WP/21/26

IMF Working Paper

Japan's Foreign Assets and Liabilities: Implications for the External Accounts

by Mariana Colacelli, Deepali Gautam and Cyril Rebillard

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Asia and Pacific Department

Japan's Foreign Assets and Liabilities: Implications for the External Accounts[1]

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Authorized for distribution by Paul Cashin

February 2021

Abstract

The composition of Japan's current account balance has changed over time, with an increasing income balance primarily reflecting a growing net foreign asset position and higher corporate saving. A comparison of Japan's income balance with peer countries highlights: (i) relatively high yields on FDI assets, and (ii) very low FDI liabilities in Japan. Panel estimation is used to derive separate exchange rate elasticities for income credit and debit, with novel accounting that disentangles the mechanical from the economic response to exchange rate fluctuations. Despite the changing composition of Japan's current account balance, its response to exchange rate movements still operates mostly through the traditional trade channel, with a small but reinforcing contribution from the income balance.

JEL Classification Numbers: E21, F21, F32, F36, F41, G15, O16

Keywords: NFA, Japan, Current Account, Income Account, Income Balance, Exchange Rate Elasticity

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[1] A summary of the analysis in this working paper was included in the Japan 2019 Article IV Staff Report and the 2019 Japan Selected Issues Paper. The authors are grateful for helpful comments by Gustavo Adler, Odd Per Brekk, Paul Cashin, Ken Chikada, Luis Cubeddu, Russell Green, Takuma Hisanaga, Gee Hee Hong, Martin Kaufman, Shujaat Ali Khan, Daniel Leigh, Pablo Lopez Murphy, Toshitaka Nagase, Kentaro Ogata, Pau Rabanal, Piyaporn Sodsriwiboon, Takuji Tanaka, Francis Vitek, Niklas Westelius, and Takefumi Yamazaki, and for informative discussions with seminar participants at the Bank of Japan and Japan Ministry of Finance during the 2019 Japan Article IV mission (November 2019), and participants at an APD internal seminar. We are particularly grateful to Albe Gjonbalaj for excellent research assistance.

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I. INTRODUCTION

Over the past decades, the composition of Japan's current account balance has changed with a now-salient income balance. Although the headline current account balance has remained relatively stable, fluctuating around 3 percent of GDP (except in the aftermath of the 2011 Fukushima accident), the trade surplus has been decreasing over time, and the income balance has increased. While this partly reflects Japan's growing NFA position and greater financial integration with the rest of the world, including through global value chains, a better understanding of the drivers behind the compositional change in Japan's current account balance is warranted. Importantly, the consequences from the growing income balance—in terms of the responsiveness of Japan's current account balance to exchange rate movements—have yet to be assessed.

This paper studies the main factors driving Japan's growing income balance, and makes a first attempt at estimating the responsiveness of the income balance to the exchange rate.[2]

- Our results highlight that Japan's income balance has grown along with increasing corporate saving. In addition, Japan's relatively high income balance is explained by the high asymmetry of income credits and debits, underpinned by high FDI yields on investment abroad, very low FDI liabilities, and low yields on portfolio debt liabilities. We also uncover offsetting patterns between trade and income balances, underlining their interconnectedness and the blurring impact of globalization and multinational firms on the attribution of income.

- Regarding the responsiveness of the current account to the exchange rate, so far, the bulk of the literature has focused on trade's response—for a review of developed economies' estimates see Hooper and Marquez (1995), while Reinhart (1994) also focuses on developing economies.[3] On the other hand, the response of the income balance to exchange rate movements has drawn relatively less attention (Alberola et al, 2018). Our results show that income credits and debits both tend to decrease with an appreciation in the real effective exchange rate (REER), mostly reflecting a mechanical effect due to the currency composition of the net foreign asset (NFA) position. However, for large net creditor countries such as Japan (where the credit response dominates), the income balance response to exchange rate fluctuations reinforces—although only marginally—the traditional trade balance response.

The rest of the paper is organized as follows. Section II presents some stylized facts on the drivers behind the increase in Japan's income balance. Section III compares Japan to its G7 country peers and highlights what makes Japan's income balance stand out from a cross-country perspective. Section IV shows evidence on how the trade and income balances are interconnected. Section V elaborates on the theory and provides empirical results on income

[2] Normative questions of whether Japan's external position is in line with fundamentals and desirable policies are outside the scope of this paper; see IMF (2020) for the latest assessment of Japan's external position.

[3] More recent estimates of trade elasticities using varying methodologies are presented in Cubeddu et al (2019), Leigh et al (2017), and Colacelli (2010), among others.

balance semi-elasticities. Section VI concludes with some policy implications. Annexes detail the estimation strategy of the income balance semi-elasticity, plus the novel methodological framework used to separate (within income credit and debit) the mechanical effect in response to exchange rate changes from the economic response.

II. What Has Driven the Increase in Japan's Income Balance?

While Japan's current account balance remained relatively stable over the past decades, a downward trend of the trade balance has been offset by an upward trend in the income balance (Figure 1, top left panel). Japan's trade balance averaged 1.3 percent of GDP over 1996-2000, but only -0.3 percent over 2014-18. Even when accounting for the 2011 Fukushima accident, which led to the temporary closure of nuclear power plants and additional energy imports, the trade balance has been on a declining trend over the past two decades. At the same time, the primary income balance rose from 1.3 percent of GDP on average over 1996-2000 to 3.8 percent over 2014-18. The secondary income balance remained low and relatively stable, around -0.2 percent of GDP over the whole period, increasing only moderately (in absolute value) in recent years.

The progressive increase in Japan's income balance primarily reflects net revenues from an increasingly positive NFA position. Japan's primary income balance is composed almost exclusively of investment income, which has grown in tandem with the growing NFA position, from close to in balance in 1980 to a positive 60 percent of GDP in 2018 (Figure 1, top right panel). Japan's present NFA is the highest in the world, at $3 trillion.[4]

In terms of <u>gross</u> flows within the external current account, the respective importance of the trade account and the income account have remained broadly unchanged over time (Figure 1, middle left panel). Both gross income flows (defined as the sum of credits and debits) and gross trade flows have nearly doubled in 20 years. As a result, the ratio of gross income (primary, secondary) flows to gross trade (goods, services) flows has increased only moderately, from 21 percent in 1996 to 25 percent in 2018.[5] More generally, gross trade flows remain predominant within the current account for all countries, with the relative importance of income flows being somewhat higher in advanced economies. Indeed, while trade integration has progressed in both advanced and emerging economies, financial integration is greater in advanced economies, including due to reduced access to international capital markets in some emerging and developing economies.

Japan's relatively large income balance is primarily the result of an asymmetric income account. With gross income flows growing in tandem with gross trade flows over the past two decades, it is the asymmetric nature of the expansion of income flows, rather than their size, that explains Japan's large and growing income balance. In particular, income credits are significantly larger than debits for most components of Japan's investment income

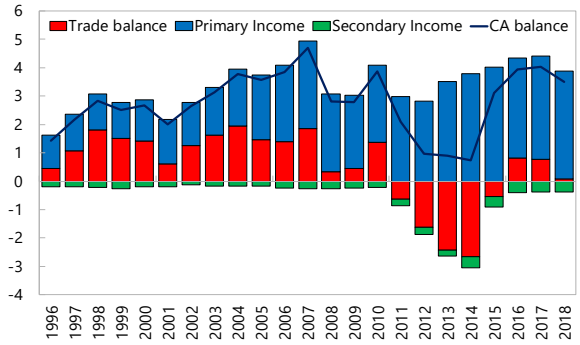
[4] The increase in Japan's income balance has not been driven by a change in yields. While implicit yields from NFA have fluctuated, they do not exhibit any clear trend or shift over time.

[5] Accommodative monetary policies have constrained interest flows in recent years; the ratio of income flows to trade flows may increase in the future when monetary policy normalizes.

(Figure 1, middle right panel). This is especially the case for direct investment income (Figure 1, bottom left panel) and portfolio income (bottom right panel).

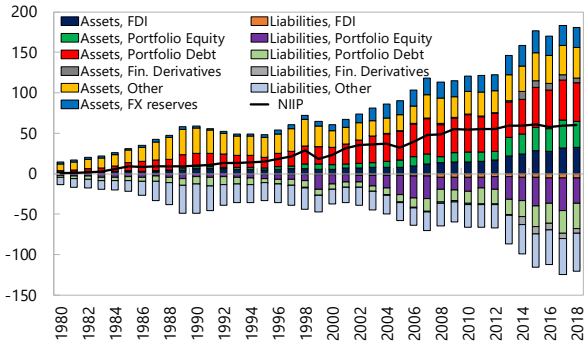
Figure 1. Japan's Increasing Income Balance and its Composition

Japan: Current Account Decomposition: Trade and Income Balances
(In percent of GDP)



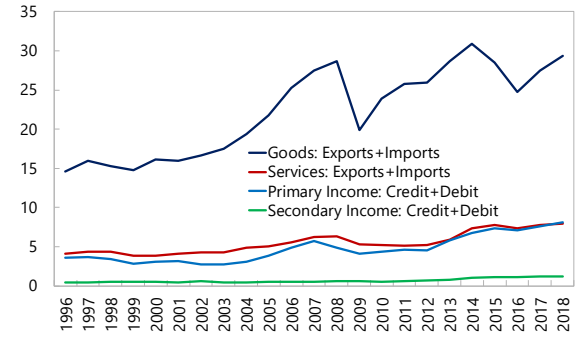
Sources: IMF BOP data; National authorities; and IMF WEO data.

Japan: Decomposition of Net International Investment Position
(In percent of GDP)



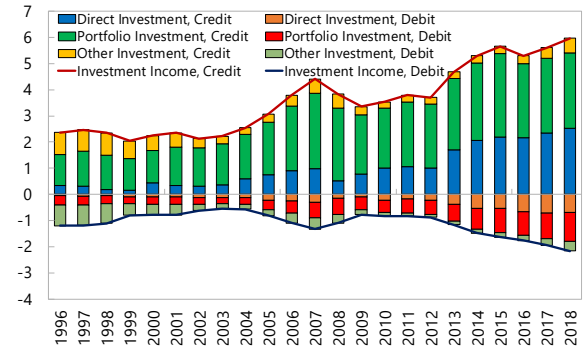
Source: Lane & Milesi-Ferretti database, External Wealth of Nations, 2018.

Japan: Current Account: Trade and Income Gross Flows
(In percent of GDP)



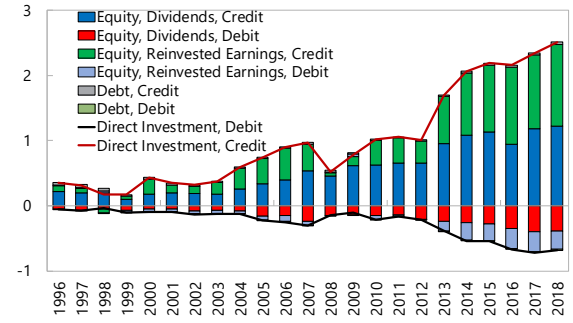
Sources: IMF, BOP data; National authorities; and IMF, WEO data.

Japan: Investment Income Decomposition
(In percent of GDP)



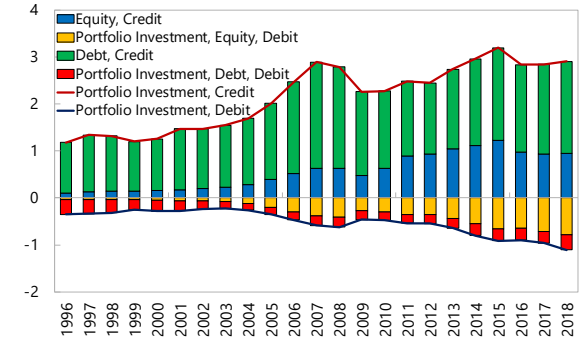
Sources: IMF, BOP data; National authorities; and IMF, WEO data.

Japan: Direct Investment Income Decomposition: Dividends, Reinvested Earnings, Debt
(In percent of GDP)



Sources: IMF BOP data; National authorities; and IMF WEO data.

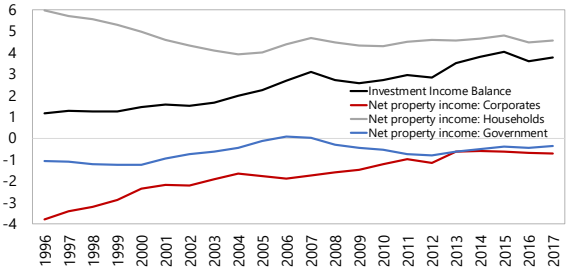
Portfolio Investment Income Decomposition: Debt, Equity
(In percent of GDP)



Sources: IMF BOP data; National authorities; and IMF WEO data.

The increase in Japan's income balance since the mid-1990s can be attributed mostly to the corporate sector, and is linked to the increase in corporate saving. The investment income balance is the sum of net property income of all sectors of the domestic economy (corporates, households, public sector).[6] In Japan, corporate net property income and the investment income balance have had a parallel trend increase since the mid-1990s, while household and government net property income have remained broadly flat (text chart). In turn, the increase in corporate net property income has been a key driver of the increase in corporate saving (see Box 1). Indeed, the rise in Japan's NFA is itself the product of persistent current account surpluses which have been increasingly driven by growing corporate saving (Figure 1, middle right panel). In line with this, Hashimoto and Kinoshita (2016) underline the role played by corporate balance sheet adjustment and the rise in corporate saving in the increase in Japanese corporates' financial net wealth.

Japan: Investment Income Balance and Net Property Income by Sector
(In percent of GDP)

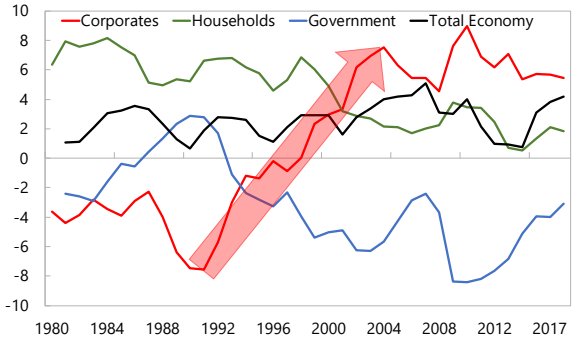


Sources: AMECO database; OECD national accounts dataset; IMF BOP data; National authorities; and IMF WEO data.

Box 1. The Rise in Corporate Saving in Japan

While Japan's current account balance has fluctuated at around 3 percent of GDP over the last four decades, this apparent stability masks large offsetting movements across institutional sectors. In parallel with a growing income account, Japan's corporate net saving—defined as the difference between gross saving and investment—increased significantly following the burst of the real estate bubble at the beginning of the 1990s (red line in text chart). The increase in corporate saving was mostly driven by non-financial firms, with Japanese banks playing a role as intermediaries when investing abroad in search for yield. However, this was compensated by changes in households and public net saving in the opposite direction, reflecting, respectively, households' dissaving (possibly linked to Japan's advanced phase of aging), and the government's efforts to get the economy out of deflation through fiscal stimulus, plus increases in social security spending.

Japan: Gross Saving minus Investment
(In percent of GDP)



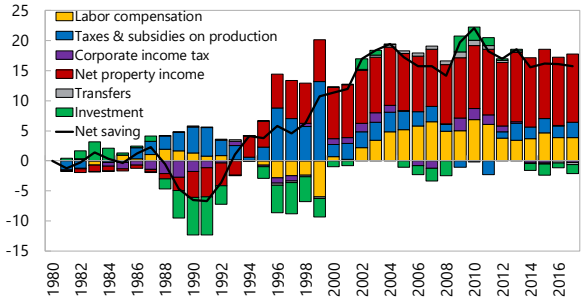
Source: AMECO database.

[6] Strictly speaking, the investment income balance is net property income of the domestic economy, *excluding rents*. However, net income from rents by sector tend to be small and stable over time.

Box 1. The Rise in Corporate Saving in Japan (concluded)

The large increase in corporate net saving can be attributed mainly to a rise in net property income and a fall in the labor share. As discussed by Ruscher and Wolff (2013), the first driver has been an increase in net property income, most of which played out already in the 1990s, and it can be related to (i) corporate deleveraging, and (ii) progressively lower interest rates as monetary policy was loosened. The fall in the labor share occurred later, from the late 1990s to the mid-2000s, in the wake of the 1995-96 labor market reforms which expanded (cheaper) non-regular employment. By contrast, and abstracting from cyclical developments (e.g. a strong increase at the time of the real estate bubble), investment did not contribute markedly to changes in net corporate saving.

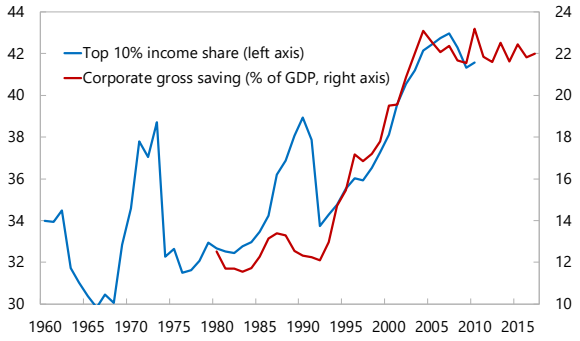
Japan: Cumulative Contributions to Changes in Net Corporate Saving
(In Percent of Corporate Value-added)



Sources: AMECO database, Chen et al (2017) online database, OECD national accounts dataset.

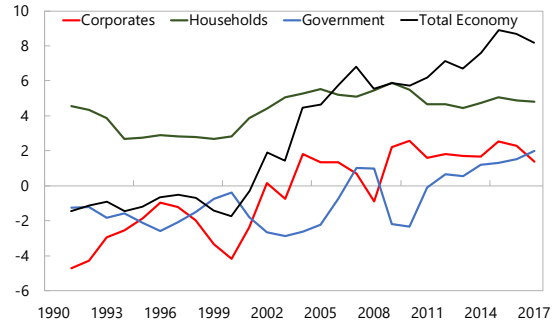
The rise in Japan's corporate saving appears closely linked to top-income inequality. Indeed, both series show sharp increases at around the same period, from the beginning of the 1990s to the mid-2000s. The temporary divergence between corporate saving and top-income inequality can be related to the real estate bubble, which likely boosted income from rents (i.e. outside the corporate sector) for wealthy real estate owners. However, further work is needed to better understand why, in Japan, households did offset (at least partially) higher corporate saving, while such offsetting was not observed in Germany where household saving was little changed despite a strong increase in corporate saving (see text chart and Dao, 2020). A possible explanation may be linked to demographics, with Japan being in a more advanced stage of population aging than Germany. Alternatively, easier access to credit in Japan (credit to the private sector was 107 percent of GDP in 2017, compared to 77 percent in Germany) may have facilitated consumption smoothing in Japan.

Japan: Corporate saving vs. Top 10% income share



Sources: AMECO database; World Inequality Database.

Germany: Gross Saving minus Investment
(In Percent of GDP)



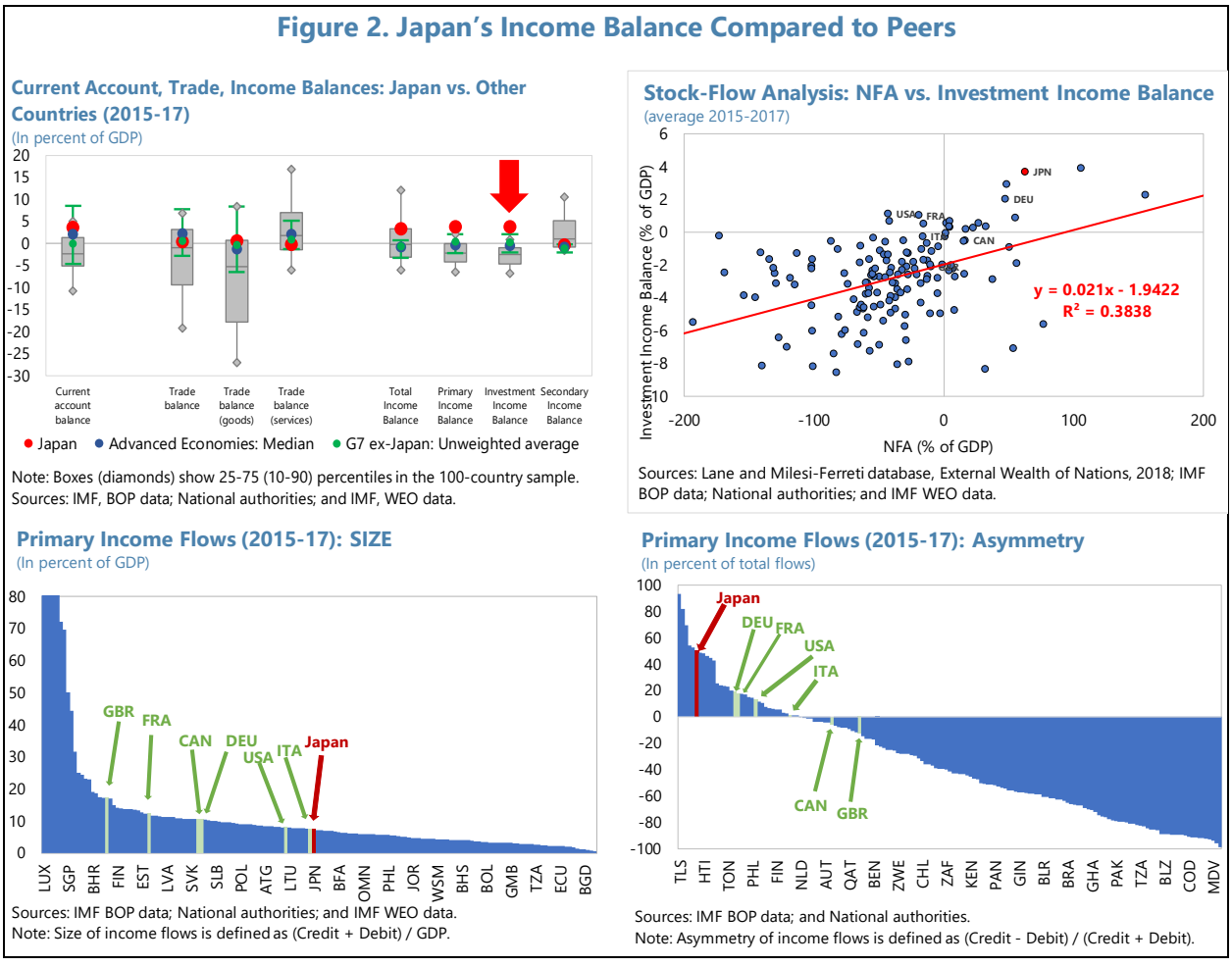
Source: AMECO database.

III. How Does Japan's Income Balance Compare to Peers?

Japan's external income balance is exceptionally large. From an accounting perspective, Japan's larger-than-average current account balance is associated with a trade balance that is close to median (among G7, advanced economies, or among a 100-country sample), but includes an exceptionally large primary income balance (investment income in particular, see Figure 2, top left panel).

Japan's large income balance is due to its asymmetry rather than the size of underlying gross income flows. While gross income flows are relatively modest in Japan, and lower than in other G7 economies (Figure 2, bottom left panel), they are highly asymmetric (Figure 2, bottom right panel). Japan also stands out compared to peers, as receiving more net income from its NFA than what the cross-country relationship between investment income and NFA would suggest (Figure 2, top right panel). As noted by Rogoff and Tashiro (2015), Japan enjoys exorbitant privilege similar to that of the United States, in the form of favorable return differentials.

Figure 2. Japan's Income Balance Compared to Peers



Japan's relatively large investment income balance among G7 countries stems not only from its creditor status (higher NFA), but also from more favorable return differentials. To shed further light on the reasons behind Japan's large income balance, we decompose the difference between the investment income balance of Japan and G6 countries (Canada, France, Germany, Italy, United Kingdom, United States), highlighting the respective contributions of stocks and yields. The 3.5 percentage point of GDP difference in investment income balance $(IB_J - IB_{G6})$ between Japan and G6 can be described with the equation below, where S denotes stocks and Y denotes implicit yields:

$$IB_J - IB_{G6} = \sum_{k\in\{Assets,Liabilities\}} \underbrace{\left[\left(S_J^k - S_{G6}^k\right).\frac{Y_J^k + Y_{G6}^k}{2}\right.}_{Contribution\ of\ Stocks} + \underbrace{\left.\left(Y_J^k - Y_{G6}^k\right).\frac{S_J^k + S_{G6}^k}{2}\right]}_{Contribution\ of\ Yields}$$

For each category *k* of foreign asset/liability, the difference in income flows between Japan and G6 can be decomposed into: (i) the contribution of stock positions, measured by the difference in stock positions $(S_J - S_{G6})$ multiplied by the average implicit yield $\frac{Y_J+Y_{G6}}{2}$, and (ii) the contribution of implicit yields, measured by the difference in implicit yields $(Y_J - Y_{G6})$ multiplied by the average stock position $\frac{S_J+S_{G6}}{2}$. Decomposition results for the difference between the investment income of Japan and G6 are presented in Table 1.[7]

Table 1. Japan and G6 Income Balance – Contributions of Stocks and Yields
(2015–17 average)

			Total (net)	ASSETS					LIABILITIES				
				Total	FDI	Portfolio Equity	Portfolio Debt	Other	Total	FDI	Portfolio Equity	Portfolio Debt	Other
Japan	Income flows	% of GDP	3.7	5.5	2.2	1.0	1.9	0.3	1.8	0.6	0.7	0.3	0.2
	Stocks	% of GDP	62.1	146.2	29.6	30.5	51.3	34.7	109.5	5.0	35.3	26.2	43.0
	Implied Yields	percent		3.8%	7.5%	3.4%	3.7%	0.9%	1.6%	12.9%	1.9%	1.0%	0.5%
G7 ex-Japan: unweighted average	Income flows	% of GDP	0.2	5.2	2.6	1.0	1.0	0.6	5.0	1.6	1.0	1.8	0.6
	Stocks	% of GDP	-4.5	225.1	60.0	48.9	41.0	75.2	231.8	48.5	34.1	73.4	75.9
	Implied Yields	percent		2.3%	4.3%	2.0%	2.5%	0.8%	2.1%	3.3%	2.9%	2.4%	0.8%
Contributions to Income Balance difference	Income flows	% of GDP	**3.5**	**0.3**	**-0.4**	**0.1**	**0.9**	**-0.3**	**-3.2**	**-0.9**	**-0.3**	**-1.5**	**-0.4**
	Stocks	% of GDP	2.2	-2.3	-1.8	-0.5	0.3	-0.4	-4.5	-3.5	0.0	-0.8	-0.2
	Implied Yields	% of GDP	1.4	2.7	1.4	0.6	0.6	0.1	1.3	2.6	-0.3	-0.7	-0.2

Source: IMF BOP data; National authorities; IMF WEO data; Lane & Milesi-Ferretti database, External Wealth of Nations, 2018; and Authors' calculations.

On the asset (or credit) side of the income-account-difference decomposition, while Japan holds fewer foreign assets than the G6, yields are higher. Overall, foreign assets explain a small part of the higher investment income balance in Japan relative to G6 countries (only 0.3 percentage point of 3.5 percentage point of GDP difference). This is particularly the case for FDI: Japan has relatively low FDI assets compared to G6 countries, but significantly higher yields (see also Rogoff and Tashiro, 2015; and Darvas and Hüttl, 2017). Several factors may help explain the higher returns on Japanese investment abroad:

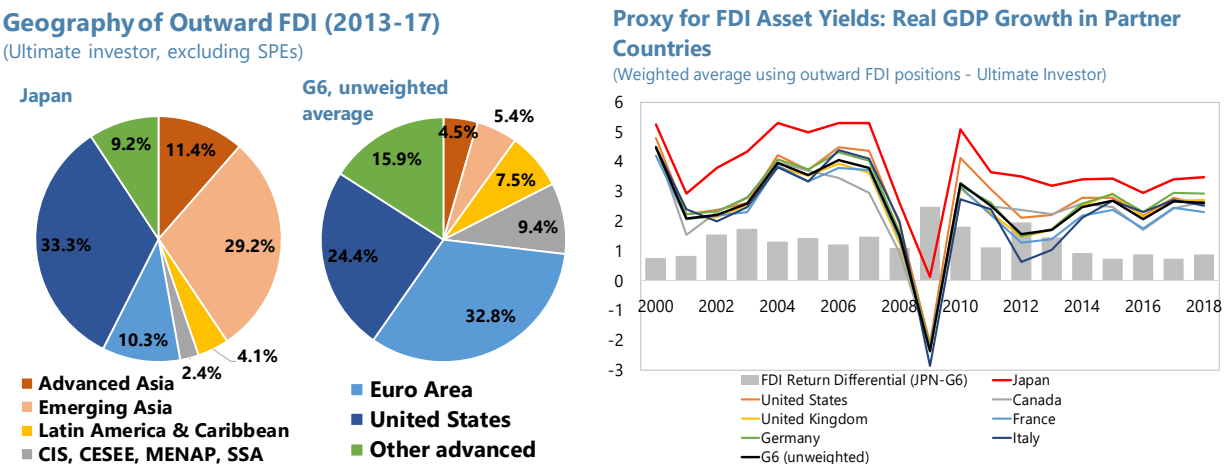
[7] Annex 1 presents further evidence on the respective role of stocks and yields in explaining Japan's large investment income balance compared to peers. Annex 2 shows that an alternative comparator group of advanced creditor countries (Belgium, Denmark, Germany, Israel, Korea) delivers similar results as those from Table 1.

- **A more favorable geographical allocation of FDI assets**, as Japan has a larger share of FDI in high-growth emerging Asia as well as the United States (Figure 3, left chart). This difference may explain around one percentage point of the higher yields in Japan than in G6 on average since 2000 (Figure 3, right chart).

- **Profit shifting through transfer pricing** may artificially boost investment income credits and suppress export figures. In the case of the United States, Wright and Zucman (2018) attribute the abnormally high returns on foreign investment (with a positive U.S. income balance, despite a negative NFA) in part to profit shifting. Tørsløv, Wier and Zucman (2018) estimate that $28 billion (0.6 percent of GDP) of profits were shifted out of Japan in 2015. Assuming that profit shifting mainly distorted Japan's direct investment income credits (and not the FDI asset position), Japan's "corrected" implied yield on FDI assets would be around 2 percentage points lower than at present.[8] Japan's move from a worldwide to a territorial tax system in 2009, while fostering dividend repatriation (Hasegawa and Kiyota, 2017) and reducing foreign cash holdings (Xing, 2018), may also have led to an intensification of transfer mispricing and profit shifting, as suggested by evidence based on the United Kingdom experience (Liu, Schmidt-Eisenlohr and Guo, 2017).

- **Other potential measurement issues.** High yields on foreign assets could also be a sign of potential measurement issues (see more below).

Figure 3. Japan: Geographical Allocation of FDI Assets, and Impact on Yields



Source: Damgaard, Elkjaer, and Johannesen (2019).

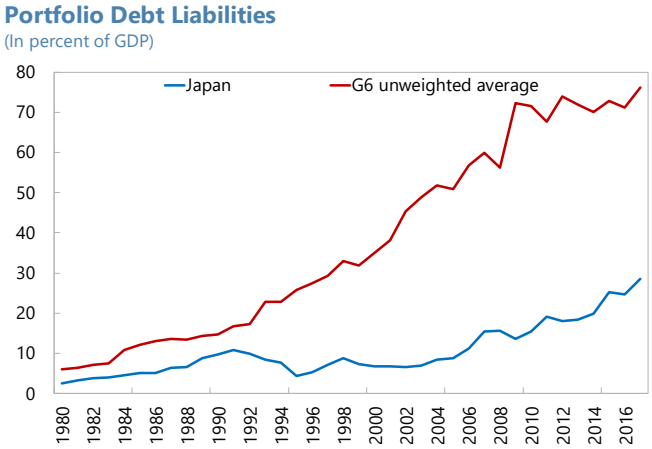
Sources: Damgaard, Elkjaer, and Johannesen (2019); World Bank WDI; and Authors' calculations.

[8] While profit shifting may partly explain Japan's high implied yields on FDI assets, both in absolute and relative to advanced economies (with profit shifting occurring mainly between large advanced economies and advanced tax havens, and thus being broadly neutral for advanced economies as a group), it does not explain the difference relative to G6 countries. Indeed, G6 economies are also affected by profit shifting, and their "corrected" implied yields on FDI assets would also be around 2 percentage points lower.

On the liabilities (or debit) side of the income-account-difference decomposition, Japan's stock of foreign liabilities is much smaller than that of G6 countries, especially for FDI but also for portfolio debt. This leads to a large contribution to the overall difference of investment income balances (3.2 out of the 3.5 percentage point of GDP difference).

- **FDI liabilities.** The fact that implicit yields paid on FDI liabilities are very high in Japan (close to 13 percent; see Table 1) suggests measurement issues, possibly on the valuation of FDI liabilities.[9] That said, adjusting implicit yields to the G6 level, while leaving FDI income payments unchanged, would only "correct" Japan's stock of FDI liabilities from 5 to 20 percent of GDP, i.e. still a level of FDI liabilities significantly below the G6 average level (at about 50 percent of GDP). The low level of inward FDI in Japan has long been recognized in the academic literature, including in relation to measurement issues and corporate governance (Lawrence, 1993; Ito and Fukao, 2005; and Hoshi, 2018).

- **Portfolio debt.** Portfolio debt income paid is small in Japan, due to both (i) low portfolio debt liabilities, and (ii) low implicit yields. On the government side, public foreign borrowing is indeed relatively low, especially when compared with G6 countries, due to the large pool of domestic saving available and domestic investors' willingness to hold Japanese public debt (strong home bias). On the corporate side, low corporate bond liabilities can be linked to the rise of corporate saving and the associated corporate deleveraging after the Japanese real estate bubble burst at the start of the 1990s. Indeed, while portfolio debt liabilities were following similar trends in Japan and in G6 countries in the 1980s, Japan's portfolio debt liabilities started to diverge from the trend in G6 countries after the bubble burst and as a consequence of corporate deleveraging (text chart). Finally, Japan's implied yields on portfolio debt are also lower than in G6 countries, due to the extremely accommodative monetary policy and low credit risk in Japan.



Source: Lane & Milesi-Ferretti database, External Wealth of Nations, 2018.

IV. Interconnectedness Between the Trade and Income Balances

Analysis of current account developments should take into account the interconnectedness between its components, the trade and income balances. While Section III studied the income balance through a static comparison across countries, the

[9] To the extent that a firm is included in national statistics, both its stock and flows of FDI should be captured, making it unlikely that macroeconomic aggregates omit FDI stocks without also omitting the corresponding flows. Measurement issues are more likely to lie in the method used to value the stock of FDI.

income balance may not reflect one for one on the current account balance given indirect effects through the trade balance. For example, additional revenue from an increase in the income balance may be spent, leading to higher imports and a lower trade balance.[10] In addition, the size of the current account balance may itself alter its composition over time. Countries experiencing current account surpluses over a sustained period of time, like Japan, will see a rise in their NFA and primary income, and to the extent that these additional revenues are spent, a decrease in their trade balance.[11] Ultimately, the size of the current account balance is driven by the saving-investment identity and its drivers, rather than any of its components taken in isolation. The remainder of this section further explores the interconnectedness between trade and income balances and their links with the current account.

In most countries, including Japan, the current account balance has a high and positive correlation with the trade balance (Figure 4, left panel, left bars). Indeed, most country-specific correlations between the current account and the trade balance (for the period 1980-2018 or longest available) are close to one (0.76 for Japan). Conversely, country-specific correlations between the current account balance and the income balance (total, primary, or secondary) tend to be much weaker, although there is substantial heterogeneity across countries.

On the other hand, the income balance is negatively correlated with the trade balance for most countries (Figure 4, left panel, right bars). Country-specific correlations between the trade balance and the income balance (total, primary, or secondary) are generally negative (-0.58 for both the total and primary income balances for Japan), with substantial heterogeneity across countries, especially for the secondary income balance. Several mechanisms may contribute to the observed negative correlation between the income and trade balances, including:

- ***General mechanisms:***

  - **Aging.** As countries age, they tend to accumulate net external assets to provide for consumption during old age, leading to an increasing income balance in the earlier phases of aging. In more advanced phases of aging, particularly the post-retirement phase, such countries are expected to start dissaving and increase imports, moving towards trade deficits.

  - **Income effect.** When the income balance increases, agents may consume the additional income, leading to higher imports and lowering the trade balance. This effect likely depends on the marginal propensity to consume of households receiving

[10] Conversely, a change in the trade balance may be partially offset by opposite changes in the income balance. For example, to the extent that the imposition of tariffs on a surplus/creditor country decreases its trade balance (after taking into account offsetting effects such as trade diversion and exchange rate depreciation), a resulting exchange rate depreciation may actually boost the income balance through the mechanical effect (see Section V), thus providing an additional offsetting mechanism.

[11] This is also consistent with the so-called "transfer problem," whereby countries with a high NFA tend to have more appreciated exchange rates (see e.g. Lane and Milesi-Ferretti, 2004), thus decreasing the trade balance.

the income: likely higher for secondary income (as migrant remittances flow to relatively poorer households), and lower for primary income (as firm shareholders tend to be wealthier).[12]

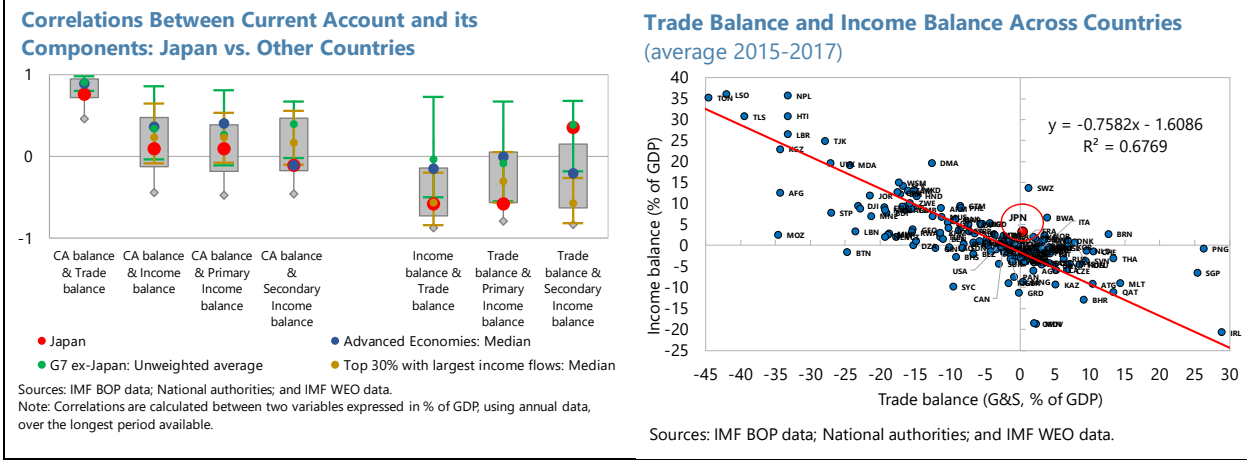
- **Market pressure.** Countries with high net debtor positions (and negative income balance) may need to run trade surpluses to meet external debt service obligations on their stock of foreign borrowing.

- Other ***mechanisms linked to globalization and the growing role of multinational firms*** may help explain the negative correlation between the income and trade balances as these forces have increasingly blurred the attribution of income between both balances:

  - **Offshoring.** As firms move their production facilities overseas, goods exports are progressively substituted by income receipts.[13]

  - **Profit shifting**, with transfer pricing affecting the trade and income balance in opposite and offsetting ways.

Figure 4. Japan: Negative Correlation Between Trade and Income Balances



The offsetting pattern between the trade balance and the income balance documented above at the country level is also observed across countries (Figure 4, right panel). Countries with a large population living abroad, receiving sizable migrants' remittances, tend to be located in the upper-left quadrant of the chart, illustrating the income effect. Low-tax jurisdictions, in turn, tend to appear in the lower-right quadrant due to distortions in the composition of their current account, reflecting profit shifting and the large role of

[12] When restricting the sample to the top 30 percent of economies with largest income flows (total, primary, secondary), correlations are more negative, especially for secondary income.

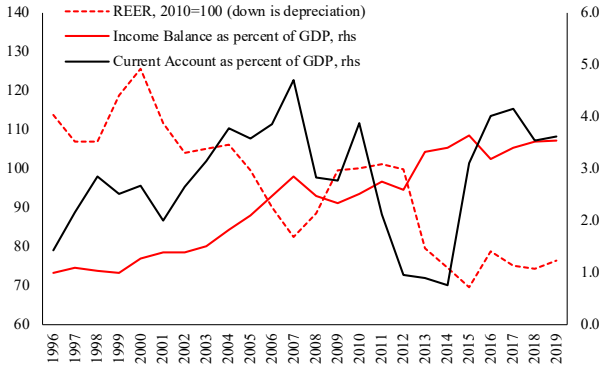
[13] Offshoring may also lead to increased services exports (intellectual property revenue including royalty payments and patent fees from overseas subsidiaries).

multinational firms. Conversely, less countries are located in the upper-right and lower-left quadrants, illustrating respectively the income effect and market pressures.

V. Does the Change in Current Account Composition Towards Income Balance Affect its Responsiveness to the Real Exchange Rate?

When facing movements in REER, there are several mechanisms at play affecting the response of the income balance and the external current account balance (CA).[14] While the trade balance response to REER changes has been widely studied, there is less literature on the income balance response—which is the focus in this paper. Notably, in the case of Japan, the increase in the income balance over the last few decades has occurred alongside REER depreciation (text chart), raising the question of the income balance responsiveness to REER changes. Alberola et al (2018) analyze the impact of foreign stock positions on the CA balance and its components, and find that the income balance is mostly determined by the NFA position while no statistically significant role is identified for exchange rates. Adler and Garcia-Macia (2018) analyze NFA returns defined as the income balance *plus NFA valuation changes*; however, with significant variation in (often large and volatile) valuation changes, results obtained on the role of the exchange rate on NFA returns in their analysis are not applicable to the income balance on its own (as studied here).[15]

Japan: REER, Current Account Balance, Income Balance



Sources: IMF BOP, INS, and WEO data.

Theoretically, we propose that the income balance response to exchange rate fluctuations can be decomposed into a mechanical effect (due to the currency composition of foreign assets and liabilities and related income credit and debit) and an economic effect:

- **Mechanical effect.** For most countries, foreign assets and related income credit tend to be denominated in foreign currency, implying that a REER appreciation would lead to a mechanical decrease in income credit (expressed as percentage of GDP). For example, in 2017 the share of foreign assets denominated in foreign currency was around 70 percent in the United States, 85 percent in Japan, and nearly 100 percent in the median emerging economy (EME), while it has been lower in the median G6 country since 1999 (at around 50 percent) following the creation of the euro (Bénétrix et al, 2019). However, the

[14] The analysis presented in Section V aims at better understanding how the income balance reacts to changes in exchange rates. Normative questions, such as whether Japan's current account or income balances should adjust, or not, are outside the scope of this paper. The reader is invited to consult IMF (2020) for the latest assessment of Japan's external position; in addition, the IMF External Sector Report focuses on the current account balance as a whole, rather than the income balance per se, given the interconnectedness between trade and income balances (see Section IV).

[15] NFA valuation changes apply to stock positions and are not included in the income balance; in contrast, the mechanical effect that we highlight here applies to flows (as such, it is much smaller than NFA valuation changes) and is part of the income balance.

currency denomination of foreign liabilities and related income debit is more heterogenous across countries, with advanced economies better able to borrow from abroad in domestic currency. For example in 2017, 85 percent of the United States' foreign liabilities were denominated in domestic currency, compared to 82 percent for the median G6 economy and 67 percent for Japan. This pattern implies a more limited mechanical effect from a REER appreciation on foreign liabilities and income debits for advanced economies. On the other hand, EME more often borrow in foreign currency due to the "original sin," delivering a mechanical decrease in foreign liabilities and income debits when the REER appreciates (80 percent of EME's foreign liabilities in 1990 were denominated in foreign currency, although that share has declined to 40 percent in 2017).[16]

- **Economic effect.** For small open economies and countries with low outward spillovers, a REER appreciation (of domestic currency against all other currencies) is unlikely to have a significant impact on growth and profits in the rest of the world, so it is not expected to affect income credits (except for the mechanical effect mentioned above). However, a REER appreciation may reduce domestic economic activity and profits (especially for exporting firms that become less competitive, or for domestic firms operating in the tradable sector, facing higher competition from foreign firms). It may thus lead to lower income debits (expressed as percentage of GDP) to the extent that firms operating in the domestic economy are, at least partially, foreign owned.[17]

Countries with large net creditor (debtor) positions are expected to see a reduction (increase) in their income balance with an appreciation, reinforcing (offsetting) the negative response of the trade balance. Overall, both income credits and debits are expected to decrease following an appreciation, with the resulting overall effect on the income balance dependent on the respective size of the credit and debit channels. In countries with a large net creditor position like Japan, an appreciation would likely lead to a decrease in the income balance, as long as the income credit channel dominates (with income credits being larger than income debits). In such countries, the income balance response would therefore reinforce the usual negative trade balance response to an appreciation. Conversely, in countries with a large net debtor position, the income debit channel may dominate and an appreciation would likely lead to an increase in the income balance, partially counterbalancing the trade balance response. Table 2 summarizes the expected theoretical effects of a REER appreciation.

[16] In this simplified presentation, we are not taking into account the potential effect that the REER appreciation may have on GDP (expressed in domestic currency), which would likely be much smaller than the mechanical effects on income credits and debits.

[17] An opposite relationship may be observed for commodity exporters, for which REER movements often reflect commodity price changes, and where extracting activities are often carried out to a large extent by foreign firms. In this case, a REER appreciation could signal improved prospects in the extracting sector and be associated with higher income debits.

Table 2. Theoretical Effects of REER Appreciation on Trade and Income Balances

Trade Balance (TB)				Income Balance (IB)						Current Account (CA)		
	Price effect	Volume effect	TOTAL TB Response[1]		Mechanical channel		Economic channel	TOTAL IB Response			TOTAL		
					ADV	EME		OVERALL	Large (+) NFA	Large (-) NFA	OVERALL	Large (+) NFA	Large (-) NFA
Exports value	+	--	-	Income credit	-	-	0[2]	-	--	-			
Imports value	-	++	+	Income debit	0[3]	-	-	-	-	--			
Trade balance			--	Income balance	-	?	+	?	-	+	--[4]	---	-[4]

[1] If the Marshall-Lerner condition is satisfied

[2] For a small open economy and countries with small outward spillovers

[3] If the country is able to borrow from abroad only in domestic currency

[4] If the trade channel dominates the income channel, as expected given relatively larger gross trade flows than income flows

Note 1: "+" represents a smaller increase than "++" while "-" represents a smaller decrease than "--"

Note 2: Grey shading represents the theoretical prediction for Japan

The empirical strategy to test theoretical priors from Table 2 uses a novel decomposition of income flows, and expands the panel-based IMF "CGER-inspired approach" to estimate income balance semi-elasticities. Panel estimation from the CGER-inspired approach is preferred over a country-specific regression due to the relatively low number of observations for a given country.

- To test predictions from Table 2, we use annual data for 1999-2018 on a sample of more than 40 countries (Annex 3 details data sources). We compute elasticity estimates both for total income flows, and for "economic income flows" (defined as the residual income flow after removing from total income flow the "mechanical effect" that alters income flow purely due to currency denomination). Our novel methodology to disentangle mechanical and economic effects within income credit and debit is detailed in Annex 4.

- To estimate income balance semi-elasticities, we first calculate panel-based income credit and debit elasticities separately. Next, both elasticities are combined using their respective country-specific shares (i.e. ratios of income credit and debit to GDP) as detailed in Annex 5. This method is parallel to the IMF "CGER-inspired approach" that estimates trade elasticities by combining export and import elasticities.

Our empirical estimates of income credit and debit elasticities broadly confirm our theoretical priors. Baseline results are shown in Table 3. The contemporaneous REER variable has the expected negative sign and is statistically significant in most specifications. Elasticities are relatively high for total income series (around -0.5 for income credit, see columns (1) and (2); and -0.3 for income debit, in columns (5) and (6)) but elasticities decrease when focusing only on "economic income" (to around -0.2 and -0.1 for credit and debit economic income, respectively). Adding one lag of the REER changes the significance of individual coefficients but does not materially affect elasticities. Our results contrast with those from Alberola et al (2018), who do not find any significant effect of the exchange rate (in nominal effective terms, using financial weights from the asset and liability sides). However, they look at the effect on the net income balance while our approach enables us to

uncover statistically significant but largely offsetting effects on the separate flows on income credit and debit.[18]

Table 3. Income Credit and Debit Elasticities to REER: Baseline Specification

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent Variable							
	Log of Income Credit, ratio to GDP	***Log of Income Credit, ratio to GDP***	***Log of Economic Credit, ratio to GDP***	***Log of Economic Credit, ratio to GDP***	***Log of Income Debit, ratio to GDP***	***Log of Income Debit, ratio to GDP***	***Log of Economic Debit, ratio to GDP***	***Log of Economic Debit, ratio to GDP***
Elasticity	***-0.56***	***-0.52***	***-0.20***	***-0.22***	***-0.28***	***-0.24***	***-0.14***	***-0.15***
Log of REER	-0.560***	-0.774***	-0.200**	-0.106	-0.279***	-0.474***	-0.141*	-0.0945
Log of REER, 1 lag		0.256**		-0.113		0.233**		-0.0560
Constant	-3.239***	-3.247***	-3.079***	-3.076***	-3.232***	-3.238***	-3.150***	-3.149***
Observations	964	964	944	944	964	964	944	944
R-squared	0.931	0.932	0.864	0.864	0.922	0.922	0.885	0.886
RMSE	0.213	0.212	0.326	0.326	0.216	0.216	0.268	0.268

Elasticities are calculated as the sum of coefficients for the REER and its lags.
Estimations include country and time fixed effects (not shown)
*** p<0.01, ** p<0.05, * p<0.1

Robustness tests and alternative specifications confirm negative estimates of elasticities for total income credit and debit, highlighting a relatively strong mechanical channel, while evidence on the economic channel is mixed. Annex 6 presents additional estimates and robustness tests.

- Distinguishing between advanced and emerging economies (Tables A2 and A3) leaves elasticities for total income credit and debit broadly unchanged, at -0.5 and -0.3 respectively. However, while "economic credit" and "economic debit" elasticities (i.e. net of the mechanical effect) are negative for emerging economies—though not statistically significant, they are positive for advanced economies—and statistically significant for credit. This finding suggests that our assumption in Table 2 that focuses on small open economies and lack of outward spillovers for predictions on economic credit may be ill fitting for advanced economies (as it appears that an appreciation will strengthen their economic credit, perhaps due to the enhanced competitiveness and performance of the economies where advanced economies invest in).

[18] Although the income credit and debit effects partially offset each other in an "average" economy (which may explain why Alberola et al do not find any effect of the exchange rate on the net income balance), these effects do not offset each other when the income balance is highly asymmetric, i.e. in large creditor or debtor countries.

- To account for delayed income responses or quick reversals in exchange rate movements, we use 5-year averages in Table A4 (as in Colacelli, 2010).[19] We build averages of the variables in the estimating equations for the periods 1999-2003, 2004-2008, 2009-2013 and 2014-2018. As expected, this specification removes much of the mechanical effect, with elasticities for "economic income" now close to the respective elasticities for total income. "Economic debit" elasticity is negative (as expected from Table 2), but not statistically significant, while "economic credit" elasticity is also negative suggesting that significant outward negative spillovers from appreciation may play a role when considering the 5-year period.

- To account for the potential importance of past realizations of income credit/debit on current income credit/debit, the lag of the dependent variable is used as an explanatory variable (Table A5). The estimation of this dynamic model of income credit/debit confirms negative elasticities for total income credit and debit (although the precise estimates are sensitive to the number of lags used for the REER). However, elasticities for the "economic effect" under the dynamic model are either not statistically significant (debit) or positive (credit). An alternative specification in first differences (Table A6) led to broadly similar results.

- We also add as control variables the size of foreign assets and liabilities (Table A7). To avoid that these additional control variables pick up some of the exchange rate effect (through their own valuation changes), we correct them following the methodology from Annex 4. While some of the resulting elasticities (income credit, economic debit) are in line with previous results, others are not (economic credit, income debit). Indeed, the control variable on foreign assets shows a negative sign in the economic credit regressions, suggesting possible issues with our valuation-effects correction of the added control variable.

Overall, the evidence points to relatively strong total income and mechanical effects. However, we find mixed results for economic effects, suggesting that we may need to consider additional theoretical channels for economic credit and debit responses to exchange rate fluctuations (beyond those in Table 2). Notably, it is possible that our specific calculation of the mechanical effect may under- or over adjust total income credit and debit (due to lack of official data on currency composition of income flows, and/or due to imputed values in the IIP currency composition dataset), complicating the proper identification of economic effects.

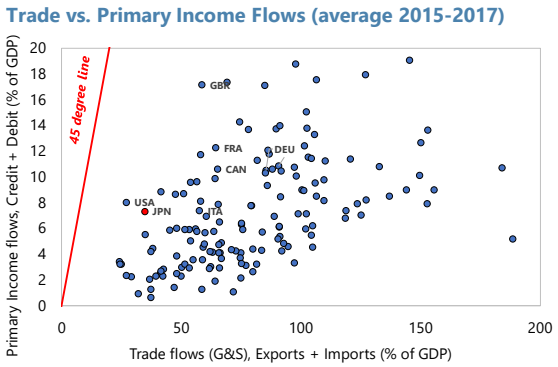
Our results suggest that the response of the income balance to exchange rate movements is smaller than the trade balance response. On one hand, an average absolute magnitude of 0.4 for income flow elasticities (-0.5 for income credit and -0.3 for income debit) is broadly similar to the magnitude of trade flow elasticities found in the literature.[20]

[19] We also tested for two lags of the REER, but the second lag was not statistically significant.

[20] Using the CGER-inspired approach, Cubeddu et al (2019) find REER elasticities of -0.11 and 0.57 for nominal exports and imports respectively (i.e. an average absolute magnitude of trade flow elasticities of 0.34). Leigh et al (2017) find exchange rate pass-through of 0.55 and -0.61 for export and import prices, and -0.32 and -0.30 price elasticities of export and import volumes. See IMF (2019) and Adler et al (2020) for further recent evidence on REER elasticities.

On the other hand, estimated income balance semi-elasticities are smaller than corresponding trade balance semi-elasticities for two reasons:

- While export and import elasticities have opposite signs, thus reinforcing the total impact on trade balance, income credit and debit elasticities have the same sign, with their effect cancelling out to a large extent;
- Income flows as a ratio to GDP (used to weigh income credit and debit elasticities to derive an income balance semi-elasticity; see Annex 5) are much smaller than trade flows for all countries (text chart).



Sources: IMF BOP data; and National authorities; and IMF WEO data.

For large creditor countries like Japan, the income balance response to changes in the real exchange rate would (marginally) amplify the trade balance response. When income credit flows are significantly larger than income debit flows, the income credit channel will dominate (as per the formula linking income credit and debit elasticities to the income balance semi-elasticity; see Annex 5). For Japan, applying income credit and debit ratios to GDP to the elasticities from Table 3 leads to an income balance semi-elasticity of -0.03 (versus trade balance semi-elasticities of -0.12 to -0.14 in Cubeddu et al, 2019).[21] The current account response to changes in REER in Japan would thus be only marginally larger when taking into account the income balance response, in addition to the usual trade balance response. Alternatively, in large debtor countries, the opposite effect may be observed as the income debit channel would dominate; in this case, the income balance response to changes in the real exchange rate would somewhat offset the trade balance response, and would therefore reduce the estimated current account response to REER changes.[22]

VI. Conclusions

The gradual increase in Japan's external income balance primarily reflects net revenues from an increasingly positive NFA position. Japan's high income balance is primarily the result of a highly asymmetric income account. The Japanese income balance

[21] More precisely, we used income credit and debit elasticities from columns (1) and (5) in Table 3, together with income credit and debit ratios to GDP of 5.5 and 1.8 percent, respectively. Japan's income balance semi-elasticity is -0.026, computed as $[0.055 * (-0.56) - 0.018 * (-0.28) = -0.026]$. We used a joint test to confirm that Japan's income balance semi-elasticity (of -0.026) is statistically different from zero.
We also estimated Japan-specific elasticities for income credit and debit with our baseline specification using only Japan data (Annex 6, Table A8). While the obtained estimates are larger than those from the panel regression, as Japan's income balance semi-elasticity would be -0.073 (computed as $[0.055 * (-1.97) - 0.018 * (-1.95) = -0.073]$), we discount these results due to the limited sample size.

[22] In addition, focusing solely on the trade balance semi-elasticity in a panel setting (CGER-inspired approach) may lead to overestimating the magnitude of the CA-REER semi-elasticity in tax havens. Our results suggest that including the income balance semi-elasticity in the CGER-inspired approach may help offset this bias. See Annex 5 for a more detailed discussion.

has been increasing over time, in line with a larger NFA position reflecting past current account surpluses and the increase in corporate saving. When compared with other G7 peer countries, Japan's relatively high income balance is due to:

- *higher yields on investment abroad*, especially on FDI (from "better" geographical positioning and possibly profit shifting), which more than offset a somewhat lower stock of foreign assets;

- *much lower FDI liabilities* (due to possible measurement issues, corporate governance, or regulatory and administrative issues) *and lower portfolio debt liabilities* (due to strong home bias and corporate deleveraging); and

- *lower yields on portfolio debt liabilities* (linked to extremely accommodative monetary policy and low credit risk in Japan).

Offsetting patterns between the trade and income balances, within the external current account, highlight their interconnectedness and the blurring impact of globalization and multinational firms on the attribution of income. While Japan's current account balance has remained relatively stable over the past decades, a downward trend in the trade balance has been offset by an upward trend in the income balance. However, gross trade flows continue to be significantly larger than gross income flows in Japan and across countries. The income balance is negatively correlated with the trade balance, possibly reflecting several mechanisms including (i) aging, (ii) an income effect, (iii) market pressures, but also (iv) offshoring and (v) profit shifting through transfer pricing.

For Japan, the income balance response to changes in the real exchange rate is estimated to reinforce the trade balance response, although only marginally. Contributing to the literature, panel estimates include separate exchange rate elasticities for income account credit and debit, with novel accounting that disentangles the mechanical from the economic response to exchange rate fluctuations. Estimates indicate that income credits and debits tend to decrease with a REER appreciation. Given relatively low gross income flows and partially offsetting credit and debit responses, the income balance response to real exchange rate movements is nonetheless smaller than the traditionally emphasized trade balance response. The compositional change in Japan's current account balance over recent decades, with the income balance being more prominent, does not in itself fundamentally modify the external adjustment process via the exchange rate, which appears to operate mainly through the trade balance. However, our results highlight that the income balance response to REER changes may amplify the traditional trade balance response in large net creditor countries such as Japan, and dampen it in large debtor countries.

Continued efforts towards promoting FDI inflows would support productivity growth and may contribute to boosting income debits, however with unclear effects on Japan's income balance and current account. While the promotion of inward FDI was one of the policy goals of Abenomics' structural reforms, recent evidence suggests that additional steps are needed to further boost inward FDI to the level of peer countries (Hoshi, 2018). Larger inward FDI would support Japan's productivity growth. Steps to boost inward FDI could include addressing corporate governance issues (with Japan's corporate governance being an

"insider system" with limited power for shareholders, potentially discouraging foreign ownership; see e.g. Hoshi, 2018) and regulatory and administrative issues, including by reducing the cost of doing business. The latter is in line with IMF advice to reform product markets, by reducing barriers to entry in some industries as well as accelerate deregulation of agricultural and professional services sectors, in order to foster growth and investment (IMF, 2018, 2020a, 2020b). While higher FDI inflows would likely boost income debits, the overall impact on the income balance and current account is unknown given possible indirect offsetting effects.[23]

Further research is needed to better understand the role of profit shifting in shaping Japan's income balance. While existing cross-country studies (e.g. Tørsløv et al, 2018) suggest that profit shifting out of Japan may be non-negligible, the size of related potential distortions to the composition of Japan's current account balance (and the relative size of the trade and income balances) remains unclear. Further analysis would help inform the debate on the costs of profit shifting to the Japanese economy and design of an optimal taxation regime.

[23] The general equilibrium analysis needed to determine the impact of higher FDI on the income balance and the CA balance is beyond the scope of this paper.

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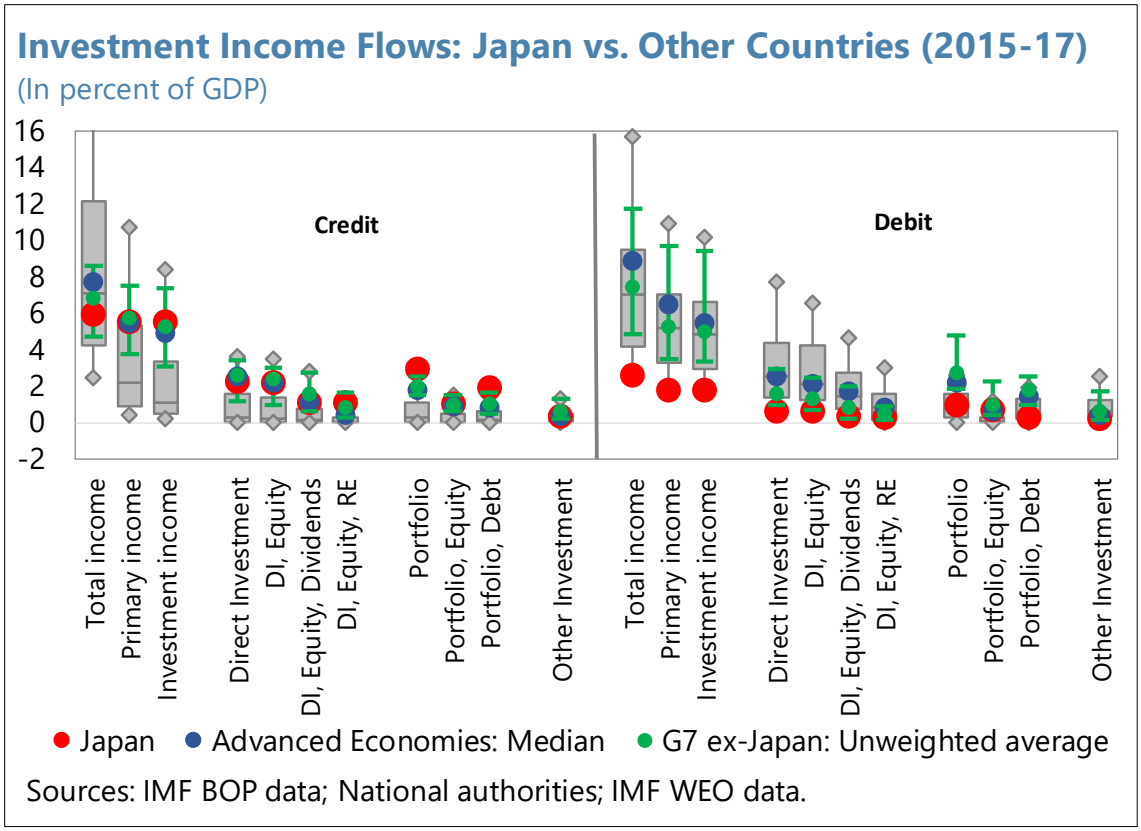
Annex 1. Comparing Japan's Income Balance to Peers – The Role of Stocks vs. Implied Yields

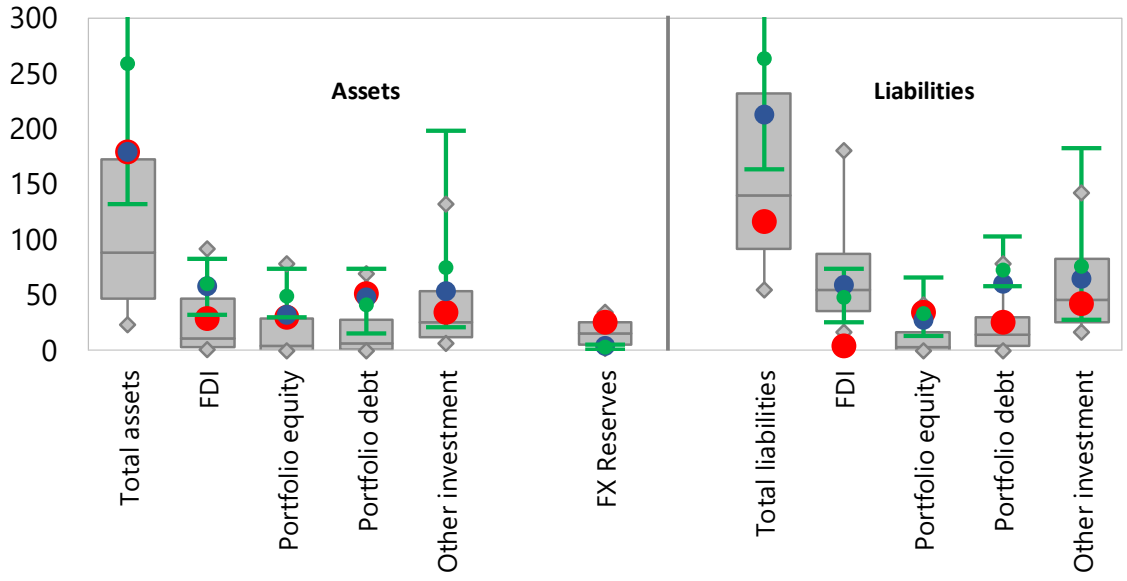
The following charts compare Japan's investment income flows (red dots) to peers: (i) G6 countries (with green dots marking the G6 unweighted average, and the green bars denoting the minimum and maximum values among G6); (ii) advanced economies (with blue dots denoting the median); and (iii) a larger 100-country sample (with boxes showing 25-75 percentiles, and diamonds showing 10-90 percentiles).

Subsequent charts further decompose investment income flows into stocks (second chart) and implied yields (third chart). Implied yields are obtained by dividing investment income gross flows (credit, debit) by the corresponding stock positions (assets, liabilities).



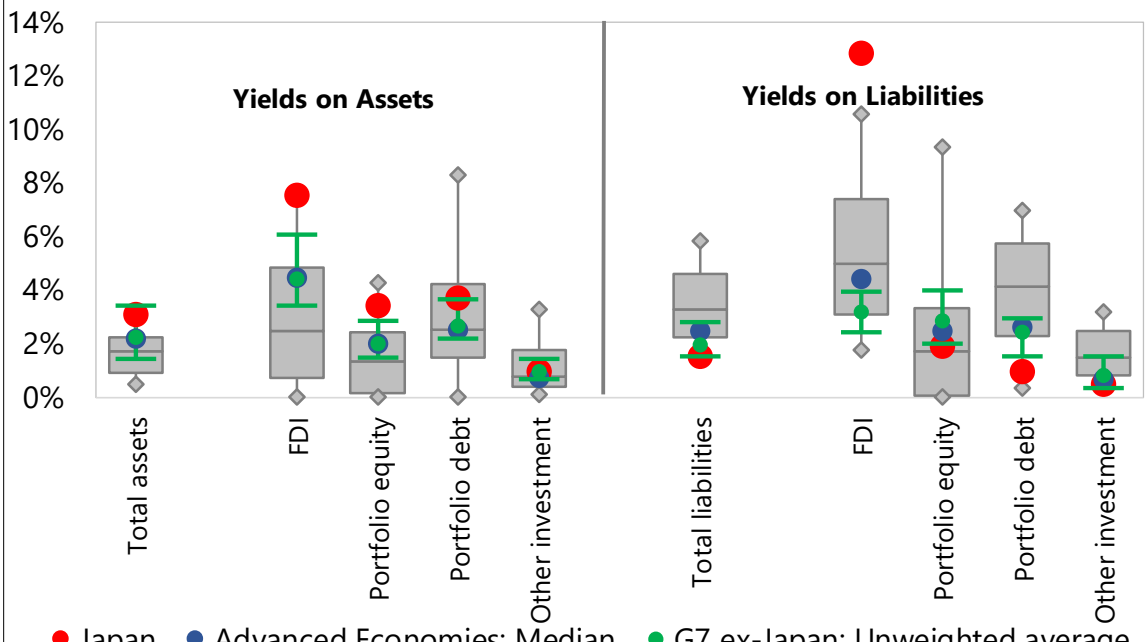
International Investment Position: Japan vs. Other Countries (2015-17)

(In percent of GDP)



Source: Lane and Milesi-Ferreti database, External Wealth of Nations, 2018.

Implied Yields on IIP: Japan vs. Other Countries (2015-17)



Sources: Lane and Milesi-Ferreti database, External Wealth of Nations, 2018; IMF BOP data; National authorities; and IMF WEO data.

Annex 2. Comparing Japan's Income Balance to Peers – Advanced Creditor Countries

Table 1 in section III decomposes the difference between Japan and G6 countries' investment income balances into the respective contributions of stocks and implied yields, on the asset and liability sides. Table A.1 below shows that choosing a different comparator group, i.e. advanced creditor countries (Belgium, Denmark, Germany, Israel, Korea) does not materially affect the results.

Table A1. Japan and Advanced Creditors' Income Balance – Contributions of Stocks and Yields (2015–17 average)

			Total (net)	ASSETS					LIABILITIES				
				Total	FDI	Portfolio Equity	Portfolio Debt	Other	Total	FDI	Portfolio Equity	Portfolio Debt	Other
Japan	Income flows	% of GDP	3.7	5.5	2.2	1.0	1.9	0.3	1.8	0.6	0.7	0.3	0.2
	Stocks	% of GDP	62.1	146.2	29.6	30.5	51.3	34.7	109.5	5.0	35.3	26.2	43.0
	Implied Yields	percent		3.8%	7.5%	3.4%	3.7%	0.9%	1.6%	12.9%	1.9%	1.0%	0.5%
Other creditors (ex. tax havens, oil exporters): DEU, BEL, DNK, KOR, ISR	Income flows	% of GDP	0.9	5.6	3.0	0.8	1.2	0.5	4.7	2.4	0.9	1.1	0.3
	Stocks	% of GDP	38.8	234.3	85.6	43.9	45.0	59.7	212.3	72.0	38.8	51.7	49.8
	Implied Yields	percent		2.4%	3.5%	1.9%	2.7%	0.9%	2.2%	3.3%	2.3%	2.0%	0.6%
Contributions to Income Balance difference	**Income flows**	% of GDP	**2.8**	**-0.1**	**-0.8**	**0.2**	**0.7**	**-0.2**	**-2.9**	**-1.8**	**-0.2**	**-0.8**	**-0.1**
	Stocks	% of GDP	2.4	-3.5	-3.1	-0.4	0.2	-0.2	-5.9	-5.4	-0.1	-0.4	0.0
	Implied Yields	% of GDP	0.4	3.4	2.3	0.6	0.5	0.0	3.0	3.7	-0.2	-0.4	-0.1

Source: IMF BOP data; National authorities; IMF WEO data; Lane & Milesi-Ferretti database, External Wealth of Nations, 2018; and Authors' calculations.

Annex 3. Income Balance Semi-Elasticity Estimates – Data and Sources[24]

Panel regression: annual frequency, period 1999-2018.

Country sample: Argentina, Australia, Austria, Belgium, Brazil, Canada, Chile, Colombia, Czech Republic, Denmark, Egypt, Finland, France, Germany, Greece, Guatemala, Hungary, India, Indonesia, Ireland, Israel, Italy, Japan, Korea, Malaysia, Mexico, Morocco, Netherlands, New Zealand, Norway, Pakistan, Peru, Philippines, Poland, Portugal, Russia, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Thailand, Tunisia, Turkey, United Kingdom, United States and Uruguay.

Variables:

- **Foreign Assets & Liabilities**: External Wealth of Nations database (Lane and Milesi-Ferretti, 2018).
- **Income Balance, GDP, Nominal Exchange Rates**: IMF's WEO or IFS datasets.
- **Currency weights**: sourced from Bénétrix et al (2019). The dataset estimates the share/weight of the five SDR basket currencies (USD, EUR, GBP, JPY and CNY), domestic currency (DC) and other foreign currency (OFC) in total assets (w_{ij}^{a}) and liabilities (w_{ij}^{l}), for a group of 50 countries (EBA sample) over the period 1990-2017. For the years for which currency weights data is missing (i.e. 2018), we assume the weights to remain constant at the level of the closest available observation (2017).

[24] Data used in the paper is available from the authors upon request.

Annex 4. Income Credit and Debit – Disentangling Mechanical and Economic Effects

We decompose overall income credit and debit into mechanical and economic effects. The mechanical effect on income credit (resp. debit) is defined as a multiplicative scaling factor accounting for the changes to income credit (resp. debit) resulting directly from the interplay between exchange rate movements and the currency composition of income credit (resp. debit)—where we assume the currency composition to be in line with that of foreign assets (resp. liabilities). The economic income credit (resp. debit) is defined as the residual income credit (resp. debit) after removing the mechanical effect.

In practice, this procedure involves two steps:

Step 1: Construct currency-of-investment weighted (CIW) exchange rate indices ($\boldsymbol{ER_i^{ciw}}$)

The indices are calculated as geometric averages of the ratios of bilateral exchange rates vis-à-vis the US dollar (R_i/R_j), for the home country (i) and its investment partners (j), rebased to be equal to one in 2010. The weights (W_{ij}) used on the asset (resp. liability) side to calculate the geometric average are the known shares of USD, EUR, GBP, CNY, JPY and domestic currency in foreign assets (resp. liabilities), taken from Bénétrix et al (2019). Given that the exact currency composition of foreign assets with regard to "other currencies" is unknown, we assume that foreign assets in "other currencies" are denominated in the known foreign currencies in the given country-year, effectively boosting the weights for known foreign currencies (in proportion to their known weight), while not changing the dataset weight for domestic currency:

$$ER_{it}^{a} = \Pi_{j \neq i} \left(\frac{R_{it}/R_{i2010}}{R_{jt}/R_{j2010}} \right)^{W_{ijt}^{a}}$$

with $\sum_{\boldsymbol{j \in \{USD,EUR,GBP,CNY,JPY\}}} \boldsymbol{S_{ijt}^{a}} + \boldsymbol{S_{i,other,t}^{a}} + \boldsymbol{S_{i,DC,t}^{a}} = \boldsymbol{1}$

and $\boldsymbol{W_{ijt}^{a}}$ defined such that: $\sum_{\boldsymbol{j \in \{USD,EUR,GBP,CNY,JPY\}}} \boldsymbol{W_{ijt}^{a}} + \boldsymbol{S_{i,DC,t}^{a}} = \boldsymbol{1}$

i.e.: $$\boldsymbol{W_{ijt}^{a}} = \boldsymbol{S_{ijt}^{a}} \times \frac{\sum_{\boldsymbol{k \in \{USD,EUR,GBP,CNY,JPY\}}} \boldsymbol{S_{ikt}^{a}} + \boldsymbol{S_{i,other,t}^{a}}}{\sum_{\boldsymbol{k \in \{USD,EUR,GBP,CNY,JPY\}}} \boldsymbol{S_{ikt}^{a}}}$$

We make similar calculations on the liability side. Finally, we define the currency of investment weighted (CIW) exchange rate index as:

$$ER_{it}^{ciw} = \frac{ER_{it}^{a}}{ER_{it}^{l}}$$

where:

$\boldsymbol{R_{it}}$: Period average bilateral nominal exchange rate of country *i* currency vis-à-vis the US dollar at time *t*
$\boldsymbol{S^a_{ijt}}$: Share of currency *j* in the foreign assets of country *i* at time *t*
$\boldsymbol{W^a_{ijt}}$: Corresponding adjusted weight
$\boldsymbol{S^l_{ijt}}$: Share of currency *j* in the foreign liabilities of country *i* at time *t*
$\boldsymbol{W^l_{ijt}}$: Corresponding adjusted weight
$\boldsymbol{ER^a_{it}}$: Exchange rate index weighted by currency composition of foreign assets at time *t*
$\boldsymbol{ER^l_{it}}$: Exchange rate index weighted by currency composition of foreign liabilities at time *t*

Step 2: Define the mechanical and economic effects

We define the mechanical and economic effects as follows:

$$M^c_{it} = ER^a_{it}$$

$$E^c_{it} = \frac{IB^c_{it}}{M^c_{it}}$$

Where for country *i* and time *t*:

$\boldsymbol{IB^c_{it}}$: Income credit, expressed as percent of GDP
$\boldsymbol{M^c_{it}}$: Mechanical effect on income credit (scaling factor), equals to one in 2010
$\boldsymbol{E^c_{it}}$: Economic effect on income credit, expressed as percent of GDP, with economic effect equal to income credit in 2010

The same formulae are applied to income debit using ER^l_{it} to calculate the mechanical and economic effects.

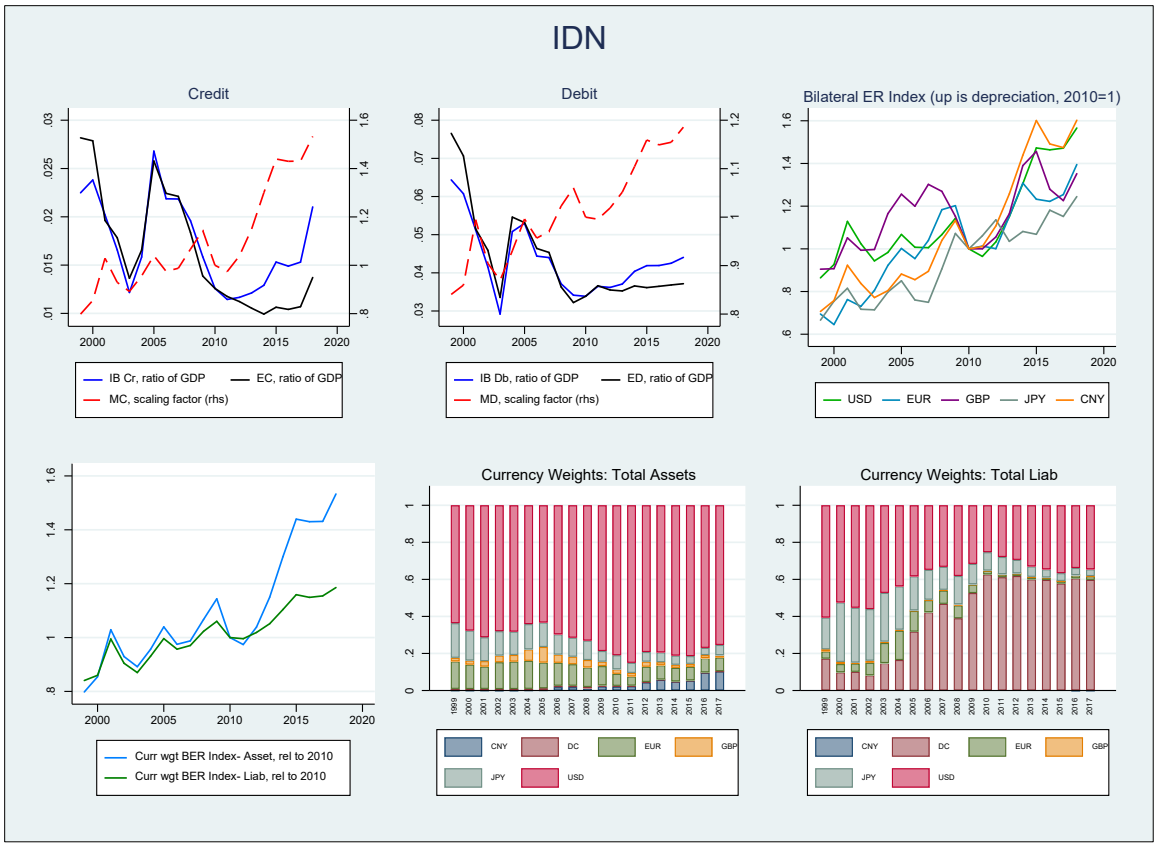
Estimated economic and mechanical income credit and debit are shown for Japan, China and Indonesia in the charts below.[25] Intuition on economic and mechanical effects for Japan is as follows:

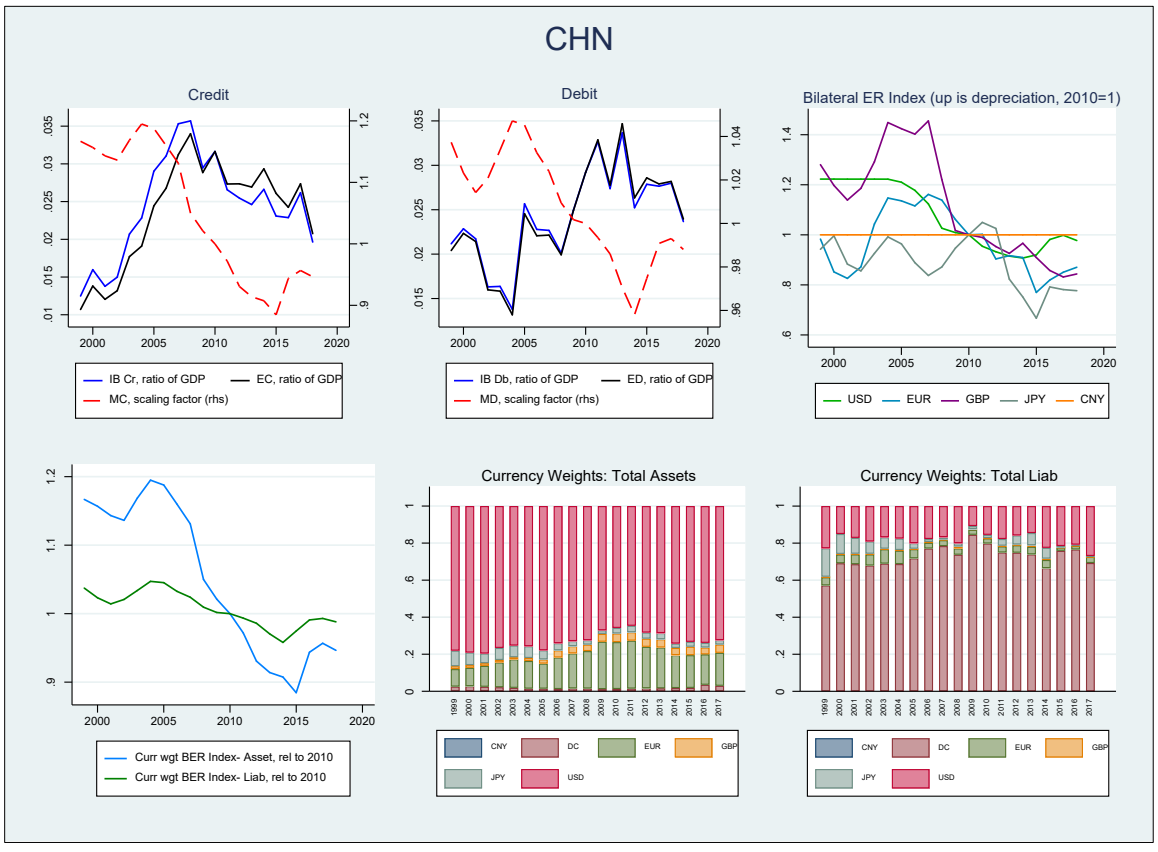
- *Income credit* as a percentage of GDP decreased markedly during the GFC, in line with observed yen appreciation (top left chart, blue line). Later, income credit increased markedly in the years of yen depreciation. Our estimated mechanical effect (dashed red line) accounts for most of these fluctuations, with the economic income credit (black line) being much smoother than the unadjusted income credit series.

- While *income debit* (top middle chart, blue line) exhibits largely similar fluctuations as income credit, our estimated mechanical effect (dashed red line) does not correct as much as it does for credit. This is because, in the dataset we use (Bénétrix et al, 2019), domestic currency represents a much larger share of Japan's foreign liabilities (bottom right chart)

[25] The "DC" label in the Japan chart represents "JPY" or yen. The "DC" label in the China chart represents "CNY" or renminbi.

than of foreign assets (bottom middle chart). It should be noted that, while the dataset used on IIP currency composition is partly based on authorities' survey responses, estimates are used when official data are missing (via instrument-specific assumptions). In the case of Japan, it seems likely that the share of yen in income debit may be overestimated given that the mechanical effect is not significantly smoothing out fluctuations in debit that are seemingly driven by exchange rate fluctuations.


IDN
Credit
IB Cr, ratio of GDP
EC, ratio of GDP
MC, scaling factor (rhs)
Debit
IB Db, ratio of GDP
ED, ratio of GDP
MD, scaling factor (rhs)
Bilateral ER Index (up is depreciation, 2010=1)
USD
EUR
GBP
JPY
CNY
Curr wgt BER Index- Asset, rel to 2010
Curr wgt BER Index- Liab, rel to 2010
Currency Weights: Total Assets
Currency Weights: Total Liab
CNY
DC
EUR
GBP
JPY
USD


CHN
Credit
IB Cr, ratio of GDP
EC, ratio of GDP
MC, scaling factor (rhs)
Debit
IB Db, ratio of GDP
ED, ratio of GDP
MD, scaling factor (rhs)
Bilateral ER Index (up is depreciation, 2010=1)
USD
EUR
GBP
JPY
CNY
Curr wgt BER Index- Asset, rel to 2010
Curr wgt BER Index- Liab, rel to 2010
Currency Weights: Total Assets
Currency Weights: Total Liab
CNY
DC
EUR
GBP
JPY
USD

Annex 5. Income Balance Elasticities – Empirical Strategy

The semi-elasticity of the current-account-to-GDP ratio with respect to the real effective exchange rate can be written as follows:

$$\frac{\Delta(CA/GDP)}{\Delta(ER)/ER} = \underbrace{\eta^{TB}}_{Trade\ account} + \underbrace{\eta^{IB}}_{Income\ account}$$

Where $\eta^{Bal} = \frac{\Delta(Bal/GDP)}{\Delta(ER)/ER}$ with $Bal = TB, IB$ is the semi-elasticity of the nominal (trade, income) balance-to-GDP ratio, and ER is a measure of the exchange rate. [26]

Using the IMF CGER-Inspired Approach for the Income Balance

To calculate the semi-elasticity of income balance to exchange rates, we follow CGER's indirect method that has previously focused on the trade balance semi-elasticity.

This method originally relied on panel regressions to estimate separately the elasticities of exports and imports, before combining them by using trade openness ratios (see e.g. Cubeddu et al, 2019). We extend the methodology in this paper to the income account, by decomposing income balance semi-elasticities into (i) the responsiveness of income flows to exchange rate; and (ii) the size of income flows. More precisely, the semi-elasticities of interest can be written as:

$$\eta^{TB} = \eta^{X} s^{X} - \eta^{M} s^{M}$$
$$\eta^{IB} = \eta^{IC} s^{IC} - \eta^{ID} s^{ID}$$

Where X, M, IC, ID are nominal flows, respectively exports, imports, income credits and income debits, $\eta^{Flow} = \frac{\Delta(Flow/GDP)/(Flow/GDP)}{\Delta(ER)/ER}$ is the elasticity of nominal flow-to-GDP ratio, and $s^{Flow} = \frac{Flow}{GDP}$ is the ratio of nominal flow to GDP.

Focusing on income flows, our most general specifications are defined as follows (with our baseline specifications in Table 3 being a simpler version):

$$ln\left(\frac{IC_{it}}{GDP_{it}}\right) = \delta_1^{IC}\ ln\left(\frac{IC_{it-1}}{GDP_{it-1}}\right) + \sum_{j=0}^{n} \beta_j^{IC}\ ln\left(ER_{it-j}\right) + \gamma_1^{IC}\ ln\left(\frac{FA_{it-1}}{GDP_{it-1}}\right) + \alpha_i + \lambda_t + \varepsilon_{it}$$

$$ln\left(\frac{ID_{it}}{GDP_{it}}\right) = \delta_1^{ID}\ ln\left(\frac{ID_{it-1}}{GDP_{it-1}}\right) + \sum_{j=0}^{n} \beta_j^{ID}\ ln\left(ER_{it-j}\right) + \gamma_1^{ID}\ ln\left(\frac{FL_{it-1}}{GDP_{it-1}}\right) + \alpha_i + \lambda_t + \varepsilon_{it}$$

[26] The estimation assumes that the CA response to the exchange rate is the sum of the separately estimated trade balance response and income balance response. This assumption is parallel to the one used by CGER's indirect method when estimating the trade balance response by using export and import elasticities estimated separately.

where:

$\boldsymbol{IC_{it}}$:	Nominal income, credit of country *i* at time *t* (in current US dollar)
$\boldsymbol{ID_{it}}$:	Nominal income, debit of country *i* at time *t* (in current US dollar)
$\boldsymbol{GDP_{it}}$:	Nominal GDP of country *i* at time *t* (in current US dollar)
$\boldsymbol{ER_{it}}$:	Exchange rate index, for country *i* at time *t* (base year = 2010)
$\boldsymbol{FA_{it}}$:	Nominal foreign assets of country *i* at time *t* (in current US dollar)
$\boldsymbol{FL_{it}}$:	Nominal foreign liabilities of country *i* at time *t* (in current US dollar)
$\boldsymbol{\alpha_i}$:	Country fixed effects
$\boldsymbol{\lambda_t}$:	Year fixed effects

Elasticities of income credits and income debits can then be calculated as:

$$\eta^{Flow} = \frac{\sum_{j=0}^{n} \beta_j^{Flow}}{1-\delta_1^{Flow}} \quad \text{with } Flow = IC, ID$$

The long-run semi-elasticity of the income balance (as a ratio to GDP) η^{IB} is then derived using η^{IC}, η^{ID}, and the corresponding shares (ratios of income credits and income debits to GDP) as follows:

$$\eta^{IB} = \eta^{IC} s^{IC} - \eta^{ID} s^{ID}$$

While the specifications above apply to total income credits and debits, we use the exact same specifications for the respective economic credit/debit (by replacing total income credit/debit with economic credit/debit).

Extra: Profit-Shifting and Current Account Elasticities

Taking into account the income balance in the IMF CGER-inspired approach could help address the upward bias in tax havens' CA-REER semi-elasticities. To see this, consider a tax haven where, with obvious notations, $CA = TB + IB$. The current account, trade and income balances can be written as:

$$CA = CA^* + CA^{ps}$$
$$TB = TB^* + TB^{ps}$$
$$IB = IB^* + IB^{ps}$$

Where variables denoted by * are "true" balances, and variables denoted by *ps* are distortions related to profit shifting. We also have $CA^{ps} = TB^{ps} + IB^{ps} = 0$: what comes in the tax haven e.g. as transfer mispricing (TB^{ps}), ultimately comes out as repatriated profits (IB^{ps}).

In this framework, the CA-REER semi-elasticity can be written as:

$$\begin{aligned} \eta^{CA} &= \eta^{TB} + \eta^{IB} \\ &= (\eta^X s^X - \eta^M s^M) + (\eta^{IC} s^{IC} - \eta^{ID} s^{ID}) \\ &= \eta^X \left(s^{X^*} + s^{X^{ps}}\right) - \eta^M \left(s^{M^*} + s^{M^{ps}}\right) + \eta^{IC} \left(s^{IC^*} + s^{IC^{ps}}\right) - \eta^{ID} \left(s^{ID^*} + s^{ID^{ps}}\right) \end{aligned}$$

In the IMF CGER-inspired approach, the panel setting implies that:

$$\eta^{X} = \eta^{X^*} = \eta^{X^{ps}}$$
$$\eta^{M} = \eta^{M^*} = \eta^{M^{ps}}$$
$$\eta^{IC} = \eta^{IC^*} = \eta^{IC^{ps}}$$
$$\eta^{ID} = \eta^{ID^*} = \eta^{ID^{ps}}$$

Finally, the CA-REER semi-elasticity can be rewritten as:

$$\eta^{CA} = \eta^{TB^*} + \eta^{TB^{ps}} + \eta^{IB^*} + \eta^{IB^{ps}} = \eta^{CA^*} + \eta^{CA^{ps}}$$

Tax havens are highly open economies. While smaller economies naturally tend to have higher trade openness ratios, Hebous and Johannesen (2015) provide evidence that profit shifting inflates trade in services.[27] $\eta^{TB^{ps}}$ may therefore introduce an upward bias in the magnitude of the trade balance semi-elasticity (as derived from the panel CGER-inspired approach). However, profit shifting also affects the composition of tax haven's CA balances, increasing their trade balance while decreasing their income balance (Guvenen et al, 2017; Tørsløv et al, 2018). As shown in Section V of this paper, countries with large negative income balances tend to have trade balance and income balance semi-elasticities of opposite signs. Therefore, $\eta^{IB^{ps}}$ would likely help offset the upward bias introduced by $\eta^{TB^{ps}}$. Therefore, including income balance semi-elasticities in the CGER-inspired approach would presumably lead to lower and more reliable estimates of CA-REER semi-elasticities for tax havens.[28]

[27] More precisely, Hebous and Johannesen (2015) show that services trade in tax havens is six times larger than predicted by standard gravity models, compared to non-tax havens of similar size and characteristics. No such difference is observed for goods trade. Further, the authors attribute the excess trade in services partly to genuine specialization in services, partly to profit shifting strategies.

[28] This conclusion relies on qualitative considerations. Quantitatively, the extent of the bias and potential offset will ultimately depend on the relative values of elasticity estimates for exports, imports, income credits and income debits. Such quantitative assessment is beyond the scope of this paper.

Annex 6. Income Balance Elasticities – Robustness Tests and Additional Estimates

Table A2. Income Credit and Debit Elasticities to REER: Advanced Economies

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent Variable							
	Log of Income Credit, ratio to GDP	***Log of Income Credit, ratio to GDP***	***Log of Economic Credit, ratio to GDP***	***Log of Economic Credit, ratio to GDP***	***Log of Income Debit, ratio to GDP***	***Log of Income Debit, ratio to GDP***	***Log of Economic Debit, ratio to GDP***	***Log of Economic Debit, ratio to GDP***
Elasticity	***-0.49***	***-0.47***	***0.29***	***0.31***	***-0.26***	***-0.26***	***0.08***	***0.08***
Log of REER	-0.493***	-0.662***	0.289***	0.178	-0.263**	-0.280	0.0844	0.104
Log of REER, 1 lag		0.193		0.127		0.0200		-0.0225
Constant	-3.284***	-3.285***	-3.360***	-3.361***	-3.307***	-3.307***	-3.353***	-3.353***
Observations	444	444	444	444	444	444	444	444
R-squared	0.949	0.949	0.947	0.947	0.953	0.953	0.952	0.952
RMSE	0.165	0.165	0.175	0.175	0.165	0.165	0.169	0.169

Elasticities are calculated as the sum of coefficients for the REER and its lags.
Estimations include country and time fixed effects (not shown)
*** p<0.01, ** p<0.05, * p<0.1

Table A3. Income Credit and Debit Elasticities to REER: Emerging Economies

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent Variable							
	Log of Income Credit, ratio to GDP	***Log of Income Credit, ratio to GDP***	***Log of Economic Credit, ratio to GDP***	***Log of Economic Credit, ratio to GDP***	***Log of Income Debit, ratio to GDP***	***Log of Income Debit, ratio to GDP***	***Log of Economic Debit, ratio to GDP***	***Log of Economic Debit, ratio to GDP***
Elasticity	***-0.53***	***-0.49***	***-0.17***	***-0.20***	***-0.32***	***-0.29***	***-0.17***	***-0.21***
Log of REER	-0.530***	-0.710***	-0.165	0.0113	-0.318***	-0.456***	-0.174	-0.0265
Log of REER, 1 lag		0.220		-0.216		0.170		-0.180
Constant	-4.676***	-4.676***	-4.334***	-4.334***	-4.061***	-4.061***	-3.857***	-3.857***
Observations	520	520	500	500	520	520	500	500
R-squared	0.894	0.895	0.804	0.804	0.835	0.835	0.753	0.753
RMSE	0.246	0.246	0.386	0.386	0.249	0.249	0.318	0.318

Elasticities are calculated as the sum of coefficients for the REER and its lags.
Estimations include country and time fixed effects (not shown)
*** p<0.01, ** p<0.05, * p<0.1

Table A4. Income Credit and Debit Elasticities to REER: Using 5-year Averages

	(1)	(2)	(3)	(4)
	Dependent Variable			
	Log of Income Credit, ratio to GDP, 5 year average	*Log of Economic Credit, ratio to GDP, 5 year average*	*Log of Income Debit, ratio to GDP, 5 year average*	*Log of Economic Debit, ratio to GDP, 5 year average*
Elasticity	***-0.54***	***-0.47***	***-0.12***	***-0.21***
Log of REER, 5 year average	-0.541***	-0.470*	-0.123	-0.207
Constant	-3.164***	-3.067***	-3.194***	-3.144***
Observations	190	186	190	186
R-squared	0.949	0.875	0.938	0.898
RMSE	0.203	0.343	0.212	0.277

Estimations include country and time fixed effects (not shown)
*** p<0.01, ** p<0.05, * p<0.1

Table A5. Income Credit and Debit Elasticities to REER: With Lagged Dependent Variable

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent Variable							
	Log of Income Credit, ratio to GDP	*Log of Income Credit, ratio to GDP*	*Log of Economic Credit, ratio to GDP*	*Log of Economic Credit, ratio to GDP*	*Log of Income Debit, ratio to GDP*	*Log of Income Debit, ratio to GDP*	*Log of Economic Debit, ratio to GDP*	*Log of Economic Debit, ratio to GDP*
Elasticity	***-0.67***	***-0.23***	***0.66***	***0.35***	***-0.48***	***-0.11***	***-0.07***	***-0.08***
Dependent Variable, 1 lag	0.754***	0.778***	0.863***	0.866***	0.761***	0.778***	0.830***	0.830***
Log of REER	-0.165***	-0.679***	0.0902**	0.345***	-0.114***	-0.552***	-0.0115	-0.000839
Log of REER, 1 lag		0.629***		-0.298***		0.528***		-0.0126
Constant	-0.755***	-0.694***	-0.355***	-0.340***	-0.742***	-0.704***	-0.456***	-0.456***
Observations	959	959	896	896	959	959	896	896
R-squared	0.975	0.977	0.978	0.979	0.970	0.972	0.974	0.974
RMSE	0.129	0.123	0.131	0.129	0.134	0.130	0.128	0.128

Elasticities are calculated as the sum of coefficients for the REER and its lags, divided by one minus the DV coefficient.
Estimations include country and time fixed effects (not shown)
*** p<0.01, ** p<0.05, * p<0.1

Table A6. Income Credit and Debit Elasticities to REER: Estimations in First Differences

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent Variable							
	Change in Income Credit, ratio to GDP	***Change in Income Credit, ratio to GDP***	***Change in Economic Credit, ratio to GDP***	***Change in Economic Credit, ratio to GDP***	***Change in Income Debit, ratio to GDP***	***Change in Income Debit, ratio to GDP***	***Change in Economic Debit, ratio to GDP***	***Change in Economic Debit, ratio to GDP***
Elasticity	***-0.68***	***-0.65***	***0.39***	***0.40***	***-0.59***	***-0.53***	***0.04***	***0.02***
Change in REER	-0.684***	-0.684***	0.391***	0.391***	-0.585***	-0.586***	0.0415	0.0430
Change in REER, 1 lag		0.0384		0.00809		0.0566		-0.0184
Constant	0.0283	0.0295	0.0503**	0.0504**	0.0152	0.0169	0.0685***	0.0682***
Observations	959	959	896	896	959	959	896	896
R-squared	0.266	0.267	0.273	0.273	0.180	0.180	0.185	0.185
RMSE	0.131	0.131	0.141	0.141	0.137	0.137	0.136	0.136

Elasticities are calculated as the sum of coefficients for the REER and its lags.
Estimations include time fixed effects (not shown)
*** p<0.01, ** p<0.05, * p<0.1

Table A7. Income Credit and Debit Elasticities to REER: With Control Variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent Variable							
	Log of Income Credit, ratio to GDP	***Log of Income Credit, ratio to GDP***	***Log of Economic Credit, ratio to GDP***	***Log of Economic Credit, ratio to GDP***	***Log of Income Debit, ratio to GDP***	***Log of Income Debit, ratio to GDP***	***Log of Economic Debit, ratio to GDP***	***Log of Economic Debit, ratio to GDP***
Elasticity	***-0.38***	***-0.36***	***-0.62***	***-0.61***	***0.10***	***0.10***	***-0.06***	***-0.07***
Log of REER	-0.378***	-0.546***	-0.623***	-0.695***	0.0987	0.123	-0.0570	0.0515
Log of REER, 1 lag		0.190*		0.0822		-0.0278		-0.122
Log of ER-corrected Foreign Assets, ratio to GDP	0.136***	0.128***	-0.353***	-0.356***				
Log of ER-corrected Foreign Liabilities, ratio to GDP					0.448***	0.450***	0.113**	0.121**
Constant	-3.187***	-3.195***	-3.230***	-3.233***	-3.261***	-3.260***	-3.152***	-3.148***
Observations	941	941	941	941	941	941	941	941
R-squared	0.933	0.934	0.872	0.872	0.937	0.937	0.887	0.887
RMSE	0.211	0.211	0.316	0.316	0.196	0.196	0.267	0.267

Elasticities are calculated as the sum of coefficients for the REER and its lags.
Estimations include country and time fixed effects (not shown)
*** p<0.01, ** p<0.05, * p<0.1

Table A8. Income Credit and Debit Elasticities to REER: Japan-specific Estimates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent Variable							
	Log of Income Credit, ratio to GDP	***Log of Income Credit, ratio to GDP***	***Log of Economic Credit, ratio to GDP***	***Log of Economic Credit, ratio to GDP***	***Log of Income Debit, ratio to GDP***	***Log of Income Debit, ratio to GDP***	***Log of Economic Debit, ratio to GDP***	***Log of Economic Debit, ratio to GDP***
Elasticity	***-1.97***	***-2.05***	***-1.83***	***-1.94***	***-1.95***	***-2.09***	***-1.91***	***-2.07***
Log of REER	-1.972***	-1.593***	-1.828***	-1.272**	-1.946***	-1.208**	-1.905***	-1.091**
Log of REER, 1 lag		-0.453		-0.665		-0.884*		-0.975*
Constant	-3.416***	-3.414***	-3.546***	-3.542***	-4.357***	-4.351***	-4.409***	-4.404***
Observations	20	20	20	20	20	20	20	20
R-squared	0.884	0.895	0.705	0.727	0.770	0.807	0.751	0.797
RMSE	0.125	0.123	0.208	0.206	0.187	0.176	0.193	0.179

Elasticities are calculated as the sum of coefficients for the REER and its lags.

*** p<0.01, ** p<0.05, * p<0.1