

# Privatization and Performance of the Japanese Postal Savings System

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## List of Abbreviations

FILP	Fiscal Investment and Loan Program
JP	Japan Post
JPB	Japan Post Bank
JPH	Japan Post Holding
JPI	Japan Post Insurance
JPN	Japan Post Network
MIC	Ministry of Internal Affairs and Communications
MPT	Ministry of Posts and Telecommunications
PSA	Postal Services Agency
PSS	Postal Savings System
PSSJ	Postal Savings System offered by Japanese Government
ROA	Return on Asset
SOB	State-Owned Bank
SOC	State-Owned Company

## Abstract

This paper discusses the privatization of the Japanese postal savings system, which has been reformed twice during the 2000s and finally Japan Post Bank -a new stock company- has been launched on October 1, 2007. Previous studies point out that state-owned banks are less efficient than private banks and that banking privatization can improve their performance. This paper evaluates the effects of the Japanese postal privatization over the 1997-2009 period. Especially, the main concern is to show the Japan Post Bank suffers from low performance compared to other banks after the privatization policy. Descriptive statistics suggest that the postal reforms have improved the performance of the postal savings system. However, the results of estimations of production functions show that the reformed postal savings bank exhibits a lower profitability than other private banks. Accounting data show that low interest income and low fees and commissions income are the main reasons. These results continue to hold when “adjusted profit data”, which subtract the effects of privileges which the postal savings system enjoyed as a government entity from original income data, are used. The cost of universal service is also considered as one reason for low profitability. While the universal service obligation is a redistribution policy from urban to rural areas and offering universal service is expected by politicians, how to estimate this cost and how to finance it are unresolved issues. Moreover, economies of scale are observed in Japanese banking business and this suggests that there is a possibility that Japan Post Bank will be a dominant market player.

# 1 Introduction

“Privatization” - selling off of state-owned companies (SOCs) and contracting out of government services - has been done in many countries since the 1980s. According to Megginson (2005a), over 100 governments around the world have privatized SOCs and have earned over \$1 trillion since 1981. There are thousands of privatized companies all over the world today, ranging from transportation to water-supply companies. Also, in the banking sector, many state-owned banks (SOBs) have been privatized. Boehmer, Nash and Netter (2003) show that banking privatizations have raised a total of \$119 billion for divesting governments in 51 countries from 1982 to 2000.

This paper discusses banking privatization and its effects in Japan. A target of this paper is two Japanese postal reforms that took place in the 2000s. The first postal reform established a public corporation - “Japan Post (JP)”- which took over three business operations from the Postal Services Agency (PSA): a mail delivery service, a postal savings service and a life insurance service on April 1, 2003. The second postal reform was initiated on October 1, 2007. The second reform is generally called “Postal privatization” in Japan. The new stock bank, “Japan Post Bank (JPB)”, was established and it took over the postal savings service from JP. Japanese postal savings system (PSS) had collected a large amount of savings from consumers for a long time. In 2000, JP had about 250 trillion yens in deposits (about 3.0 trillion Canadian dollars).<sup>1 2</sup> Thus, this privatization created one of the world’s biggest banks in terms of deposits. According to the latest statistics,<sup>3</sup> while the total assets of Mitsubishi UFJ financial group, which is the largest private bank in Japan, were 148 trillion yens in March 2010, the total assets of JPB were 194 trillion.

Previous studies suggest that banking privatizations improve performance, raise revenue for governments and develop capital markets. Policymakers in Japan expected the same effects when they initiated the postal reforms. This paper tries to evaluate the effects of the

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<sup>1</sup>“Annual Report 2000” Ministry of Posts and Telecommunications.

<sup>2</sup>One Canadian dollar was equal to 83.36 Japanese yens at the end of 2010.

<sup>3</sup>“Financial Statistics of All banks” Japan Bankers Association.

two postal reforms. However, it should be noted that the privatization process has not been completed and the government still owns all stocks of JPB. Thus, this paper's conclusion will be a mid-term evaluation of postal privatization.

When all reforms are completed, JPB is supposed to be one of the largest private banks in Japan. Therefore, this paper compares the performance of JPB to other private banks. The stocks of JPB are planned to be sold by 2017, so it is important for the Japanese government to improve the profitability to the level of other banks in order to obtain a profit from the sale. This paper estimates a production function and evaluates the performance.

Generally since the goods and services supplied by SOCs are often essential, stable supply is required during the privatization process. PSS offered basic banking services throughout Japan, so some policymakers insist that the basic banking service is essential for the public after privatization. Privatized JPB is required to offer their services universally. Thus, the effects of universal service obligation and cost are discussed.

The remainder of the paper is organized as follows. Section 2 presents an overview of the privatization of the Japanese PSS. Section 3 reviews previous studies about banking privatization. Section 4 analyzes the performance of JP and JPB. Section 5 concludes.

## **2 Japanese Postal Savings Privatization**

### **2.1 Overview of the Japanese Postal Savings System**

A "postal savings system" (PSS) is a general term for a system which provides banking services to the public through state-owned post offices. According to the Ministry of Posts and Communications (1970), the first PSS was started in England in 1861. In 1875, the Japanese government introduced the PSS. Japan is the fourth country which has founded a PSS in the world. This may be surprising, considering that Japan was a developing country at that time. This is because Japan adopted the postal system from England. Meanwhile, the Bank of Japan, which is the Japanese central bank, was founded in 1881. Thus, the

Japanese PSS has a longer history than the central bank.

PSSs have spread to many countries. According to the World Savings Banks Institute (2010), there are about forty countries which have PSSs. Moreover, over 70 percent of countries use post offices to deliver financial services. In addition, public banks which provide basic financial services to the general public and encourage them to save up are common in many countries. Generally, this type of bank is called a savings bank. In Japan, public retail financial services have been provided by the PSS, not saving banks.

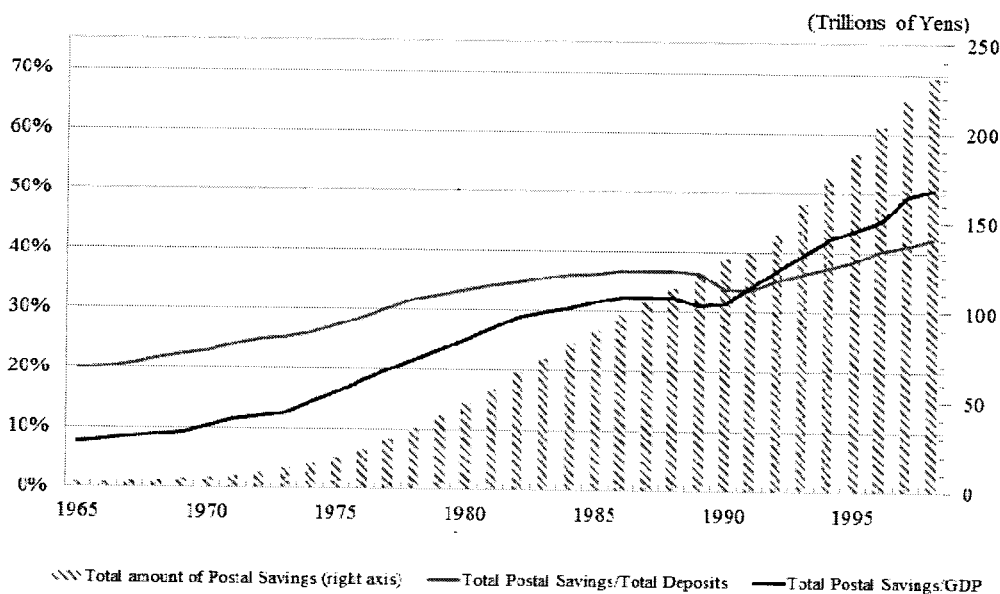
Tanaka (2008) points out that the reason why the government imported the PSS was to improve low-income people's welfare. Japanese policymakers tried to encourage the public to save, because savings could reduce people's risks in cases of illness or accident. In those days, the Japanese did not save their money in banking accounts. Tanaka shows that the PSS was considered an alternative social security system. In addition, around the year 1900, Japan experienced two wars and needed enormous amounts of money for industrialization. The funds collected by the PSS were used for financing these costs by the government. The PSS's total amount of deposits as a percentage of GDP was 1.0% in 1880, 5.6% in 1920 and 40.1% in 1940. During this period, other private banks also had expanded their business. However, only the PSS had many branches across the country and it became the most popular savings bank.

In addition, after WWII, the PSS expanded its scale rapidly. Figure 1 presents the growth of the PSS from 1964 to 1999.<sup>4</sup> It shows that the total amount of postal savings, the share of postal savings on all fixed-term deposits and the ratio of postal savings to GDP, have increased over that period.

Ito (2010) argues that the government needed money to construct infrastructures in this period so that the PSS was designed to raise the funds efficiently. The funds were used for financing the government and SOCs' budgets. The money was also used by other SOBs for their lending enterprises. SOBs lent the money to private companies, mainly infrastructure

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<sup>4</sup>The data are based on System of National Accounts, an international standard definition established in 1968 (SNA68). The System of National Accounts was revised in 1993 (SNA93). This section uses data based on SNA68, because long term data based on SNA93 are not provided in Japan.



Source: Bank of Japan "Flow of Funds"

**Figure 1 Share of Postal Savings from 1965 to 1998**

companies, to attain reconstruction and economic growth. The government collected savings through post offices and rationed them through other SOBs. This system is called "the fiscal investment and loan program (FILP)". Several researchers point out that FILP worked well in periods of rapid economic growth.<sup>5</sup>

As a result, on March 31, 2001, the PSS accepted about 250 trillion yens deposits. The number of post offices was 24,583.<sup>6</sup> There were some positive and negative aspects of this large public banking system. According to Takahashi (2006), the main positive aspects were: (1) every individual could access basic financial services, (2) the government and public companies could invest massive amount of money. The main negative aspects were: (1) the PSS might accept too much money and it harmed other private-owned banks' business, (2) the government and SOBs might use the money irrationally because of a lack of governance

<sup>5</sup>Takahashi (2006) sums up previous studies about FILP. He shows that although the policy effects of FILP have been a controversial issue, most researchers agree that FILP contributed to improve infrastructures at least before 1970. For example, Vestal (1993) and Forsberg (2000) find positive effects of FILP.

<sup>6</sup>"Annual Report 2000" Ministry of Posts and Telecommunications.

and political pressure and (3) the government could not collect taxes because the PSS did not pay taxes.

This system might have been an efficient way of financing development when Japan was catching up with other developed countries. However, policymakers came to consider that this government oriented banking system was old-fashioned.<sup>7</sup>

Besides the postal reforms, the FILP was reformed in 2001. Before 2001, SOBs and SOCs could use the money accepted by the PSS automatically without market reviews. The Ministry of Finance decided the allocation program each year. After 2001, each SOB and SOC came to issue each corporation's bonds.<sup>8</sup> In addition, many financial regulations have been removed in line with the Financial Revitalization Program (Financial Services Agency (2002)). Therefore, not only the postal privatization, but also many financial reforms have been implemented to enhance capital markets in the 2000s. This paper focuses on the postal reforms, but other reforms are also important.

## 2.2 Two Postal Reforms in the 2000s

### 2.2.1 Background and History

In 1997, the Japanese government decided that they would establish a new public corporation and it would take over three postal services in 2003 (the Administrative Reform Conference (1997)).<sup>9</sup> On April 1, 2003, the old postal system was reformed and JP was launched. This paper labels it as the first postal reform. The public corporation is not a private company and is similar to an affiliated company which has certain autonomy. According to Ministry of Internal Affairs and Communications (2003), the objective of the first postal reform was to enable a flexible and autonomous management under the self-supporting accounting system.

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<sup>7</sup>Takahashi (2006) sums up the political discussion.

<sup>8</sup>Takahashi (2006) explains this reform. Official documents about the reform are made available by the Ministry of Finance ([www.mof.go.jp/english/filp/index.html](http://www.mof.go.jp/english/filp/index.html)).

<sup>9</sup>The administrative conference also contained many government reforms. It contained that the Ministry of Posts and Telecommunications (MPT) would merge with other ministries and changed into the Ministry of Internal Affairs and Communications (MIC).

The role of Japanese government came to be that of a regulator.

The reform might have advanced the management effectiveness and made the postal services more convenient. Nevertheless, with the new public corporation still young, another postal reform was discussed again soon. Prime Minister Koizumi who took office in 2001 insisted on the importance of postal privatization, and finally his cabinet submitted the postal privatization bill to Congress in 2005. After political turmoil, the bill was passed and the Postal Privatization Act was enacted on September 1, 2005. “Basic policy of privatization of the Japan Post” which was published from the Japanese cabinet as a policy line, explains the objectives of the privatization are three: to improve the company’s efficiency, to reduce social costs and to use deposits in a more efficient way (Cabinet decision (2004)). Especially, the basic policy emphasized the problem of the “invisible public burden”. The idea was that JP had several privileges and these privileges had generated some social costs. For example, JP was exempt from taxes and deposit insurance fees so that if JP had been privatized, the government could impose more taxes. Moreover, these privileges might have harmed market competition.

Finally on October 1, 2007, the Postal Privatization Act was enforced and JP was divided into one holding company (the Japan Post Holding (JPH)), three operational companies: a mail delivery company (the JP Delivery), a bank (the Japan Post Bank (JPB)) and an insurance company (the Japan Post Insurance (JPI)), and one counter service company (the Japan Post Network (JPN)). The three operational companies have contracted with JPN to use post offices and have taken advantage of the existing 24000 post offices network. The Financial Services Agency <sup>10</sup> came to regulate JPB and JPI. This reform is called the second postal reform in this paper. In April 2011, the Japanese government preserves all stocks of JPH. JPB will be privatized totally by 2017. The two reforms are illustrated in figure 2.

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<sup>10</sup>The Financial Services Agency is a financial regulator in Japan.

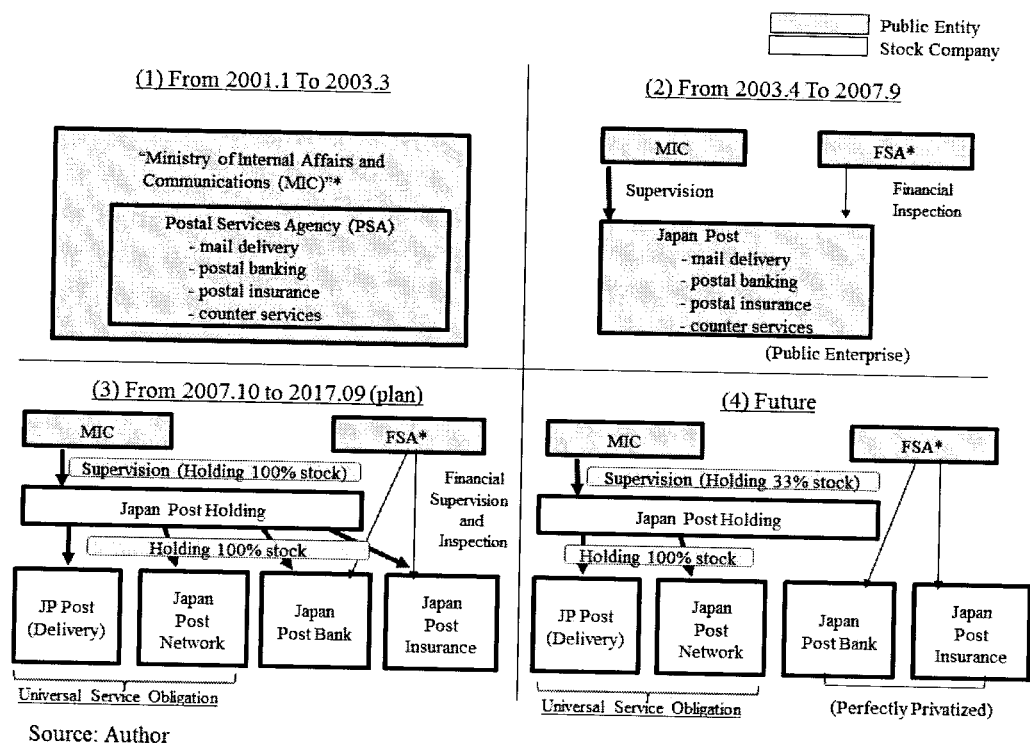


Figure 2 Japanese Postal Reforms in the 2000s

### 2.2.2 The Postal Privatization Act

Since the Japanese postal system was large and geographically spread, the Japanese government set ten years as a transition period so as to mitigate the impact. The Postal Privatization Act also imposes some restrictions on the privatized companies and prescribes government obligations. First of all, the act stipulates that the Japanese government shall sell its stocks of JPH as soon as possible. However it has to preserve one third of all stocks. Moreover, JPH shall sell its stocks of JPB and JPI by the end of September 2017. Therefore, JPB has been a SOB which is scheduled for full privatization by 2017.

On the other hand, JPB has been basically considered as a private bank under Japanese law. The Postal Privatization Act stipulates that JPB and JPI have to obtain licenses as a private bank and a private insurance company. Private banks and the regulatory system are defined by the Banking Act. This also means that JPB has to pay deposit insurance fees

to the Deposit Insurance Corporation and has to hold minimum reserves in a central bank account.

A more important point of the act is that the imposed regulatory level has not been the same compared with other private banks. From 2007 to 2017, the new bank JPB will be preserved by the Japanese government and this is a transitional period. Therefore, the new government owned bank is required to obey a strict regulation. According to the “Basic Policy”, consumers may consider that there is no possibility of bankruptcy, because the government is expected to bail JPB out during the transition period. In other words, JPB still has an “implicit government guarantee”.<sup>11</sup>

Therefore, regulations on JPB have been stricter than on other banks. For example, when JPB launches a new business, government permission is required even though the new business is a common banking business.<sup>12</sup> The government shall not permit when there is a possibility that the new service impedes market competition and other banks’ business. By this regulation, a lending business has been restricted for JPB. JPB has managed its assets mainly by bonds and securities. In addition, the maximum amount of deposits per one consumer has been limited to ten million yens in order not to stifle competition.<sup>13</sup> This regulation suggests that policymakers consider that the PSS has accepted too many deposits.

Also, the Japan Post Delivery and JPN shall provide universal services like privatized electrical companies and telecommunication companies in Japan.<sup>14</sup> This regulation is generally called a universal service obligation (USO). The Postal Privatization Act does not stipulate USO for JPB and JPI directly. However, JPB and JPI have to contract with JPN and offer universal services through postal offices by 2017.<sup>15</sup> The government is supposed to remove all restrictions by 2017. According to the act, JPB will be a private bank completely. However, the USO on JPB may remain after 2017. Discussion about the USO is a politically

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<sup>11</sup>Originally, this term is used to explain that the U.S. government-owned financial companies like Fannie Mae and Freddie Mac (generally called the “GSEs”) can issue their securities at rates below other companies’ bonds. Passmore (2005) calculates its effects.

<sup>12</sup>Act, No.97 of 2005, art.110.

<sup>13</sup>Act No.97 of 2005 art.107.

<sup>14</sup>Act No.97 of 2005 art.5.

<sup>15</sup>Act No.98.2 of 2005 art.5.

sensitive issue in Japan. These issues will now be discussed in more detail.

### 2.2.3 Universal Service Obligation

A USO requires regulated companies to offer their services all over the country even though their services do not turn profits in rural areas. It is easily understandable that the USO is necessary in the postal delivery service. As other examples of USO, telecommunication companies, electronic companies and water supply companies have to offer their services universally in many countries. In many cases, the companies are also required to set a single-price. Cremer, Gasmi, Grimaud and Laffont (1998a) summarize economic theories and discussions about USO. They point out that USO in telecommunication or transportation services can simply be seen as a way of contributing to the provision of "public goods" because the services are considered as essential for democracy and because for ethical reasons, society finds it unacceptable that anyone cannot use these kinds of services.

Moreover, USO can be considered as a transfer policy from urban to rural areas. Cremer, Gasmi, Grimaud and Laffont (1998a) also argue that uniform pricing is less visible than direct transfer, so that the USO is preferred by policymakers and pressure groups. When a monopolist faces a USO, the optimal design of the USO is like a Ramsey pricing problem with two different markets.<sup>16</sup> This model shows that the monopolist has to raise its price in urban areas, and society as a whole bears the costs of the USO. The basic model is explained in Appendix A.

There are two ways to finance the universal service costs: cross subsidies and transfers from the regulator to the firm. The Japanese government uses cross subsidies in the telecommunication sector. The privatized telecommunication company NTT has to offer basic telecommunication services universally by the NTT Act<sup>17</sup> and every user has to pay the universal service fees no matter what telecommunication carrier she uses, for financing

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<sup>16</sup>Ramsey pricing is a pricing rule concerning what price a monopolist offers in order to maximize social welfare subject to a break-even condition *i.e.* a second-best pricing rule.

<sup>17</sup>Act No.85 of 1984.

the universal service costs (Ministry of Internal Affairs and Communications (2007)).<sup>18</sup> This is an example of cross subsidies.

The important point concerning the USO imposed on JPB is that both big political parties in Japan insist that the universal banking services should be offered in the future. For example, the Democratic Party ruling since 2009 insisted “the postal banking savings service and the postal insurance service shall surely be treated in the post office” in their manifesto and claimed that a new act which stipulates the USO should be enacted (Democratic Party Japan (2009)).<sup>19</sup> The other big political party, the Liberal Democratic Party of Japan published a similar affirmation (Liberal Democratic Party of Japan (2009)). This implies that it will be difficult for JPB to halt the universal services because political pressure will be anticipated even though there is no explicit USO when JPB becomes a private bank completely. In addition, new regulation about the USO may be enacted in the future. Therefore, this paper assumes that a *de facto* USO is imposed on JPB.

#### 2.2.4 Change after the First Postal Reform

When a PSS was offered by the Japanese government (this paper calls it PSSJ), the main services were just basic banking services such as offering saving or checking accounts, issuing bank-drafts, currency exchange and others. After the first postal reform, a new chief executive of JP was chosen from the private sector and he and JP tried to reform PSSJ more efficiently. For example, JP agreed a tie-up with a convenience franchise company in ATMs service. Moreover, JP started to sell mutual funds to earn commissions (Japan Post (2005)). After the first postal reform, JP came to be expected to earn more profits without any government help as other private banks did. JP has also started using the same accounting system as other private banks. The main difference between a public accounting system and a standard banking accounting system is that the public accounting system does not use the

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<sup>18</sup>Every user has to pay 7.35 yens per month in 2011.

<sup>19</sup>This regulation had not been enacted by April 2011.

concept of equity. The difference is explained more in 4.2.7. On the other hand, the staffs remained government officers and the number of staffs and branches did not change. The first reform was not a full-scale reform.

### **2.2.5 Change after the Second Postal Reform**

After the second postal reform, JPB has launched some new businesses and streamlined their body. JPB insisted that the new bank would be a retail specialized bank for households (Japan Post Bank (2009)). JPB planned to earn more commissions by selling financial products such as government bonds and various mutual funds, and offering credit card services (Japan Post Bank (2008) and Japan Post Bank (2009)). JPB started to participate in syndicated loans.<sup>20</sup> Furthermore, JPB insisted that they would start mortgage loans by 2013. JPB advocated that these new businesses would enhance profitability and stability, taking advantage of post offices (Japan Post Bank (2010)).

### **2.2.6 Postal Savings Systems and Reforms in Other Countries**

While there are many examples of banking privatizations, there are a few example of privatization of PSS. Famous examples are the Netherlands and Germany. In 1989, the Dutch Post and Telecommunications Entity was privatized in a step-by-step process that led to the separation of post, telecommunication and banking services. Finger (2005) discusses the privatization and argues that it can be seen as a success story, at least when compared with other European postal operators. Also, in Germany the Bundespost was divided into three public corporations, and those corporations were privatized in 1995, resulting in the creation of the Deutsche Post AG (a delivery company), Deutsche Telekom AG (a telecom-

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<sup>20</sup>A syndicated loan is a type of loan provided by a group of lenders. It is structured, arranged and administered by one or several commercial banks or investment banks known as arrangers. Other lenders participate in the corporate loan program arranged by the arrangers. It is often used when a big project needs a large amount of money to finance, that one bank cannot take the risk alone (Downes and Goodman (2010)).

munications company) and Deutsche Postbank AG (a postal bank). New Deutsche Postbank AG was one of the biggest banks in Germany. Other large European countries such as the United Kingdom, France and Italy reformed their postal services in the 1990s. But they just founded public corporations, not private companies. Their postal delivery services are provided by the government. Moreover, the United States did away with its PSS in 1966. Canada also did away with it in 1968. Reforms of the PSS are presented in table 1.

**Table 1 Reforms of Postal Savings Systems in Developed Countries**

Country	Name	Reform	Status
The United States	-	1966: abolished	N.A.
Canada	-	1968: abolished	N.A.
The United Kingdom	National Savings & Investment	1996: changed into an executive agency	State-owned
France	La Poste	1991: changed into a public enterprise	State-owned
Germany	Deutsche Postbank	1995: changed into a stock company (government holding) 2001: completed an Initial public offering	Privatized
Italy	Poste Italiane	1994: changed into a public enterprise	State-owned
The Netherlands	Postbank N.V.	1986: changed into a stock company 1989: merged with other private bank	Privatized
Japan	Japan Post Bank	2007: changed into a stock company (government holding) 2017: total privatization (plan)	on Privatization Process

Source: Finger (2005) and each institution's official website.

### 3 Previous Studies

Policymakers who are in favor of privatization often insist that SOCs are inefficient because they lack disciplined governance. However, they often do not have strong rationales. SOCs are often criticized as bureaucratic and inefficient, but this does not mean that private companies are always innovative or efficient. Some economists insist that a lack of appropriate governance is a major reason for SOCs' inefficiency. Many empirical studies support this idea as referred to hereinafter. In the case of banking privatization, researchers have found that banking privatization has enhanced performance of SOBs in many countries.

### 3.1 General Studies

Laffont and Tirole (1993a), McFetridge (1997), Megginson (2005a), Megginson (2005b) and Thümmel and Thümmel (2005) sum up the general discussion about privatization.

Laffont and Tirole (1993a) maintain that an ownership structure does not matter if complete contracts can be written. However, they point out complete contracts are unrealistic and governments do not have enough information to regulate SOCs. They argue that the problem about privatization is a corporate governance problem and principal-agent models are useful because the difference between SOCs and private companies lies mainly in ownership structure. They also set up an economic model about privatization by expanding the basic principal-agent model. In this model, they emphasize that the objective of the regulator and the objective of shareholders are different and this fact may cause low performance. They also point out that the absence of a capital market is a big problem. For example, the managers of SOCs are not given the stocks and stock options, which would encourage them to take a long-term perspective. Moreover, there are no market valuations.

McFetridge (1997) summarizes Canadian privatization experiences and discusses its positive and negative effects and the government role. Especially, he emphasizes the importance of a regulatory reform such as an entry regulation when the government implements the privatization policy using the case of Air Canada and West Jet.

Megginson (2005a) surveys studies on privatization in many sectors. Megginson (2005b) is also a survey paper which focuses on banking privatization. He argues that political power often distorts the management of SOBs and many studies support it. Governments are subject to pressures of interest groups. Especially, politicians often exert pressures upon SOBs and SOBs sometimes have to conduct inefficient projects. Thümmel and Thümmel (2005) review several experiences of banking privatizations in many countries and reach a similar conclusion.

These general studies about privatization policy point out that SOBs are an ineffective

banking structure and banking privatizations tend to have positive effects. There are several theoretical rationales to explain this. Lack of governance and political distortion are often discussed as a main reason. They also emphasize that all privatization policies did not improve economic effectiveness. The reasons of ineffectiveness vary. Many elements - market scale, rival companies, existence of stock market, a political structure or government's transparency have to be considered to judge a privatization policy.

### 3.2 Empirical Studies

Does empirical evidence support banking privatization? A large number of empirical studies have attempted to answer this question. Many studies have found positive effects. Megginson (2005b), who surveys previous studies widely, sums up: "the weight of empirical evidence now clearly suggests that state ownership of commercial banks yield few benefits, yet is associated with many negative economic outcomes" (page 7).

Firstly, there are studies that analyze the relationship between banking ownership structures and profitability using cross section or panel data. Molyneux and Thornton (1992) analyze banking profitability across 18 countries in Europe, from 1986 to 1989. Their result suggests that SOBs generate higher returns on capital than private banks. They explain this by the fact that SOBs generally maintain lower capital ratios than their private sector counterparts.<sup>21</sup>

Iannotta, Nocera and Sironi (2006) find an opposite result to Molyneux and Thornton (1992). They compare the performance and risk of a sample of 181 large banks from 15 European countries over the 1999-2004 period. Their results show that private banks appear to be more profitable than both mutual banks and SOBs. They also point out that this result stems from higher net returns on private banks' earning assets rather than from superior cost efficiency because they often invest in a riskier and more profitable way than others. In

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<sup>21</sup>An international capital ratio regulation (so-called BIS regulation) was published in 1988 and started in 1992.

fact, public and mutual banks' costs are relatively lower than private banks.

La Pirta, Florencio and Andrei (2002) support this idea. They use data on SOBs from 92 countries around the world and show that state-ownership is larger in countries with low levels of per capita income. They also point out that the government ownership of banks is associated with lower subsequent growth, especially productivity growth. They conclude that their result is more supportive of the hypothesis that ownership of banks enables the government to finance the inefficient but politically desirable projects. Policymakers and governments often utilize SOBs to finance unprofitable projects.

Dinç (2005) shows that SOBs increase their loans during election years relative to private banks. He chooses 22 emerging countries and 220 banks and adopts cross-country panel regressions. He shows that SOBs tend to possess more government securities than private banks and are also much less profitable than private banks. He points out that this tendency reflects political pressure imposed on SOBs. He insists that although the government ownership of banks aims at financing economically desirable projects that the private banks are unwilling or unable to finance, they seem to just finance more governments themselves than private projects.

Cornette, Guo, Khaksari and Tehranian (2010) examine performance differences between privately-owned banks and SOBs in sixteen Far East countries from 1989 to 1998. They find that SOBs are significantly less profitable than privately-owned banks due to SOBs' lower capital ratios, greater credit risk, lower liquidity and lower management efficiency.

Some studies focus on foreign-owned banks. For example, Bonin, Hasan and Wachtel (2005) argue that foreign-owned banks are most efficient in all types of banks (SOBs, foreign-owned banks, domestic-owned private banks, and mutual banks) and the existence of foreign investors is important when governments try to sell stocks of SOBs. They found that this feature is basically observed in developing countries. They suggest that this is because foreign investors from developed countries have knowledge about banking management. Therefore, governments should not forbid foreign investors from purchasing privatized banks although many developed countries do.

There are several studies which have investigated privatization in one country in depth. Altunbas, Nocera and Sironi (2001) study the German banking industry and find little evidence to support that private banks are more profitable than SOBs. They adopt the cost profit frontier methodology.<sup>22</sup> They also find that all banks -private banks, mutual banks and SOBs- benefit from widespread economies of scale.

Sapienza (2004) focuses on the Italian banking industry and political pressure. He shows that SOBs charge lower interest rates than private banks do. He also finds that interest rates offered by SOBs are low in areas where the head of the local SOBs has the same party affiliation as the ruling political party. This result implies that SOBs may be subject to political pressure from the ruling party.

Lin and Zhang (2009) provide evidence that the Chinese "big four" SOBs are less profitable, less efficient and have worse asset quality than other types of banks. They use a panel of Chinese banks over the 1997-2004 period and assess the effects of bank ownership on performance.

Baum, Caglayan and Talavera (2010) analyze the effects of parliamentary election cycles on the Turkish banking system from 1963 to 2007 and conclude that banking business is influenced by election cycles. However, they find that Turkish SOBs tend to reduce their loan in a pre-election year and this result is opposite to Dinç (2005).

The reviewed evidence basically upholds the SOBs' inefficiency compared with private banks. The following studies focus mainly on differences between pre-privatization and post-privatization.

Boubakri, Cosset, Fischer and Guedhami (2005) compare previous SOBs and privatized banks in developing countries. They examine the 81 privatized banks which have been privatized between 1986 and 1998 from 22 developing countries. They find that in the long run, privatizations tend to yield significant improvements in efficiency and credit risk exposure, but in the short run, this effect is small or unobservable, which depends on the

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<sup>22</sup>The cost profit frontier methodology is an econometric method that assumes there is a production frontier and the distance between the production frontier and the real outputs is considered as ineffectiveness (Mátyás and Sevestre (2008) Ch.21).

type of owners.

Otchere and Chan (2003) observe the impact of privatization of the Commonwealth Bank of Australia's in Australia in the 1990s. They find that the stock prices of major rival banks reacted negatively to the bank's sales. In addition, the bank's long-run stock price performance has significantly improved. However, they also observe that the stock price did not change notably in short-run.

Otchere (2005) compares operating performance of privatized banks and their rivals in middle and low-income countries. He uses a sample of 18 banks from 9 countries and finds that the privatized banks have not improved their performance, which is below average. He concludes that the reason is that the sample countries are from middle and low-income countries where privatized firms face less capital market monitoring. Another reason is that the sample banks are mostly partially privatized banks. He also finds that the stock prices of rival banks have reacted negatively to privatization announcements. He argues that this response means that investors viewed privatization announcements as foreshadowing bad news for rival banks because privatization would cause more competitive markets.

Otchere (2009) analyzes developed countries using a method similar to Otchere (2005), and finds that privatized banks have enhanced their performance. He also points out that the privatization announcements have lowered rival companies' stock prices. Moreover, he compares the performance of privatized banks in developed and developing countries and insists that privatization has encouraged excessive risk taking among privatized banks in developed countries.

Boehmer, Nash and Netter (2005) scrutinize banking privatizations in a different way. They use a panel data of 101 countries from 1982 to 2000 and analyze them using the logit choice model.<sup>23</sup> In developing countries, countries which do not have large public debts tend to opt for privatization. The more likely bank privatization is, the more accountable is the government. The authors argue that this is because a public official's ability to capture

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<sup>23</sup>A logit choice model is an econometric model which fits data to a logit function. It is often used when dependent variables are binary choice data (Greene (2007)).

rents from SOBs will be limited by an institutional structure that provides accountability to voters. A highly accountable government means that public officials cannot use SOBs as “patronage machines”. Their research implies that SOBs face strong political pressure. However, the relationship between political pressure and determination of privatization is not founded in developed countries.

Many empirical studies indicate that the performance of SOBs is lower than private banks. Political pressure, a risk-averse management, and governance problems are considered the main reasons for it. Moreover, it is shown that a number of privatizations have improved SOBs’ performance. However, some studies point out that the SOBs’ ineffectiveness is not observed especially in some developed countries. Japan has no experience of banking privatization so that there are no studies about this topic. Therefore, a statistical approach is required to evaluate banking privatization.

## 4 Evaluation of Postal Reforms

### 4.1 Approaches to Evaluate Banking Performance

This section analyzes the postal reforms in Japan. As a first step, several basic approaches to evaluate banking performance are discussed. Matthews and Thompson (2005) sum up five approaches to evaluate banking performance.<sup>24</sup> The first one is comparing several metrics such as share price, real option premium, dividends with other banks or previous bank. The second approach is estimation of the production function. The third approach is estimation of the cost function. This is similar to the second approach. The fourth approach is comparing several accounting indicators such as return on assets, return on equity or overhead costs to total asset cash flows. The fifth approach is estimation of the efficient frontiers and measurement of the gap between actual and best practice. Basically, this approach is similar to the second approach, but this is a more technical method.

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<sup>24</sup>These approaches have been used to evaluate the effects of banking mergers mainly.

This paper adopts the second and fourth approaches. The first approach needs data on share prices, but PSSJ did not issue shares. The second, third and fifth approaches are similar because they rely on estimation of functions. As shown in 3.2, many previous studies use the second approach so this paper follows them. There are not so many studies about this topic that this paper chooses standard approaches. The fourth approach does not require estimation and this is tried in the first place. This section first discusses the definitions and data problems. After that, the results of the fourth approach and second approach are shown.

## 4.2 Data

Revenue indicators are necessary to implement the fourth approach. Input and output indicators are also required to estimate production functions. This subsection discusses both issues. First of all, data sources, data definitions and data periods are introduced. Then, limitations of data are discussed.

### 4.2.1 Data Sources

All data on PSSJ, JP and JPB are from annual reports published by MPT, MIC, JP and JPB. All statistics on private banks are from “Financial Statements of All Banks” published by the Japanese Bankers Association. Both of them include income statements and balance sheets.

### 4.2.2 Sample Period

In Japan, disclosure documents are generally published twice a year.<sup>25</sup> The accounting year starts in April. Considering that the two postal reforms took place in the 2000s, this paper sets the analyzed period from April 1, 1996 to March 31, 2010. This period can be divided into three sub-periods. The first is a period when the government (PSSJ) offered postal savings services directly (from April 1, 1996 to March 31, 2003). The second is a

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<sup>25</sup>Only some international banks publish disclosure documents four times a year like other countries.

period when the public company (JP) offered postal savings services (from April 1, 2003 to September 30, 2007). The third is a period when the privatized JPB (but the government owns all stocks) offered banking services (from October 1, 2007 to September 30, 2010).

This paper uses annual data except for 2007. Annual data for 2007 are not perfect because JPB took over the postal savings section of JP on October 1, 2007. JPB published the annual report which contained data from April 1, 2007 to March 31, 2008 as a provisional value. Moreover, JP also published accounting data from April 1, 2007 to September 30, 2007. Therefore, there are two kinds of data. This paper uses half year data for 2007. However, in estimation section, annual data are used. All stock data are end-of-period values.

Also, the production function is estimated for 2003 to 2009. This is because PSSJ used a different accounting system and appropriate data are not provided. Details are explained in 4.2.7.

### 4.2.3 Scope of Banks

In Japan, there are several categories of depositary institutions; licensed banks, credit unions, credit associations and other associations (*e.g.* labour associations, agricultural cooperatives and others.). JP changed into a licensed bank at the second postal reform, so that JPB should be compared with licensed banks. Licensed banks are also divided into several subcategories under Japanese statistics. Important subcategories are city banks and local banks. City banks are large-scale banks which have branches across the country. In 2011, there are six city banks in Japan. Local banks are licensed banks which do their business in a limited area. In 2011, there are 105 local banks. City banks, local banks and PSSJ have had a 70 percent market share in terms of deposits in 2000.<sup>26</sup> Generally city banks show higher profitability than local banks. This paper mainly compares city banks and local banks with PSSJ, JP and JPB and in this section, “private banks” means city banks and local banks. Special banks such as trust banks and Internet specialized banks are not treated. They may have different production functions. Each institution’s feature and definition are explained

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<sup>26</sup>“Flow of Fund” Bank of Japan.

in Appendix B. The number of private banks was 136 in 1996, 124 in 2003, and 115 in 2009. This is because mergers took place during that period.

#### 4.2.4 Revenue Indicators

There are several indicators which capture banking performance. First of all, it should be noted that banks have large balance sheets and a diversity of assets and liabilities. Although Japanese private banks are commercial banks and their main profits are from interests margin, their profits and expenses are influenced by the business cycle and price fluctuations of financial assets and real estates. One indicator which reflects true profitability is desirable. However it is difficult to define true profitability and choose one indicator. This paper adopts “gross business profit” and “net business profit” as revenue indicators.<sup>27</sup> Gross business profit represents the bank’s “gross profit” which is equal to business income minus business expenses. Business income is a summation of basic income such as interest income and fees and commissions income. Business expenses is a summation of basic expenses. Net business profit represents gross business profit minus non-occasional costs such as employment costs, facilities expenses and provision of allowance for loan losses. This means “operating profit” in general accounting. As other basic revenue indicators, “ordinary profit” and “income before income taxes” are often used in business analysis. However, these two indicators were not published before the first reform so they are not applicable.

Several ratios are also useful to measure and compare banking performance. This paper uses “Return on Asset (ROA)”. ROA is a ratio of revenue relative to total assets. When calculating ROA, net profit is often used as a numerator, but gross business profit is used in this paper in order to focus on stable profitability. “Return on Equity (ROE)” is also used as a performance ratio indicator. However, because PSSJ was one government entity, the concept of equity is unclear and PSSJ did not publish any data on this, so this paper does not adopt ROE.

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<sup>27</sup>Terms and definitions are based on the Japan Bankers Association ([www.zenginkyo.or.jp/en/stats](http://www.zenginkyo.or.jp/en/stats)).

#### 4.2.5 Adjusted Revenue Indicator

As explained in 2.2, several privileges which PSSJ and JP had were removed at the second postal reform. After the second postal reform, JPB came to have to pay taxes and deposit insurance fees, and keep reserve requirement on its account of the central bank. An “adjusted revenue indicators” is defined as a revenue indicator which is considering the effects of these privileges. According to Nishigaki (2009), there are four privileges given to PSSJ and JP; taxes as ordinary expenses, exemption from the deposit insurance, interest on the bank’s holdings of reserve requirement and exemption from corporation taxes and local taxes. Nishigaki (2009) estimates each of them based on data from 1998 to 2006. Since 2007, these privileges have been removed so that they were not observed in 2008, 2009 and 2010. He also argues that there were special taxes of 200 billion yens imposed on PSSJ from 1996 to 2000 in order to pay national railway costs.<sup>28</sup> So, he considers the special taxes as special burdens imposed by political pressure. This paper estimates the privileges from 1996 to 1997 as in Nishigaki (2009). The method is shown in Appendix C.

Finally, adjusted gross business profit, adjusted net business profit and adjusted ROA are calculated.<sup>29</sup> All definitions in 4.2.4 and 4.2.5 are summed up in table 11 (Appendix D).

#### 4.2.6 Input Indicators and Dummy Variables

To estimate production functions, several indicators are needed as input variables. The theory of production functions is discussed in 4.4.1. This subsection introduces several indicators which can be used as input variables. I have tried many indicators. The following indicators obey the theory and induce the effective econometric results.

The first is a capital indicator. “Total price of premises and equipment” is used as a capital indicator, which is given by each bank’s balance sheet. It represents the present value of real estate and equipment which the bank preserves.

Next, a labour force indicator is discussed. “Total employment cost” is used as a labour

<sup>28</sup>This is an example of political pressure on PSSJ.

<sup>29</sup>Exemption from corporation taxes and local taxes does not influence gross business profit.

force indicator. The number of staffs is also considered as a variable which represents the labour force. However, it is known that salaries in big banks are higher than in local banks in Japan. The reason may be that staffs in big banks are more skillful than those in local banks. Thus, total employment cost is considered better as a labour force variable. This is given by each bank's income statements.

Thirdly, operating cost is discussed as an alternative indicator. There are some statistical problems with "total price of premises and equipment" and "total employment cost". For example, if a bank leases offices, these costs are not included in the total price of premises and equipment. This is because this price includes the total value of real estate as the bank's capital. Renting costs are flow data and categorized in the "general and administrative expenses". Offices should be considered as an input indicator in theory. Moreover, if a bank contracts out its work, total salaries will be reduced even though total labour force has not changed. Contracting out costs are categorized as "general and administrative expenses". Therefore, both total price of premises and equipment and total employment cost do not present capital and labour force perfectly. Thus, "general and administrative expenses" may be a better indicator because it includes rental, contracting out and employment costs. "General and administrative expenses" is considered another indicator to represent both capital and labour force at the same time. This is also given by each bank's income statements.

Finally, the amount of deposits may be a good input indicator. In general, labour and capital are considered as the main input variables. On the other hand, some previous studies adopt the amount of deposits as an input variable because banks invest their deposits and earn profits (Berger, Clarke, Cull, Klapper and Udell (2005)). Although recent banks do many businesses, Hoshi and Patrick (2000) pointed out that Japanese banks' main revenues come from interest profits. Therefore, this paper uses the amount of deposits as an output variable. There are several categories of deposits: checking account deposits, savings account deposits, long-term savings account deposits and negotiable deposits. This paper uses long-term deposits because this indicator induces better results.

In addition, dummy variables may be necessary to estimate the production functions.

First, considering city banks' high performances and presence in Japan, a dummy variable for city banks may be justified. Second, in order to see the difference between PSS and private banks, a postal dummy is introduced. If PSSJ, JP and JPB have different production functions from other private banks, the postal dummy will be significant and the difference will be shown statistically.

#### 4.2.7 Data Limitations

There are three data limitations. First, the public accounting system which PSSJ used is different from the basic banking accounting system. Generally, government sections do not pay taxes and issue shares. Therefore, the public accounting system is simple. After the first reform, JP started to use the banking accounting system. So, the definition of data is not consistent for the post savings system and reformed JP and JPB. This difference causes some problems. For example, even if both accounting systems use the same name of an accounting item (*e.g.* employment costs, total revenue and total assets), the definitions are not the same. Another big problem is that several items do not exist in the public accounting system. There is no concept of equity and capital in the Japanese public accounting system. The data about employment costs and total capital also do not exist. This is the reason why it is difficult to estimate banking production functions using data before the first postal reform.

Second, JP has been divided into one holding company and four companies at the second postal reform. When the government offered postal services, the government published three disclosure documents by each section (the one is PSSJ). JP published the same three disclosure documents. Basically, JPB took over the postal savings section, but there are some differences between PSSJ, the postal savings sections of JP and JPB. Thus, the data lack continuity.

The third problem is that the sample size is decreasing during the period because of mergers and acquisitions. This problem makes panel estimation difficult. For example, when banking mergers take place, the new bank and two old banks should be treated as dif-

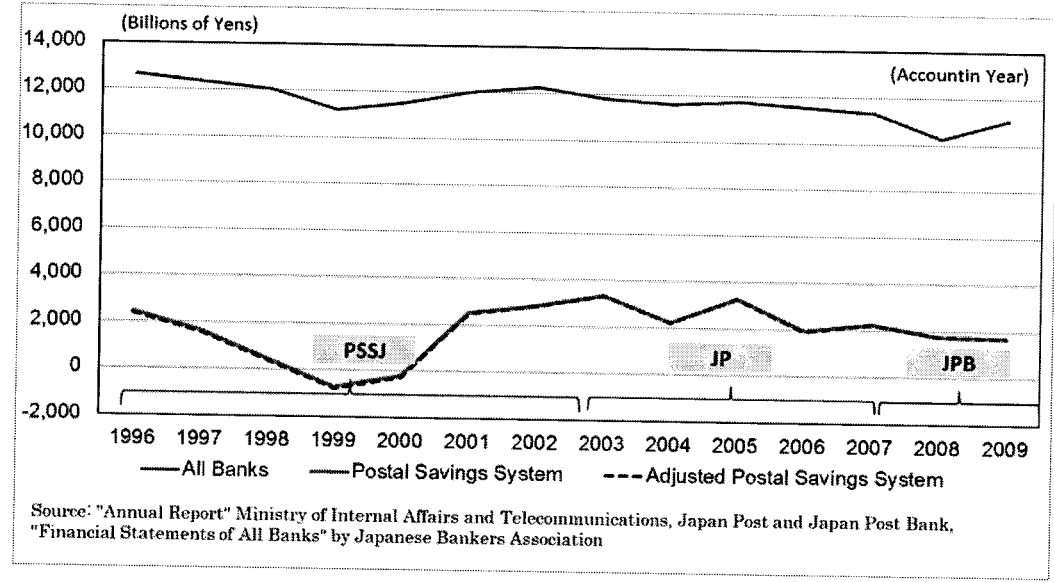


Figure 3 Gross Business Profit from 1996 to 2009

ferent entities which may have different production functions. Moreover, several banks went bankrupt and new banks were launched after the corporate reorganization process during the period. The new bank may have a different production function. This is called the attrition problem. This problem is a common problem when using panel data (Wooldridge (2002) and Mátyás and Sevestre (2008)). Matsuura and Colin (2005) argue that after the Japanese banking crisis in 1999, most banks have changed their structure, so that the attrition problem is large when analyzing the Japanese banking sector. When there is an attrition problem, the advantage of panel regression will be reduced and a survival bias may occur.

### 4.3 Trend of Revenue Indicators and Ratios

The revenue indicators and revenue ratios of PSSJ, JP, JPB and private banks are shown in figures 3, 4 and 5. Ratio data on private banks are weighted averages. Detailed data are shown in tables 12 and 13 (Appendix D): Descriptive statistics and the estimated privileges show the following points.

First, gross business incomes are rather stable (figure 3). Net business incomes of PSSJ

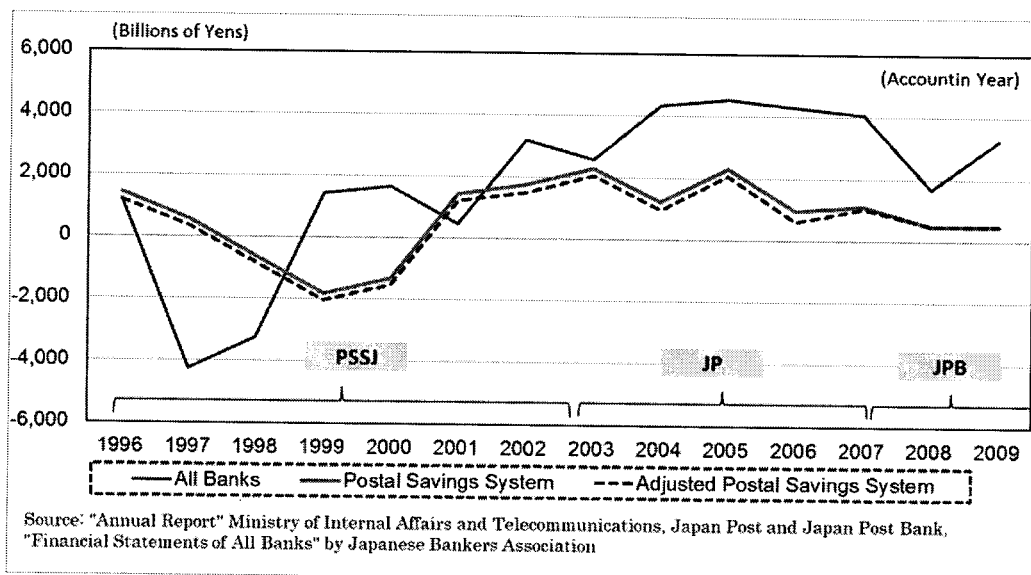


Figure 4 Net Business Profit from 1996 to 2009

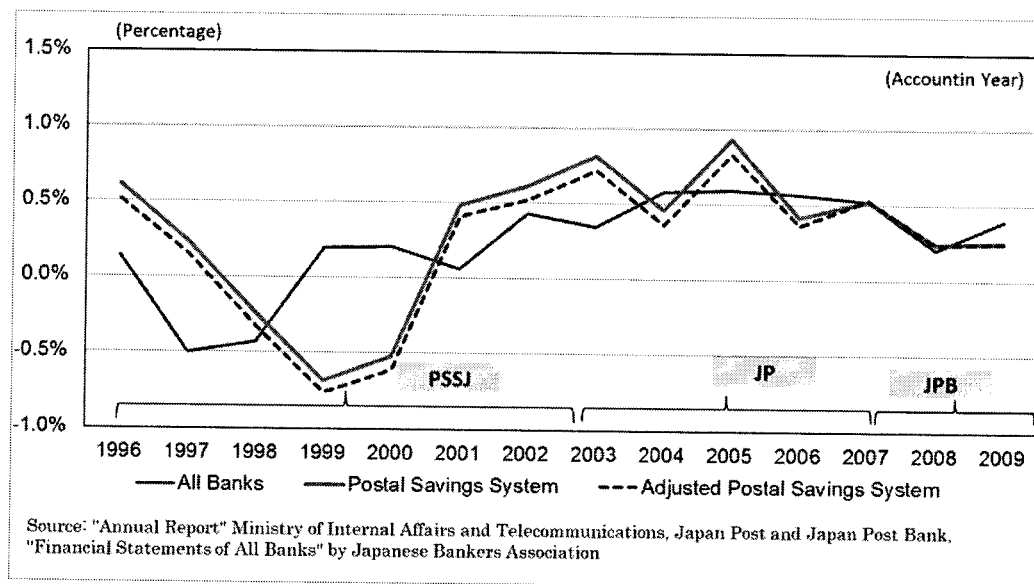


Figure 5 Return on Assets from 1996 to 2009

and private banks fluctuate widely and even show negative values in certain years (figure 4). One reason is that provision of allowance for loan losses fluctuates according to market conditions. Especially, private banks had to prepare high provision of allowance for loan losses in the Japanese financial crisis around 2000.

Second, the long trends of profitability indicators are similar between PSSJ, JP and JPB, and private banks. When JP showed high profitability, private banks earned high revenues, too. This implies that the market condition affects both and the period from 2003 to 2006 seemed to be the best market environment for them (figures 3, 4 and 5).

Third, after the first postal reform profitability seemed to improve. The highest period was the period when JP offered the postal savings services (figures 3, 4 and 5). After the second postal reform, revenue indicators have decreased, so that the second reform might have had a negative impact on the performance JPB. However, the performance of private banks has also decreased after the second period. Poor market conditions may be the reason (figures 3, 4 and 5).

Finally, even if adjusted revenue indicators are used, the above tendencies do not change. Certainly, the privileges existed but they are not so large (figures 3, 4 and 5).

#### **4.4 Estimation of Production Functions**

This subsection estimates banking production functions and tries to answer whether the privatized JPB is as efficient as other private banks and whether there are economies of scale in the banking industry. The second question is related to the privatization process and the possibility that the new privatized bank can make profits in the future. If there are strong economies of scale, it can be said that JPB will be able to make enough profits because they have already accepted large deposits and managed a lot of branches.

Firstly, forms of the production functions are discussed. Next, the production functions are estimated. Then, results are shown.

#### 4.4.1 Theory and Form<sup>30</sup>

Standard assumptions of production functions: continuity, second differentiable, increasing and convexity of indifference curve are made. The general form of a production function is:

$$y = f(\mathbf{x}), \quad (1)$$

where  $y$  is an output variable and  $\mathbf{x}$  is an input vector. To simplify, the output variable  $y$  is assumed to be unidimensional. The input vector  $\mathbf{x}$  contains several input variables. If the number of variables is  $n$ , this is written,  $\mathbf{x} = (x_1, x_2, \dots, x_n)$ .  $f$  is an increasing, continuous and twice differentiable function on  $\mathbf{x}$ . However, a more specific functional form is required for estimation.

The Cobb-Douglas and Trans-log production functions are often used in econometrics. The Cobb-Douglas production function is written in logarithmic form:

$$\log y = c + \sum_{a=1}^n \alpha_a \log x_a \quad (2)$$

$c$  is a constant term.  $\alpha_a$  is the coefficient of  $x_a$ .  $\alpha_a$  should be positive because  $f$  is an increasing function. Under the cost minimization assumption, the elasticity of substitution between two inputs  $a$  and  $b$ ,  $\sigma_{a,b}$  is given by:

$$\sigma_{a,b} = - \frac{d \log(x_a/x_b)}{d \log(MRST_{a,b})} \quad a, b = 1, 2, \dots, n \quad (3)$$

$MRST_{a,b}$  is the marginal rate of technical substitution between  $a$  and  $b$ , which is defined as:

$$MRST_{a,b} = \frac{dy/x_a}{dy/x_b} \quad (4)$$

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<sup>30</sup>Theories of production functions and symbols follow Jehle and Reny (2000). Properties of each production function are explained by Jehle and Reny (2000) and Varian (1992). Mátyás and Sevestre (2008) discuss several problems when estimating each production function using cross section and panel data.

In the Cobb-Douglas production function, the next equation always holds,

$$\sigma_{a,b} = 1 \quad \forall a, b \quad (5)$$

This means that if one input increases by 1 % and another input decreases by 1 %, total output will remain unchanged. The elasticity of scale ( $e(\mathbf{x})$ ) is used to measure economies of scale. It is defined by:

$$e(\mathbf{x}) = \frac{\frac{dy(t)}{y(t)}}{\frac{dt}{t}} \quad (6)$$

where  $t$  is a positive scalar and  $y(t) = f(t\mathbf{x})$ . In the Cobb-Douglas production function with  $n$  inputs, the elasticity of scale is:

$$e(\mathbf{x}) = \sum_{a=1}^n \alpha_a \quad . \quad (7)$$

The technology exhibits locally increasing, constant, or decreasing returns to scale as  $e(\mathbf{x})$  is greater, equal, or less than 1. In the Cobb-Douglas production function, the elasticity of scale is constant.

The Trans-log function is written as:

$$\log y = c + \sum_{a=1}^n \alpha_a \log x_a + \sum_{a=1}^n \beta_{aa} (\log x_a)^2 + \sum_{a=1}^n \sum_{b=1}^n \beta_{ab} \log x_a \log x_b \quad a \neq b \quad (8)$$

$\alpha_a$  is output elasticity of each variable.  $\beta_{aa}$  represents increasing or decreasing effects of output elasticity of each variable.  $\beta_{ab}$  represents substitution and complementarity effects between inputs  $x_a$  and  $x_b$ . The two features of the Cobb-Douglas production function: the elasticity of substitution is 1 and the constant elasticity of scale are not assumed. The

elasticity of scale is:

$$e(\mathbf{x}) = \sum_{a=1}^n \alpha_a + 2 \sum_{a=1}^n \beta_{aa} + \sum_{a=1}^n \sum_{b=1}^n \beta_{ab} (\log x_a + \log x_b) \quad a \neq b \quad (9)$$

The advantage of Cobb-Douglas production function is that the form is simple and easy to estimate. Especially, when data are limited and sample size is small, this feature is useful. However, this function is based on some restrictive assumptions. On the other hand, the Trans-Log production function is a more general form. However, there are many coefficients to be estimated so that it is difficult to get significant results (Greene (2007)).

There are several options of input indicators. This section adopts deposits indicator as one option. Also, as explained in 4.2.6, labour indicator and capital indicator have statistical problems and general and administrative expenses may be a better indicator. This paper chooses best input indicators after analyzing estimation results.

This section uses the following notations.  $y$  is output,  $k$  is capital,  $l$  is labour force,  $d$  is deposits, and  $s$  is an input which represent  $k$  and  $l$ . *City* and *Post* are dummy variables. *City* is 1 when  $i$  is a city bank and 0 otherwise. *Post* is 1 when  $i$  is JP or JPB and 0 otherwise. This paper's production function is rewritten as follows using  $\mathbf{x} = (k, l, d)$ , instead of  $\mathbf{x} = (x_a)$ ,  $a = (1, 2, \dots, n)$ :

$$y = f(k, l, d) \quad (10)$$

When  $s$  is used instead of  $k$  and  $l$ , the new production function is:

$$y = g(s, d) \quad (11)$$

When one year cross-section estimation is implemented, the reduced form of the Cobb-

Douglas production function with three input variables ( $k$ ,  $l$  and  $d$ ) is written as:

$$\begin{aligned}\log y_i &= c + \alpha_1 \log k_i + \alpha_2 \log l_i + \alpha_3 \log d_i \\ &+ \phi_1 City_i + \phi_2 Post_i + \varepsilon_i\end{aligned}\quad (12)$$

where  $\varepsilon_i$  is an error term.  $i$  indicates the observation on a bank.  $\phi_1$  and  $\phi_2$  are the coefficients of  $City$  and  $Post$ . The sample contains all private banks and JP or JPB. In the two input variables case ( $s$  and  $d$ ), the reduced form is:

$$\begin{aligned}\log y_i &= c + \beta_1 \log s_i + \beta_2 \log d_i \\ &+ \phi_1 City_i + \phi_2 Post_i + \varepsilon_i\end{aligned}\quad (13)$$

The reduced form of The Trans-log function (a logarithmic form, input variables are  $k$ ,  $l$  and  $d$ ) is:

$$\begin{aligned}\log y_i &= c + \gamma_1 \log k_i + \gamma_2 \log l_i + \gamma_3 \log d_i \\ &+ \gamma_4 (\log k_i)^2 + \gamma_5 (\log l_i)^2 + \gamma_6 (\log d_i)^2 \\ &+ \gamma_7 (\log k_i)(\log l_i) + \gamma_8 (\log k_i)(\log d_i) + \gamma_9 (\log l_i)(\log d_i) \\ &+ \phi_1 City_i + \phi_2 Post_i + \varepsilon_i\end{aligned}\quad (14)$$

The two input variables case is:

$$\begin{aligned}\log y_i &= c + \delta_1 \log s_i + \delta_2 \log d_i \\ &+ \delta_3 (\log s_i)^2 + \delta_4 (\log d_i)^2 + \delta_5 (\log s_i)(\log d_i) \\ &+ \phi_1 City_i + \phi_2 Post_i + \varepsilon_i\end{aligned}\quad (15)$$

The theory suggests  $\alpha_1, \alpha_2, \alpha_3, \beta_1, \beta_2, \gamma_1, \gamma_2, \gamma_3, \delta_1$  and  $\delta_2$  are positive. If  $\phi_2$  is negative, the performance of JP or JPB would be considered higher than other banks.

#### 4.4.2 Output Variables for Estimation

The problem of input variables has been discussed. Also, it is necessary to define outputs. It is difficult to define banking revenues; revenue indicators have been discussed above. Previous studies use several indicators which represent revenues as banks' outputs. This paper uses "business income" as the output indicator. "Business income" contains every banking service, while occasional profits or losses are not included. "Gross business profit" and "net business profit" are considered other indicators but these indicators sometimes show negative value and it is impossible to get logarithmic data. The definition was explained in 4.2.4. However, business income is influenced by the level of interest rates. When the interest rates are high, business income will raise automatically because it contains interest income. This causes some problems in time series analysis. This subsection adopts cross section estimation to avoid this problem.

#### 4.4.3 Estimation

The Cobb-Douglas and the Trans-log production functions have a linear logarithmic reduced form so that I can rely on a linear estimation. I start by estimating the cross section function for each year separately. Later, all regression is combined during all years. In all regressions, I correct for possible heteroscedasticity.

There are four alternative equations to be estimated; (12), (13), (14) and (15). Tables 2 and 3 show the cases of the Cobb-Douglas production function ((12), (13)). The F-values of White heteroscedasticity test suggests strong heteroscedasticity so the White's asymptotic formula is used when estimating standard errors.<sup>31</sup> Considering statistical significance and signs, the Cobb-Douglas and two variables ( $s$ ,  $d$ ), equation (13), is considered the best equation. The coefficients of the two input variables are statistically significant and signs obey the theory. On the contrary, the result of three input variables, (12), has some problems. Especially, in all periods, the coefficient of capital,  $\alpha_1$  is not statistically significant at the 5

<sup>31</sup>When the standard error of an error term is not constant (heteroscedasticity) the estimated standard error of the basic OLS estimator does not satisfy  $t$  distribution which is based on OLS. White's asymptotic formula is used to estimate the standard error which satisfies consistency asymptotically (Greene (2007)).

percent level.

In the case of two input variables, (13), the coefficients of *Post* are negative and significant from 2006 to 2009. On the other hand, while the coefficient of *Post* is positive in 2003, it is not statistically significant at the 5 percent level from 2003 to 2005. This indicates that the performances of JP and JPB were lower than other banks from 2006 to 2009. The coefficients of *Post* are from -0.57 to -0.87, which means that if *Post* is 1, *y* decreases by 50 percent.<sup>32</sup> The effects of *City* are not clear. While the signs are positive, the p-values are higher than 0.05. Therefore, the city banks may be more efficient than other banks, but the difference is not large.

Considering statistical significance and signs, the Trans-Log production function ((14) and (15)) have many problems. Many coefficients do not satisfy the 5 percent level of statistical significance. The signs are not stable. Thus this paper does not adopt the cases of the Trans-Log production function. This is because there are many coefficients to be estimated in the Trans-Log production function. Multicollinearity is considered one reason that the estimated signs are unreliable. The results are shown in tables 4 and 5.

**Table 2 Cross Section Estimation (Cobb-Douglas, Input variables are *k*, *l* and *d*, equation (12))**

		2003 (Sample Size=124)			2004 (Sample Size=122)			2005 (Sample Size=120)			2006 (Sample Size=119)		
		COEF.	S.E.	p	COEF.	S.E.	p	COEF.	S.E.	p	COEF.	S.E.	p
constant	c	-3.298	0.412	[.000]	-3.323	0.374	[.000]	-3.798	0.466	[.000]	-4.074	0.436	[.000]
capital	$\alpha_1$	0.020	0.059	[.741]	0.001	0.058	[.990]	0.031	0.052	[.553]	-0.041	0.043	[.343]
labour	$\alpha_2$	0.305	0.192	[.114]	0.319	0.158	[.046]	0.163	0.174	[.353]	0.280	0.162	[.087]
deposits	$\alpha_3$	0.785	0.140	[.000]	0.793	0.117	[.000]	0.916	0.141	[.000]	0.911	0.133	[.000]
city dummy	$\phi_1$	0.255	0.166	[.127]	0.280	0.132	[.036]	0.192	0.155	[.217]	0.248	0.139	[.077]
post dummy	$\phi_2$	-0.291	0.135	[.034]	-0.615	0.113	[.000]	-0.628	0.137	[.000]	-1.159	0.116	[.000]
Adjusted R2		0.978			0.977			0.978			0.981		

		2007 (Sample Size=118)			2008 (Sample Size=117)			2009 (Sample Size=115)		
		COEF.	S.E.	p	COEF.	S.E.	p	COEF.	S.E.	p
constant	c	-4.336	0.458	[.000]	-4.138	0.370	[.000]	-3.696	0.336	[.000]
capital	$\alpha_1$	-0.053	0.041	[.197]	-0.057	0.048	[.232]	-0.003	0.047	[.953]
labour	$\alpha_2$	0.255	0.179	[.156]	0.245	0.139	[.080]	0.199	0.129	[.125]
deposits	$\alpha_3$	0.957	0.146	[.000]	0.947	0.115	[.000]	0.901	0.100	[.000]
city dummy	$\phi_1$	0.258	0.159	[.107]	0.218	0.158	[.171]	0.176	0.135	[.196]
post dummy	$\phi_2$	-0.880	0.337	[.010]	-0.949	0.266	[.001]	-0.788	0.225	[.001]
Adjusted R2		0.980			0.982			0.983		

<sup>32</sup> $e^{-0.7}$  is about 0.5.

**Table 3 Cross Section Estimation (Cobb-Douglas, Input variables are  $s$  and  $d$ , equation (13))**

		2003 (Sample Size=124)			2004 (Sample Size=122)			2005 (Sample Size=120)			2006 (Sample Size=119)		
		COEF.	S.E.	p	COEF.	S.E.	p	COEF.	S.E.	p	COEF.	S.E.	p
constant	c	-1.529	0.278	[.000]	-1.518	0.258	[.000]	-1.925	0.339	[.000]	-2.481	0.339	[.000]
general costs	$\beta_1$	0.807	0.079	[.000]	0.789	0.081	[.000]	0.712	0.090	[.000]	0.652	0.088	[.000]
deposits	$\beta_2$	0.292	0.074	[.000]	0.305	0.074	[.000]	0.394	0.087	[.000]	0.481	0.086	[.000]
city dummy	$\phi_1$	0.165	0.136	[.228]	0.209	0.111	[.062]	0.213	0.143	[.141]	0.193	0.139	[.168]
post dummy	$\phi_2$	0.385	0.104	[.000]	0.079	0.092	[.391]	0.034	0.119	[.775]	-0.574	0.111	[.000]
Adjusted R2		0.984			0.987			0.984			0.987		

		2007 (Sample Size=118)			2008 (Sample Size=117)			2009 (Sample Size=115)		
		COEF.	S.E.	p	COEF.	S.E.	p	COEF.	S.E.	p
constant	c	-2.596	0.395	[.000]	-2.584	0.358	[.000]	-2.192	0.321	[.000]
general costs	$\beta_1$	0.633	0.106	[.000]	0.575	0.087	[.000]	0.602	0.079	[.000]
deposits	$\beta_2$	0.505	0.103	[.000]	0.542	0.086	[.000]	0.489	0.078	[.000]
city bank dummy	$\phi_1$	0.223	0.165	[.180]	0.185	0.145	[.205]	0.116	0.107	[.281]
post dummy	$\phi_2$	-0.701	0.111	[.000]	-0.867	0.097	[.000]	-0.762	0.088	[.000]
Adjusted R2		0.985			0.986			0.989		

**Table 4 Cross Section Estimation (Trans-Log, Input variables are  $k$ ,  $l$  and  $d$ , equation (14))**

		2003 (Sample Size=124)			2004 (Sample Size=122)			2005 (Sample Size=120)			2006 (Sample Size=119)		
		COEF.	S.E.	p	COEF.	S.E.	p	COEF.	S.E.	p	COEF.	S.E.	p
constant	c	18.166	7.409	[.016]	12.887	4.177	[.003]	12.377	3.310	[.000]	10.630	2.259	[.000]
capital	$\gamma_1$	-0.505	0.712	[.480]	-1.096	0.890	[.221]	-0.153	0.902	[.866]	0.423	0.926	[.649]
labour	$\gamma_2$	11.528	2.794	[.000]	10.732	1.445	[.000]	10.372	1.400	[.000]	8.024	1.264	[.000]
deposits	$\gamma_3$	-9.618	3.082	[.002]	-7.832	1.561	[.000]	-8.247	0.974	[.000]	-6.804	0.747	[.000]
capital-capital	$\gamma_4$	0.218	0.064	[.001]	0.244	0.078	[.002]	0.306	0.077	[.000]	0.150	0.063	[.019]
labour-labour	$\gamma_5$	2.181	0.217	[.000]	2.874	0.405	[.000]	2.014	0.425	[.000]	1.090	0.437	[.014]
deposits-deposits	$\gamma_6$	1.352	0.313	[.000]	1.311	0.188	[.000]	1.260	0.159	[.000]	1.047	0.128	[.000]
capital-labour	$\gamma_7$	-0.839	0.211	[.000]	-1.367	0.343	[.000]	-0.824	0.270	[.003]	-0.018	0.331	[.956]
labour-deposits	$\gamma_8$	0.294	0.159	[.067]	0.656	0.262	[.014]	0.129	0.227	[.572]	-0.237	0.244	[.334]
deposits-capital	$\gamma_9$	-3.176	0.507	[.000]	-3.655	0.455	[.000]	-2.874	0.524	[.000]	-2.021	0.473	[.000]
city dummy	$\phi_1$	0.041	0.204	[.841]	0.021	0.129	[.871]	0.038	0.107	[.721]	-0.005	0.095	[.960]
post dummy	$\phi_2$	-2.467	0.961	[.012]	-1.708	0.527	[.002]	-1.605	0.534	[.003]	-1.823	0.355	[.000]
Adjusted R2		0.985			0.989			0.984			0.987		

		2007 (Sample Size=118)			2008 (Sample Size=117)			2009 (Sample Size=115)		
		COEF.	S.E.	p	COEF.	S.E.	p	COEF.	S.E.	p
constant	c	12.639	2.336	[.000]	10.626	3.661	[.005]	6.310	4.036	[.121]
capital	$\gamma_1$	0.728	0.821	[.377]	0.114	1.313	[.931]	0.778	0.950	[.415]
labour	$\gamma_2$	8.788	1.230	[.000]	8.013	2.126	[.000]	4.269	2.415	[.080]
deposits	$\gamma_3$	-7.827	0.810	[.000]	-6.579	1.644	[.000]	-3.854	1.922	[.048]
capital-capital	$\gamma_4$	0.140	0.058	[.017]	0.062	0.085	[.473]	0.046	0.073	[.528]
labour-labour	$\gamma_5$	1.218	0.349	[.001]	0.781	0.475	[.103]	0.101	0.542	[.852]
deposits-deposits	$\gamma_6$	1.135	0.149	[.000]	0.900	0.225	[.000]	0.475	0.253	[.063]
capital-labour	$\gamma_7$	-0.069	0.226	[.761]	0.095	0.300	[.754]	0.244	0.334	[.467]
labour-deposits	$\gamma_8$	-0.208	0.146	[.156]	-0.162	0.283	[.568]	-0.284	0.231	[.222]
deposits-capital	$\gamma_9$	-2.208	0.439	[.000]	-1.686	0.633	[.009]	-0.603	0.707	[.396]
city dummy	$\phi_1$	0.010	0.099	[.920]	0.112	0.115	[.334]	0.220	0.139	[.118]
post dummy	$\phi_2$	-7.412	0.667	[.000]	-6.467	1.405	[.000]	-4.062	1.460	[.006]
Adjusted R2		0.987			0.986			0.986		

**Table 5 Cross Section Estimation (Trans-Log, Input variables are  $s$  and  $d$ , equation (15))**

		2003 (Sample Size=124)			2004 (Sample Size=122)			2005 (Sample Size=120)			2006 (Sample Size=119)		
		COEF.	S.E.	p	COEF.	S.E.	p	COEF.	S.E.	p	COEF.	S.E.	p
constant	c	-1.889	4.773	[.693]	-0.293	4.871	[.952]	3.203	4.194	[.447]	10.469	6.273	[.098]
cost	$\delta_1$	0.739	1.535	[.631]	0.131	1.862	[.944]	-1.183	1.705	[.489]	-3.892	2.018	[.056]
deposits	$\delta_2$	0.268	1.284	[.835]	0.803	1.645	[.626]	1.879	1.565	[.232]	4.087	1.546	[.009]
cost-cost	$\delta_3$	-0.024	0.008	[.004]	-0.018	0.007	[.015]	-0.025	0.008	[.002]	-0.019	0.006	[.003]
deposits-deposits	$\delta_4$	-0.038	0.089	[.671]	-0.001	0.114	[.990]	0.077	0.104	[.462]	0.242	0.115	[.037]
cost-deposits	$\delta_5$	0.065	0.094	[.491]	0.021	0.124	[.867]	-0.054	0.114	[.636]	-0.227	0.112	[.045]
city dummy	$\phi_1$	0.082	0.181	[.650]	0.129	0.138	[.351]	0.162	0.127	[.206]	0.107	0.144	[.457]
post dummy	$\phi_2$	0.532	0.687	[.440]	0.117	0.697	[.867]	-0.281	0.511	[.583]	-1.753	0.718	[.016]
Adjusted R2		0.986			0.989			0.989			0.990		

		2007 (Sample Size=118)			2008 (Sample Size=117)			2009 (Sample Size=115)		
		COEF.	S.E.	p	COEF.	S.E.	p	COEF.	S.E.	p
constant	c	16.290	7.968	[.043]	10.964	5.397	[.045]	9.011	4.027	[.027]
cost	$\delta_1$	-5.758	2.585	[.028]	-3.715	1.786	[.040]	-3.075	1.317	[.021]
deposits	$\delta_2$	5.502	2.009	[.007]	3.771	1.417	[.009]	3.322	1.051	[.002]
cost-cost	$\delta_3$	-0.019	0.007	[.010]	-0.020	0.008	[.010]	-0.020	0.004	[.000]
deposits-deposits	$\delta_4$	0.347	0.147	[.020]	0.227	0.102	[.028]	0.188	0.073	[.012]
cost-deposits	$\delta_5$	-0.330	0.144	[.024]	-0.205	0.102	[.047]	-0.169	0.073	[.023]
city dummy	$\phi_1$	0.120	0.157	[.445]	0.138	0.127	[.281]	0.153	0.090	[.094]
post dummy	$\phi_2$	-2.930	0.896	[.001]	-2.528	0.557	[.000]	-2.200	0.382	[.000]
Adjusted R2		0.988			0.988			0.991		

As a next step, the adjusted profits are used as an input variable  $y$ . This is shown in table 6. Only (13) is estimated. The most interesting point is the coefficients of  $Post$ . Table 6 shows that coefficients of  $Post$  are negative and significant from 2004 to 2009. This result shows the low performance tendency of JP and JPB more clearly considering the privileges.

In order to check economies of scale, restricted OLS is applied. If  $\beta_1 + \beta_2 = 1$ , (13) becomes:<sup>33</sup>

$$\log y - \log d = c + \beta_1 (\log s - \log d) + \varepsilon. \quad (16)$$

The F-test is a basic method to test linear restrictions.<sup>34</sup> The result is shown in table 7. The data are the same as in table 3. Table 7 shows that the null hypothesis  $\beta_1 + \beta_2 = 1$  is rejected in each period. Therefore, it can be said that there are economies of scale in the banking industry. By (7), the estimated elasticity of scale  $e(\mathbf{x})$  is about 1.1.

Finally, instead of the Cobb-Douglas production function model using cross section data,

<sup>33</sup>Subscripts and dummy variables are omitted.

<sup>34</sup>LM test or Wald test were also used. In this case, all tests lead to the same conclusion. All tests are discussed in Greene (2007).

**Table 6 Cross Section Estimation (Cobb-Douglas, Input variables are  $s$  and  $d$ , equation (13), adjusted  $y$ )**

		2003 (Sample Size=124)			2004 (Sample Size=122)			2005 (Sample Size=120)			2006 (Sample Size=119)		
		COEF.	S.E.	p	COEF.	S.E.	p	COEF.	S.E.	p	COEF.	S.E.	p
constant	c	-1.5290	0.2777	[.000]	-1.5182	0.2577	[.000]	-1.9254	0.3392	[.000]	-2.4806	0.3386	[.000]
general costs	$\beta_1$	0.8070	0.0794	[.000]	0.7890	0.0812	[.000]	0.7115	0.0900	[.000]	0.6516	0.0877	[.000]
deposits	$\beta_2$	0.2918	0.0743	[.000]	0.3053	0.0744	[.000]	0.3941	0.0870	[.000]	0.4808	0.0857	[.000]
city dummy	$\phi_1$	0.1651	0.1363	[.228]	0.2092	0.1112	[.062]	0.2128	0.1434	[.141]	0.1930	0.1392	[.168]
post dummy	$\phi_2$	0.2573	0.0955	[.008]	-0.6899	0.0821	[.000]	-0.4496	0.1046	[.000]	-1.1656	0.0978	[.000]
Adjusted R2		0.9867			0.9874			0.9832			0.9863		

		2007 (Sample Size=118)			2008 (Sample Size=117)			2009 (Sample Size=115)		
		COEF.	S.E.	p	COEF.	S.E.	p	COEF.	S.E.	p
constant	c	-2.5958	0.3947	[.000]	-2.5835	0.3582	[.000]	-2.1916	0.3208	[.000]
general costs	$\beta_1$	0.6332	0.1057	[.000]	0.5748	0.0874	[.000]	0.6024	0.0787	[.000]
deposits	$\beta_2$	0.5045	0.1025	[.000]	0.5417	0.0864	[.000]	0.4887	0.0777	[.000]
city dummy	$\phi_1$	0.2233	0.1654	[.180]	0.1846	0.1447	[.205]	0.1161	0.1072	[.281]
post dummy	$\phi_2$	-1.0320	0.1113	[.000]	-0.8667	0.0972	[.000]	-0.7615	0.0881	[.000]
Adjusted R2		0.9844			0.9858			0.9888		

**Table 7 F test ( $H_0 : \beta_1 + \beta_2 = 1$ )**

	2003	2004	2005	2006	2007	2008	2009
F value	35.16	35.27	32.62	61.12	56.69	46.5	37.49
P value	[.0000]	[.0000]	[.0000]	[.0000]	[.0000]	[.0000]	[.0000]

paneled regression is tested. Banking business profits are influenced by the business cycle and interest rates. This is one large problem when using time series data and panel data. I cannot find any good variables which represent the banking business cycle. Therefore time dummy variables are used as business cycle variables. It is assumed that every bank has the same fixed effects that change with time. Moreover, the test uses *JPBDummy*, which is equal to 1 for 2007, 2008 and 2009. This is introduced to see the difference between JP and JPB. If the coefficient of *JPBDummy* is positive, it can be said that the second reform enhanced profitability. Data are adjusted using the GDP deflator.<sup>35</sup>

The result is shown in table 8. The null hypothesis that the coefficient of every time dummy is the same is rejected by the F test.<sup>36</sup> The null hypothesis  $\beta_1 + \beta_2 = 1$  is also rejected. Therefore, there are economies of scale. The important point is that the coefficient of *Post* is positive but the coefficient of *JPBDummy* - $\phi_3$ - is negative. This suggests that the

<sup>35</sup>“National Accounts of Japan” Economic and social Research Institute.

<sup>36</sup>The F value is 14.87. This means the null hypothesis is rejected with 99% significance.

second postal reform had a negative effect on JPB's performance. When the time dummy is removed, the coefficient of Post dummy is negative, but the model with time dummy model shows opposite results. This shows that it is difficult to judge whether private banks and PSS are more effective. This depends on the observed year. However, after the second postal reform, JPB's performance is lower than other private banks.

**Table 8 Panel Estimation (Cobb-Douglas, Input variables are  $s$  and  $d$ , equation (13))**

		Sample Size=855					
		OLS with time dummy			OLS without time dummy		
		COEF.	S.E.	p	COEF.	S.E.	p
	C	-	-	-	-2.1405	0.1467	[.000]
general cost	$\beta_1$	0.6537	0.0378	[.000]	0.6740	0.0347	[.000]
deposits	$\beta_2$	0.4565	0.0366	[.000]	0.4366	0.0342	[.000]
city bank dummy	$\phi_1$	0.1858	0.0529	[.000]	0.3173	0.0602	[.000]
post dummy	$\phi_2$	0.6158	0.1152	[.000]	-0.3672	0.0729	[.000]
JPB dummy	$J\phi_3$	-0.8489	0.1302	[.000]	-0.8339	0.1183	[.000]
2003 dummy	TD03	-2.2587	0.1409	[.000]			
2004 dummy	TD04	-2.2437	0.1598	[.000]			
2005 dummy	TD05	-2.2010	0.1492	[.000]			
2006 dummy	TD06	-2.1653	0.1689	[.000]			
2007 dummy	TD07	-2.1352	0.1587	[.000]			
2008 dummy	TD08	-2.2022	0.1484	[.000]			
2009 dummy	TD09	-2.2719	0.1826	[.000]			
SSR		16.43			18.21		
Adjusted R2		0.9855			0.9840		

In conclusion, the results show that the performances of JP and JPB tend to be lower than other banks especially between 2006 and 2009. This suggests that the second postal reform decreased profitability. There are three reasons for this low profitability.

First, the fees and commissions income of JPB has been small. As explained in sections 2.2.4 and 2.2.5, JPB has started new banking businesses such as selling mutual funds. JPB has taken advantage of branches and post offices to sell them so that fees and commissions income has increased. Despite this, most JPB's profits come from interest income. Other banks earn more profits from other sources. For example, in 2009, all city banks earned about 3.8 trillion yens as interest income and about 1.0 trillion yens as fees and commissions income.

In contrast, JPB earned about 1.6 trillion yens as interest income and about 0.086 trillion yens as fees and commissions income (tables 12 and 13). Therefore, there is a possibility that JPB can increase fees and commissions income. However, JPB does not utilize the new income source.

Second, JPB's interest income is low because it does not have enough investment destinations. The JPB's interest income over total deposits in 2010 is 0.0117 and the city banks average is 0.0188 (tables 12 and 13). If JPB started a lending business and invested more efficiently, it could earn more. Nevertheless, there are some obstacles to start a lending business. For example, JPB does not have any previous experience in this area. Furthermore, money demand has been depressed because of a long depression in Japan. Therefore, if JPB starts a lending business, it will take a long time to earn high profits. As previous studies show, SOBs tend to be risk-averse and privatization can change this attitude. JPB had the same tendency. Nevertheless, even though JPB insists that they have started to diversify investments (Japan Post Bank (2010)), the observed effect is limited.

The third reason is the additional regulations and the *de facto* USO explained in 2.2.3. After the second postal reform, JPB requested launching new businesses and received permission. So, the regulation about business areas does not seem to be a critical factor for the performance of JPB. However, the USO is considered as a big burden on JPB's business. It is difficult to calculate the precise costs of the USO because data about regional demands and costs are required in order to calculate regional demand functions and cost functions. These types of data are not available. Japan Post (2006) reports the costs of the universal services using data on 2005. This is the only research about this topic. JP argues that the number of loss-making post offices in postal savings services was 11237 and the total cost was 110 billion yens in 2005. Population in rural areas has been decreasing, so that if the fixed costs per one post office do not change, average costs have been increasing for JPB. Thus, the recent universal services costs may be higher than Japan Post (2006). However, it should be noted that JP had an incentive to overestimate the universal services costs in order to obtain government subsidies. Japan Post (2006) does not make the data source

available, so it is impossible to evaluate it.

Boubakri, Cosset, Fischer and Guedhami (2005) insist that privatization needs a long time to enhance profitability. This may be one reason behind the low profitability. The results also suggest that there are economies of scale in the banking industry. The existence of economies of scale implies that JPB will be a dominant market player when it can improve its performance.

## 5 Conclusion

The Japanese government accepted privatization policy and reformed its government-oriented public banking system offered by the PSS twice. Objectives of the two reforms were to improve performance of government's offering services, and to create a free and fair banking market. Previous research supports this idea. After the reform, JPB came to be treated as a private bank and some privileges have been removed. Nevertheless, it cannot be said that the objectives have been totally attained. Certainly, JP and JPB launched new businesses. However, statistics show that its performance has been lower than other private banks and moreover the second postal reform might have had a negative effect.

JPB's profitability is not high, but it has earned more revenues since the first privatization. This is a good symptom. As some previous studies about privatization insist, it may take more time to improve the new bank's performance. Now, the Japanese government and JPB should think how to improve the bank's efficiency. If the Japanese government removes every regulation on JPB and improves JPB's governance, the government can sell stocks of JPB for a high price.

However, an important remaining issue is the USO. Since the second postal reforms, there has been no public savings bank in Japan. the USO is not used in banking regulation generally, but many countries consider basic banking services as essential for the public. For

example, the Canadian banking act and regulation<sup>37</sup> prescribes that banks shall open accounts to every consumer who meets the prescribed conditions. There are many depopulated areas in Japan and it will be more difficult to offer basic financial services in the country. If basic banking services are considered as public goods in Japan, the USO as a transfer policy will be justified and new regulation would be enacted. It should also be discussed how much money is needed to offer universal services and how to finance its costs. The present *de facto* USO is complicated and lacks legal stability. This paper's result implies that the *de facto* USO imposed on JPB has been one reason for the low profitability. The precise costs of the USO have not been estimated and further discussion and study are needed.

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<sup>37</sup>"Bank Act, 1991" c. 46 art.448.1, 458, and 458.1., "Access to Basic Banking Services Regulations" SOR/2003-184.

## A Ramsey-Boiteux Pricing

The Ramsey-Boiteux pricing rule is such that the regulator maximizes social welfare subject to a break-even condition. This appendix applies the basic Ramsey-Boiteux pricing to evaluate economic effects of the USO. The Basic Ramsey-Boiteux is explained in Laffont and Tirole (1993b) and Laffont and Tirole (1999). The following model is an expansion of the basic model. Assumptions and variable means are the same as Laffont and Tirole (1993b) use in Chap. 2-4. Generally this pricing rule is known as a second best pricing rule. It assumes that the regulator has full information about costs and demands, and thereby ignores the regulated firm's incentive problems. There is one regulated firm which produces one good.  $q$  is quantity of the good, and  $p$  is price.  $q(p)$  is an aggregate demand function that satisfies differentiability and is decreasing in price.  $C(q(p))$  is a differentiable cost function. Social welfare  $W$  is defined as the difference between consumer gross surplus and costs. The firm's profit  $\Pi$  is defined as the difference between revenues ( $pq$ ) and costs. The regulator's problem is set as follows:

$$\max_p W = \int_p^\infty q(\tilde{p}) d\tilde{p} + pq(p) - C(q(p)) \quad (17)$$

$$s.t. \Pi = pq(p) - C(q(p)) \geq 0 \quad (18)$$

If the constraint condition is binding and the problem has an interior solution, the Lagrangian is given by:

$$\mathcal{L}(p, \lambda) = \int_p^\infty q(\tilde{p}) d\tilde{p} + pq(p) - C(q(p)) + \lambda [pq(p) - C(q(p))] \quad (19)$$

The first order conditions are:

$$\frac{\partial \mathcal{L}}{\partial p} = -q + q + p^* \frac{\partial q}{\partial p} - \frac{\partial C}{\partial q} \frac{\partial q}{\partial p} + \lambda \left[ q + p^* \frac{\partial q}{\partial p} - \frac{\partial C}{\partial q} \frac{\partial q}{\partial p} \right] = 0 \quad (20)$$

$$\frac{\partial \mathcal{L}}{\partial \lambda} = pq(p) - C(q(p)) = 0 \quad (21)$$

Let  $\eta$  be price elasticity of demand which is defined as  $\eta \equiv -\frac{p}{q} \frac{\partial q}{\partial p}$ . Then, using  $\eta$ , (20) can be rewritten as follows:

$$\frac{p^* - \frac{\partial C}{\partial q}}{p^*} = \frac{\lambda}{1 + \lambda} \frac{1}{\eta} \quad (22)$$

This result shows that the regulated firm's mark-up rate is proportional to the inverse of price elasticity of demand.

Let's assume that there are two categories of consumers: urban and rural. For simplicity, it is assumed that the number of consumers is the same in both areas and each of them has the same demand function. However, since rural areas are large and density of population is low, production cost may be higher in rural areas. Let  $q_u$ ,  $p_u$ , and  $c_u(q)$  be the quantity, the price and the cost function in an urban area, and  $q_r$ ,  $p_r$ , and  $c_r(q)$  be the corresponding variables. Then higher production costs imply:

$$\frac{\partial C_u}{\partial q_u} \frac{\partial q_u}{\partial p_u} < \frac{\partial C_r}{\partial q_r} \frac{\partial q_r}{\partial p_r} \quad (23)$$

The regulator aims to maximize social welfare subject to a break even condition and the universal service pricing rule which means that the price in a rural area and the price in an urban area are the same. The regulator's maximization problem is:

$$\begin{aligned} \max_{p_u, p_r} W' &= \int_{p_u}^{\infty} q_u(\tilde{p}_u) d\tilde{p}_u + \int_{p_r}^{\infty} q_r(\tilde{p}_r) d\tilde{p}_r + p_u q_u(p_u) + p_r q_r(p_r) - \\ &\quad C_u(q_u(p_u)) - C_r(q_r(p_u)) \end{aligned} \quad (24)$$

$$s.t. \Pi' = p_u q_u(p_u) + p_r q_r(p_r) - C_u(q_u(p_u)) - C_r(q_r(p_r)) \geq 0 \quad (25)$$

$$p_u = p_r \quad (26)$$

The last constraint means that the firm has to sell its goods for the same price in rural and urban areas. By assumption,  $\eta_u = \eta_r = \eta'$ . This maximization problem's solution is

given by:

$$\frac{2p'^* - \left( \frac{\partial C_u}{\partial q_u} + \frac{\partial C_r}{\partial q_r} \right)}{2p'^*} = \frac{\lambda}{1 + \lambda} \frac{1}{\eta'} \quad (27)$$

where  $p'^*$  is the Ramsey pricing when the government applies the USO.

Let  $p_u^*$  be the Ramsey Price in urban areas and  $p_r^*$  be the Ramsey Price in rural areas when the government does not apply the USO. By (22) and (23), it is obvious that  $p_u^* < p_r^*$ . Finally the next relationship holds:

$$p_u^* < p'^* < p_r^* \quad (28)$$

This means that consumers in urban areas have to pay more when the USO is applied and their benefit will decrease while the benefit of rural consumers improves. This result shows that the USO sets a redistribution policy from urban to rural areas. This model assumes that the regulated firm is a monopoly. JPB is a monopolist bank in highly depopulated areas. According to Japan Post (2006), there are 154 administrative areas where there is no private depositary institution.

## B Categories of Depositary Institutions in Japan

A “Depositary institutions” is an institution which can accept deposits and generally it is regulated by government. Following the standard classification, there are five categories of depositary institutions in Japan.<sup>38</sup>

### 1. *Licensed Banks*

Licensed Banks are defined in the Banking Act.<sup>39</sup> They can collect and lend money freely. They are stock companies. Generally, they are divided into seven subcategories.

- *-City Banks-* City banks are banks which offer services in many provinces.

<sup>38</sup>Hoshi and Patrick (2000) is a convenient introduction to the Japanese financial system.

<sup>39</sup>Act No. 59 of 1981.

- *-Local Banks-* Local banks are banks which offer services in (mainly) one province.
- *-Trust Banks-* Trust banks are banks which are organized to perform the fiduciary of trusts and agencies. They are also permitted to do banking businesses. They are
- *Internet Specialized Banks (New Type Banks)* Internet specialized banks are banks which offer services through Internet. For example, there is a bank which offers only settlement and payment services through cellular phones Internet service in Japan.
- *-Foreign Banks-* Foreign banks are banks which do business as branches of foreign banks. Foreign banks means that their licenses are issued by other countries. Japanese branches need to receive licenses by the regulator as banks.
- *-Long Term Credit Banks-* Banks that offer long-term loans mainly. There have been no long-term credit banks since 2006.
- *Japan Post Bank* JPB has been categorized as a bank since 2007.

## 2. *Credit Unions*

Credit unions are defined in the Shinkin Bank Act.<sup>40</sup> Basically, the differences from banks are (1) they are not stock companies, (2) they offer services only to members and companies in specific locations, and (3) tax rates are lower than banks. They basically lend money to small and medium-sized enterprises.

## 3. *Credit Associations*

Credit associations are defined in the Act on Financial Businesses by Cooperatives.<sup>41</sup> They are similar to credit unions, but they are smaller institutions and they lend money to family-type operations.

## 4. *Others*

Agricultural cooperatives, fisherman cooperatives and labour credit associations are

<sup>40</sup> Act No. 238 of 1951.

<sup>41</sup> Act No. 183 of 1949.

small depositary institutions like credit associations. Each institution is defined by a specific act. They offer financial services to their members.

### 5. *Postal Savings System*

Since 2007, this category has been removed.

The number of stores and the share of deposits are shown in table 9. Some very small categories such as Internet specialized banks are excluded.

**Table 9 The Number of Stores and the Share of Deposits by Category of Depositary Institutions**

#### 1. The number of Stores

Date	Banks				Credit	Credit	Labour	Agricultural	Post
	City Banks	Local Banks	Trust Banks	Other Banks	Unions	Associations	Associations	Communitives	Offices
2000.03	2,996	15,531	443	40	8,673	2,677	689	13,255	24,774
2010.03	2,479	9,621	273	60	7,671	1,765	665	8,795	24,531

#### 2. The Share of Deposits (percentage)

Date	Banks				Credit	Credit	Labour	Agricultural	Post
	City Banks	Local Banks	Trust Banks	Other Banks	Unions	Associations	Associations	Communitives	Offices
2000.03	22.2	24.9	3.5	n.a.	10.8	2.0	1.2	7.4	27.6
2010.03	29.6	22.1	3.9	n.a.	12.7	1.8	1.8	9.0	18.7

Source: Japan Bankers Association, Shinkin-chukin, Zenshinkumiren, Rodochukin, JA Bank, Japan Post Banks and Bank of Japan.

\*There are other small depositary institutions (e.g. Internet Specialized Banks). Then, the total is not 100.

## C Estimation of Privileges of Postal Savings System

As mentioned in 4.2.2, Nishigaki (2007) estimates the privileges of the PSS from 1998 to 2006. His basic idea is that if the PSS had been a private bank, it would pay several costs like other private banks and these costs are considered as privileges. Since systems of taxes and deposit insurance fees are very complicated, he calculates in a simple way. Especially, he uses some average costs of banks to estimate the PSS's privileges. This paper extends his estimation to 1996 and 1997. All data used are from "annual report" by MPT and Japan Bankers Association. He categorizes four types of privileges.

### 1. *Taxes as ordinary expenses* - $p_1$ -

Most "taxes as ordinary expenses ( $p_1$ )" are fixed assets taxes. Therefore, Nishigaki

(2007) assumes that the tax rates are the same on the average of all banks. The formula is:

$$p_1 = p'_1 \times \frac{TotalRealEstate(Post)}{TotalRealEstate(Banks)} \quad (29)$$

$$= TotalRealEstate(Post) \times 0.014 \quad (30)$$

where  $p'_1$  is the sum of taxes and ordinary expenses of banks.  $TotalRealEstate(Post)$  and  $TotalRealEstate(Banks)$  are values of the PSS and banks' total real estate. 0.014 is the average assets tax rate of banks estimated by Nishigaki (2007).

2. *Exemption from deposit insurance - $p_2$ -*

Exemption from deposit insurance ( $p_2$ ) is imposed in proportion to total deposits in Japan. Therefore, the formula is:

$$p_2 = TotalDeposits(Post) \times 0.0008 \quad (31)$$

$TotalDeposits(Post)$  is total deposits the PSS accepts. The rate "0.0008" is decided by the Deposit Insurance Act.

3. *Interest on Bank's Holdings of Reserve Requirement - $p_3$ -*

Interest on Bank's Holdings of Reserve Requirement ( $p_3$ ) is equal to the reserve requirement times interest rates,  $i$ , if the PSS can invest the reserves freely. Nishigaki (2007) shows several interest rates and discusses them. This paper uses the yield of 10 years government bonds. The formula is:

$$p_3 = (TotalLiquidDeposits \times 0.013 + TotalFixedDeposits \times 0.012) \times i \quad (32)$$

$TotalLiquidDeposits$  and  $TotalFixedDeposits$  are liquid deposits and fixed deposits. 0.013 and 0.012 are reserve rates decided by the Bank of Japan.

4. *Exemption from corporation taxes and local taxes - $p_4$ -*

Exemption from corporation taxes and local taxes ( $p_4$ ) is equal to ordinary profit times corporate tax rate (0.4087). The ordinary profit has to be adjusted by  $p_1$ ,  $p_2$  and  $p_3$ . Therefore, the formula is:

$$p_4 = (OrdinaryProfit(Post) - p_1 - p_2 - p_3) \times 0.4087 \quad (33)$$

The result is shown in table 10.

**Table 10 Estimated Privileges on Postal Savings System**

		(Billions of Yens)										
Accounting year		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
1.	Taxes as ordinary expenses	39	39	38	37	36	38	40	32	34	29	30
2.	Exemption from deposit insurance	105	106	112	119	124	123	201	194	190	202	182
3.	Interest on reserve requirement	92	64	63	61	60	43	29	22	21	21	22
4.	Exemption from corporation taxes	274	162	-200	-200	-200	202	509	838	403	695	593
	Privileges (1. + 2. + 3.)	235	209	213	218	219	204	270	248	245	251	234
	Privileges (1. + 2. + 3. + 4.)	509	371	13	18	19	406	779	1086	648	946	827
	Adjusted Gross Business Profit	2354	1584	387	-789	-279	2473	2829	3313	2194	3266	1919
	Adjusted Net Business Profit	1183	360	-844	-2028	-1548	1220	1478	2033	966	2056	606
	Adjusted ROA	0.51%	0.15%	-0.33%	-0.76%	-0.61%	0.41%	0.52%	0.72%	0.36%	0.83%	0.36%

Accounting year		2007	2008	2009
1.	Taxes as ordinary expenses	14	0	0
2.	Exemption from deposit insurance	90	0	0
3.	Interest on reserve requirement	10	0	0
4.	Exemption from corporation taxes	0	0	0
	Privileges (1. + 2. + 3.)	115	0	0
	Privileges (1. + 2. + 3. + 4.)	115	0	0
	Adjusted Gross Business Profit	2243	1744	1708
	Adjusted Net Business Profit	1021	478	487
	Adjusted ROA	0.53%	0.24%	0.25%

Source: Nishigaki (2009) and Author. "Annual Report" Ministry of Posts and Telecommunications, Japan Post and Japan Post Bank. Bank of Japan.

## D Definition of Revenue Indicators and Historical Data of Postal Savings System and Private Banks

Table 11 Definitions of Revenue Indicators

Name	Definition	on General Accounting
Business Income	Interest Income + Fees and Commissions + Trading Income + Other Ordinary Income	Sales Amount
Business Expenses	Interest Expenses + Fees and Commissions Payments + Trading Expenses + Other Ordinary Expenses	Sales Cost
Gross Business Profit	Business Income - Business Expenses	Gross Operating Profit
Ordinary Income	Business Income + Other Income	Ordinary Profit
Ordinary Expenses	Business Expenses + Other Expenses	Ordinary Expenses
Ordinary Profit	Ordinary income - Ordinary Expenses	Ordinary profit
Net Business Profit	Ordinary Profit - General and Administrative Expenses - Provision of Allowance for Loan Losses	Operating Profit
Income before Income Taxes	Ordinary Profit + Extraordinary Income Extraordinary Loss	Income Before Income Taxes
Return on Asset (ROA)	Net Business Profit / Total Asset	Return on Asset
Adjusted Gross Business Profit	Gross Business Profit - Estimated Privileges (without "Exemption from Corporation Taxes")	-
Adjusted Net Business Profit	Net Business Profit - Estimated Privileges	-
Adjusted ROA	Adjusted Net Business Profit / Total Asset	-

Source: Japan Bankers Association and Author.

**Table 12 Basic Management Data of Postal Savings System from 1996 to 2010**  
(Billions of Yens)

Accounting year	Government Sector*									
	1996	1997	1998	1999	2000	2001	2002			
Total Deposits	224,887	240,546	252,486	259,970	249,934	239,342	233,247			
Long-Term Deposits	203,188	214,942	224,178	228,918	209,167	191,305	182,183			
(1) Business Income	10,745	10,276	9,092	7,864	6,898	7,566	6,291			
Interest Income	10,743	10,275	9,091	7,863	6,891	7,555	6,291			
Fees and Commissions	1	1	1	1	7	5	1			
(2) Business Expenses	8,297	8,628	8,642	8,592	7,117	5,043	3,434			
(3) Gross Business Profit ((1) - (2))	2,446	1,648	450	-728	-219	2,516	2,858			
(4) General and Administrative expenses	1,028	1,079	1,081	1,082	1,110	1,092	1,110			
(5) Provision of Allowance for Loan Losses	0	0	0	0	0	0	0			
Net Business Profit ((3) - (4) - (5))	1,418	569	-631	-1,810	-1,329	1,424	1,748			
Return on Asset (ROA)	0.61%	0.23%	-0.24%	-0.68%	-0.53%	0.48%	0.61%			
Adjusted Gross Business Profit	2354	1584	387	-789	-279	2473	2829			
Adjusted Net Business Profit	1183	360	-844	-2028	-1548	1220	1478			
Adjusted ROA	0.51%	0.15%	-0.33%	-0.76%	-0.61%	0.41%	0.52%			
(Billions of Yens)										
Japan Post (public enterprises)										
Japan Post Bank (Stock Company)										
Accounting year	2003	2004	2005	2006	2007.1st**	2007.2nd**	2008	2009	2010.1st**	
Total Deposits	227,382	210,909	198,095	185,823	180,910	181,744	177,480	175,798	175,040	
Long-Term Deposits	173,631	155,209	141,742	129,759	125,490	126,000	124,100	124,240	116,798	
(1) Business Income	5,856	4,082	4,502	3,035	1,758	1,335	2,476	2,188	1,098	
Interest Income	4,589	3,823	3,134	2,817	1,311	1,265	2,310	2,066	1,019	
Fees and Commissions	85	95	103	120	61	60	112	108	55	
(2) Business Expenses	2,521	1,867	1,215	1,083	434	406	732	480	222	
(3) Gross Business Profit ((1)/(2))	3,335	2,215	3,287	1,952	1,324	929	1,744	1,708	876	
(4) General and Administrative expenses	1,054	1,004	980	994	518	618	1,266	1,221	608	
(5) Provision of Allowance for Loan Losses	0	0	0	0	0	0	0	0	0	
Net Business Profit ((3) - (4) - (5))	2,281	1,211	2,307	958	806	311	478	487	268	
Return on Asset (ROA)	0.81%	0.46%	0.93%	0.41%	0.64%	0.28%	0.24%	0.25%	0.29%	
Adjusted Gross Business Profit	3313	2194	3266	1919	1121	1121	1744	1708	876	
Adjusted Net Business Profit	2033	966	2056	606	714	306	478	487	268	
Adjusted ROA	0.72%	0.36%	0.83%	0.36%	0.61%	0.26%	0.24%	0.25%	0.29%	

Source: "Annual report" Ministry of Posts and Telecommunications, Ministry of Internal Affairs and Communications, Japan Post and Japan Post Bank.

Accounting year is from April 1 to March 31.

\*Ministry of Posts and Telecommunications (From 1996 to 2000), Postal Service Agency (From 2001 to 2003)

\*\*1st means the first term (from April 1 to September 30), 2nd means the second term (from October 1 to March 31).

**Table 13 Basic Management Data of All Private Banks from 1996 to 2009**  
All Banks (Billions of Yens)

Accounting year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Total Deposits	546,761	525,035	491,664	493,236	512,013	523,535	524,996	553,559	540,764	548,637	557,558	565,174	576,352	588,749
Long-Term Deposits	440,167	414,582	372,322	354,698	359,013	3,069,136	290,840	285,144	280,377	273,129	280,824	296,274	302,660	304,295
(1) Business Income	36,969	31,312	27,168	23,258	19,339	17,712	16,339	15,401	15,118	16,347	17,640	19,555	17,841	15,212
Interest Income	32,678	26,812	20,898	18,737	16,013	14,127	12,062	10,903	10,652	11,609	13,020	14,321	13,229	11,163
Fees and Commissions	1,727	1,789	1,669	1,712	1,865	1,916	2,064	2,357	2,658	3,024	3,099	2,919	2,597	2,549
(2) Business Expenses	24,337	18,957	15,131	12,074	7,848	5,712	4,094	3,608	3,518	4,597	6,116	8,223	7,599	4,146
(3) Gross Business Profit (1) - (2)	12,632	12,355	12,037	11,184	11,491	12,000	12,245	11,793	11,600	11,750	11,524	11,332	10,242	11,066
(4) General and Administrative expenses	8,014	7,978	7,530	7,269	7,121	6,896	6,993	6,732	6,422	6,526	6,517	6,738	6,934	6,971
(5) Provision of Allowance for Loan Losses	3,447	8,630	7,757	2,486	2,729	4,649	2,506	2,490	843	685	712	522	1,643	849
Net Business Profit ((3) - (4) - (5))	1,171	-4,253	-3,250	1,429	1,641	455	3,191	2,571	4,335	4,539	4,295	4,071	1,665	3,246
Return on Asset (ROA)	0.137%	-0.502%	-0.428%	0.194%	0.204%	0.060%	0.428%	0.344%	0.581%	0.592%	0.564%	0.522%	0.206%	0.398%
The Number of Banks	146	146	138	137	136	133	134	131	129	126	125	124	123	120

Source: Japanese Bankers Association

Accounting year is from April 1 to March 31.

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