CAN AUTOMATIC TELLER MACHINE INVESTMENT IMPROVE BANK COST EFFICIENCY

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INTRODUCTION

Automated Teller Machines (ATMs) were introduced in the 1970s to reduce the need for bank tellers and to provide convenience for bank customers. Today, ATMs are an important part of everyday life. According to statistics, there is one automated teller machine for every 284 American households. Nearly 11 billion transactions are conducted through ATMs each year. As everyone knows, automation replaces labor and improves the traditional labor transaction process. With the introduction of automatic equipment, the advantages of automation such as reduction in labor errors and saving in processing time will increase efficiency of banks and improve service quality. Moreover, installing more ATMs will reduce the amount of work on branches relatively. In this way, the labor force of branches can be redistributed and redeployed more efficiently than before. Since ATMs are one of well known representative IT investment in banking industry, we choose to conduct an empirical study in banking industry and explore the effect of ATMs on cost efficiency of banks. In other words, the purpose of this paper is to study the relationship between ATM intensity and cost efficiency of banks.

LITERATURE REVIEW AND EMPIRICAL HYPOTHESIS

Kudyba and Diwan found that banking industry was always ranked first in IT investment. Previous reports had discussed various aspects of ATMs. Hannan and Mcdowell found that wage rate and firm size have positive effect on deciding ATM adoption. All these mean that reducing operating cost is one of the important drivers for banks to invest in innovation IT such as ATMs. Kauffman and Banker showed that easier transactions were transferred from tellers to ATMs, thus contributing to less productivity of tellers in processing transactions. Dos Santos and Peffers confirmed that the difference between first movers and earlier followers in ATMs was that first movers could obtain the growth opportunity of market share. The conclusion was consistent with Laderman that ATMs could reduce human resource costs of tellers and branch establishment costs. Furthermore, Peffers and Dos Santos pointed out that the benefits of earlier

IT adoption may not show immediately but will appear significant in the following years. Haynes and Thompson presented empirical results of the productivity effect of IT adoption and mentioned that ATMs improve the speed of process and expand additional service value, such as providing 24-hour service. Therefore, ATMs could be treated as the representation of process and product innovation. Therefore, because of the substitution effect and operating cost consideration, banks will introduce and upgrade more ATMs to achieve the goals of operation efficiency. According to the above discussion, we develop our hypothesis that the intensity of ATM will have positive effect on cost efficiency of banks.

H1 The intensity of ATM is positively related to cost efficiency of banks

RESEARCH METHOD

Table 1 Definition of Variables

Dependent Variables	
Name	Definition
CR1	OE / IR
CR2	OE / TA
Independent Variables	
ATMI	NATM / NE
BS	log(TA)
SL	PE / NE
NPLR	NPL / TL
NBD	1 for new bank and 0 otherwise
CR1	Operating Cost Rate
CR2	Asset Management Cost Rate
IR	Interest Revenue
OE	Operating Expense
PE	Personnel Expense
TL	Total Loans
NPL	Non-performing loans
TA	Total Assets
NE	Number of Employees
NATM	Number of ATMs

In order to test our empirical hypothesis on the impacts of ATM on cost efficiency, we specify the following statistical model:

$$CR_{iy} = \alpha_0 + \alpha_1 ATMI_{iy} + \alpha_2 BS_{iy} + \alpha_3 SL_{iy} + \alpha_4 NPLR_{iy} + \alpha_5 NBD_{iy} + \varepsilon_{iy} \quad (1)$$

Where

CR_{iy} = cost ratio of bank i in year y

$ATMI_{iy}$ = automatic teller machine intensity of bank i in year y

BS_{iy} = bank size of bank i in year y

SL_{iy} = salary level of bank i in year y
$NPLR_{iy}$ = non-performing loan ratio of bank i in year y
NBD_{iy} = new bank dummy of bank i in year y

DATA AND RESULTS

The data used in this paper were obtained from Bureau of Monetary Affairs, Financial Supervisory Commission, Executive Yuan, R. O. C. Related financial data of banks can be derived from their annual reports. The sample contained a total of 264 observations from 1991 to 2000.

Table 2 OLS Regression Results

Independent Variables	Dependent Variables	
	CR1 (OE / IR)	CR2 (OE / TA)
Intercept	0.92104***	0.04539***
	(10.94)	(10.42)
ATMI (NATM / NE)	-0.34096***	-0.01905***
	(-2.85)	(-3.07)
BS (log(TA))	-0.04194***	-0.00168***
	(-8.72)	(-6.73)
SL (PE / NE)	0.00013***	0.000002**
	(7.44)	(2.20)
NPLR (NPL / TL)	0.19301**	0.00150
	(2.17)	(0.33)
NBD	0.02432***	0.00024
	(3.11)	(0.61)
Adj-R^2	0.2856	0.2428
F-value	22.02	17.87
P-value	<.0001	<.0001
N	264	264

Note * : Significant at 0.10. ** : Significant at 0.05. *** : Significant at 0.01.