RIETI Discussion Paper Series 23-E-076

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RIETI Discussion Paper Series 23-E-076

October 2023

Unit Cost of Financial Intermediation in Japan, 1954−2020[†]

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Abstract

This study estimates the unit cost of financial intermediation in Japan over the period 1954–2020. We measure the cost as the ratio of financial intermediaries' income (financial income) to the financial output provided to non-financial end-users by integrating hand-collected data from various sources. To measure financial income, we use semi-aggregated data to take into account several income components that are not considered in the financial industry's value added in the current System of National Accounts. We find that the unit cost of financial intermediation in Japan exhibits a secular decline. No similar decline is observed in the United States, Germany, and United Kingdom, where the unit cost of financial intermediation has been relatively stable over time. The decrease in Japan's unit cost is due to the stagnation of financial income, even though financial output increased. The stagnation of financial income is due to the absence of growth in asset management services and the decrease in net interest income from loans and deposits.

Keywords: financial intermediation, unit cost, financial income, financial output

JEL classifications: E44, G20, N25

[†] This study forms part of the project "Study Group on Corporate Finance and Firm Dynamics" at the Research Institute of Economy, Trade and Industry (RIETI) and received financial support from JSPS KAKENHI Grant Numbers 20H01517 (Principal investigator: Ono) and 22H00860 (Uchida). We would like to thank Makoto Yano, Masayuki Morikawa, Hiroshi Ohashi, Iichiro Uesugi, Kenichi Ueda, Daigo Nakata, Masazumi Hattori, Kaoru Hosono, Daisuke Miyakawa, and members of the RIETI project for their helpful comments and suggestions.

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1. Introduction

The primary function of a country's financial system is to transfer financial resources from people who have them to those who need them. Through this process, financial intermediaries provide liquidity, produce information, manage risks, and earn income. From the perspective of non-financial end-users including households, firms, and governments, financial intermediaries' income is the cost that they pay for receiving various financial intermediation services. At the macro-level, this cost can be represented by the unit cost of financial intermediation, which is obtained by dividing the financial income of all financial intermediaries in an economy by the quantity of total financial intermediation services to non-financial end-users (Philippon 2015). Developments in this unit cost can be used as a useful aggregate measure of long-run developments in financial intermediation such as the efficiency of the financial system. Based on Philippon's (2015) approach, this study aims to examine developments in the cost of financial intermediation for Japan over the past decades from 1954 to 2020.

The definition of the unit cost of financial intermediation in Philippon (2015) is based on two important considerations. First, traditional measures of the cost of financial intermediation, such as interest spreads, include costs associated with transactions among financial institutions. As Greenwood and Scharfstein (2013) show in the case of the United States, amid the growth of shadow banks, transactions among financial institutions have been increasing, so that in recent years traditional measures do not provide accurate measures of the user-cost of financial intermediation. Second, traditional measures do not account for possible cross-subsidization across various financial services. Recent changes in the nature of financial intermediation, such as the "originate-to-distribute" model of banking, make these problems acute (Philippon 2015, Bazot 2018). Philippon's (2015) approach circumvents these problems by using aggregated financial income, which excludes financial transactions among financial intermediaries, since the income earned by one intermediary will be canceled out by the cost incurred by another intermediary. Likewise, aggregated financial income is also immune to the issues associated with cross-subsidization across financial services.

The major contribution of this study is that we measure the unit cost in a more precise manner than previous studies. That is, while most studies rely on the value added (VA) of the financial industry

in the current System of National Accounts (SNA) to measure the unit cost of financial intermediation, we integrate hand-collected data from various sources to calculate "corrected" financial income and unit costs. Specifically, in addition to the net financial income from deposits and loans as well as fees and commissions for financial services, which are included in the financial industry's VA in the current SNA, the corrected financial income considers three important income components: the interest and dividends from security investments, capital gains/losses from the purchase and sale of securities (trading gains/losses), and gains/losses from non-performing loans (credit costs). For comparison, we also calculate the "plain" financial income, which conceptually corresponds to the financial industry's VA in the current SNA, and the plain unit cost.

The major findings of this study are as follows. First, although the levels of the corrected and plain unit cost of financial intermediation in Japan differ, both exhibit a secular decline from 1954 to 2020. This trend in the unit cost in Japan contrasts sharply with that in the U.S., where the plain unit cost has been stable for more than a century (Philippon 2015). The declining trend in the corrected unit cost in Japan also differs from developments in the corrected unit cost in Germany and the U.K., where it remained stable (Bazot 2018).[1]

Second, the plain and corrected financial income, i.e., the numerator of the unit cost, did not grow in the long run in Japan when standardized by GDP. Specifically, the GDP share of financial income increased in the 1980s, when financial asset prices surged during the "bubble" period, and decreased in the 1990s and early 2000s after the burst of the bubble. The average share of financial income in the period after 2005 (2005–2020) and that in the period before the bubble (1954–1984) both are 3.3 percent. Looking into changes in income components between these two periods, we find that net interest income from loans and deposits declined from 1.8 percent (1954–1984) to 1.4 percent

[1] The corrected unit cost in France resembles that in Japan in that it started to decline in the 1990s (Bazot 2018). However, the decline in Japan's corrected unit cost started from the 1950s, the period during which financial intermediaries were heavily regulated. Likewise, the plain unit cost in France, Germany, and the U.K. only started to decline in the 1990s, whereas the plain unit cost in Japan started to decline in the 1950s.

(2005–2020). The decline in net interest income was offset by an increase in trading gains and fees and commissions.

Third, financial output, the denominator of the unit cost, exhibits an increasing trend throughout the period 1954–2020 when standardized by GDP. Somewhat surprisingly, financial output increased even after the burst of the bubble economy in the 1990s. The decomposition of financial output shows that this is due to a substantial increase in the money stock. On the other hand, loans and equity, which are also components of financial output, declined after the burst of the bubble economy and remained stable from the mid-2000s.

Our second and third findings indicate that the secular decline in the unit cost of financial intermediation in Japan is due to the stagnation of financial income. In contrast, studies on the U.S., France, Germany, and the U.K. (Greenwood and Scharfstein 2013, Philippon 2015, Bazot 2018) show that financial income in these countries grew until the Global Financial Crisis (GFC). To examine why financial income in Japan stagnated, we investigate which income components are responsible for the stagnation in financial income by comparing financial income in Japan and the U.S. Our investigation suggests that the lack of growth in income from asset management services and the decrease in net interest income from loans and deposits were major reasons for the stagnation in financial income in Japan. We conjecture that asset management services did not grow in Japan because the share of risky assets in households' portfolios did not increase in tandem with the increase in their financial wealth. We also examine the loan interest spread (i.e., the difference between loan rates and the reference rate) and the deposit interest spread (the difference between the reference rate and deposit rates) and find that both spreads contributed to the decrease in net interest income from loans and deposits.

This study is related to the growing literature on the measurement of the cost of financial intermediation. As noted above, some studies report that this cost has been relatively stable in the U.S. and European countries over time. Philippon (2015, 2019) finds that the plain cost in the U.S. has remained nearly constant for more than a century, despite technological innovations and regulatory changes that likely affected the cost of financial intermediation. Bazot (2018) measures the plain and corrected costs for Germany, France, the United Kingdom, and a number of European countries together

for the period 1950–2007. He finds that the plain unit cost in European countries declined after the 1990s, whereas the corrected unit cost was relatively stable, except for France, where it decreased. Our study contributes to the literature by providing new evidence for Japan.

To the best of our knowledge, Bazot (2023), which provides the unit cost of financial intermediation for 15 countries, is the only study that measures the unit cost of financial intermediation for Japan. While Bazot (2023) does not specifically focus on Japan, his analysis shows that the plain unit cost in Japan declined during his observation period (1973–2014), while the corrected unit cost was stable (observation period: 1989–2008). The present study differs from, and complements, Bazot (2023) in four respects.

First, our observation period, from 1954 to 2020, is more comprehensive than that in Bazot (2023). We can estimate the cost for a longer period because we use hand-collected semi-aggregated data from various sources, whereas Bazot uses the EU-KLEMS and OECD data.

Second, using semi-aggregated data, we measure financial income by sector and income component, like Greenwood and Scharfstein (2013) did for the U.S. The decomposition of financial income helps to examine why Japan's income did not grow in the long run.

Third, the way we correct financial income differs from that of Bazot (2023). Specifically, in addition to the net income from and capital gains/losses on securities that Bazot (2023) considers, we also take into account credit costs, which are an important element in measuring income given the huge non-performing loans problem in Japan in the late 1990s and early 2000s. Also, different from his study, we explicitly consider how to deal with insurance companies' income and output and report the unit cost with and without them. Because the share of the insurance sector in the financial industry has been increasing over time not only in Japan but also in other developed countries, how to deal with insurance companies is important in the measurement of the unit cost. Our finding of a secular decline in both the plain and corrected financial income for the period 1954–2020 is similar to Bozot's (2023) result for plain financial income in Japan but differs from his result for corrected financial income.

Fourth, we investigate why financial income in Japan did not grow in the long run. Bazot (2023) shows that the unit cost of financial intermediation fell in most of the 15 countries he examined

and argues that financial deregulation contributed to the decline. Our decomposition of banks' financial income accounts suggest that deregulation was not the only driver of the decline in the unit cost. While the decrease in net interest income from loans and deposits – the main component of traditional banking services – is consistent with Bazot's (2023) argument, our decomposition of financial income accounts additionally suggests that the lack of new financial products and services is another reason for the lack of growth of financial income in Japan. In sum, this study contributes to the literature by providing a more precise measurement of the unit cost of financial intermediation in Japan and by covering a longer period than the study by Bazot (2023).

The remainder of this study is organized as follows. Section 2 explains the methodology we use to measure financial income and financial output and the data that we employ. Section 3 presents the empirical results and shows the developments in financial income, financial output, and the unit cost. We also discuss why Japan's financial income has not grown over time. Finally, Section 4 concludes.

2. Methodology and data

We use aggregate data of financial income, y, and financial output (intermediated financial services), q, to measure the unit cost of financial intermediation, ψ, as shown in Equation (1):

$$\psi = \frac{y}{q} \tag{1}$$

In this section, we explain how we measure y and q.

2.1. Financial income

We measure financial income using Japan's SNA and semi-aggregated income statements for various financial sectors. In the SNA, the income of the financial industry is measured in terms of value added, which is the sum of revenues received by the financial industry minus intermediate consumption for the production of financial services. Specifically, the financial industry VA in Japan's SNA is composed of the following four items: (i) financial intermediation services indirectly measured (FISIM), (ii) fees and

commissions, (iii) life insurance, and (iv) non-life insurance (Yamazaki 2016).

However, as Bazot (2018) points out, financial income in the SNA omits several important items that are regarded as income on banks' income statements. First, interest and dividends on securities (bonds and stocks) are excluded from FISIM, since FISIM corresponds to banks' net interest income from deposits and loans. This issue is important because, against the background of a downward trend in the loan-to-deposit ratio, Japanese banks have considerably increased their investment in securities. Second, "trading gains/losses," i.e., capital gains/losses from the purchase and sale of securities, are also not accounted for as financial income in Japan's SNA, even though, according to the 2008 SNA Manual by the UN Statistics Division, trading gains/losses should be included. Yamazaki (2016) argues that trading gains/losses are not included in Japan's SNA because of the lack of reliable original data to estimate them. Meanwhile, Bazot (2018) argues that measuring banks' financial income without accounting for their income from investing/trading in securities is problematic because of the increasingly larger share of interest, dividends, and capital gains on securities in banks' income. He calculates the "corrected" financial income, which includes interest and dividends on securities and trading gains/losses. In light of the increase in Japanese banks' investment in and trading of securities, the present study also calculates the corrected financial income including these two income components, using semi-aggregated bank income statements.

The third item that is missing in the financial income in Japan's SNA is "credit costs," i.e., expected losses from borrower defaults. Japanese banks experienced enormous amounts of accounting losses in the 1990s and early 2000s due to the accumulation of massive non-performing loans after the burst of the bubble economy in the late 1980s. However, these realized credit costs are regarded as income transfers from creditors to debtors (68SNA) or capital losses on financial assets (93SNA) in Japan's SNA and are not taken into account in measuring FISIM. In contrast, in the U.S., expected credit costs have been reflected in FISIM since the comprehensive revision of the national income and product accounts in 2013 (Hood 2013). Because credit costs are an essential component of banks' financial income accounts, we will consider credit costs in our corrected financial income by applying the methodology by Hood (2013), which we outline below.

As noted above, FISIM corresponds to the financial income accruing from banks' lending and deposit-taking activities. Specifically, the financial income from loans and deposits in FISIM is measured by the following equations:

$$FISIM\_LOANS = L \times (r_L - r_{RF}), \quad (2)$$

$$FISIM\_DEPOSITS = D \times (r_{RF} - r_D), \quad (3)$$

where L and D respectively represent the outstanding loans and deposits and r_L and r_D respectively represent the interest rates on loans and deposits. r_{RF} is the risk-free reference rate, and the service margins of loans and deposits are calculated as the difference between the loan rate and the reference rate and the difference between the reference rate and the deposit rate, respectively. We call the former the loan rate spread and the latter the deposit rate spread.

Some of the interest that banks charge on loans is used to cover expected credit costs, and expected credit costs should be excluded from the measurement of the service margin of loans. This is because funds that are used to cover credit costs are not available to cover the costs of the labor and capital needed for producing loans, so they should be subtracted when measuring value added; otherwise, financial income does match with value added. To exclude expected credit costs, we modify Equation (2) and calculate the corrected financial income from loans as follows:

$$FISIM\_LOANS\_CORRECTED = L \times (r_L - d - r_{RF}). \quad (4)$$

In Equation (4), the default margin d represents the expected credit costs and is subtracted from the loan interest rate as intermediate consumption for the production of loans. Hood (2013) estimates the default margin for the U.S. using actual charge-offs reported in the Call Reports. Specifically, he computes adjusted charge-off rates (charge-offs divided by loan balances) that are smoothed over time using a geometrically declining weighted average. The weight is chosen to match the average maturity and repricing dates of loans on banks' books. In this study, we use the three-year moving average of actual credit costs, which are the sum of write-offs and loan allowances.[2]

[2] We use the three-year moving average for the following reasons. First, the amount of banks' loan loss reserves in their books is often based on the average loan losses during the past three years (Ginko Keiri Mondai Kenkyu-

2.2. Financial output

Following Philippon (2015), we measure financial output, which is the total production of financial services provided to non-financial sectors (i.e., households, firms, and governments), as follows:

$$q = q^{stocks} + q^{flows}, \tag{5}$$

$$q^{stocks} = c^{stocks} + e^{stocks} + m^{stocks}, \tag{6}$$

$$q^{flows} = c^{flows} + e^{flows}, \tag{7}$$

where q is the total financial output, c is the intermediation of credit to non-financial sectors, e is the intermediation of equity, and m is liquidity services to non-financial sectors. Because some financial services are linked to stocks and some are linked to flows, we measure them separately as shown by the superscripts on the variables in Equations (6) and (7) and add them up as in Equation (5).

As in Philippon (2015), Equations (5)–(7) assume that all financial services require the same intensity of intermediation (normalized to unity) and that the intensity of intermediation is constant over time.[3] Philippon (2015) additionally estimates quality-adjusted series of financial output for the U.S. and shows that the adjusted financial output is larger than the simple financial output because of the increase from the 1980s onward in lending to low-cash firms and poor households, which requires more intensive screening and monitoring. If the quality of financial intermediation in Japan has improved over time, our measurements of financial output in more recent years are underestimated and therefore should be regarded as the lower bound. Similarly, if it has deteriorated, our measurements should be regarded as the upper bound.

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kai 2016). And second, the average maturity of outstanding loans of the three big banks (Bank of Mitsubishi UFJ, Sumitomo Mitsui Banking Corporation, and Mizuho Bank) for fiscal 2020 is 3–4 years (based on the authors' own calculation using these banks' disclosure materials). For reference, the average maturity of loans in the U.S. is also about three years.

[3] As in Philippon (2015), we assume that the weights attached to certain financial services, namely, financial services associated with government debt and equity issuance, are not one. See Section 2.3.2 for details.

The following two points should be noted. First, in Equations (5)–(7), financial services associated with derivatives are not considered explicitly as financial output. Our treatment of derivatives is identical to that in Philippon (2015) and Bazot (2018). Philippon (2015) argues that derivatives-related services are implicitly taken into account in the above equations. For example, if derivatives induce more efficient risk sharing among financial intermediaries, this benefit will be reflected in an increase in intermediated financial assets (e.g., the amount of credit to non-financial sectors) that will be accounted for in Equations (5)–(7). If derivatives improve risk management by firms, this benefit will be reflected in an increase in firm values, which might be captured by e^{stock} in Equation (6).[4]

Second, insurance is also not included in the financial output in Equations (5)–(7). We do not include insurance because it is significantly different from traditional financial intermediation. However, we are aware that the omission of insurance could potentially be problematic because income accruing from insurance services is included in the financial VA in the SNA (i.e., the numerator of the unit cost), whereas insurance services are not included in financial output (the denominator of the unit cost), resulting in biased estimates of the unit cost of financial intermediation. In this respect, Philippon (2015) argues that whether insurance services should be entirely excluded from financial intermediation is debatable, because insurance services affect the saving decisions of individuals and the size of financial output.[5] Therefore, in Section 3.4.2., we calculate alternative measures of financial intermediation costs that take insurance services into account.

2.3. Data and measurement

2.3.1. Financial income

As noted above, we use two types of data sources to measure financial income: the SNA and semi-aggregated income statements for various financial sectors. When using the SNA, we use the finance

[4] See Section 2.3.2 for details on how we measure e^{stocks}.

[5] Philippon (2015; Figure 17) estimates an adjusted unit cost of financial intermediation without insurance by subtracting consumption expenditure on non-life insurance services from financial income.

and insurance industry VA. Specifically, we use the "National Accounts for 2020 (2008SNA, benchmark year = 2015)" published by the Economic and Social Research Institute of the Cabinet Office to measure financial income from 1994 to 2020.[6] To construct time-series data for the period before 1994, we use the "Long-Term Time-Series of the SNA: 1955–1998 (1968SNA, benchmark year = 1990) (*Choki sokyu shuyo keiretsu kokumin keizai keisan hokoku: Heisei 2 nen kijun*)" and the "1963 White Paper on National Income (*Showa 38 nendo-ban kokumin shotoku hakusho*)."

One important caveat regarding the use of Japan's SNA to measure financial income is that the individual components of finance and insurance industry VA are not publicly available. If these data were available, we could measure corrected financial income by adding net interest income from securities investment, trading gains/losses, and credit costs to FISIM and subtracting insurance income, but this is not possible. To deal with this issue, we resort to using semi-aggregated income statements for various financial sectors published by industry associations and government agencies as well as income statements of individual financial institutions (Table 1). Specifically, we use income statements of the following sectors: *zenkoku* banks, *sogo* banks (until 1988),[7] *shinkin* banks, government financial institutions, and securities companies. *Zenkoku* banks are private commercial banks that include city, regional, and second-tier regional banks, while Shinkin banks are private cooperative banks that specifically provide commercial banking services to SMEs and individuals in their local areas.[8] Government financial institutions consist of the Postal Saving Service, which mainly collects funds through deposits, and many other government financial institutions that provide loans to specific types

[6] https://www.esri.cao.go.jp/en/sna/data/kakuhou/files/2020/2020annual_report_e.html.

[7] *Sogo* banks were mutual companies and distinct from *zenkoku* banks, which were limited companies. In 1989, *sogo* banks became limited companies and became *zenkoku* banks classified as second-tier regional banks.

[8] We do not include other cooperative banks such as credit cooperatives (*shinyo-kumiai*), labor banks (*rodo-kinko*), agricultural cooperatives (JA banks), fishery cooperatives (JF Marine banks), etc., because of limitations in the data that are available to us. We will discuss the extent of the potential measurement error due to the exclusion of credit cooperatives, the largest sector among these cooperative banks, in Section 3.4.1.

of borrowers (e.g., SMEs) but do not take deposits. Until the 2000s, deposits collected by the Postal Saving Service flowed to other government financial institutions through the Fiscal Investment and Loan Program (FILP), so that these government financial institutions collectively acted as a bank through the FILP.[9] Because there are no aggregated income statements for government financial institutions, we collected income statements of individual institutions and add them up.[10] Securities companies provide financial intermediation services related to public debt and equity markets, such as broking, dealing, and investment banking services.

Using financial institutions' income statements, we measure the following components: (i) net interest income from loans and deposits,[11] (ii) fees and commissions, (iii) net income from investment in securities and money held in trust, (iv) trading gains/losses, and (v) credit costs. Items (i) and (ii) basically correspond to the financial industry's VA (FISIM and fees and commissions) in Japan's current SNA,[12] while (iii)–(v) correspond to the missing items in Japan's SNA as outlined in Section 2.1. Below,

[9] The FILP was substantially restructured in the 2000s. As a result, the Postal Saving Service became Japan Post, a private financial conglomerate that has a bank and an insurance company as subsidiaries, although the Japanese government still owns a sizable equity stake in Japan Post. The link between Japan Post and the FILP has been substantially reduced since then. In addition, many other government financial institutions were consolidated and partially privatized, and started to raise funds through FILP bonds. For details of the FILP, see Doi and Hoshi (2003), Miyake (2016) and Sasaki (2019).

[10] The list of government financial institutions, the criteria for the selection of these institutions, and the data sources are provided in Appendix A1. Even though some of the institutions were privatized after the restructuring of the FILP in the 2000s, we categorize these institutions collectively as "government financial institutions" throughout this study.

[11] Specifically, we calculate item (i), the net interest income from loans and deposits, by subtracting net interest income and dividends from investment in securities from total net interest income. This means that the net interest income accruing from assets and liabilities other than loans, deposits, and securities is also included in (i). However, the value of other assets and liabilities is relatively small.

[12] Specifically, FISIM in the SNA and the net interest income from loans and deposits that we measure, which

we use items (i) and (ii) to measure the plain financial income, while we sum up all five items to measure the corrected financial income. Appendix A2 provides details regarding how we construct each of the five items.

If financial institutions export some of their services abroad and import financial services for intermediate consumption, we need to make adjustments for the net export (i.e., the difference between exports and imports) of financial services to measure the unit cost of financial intermediation for end-users in Japan. However, data for exports and imports of financial services in Japan's Balance of Payment Statistics are available only from 1996 onward. The ratio of net exports of financial services to the finance industry VA from 1996 to 2020 is less than 1 percent on average. Because the degree of possible mismeasurement is likely to be minimal, we do not adjust for net exports of financial services.[13]

2.3.2. Financial output

To measure the financial output given by Equations (5)–(7), we use the Flow of Funds compiled by the Bank of Japan and Utsunomiya (2011). In addition, we use various other statistics. Details of the data

excludes interest and dividends on securities, are equivalent only if the amount of loans (assets) and deposits (liabilities) are the same. Whether FISIM is larger or smaller than our measured net interest income depends on the relative amount of loans and deposits and the signs of interest spreads. If the amount of loans is smaller than that of deposit, which basically holds during our observation period, then FISIM will be larger than the net interest income as long as the loan interest spread ($r_L - r_{RF}$ in Equation (2)) and the deposit interest spread ($r_{RF} - r_D$ in Equation (3)) are positive. However, if, for example, the deposit interest spread is negative, then FISIM will be smaller than the net interest income. During our observation period, the loan-to-deposit ratio has been less than one for *zenkoku* banks, while deposit interest spreads have been negative or around zero since the mid-1980s (see Figure 8). Therefore, we cannot tell whether the net interest income is larger or smaller than FISIM.

[13] Philippon (2015) reports that net exports of financial services for the U.S. are small and therefore does not make any adjustments in measuring the unit cost. Bazot (2018) reports that while the effect of adjusting for net exports of financial services on the unit cost of financial intermediation is large for the United Kingdom, it is small for France and Germany.

sources for each component of financial output are provided in Appendix A.3.

Credit c includes loans to households, non-financial firms, and government institutions and bonds issued by non-financial firms and government institutions. As discussed in Section 2.2, Equations (5)–(7) assume that all financial services require the same intensity of intermediation and the weights attached to each service are normalized to unity. However, as in Bazot (2018), we assume that the weight of government debt (loans and bonds) is one-tenth.[14] Equity e represents the equity shares of non-financial firms, and we use the total market capitalization of listed firms for the stock measure and the gross equity issuance as the flow measure. Philippon (2015) and Bazot (2018) argue that using the market value instead of the book value for the stock measure is preferable for the following reasons. First, improvements in financial intermediation are likely to be reflected in a rise in user firms' market value. Second, book values likely fail to capture the value of firms' intangible assets. This study follows Philippon's (2015) and Bazot's (2018) argument and uses the market value of listed firms.[15] Turning to the flow measure of equity, one issue is the weight that should be assigned to equity issuance. Given that the underwriting fees for equity are three to four times higher than for debt (Altinkilic and Hansen 2000), Philippon (2015) uses a weight of 3.5. We also set the weight of equity issuance to 3.5.

We measure payment and liquidity services m using the cash and total demandable deposits

[14] Alternatively, following Philippon (2015), we could set the weight to zero. This would be justified if it is the government, not financial institutions, that can be regarded as providing financial intermediation services to financial institutions and non-financial investors by providing government bonds that act as safe and liquid financial assets. On the other hand, financial institutions face a duration risk on their government bonds, which makes the intermediation of government debt costly. Considering the latter case, Philippon (2015) also calculates the unit cost by using a weight of one-tenth for government debt instead of setting the weight to zero.

[15] It is difficult, if not impossible, to estimate the market value of non-listed firms. However, we conjecture that the measurement error due to the exclusion of non-listed firms is small. To examine the validity of this conjecture, we compare the market value of listed firms to the estimated market value of non-financial firms including non-listed firms in the 2008SNA. We find that during the period 1997–2011 the latter is only 7 percent larger than the former. Thus, the measurement error due to excluding non-listed firms is likely to be small.

held by households, non-financial firms, and government institutions. We do not include money market mutual funds and repos, given that the size of the market for money market mutual funds and repos in Japan is small and they are not used (at least not directly) for settlement.

Finally, following Philippon (2015), we use the value of mergers and acquisitions (M&As) as another component of the flow measure for the period after 1985, for which data are available to us. Taken together, the stock and flow measures of financial output given by Equations (6) and (7) can be rewritten as follows:

$$q^{stocks} = Loans + Corporate\ bonds + 0.1 \times Government\ debt + Market\ capitalization + Money, \quad (6)'$$

$$q^{flows} = Loans + Corporate\ bonds + 0.1 \times Government\ debt + 3.5 \times Equity\ issuance + M\&A. \quad (7)'$$

3. Results

3.1. Financial income

Figure 1 plots the share of financial income in GDP when we use the SNA. Using time-series data from the three different sources outlined in Section 2.3.1 (i.e., the 2008 SNA for 1994–2020, the 1968 SNA for 1995–1998, and the 1963 White Paper for 1930–1963), we construct a single time series in which we adjust for divergences between the different series.[16] The result is shown as the solid line in Figure 1, whereas the original time series are shown as broken lines with markers.

Figure 1 shows that the share of finance and insurance industry income in GDP declined

[16] The broken lines in Figure 1 show that there are divergences between the different series for the years in which they overlap, especially between the 1968 SNA and the 1963 White Paper series. To construct a single time series, we use the finance and insurance industry income in the earliest year of the newer series and the year-on-year growth rate in the older series. For example, we calculate the finance and insurance income for 1993 by calculating the year-on-year growth rate for 1994 from the 1968 SNA and dividing the 1994 finance and insurance income in the 2008 SNA by 1 plus this growth rate.

during the Second World War but recovered sharply after the war and increased steadily from 1955 to 1989. Following the collapse of the bubble economy in 1990–1991, the share of the finance and insurance industry decreased until 2020, with the exception of the period 2002–2004, during which the share rose temporarily. The GDP share of the finance and insurance industry in 2020 was 4.3 percent, which is almost the same share as in 1955.

Next, using the semi-aggregated sectoral data, Figure 2 presents the GDP share of corrected financial income by income component. As explained in Sections 2.2 and 2.3.1, corrected financial income excludes income of the insurance industry and adds several income components that are not considered in Japan's current SNA.[17] The solid black line in Figure 2 shows that the GDP share of corrected financial income was stable from 1954 to 1980 and then increased in the 1980s. The increase in the GDP share of financial income in the 1980s was mainly driven by the increase in fees and commissions, income from securities investment, and trading gains, which likely reflected the surge in financial asset prices during the bubble period and Japanese banks' active involvement in securities markets. After the burst of the bubble, corrected financial income declined substantially in the 1990s because of the increase in credit costs associated with non-performing loans. While corrected income increased amid the resolution of the non-performing loans problem in the early 2000s (i.e., the decrease in credit costs), it decreased again from 2005 to 2020. The decrease in corrected financial income after 2005 is due to two factors: the temporary increase in credit costs during the turmoil of the GFC in 2008–2010 and the persistent decline in net interest income from deposits and loans.

In addition, Figure 2 shows the following. First, developments in plain financial income (grey broken line) differ from those in the finance and insurance industry VA shown in Figure 1 in that plain financial income did not increase from 1955 to 1980 when the finance and insurance industry VA was increasing steadily. This difference is presumably due to the exclusion of the insurance industry in plain financial income and suggests that insurance companies contributed to the increase in the finance and

[17] Figure A1 in the Appendix presents corrected financial income shares by sector. It shows that much of the corrected financial income is earned by *zenkoku* banks and securities companies.

insurance industry VA until 1980.[18] Second, Figure 2 shows that, in the long run, financial income in Japan did not grow. That is, when we compare the average GDP share of financial income after the resolution of the non-performing loans problem (2005–2020) and that before the bubble period (1954–1984), both shares are 3.3 percent. The lack of growth in financial income in Japan is in sharp contrast to the growth in financial income in the United States and European countries until the GFC (Greenwood and Scharfstein 2013, Philippon 2015, Bazot 2018). Third, the share of net interest income from loans and deposits declined over time. The average share was 1.8 percent during the period 1954–1984 but only 1.4 percent during the period 2005–2020. This decline in net interest income from loans and deposits is partly attributable to the decline in the loan-to-deposit ratio and the increase in the securities-to-deposit ratio. However, the share of net interest income *including* interest and dividends on securities, which is not affected by the changes in the loan-to-deposit and securities-to-deposit ratios, also decreased after 2005: the share was 2.7 percent during the period 1954–1984 but only 2.3 percent during the period 2005–2020. The income components that offset the decline in net interest income from loans and deposits are trading gains and fees and commissions, which increased.

3.2. Financial output

Figure 3 presents developments in financial output, i.e., the denominator of the unit cost, as a ratio to GDP. Specifically, the solid back line represents the stock measure given by Equation (6)', while the solid grey line represents the flow measure given by Equation (7)'. After World War II, the stock measure exhibited a steady increase from around 70 percent in 1949 to almost 500 percent in 1989. After 1990, it stagnated until 2013 and then increased again. Meanwhile, the flow measure exhibits cyclical increases and decreases in the range of 10 to 30 percent until 1989. It then fell to a range of around 5 to 15 percent before rising again in 2020.

Figure 4 presents developments in the GDP ratio of financial output broken down by intermediated asset for the period after World War II. Intermediated assets in the stock measure – i.e.,

[18] Figure A1 in the Appendix shows that the financial income earned by insurance companies increased over time.

loans, corporate bonds, government debt, equities as measured by market capitalization, and money – increased steadily until 1989. After 1989, loans and equities decreased while corporate bonds, government debt, and money increased. The intermediated asset that saw the most substantial increase is money. While the GDP ratios of loans (1.69) and money (1.58) were comparable in 1990, by 2020, the GDP ratio of money (2.87) was 1.9 times larger than that of loans (1.53). Figure 4 also shows that the decrease in the flow measure after 1990 was due to a reduction in net loan origination.

3.3. The cost of financial intermediation

Figure 5 presents developments in the unit cost of financial intermediation given by Equation (1). The solid and dotted lines represent the unit cost using corrected and plain financial income, respectively. While the levels of the two measures differ, especially in the 1980s, both exhibit a secular decline. Specifically, the corrected measure fell from around 2.2 percent in 1954 to 0.5 percent in 2020, while the plain measure dropped from 2.1 percent to 0.3 percent.

This secular decline in the unit cost of financial intermediation in Japan contrasts from Philippon's (2015) result for the U.S. focusing on the plain unit cost of financial intermediation, which has been stable for more than a century, and Bazot's (2018) result for the corrected unit cost of financial intermediation in Germany and the U.K., where it also remained stable from 1979 to the end of his observation period in 2007. On the other hand, for France Bazot (2018) finds that the corrected unit cost declined from the late 1990s. He suggests that this is due to the larger impact of financial deregulation in France, which has a state-based financial system, than in Germany (bank-based financial system) and the U.K. (market-based financial system). Thus, although France also experienced a decline, what sets Japan's experience apart is that the decline started in the mid-1950s, i.e., well before financial deregulation in the 1980s. The results for Japan suggest that deregulation is not the only driver of a decline in the unit cost.

3.4. Adjusted measures

3.4.1. Financial income of credit cooperatives and non-banks

In this study, we use semi-aggregated data for various sectors in the financial industry to measure financial income. Although we cover major financial sectors, there are several sectors for which we were unable to obtain data. Therefore, the unit cost of financial intermediation we measured in Figure 5 is likely to be the lower bound of the true unit cost. In this subsection, we examine the magnitude of the possible measurement error due to such data limitations. Specifically, we use the financial income data for credit cooperatives (*shinyo-kumiai*), which are similar to *shinkin* banks in that both are non-profit oriented cooperative banks but which are smaller than *shinkin* banks, and non-banks for a limited time period for which we were able to obtain data and examine to what extent the unit cost of financial intermediation is biased downward. We focus on credit cooperatives because after *shinkin* banks, which are included in our main measure of financial income, they form the largest sector among cooperative banks (see footnote 8).

The data source for credit cooperatives is the *Zenkoku Shinyo-kumiai Zaimushohyo* (Financial Statements of Credit Cooperatives) provided by *Kinyu Tosho Consultantsha*, which contains data on net interest income *including* interest and dividends on securities from 2002 to 2016.[19] During 2002–2016, the net interest income of credit cooperatives is, on average, 16.9 percent of that of *shinkin* banks and 3.6 percent of that of *zenkoku* banks.

The data source for non-banks is the Nikkei Financial Quest database provided by Nikkei Media Inc., which contains income statements of individual non-banks from 2007 to 2020. The number of non-banks for which we can obtain income statements in each year during that period ranges from 161 to 216. All income components are available for non-banks. Because we use the three-year moving average to calculate credit costs, the period for which we can measure the financial income of non-banks is from 2009 to 2020. During this period, the corrected financial income of non-banks was, on

[19] Due to data limitations, we cannot separate net interest income from loans and deposits and net interest income from securities. Income components other than net interest income are unavailable.

average, 13.1 percent of that of *zenkoku* banks.[20]

Using these pieces of information, we estimate the unit cost of financial intermediation including the net interest income of credit cooperatives and the total financial income of non-banks. Adjusting for these sectors, the unit cost is, on average, 0.1 percentage points higher than the corrected unit cost shown in Figure 5. This result suggests that the possible measurement error due to data limitations is not large.

3.4.2. Insurance

As discussed in Section 2.2, we do not include the financial income and financial output of the insurance industry when measuring the unit cost of financial intermediation. In this subsection, we construct two alternative measures of financial intermediation costs in which we adjust for insurance. First, we add the insurance industry's income from investment in financial assets such as interest from loans and bonds as well as dividends to financial income (the numerator in Equation (1)). In the baseline estimation, some of the financial services (e.g., loans) that non-financial end-users received were likely provided by insurance companies, and they are included in the financial output (the denominator in Equation (1)), leading to a possible underestimation of the unit cost. We aim to adjust for this possible mismeasurement. Second, in addition to the first adjustment, we add the insurance industry's income from insurance services to financial income and the value of financial claims held by insurance policy

[20] It is likely that the financial income of non-banks was larger prior to 2006, the year in which the Ordinance for Enforcement of the Money Lending Business Act was amended. The amended Act lowered the regulatory upper limit on the interest rate set by non-banks and the total amount that a non-bank can lend to a particular borrower. As a result, net interest income excluding interest and dividends on securities, which is non-banks' largest income component, likely declined substantially. For example, while non-banks' net interest income excluding interest and dividends on securities in 2007 (i.e., one year after the amendment of the Act) amounted to 52.2 percent of that of *zenkoku* banks, which is exempt from the amended Act, by 2010, this percentage had fallen to 25.2 percent in 2010, which suggests that the amended Act had a significant impact on non-banks' financial income.

holders (end-users) to financial output. In this second adjustment, insurance services are regarded as another type of financial intermediation that should be additionally taken into account in calculating the cost of financial intermediation.

The data source for the insurance industry's income is *Insurance: Seimei Hoken Tokei-go* (Insurance: Special Issue on the Statistics of Life Insurance) and *Insurance: Songai Hoken Tokei-go* (Insurance: Special Issue on the Statistics of Non-Life Insurance) provided by Hoken Kenkyusho. The data sources for the value of insurance services as financial output are the Flow of Funds compiled by the Bank of Japan and Utsunomiya (2011).

Figure 6 shows developments in financial intermediation costs after the adjustment for insurance.[21] The solid black line represents the insurance-adjusted unit cost taking insurance companies' income from investment in financial assets into account, while the solid grey line represents the adjusted unit cost additionally taking income from and output of insurance services into account. As can be seen, both insurance-adjusted unit cost series are higher than the baseline unit cost series (dotted line). However, like the baseline unit cost series, the insurance-adjusted unit cost series display a secular decline.

3.5. Discussion of the results

Why has the unit cost of financial intermediation in Japan been declining for a long period? Arithmetically, the reason is that financial income has been relatively stable over time, while financial output has been increasing. These trends contrast with those in the U.S. until the GFC. In the U.S., the unit cost was stable because both financial income and financial output followed an increasing trend (Philippon 2015). Moreover, the unit cost remained stable after the GFC, but the underlying trends differed: both financial income and the financial output stagnated (Philippon 2019). In a nutshell, the different trends in unit costs in Japan and the U.S. mainly stem from the different trends in financial

[21] Developments in financial income and financial output adjusting for insurance are provided in Appendix Figures A1 and A2.

income, at least until the GFC.

There are two possible reasons why financial income did not grow in Japan. First, unlike in the U.S., asset management fees essentially stagnated in Japan. Greenwood and Scharfstein (2013) show that roughly half of the growth in financial income in the U.S. during the period 1980–2007 is attributable to the securities industry, income growth in which is primarily led by professional asset management services. In contrast, the financial income of Japan's securities industry hardly grew, except during the bubble period in the late 1980s. The average share of the securities industry in financial income has been 0.6 percent during the period since 2005 (2005–2020), only marginally above the 0.5 percent before the bubble period (1954–1984).[22]

Gennaioli et al. (2014) present a model showing that the financial income of the asset management industry grows in tandem with financial wealth, implying that the unit cost is constant over time. In their model, the unit cost is constant because of the following offsetting effects. On the one hand, the fees for a given financial product decline over time due to diminishing returns to capital and increased competition through the entry of new financial intermediaries. On the other hand, the share of risky financial assets in households' portfolio increases over time because increased competition brings client households closer to their intermediary and enhances their trust in the intermediary. Because fees for risky assets are higher than those for safe assets, the increase in households' risk-taking raises the unit cost of asset management services. While Gennaioli et al.'s (2014) model is particularly suited to explain the growth of the asset management industry, their model's predictions are also consistent with Philippon's (2015) findings for the unit cost of overall financial intermediation. However, Gennaioli et al.'s (2014) model is inconsistent with developments in Japan in that the share of risky assets in households' portfolios did not increase in tandem with the increase in financial wealth.[23] This lack of increase in the share of risky assets in households' portfolios explains

[22] During the bubble period (1985–1989), the average share of the securities industry in financial income was 1.3 percent.

[23] The average share of stocks in Japanese households' portfolios during 2005–2020 was 9.3 percent, whereas

why the share of financial income in GDP in Japan has been stable. Why the share of risky assets in Japanese households' portfolios did not increase in tandem with household wealth is an important research question to be addressed in the future.

Second, the level of and growth in financial income from banking services in Japan are also lower than in the U.S. Greenwood and Scharfstein (2013) show that roughly one quarter of the growth in financial income in the U.S. before the GFC is attributable to the growth of credit intermediaries. To examine the difference in developments in the financial income of deposit-taking financial institutions between Japan and the U.S., Figure 7 presents the financial income of U.S. deposit-taking financial institutions from 1986 to 2020 using FDIC data.[24] In the figure, we reclassify the income components of the FDIC data to make them comparable to those for Japan in Figure 2. We find that U.S. deposit-taking financial institutions' financial income share in GDP generally increased until 2006, which is consistent with Greenwood and Scharfstein's (2013) finding. It decreased sharply during the turmoil of the GFC and then recovered to nearly the same level as before the GFC. Looking individual income components, net interest income from loans and deposits, despite some small fluctuations, has remained essentially unchanged since around 2000.[25] In contrast, in Japan, net interest income from loans and deposits displays a clear downward trend since 2002 (Figure 2). Figures 2 and 7 also show that the difference in the level of net interest income between the U.S. and Japan is quite large: while the GDP share in the U.S. is roughly 2 percent, it is only about 1 percent in Japan. Because of the large share of

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that before the bubble period (1953–1984) was 14.1 percent (authors' calculations based on the Flow of Funds compiled by the Bank of Japan). In contrast, Figure V in Gennaioli et al. (2014) shows that in the U.S. the share of risky assets in total household assets overall followed an upward trend during their observation period, rising from around 20 percent in 1950 to around 30–40 percent in the 2000s.

[24] QBP Time Series Spreadsheets, Annual Income, https://www.fdic.gov/analysis/quarterly-banking-profile/ (accessed on May 20, 2022).

[25] The GDP share of net interest income from loans and deposits before the GFC period (2001–2007) is 2.0 percent, while the same share after the GFC period (2012–2020) is 2.1 percent.

financial income that banks account for in Japan, the decrease in and low level of net interest income has hampered the growth of overall financial income in Japan.

What explains the decrease in net interest income by banks in Japan? Figure 4 shows that both loans and deposits (money) followed an increasing trend. This means that the decrease in banks' net interest income is due to declines in the loan interest spread and the deposit interest spread, i.e., $(r_L - r_{RF})$ and $(r_{RF} - r_D)$ in Equations (2) and (3) in Section 2.1. Developments in loan and deposit interest spreads using data for *zenkoku* banks are shown in Figure 8. The black solid line shows that the interest rate differential between loans and deposits $(r_L - r_D)$ was more than 5 percent in the early 1950s but decreased to about 1 percent in 2020. Decomposing this interest rate differential into the loan and deposit spreads shows that both contributed to the decrease. The decrease until the second half of the 1980s was mostly due to the decrease in the deposit interest spread. The deposit interest spread turned substantially negative in the late 1980s and remained substantially negative until the early 2000s, which was likely due to the deregulation of deposit interest rates, which started from 1979 and ended in 1994, and monetary easing by the Bank of Japan, which started from 1991. The growth in deposit during this period therefore implies that banks made losses by providing deposit services. Meanwhile, the loan interest spread started to decrease substantially from the early 2000s onward. Examining the underlying reasons for the decline in loan and deposit interest spreads is another important issue to be addressed in the future.

4. Conclusion

Using various hand-collected data, we measured the unit cost of financial intermediation in Japan from 1954 to 2020. We find that the cost of financial intermediation in Japan exhibits a secular decline, reflecting the fact that financial income as a share of GDP has remained essentially unchanged over time, while financial output has followed an increasing trend. Our finding of a declining cost holds regardless of whether the financial income of credit cooperatives and nonbanks and the financial income and output of insurance are included or not. Looking at the individual components shows that financial income in Japan did not grow because the increase in trading gains and fees and commissions was offset

by a decrease in net interest income from loans and deposits. Comparing financial income in Japan and the U.S. suggests that the decrease in net interest income from loans and deposits and the lack of growth in asset management services in Japan contributed to the stagnation of financial income.

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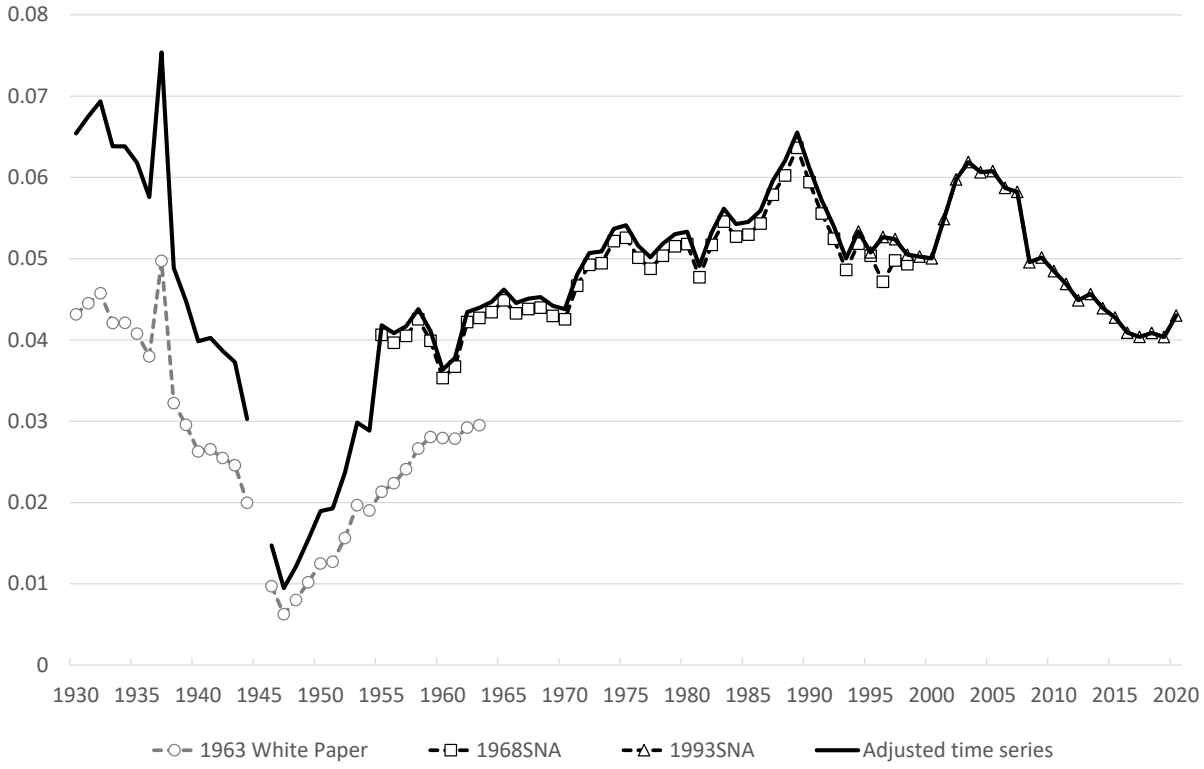
Table 1. Data sources for financial income

Sector	Data source	First year	Last year
Zenkoku banks	Japanese Bankers Association, Financial statements of all banks (*Zenkoku ginko zaimu shohyo bunseki*)	1949	2020
Sogo banks	Sogo Banks Association, Financial statements of all Sogo banks (*Zenkoku Sogo ginko zaimu shohyo bunseki*)	1949	1987
	The Second Association of Regional Banks, Annual statistics of all banks in the Second Association of Regional Banks (*Dainichiginkyo chigin tokei nenpo*)		
Shinkin banks	National Association of Shinkin Banks, Financial statements of all Shinkin banks (*Zenkoku Shinyo kinko zaimu shohyo bunseki*)	1973	2020
	Ministry of Finance Banking Bureau, Annual Report of Banking Bureau (*Ginkokyoku kinyu nenpo*)	1955	1972
Government financial institutions	Ministry of Finance Budget Bureau, Financial statements of government-affiliated organizations (*Seifukankei kikan kessansho*)	1949	2020
	Japan Post, Financial statements	2003	2020
	Ministry of Finance Budget Bureau, Reference materials for the financial statements of government special account (*Tokubetsu kaikei kessan sanshosho*)	1965	2002
	Ministry of Posts and Telecommunications, Annual statistics of posts and telecommunications (*Yusei tokei nenpo*)	1956	1964
	Ministry of Posts and Telecommunications, Business history of posts and telecommunications continued (*Zoku teshin jigyoshi*), Hundred-year history of posts and money orders (*Yubin kawase jigyo hyakunenshi*)	1945	1955
Securities companies	Japan Securities Dealers Association, Financial overview of regular members (*Kaiin no kessan gaikyo*)	1989	2020
	Tokyo Stock Exchange, Annual statistics of securities (*Shoken tokei nenpo*)	1979	1988
	Ministry of Finance Securities Bureau, Annual Report of Securities Bureau (*Okurasho shokenkyoku nenpo*)	1961	1978

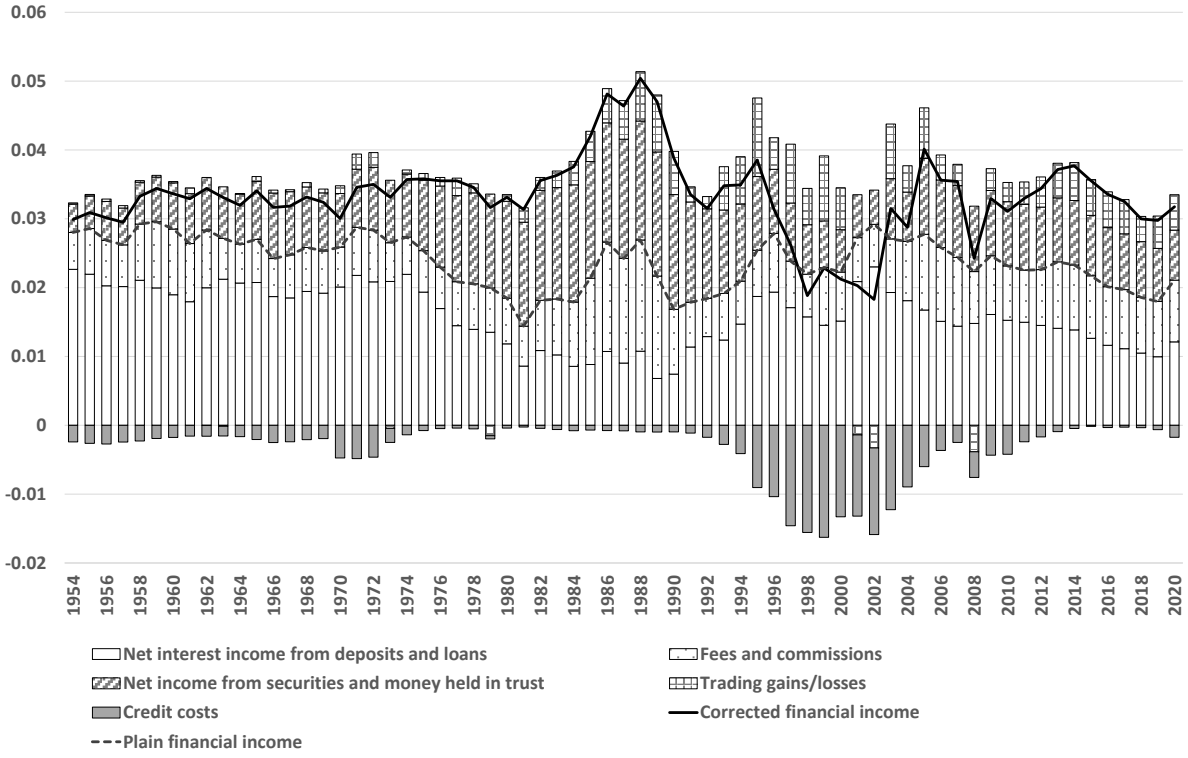
Note: This table shows the original data sources for the financial income using semi-aggregated data in Figure 2. The year refers to the fiscal year, which begins in April of the calendar year and ends in March of the next calendar year. A list of government financial institutions is provided in Appendix Table A1.

Figure 1. GDP share of finance and insurance income on an SNA basis



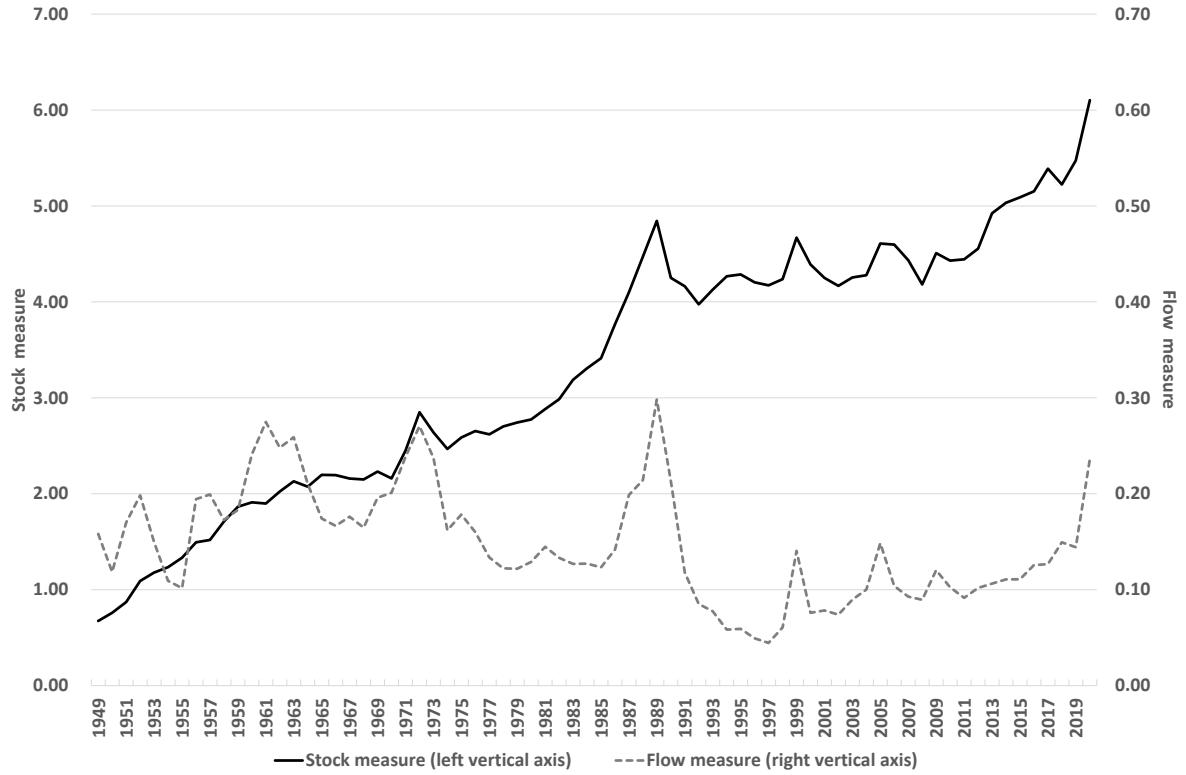
Note: This figure shows the share of finance and insurance income in nominal GDP from 1930 to 2020 based on SNA data. Data are on a calendar year basis, except for 1946–1950, for which they are on a fiscal year basis. For the period 1946–1950, we use GNI instead of GDP. The three broken lines with markers are based on the 2008 SNA for 1994–2020, the 1968 SNA for 1995–1998, and the 1963 White Paper for 1930–1963. Because finance and insurance income is not available in the 1963 White Paper, we estimate it by multiplying the finance, insurance, and real estate income in the 1963 White Paper by 0.371, which is the average share of finance and insurance industry income in finance, insurance, and real estate income in 1955–1959. The black solid line shows the adjusted time-series, which is constructed by using the finance and insurance industry income in the earliest year of the newer series and the year-on-year growth rate in the older series. For example, we calculate the finance and insurance income for 1993 by calculating the year-on-year growth rate for 1994 from the 1968 SNA and dividing the 1994 finance and insurance income in the 2008 SNA by 1 plus this growth rate.

Figure 2. GDP share of financial income using sectoral data: By income component



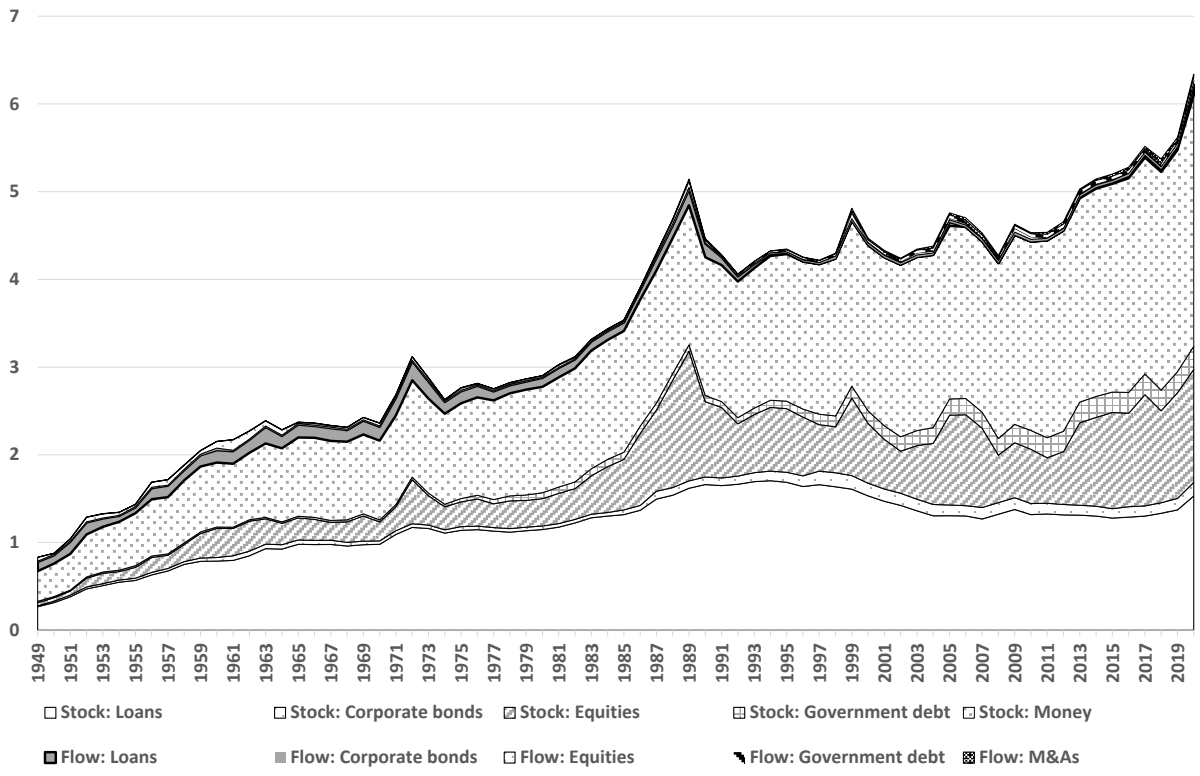
Note: This figure shows the share of financial income in nominal GDP from 1954 to 2020 using the various semi-aggregated data sources shown in Table 1. Data are on a fiscal year basis. The grey broken line shows the plain financial income, while the black solid line shows the corrected financial income. The construction of each income component is explained in Appendix A.2.

Figure 3. Financial output relative to GDP: Stock and flow measures



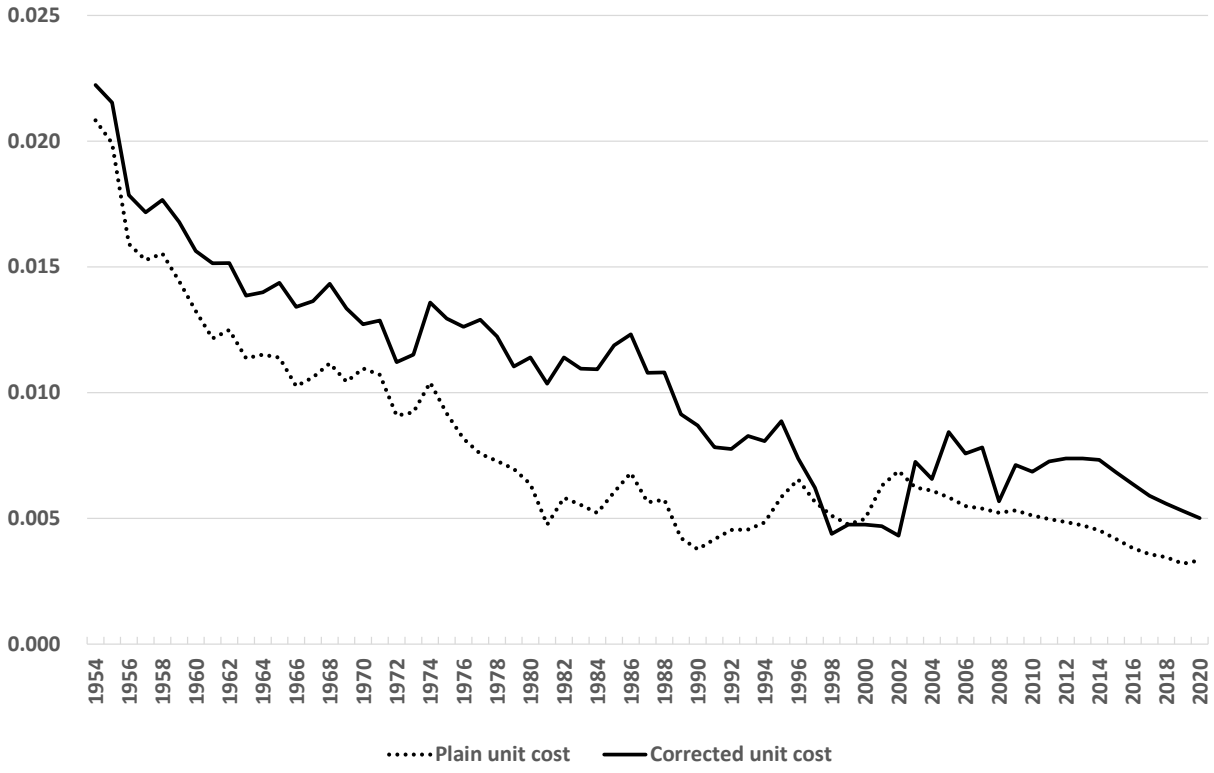
Note: This figure shows the ratio of financial output to nominal GDP from 1949 to 2020 using the various semi-aggregated data sources shown in Appendix Table A3. Data are on a calendar year basis, except for 1949–1952, for which they are on a fiscal year basis. The grey broken line shows the ratio for the flow measure in Equation (7)', while the black solid line shows the ratio for the stock measure in Equation (6)'.

Figure 4. Financial output relative to GDP: By intermediated asset



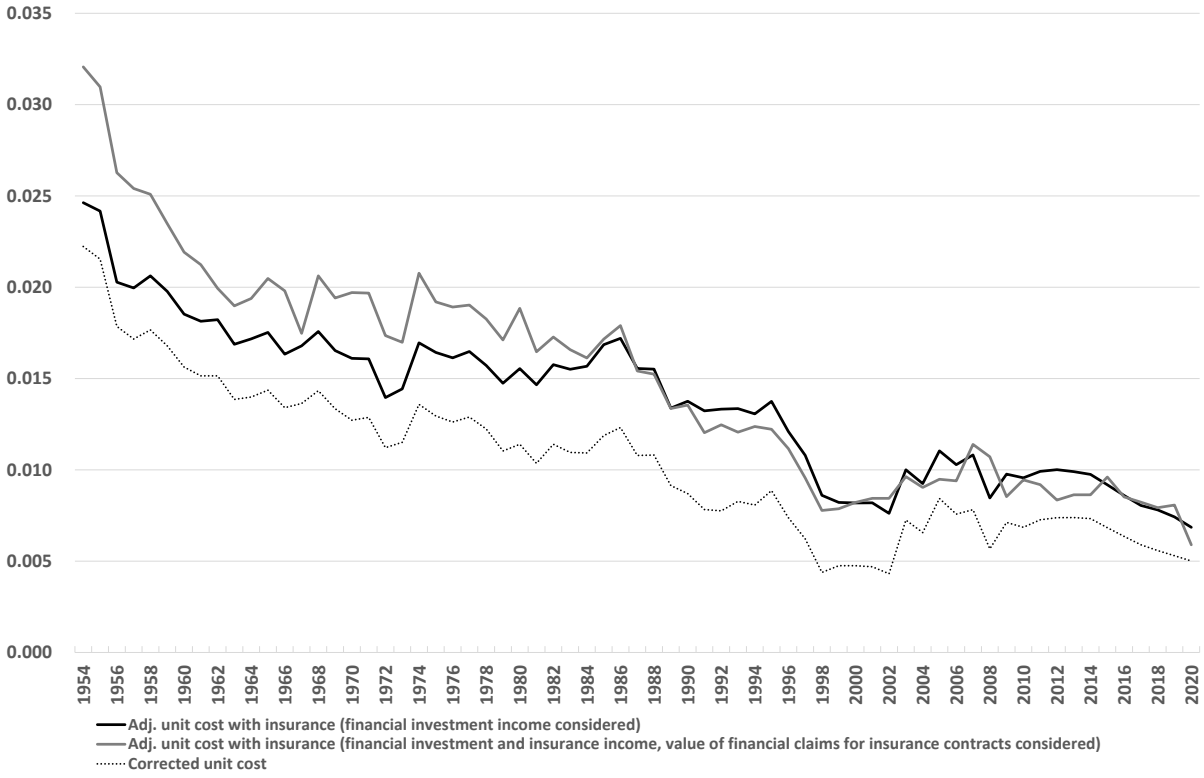
Note: This figure shows the ratio of financial output to nominal GDP from 1949 to 2020 using the various semi-aggregated data sources shown in Appendix Table A3. Data are on a calendar year basis, except for 1949–1952, for which they are on a fiscal year basis.

Figure 5. Unit cost of financial intermediation



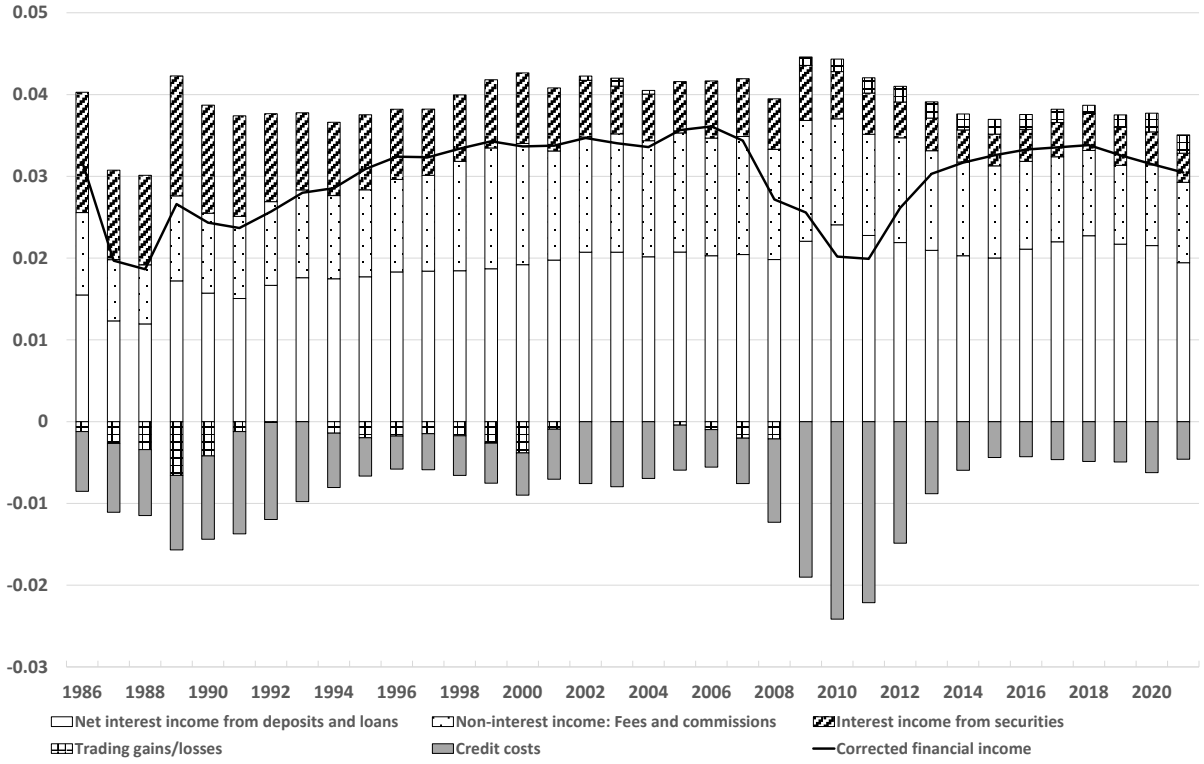
Note: This figure shows the unit cost of financial intermediation from 1954 to 2020. The grey dotted line shows the unit cost using the plain financial income, while the black solid line shows the unit cost using the corrected financial income.

Figure 6. Adjusted unit cost of financial intermediation adding insurance income and output



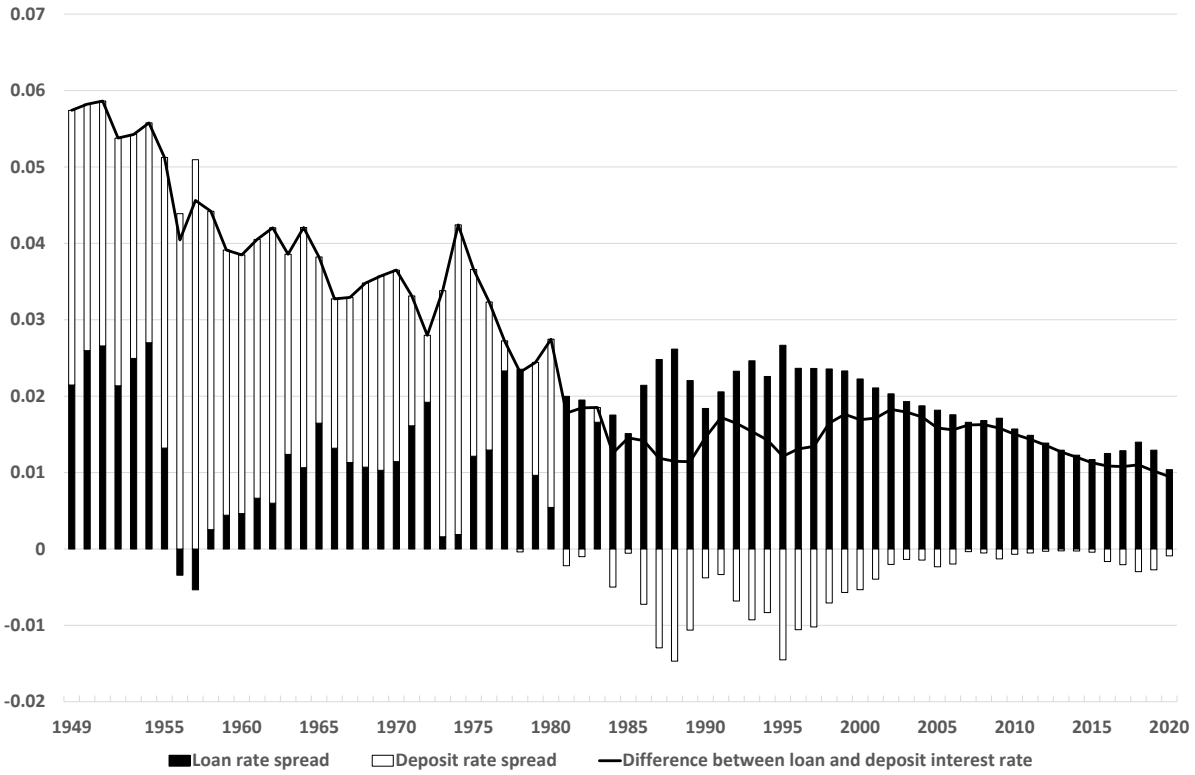
Note: This figure shows the unit cost of financial intermediation with and without the insurance sector from 1954 to 2020. The dotted line shows the corrected unit cost from Figure 5. The grey solid line shows the insurance-adjusted corrected unit cost when the financial investment income of insurance companies is included in financial income (the numerator of the unit cost). The black solid line shows the insurance-adjusted corrected unit cost when the financial investment and insurance income of insurance companies are included in financial income (the numerator) and the value of financial claims held by insurance policy holders (end users) are included in financial output (the denominator).

Figure 7. GDP share of U.S. deposit-taking financial institutions' financial income



Note: This figure shows the share of U.S. deposit-taking financial institutions' corrected financial income in nominal GDP from 1986 to 2021 using FDIC data (QBP Time Series Spreadsheets, Annual Income). To make this figure comparable to Figure 2 showing the share of Japanese financial intermediaries' financial income in GDP, we reclassify the income components of the FDIC data as follows:
Net interest income = (Interest income: Domestic office loans, Foreign office loans, Lease financing receivables, Balances due from depository institutions, Federal funds sold, Other interest income) － (Interest expense: Domestic office deposits, Foreign office deposits, Federal funds purchased, Subordinated notes and debentures)
Non-interest income: Fees and commissions = (Noninterest income: Fiduciary activities, Service charges on deposit accounts, Net servicing fees, Net securitization income, Insurance commission fees and income, Other noninterest income)
Interest income from securities = Interest income: Securities
Trading gains/losses = (Interest income: Trading accounts) + (Noninterest income: Trading account gains and fees, Investment banking, advisory, brokerage and underwriting fees and commissions, Venture capital revenue) + Securities gains (losses) － (Interest expense: Trading liabilities and other borrowed money)
Credit costs = Provision for loan and lease losses + Net charge-offs

Figure 8. Loan and deposit rate spreads



Note: This figure shows the difference between the loan and the deposit interest rate (black solid line), the loan rate spread (the difference between the loan interest rate and the reference rate, black bar), and the deposit rate spread (the difference between the reference rate and the deposit interest rate, white bar) for *zenkoku* banks. Second-tier regional banks are not included in *zenkoku* banks prior to 1989. The loan interest rate is calculated as the ratio of interest income from loans to loans outstanding. The deposit interest rate is calculated as the ratio of interest expenses for deposits and bank debenture bonds to deposits and bank debentures outstanding. For the reference rate, we use the Bank of Japan's discount rate until 1995 and the overnight uncollateralized call rate from 1996.

Appendices

A1. Government financial institutions

To measure the financial income of government financial institutions, we select institutions whose financial statements are reported in the central government's budgetary financial statement each year. Because of the reform of the FILP in the early 2000s, some financial institutions (Development Bank of Japan, Japan Bank for International Cooperation, and Japan Post) were fully or partially privatized and were no longer listed in the central government's budget statements after privatization. For the period after privatization, we therefore use their disclosure materials. For consistency with the fact that we exclude insurance companies in our baseline estimate of the unit cost of financial intermediation, we do not include the credit insurance programs currently conducted by the Japan Finance Corporation.[26]

[26] For details of the FILP reforms, see Doi and Hoshi (2003), Miyake (2016) and Sasaki (2019). For an early history of the FILP including the background of its establishment, see Shima et al. (1961) and Endo (1966).

Table A1. List of government financial institutions

Name of the institution	Date of establishment	Date of closure	Note
Postal Savings	May 1875	Existing	Currently Japan Post Bank Co., Ltd.
Housing Loan Corporation	June 1950	March 2007	Operations were taken over by Japan Housing Finance Agency
People's Finance Corporation	June 1949	Oct. 1999	Merged with Environment Sanitation Business Finance Corporation to become Public Finance Corporation
Environment Sanitation Business Finance Corporation	Sept. 1967	Oct. 1999	Merged with People's Finance Corporation to become Public Finance Corporation
Public Finance Corporation	Oct. 1999	Oct. 2008	Operations were taken over by Japan Finance Corporation
Japan Finance Corporation for Small Business	August 1953	Oct. 2008	Operations were taken over by Japan Finance Corporation
Agriculture, Forestry and Fisheries Finance Corporation	April 1953	Oct. 2008	Operations were taken over by Japan Finance Corporation
Hokkaido Tohoku Development Finance Corporation	June 1956	Oct. 1999	Operations were taken over by Development Bank of Japan
Okinawa Development Finance Corporation	May 1972	Existing	
Japan Finance Corporation for Municipal Enterprises	June 1957	Oct. 2008	Operations were taken over by Japan Finance Organization for Municipalities
Medical Care Facilities Financing Corporation	July 1960	Jan. 1985	Operations were taken over by Welfare and Medical Service Agency
Japan Development Bank	April 1951	Oct. 1999	Operations were taken over by Development Bank of Japan
Export-Import Bank of Japan	Dec. 1950	Oct. 1999	Operations were taken over by Japan Bank for International Cooperation
Japan Finance Corporation	Oct. 2008	Existing	
Development Bank of Japan	Oct. 1999	Existing	
Japan Bank for International Cooperation	Oct. 1999	Existing	Temporarily merged with Japan Finance Corporation from Oct. 2008 to March 2012

Sources: Ministry of Finance (2004), websites of respective institutions.

A2. Financial income items

Banks' financial income accounts consist of (i) net interest income from loans and deposits, (ii) fees and commissions, (iii) net interest income from investment in securities and money held in trust, (iv) trading gains/losses, and (v) credit costs. We explain how we construct each item using the "Financial Statements of All Banks (FY2020)" compiled by the Japanese Bankers Association as an example.[27] The construction of each item for *sogo* banks, *shinkin* banks, and government financial institutions is similar to that for *zenkoku* banks, although specific account items differ in some cases. For securities companies, the construction of items is explained below when necessary, using the "Financial Overview of Regular Members (FY2020)" compiled by the Japan Securities Dealers Association.[28]

(i) Net interest income from loans and deposits is measured as the difference between *interest income* and *interest expenses*. To measure net interest income in a way that is consistent with FISIM, we exclude *interest and dividends on securities*, which form part of interest income in banks' income statements but are not included in FISIM. While interest income and expenses include those from transactions among financial institutions, these will cancel each other in the semi-aggregated income statements of all financial institutions, since the interest income of one financial institution corresponds to the interest expense of another financial institution. Therefore, the net interest income that we measure roughly corresponds to that from end-users:

$$(i)\ Net\ interest\ income\ excluding\ interest\ and\ dividends\ on\ securities = Interest\ income - Interest\ and\ dividends\ on\ securities - Interest\ expenses \quad \text{(A2.1)}$$

For securities companies, we use the difference between *financial revenue* and *financial expenses*. *Financial revenue* includes interest income from providing margin trading to customers, interest and dividends from securities that securities companies hold as inventories, etc. *Financial expenses* include interest expenses for margin trading, interest expenses for securities companies' debts,

[27] https://www.zenginkyo.or.jp/en/stats/year2-01/2020-terminal/ (accessed: December 27, 2022).

[28] https://www.jsda.or.jp/en/statistics/securities-industry/html/fy_year_i.html (accessed: December 27, 2022).

etc.

(ii) Fees and commissions are measured as the difference between *fees and commissions* and *fees and commissions payments*. We also use *trust fees*. That is, fees and commissions are calculated as follows:

$$(ii)\ Fees\ and\ commissions$$
$$= Fees\ and\ commissions + trust\ fees \quad \text{(A2.2)}$$
$$- fees\ and\ commissions\ payments$$

For securities companies, we use *commissions received*, which include brokerage commissions, underwriting and secondary distribution fees, offering and secondary distribution handling fees, etc.

(iii) Net income from investment in securities and money held in trust is measured as the sum of *interest and dividends on securities* and the net gains on money held in trust (i.e., the difference between *gains on money held in trust* and *losses on money held in trust*):

$$(iii)\ Net\ income\ from\ investment\ in\ securities\ and\ money\ held\ in\ trust$$
$$= interest\ and\ dividends\ on\ securities \quad \text{(A2.3)}$$
$$+ gains\ on\ money\ held\ in\ trust - losses\ on\ money\ held\ in\ trust$$

(iv) We construct trading gains/losses from the following three items. The first is the difference between *other ordinary income* and *other ordinary expenses*, which includes net gains (losses) on trading securities, net gains (losses) on trading account securities, etc. The second is the difference between *gains on trading account transactions* and *losses on trading account transactions*. These are accounting items for those banks that have been permitted to set up "specified transaction accounts" for their trading business since 1997. Finally, the third is the difference between *gains on the sale of equity securities* and *losses on the sale of equity securities*, both of which are not included in the first and second components. That is:

$$
\begin{aligned}
(iv)\ Trading\ gains/losses \\
&= other\ ordinary\ income - other\ ordinary\ expenses \\
&+ net\ gains\ on\ trading\ account\ transactions \\
&+ net\ gains\ on\ the\ sale\ of\ equity\ securities
\end{aligned}
\tag{A2.4}
$$

For securities companies, we use *net trading income*.

(v) Credit costs are the sum of net loan-loss provisions, i.e., the difference between *loan-loss provisions* and *reversals of loan-loss provisions*, and net write-offs, i.e., the difference between *written-off loans* and *recoveries of written-off receivables*. As discussed in Section 2.1, we use the three-year moving average of actual credit costs to measure expected credit costs, which should be excluded when measuring financial income, since banks' loan-loss provisions in their books are usually based on the average loan losses during the past three years (Ginko Keiri Mondai Kenkyu-kai 2016). To construct expected credit costs, which form part of intermediate consumption in loan production, we use the three-year moving average of actual credit costs, since banks' loan loss reserves in their books are usually based on the average loan losses during the past three years (Ginko Keiri Mondai Kenkyu-kai 2016).

$$
(v)\ Credit\ costs\ = \sum_{\tau=0}^{2} \frac{Net\ loan\ loss\ provisions_{t-\tau} + Net\ write-offs_{t-\tau}}{3} \tag{A2.5}
$$

The names and definitions of the various account items outlined above are for fiscal 2020. Some differ for earlier years, and we match account items over the years so that they are consistent with the definitions for (i) to (v) above. Moreover, some account items are missing in earlier years. For example, account items that specifically represent trading gains/losses (i.e., item (iv)) of *zenkoku* banks did not exist before FY1964. The likely reason for missing items is that the business itself was small due to regulations on business activities and interest rates. We basically assume that the amount of missing account items is zero unless this assumption results in abrupt changes in time-series data. Two items for which we do not make this assumption are (iv) trading gains/losses and (v) credit costs. For (iv) trading gains/losses before FY1964, we assume that they are 20 percent of "*other ordinary income−other ordinary expenses,*" since the percentage share of trading gains/losses in "*other ordinary*

income−other ordinary expenses" was 18.2 percent on average during FY1964–1968. For (v) credit costs, data on net loan-loss provisions are not available for *zenkoku* banks for years prior to FY1964, for *sogo* banks for FY1963–1972, and for *shinkin* banks prior to FY1968. Net write-offs are unavailable for *shinkin* banks prior to FY1973. We estimate missing data for net loan-loss provisions employing the formula used for calculating net loan-loss provisions in tax law, which essentially prescribes the percentage of loans outstanding for which a bank can make loan-loss provisions each year. We estimate missing data for net write-off by *shinkin* banks prior to FY1973 using the net write-offs by *sogo* banks, which were most similar to *shinkin* banks in the sense that both are non-profit-oriented community banks. For details on the estimation of credit costs, see the Appendix 3 of Gunji et al. (2021).

A3. Financial output items

To construct the items of the stock indicator in Equation (6)', we mainly use the Bank of Japan's Flow of Funds Accounts. The sources for each item in Equation (6)' are given in Table A3. For detailed definitions of the items, see Tables 8 and 9 in Gunji et al. (2021). We use the outstanding borrowing balance (liabilities) of the nonfinancial sector for loans in Equation (6)'. Similarly, we use the corporate bond balance (liabilities) for the nonfinancial sector for corporate bonds in Equation (6)', the borrowing balance (liabilities) of the government sector for government debt in Equation (6)', and the cash and deposits balance (assets) of the nonfinancial sector for money in Equation (6)'.

For market capitalization in Equation (6)', we use the stock market capitalization for Japan overall for the period from 1949 to 2011, and the market capitalization of the Tokyo Stock Exchange for the period from 2012 to 2020. The difference between the two is small, since the Tokyo Stock Exchange accounts for well over 90 percent of the total stock market capitalization in Japan since the 2000s. For instance, the share in 2011 was 99.1 percent.

The sources for the items in the flow indicator in Equation (7)' are also provided in Table A3. For details of their definitions, see Table 10 in Gunji et al. (2021). For loans in Equation (7)', we use loans (liabilities) of the nonfinancial sector in the flow table for 1954 and later years. Because there is no flow table for the period before 1954, we use the difference between the stock of loans in the current

year and that in the previous year.

As for corporate bonds in Equation (7)', we use the issuance of private-sector bonds from the Koshasai Shijo Kenkyukai (2011) for the period 1949–1997. For the period 1998 onwards, we use "Issuance, Redemption, and Outstanding Amount of Bonds" from the website of the Japan Securities Dealers Association.[29] For details on the particular items in the original data sources we used to estimate corporate bonds (flows), see Gunji et al. (2021).

As for government debt in Equation (7)', for the period 1949–1997, we use the total public bond issuance from Koshasai Shijo Kenkyukai (2011). For 1998 onward, we use the total amount of publicly offered public bonds and privately placed special bonds in "Issuance, Redemption, and Outstanding Amount of Bonds" from the website of the Japan Securities Dealers Association.

For equity issuance in Equation (7)', we use the total amount of financing by equity by companies listed on stock exchanges nationwide from the annual editions of "Tosho Yoran" for the period 1955–2011. We construct a similar series from the Japan Exchange Group's (JPX) website for 2012 onward.[30] Data for the period before 1955 are constructed from "Shoji Homu Kenkyu" (Table A3). For details on the particular items in the original data sources we used to estimate equity issuance (flows), see Gunji et al. (2021), Table 10.

Finally, for M&As in Equation (7)', we use the RECOF M&A database, which provides data from 1985. To measure the M&A services provided to non-financial users, we exclude M&As among financial institutions. However, since it is not possible to distinguish financial institutions before 1996, we use the value for all firms from 1985 to 1995. We assume that the value of M&As before 1985 is zero.

[29] https://www.jsda.or.jp/shiryoshitsu/toukei/hakkou/index.html (accessed: December 27, 2022).

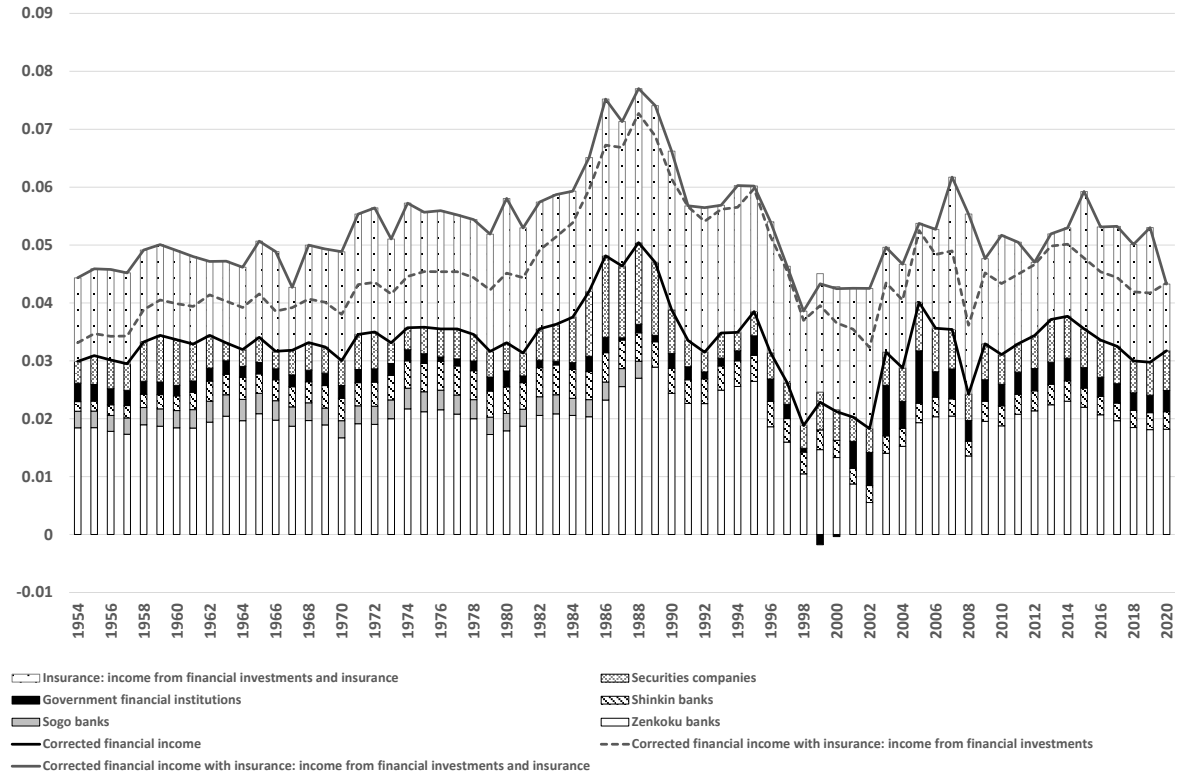
[30] https://www.jpx.co.jp/markets/statistics-equities/misc/06.html (accessed: December 27, 2022).

Table A2. Financial output items

Stock/Flow	Item	Source
Stock	Items except equity	1949–1952: Utsunomiya (2011) 1953–2020: Flow of Funds, Bank of Japan
	Equity	1949–2011: Tosho Yoran, Tokyo Stock Exchange 2012–2020: Tokyo Stock Exchange website
Flow	Loans	1949–1952: Utsunomiya (2011) 1953–2020: Flow of Funds, Bank of Japan
	Corporate bond issuance	1949–1997: Koshasai Shijo Kenkyukai (2011) 1998–2020: Japan Securities Dealers Association website
	Public bond issuance	1949–1997: Koshasai Shijo Kenkyukai (2011) 1998–2020: Japan Securities Dealers Association website
	Equity issuance	1949–1954: Shoji Homu Kenkyu Zokan Go, Zoshi Hakusho 1955–2011: Tosho Yoran, Tokyo Stock Exchange 2012–2020: Japan Exchange Group website
	M&As	1949–1984: Assumed to be zero. 1985–1995: M&A Research Report, RECOF 1996–2020: RECOF M&A Database

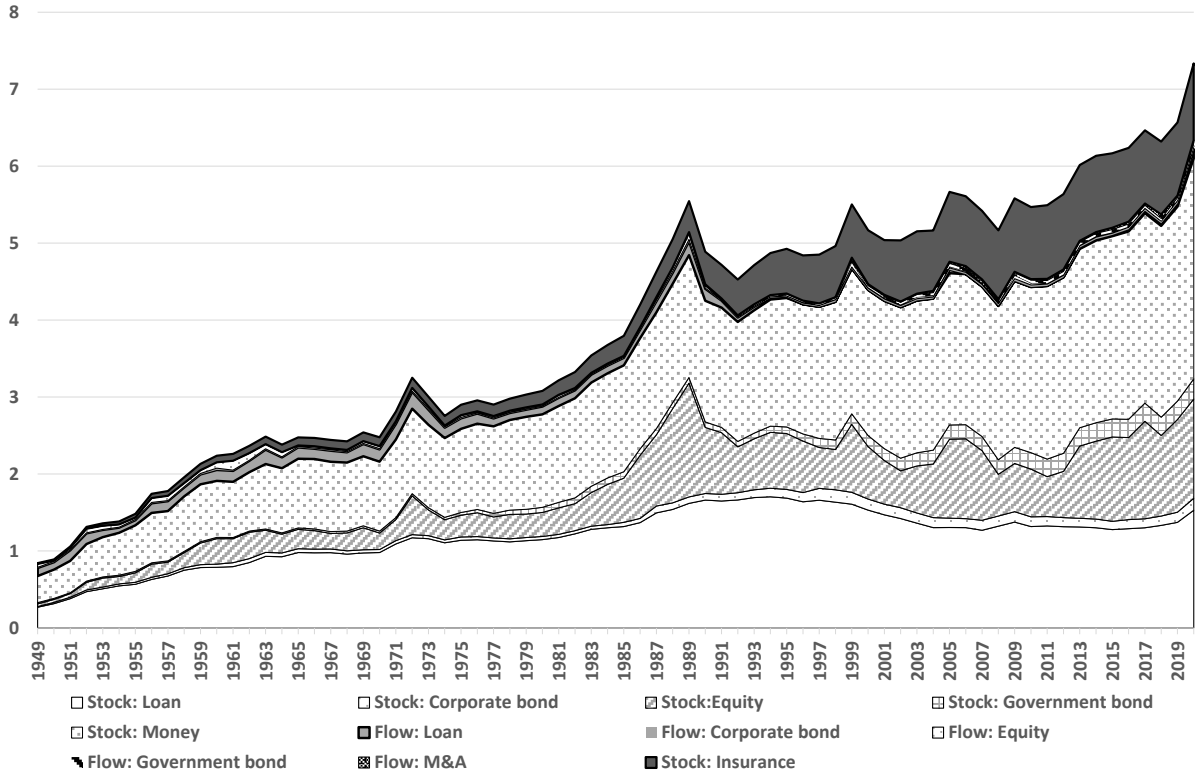
A4. Financial income and financial output by sector

Figure A1. GDP share of financial income using sectoral data: By sector including insurance



Note: This figure shows the share of sectoral financial income in nominal GDP from 1954 to 2020 using the various semi-aggregated data sources shown in Table 1 and Section 3.4.2 in the main text. Data are on a fiscal year-basis. The grey solid and broken lines show corrected financial income with insurance companies, while the black solid line shows the corrected financial income without insurance companies. The construction of each income component is explained in Appendix A.2 and Section 3.4.2.

Figure A2. Financial output relative to GDP: By intermediated asset, including insurance



Note: This figure shows the ratio of financial output, including insurance, to nominal GDP from 1949 to 2020 using the various semi-aggregated data sources shown in Appendix Table A3 and Section 3.4.2 in the main text. Data are on a calendar year-basis, except for 1949–1952, for which they are on a fiscal-year basis.

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