



An econometric evaluation of bank recapitalization programs with bank- and loan-level data



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ABSTRACT

Public capital injections into the banking system are a comprehensive policy program aimed at reducing the financial risks faced by capital-injected banks, thereby stimulating their lending and profitability. This paper evaluates empirically Japan's two large-scale capital injections in 1998 and 1999. We begin by extracting the treatment effects of the public injections from bank-level panel data. Using a difference-in-difference estimator in two-way fixed-effects regression models, we find that the public injections significantly reduced the financial risks faced by the capital-injected banks but did not stimulate their lending or profitability. Next, we investigate what factors impeded bank lending after the public injections using a matched sample of Japanese banks and their borrowers. By employing three-way fixed-effects regression models corresponding to the matched sample, we provide evidence that the deterioration of borrowers' creditworthiness inhibited not only the injected banks but also the noninjected banks from lending more.

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1. Introduction

Public capital injections into the banking system are a comprehensive policy program aimed at reducing the financial risks of capital-injected banks, thereby stimulating their lending and profitability. The financial crisis after the Lehman shock in 2008 and the global recession that followed forced industrialized countries, including England, France, Germany, Ireland, the US and Switzerland, to implement such bank recapitalization programs. Accordingly, a macroeconomic framework to conceptualize theoretically how this policy program works has been developing (see, e.g., Gertler and Kiyotaki (2010), Kollmann et al. (2012) and Hirakata et al. (2013)), but no empirical consensus exists on whether it has produced the desired results. This paper utilizes Japan's two large-scale capital injections in 1998 and 1999, which are regarded as precedents for the European and US public capital injections, as a natural experiment in bank recapitalization policy, and attempts to offer new insights into the actual implementation of public capital injection into the banking system.

Theoretically, when asymmetric information exists, an increase in a bank's financial risk can cause its lending behavior to deteriorate. The phenomenon where a bank restrains its lending because of an increase in its financial risk is called a "capital crunch". Indeed, several papers found evidence supporting the existence of capital crunches both in the US and in Japan in the 1990s (see, e.g., Bernanke and Lown (1991) and Peek and E. (1995) for studies of capital crunches in the US, and Woo (2003) and Watanabe (2007) for studies of Japan's experience). Previous studies of Japanese bank recapitalization programs in 1998 and 1999 mainly focused on whether the two programs resolved the capital crunch of banks needing a capital injection.

The favorable view of the effect of Japan's public capital injections suggests that they reduced the default risk of the capital-injected banks, thereby improving their lending (see Allen et al. (2011) and Giannetti and Simonov (2013)). Figs. 1 and 2 show the historical paths of the probability of default and bank loans to domestic enterprises of Japanese banks, divided into two groups: the treated group includes banks that have been involved in bank recapitalization programs, and the control group includes banks that have not.¹ Fig. 1 shows that the probability of default of the treated

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¹ See Section 2.3 for the method of calculating the probability of default and for the definition of bank loans.

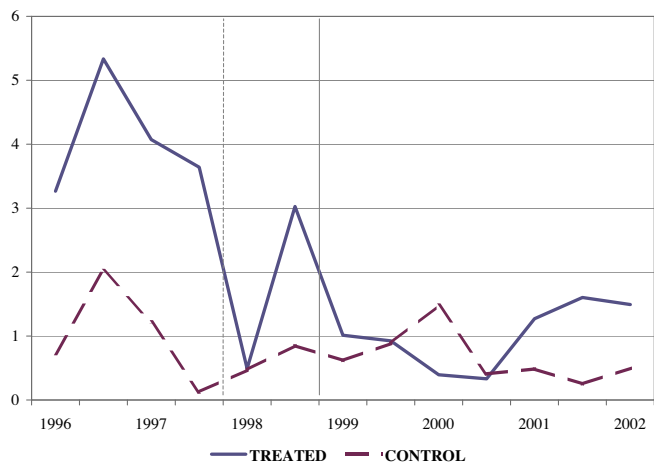


Fig. 1. The probability of default of Japanese banks. The vertical dotted line indicates the first injection period, and the vertical solid line indicates the second injection period. The solid line indicates the path of the injected banks (treated group), and the dashed line indicates that of the noninjected banks (control group). The probability of default is calculated using Merton (1974) structural model for option pricing. See Section 2.3 for details.

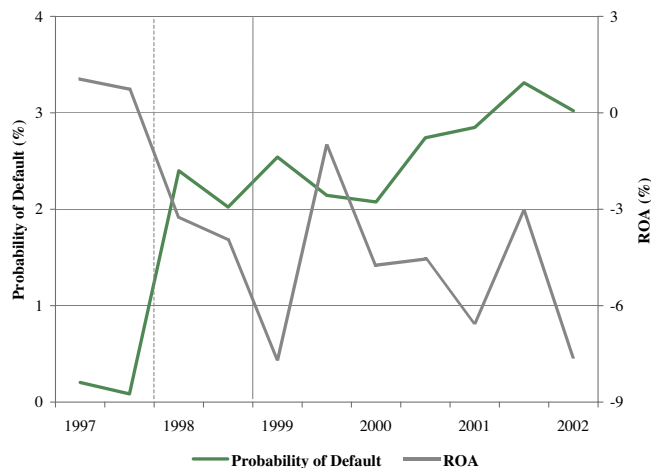


Fig. 3. The default risk and profitability of borrowing firms. The vertical dotted line indicates the first injection period, and the vertical solid line indicates the second injection period. The probability of default of borrowing firms is calculated using Merton (1974) structural model for option pricing. ROA (return on assets) is defined as $\frac{\text{net profits}}{\text{total assets}} \times 100$. See Section 4.2 for details.

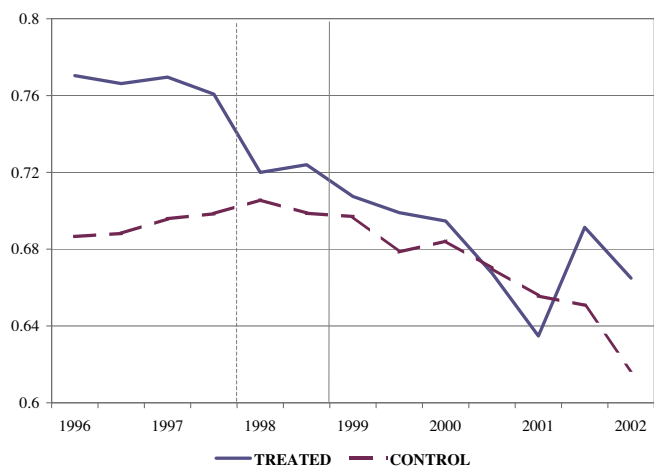


Fig. 2. Bank loans to domestic enterprises. The vertical dotted line indicates the first injection period, and the vertical solid line indicates the second injection period. The solid line indicates the path of the injected banks (treated group), and the dashed line indicates that of the noninjected banks (control group). Bank loans is defined as the ratio of loans for domestic enterprises to total assets. See Section 2.3 for details.

ted group decreased drastically after the two public capital injections in 1998 and 1999, while that of the control group rarely changed before and after the capital injections. On the other hand, Fig. 2 demonstrates that the bank loans not only of the treated group but also of the control group decreased continuously after the capital injections. Casual observation reveals that the favorable view cannot successfully explain why the lending by the injected banks did not improve, even though their financial conditions improved substantially.

One promising explanation is that the policy framework of the two Japanese capital injections that forces each capital-injected bank to maintain and raise its capital ratio ends up impeding its lending, as pointed out by Osada (2011). However, the unfavorable view ignores and fails to explain why the relatively stable financial conditions of noninjected banks and their reduction in loans to domestic enterprises coexist.

Despite the different implications of the effect of Japan's public capital injections, the opposing views outlined above share a common premise that the lending of Japanese banks after the capital injections was determined primarily by lender-side factors such as the banks' financial conditions and profitability. However, once we note that the creditworthiness of many borrowers deteriorated during the severe recession after Japan's two large-scale capital injections, we cannot simply ascribe the stagnant bank lending after the capital injections to lender-side factors. In other words, the increased default risk and the decreased profitability of the borrowing firms shown in Fig. 3 appear to be dominant factors causing stagnant bank lending after the public capital injections.

Some theoretical and empirical studies have noted the substantial role that borrower-side factors can play in causing stagnant bank lending during a severe recession. Bernanke and Gertler (1989) and Bernanke et al. (1999) demonstrated theoretically that the deterioration of borrowers' creditworthiness in a severe recession can increase agency costs associated with lending to them, thereby decreasing bank credit supply. The empirical study of US capital injections by Berrospide and Edge (2010) demonstrated that the US slowdown in loan growth after the capital injections cannot simply be attributed to banks' capital position; then, they suggested that an adequate explanation of banks' decision making in lending after the US capital injections needs to consider borrower-side factors, together with lender-side ones. De Nicoló and Lucchetta (2011) demonstrated empirically that bank credit demand shocks are the main drivers of the bank lending cycle for the G-7 economies; therefore, they disproved the common wisdom that constraints in bank credit supply have been a key driver of the sharp downturn in real activity after the Lehman shock in 2008. These studies suggested that an analysis of underlying bank lending in a severe recession after a public capital injection should include borrower-side factors.

When empirically evaluating bank lending after Japan's public capital injections in 1998 and 1999, this paper takes into account the notion that public capital injections are a comprehensive policy program designed first to stabilize the banking system and then to stimulate bank lending and profitability. More precisely, this paper evaluates the two public capital injections by addressing the following three issues.

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