assets	9.67E-12	9.55E-12	7.93E-12	9.97E-12	1.46E-09	1.93E-09
Constant	8.031042***	1.174541	9.15936***	1.959307	8.235745***	1.737817
Sample Size	316		195		121	
R ² Within	0.03		0.11		0.00	
R ² Between	0.14		0.10		0.19	
R ² Overall	0.12		0.12		0.18	
Hausman Test χ^2	8.34(0.13) <i>re</i>		4.33(0.50) <i>re</i>		8.51(0.07) <i>re</i>	

*** Indicates p value of 1%

** Indicates p value of 5%

* Indicates p value of 10%

(.) Indicates p value

re indicates use of Random Effects and *fe* indicates use of Fixed Effects – Based on Results of Hausman Test

Table 6B :
The Relationship Between ATM Surcharge and Growth in ROE, 1996-2001

The dependent variable, growth in ROE, measures the change in ROE from year $t+1$ minus year t divided by year t . A positive (negative) coefficient on surcharge indicates that a higher surcharge will result in an increase (decrease) in ROE in the following year.

	All Banks	Std Error	Big Banks (Assets > \$1B)	Std Error	Sml Banks (Assets < \$1B)	Std Error
Surcharge	1.616683*	0.926703	2.572858*	1.536277	0.122973	0.412405
Number of ATMs	-0.00021	0.000666	-0.00042	0.000867	-0.00057	0.003296
Geographic Dispersion	0.440089	0.511087	0.555788	0.720363	-0.00719	0.384666
Bank CapitalRatio	0.029634	0.083965	0.32246	0.292052	-0.01213	0.028164
Bank Assets	-2.74E-12	1.33E-11	-2.48E-12	1.70E-11	1.17E-09	8.93E-10
Constant	-2.21803	1.669656	-5.80601*	3.382597	-0.09159	0.869408
Sample Size	316		195		121	
R^2 Within	0.01		0.03		0.01	
R^2 Between	0.02		0.02		0.06	
R^2 Overall	0.01		0.02		0.01	
Hausman Test χ^2	0.56(0.98) <i>re</i>		2.78 (0.73) <i>re</i>		0.37(0.98) <i>re</i>	

*** Indicates p value of 1%

** Indicates p value of 5%

* Indicates p value of 10%

(.) Indicates p value

re indicates use of Random Effects and *fe* indicates use of Fixed Effects – Based on Results of Hausman Test

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