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November 6, 2018

Approved By
Asia and Pacific
Department

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THE IMPACT OF CONSUMPTION TAX INCREASES AND THEIR POLICY IMPLICATIONS FOR JAPAN¹

Japan's VAT rate is set to increase in October 2019 to 10 percent. Given past experiences of VAT rate increases, there are concerns regarding its impact on the economy.² Carefully designing policy measures and communicating them clearly to the public are paramount to attenuate any negative outcomes in the short term. A simple, single-rate VAT would efficiently raise tax revenues and support the government's objective of achieving fiscal consolidation in the medium term.

A. Introduction

- 1. Japan is gearing up for a two-percentage point increase in its value-added tax (VAT) rate in October 2019. With the world's highest debt-to-GDP ratio (over 200 percent), raising the standard VAT rate to 10 percent is critical to achieving the government's objective of a primary surplus and moving toward debt sustainability. However, concerns remain that the VAT rate increase targeted for October 2019 may trigger a sharp macroeconomic contraction, given previous experiences where quarterly GDP growth declined by 0.7 percentage points and 1.8 percentage points following the 1997 and 2014 VAT increases, respectively.
- 2. This chapter explores Japan's experiences with past VAT rate increases and discusses potential policy options to mitigate the economic impact of a third rate increase. It assesses the impact on the Japanese economy and, where possible, provides some international context. Alongside possible mitigating policies, it also discusses the importance of policy commitment and credibility, and how they can influence the macroeconomic impact of tax rate changes.

B. Impact of VAT Rate Increases on the Japanese Economy

3. The 2014 Japan VAT rate increase appears to have been markedly different from previous experiences. Following a decade of debate, Japan successfully introduced a broad-based consumption tax at a rate of 3 percent in April 1989 (Table 1). The rate was subsequently increased on two further occasions, in April 1997 and April 2014, by 2 and 3 percentage points, respectively. However, the impact of the VAT rate changes on the economy differed for each episode (Figure 1). Last-minute consumption and investment demand by both households and corporates was particularly strong prior to the 2014 VAT rate increase—leading to swings in consumption and (residential and nonresidential) investment growth around its implementation.

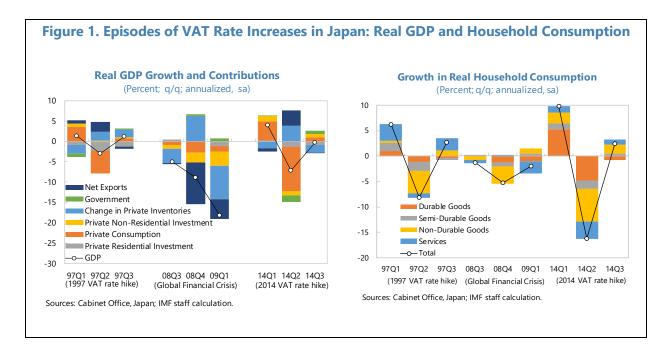
¹ Prepared by Aqib Aslam (FAD) and Kenichiro Kashiwase (OAP).

² The VAT is more commonly referred to as the consumption tax (shōhizei) in Japan. The increase in its rate from 8 to 10 percent has been postponed twice. The increase was initially planned for October 2015, but was postponed to April 2017 in November 2014. In May 2016, Prime Minister Abe again postponed the increase to October 2019, due to concerns over prevailing macroeconomic conditions. On October 15, 2018, Prime Minister Abe announced that the consumption tax rate increase will proceed in October 2019.

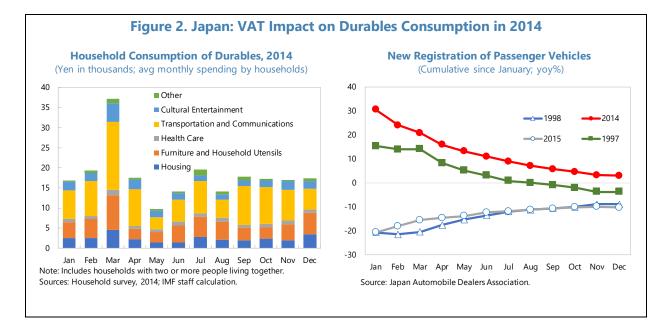
Date	Date Prime Minister Announcement		Implementation	
		The Cabinet approved introduction of the "general consumption tax" to improve		
Jan-79	Ohira, Masayoshi	public finance. However, PM Ohira abandoned the plan during the general		
		election in Oct-79 given severe public backlash.		
Feb-87	Nakasana Vasubira	The administration submitted a draft "Sales Tax" bill to the Diet, but abandoned in		
	Nakasone, Yasuhiro	May-87 in the face of widespread public opposition.		
***************************************	Takeshita, Noboru	Tax bill including the consumption tax was passed, following months of intense		
Dec-88		negotiation between politicians, bureaucrats, businesses and labor unions and a		
		26-hour parliamentary session.		
Apr 90	Takeshita, Noboru		VAT introduced at	
Apr-89			3 percent.	
	Hosokawa, Morihiro	The administration announced a plan to abolish VAT and introduce a 7 percent		
Feb-94		national welfare tax. However, the plan was withdrawn soon after its		
		announcement with disarray of the coalition government.		
Nov-94	Murayama, Tomiichi	The Diet passed a bill to increase VAT rate from 3 percent to 5 percent in 1997,		
NOV-94		including a regional VAT of 1 percent.		
Apr-97	Hashimoto, Ryutaro		VAT increased to	
Api-91	Hasnimoto, kyutaro		5 percent (+2).	
	Hatoyama, Yukio	The Democratic Party of Japan (DPJ), led by PM Hatoyama, defeated the Liberal		
Sep-09		Democratic Party (LDP) ending its uninterrupted rule since 1955. Th DPJ pledged		
		no VAT rate increases for four years.		
Jun 10	Kan, Naoto	The DPJ, led by PM Kan, announced its intention to raise the VAT to 10 percent		
Jun-10		but went on to suffer a loss in the Upper House election in Jul-10.		
Jun-12	Noda, Yoshihiko	The Noda administration introduced a bill to raise the VAT rate to 8 percent in Apr		
		14 and to 10 percent in Oct-15, which was approved by the Upper House in Aug-		
		12.		
Apr-14	Abe, Shinzo		VAT increased to	
			8 percent (+3).	
Nov-14	Abe, Shinzo	The administration postponed the scheduled increase in VAT rate to 10 percent		
1100-14	Abe, Siliiizo	by 18 months, from Oct-15 to Apr-17.		
Jun-16	Abe, Shinzo	The administration postponed the scheduled increase in VAT rate to 10 percent		
Juli- 10	ADE, SHIIIZO	by 30 months, from Apr-17 to Oct-19.		

4. A record decline in household consumption in the second quarter of 2014 led to a sharp macroeconomic contraction. This was driven by a large downturn in durable and non-durable household consumption, which was far more pronounced than during the global financial crisis and previous VAT rate increases (Figure 1). Empirical evidence suggests that, in addition to the direct impact of the three-percentage point increase in April 2014, the negative reaction by households was exacerbated by anticipation of an additional two-percentage point increase in the VAT rate scheduled for 18 months later (Cashin and Unayama, 2016). That is, households potentially made "excessive" advance purchases of durables and storable non-durables prior to April 2014 in anticipation of a total five-percentage point increase in the VAT rate.³

³ Cashin and Unayama (2016) find evidence that the total consumption response between announcement and implementation of the April 2014 rate increase was approximately 5 percent—4 percent at announcement and 1 percent at implementation. Consumers expected to bear the full burden of the VAT rate increases in the form of higher prices, as in previous instances. Therefore, the income shock was roughly proportional to the expected cumulative tax rate increase of five percentage points (in 2014 and 2015), and consumption fell one-to-one with the income shock.



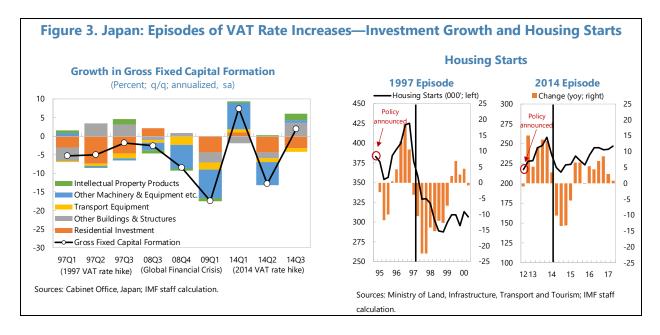
- 5. VAT passthrough was larger in 2014 than in previous episodes, reducing real disposable incomes and exacerbating the economic downturn. Many retailers and wholesalers passed the VAT rate increase fully into prices of their goods and services in 2014. About 60 percent of the respondents to a survey of over 3,000 small- and medium-sized enterprises reported that they had fully passed the VAT rate increase through to their customers by May 2014, whereas about 30 percent had "only partially" done so (see Japan Chamber of Commerce and Industry, 2014). This was up from 40 and 22 percent, respectively, following the VAT rate increase in 1997. A higher fraction of wholesalers (75 percent), compared to retailers (56 percent), indicated the tax had been passed through fully. As a result, year-over-year monthly CPI inflation jumped in April 2014 to 3½ percent, compared to an average of 1 percent for the previous 12 months. At the same time, real wages also declined significantly in 2014.
- **6.** Within durables consumption, automobile purchases reacted most sharply to the 2014 VAT rate increase. Extracts from the Japanese Family Income and Expenditure Survey show how last-minute demand for automobiles and furniture boosted durable consumption in the month before the 2014 rate increase (Figure 2). This is consistent with survey findings by the Japan Automobile Manufacturers Association (2014), which indicate that households made several advance purchases prior to the rate increase. Although seasonality can partly explain fluctuations in automobile purchases, the annual fluctuation in the purchases at the 2014 tax increase was substantial. Underlying demographic change also drove demand. In particular, the share of licensed female drivers aged 50 years and above increased by over 20 percentage points during 2001–15. Demand for more fuel-efficient cars (including small cars) also increased as consumers looked to save on fuel expenditure both in the short and medium term. In the months following the 2014 rate increase, average monthly expenditure on transportation, communications, furniture, and home utensils contracted by more than one half. Overall demand for durables was slow to recover, and the contractionary impact lingered largely due to the long replacement cycle (Higashi and Kawata, 2017).



- 7. Firms' investment decisions also helped amplify demand behavior in 2014. Investment demand—including purchases of machinery and equipment—increased at an annualized rate of 26 percent in the first quarter of 2014 vis-à-vis the previous quarter.⁴ This was followed by a 22 percent decline in the subsequent quarter, and declines in housing demand also contributed (Figure 3).⁵ This amplitude was the largest since the government started collecting such data on a consistent basis in 1994, and was partly driven by the VAT rate increase. The boom-bust pattern clearly added to fluctuations in overall fixed investment, and to a lesser extent in the overall economy. As with consumption, the behavior of fixed investment in 2014 differs from past episodes.
- 8. Residential investment was also affected in 2014, but less so than in 1997. The average age of Japanese who purchase their first home has declined from 48 years in 2008 to 43 years in 2017 (MLIT, 2018). At the same time, the rate of home ownership among 20- and 30-year-olds has been gradually declining. An increasing number of young individuals move into metropolitan areas where house prices tend to be very high. At the same time, this cohort relies more on non-regular employment for a larger share of their income, at the cost of good wage dynamics over their working lives. These factors may explain the diminished impact of VAT rate increases on home purchases in the 2014 episode. In contrast, a financial crisis triggered by the failure of Hokkaido Takushoku Bank and Yamaichi Securities had a strong impact on the housing market in 1997 (Figure 3).

⁴ For example, business owners had invested in new operating systems in anticipation of the ending of the support for Windows XP in April 2014.

⁵ To take advantage of the low tax rate, the delivery of houses needed to be made before the VAT rate increase in April 2014. Hence, housing demand picked up over several months before the rate increase.



C. Japan: Policy Changes and Uncertainty

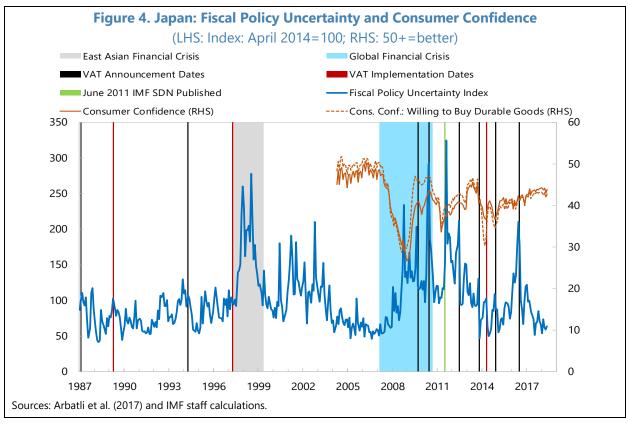
9. The prolonged uncertainty and lack of time to prepare for the rate increase may have amplified its macroeconomic impact in 2014. It was during the Noda administration (between 2011 and 2012) that the law to implement the 2014 and 2015 VAT rate increases was passed, as part of the Comprehensive Review of Social Security and Tax.⁶ However, following his election in December 2012, Prime Minister Abe could not commit to these policies for 10 months since the government had to carefully assess economic conditions before implementing the law. The Cabinet announcement supporting the VAT rate increase was finally made in October 2013, at which point the public had only six months until implementation.

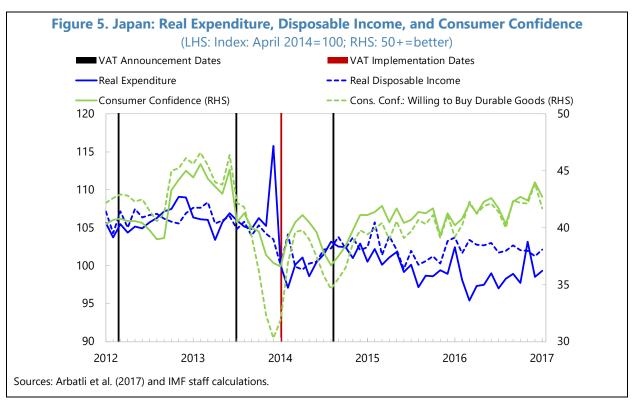
10. This atmosphere of uncertainty may arise again for the 2019 VAT rate increase—with the two earlier delays having a potentially negative impact on the credibility of policy implementation.

Survey data suggests that spikes in fiscal policy uncertainty and dips in consumer confidence have coincided with VAT developments—most notably announcements (Figure 4). At the same time the sensitivity of household consumption and consumer confidence have also tracked VAT announcements before and after the 2014 VAT implementation (Figure 5). The initial delay (in late 2014) of the slated October 2015 rate increase to 2017, and the second postponement announced in 2016 pushing the VAT rate increase to 2019, have potentially undermined the credibility of future VAT increases. Following his win in the September 2018 LDP leadership election, at the Cabinet meeting of October 15, 2018, Prime Minister Abe confirmed that the VAT rate hike would proceed in October 2019. However, there remains the risk that uncertainty about actual implementation may rise during the period between announcement and implementation. This could imply that the timing of any reaction in consumption could once again be delayed even closer to the date of implementation.

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⁶ See, for example, promotional material produced by the Ministry of Finance: https://www.mof.go.jp/english/tax policy/publication/tax005/E 1822.pdf.





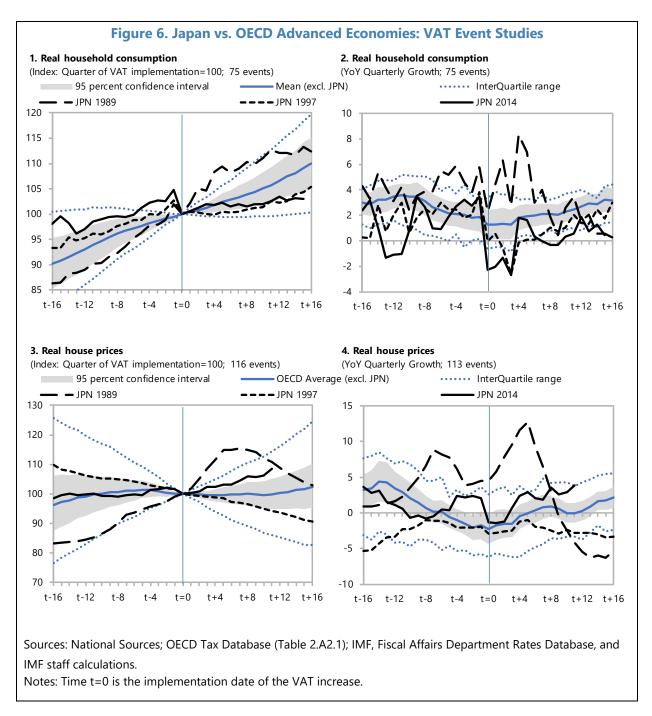
- **11.** Uncertainty about the impact is also compounded by the different accompanying policies the government is now considering. Prior to the 1997 increase, labeling of prices inclusive or exclusive of VAT was not enforced. Anecdotal evidence indicates that retailers raised their prices above and beyond the two-percentage point VAT rate increase. To induce households to purchase goods, they labeled a discounted price inclusive of the correct VAT rate. In other instances, retailers—at their own discretion—applied lower VAT rates to their goods, forcing wholesalers to accept smaller profit margins. Given these 1997 experiences, temporary VAT rate reduction sales were banned prior to the 2014 VAT rate increase, given concerns over tax shifting. The 2018 Basic Policy on Economic and Fiscal Management and Reform aims to prevent such tax shifting again, thereby allowing business owners to freely set prices at their own discretion while monitoring the underlying demand conditions. However, wholesale SMEs face concerns of lost profit margins as a result. Implementation of the measure needs to be crystalized and clearly communicated ahead of the October 2019 deadline.⁷
- 12. Few mitigating measures were introduced to moderate the impact of the VAT rate increase in 2014. While it is possible that the behavior of consumption around the April 2014 VAT rate increase was exacerbated by the anticipation of the second VAT rate increase in October 2015, the government also did not introduce specific measures to attenuate it. Furthermore, the integrated reform of both social security and tax may have exacerbated the impact of the VAT rate increase in 2014. Ahead of the October 2019 VAT rate increase, the Japanese government will need to clearly communicate not only the details of the VAT increase to both consumers and businesses, but also all associated policies, including both the December 2017 policy package for childcare and education, and additional mitigating measures. This is essential to prevent confusion, reduce uncertainty, and dampen any (over)reactions in household consumption.

D. Cross-country Evidence on VAT Rate Increases

13. Japan's past stepwise VAT rate increases are not unusual when compared with other advanced economies, but its consumption response was unusual. The average increase in the standard VAT rate across OECD advanced economies is just under three percent, and on average real household consumption growth fell by 0.6 of percentage points at implementation (Figure 6, panels 1 and 2).8 However, Japan's fall in consumption growth averaged 4.4 percentage points across all three episodes—the 2014 episode alone saw real consumption growth fall by 5.8 percentage points. While on average real consumption growth gradually recovers for OECD advanced economies, real consumption growth in Japan not only turned negative after the 1997 and 2014 increases but remained so for the subsequent three quarters.

⁷ Prices inclusive and exclusive of VAT rate also need to be labeled clearly on purchases of food and beverages, to prevent any price confusion such as that which occurred in 1997.

⁸ Using a combination of IMF data, national sources, and OECD data on VAT rates, the averages are calculated across 91 episodes in which there was an increase in the standard VAT rate. The average fall in real consumption growth across OECD advanced economies rises to just over 0.8 percentage points for a subset of 35 episodes in which the standard VAT rate increases by 2 percentage points or more.



14. Japan's outsize effect of past consumption tax increases is also related to its relatively large impact on the housing market, compared with other sectors of the economy. In 1997, the consumption tax increase was blamed for a long-term slump in home sales, and the corresponding wealth effects are believed to have triggered a recession. In 1989, real house prices continued to increase, uninterrupted by the VAT introduction. In 2014, real house prices once again reacted differently (Figure 6, panels 3 and 4). There was a sharp correction in both the level and growth of real house prices before they eventually recovered. If housing market conditions in Japan are similar now to those in 2014, it is possible that there could be a similar correction—with associated

macroeconomic implications. Real house prices in other advanced economies have (on average) displayed much more muted responses—though this could be influenced by differences in the tax treatment of housing.⁹

15. VAT rate increases in advanced economies are associated with a fall in consumption at their point of implementation, but typically by more than rate cuts increase consumption.

Many factors can determine the impact of VAT rate increases on consumption. ¹⁰ To better gauge magnitudes, available macroeconomic data is used to estimate the response of household consumption to increases in the standard VAT rate using local projection methods. ¹¹ Figure 7 plots the response of real household consumption to: (i) a VAT rate "shock", using a dummy variable to capture rate changes; and (ii) a one percentage point change in the VAT rate. ¹² What we find is that the response of household consumption to increases and decreases in VAT rates is asymmetric. On average, across advanced economies, real household consumption falls on impact—by almost one percentage point—following an increase in the VAT rate before slowly recovering. By contrast, the response of consumption to a rate decrease, while positive, is not statistically different from zero (Figure 7, panels 1 and 2).

16. Advanced economies have, on average, experienced only small changes in consumption following changes in VAT rates. In terms of magnitudes, our sample of advanced economies (including Japan) on average see real household consumption fall by almost 0.25 of a percentage point following a one percentage point increase in the VAT rate (Figure 7, panel 3). Again, while the effect appears persistent in the years following the VAT rate change, the response is not statistically significant. We also look at the consumption response for those episodes where VAT rate changes took place outside of a recession (Figure 7, panel 3): in this case, the effect on real household consumption is not only negligible but also not statistically different from zero. While the impact of a one percentage point increase in the standard VAT rate (in a non-recession period) is still negative, it tends not to persist as long.

⁹ For example, new housing is VAT-exempt in Germany, which is contrary to best practice.

¹⁰ Typically, tax rate increases operate via two mechanisms: first, they decrease spending power, making households feel as if they have less income; second, they change the relative prices of goods. In the absence of microdata, the relative strength of these income and substitution effects are difficult to ascertain—see Cashin and Unayama (2016).

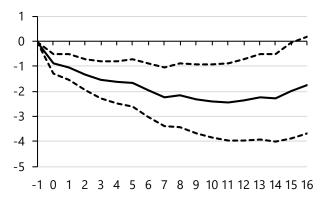
¹¹ The empirical approach consists of regressing contemporaneous and future consumption growth on changes in VAT rates to estimate an impulse response function at various horizons, controlling for country fixed effects, time (quarter) fixed effects, lags and forwards of VAT shocks, and lagged consumption growth. Additional specifications also control for other factors such as changes in personal and corporate income tax rates, and real house prices.

¹² These responses are at the point of implementation of the VAT rate increase. The response of consumption at the point of announcement was not estimated given the lack of information on the announcement dates for the majority of the VAT rate changes catalogued.

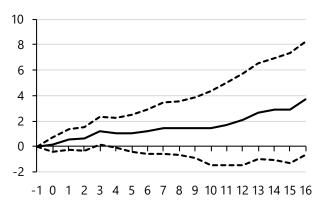
Figure 7. Response of Household Consumption to Changes in the Standard VAT Rate Across OECD Advanced Economies

(Percent; quarters on x-axis)

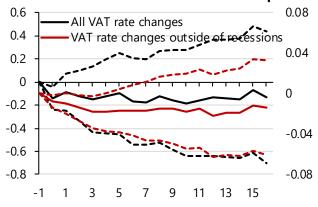
1. Response of real household consumption following an increase in the VAT rate



2. Response of real household consumption following a decrease in the VAT rate



3. Effect of 1 percentage point increase in the VAT rate on real household consumption



Source: IMF staff calculations.

- 17. In many countries, VAT rate changes have typically not been introduced in isolation—they have formed part of larger fiscal and monetary policy packages. However, it is difficult to identify countries in which tax and spending policies have been specifically used to offset the impact of VAT rate increases on incomes and consumption. Newhouse and Zakharova (2007) explored the impact of specific fiscal measures when the Philippines increased its VAT rate from 10 to 12 percent and broadened the base between November 2005 and February 2006. Measures chosen to alleviate the impact on the poor included reductions in fuel excises and tariffs, and the earmarking of a share of the additional VAT revenues to increased education and health spending. Although these spending measures offset the household income reductions from the VAT rate increase for about 25 percent of all households, the authors found that high-income households also benefit substantially given their larger consumption shares of goods that saw tax rates reduced. As an alternative, targeted transfer schemes instead have the potential to deliver a much higher percentage of benefits to the poor.
- **18.** Many countries have opted to offset the negative impact of VATs on poorer households by introducing reduced rates for necessity goods. Japan has also opted to take this route. However, the two-percentage point differential between the standard and reduced rate is less likely to help poorer households, given that existing price dispersion across the same goods is likely to be larger. Reducing rates on essential items hampers the efficiency of the VAT, increases compliance and administrative costs, and undermines the primary revenue-raising function of the VAT (Ebrill et al., 2001).

E. Conclusion and Policy Implications

- 19. Assuming underlying macroeconomic conditions are favorable, the October 2019 VAT rate increase could potentially have a smaller impact on the economy relative to that of 2014 for a number of reasons. Firstly, the VAT rate increase is 1 percentage point less than in 2014, while the VAT rate for food and beverages will remain at 8 percent. According to household surveys, expenditure on these latter items accounts for about one quarter of total expenditure. Therefore, it is possible that the impact on the economy and pass-through to inflation will be lower than in previous episodes. Secondly, replacement demand for longer-lived durable goods—which reacted strongly in 2014—could be marginal, given that many households purchased them prior to the 2014 episode of the VAT rate increase.
- 20. To reduce policy uncertainty and alleviate any adverse impacts from the 2019 VAT rate increase, the authorities should clearly communicate the timing and content of associated mitigating measures. To finance growing aging costs, this will require a gradual and credible

¹³ Following the October 2019 VAT rate increase to 10 percent, the reduced tax rate of 8 percent (inclusive of local consumption tax rate of 1.76 percent) will be applied to sales of food and beverages (excluding alcoholic drinks and dining out), and sales of newspapers published more than twice a week (under subscription contracts). See Ministry of Finance: https://www.mof.go.jp/english/tax policy/tax system/consumption/05 3.pdf.

¹⁴ The *Outlook for Economic Activity and Prices* by the Bank of Japan, published in April 2018, estimates a gradual effect of the October 2019 VAT rate increase on CPI inflation: an additional 1.0 percentage point for October 2019 onward.

increase in the consumption tax rate beyond 10 percent, to help dampen long-term stability risks and open more fiscal space as part of a credible medium-term fiscal framework. From an efficiency perspective, there should be a single VAT standard rate of 10 percent, rather than the proposed reduced rate for food and beverages. As discussed, equity concerns over VAT rate increases would instead be better addressed through mitigating measures, including through expenditure policy that uses targeted transfers.

- 21. Given concerns over durables consumption and investment, the government should carefully design mitigating measures to attenuate the impact of the VAT rate increase. For example, abolishing the automobile acquisition tax will help partly offset the VAT rate increase, likely moderating the impact on an important component of durables consumption. The authorities could also consider a time-bound and well-targeted tax rebate or transfers program, which would be more effective at reducing the burden of the VAT increase on households at the lower end of the income distribution. Implementing such a program could be appropriately timed to be most cost effective for the policy's objectives.
- 22. Bearing in the mind the impact of the increase in the consumption tax rate on the housing market in 2014, the government could also consider measures to insulate housing from the pending rate increase. While the government should continue to apply VAT on only new home sales, the transactions-based real estate acquisition tax could be abolished with any lost revenue made up using higher recurrent (and less distortionary) property taxes. Such a measure will help assuage volatility in the housing market.

¹⁵ The automobile acquisition tax is a transaction tax as it was initially introduced in 1968. Its effective tax rate ranges from 0 to 3 percent, depending on the level of emissions of the purchased vehicles. A zero percent is applied to certain types of environmentally-friendly and fuel-efficient automobiles. The environmental aims of this tax will continue to be met by replacing this automobile acquisition tax with an environmental excise in 2019.

References

Arbatli, E.C., S.J. Davis, A. Ito, N. Miake, and I. Saito, 2017, "Policy Uncertainty in Japan," NBER Working Paper No. 23411.

Bank of Japan, 2013, "Outlook for Economic Activity and Prices," Secretariat of the Policy Board, Bank of Japan: Tokyo.

Bank of Japan, 2018, "Outlook for Economic Activity and Prices," Secretariat of the Policy Board, Bank of Japan: Tokyo.

Cashin, D. and T. Unayama, 2016, "The Impact of a Permanent Income Shock on Consumption: Evidence from Japan's 2014 VAT Increase," RIETI Discussion Paper Series No. 16-E-052.

Ebrill, L., M. Keen, J.-P. Bodin, and V. Summers, 2001. *The Modern VAT*. Washington, D.C.: International Monetary Fund.

Higashi, M. and H. Kawata, 2017, "Recent Developments in Durable Goods Consumption: A Perspective from Spectrum Analysis," Research and Statistics Department, Bank of Japan.

Ishi, H., 1992, "Japan's VAT and its Aftermath." Hitotsubashi Journal of Economics, Vol. 33, pp. 19–48.

Japan Automobile Manufacturers Association, 2014, "Passenger Cars: 2013 Survey of Market Development."

Japan Automobile Manufacturers Association, 2018, "Passenger Cars: 2017 Survey of Market Development," Japan Automobile Manufacturers Association.

Japan Chamber of Commerce and Industry, 2014, "1st Survey of the Pass Through of the Consumption Tax among SMEs."

Keen, M., M. Pradhan, K. Kang, and R. de Mooij, 2011, "Raising the Consumption Tax in Japan: Why, When, How?" IMF Staff Discussion Note No. 11/13.

MLIT, 2018, "Survey of Housing Market Developments," Ministry of Land, Infrastructure, Transport, and Tourism: Tokyo.

Newhouse, D. and D. Zakharova, 2007, "Distributional Implications of the VAT Reform in the Philippines," IMF Working Paper No. 07/153.

FINANCING THE COSTS OF JAPAN'S DEMOGRAPHIC TRANSITION¹

Japan's demographics, combined with its generous social security system for health and retirement, are set to substantially increase age-related costs. Simulation results from a carefully calibrated general equilibrium overlapping generations model suggest the consumption tax rate would need to be increased gradually to around 15 percent by 2030 and further to 20 percent by 2050 to finance the costs of aging. Consumption taxes are also found to be the least distortive way—in terms of effects on growth and welfare—to finance aging costs. The model results also underscore that the cost of postponing the financing adjustment is substantial, benefiting the current elderly to the detriment of all future generations. The gradual consumption tax rate increases should be complemented by broader reforms—improving efficiency of healthcare services, raising the fertility rate, and achieving faster productivity growth.

A. Introduction

- 1. Japan's demographic headwinds have and will put additional pressures on fiscal sustainability. Japan's population started declining around 2009, and is expected to fall by 25 percent over the next 40 years. In addition, the old age dependency ratio (the population aged 65 years and older as a share of the population aged 15-64 years) is expected to increase from 44 percent in 2016 to 75 percent by 2060, putting downward pressure on GDP and per capita GDP. These demographic trends, combined with Japan's generous social security system, pose substantial challenges to the financing of its already large fiscal imbalances. The Japanese government has already implemented some important reforms—most notably a macro-indexing mechanism in the pension system with the aim of controlling the aggregate pension spending as a percent of GDP (introduced in 2004 followed by subsequent reforms). However, more needs to be done. In particular, the social security system in Japan includes universal health care and a generous long-term care system. Per adult spending on health and long-term care increases exponentially with aging. In addition, health and long-term care costs per adult, conditional on age, have increased at a faster rate than GDP per person over the last decade. The aging and shrinking Japanese population are expected to have a significant impact on the country's macro-fiscal outlook.
- 2. Against this backdrop, this chapter aims to quantitatively assess the macroeconomic and distributional implications of different options for financing the cost of aging. The interlinkages between alternative fiscal paths and demographics are complex and require a general equilibrium framework to be properly assessed and quantified. Attention is paid to financing's distortive impact on growth, intergenerational equity, and the cost of delaying sufficient adjustment.

B. Framework of Analysis

3. The analysis is based on a general equilibrium overlapping generations model developed for the quantitative analysis of aging costs and fiscal policy.² This model has a rich

¹ Prepared by Kazuaki Miyachi (APD) and Adrian Peralta-Alva (FAD).

² For further details on the model tailored to Japan, see McGrattan, Miyachi and Peralta-Alva (2018).

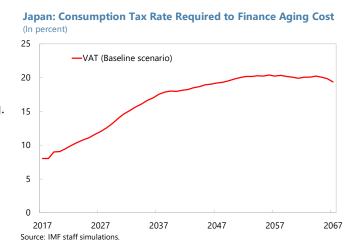
set of fiscal policy instruments. Households vary by generation and skill level, and face different levels of taxation and transfers. On the spending side, households receive age-dependent transfers—pension benefits as well as health and long-term care. On the other hand, financing instruments include time-varying progressive labor income taxation (including social security contributions), consumption tax, corporate income tax, and government debt. These instruments and related parameters are tailored to Japan's data at the macro and micro level. In addition, the model's assumed demographic transition closely follows the authorities' projections to capture the dynamics of age-related cost.

4. Four scenarios for financing the cost of aging are considered. First, the fiscal adjustment need is quantified in terms of the consumption tax rate, with a view to finance the costs of aging while stabilizing government debt at its current level. Three alternative scenarios are then considered—financing through social security contributions; financing through government debt (the debt is only stabilized after 2040); and financing through increases in health and long-term care copayments. In all cases, consumption taxes adjust to make the government budget constraint hold (given other taxes and the debt path). The rich demographic and fiscal structure of the model allows us to quantify not only growth implications but also welfare implications (computed as the discounted life-time utility for each given type and generation of each household—current and future generations included).

C. Financing Options

5. Financing aging-related costs will require substantial increases in Japan's consumption

tax rate. Our baseline scenario (hereinafter labeled as "preferred policy scenario" because of its relatively benign effects on growth and welfare) assumes the consumption tax rate will be adjusted over time to finance the increasing costs of aging. The resulting sequence of consumption tax rate increases occurs very gradually but continuously to around 15 percent by 2030 and to 20 percent by 2050 (a level comparable to that of Scandinavian countries).³ This underpins IMF staff's long-standing recommendation that the



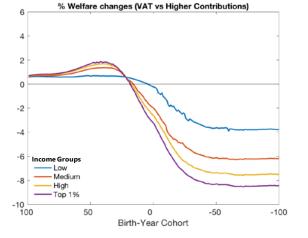
consumption tax rate needs to be increased well beyond the 10 percent rate scheduled to be achieved in October 2019.

³ The required consumption tax rate implied by this analysis stands at the lower end of the range obtained by alternative researches—see Braun and Joines (2015), Imrohoroglu and Sudo (2011), and Imrohoroglu, Kitao and Yamada (2016).

6. Higher social security contributions result in larger losses in GDP and welfare. Under the current health and long-term care system, about half of total spending is financed through

social security contributions, which will be adjusted across all income brackets. These taxes ultimately reflect higher effective taxation on labor income. In order to analyze the implications of increases in social security contributions, it is assumed that the rate of labor income tax is gradually increased by 8 percentage points over 20 years to finance the expected increases in health spending (see Figure 1). Compared to the "preferred policy scenario" (i.e., financing aging costs through consumption tax rate increases), the required increases in the consumption tax rate are substantially smaller (peaking at

Japan: Welfare Effects of Financing Aging Costs Through Increases in Contributions (Relative to Preferred Policy Scenario) (In percent of welfare changes)

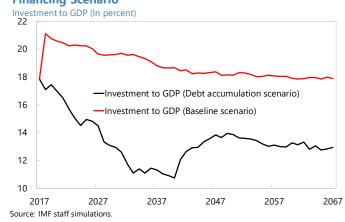


Source: IMF staff simulations.

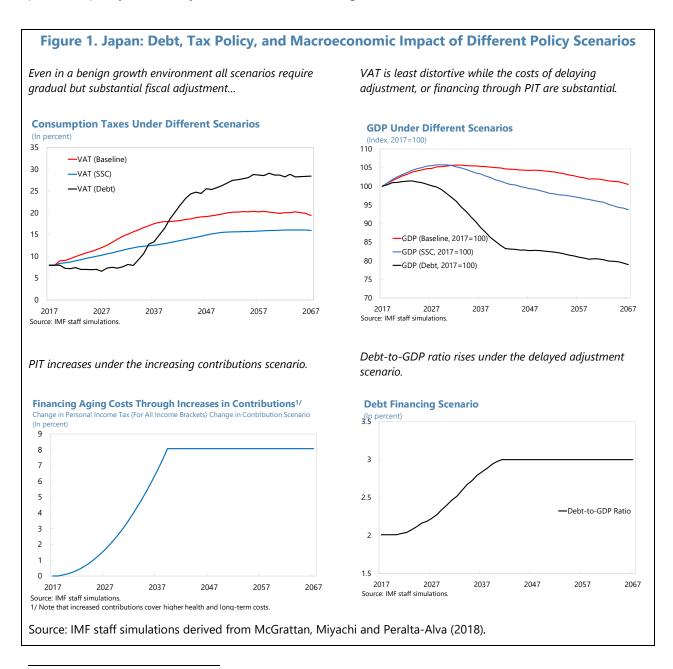
16 percent for VAT(SSC) in Figure 1). However, as labor income taxes are more distortive than consumption taxes, the losses in GDP are larger (see GDP(SSC) in Figure 1). In addition, in terms of welfare, retirees and older workers gain since they care mostly about consumption, while young workers and all future generation suffer very large losses. Because labor income taxes are progressive, partly financing the costs of aging through this way has more negative effects on individuals with higher productivity. The overall welfare losses of this policy—relative to the preferred policy—are very large, due to the highly distortive nature of labor income taxes (in the model "being born" means arriving immediately at working age, hence, the Birth-Year Cohort equal to 0 in the text chart represents an individual that just entered the workforce).

7. The macroeconomic costs of delaying the financing adjustment include substantial crowding out of private sector investment, even higher consumption taxes, and large GDP losses. To analyze the costs of delaying adjustment, continuous deficit financing (and debt accumulation) is assumed to finance the age-related costs and debt is only stabilized after 2040 (the resulting debt-to-GDP ratio is higher by about 100 percent of GDP, see Figure 1). The interest rate on government debt is assumed to be

Japan: Crowding Out of Private Sector Investment in Debt Financing Scenario



held domestically and remain unchanged in real terms.⁴ In equilibrium, this policy causes large crowding out of private sector investment. The reason is that households must be compelled to save enough to hold a much larger stock of government debt, and this can only happen by increasing the cost of capital for the private sector. Stabilizing debt under this scenario requires even higher future consumption tax rates to finance the government budget, peaking at about 30 percent (see VAT(Debt) in Figure 1). Because of the crowding out effect, GDP is 15 percent lower relative to the preferred policy within 20 years (see GDP(Debt) in Figure 1).



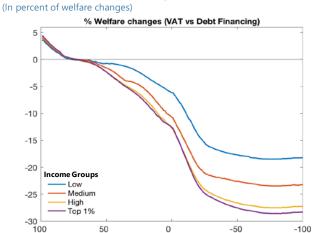
⁴ To match the model with Japan's low interest rate environment, we followed the assumption in Braun and Joines (2015) and Kitao (2015) and assumed an exogenous interest rate on government debt. Private capital interest rates and the proportion of private capital as a share of total financial assets will be determined endogenously.

8. Postponing adjustment translates into large welfare losses for most individuals. Relative to

the preferred policy scenario, all future generations and current workers lose substantially in the debt financing scenario. The reason is twofold: first, crowding out of private investment reduces private capital and thus business profitability (and wages); second, households know they will face higher consumption tax rates than in the preferred policy scenario. Retirees could thereby benefit from lower consumption taxes. However, lower aggregate growth due to the crowding out effect outweighs the potential benefits for the most elderly. These results highlight that the remaining scope for near-term fiscal support is limited, and the authorities should therefore accelerate much needed structural reforms.

9. A uniform increase in health and long-term care copayment rates for the elderly could help mitigate tax increases for future generations, but at the risk of regressive consequences. If the copayment rates for the elderly (aged 65 years and older) are increased to the average level paid by the working age (between 20 and 64 years old), the required increases in consumption tax rates will decline by about 3 percentage points. However, the relatively large welfare losses for lower income households highlight the importance of due consideration in safe-guards for low-income households in the presence of this kind of reform.

Japan: Welfare Effects of Debt Financing Scenario (Relative to Preferred Policy Scenario)

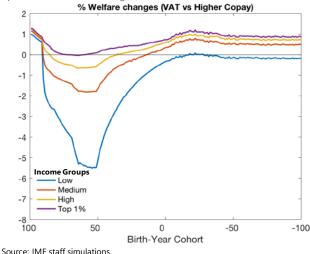


Source: IMF staff simulations.

Japan: Welfare Effects of Increasing Copayment Rates (Relative to Preferred Policy Scenario)

Birth-Year Cohort

(In percent of welfare changes)



D. Complementary Reform Options

Improving the efficiency of the healthcare system could deliver meaningful fiscal savings.

Measures to contain health and long-term care spending should balance the objectives of delivering fiscal consolidation and preserving public welfare—focusing primarily on improving efficiency. For example, reducing per capita spending by 10 percent through improving efficiency would decrease the required increase in the consumption tax rate by more than 2 percentage points over the long-run. Importantly, this analysis also highlights the difficulty of predicting the required consumption tax rate without anchoring social security spending as a percent of GDP. Therefore, specific policy measures to curb health and long-term care outlays are important as they will help reduce policy uncertainty on the path of future consumption tax rates.

11. Higher fertility rate and TFP growth can also complement fiscal reforms. Reforms that raise the fertility rate can improve long-term growth and fiscal prospects, by delivering a substantial increase in aggregate GDP and lowering the required consumption tax rate by 3 percentage points over the long-run. Comparable savings can be attained through reforms that improve overall productivity growth if government outlays are contained.⁵ These results highlight the importance of a comprehensive policy package, which includes both a government financing plan that minimizes distortions on the economy as well as broader structural reforms.

E. Conclusions

- 12. Japan's demographics and generous welfare system require spending controls and a gradual and credible fiscal adjustment to finance the costs of aging. Within the scenarios considered here, financing the costs of aging through consumption taxes has the least negative effect on GDP and welfare. The required increases should be gradual, reaching a rate of around 15 percent by 2030 and 20 percent by 2050. If instead higher social security contributions are used to finance the costs of aging, labor income tax rates would have to go up by about 8 percentage points over the sample period. Relative to the preferred policy (financing through consumption tax rate increases), the model predicts a 7 percent permanent lowering of GDP by financing through higher social security contributions. Containing the costs of aging is a priority, as it will help reduce uncertainty on future tax burden.
- 13. The cost of postponing adjustment is substantial—benefiting current retirees and adversely affecting current workers and all future generations. Postponing the financing adjustment (and thus accumulating debt) increases the debt burden to three times GDP, has important negative crowding out effects on private investment, and would also result in permanent GDP losses of about 15 percent according to the model (relative to the preferred policy). A key result is that higher debt allows consumption taxes to remain lower than in the preferred policy scenario. However, this would also crowd out private investment, substantially hurt the incomes of current young workers (who need to accumulate assets), and result in even higher tax rates to finance the government budget. Financing aging costs through higher social security contributions is also highly distortive to growth and welfare.
- 14. A credible fiscal framework should be implemented. Such a framework would be mindful of the costs of aging; the implications of different ways of financing; and the cost of delaying reform. Given that the adjustment needs depend heavily on the trajectory of health and long-term care, well-specified measures for containing the growth of health and long-term care costs (in percent of GDP) should be an essential part of such a fiscal framework. This cost containment should be accompanied by a gradual path of consumption tax rate increases beyond 10 percent. The substantial cost of postponing fiscal adjustment underscores that the fiscal framework needs to be implemented as soon as possible.

⁵ Higher GDP growth does not automatically lower government outlays as a percent of GDP. In particular, some expenditures are explicitly linked to growth and wages (e.g., pension benefits).

References

Braun, A. and D.H. Joines, 2015, "The Implications of a Graying Japan for Government Policy." *Journal of Economic Dynamics and Control*, Vol. 15, pp. 1–23.

Imrohoroglu, S. and N. Sudo, 2011, "Productivity and Fiscal Policy in Japan: Short-Term Forecasts from the Standard Growth Model," *Monetary and Economic Studies*, Bank of Japan, pp.73–106.

Imrohoroglu, S., S. Kitao, and T. Yamada, 2016, "Achieving Fiscal Balance in Japan," *International Economic Review*, Vol. 57, pp. 117–53.

Kitao, S., 2015, "Fiscal Cost of Demographic Transition in Japan," *Journal of Economic Dynamics and Control*, Vol. 54, pp. 37–58.

McGrattan E.R., K. Miyachi, and A. Peralta-Alva, 2018, "On Financing Retirement, Health, and Long-Term Care in Japan," IMF Working Paper 18/249.

INEQUALITY IN JAPAN: GENERATIONAL, GENDER, AND REGIONAL CONSIDERATIONS¹

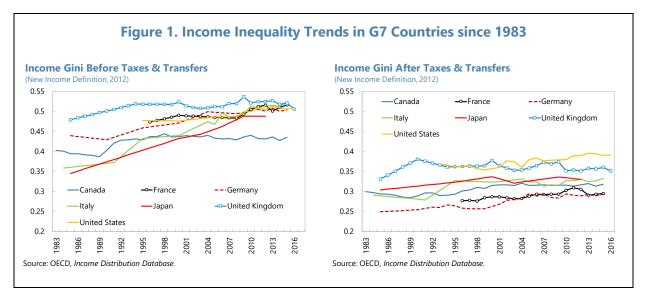
Income inequality has been increasing in Japan, as in other advanced economies. Studies identify demographic forces and increases in non-regular work and female labor force participation as contributors to this trend. Fiscal redistribution via taxes and transfers—mainly to older generations—has helped maintain a relatively stable level of disposable income inequality. Older generations exhibit higher income inequality but also higher wealth than younger generations. Gender inequality is significant, but there has been a decline in the gender wage differential over time. Poorer and older prefectures show higher income inequality, though income inequality across prefectures has decreased over time. Highlighted intergenerational, gender-based, and regional considerations are essential for a well-balanced comprehensive macroeconomic policy package to help tackle inequality in Japan.

A. Introduction

1. As in other advanced economies, income inequality has been increasing in Japan (Figure 1). Following extremely high income concentration in Japan pre-World War Two (WWII), concentration declined abruptly during WWII and remained very low for the rest of the twentieth century (Moriguchi and Saez, 2008).² Over the last few decades, technological progress and globalization have been identified as drivers of income inequality increases in advanced countries (IMF, 2017). For example, technological change has contributed to the skill premium, with a more educated population having a comparative advantage on new technology adoption. In the case of Japan, aging and demographic factors, plus the rise of non-regular work, have been identified as contributors to this trend (Cabinet Office, 2006; Jones, 2007). Shirahase (2013) also emphasizes the rise in female labor force participation vis-à-vis significant gender inequality in Japan's labor market.

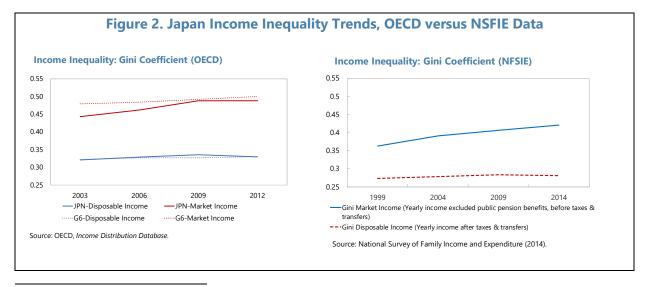
¹ Prepared by Mariana Colacelli and Anh Le (both APD).

² Moriguchi and Saez (2008) identify WWII as a defining event for income concentration in Japan. Large-scale government intervention, inflation and war destruction brought a decline in income concentration at the top of the distribution due to the collapse of capital income. Occupational reforms after the war (i.e. transferring assets from higher to lower end of the distribution) prevented re-concentration, while lifetime employment and collective bargaining have reduced wage income concentration since the 1960s.



2. While Japan's market income inequality has been increasing rapidly, disposable income inequality has been more stable due to fiscal redistribution via taxes and transfers.³

Even though Japan's market income inequality has been increasing, it is still lower than that of other advanced countries. However, Japan's market income inequality was 27 percent higher than its disposable income inequality in 2003, but this had increased to 33 percent by 2012 (OECD data in Figure 2, left panel). This trend highlights the growing redistributive role of taxes and transfers over time, which appears to be increasing faster in Japan than in all other G7 countries. Most recent data are available for 2014 (NSFIE data in Figure 2, right panel) and show a further uptick in market income inequality while disposable income inequality remains stable.

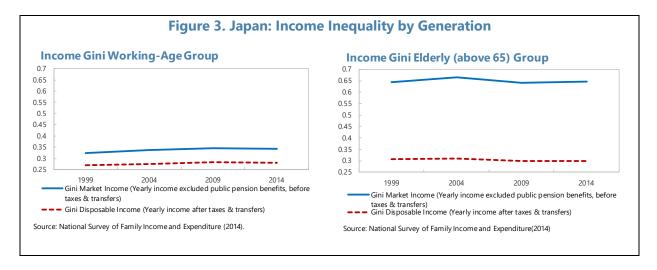


³ Market income inequality corresponds to income before including taxes and transfers, while disposable income inequality corresponds to income post taxes and transfers. As outlined by IMF (2017), fiscal policy via taxes and income-related transfers affect disposable income inequality – with pensions accounting for the largest share in Japan. In addition, fiscal policy via healthcare and education spending (i.e. in-kind transfers) affect market income inequality over time via changes to the human capital distribution. Lastly, healthcare and education policy affect adjusted disposable income inequality (by in-kind transfers), but there are insufficient data to study adjusted disposable income inequality.

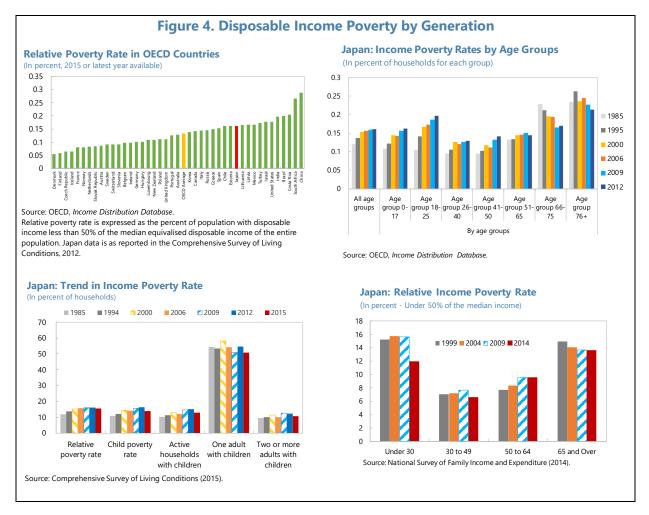
3. The remainder of the chapter covers generational, gender, and regional aspects of inequality in Japan. Section E summarizes the key findings and includes a policy discussion. The appendix highlights important differences and limitations from available national surveys that cover inequality.

B. Inequality and Generations

4. Income inequality is higher for older generations, and it is expected to further increase as the share of the elderly continues to rise. Data for different cohorts show that income inequality is higher among the elderly than among the working-age population, even though fiscal redistribution significantly reduces the difference (i.e. note the 50 percent reduction from the Gini market income to the Gini disposable income for the elderly, in Figure 3). A similar pattern is observed among cohorts "30 years old and under," "30–49 years old," and "50–64 years old," with higher income inequality for older cohorts.



5. Evidence points to some convergence between disposable income poverty rates of old and young generations. Japan's poverty rate is above the OECD average. Starting in the 1980s, older generations (above 50 years old) show flat or declining disposable income poverty rates, while younger generations experienced poverty increases up to 2012 (OECD data, top panels Figure 4). Specifically for children, there is evidence that those in a single-mother household are more likely to suffer poverty (and chronic poverty) than children in other types of households, based on Japanese Longitudinal Survey of Newborns up to 2013 (Kureishi and Wakabayashi, 2017). However, Japanese CSLC and NSFIE data (bottom panels Figure 4) provide evidence that there has been a reversal in this trend for 2014 and 2015, showing a reduction in disposable income poverty rates for younger generations.

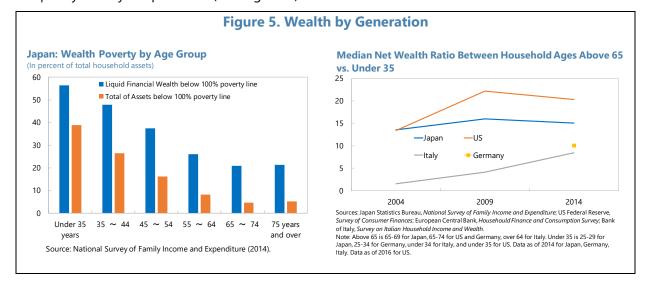


6. Older generations, who benefit most from fiscal redistribution (via taxes and transfers), are significantly wealthier than younger generations. Wealth poverty is significantly lower for older generations (Figure 5, left panel). Moreover, the wealth ratio of older versus younger cohorts is relatively high in Japan when compared with Germany and Italy, though lower than in the U.S. (Figure 5, right panel).⁴ Therefore, the evidence points to significant wealth inequality across generations—with wealthier older cohorts and less wealthy younger cohorts. The highlighted relative wealth of older generations in Japan calls into

⁴ Due to the lack of consistent cross-country data, we constructed "old-to-young net wealth ratio" by using the ratio of net wealth for household heads ages 65-69 vs. 25-29 for Japan, 65-74 vs. 25-34 for Germany, over 64 vs. under 34 for Italy, and 65-74 vs. under 35 for the U.S. For Japan, net wealth is defined as total assets including financial assets (current amount of savings - current amount of liabilities) and houses, residential land, and major durable goods (National Survey of Family Income and Expenditure). For Germany, net wealth is calculated as the difference between gross wealth (consisting of non-financial assets and financial assets) and debt (Panel on Household Finances). For Italy, net wealth comprises of the total amount of all real assets (property, businesses, and valuables), financial assets (deposits, government securities, shares, etc.) net of any financial liabilities (mortgages and other debts) (Survey on Italian Household Income and Wealth). For the U.S., net wealth is the difference between total assets (including total financial assets and non-financial assets) and total debt (Survey of Consumer Finances).

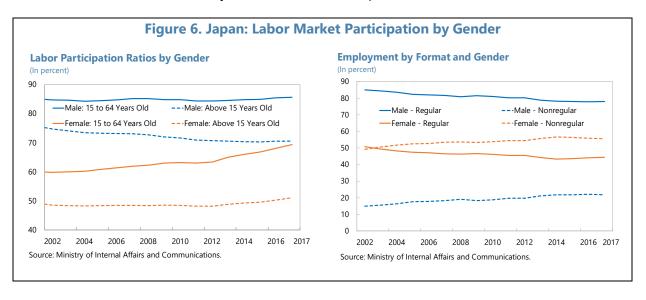
⁵ Relatedly, Chen et.al. (2018) document increasing intergenerational inequality in the European Union since the Global Financial Crisis, with a growing poverty risk for the young and declining risk for the elderly.

question the costly fiscal redistribution mechanism in place that reduces elderly income inequality mainly via pensions (see Figure 3).



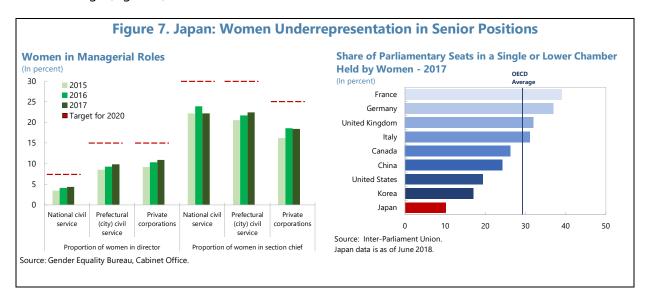
C. Inequality and Gender

7. Women's economic participation in Japanese labor markets has increased, though much of the increase represents non-regular and part-time work, which has contributed to higher inequality. Female labor force participation (FLFP) shows a significant uptick in recent years, with more women joining and remaining engaged in the labor force (Figure 6). However, many of the jobs that women have are non-regular or part-time jobs that receive lower wages, training and career opportunities, which increases inequality (Miake, 2017; Shirahase, 2013). Along similar lines, Yokoyama and Kodama (2018) find that the decrease in earnings of middle-class female workers (between 1989 and 2013) is mainly due to the increase in part-time workers.



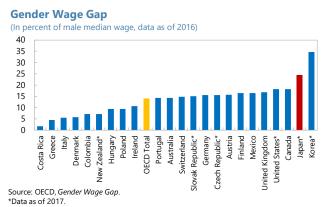
8. Women are underrepresented in Japanese managerial and policy-making positions.6

There has been some improvement in female representation in managerial roles within public and private sectors, but outcomes are still below the government's 2020 targets (Figure 7). Similarly, the share of female board members in listed companies has increased (from 1.6 percent in 2012 to 3.7 percent in 2017), but it remains well below the 10 percent target set for 2020. Regarding female representation among policy makers, Japan ranks low with only 10 percent of lower chamber representatives being women—the lowest share among the G7 countries and 70 percent below the OECD average (Figure 7).



9. Inequality by gender is significant in Japan but there has been a decline in the gender (hourly) wage differential over time. Japan's gender wage gap (of 25 percent) is 75 percent

higher than the OECD average. Japan's male-female hourly wage ratio was 134 percent in 2015 and varies by prefecture, with many of the western prefectures showing the lowest hourly wage differentials (Figure 8).⁷ Improvements in the status of women within Japan's labor market is evidenced by the 8 percent decrease in the gender hourly wage differential between 2005 and 2015. Similarly, Lise et al (2014) find a decrease in (hourly) wage inequality for women

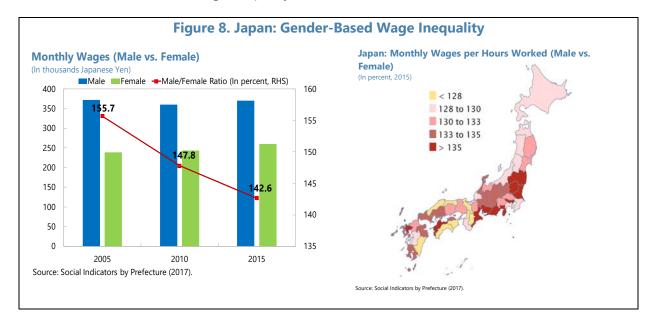


The gender wage gap is unadjusted and is defined as the difference between median earnings of men and women relative to median earnings of men. Data refer to full-time employees and to self-employed.

⁶ Kato and Kodama (2017) provide a literature review on the effects of management practices on women in the workplace. Their findings include that individual incentives linking pay to objective performance may enhance gender diversity, while those with subjective performance may decrease it.

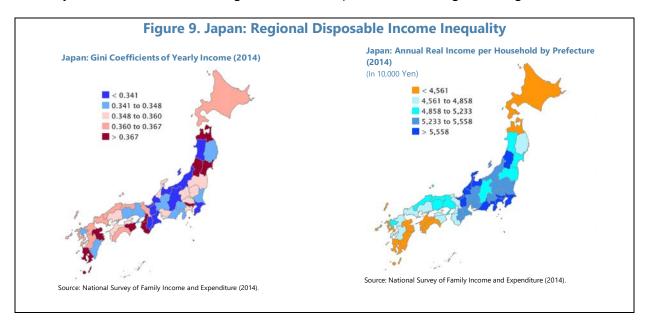
⁷ Abe (2013) finds that FLFP is higher in Japan's northern coastal region, mainly from regular full-time work by married women with children. Identified drivers are supply-side factors (e.g., childcare availability, three-generation households, husband's income), demand factor (i.e. industry structure), and cultural norms regarding women's work.

between 1991 and 2008; but, due to a sharp increase in "hours inequality" for women, they document an increase in earnings inequality for women.



D. Regional Inequality

10. Poorer and older Japanese prefectures show higher income inequality, although income inequality across prefectures has decreased over time (NSFIE data). Disposable income inequality by prefecture, available for 2014, is higher for poorer and older prefectures—with correlations of 0.5 and 0.2, respectively (NSFIE data in Figure 9). Between 2009 and 2014, inequality decreased across prefectures as measured by the 90/10 (or 80/20) percentiles ratio of prefectures' average income—driven by a relative decrease of average incomes in the prefectures with higher average income.



E. Findings and Policy Discussion

- 11. Greater equality and healthy social mobility are key for inclusive growth. For high-income countries, higher income inequality skews opportunity and reduces intergenerational mobility (Corak, 2013; Chetty et al, 2016). Excessive inequality and lack of opportunity may increase polarization, weaken social cohesion, and lead to lower economic growth. To promote inclusive growth in developed economies, the key is to advance policies that can both boost innovation-based growth and enhance social mobility and equality.
- 12. Income inequality has been increasing rapidly in Japan, driven by demographic forces and increases in non-regular work and female labor force participation. Several factors are associated with higher inequality in Japan:
- Older generations show higher income inequality—and benefit the most from fiscal redistribution via pensions—but they are also wealthier than younger generations.
- Inequality by gender is still significant in Japan, but there has been a decline in the gender (hourly) wage differential over time.
- Poorer and older prefectures show higher income inequality, though income inequality across prefectures has decreased over time (per NSFIE data).
- 13. However, Japan's disposable income inequality is stable, thanks to an increasing role of fiscal redistribution (taxes and transfers) over time. While market income inequality has been rising rapidly since the early 1980s, growing fiscal redistribution to older generations via taxes and transfers (chiefly pensions) has helped disposable income inequality remain broadly stable over the period.
- **14. Fiscal and structural reforms are key levers to obtain the desired balance between growth, fiscal consolidation, and redistribution objectives** (Ostry et al, 2014, 2018). Aoyagi et al (2015) links monetary policy under Abenomics with rising prefectural income inequality, possibly driven by unequal income gains from higher inflation, and emphasizes that further structural reforms are necessary to foster growth and increase equality. Moreover, it is important that reform design carefully accounts for distributional considerations by focusing on policies that foster equality and social mobility, while also accomplishing growth and fiscal objectives.
- 15. Intergenerational, gender-based, and regional considerations are essential for a well-balanced comprehensive and inclusive macroeconomic policy package. Independently of the chosen balance among sometimes competing policy objectives (i.e. growth and fiscal consolidation), a comprehensive policy package that takes all trade-offs and synergies into account is key, incorporating critical intergenerational, regional and gender-based considerations.
- In connection with structural policies: (i) labor market reforms should provide a relative productivity boost to disadvantaged workers (i.e. non-regular and female), including via training

- and education; and (ii) policies that enhance product market competition and firm dynamism should also increase social mobility.
- In connection with fiscal policy: (i) public expenditure policy should carefully consider the distributional impact across age groups, gender and regions; and (ii) tax policy has a role to play in adjusting the burden across generations and gender.
- For example, the Japanese authorities have advanced <u>pension reform</u> to decrease pension spending per capita over time (Kashiwase et al, 2012). The reform is expected to address intergenerational inequality by redistributing the fiscal burden from younger to older generations. However, the reform will reduce fiscal redistribution that benefits the low-income elderly population. Fiscal policy may consider strengthening mitigating measures, by targeting potential redistribution to the most affected disadvantaged groups among the elderly.
- Fiscal policy also has a role to play in increasing <u>opportunities for women</u> in the labor force via the elimination of disincentives to full-time and regular work from the tax and social security system. Moreover, there is room to improve availability of childcare and nursing facilities (see IMF, 2017a).

References

Abe, Y., 2013, "Regional Variations in Labor Force Behavior of Women in Japan," *Japan and the World Economy*, Vol. 28, pp. 112–24.

Aoyagi, C., G. Ganelli, K. Murayama, 2015, "How Inclusive is Abenomics?" IMF Working Paper/15/54.

Cabinet Office, 2006, Annual Report on the Japanese Economy and Public Finance, "Japanese Economy Heading for New Growth Era with Conditions for Growth Restored," Government of Japan http://www5.cao.go.jp/zenbun/wp-e/wp-je06/06-00303.html.

Chen, T., J. Hallaert, A. Pitt, H. Qu, M. Queyranne, A. Rhee, A. Shabunina, J. Vandenbussche, I. Yackovlev, 2018, "Inequality and Poverty Across Generations in the European Union," IMF SDN/18/01.

Chetty, R., D. Grusky, M. Hell, N. Hendren, R. Manduca, J. Narang, 2016, "The Fading American Dream: Trends in Absolute Income Mobility Since 1940," NBER Working Paper No. 22910.

Corak, M., 2013, "Income Inequality, Equality of Opportunity, and Intergenerational Mobility," *Journal of Economic Perspectives*, Vol. 27, Issue 3, pp. 79–102.

IMF, 2017, "Tackling Inequality," Fiscal Monitor, October.

IMF, 2017a, Japan: Article IV Consultation Staff Report, IMF Country Report No. 17/242.

Jones, R.S., 2007, "Income Inequality, Poverty and Social Spending in Japan", OECD Economics Department Working Papers, No. 556, OECD publishing, Paris.

Kashiwase, K., M. Nozaki, K. Tokuoka, 2012, "Pension Reforms in Japan," IMF Working Paper 12/285.

Kato, T. and N. Kodama, 2017, "Women in the Workplace and Management Practices: Theory and Evidence," *Oxford Handbooks Online*, DOI: 10.1093/oxfordhb/9780190628963.013.33.

Kureishi, W. and M. Wakabayashi, 2017, "Investigation into Chronic Poverty of Households with Children," *Social Security Studies*, Vol. 2, No. 1, pp. 90–106.

Lise, J., N. Sudo, M. Suzuki, K. Yamada, T. Yamada, 2014, "Wage, Income and Consumption Inequality in Japan, 1981-2008: From Boom to Lost Decades," *Review of Economic Dynamics*, Vol. 17, Issue 4, pp. 582–612.

Miake, N., 2017, "Japan's Lifetime Employment and Gender Inequality," 2017 Japan Selected Issues, IMF Country Report No. 17/243, pp. 31–36.

Moriguchi, C. and E. Saez, 2008, "The Evolution of Income Concentration in Japan, 1886-2005: Evidence from Income Tax Statistics," *The Review of Economics and Statistics*, Vol. 90, pp. 713–34.

OECD, 2012, "Income Distribution Data Review – Japan" www.oecd.org/social/inequality.html.

Ostry, J., A. Berg, S. Kothari, 2018, "Growth-Equity Trade-Offs in Structural Reforms," IMF Working Paper/18/5.

Ostry, J., A. Berg, C. Tsangarides, 2014, "Redistribution, Inequality, and Growth," IMF SDN/14/02.

Shirahase, S., 2013, Social Inequality in Japan, London, Routledge.

Yokoyama, I., Kodama, N., 2018, "Why the Earnings of the Middle Class Declined: Evidence from Japan," *Applied Economic Letters*, https://doi.org/10.1080/13504851.2018.1441505.

Appendix I. Multiple National Surveys

National surveys use different sampling methods and income definitions, delivering considerably different income inequality estimates. For example, Japan's NSFIE excludes some households and some income items, while Japan's CSLC includes students' households and more of the elderly. OECD (2012) reports that, due to the differences between surveys, NSFIE's measures of income inequality are lower than those reported by national studies based on CSLC. OECD measures of income inequality are estimated with CSLC data and are in between those from CSLC and NSFIE. Similarly, poverty rates as measured by the OECD are similar to those from national estimates based on CSLC, while both OECD and CSLC report higher poverty rates than NSFIE.

Table 1. Databases and National Surveys

Database	Time Period	Sample Size	Notes	Source
National Family Income and Expenditure Survey (NSFIE)	Every 5 years. Statistical tables available for 1999, 2004, 2009, and 2014.	57,000 households. Household head is defined as main earner.	In 2009, there is only Gini data for two-or-more-person households, and workers households. No Gini data for one-person household or total household available in 2009. Executives are not included in workers' households. Period when most workers receive bonus is not included. Specific survey period (two-or-more person households: from September to November, one-person households: from October to November) can cause bias reflected by seasonality. 13 percent of surveyed households have annual income below 3 million yen (2009).	Japan's Statistics Bureau
Comprehensive Survey of Living Conditions (CSLC)	Large scale every 3 years, small scale surveyed in interim year of large scale year.	About 290,000 households surveyed. For income and savings portions, about 30,000 households surveyed. Household's head is defined as the reported household's head.	Proportion of single-person households was lower in CSLC than other statistics (suggesting one-person households are underrepresented in CSLC). Does not replenish when survey is refused. Average age of household's head is higher in CSLC than NSFIE. CSLC has larger share of three-ormore-person household and lower share of one-person household. 32 percent of surveyed household have annual income below 3 million yen (2010).	Ministry of Health, Labour and Welfare
OECD Income Distribution Database	Latest year with data available varies by country. Starting from December 2017, the OECD Income Distribution Database is updated 3 times per year.	Data available for total population, working age population (18-65 years old), and retirement age population (above 65 years old).	Japan Gini data available as of 2012 only.	OECD measures of income inequality are estimated with CSLC data and are in between those from CSLC and NSFIE. Poverty rates from OECD are similar to those from national estimates based on CSLC, while both OECD and CSLC report higher poverty rates than NSFIE.
OECD Wealth Distribution Database	Latest year with data available varies by country.	Data available for total population only.	Data begin in 2003 with few data points across all countries.	
Social Indicator by prefecture	Data are available annually.		Data on income decile by prefecture were discontinued in 2009.	Japan's Statistics Bureau

Source: IMF staff compilation.

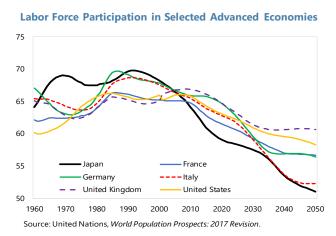
JAPAN—MACROECONOMIC IMPLICATIONS OF AUTOMATION¹

The rapid decline of Japan's work force, together with the thus far limited influx of foreign labor, create a powerful incentive for automation to help address an already serious labor shortage. This chapter assesses the macroeconomic implications of automation in a Japan-specific context, taking particular account of its aging and declining population. We find that automation could help compensate for shrinkage of the labor force, and may increase overall output growth. As the country has successfully embraced automation in the manufacturing sector, a new wave of automation could potentially unlock productivity gains (especially in the services sector) and help circumvent labor shortages and their negative effect on growth. However, low-skilled and female workers with greater job substitutability may be adversely affected, and policy measures will be needed to address such distributional consequences.

A. Introduction

1. Japan's rapidly shrinking labor force poses a direct threat to its future economic growth and productivity. Japan's severe demographic challenges are well known—possessing the

fastest decline of total and working age population among its economic peers. The Population Division of the U.N. Department of Economic and Social Affairs estimates that by the century's end, Japan could lose 34 percent of its current population and labor force. Concurrent with this nominal decline, the population is also aging rapidly. Nearly a third of all Japanese citizens were older than 65 in 2015, and this will rise to near 40 percent by 2050, according to the National Institute of Population and Social Securities Research.



2. The Japanese government has embraced automation and AI technology as a pillar of economic revitalization and help in addressing strong demographic headwinds.² The government's 2014 Japan Revitalization Strategy, envisaged a "New Industrial Revolution Driven by Robots." A 'Robot Revolution Realization Council,' comprising field experts and government officials,

¹ Prepared by Gee Hee Hong and Todd Schneider (both APD).

² "Automation" in this paper refers to the use of technology—including robots, information and communications, and artificial intelligence (Al)—to substitute for or augment human labor.

subsequently introduced 'Japan's new robot technology' in 2015.³ The strategy promotes the utilization and dissemination of robots across Japan and seeks to globally standardize Japan's robot technologies. This vision was codified in the government's 'Society 5.0' initiative.⁴ The initiative highlights health care, mobility, infrastructure, and FinTech as sectors that are both sensitive to demographic trends and where there needs to be a focus on integration of robot and AI technology.

- 3. This chapter assesses the macroeconomic implications of automation in Japan. Against the backdrop of Japan's aging and shrinking work force, two questions are addressed: First, how much has automation in the industrial sector influenced productivity and labor market dynamics in Japan? Second, what could be the influence of a second wave of automation—i.e., expanding into non-manufacturing activities—with respect to labor market outcomes and growth? For both questions, the distributional consequences across skill type and gender are also considered.
- **4. This chapter is structured as follows**: Section B provides an overview of automation technology and its relevance in the context of Japan. Section C describes the penetration of industrial robots in Japan and analyzes its impact on local productivity and the labor market. Section D discusses robots and automation in non-manufacturing (service sectors) in Japan. Section E presents a model-based results on the potential implication of automation in sectors with the demographic features. Section F discusses policy implications.

B. Overview of Automation and its Prospects in Japan

- 5. The global trend toward greater use of automation—by robots, artificial intelligence, or information and communications technology—is well recognized. Particularly in advanced economies, the specter of automation replacing human labor in some tasks and processes has raised concerns about the future of jobs and wages. There has been dramatic progress in recent years in Al and robotics and their application in a diverse set of areas. Some observers have raised concerns regarding how automation and Al technology will adversely affect the labor market—reducing wages and employment (Acemoglu and Restropo, 2017). Others have highlighted the likelihood of job creation, however, and that the current wave of technological change is not vastly different from other periods of innovation and adjustment (Borland and Coelli, 2017). In addition, automation is likely to have distributional consequences, as it will disproportionately affect workers in more automatable occupations while benefiting workers in non-automatable occupations (Autor, 2015; Berg, Buffie, Zanna, 2018).
- 6. However, the implications of automation may not be uniform across countries. Country-specific factors, such as demographics, the level of human capital, the advancement of automation technology, and its dissemination in the economy can influence how automation will affect labor markets, productivity and income. The distributional effect of automation will be influenced by various factors such as industry composition, level of human capital, the degree of

³ New Robot Strategy by the Headquarters for Japan's Economic Revitalization available at (http://www.meti.go.jp/english/press/2015/pdf/0123 01b.pdf)

Details of 'Society 5.0' available at the Cabinet Office: (http://www8.cao.go.jp/cstp/english/society 5.0' available at the Cabinet Office: (http://www8.cao.go.jp/cstp/english) at the Cabinet Office: (http://www8.cao.go.jp/cstp/english) at the Cabinet Office: (http://www8.cao.go.jp/cstp/english/society 5.0' available at the Cabinet Office: (http://www8.cao.go.jp/cstp/english/society 5.0' available at the Cabinet Office: (http://www8.cao.go.jp/cstp/english/society 5.0' available at the Cabinet Office: (http://www.cao.go.jp/cstp/english/society 5.0' available at the Cabinet Office: (http://www.cao.go.jp/cstp/english/society 5.0' available at the Cabinet Office: (http://www.cao.go.jp/cstp/english/society 5.0' available at th

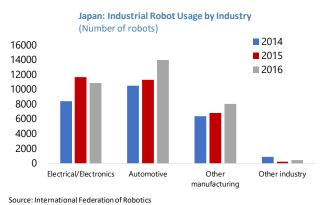
labor market duality across workers with different skill sets, and availability of education to train workers with skills to benefit from the new technology and its redistributive effects.

7. Japan's adverse demographic trends makes it a unique and important laboratory to understand the opportunities and challenges of future automation. With a limited influx of foreign workers (which might otherwise mitigate the effects of a declining labor force), automation may yield greater benefits in Japan than in other countries with different circumstances. Automation technology, even those that are labor-saving, could be a promising channel to offset a shrinking work force and prevent overwork. It will be particularly useful in sectors that are expected to have greater demand in an aging society such as health care, logistics/transportation, delivery and accommodation. On the other hand, Japan's significant degree of labor market duality and the state of investment in human capital investment suggest that the distributional cost entailed with automation technology may not be negligible.

C. Industrial Robots and Their Impacts on Productivity and Labor Market

8. Japan is the world's predominant robot manufacturer, with by far the highest level of global shipments/sales, and has high robot density. Robots have been used in industrial settings

in Japan—particularly in the automotive, electrical, and electronics industries—since the early 1980s. For instance, about 700,000 industrial robots were used worldwide in 1995, 500,000 of them in Japan. Japan has been one of the most robot-integrated economies in the world. One metric often used to refer to the penetration of robots into manufacturing sector is 'robot density' – measured as the number of robots relative to humans (either number of hours worked



or number of workers). Japan had the highest robot density until 2010, when Korea's use of industrial robots surged and Japan's industrial production increasingly moved abroad. Japan is also a leader in producing robots, responsible for about 52 percent of global robot production in 2016.

9. Empirical evidence on the impact of industrial/manufacturing automation and labor-saving technology on productivity and the labor market is mixed. Some studies suggest that industrial robots have adversely affected the local labor market. For instance, Acemoglu and Restrepo (2017) estimate that one additional robot results in a reduction of employment by 6.2 workers in certain regions in the United States. On the other hand, cross-country work conducted by Graetz and Michaels (2015) suggest the opposite, by showing that the increased use of robots raised countries' average growth rates by about 0.4 percent, and increases both wages and total factor productivity. Borland and Coelli (2017) provides evidence that in Australia, computer-based technologies have not necessarily reduced the total amount of human work, and that automation will not necessarily lead to the job loss. Despite the differences across studies in their assessment of the impact, studies tend to agree that industrial robots have contributed to an increase in inequality,

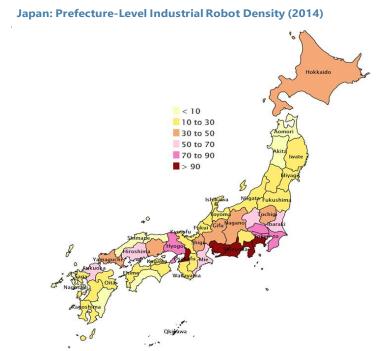
as labor-saving technology has predominately replaced the jobs of middle-skilled or low-skilled workers whose occupations are, thus far, more automatable (Autor and Dorn, 2013; Goos and Manning, 2007).

10. Japan's experience with industrial robots—measured on the prefectural (regional) level—is instructive on the future impact of automation on productivity and labor. Following recent work by Acemoglu and Restrepo (2017) for the United States, the question is addressed here by estimating prefecture-specific robot density. Prefecture-level robot density is estimated as a weighted sum of the share of robots used in each sector out of the total number of robots used in the economy, weighted by the share of a prefecture's output contribution to a specific industry to the total output of the industry. That is, for each prefecture that has S_p number of industries, robot density of prefecture p at time t, $robot\ density_{p,t}$ is calculated as below:

$$robot \ density_{p,t} = \sum_{s=1}^{S_p} \frac{y_{st}^p}{y_{st}} \frac{robot \ stock_{st}}{Hours \ worked_{st}}$$

where y_{st}^p is the total output of industry s of prefecture p at time t, y_{st} is the total output of industry s

at time t, $Hours\ worked_{st}$ is the total hours worked, and $robot\ stock_t$ is the number of operational stock of robots for industry s at time t. Based on this calculation, robot density varies across prefectures, depending on the industrial composition of the prefecture. Prefectures with the highest robot density are those that have large automotive and electronics manufacturing plants: Aichi prefecture with several automobile manufacturing plants including Toyota, and Kanagawa prefecture with Nissan's headquarters and some of Nissan's manufacturing plants. Some examples of prefectures with the lowest robot density are located in the Northwestern part of Honshu (such as Akita and Aomori



Sources: International Federation of Robotics, Japan Statistical Bureau; IMF staff calculations

fishing and forestry. Honshu (such as Akita and Aomori prefectures)—known for its agriculture, fishing and forestry.

11. Panel regressions using estimated prefecture-level robot density shows that Japanese prefectures with greater exposure to robots had higher productivity and employment growth.

prefectures)—known for its agriculture,

In a panel regression with prefecture and industry group fixed-effects, we find that prefectures more exposed to robots have sizeable positive effects on local labor market outcomes as well as productivity. Controlling for the Global Financial Crisis (GFC) where the adoption of robots collapsed due to weak global demand, we find that an increase of robot density by one percentage point corresponds to 15 percent increase in TFP growth for all samples and 6 percent growth for the manufacturing sample. In addition, employment growth is also positively correlated with an increase in robot density by 0.3 percentage points (Table 1).

Table 1. Robot De	ensity and Manufacturin	g Sector at Prefecture L	.evel
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	All Sample			Manufacturing		
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	TFP	Wage growth	Employee growth	TFP	Wage growth	Employee growtl
Robot Density (prefecture)	15.31***	0.0454	0.201***	6.307**	0.0912	0.275***
	(0.367)	(0.159)	(0.067)	(2.657)	(0.171)	(0.078)
Crisis * Robot Density	-11.94***	-0.525***	-0.169***	-14.28***	-0.533***	-0.173***
	(0.139)	(0.060)	(0.025)	(0.996)	(0.064)	(0.029)
Constant	-1.342	-0.586	-0.644	-22.63	-2.551*	-3.681***
	(2.557)	(1.108)	(0.467)	(22.630)	(1.456)	(0.666)
Prefecture FE	N	N	N	Υ	Υ	Υ
Prefecture*Industry Group FE	Υ	Υ	Υ	N	N	N
Observations	4,700	4,700	4,700	940	940	490
R-squared	0.77	0.158	0.546	0.207	0.1	0.111

Source: IMF staff calculations. Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

12. Our results are also indicative of potential spillover effects of automation in the manufacturing sector onto service sectors. Using prefecture-level information, higher robot density per prefecture is significantly correlated with higher TFP growth. However, it also shows that higher automation in manufacturing is negatively correlated with some labor market outcomes in service sectors of that same prefecture (Table 2). Controlling for GFC and prefecture fixed effects, we find that an increase in robot density by one percentage point leads to a 1.2 percentage point decrease in employee growth in the service sector, while the impact on service-sector wage growth is negative, but insignificant.

Table 2. Jap	oan: Robot Densi	ty and Service S	ector at Pre	fecture Level
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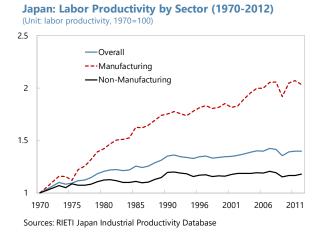
	(1)	(2)	(3)
VARIABLES	TFP	Wage Growth	Employee Growth
Robot Density (Prefecture)	3.235***	-2.132	-1.208***
	(0.911)	(1.905)	(0.433)
Crisis*Robot Density	-1.159***	-3.687***	-1.136***
	(0.353)	(0.737)	(0.167)
Constant	-1.789**	2.739	2.159***
	(0.826)	(1.726)	(0.392)
Prefecture FE	Y	Υ	Υ
Observations	940	940	940
R-squared	0.048	0.036	0.141

Source: IMF staff calculations. Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

D. Automation in the Services Sector of Japan

13. The productivity gap between manufacturing and the services sector is significant in **Japan.** Labor productivity has tripled since 1970 in manufacturing, but improved by only 25 percent

in the non-manufacturing sector. While there are many causes, the largest gains in industrial productivity have been closely related to increased use of information and communication technology and to automation. The most productive manufacturing sectors in Japan—automotive and electronics—are those where production processes are heavily reliant on automation. By contrast, the services sector, which accounts for 75 percent of Japan's GDP, has seen little annual productivity growth—only about half that of the United States.



- 14. Tight labor market conditions and severe labor shortages in certain service sectors have resulted in a deterioration in the quality of services in Japan. Surveys support the view that both the volume and quality of services in Japan are in decline. Recent work by the Research Institute of Economy, Trade and Industry (Morikawa, 2018) shows eroding quality of services due to labor shortages, with the sectors most critically affected being parcel delivery, hospitals, restaurants, elementary and high school education, convenience stores, and government services.
- 15. The advancement of technology to utilize automation technology in the non-manufacturing sector coincides with an increase in the need for automation in some age-related service sectors. The government's new industrial vision (Society 5.0) counts on the integration of automation to transition smoothly in the face of a shrinking population and an aging society. Also, with significant labor shortages, firms have begun to embrace new technology to compensate for scarce labor and stay competitive. For instance, Japan's *Regional Economic Report* and the annual survey on planned capital spending by the Development Bank of Japan suggest that retailers and service sector firms adopt labor-saving technology, i.e. self-checkout registers at retail convenience stores, touch-screen order terminals at restaurants and train terminals, robot chefs, and robot hotel staff in accommodation.
- 16. However, the introduction of automation in service sectors may negatively affect female and low-skilled workers disproportionately, as they tend to work in highly-automatable occupations. Hamaguchi and Kondo (2018) estimate the 'computerizability' of each occupation in Japan based on the sophistication of tasks involved in the occupation, such as; the use of creative intelligence; social intelligence; and cognitive perception and manipulation. Matching these estimates with rich employment data in Japan, the paper finds that female workers are exposed to higher risk of computerization than male workers, since female workers tend to be

engaged in occupations with higher probability of computerization such as receptionists, clerical workers, and sales workers.

E. Macroeconomic Implications of Automation with a Declining Labor Force

- 17. In this section, a simple theoretical model is used to project the potential impact of technology, whether labor-saving or labor-augmenting, on output and wages. As in previous models which address similar questions (Berg, Buffie and Zanna, 2018; IMF 2018), the key parameter in this exercise is the substitutability of labor and capital. To address this, we take two scenarios for technology: labor-saving technology which substitutes existing human labor and labor-augmenting technology which complements human labor. As an extension of the previous models, the role of Japan's shrinking labor force (and thus rising dependency ratio) is a crucial factor that reflects its unique setting.
- 18. An increase in the dependency ratio (number of non-workers as a ratio to workers) leads to over-saving, resulting in the over-accumulation of capital. Our baseline scenario is a standard Blanchard-Yaari overlapping generation model (Blanchard (1985); Yaari (1965)) which introduces retirement. An increase in the number of retirees, ceteris paribus, captures an increase in the dependency ratio, as the relative size of the work force which enters at a constant rate declines with an increase in the share of retirees. Under this setting, a high retirement rate may lead to oversaving since a higher rate of retirements, which is equivalent to early retirement in the model, implies a longer span of the retired period and therefore a need for higher saving for retirement. In such a case, capital accumulation exceeds its optimal level and due to this misallocation, output growth is lower than optimal.
- 19. Introduction of labor-augmenting robots to the baseline leads to higher output growth and real wage growth, compared to the case without the introduction of robots. The first scenario introduces labor-augmenting robots in a production function, where robots are assumed to be complements to capital. That is, a unit of robot improves 'productivity' of labor. With an increase in the retirement rate, and therefore an increase in the dependency ratio, an increase in the use of labor-augmenting robots may offset the lower-than-optimal output in the baseline scenario. However, the wealth disparity between workers and retirees increases, as the wage for workers rises in proportion to the increase in the growth of technology of robots.
- 20. In the scenario of labor-saving technology, the wealth of workers and retirees depend crucially on the degree of substitutability between human labor and technology. Without separation of skills among workers, a high degree of substitutability between human labor and the technology of labor-saving automation will lead to higher output of the economy, where the share of income going to capital (robots and traditional capital) is much higher than the share of labor income going to retirees and workers altogether.
- 21. Finally, automation leads to an increase in inequality between skilled and unskilled workers. A simple modification to differentiate workers into two types—skilled workers who are

complements to robots and unskilled workers who are substitutes to robots—shows that overall growth could be higher when the productivity of robots exceeds certain level, even in the face of an increase in the dependency ratio. However, wages of skilled workers will rise in proportion to the productivity increase of robots, while that of unskilled workers will experience dislocation as robots replace them as workers. As a result, the inequality between the two groups of workers in terms of wage growth will increase, as well as the stock of wealth of each group after their retirement.

F. Policy Implications

- **22.** Automation technology and artificial intelligence can be a partial solution for Japan to deal with its rapidly-declining labor force. Strong and effective social safety nets will be crucial, since disruption of some traditional labor and social contracts seems inevitable. While there is no one-size-fits-all policy, policies to accentuate the positive aspects of automation should be introduced to encourage automation technology in areas most affected by labor shortages due to demographic challenges.
- 23. Given the expected distributional consequences of automation technology, the quality and adaptability of education to provide adequate training for the new generation of workers will be crucial. While it is difficult to prognosticate how individual occupations and tasks will evolve with the introduction of automation and AI technology, most agree on the growing importance of technological as well as social and emotional skills, rather than manual and physical skills (McKinsey, 2018). The need for education and training of the next generation of workers to adapt to such changes, and to reflect the rising need for these skills, are essential to minimize the negative effects that disproportionately hurt highly substitutable workers. To equip future workers with skills to shift across occupations more easily, general education may need to re-focus on problem-solving and emphasize cognitive skills (IMF, 2018).
- 24. To offset demographic challenges, policies to encourage an untapped labor force, such as female workers, should be further promoted and consideration given to permitting more foreign workers. Beyond the adoption of automation to offset Japan's demographic headwinds, policies should first address issues that prevent the existing pool of potential workers from entering the labor force, i.e. female workers or older workers. While it is encouraging that Japan's female labor force participation has increased in recent years, greater efforts to help females better balance between domestic responsibilities and professional careers could be done, for instance, by providing greater access to child care, equal treatment of female workers at work. On foreign workers, while some progress has been under consideration to accept foreign workers who have a certain level of professional and technical skill, the government could make further efforts, particularly in sectors that are suffering from significant labor shortages. ⁵

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⁵ The Japanese Cabinet decided to create new status of residence in June 2018, to allow foreign workers into the country to ease labor shortages and, if the relevant act is amended, starting April 2019, to accept foreign workers who have a certain level of professional and technical skill.

References

Acemoglu, D. and P. Restrepo, 2017, "Robots and Jobs: Evidence from U.S. Labor Markets," NBER Working Paper No. 23285.

Autor, D.H. and D. Dorn, 2013, "The Growth of Low-Skilled Service Jobs and the Polarization of the U.S. Labor Markets," *American Economic Review*, Vol. 103, pp. 1553–97.

Berg, A., E. Buffie and F. Zanna, 2018, "Should We Fear the Robot Revolution? (The Correct Answer is Yes)," IMF Working Paper 18/116.

Blanchard, O., 1985, "Debt, Deficits, and Finite Horizons," *Journal of Political Economy*, Vol. 3, pp. 223–47.

Borland, J. and M. Coelli, 2017, "Are Robots Taking Our Jobs?" *Australian Economic Review*, Vol. 50, pp. 377–97.

Graetz, G. and G. Michaels, 2015, "Robots at Work," CEP Discussion Paper No. 1335.

Goos, M. and A. Manning, 2007, "Lousy and Lovely Jobs: The Rising Polarization of Work in Britain," *Review of Economics and Statistics*, Vol. 89, pp. 118–33.

Hamaguchi, N. and K. Kondo, 2017, "Regional Employment and Artificial Intelligence," RIETI Discussion Paper, 17-K-023. Research Institute of Economy, Trade and Industry, Tokyo.

IMF, 2018, "Technology and the Future of Work," Group of Twenty Note, International Monetary Fund, Washington DC.

McKinsey, 2018, "Skill Shift: Automation and The Future of The Workforce," McKinsey Global Institute, Discussion Paper, May 2018.

Morikawa, M., 2018, "Labor Shortage Beginning to Erode the Quality of Service: Hidden Inflation," Research Institute of Economy, Trade and Industry, Tokyo.

Schneider, T., G. Hong, and A. Le, 2018, "Land of the Rising Robots," *Finance and Development,* Vol. 55, No.2, pp. 28–31.

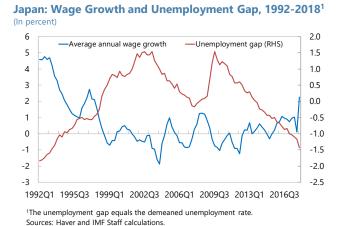
Yaari, M., 1965, "Uncertain Lifetime, Life Insurance, and the Theory of Consumer," *The Review of Economic Studies*, Vol. 32, pp. 137–50.

UNDERSTANDING WAGE GROWTH IN JAPAN¹

Lackluster nominal wage growth has frequently been highlighted as a key reason for Japan's continued struggle to reflate the economy. This chapter takes a closer look at why wage inflation has been missing in Japan. The empirical results suggest that while cyclical factors (e.g., labor market slack and inflation expectations) play an important role in driving wage growth, the main reason for the "missing wage inflation" is the downward pressure exerted by structural factors (e.g., dual labor market effects and wage rigidities).

1. Wage inflation in Japan has been largely absent since the mid-1990s. Annual wage growth fell sharply following the bursting of the asset bubble in the early 1990s. By the end of the

decade it had dropped below zero (see figure). The lackluster wage growth continued between 2000 and 2007, and remained in negative territory during the initial phase of the Global Financial Crisis (GFC). In the post-crisis era, however, wage growth has been on a slight upward trend. Nevertheless, wage growth remains well below the government's three percent goal, and continues to pose a major roadblock to the Bank of Japan's (BoJ) efforts to reflate the economy. The low wage growth is



particularly puzzling given the sharp drop in unemployment in recent years, triggering renewed interest in finding the causes for this "missing wage inflation" (e.g., Iwasaki et al, 2018; Bank of Japan, 2017).

2. This chapter attempts to shed light on why wage inflation has been missing in Japan, distinguishing between cyclical and structural drivers. By estimating a set of wage Phillips curves (WPCs)—augmented with structural factors—several interesting results emerge. First, unemployment and inflation remain key drivers of wage growth. Second, the response of wage growth to labor market slack exhibits downward rigidity, causing the slope of the WPC to flatten at higher rates of unemployment. Third, the pass-through from productivity gains to nominal wages is economically significant. Fourth, labor market duality tends to negatively affect wage growth through its "composition effects," but more importantly by flattening the WPC. Finally, distinguishing between cyclical and structural factors, the absence of wage inflation in recent years, despite labor market tightening, is due primarily to structural factors—the lack of price pressure on consumer goods has meant less upward pressure on wages.

¹ Prepared by Niklas Westelius (APD).

A. Cyclical and Structural Drivers of Wage Growth in Japan

3. Nominal wages appear responsive to economic fluctuations, but the relationship changes over the business cycle and over time.

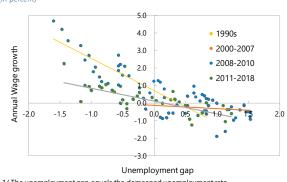
- Labor market slack. In economic downturns, demand for goods and services falls, resulting in downward pressure on both prices and output. To maintain profitability, Japanese firms seek to constrain labor costs by constraining employment and wage growth. One would thus expect wage growth to be pro-cyclical and negatively correlated with unemployment. Indeed, this relationship broadly holds in Japan over the period 1993–2018 (see figure). However, the relationship also appears to change over time. It was particularly strong in the 1990s, weakened significantly between 2000 and 2007, but reappeared after 2011.
- Inflation. When the cost of living increases, workers will demand higher nominal wages to
 maintain the purchasing power of their earnings. On the other hand, if output prices fall, firms
 will push for lower nominal wages to maintain profit margins. Moreover, given wage rigidities,
 expected inflation is also likely to be an important determinant of current wages. Not
 surprisingly, wage growth and inflation do indeed exhibit a strong positive relationship (see
 figure).

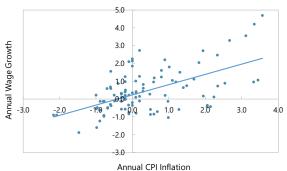
Japan: Annual Wage Growth and Unemployment Gap, 1993-2018

(In percent)

Japan: Annual Wage Growth and Inflation, 1993-2018

(In percent)





1/ The unemployment gap equals the demeaned unemployment rate.

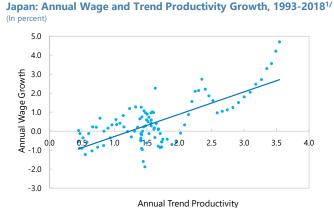
Sources: Haver Analytics and IMF staff calculations.

Sources: Haver Analytics and IMF staff calculations.

• Wage rigidities. Wage growth may also vary depending on whether the economy is in a weakening or strengthening phase. For instance, in a cross-country analysis, IMF (2017) finds that, at any given level of labor market slack, wages tend to adjust faster when the economy is entering a recession than when it is exiting a recession. Of course, the opposite could also be true. That is, due to rigidities, wage growth may be slow to adjust in the initial stage of the recession only to pick up once the recovery is well underway. In addition, a large body of literature has argued that firms may find it harder to lower nominal wages in downturns. This would suggest an L-shaped relationship between wage growth and unemployment. In fact, the reasons why wage growth seemed unresponsive to unemployment during the period 2000–07 may be that unemployment was above its long-term level for most of this period and wages were unable to adjust downward.

4. Trend productivity growth has likely also influenced wage growth dynamics. Holding

wages and prices constant, the more productive workers are, the lower is the cost of producing one additional unit of output. The consequent increases in profit per unit of output, encourages firms to expand production and hire more workers. Eventually, wages will be bid up and the cost per unit of output rises to reflect the higher level of labor productivity. Hence, we would expect nominal wage growth and trend labor productivity growth to be positively correlated. This prediction appears supported by the unconditional

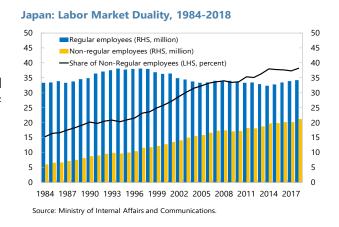


1/ Trend productivity is measured as HP-filtered real output per hour. Sources: Haver Analytics and IMF Staff calculations.

correlation between the two variables (see figure).

5. The impact of labor market duality on wage growth could work through several channels, but the net effect may be ambiguous. Employment in Japan can generally be

divided into regular or non-regular workers. Workers employed under regular contracts enjoy higher wages and job security than non-regular workers. Non-regular workers are predominantly employed part-time and are not unionized. Helped by the passing of major labor market reforms in the late 1990s and early 2000s, the share of non-regular workers has gradually increased in Japan (see figure), reflecting a desire by firms to lower overall wage costs and increase employment flexibility.² The



increased labor market duality is likely to have affected wage growth through several channels.

Involuntary part-time employment effect. Because some fraction of part-time workers would
prefer to be employed full-time, a high share of part-time workers may reflect a certain degree
of labor market slack not captured by the overall unemployment rate. Since most non-regular
workers are employed part-time, a rise in the share of non-regular workers would be indicative
of growing labor market slack.

² Watanabe (2017) suggest that the motivation for the labor market reforms in the late 1990s and early 2000s reflected the need by Japanese companies to increase functional flexibility and decrease production costs in response to intensified regional economic competition.

- Composition effect. With non-regular workers on average being paid less, a higher share of non-regulars would automatically translate into a lower overall wage level. Hence, wage growth should be negatively related to the change in the share of non-regular workers.
- Inside-outside effect. How wages respond to labor market slack may differ between regular (protected insiders) and non-regular workers (unprotected outsiders). For instance, Bank of Japan (2017) argues that wages of regular workers may not respond much to labor market slack as labor unions (which overwhelmingly represent regular workers) prioritize job security over wage increases even under tight labor market conditions. Hence, an increase in the share of non-regular workers should lead to a steeper WPC.
- Labor supply elasticity effect. Because the supply of non-regular workers responds with relatively higher elasticity to wage increases (e.g., labor force participation rates of women and older workers have increased in tandem with demand for non-regulars), the rising share of non-regular workers may have increased the overall labor supply elasticity and hence caused the slope of the WPC to flatten.^{3,4}

B. Estimating Wage Phillips Curves Augmented with Structural Drivers

- 6. Several WPC specifications are estimated to assess the relative importance of cyclical and structural drivers of wage growth in Japan. The methodology follows IMF (2017), but is extended to incorporate downward wage rigidity and dual labor market effects. Table 1 displays the results from five different WPC specifications.
- Baseline specification (column 1). In the baseline regression, annual wage growth—
 measured by scheduled cash earnings per hour—is regressed on (i) lagged annual CPI
 inflation, (ii) expected CPI inflation five years ahead based on consensus survey data, and
 (iii) the unemployment gap, defined as the demeaned unemployment rate. Two dummies for
 the 1997 and 2014 VAT rate increases are also included.⁵
- Wage rigidity specification (column 2). To test for wage rigidities (as discussed above), the baseline regression is augmented in the following manner. First, the change in the unemployment gap is included to capture any potential lagged response of wage growth to labor market slack. Second, an interaction term between the squared unemployment gap and a binary dummy variable—taking the value one if unemployment is above its long-run average—is added to allow for non-linearities in the WPC and downward wage rigidity.

³ Bank of Japan (2018) finds that the wage elasticity of labor supply of female and senior part-time workers is higher than working aged men, and argues that this has reduced the impact of increased labor demand on wages.

⁴ See Gali (2011) for a theoretical derivation of the negative relationship between labor supply elasticity and the slope of the WPC.

⁵ Dummies for VAT rate increases in 1997 and 2014 are also included in all specifications. Results indicates that while the 1997 VAT rate rise did affect wages positively, the 2014 VAT rate increase did the opposite.

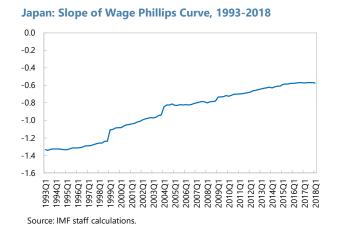
• Trend productivity growth and labor duality (column 3–5). HP-filtered real output per hour is included to as a measure for annual trend productivity growth. Labor market duality is modeled in three ways. First, the ratio of part-time workers is included to capture added slack from involuntary part-time employment. Second, the change in the ratio of part-time workers is used as a proxy to account for the composition effect from a rising share of non-regular workers. Third, the ratio of part-time workers is interacted with the unemployment gap to investigate how labor market duality affects the slope of the WPC.

7. Overall the empirical results suggest that both cyclical and structural factors play an important role in driving wage growth in Japan.

- Labor market slack. Wage growth is negatively related to the unemployment rate across specification, indicating that wage growth does respond to the business cycle. However, the share of part-time workers does not seem to affect directly wage growth to a significant degree, suggesting that the dual labor market does not contain much "hidden" slack.
- Inflation. A one percent increase in lagged inflation translates into a 0.3–0.4 percentage point increase in wage growth. The impact of inflation expectations on wage growth is large and significant for most of the specifications, but its economic importance falls as structural features are added to the model. The average impact (across specification) of expected inflation on wage growth is about 0.8. Taking these estimates at face value, if BoJ would successfully anchor actual and expected inflation at its 2 percent inflation target, wage growth would on average— abstracting from productivity gains—equal about 2 percent over the business cycle.
- Wage rigidities. The change in the unemployment rate has a positive and significant coefficient. This is contrary to the findings in IMF (2017) and would indicate that, given the degree of labor slack, wages tend to adjust slower when the economy is weakening than when it is strengthening. Hence, wage growth appears to react with a lag to labor market slack. The positive and significant coefficient on the interaction term between the squared unemployment gap and the sign dummy indicates that downward rigidity is an important factor and that the WPC is indeed L-shaped in Japan.
- *Productivity*. Trend productivity growth enters the regression positively and is statistically significant, suggesting that productivity gains are an important driver of wage growth in Japan. The point estimate (in column 5), indicates that over two thirds of the productivity gain is passed on to wages.

• Labor market duality. The interaction terms between the unemployment gap and the share of part-time employment share is statistically significant and positive. This indicates that an

increase in the part-time employment share causes the slope of the WPC to decline (as predicted by the supply elasticity effect). In fact, the rising share of part-time workers has caused the slope of the WPC to fall from around 1.4 percent in 1993 to 0.6 percent in 2018, suggesting that the impact on wage growth from a fall in the unemployment rate in 1993 would have been twice as large as today. In addition, as expected, the



coefficient on the change in the share of part-time workers enters negatively and is significant, showing that the level composition effect has indeed constituted an important drag on wage growth.

Table 1. Japan: Estimates of Wage Phillips Curves Augmented with Productivity, Wage Rigidity, and Labor Market Duality

	(1)	(2)	(3)	(4)	(5)
	Wage growth ¹				
Lagged CPI inflation ²	0.40 ** (0.18)	0.33 ** (0.08)	0.30 ** (0.09)	0.24 ** (0.09)	0.26 * (0.08)
Long-run inflation exp (5-year) ²	1.30 **	1.19 **	0.88 **	0.42 *	0.18
	(0.46)	(0.25)	(0.20)	(0.22)	(0.28)
Unemployment gap ³	-0.57 *	-2.21 **	-1.93 **	-0.85 **	-2.01 *
	(0.29)	(0.35)	(0.34)	(0.39)	(0.55)
Squared unemployment gap		1.16 **	0.92 **	0.33 *	0.30 *
x Sign dummy for unemployment gap) ³	(0.14)	(0.15)	(0.19)	(0.18)
Sign dummy for unemployment gap		0.68 *	0.86 **	0.24	0.37
		(0.35)	(0.31)	(0.32)	(0.29)
Unemployment gap					0.05 *
x Part-time employment share					0.02
Part-time employment share				-0.02	-0.01
				(0.02)	0.02
Change in part-time employment share	e			- 0.36 ** (0.06)	- 0.35 * (0.06)
Change in unemployment rate		1.16 **	1.25 **	1.29 **	1.40 *
		(0.17)	(0.17)	(0.22)	0.19
Trend productivity growth ⁴			0.53 **	0.49 *	0.71 *
			(0.20)	(0.28)	(0.21)
Adjusted R-squared	0.64	0.89	0.90	0.83	0.85
Number of observations	106	106	106	97	97
Sample period	1991Q1-	1991Q1-	1991Q1-	1994Q1-	1994Q1-
	2018Q4	2018Q4	2018Q4	2018Q4	2018Q4

Source: IMF staff calculations.

Note. Standard errors are made robust to autocorrelation and heteroscedasticity. Standard errors in parentheses. * p < .10; ** p < .05.

 $^{^{\}rm 1}\,{\rm Wage}$ growth is measured as annual average scheduled cash earnings per hour

 $^{^2\,}Lagged\,inflation\,is\,the\,year\text{-}on\text{-}year\,CPI\,inflation\,lagged\,one\,period.\,Inflation\,expectations\,is\,the\,5\text{-}year\,consensus\,forecast.}$

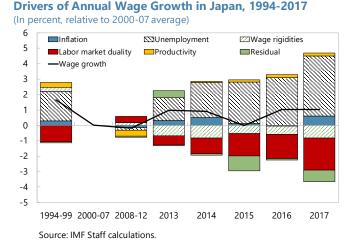
³ The unemployment gap is the demeaned unemployment series, and the sign dummy takes the value one when the unemployment gap is negative.

⁴ Trend productivity growth is HP-filtered real output per hour.

8. Japan's missing wage inflation is due primarily to dual labor market effects and low consumer price inflation. Using the WPC estimation from column 5 in Table 1, it is possible to

compare various drivers of wage growth in recent years to those in the pre-GFC period 2000–07 (see figure). For instance, in 2018, wage growth was about one percent higher than the average wage growth in the pre-GFC period.

Abstracting from labor market duality and wage rigidities, cyclical factors (unemployment and inflation) and productivity gains should have generated wage growth about 4 percent higher than in the pre-GFC period. However, wage rigidities and dual labor market



effects shaved of about 3 percent from wage growth. The flattening of the WPC accounted for about two thirds of the drag and wage rigidities for about one third.

C. Conclusion

- 9. The empirical results presented in this chapter indicate that both structural and cyclical factors are important drivers of wage growth, although they tend to work in opposite directions. Despite reduced labor market slack in recent years, wage inflation has only showed a slight pick-up. Estimation of the wage Phillips curve (WPC) augmented with structural drivers, shows that the main reason for this "missing wage inflation" is the downward pressure exerted by dual labor market effects and wage rigidities. The flattening of the WPC due to the large share of non-regular workers has been a particularly important drag on wage growth. However, looking forward, as the pool of untapped non-regular workers wanes and their labor supply elasticity rises, the WPC may steepen.
- 10. The results also highlight the importance of implementing a comprehensive and coordinated policy package to kick start wage-price dynamics and address labor market duality. Reducing the negative effects from labor market duality could have a significant impact on wage growth both by reducing the wage gap between regular and non-regular workers (i.e., reversing the composition effect), but also by making demand stimulus more effective through a steepening of the WPC. Higher wage growth would in turn help stimulate demand for goods and services and lead to higher inflation, which would feed back into higher wage growth. Income policies to boost wages could also provide an initial boost to wage growth, but have to be backed by significant demand support to be successful.

References

Bank of Japan, 2017, "Features of Japan's Labor Market and Macro-Level Wages," Box 2, *Outlook for Economic Activity and Prices*, July, Bank of Japan: Tokyo.

Bank of Japan, 2018, "The Recent Increase in Labor Supply and Wage Developments," Box 1, *Outlook for Economic Activity and Prices*, July, Bank of Japan: Tokyo.

International Monetary Fund, 2017, "Recent Wage Dynamics in Advanced Economics: Drivers and Implications," Chapter 2, *World Economic Outlook*, October, Washington D.C.

Iwasaki Y., I. Muto, and M. Shintani, 2018, "Missing Wage Inflation? Estimating the Natural Rate of Unemployment in a Nonlinear DSGE model." 2018 BOJ-IMES Conference, IMES, Bank of Japan.

Gali, J., 2011, "The Return of the Wage Phillips Curve," *Journal of the European Economic Association*, Vol. 9, pp. 436–61.

Watanabe, H.R., 2018, "Labour Market Dualism and Diversification in Japan," *British Journal of Industrial Relations*, Vol. 53, Issue 3, pp. 579–602.

WHAT DRIVES RAPID YEN APPRECIATIONS?1

Rising global interest rates, combined with the Bank of Japan (BoJ)'s framework of Yield Curve Control, should weaken the yen and raise inflation. But widening interest rate differentials may also encourage investors to take unhedged short positions in yen to earn the interest rate carry. An initial yen appreciation (triggered by, for example, global uncertainty and a flight to safety) could result in a sudden unwinding of these positions—amplifying the yen appreciation and undermining the BoJ's efforts to reflate the economy.

- 1. The yen is an important barometer for the Japanese economy. Depreciations are typically associated with favorable economic developments such as increased corporate profits, rising equity prices, and upward pressure on domestic consumer prices. On the other hand, large and sharp appreciations run the risk of lowering actual and expected inflation, generating a negative wealth effect through depressed equity prices, and squeezing corporate profits. Moreover, large appreciations and accompanying negative effects risk reducing confidence in domestic policies. This is particularly true with respect to the BoJ's efforts to reflate the domestic economy and anchor inflation expectations at the two percent inflation target.
- 2. This note takes a closer look at underlying drivers of rapid yen appreciations, highlighting the key role of carry-trade and the zero lower bound (ZLB) as amplifiers. Based on an event study of three historical episodes and the empirical results from vector autoregression (VAR) models, three main conclusions are put forth.
- A rise in foreign interest rates tends to depreciate the yen. However, it also encourages carry
 trade activities (i.e., the taking of net short positions in yen), which increases the likelihood of a
 large appreciation in the yen as the risk of a carry trade reversal increases.
- Heightened uncertainty typically leads to an appreciation of the yen due to safe haven effects, which can be amplified by a reversal in carry trade activities.² Because interest rates in Japan are unable to adjust due to the effective zero lower bound (ZLB), yen appreciation is likely to be more pronounced than that of other safe haven currencies.
- Carry trade reversals typically work as shock amplifiers, making an initial appreciation more
 pronounced. However, a purely speculative shock that leads to a carry trade reversal can also
 cause a self-fulfilling appreciation cycle, as yen appreciation leads to further carry trade
 reversals.

A. Main Drivers of Short-run Yen Dynamics

3. Understanding the drivers of short-run exchange rate movements is notoriously difficult. The analysis presented in this chapter takes a parsimonious approach by focusing on three

¹ Prepared by Fei Han (MCM), and Niklas Westelius (APD).

² Safe haven appreciations typically occur during heightened market uncertainty/risk-off periods when investors move into assets that are perceived as "safe"—such as Japanese government bonds (JGBs).

of the most-cited drivers of sudden short-term yen appreciations. These are: (i) monetary policy shifts, (ii) safe haven effects, and (iii) carry trade reversals.

- Monetary policy shifts. Today's exchange rate should reflect perceptions about the future
 expected path of interest rate differentials between foreign and domestic (Japanese) short-term
 interest rates. For instance, a sharp fall in the current or expected U.S. short-term interest rate
 should lead to an immediate appreciation of the yen relative to the U.S. dollar. Similarly, an
 improved (higher) inflation outlook for Japan may increase the likelihood of monetary policy
 normalization, reducing the expected path of the U.S.-Japan interest rate differential and leading
 to a strengthening of the yen vis-à-vis the U.S. dollar.
- Safe haven effects. During periods of heightened market uncertainty or so-called risk-off episodes, investors tend to move into currencies that are perceived to have safe haven qualities (i.e., they provide a hedge against potential adverse risk scenarios). A large literature documents that a handful of currencies exhibit this characteristic, including the U.S. dollar, the yen and the Swiss franc (e.g., Ranaldo and Soderlind, 2009). Hence, a rise in market uncertainty tends to be associated with a yen appreciation.
- Carry trade reversals. Carry trade is an investment strategy under which investors borrow in a low-interest rate currency (i.e., the funding currency) and invest in a high-interest currency (i.e., the target currency). For such a strategy to be profitable, the underlying assumption is that exchange rate movements will not eliminate the interest carry over the investment horizon.³ Because these positions are leveraged and unhedged, an appreciation of the funding currency (or worries about a future appreciation), can generate a sharp unwinding of these positions which in turn reinforce the initial appreciation. Because Japanese interest rates have been close to zero for about two decades, the yen has been a popular funding currency, making it particularly vulnerable to carry trade reversals.

B. Three Distinct Episodes of Large and Rapid Yen Appreciations

4. Three episodes of large yen appreciation are identified to illustrate initial triggers and how monetary policy, market uncertainty, and carry trade reversals interact.⁴ In each episode, the cumulative appreciation of the yen (vis-à-vis the U.S. dollar) is linked to the evolution of variables intended to capture shifts in the underlying drivers discussed above. Specifically, the change in the two-year interest rate differential between U.S. and Japan treasury bonds is used to capture actual and expected monetary policy shifts; the CBOE's volatility index (VIX) is used to measure market uncertainty; and the yen net non-commercial futures position is used to capture shifts in unhedged carry trade

³ This implicitly assumes that the uncovered interest rate parity does not hold, which tends to be true empirically (see Fama, 1984).

⁴ The three episodes were first identified by looking at the size of the appreciation (through a threshold methodology) as well as the size and sequencing of the three drivers based on quantitative and narrative records.

positions.⁵ Figure 1 shows the cumulative change of the yen/U.S. dollar exchange rate during each episode together with the dynamics of each of the three drivers.

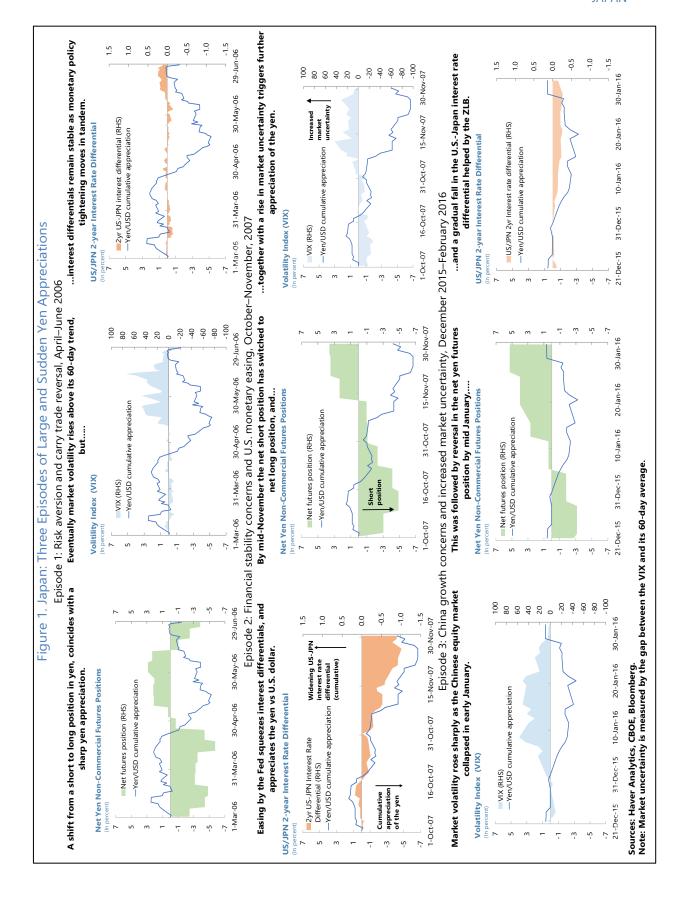
- Episode 1: Rising risk perception and carry trade reversal in the spring of 2006. During 2005, the U.S.-Japan two-year interest rate differential rose by around 100 basis points, causing the yen to depreciate significantly. However, it also created ample incentives to expand carry trade positions. Indeed, the yen net short position of non-commercial futures as well as yen borrowing expanded significantly towards the end of 2005 (e.g., Galati and others, 2007). By early 2006, however, risk aversion in global financial markets started to mount, particularly affecting leverage positions in risky assets (see IMF, 2006). As a result, investors began to unwind carry trade positions, causing a sharp yen appreciation of more than 5 percent in April-May, 2006. The VIX did not rise above its 60-day average until mid-May, possibly indicating that the carry trade reversal and exchange rate volatility preceded equity market volatility. Moreover, while expectations of monetary policy did tighten during this period as concerns of overheating emerged, the two-year interest rate differential did not move significantly, perhaps reflecting that both the U.S. and Japan were expected to tighten policy in tandem.

 Nevertheless, the anticipation of tighter liquidity conditions may also have contributed to amplifying the carry trade reversal.
- Episode 2: Financial stability concerns and U.S. monetary easing in the second half of 2007. In September 2007, the U.S. Fed responded aggressively to the ongoing financial crisis by cutting the federal funds rate by 50 basis points. The two-year U.S.-Japan interest rate differential started to fall in mid-October and by end-November it had fallen by 100 basis points. By early November, the yen had appreciated by about 2 percent. With the VIX quickly surpassing its trend and the net yen non-commercial futures position switching from yen short to yen long position (i.e., a carry trade reversal), the yen appreciated sharply in the second half of the month, rising by close to 7 percent over the whole episode. In contrast to Episode 1, the carry trade reversal appears to have functioned more as an amplifier than a trigger for Episode 2.
- Episode 3: China growth concerns and a spike in market uncertainty, December 2015-February 2016. On the back of rising concerns of a sharp economic downturn, equity prices in China fell by 18 percent between January 4 and January 18, 2016. With major stock markets following suit and worries of deteriorating global growth, market uncertainty rose sharply. The rise in the VIX—exacerbated by a reversal in carry trade (the yen futures position turned from short to long in early January)—led to a cumulative appreciation of the yen vis-à-vis the U.S. dollar by over 3 percent by

⁵ Following Brunnermeier and others (2008), the net futures position of non-commercial traders is used as a proxy measure for carry trade activity. The net futures positions are calculated by subtracting non-commercial traders' short futures position in yen from their long futures position in yen, both expressed as a fraction of total open interest of all traders. Non-commercial traders are classified as those who do not use futures for hedging purposes by the U.S. Commodity Futures Trading Commission (CFTC). Although this measure only captures the derivatives carry trade activities through futures but not those through forward contracts, it should be a valid indicator for the overall carry trade as the non-commercial traders are basically speculators who use futures to engage in carry trade (Brunnermeier and others, 2008). Daily observations are used for the two-year U.S.-Japan interest rate differential, VIX and exchange rate, while only weekly data is available for the net yen non-commercial position.

January 20. The flight to safety also likely squeezed the U.S.-Japan two-year interest rate differential (as Japan's yield was effectively constrained by the ZLB), further contributing to appreciation pressure.

5. The three episodes illustrate how changes in underlying exchange rate drivers can trigger sharp yen appreciations that are amplified by a carry trade reversal and falling interest rate differentials. In particular, the 2006 episode shows how rising global interest rates can lead to a buildup of large unhedged carry trade positions. Once a triggering event occurs—such as a rise in risk perception (the 2006 episode), a policy switch (the 2007 episode), or an increase in market uncertainty (the 2016 episode)—the reversal of the carry trade position will lead to an amplification of the yen appreciation. Moreover, during risk-off episodes, the demand for perceived safe assets (e.g., U.S. and Japanese bonds) increases. Because bond yields in Japan are already close to the ZLB, such flows lead to a squeeze in interest rate differentials, which further amplifies the yen appreciation. This could also potentially explain why the yen tends to appreciate even against other safe haven currencies, during times of heightened global uncertainty.



C. Disentangling Exchange Rate Drivers Using a VAR Model

6. A VAR model is used to disentangle the impact of each factor on short-run movement in the U.S. dollar/yen exchange rate. With all three drivers—monetary policy shifts, safe haven effects, and carry trade reversals—endogenously correlated with the exchange rate, a VAR model following Brunnermeier and others (2008) is specified to estimate the impact of each factor. In addition to the three variables used in the event study, the 10-year interest rate differential between the U.S. and Japan is added to capture the difference in the two countries' growth outlooks, which could also affect demand for the two currencies.⁶ The VAR model is assumed to be the following

$$Z_t = \beta_0 + \sum_{j=1}^J A_j Z_{t-j} + \varepsilon_t,$$

where *Z* is a vector of endogenous variables, including the logarithm of VIX, the two-year and 10-year interest rate differentials between Japan and the U.S., the net futures position of non-commercial traders in yen, and the average daily change in the U.S. dollar/yen exchange rate (averaged to weekly frequency). *Z* can be written as

$$Z = \begin{bmatrix} \log(VIX) \\ i_{2y}^{JPN} - i_{2y}^{US} \\ i_{10y}^{JPN} - i_{10y}^{US} \\ FP^{yen} \\ \Delta \log(EXR) \end{bmatrix}$$

The Cholesky decomposition is used to identify each shock in the baseline VAR model, and hence the ordering of the variables matters for the estimates. Therefore, we also re-run the baseline model with different Cholesky orderings and find that the main results discussed in the next section remain more or less unchanged qualitatively. Moreover, historical decomposition is used to estimate the contributions of each factor to the change in the U.S. dollar/yen exchange rate for each of the three episodes discussed above.

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⁶ Since the CFTC net futures position in yen is only available on a weekly basis, we average the daily data into weekly and run the VAR model at the weekly frequency. The model is run from 1996 to the present to avoid taking into account the effects of the Plaza Accord signed in 1985 (and the subsequent Louvre Accord) on the exchange rate, as some regard these agreements as a trigger for the long-run trend of yen appreciation for the next 10 years (Ito, 2015).

⁷ The impact of carry trade reversal on exchange rate movement becomes statistically insignificant only when it is ranked last in the Cholesky ordering, while the effects of other shocks remain qualitatively unchanged. Moreover, the main qualitative results also hold when we include the EPFR fund flow data—a proxy measure of capital flows at weekly frequency.

D. Results

- 7. The impulse response functions suggest that all the factors discussed above could have significant effects on the U.S. dollar/yen exchange rate in the short term. Figure 2 presents the impulse responses of (average daily) exchange rate movement to one-standard-deviation shocks to the logarithm of VIX, the two-year interest rate differential between Japan and the U.S., and the net futures position of non-commercial traders, respectively. These shocks correspond to an increase in VIX, a narrowing in the interest rate differential between the U.S. and Japan (as the interest rates in the U.S. have been above those in Japan throughout our sample period), and a carry trade reversal.
- Uncertainty shock. A one-standard-deviation increase in log(VIX), which translates to about 10 percent increase in the level of VIX, could lead to a 0.2 percent appreciation in the yen against the U.S. dollar in the first week. Moreover, the impulse response of the net futures position in yen to the VIX shock also suggest a significant reversal in carry trade activities—by about 1 percent during the first week and 1.9 percent at its peak during the tenth week—in response to higher uncertainty (see Figure 2, top row).
- Interest rate shock. If the two-year interest rate differential between the U.S. and Japan narrows by one standard deviation, which is about 0.1 percentage points, then the yen is likely to appreciate by about 0.4 percent during the first week. 10 In contrast, a widening in the interest rate differential due to rising interest rates in the U.S. could encourage carry trade activities and depreciate the yen (see Figure 2, middle row).
- Carry trade shock. A one-standard-deviation pure speculative shock to carry trade activities, which translates to about an 8 percent decline in the net futures position of noncommercial traders in yen, could lead to a 0.6 percent appreciation in the yen against the U.S. dollar in the first week (see Figure 2, bottom row). This significant impact of carry trade reversal on yen appreciation, together with the earlier finding that the carry trade position tends to unwind in response to the VIX shock, suggests that carry trade could be an amplification channel for yen appreciation when uncertainty rises. Moreover, the results suggest that a shock to the exchange rate could lead to a further reversal in carry trade positions, triggering a self-fulfilling appreciation cycle. 12

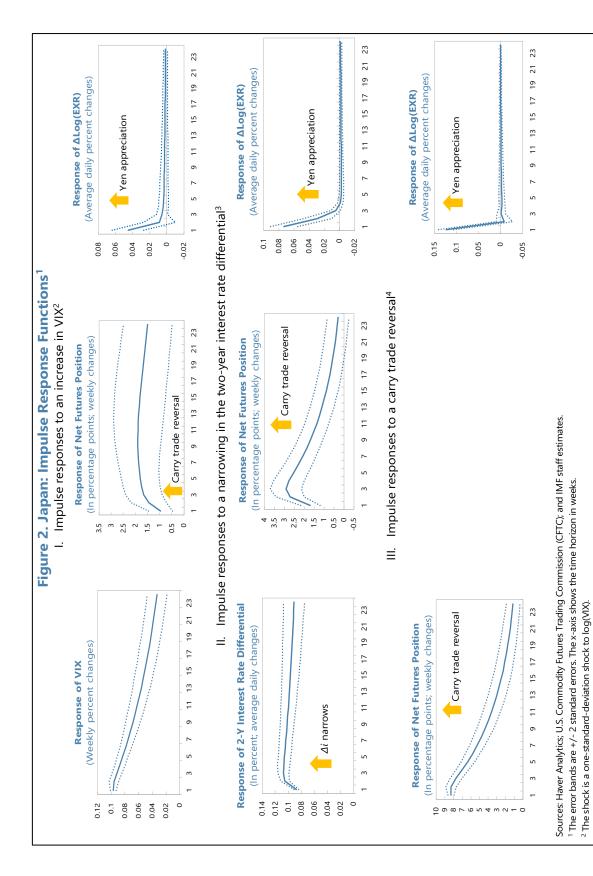
⁸ The impulse responses to a shock to the 10-year interest rate differential are suppressed from Figure 2 as they are qualitatively similar to those to a shock to the 2-year interest rate differential albeit with less statistical significance.

⁹ Notice that the impulse responses of exchange rate movement presented in Figure 2 are average daily percent changes.

¹⁰ The narrowing in the interest rate differential between the U.S. and Japan could happen when U.S. interest rates decline while interest rates in Japan remain constant under its Yield Curve Control (YCC) policy.

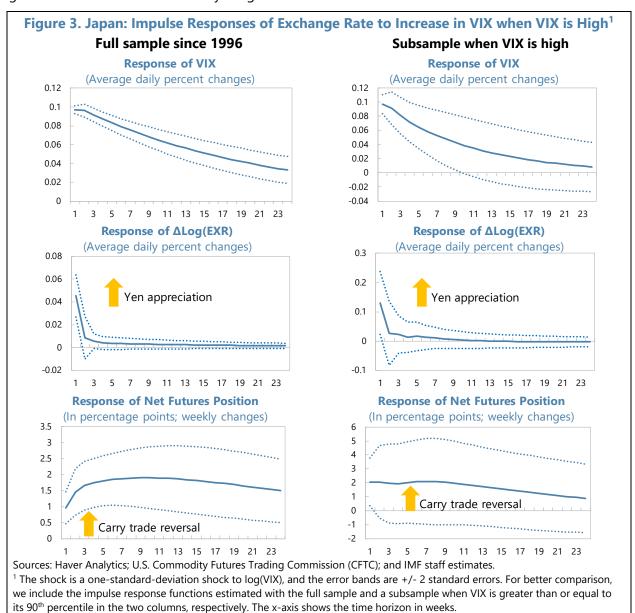
¹¹ The pure speculative shock to carry trade activities is orthogonal to the shocks to VIX and interest rate differentials in the baseline VAR model (1).

¹² The impulse response of carry trade position (i.e., the net futures position in yen) to a shock to the exchange rate movement is suppressed from Figure 2 but available upon request.

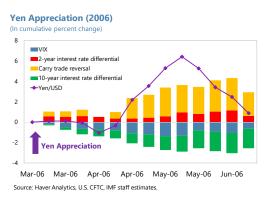


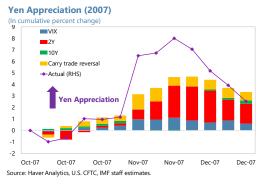
3 The shock is a one-standard-deviation shock to the 2-year interest rate differential. Since the 2-year interest rate in the U.S. has been above that of Japan throughout our sample period, an increar in the interest rate differential between Japan and the U.S. indicates a narrowing in the interest rate differential between the U.S. and Japan.

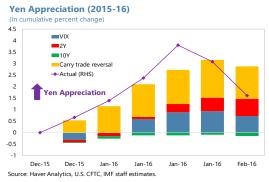
8. An increase in uncertainty could have a larger impact on yen appreciation when the *level* of uncertainty is already high, which is due partly to a faster reversal in the carry trade position. We rerun the VAR model using a subsample when VIX is above its 90th percentile. The impulse response functions, along with those estimated from the full sample for a better comparison, are presented in Figure 3. As we can see from Figure 3 (top row), the standard deviation of VIX did not change between the full sample and the subsample. However, the impact of a one-standard-deviation increase in log(VIX) when the subsample is used is about three times as large as compared to the full sample (Figure 3, middle row). By examining all the impulse response functions between the two models, we find that the carry trade position unwinds much faster in the first week after the shock when uncertainty (VIX) is above its 90th percentile—about two times the speed that carry trade unwinds when VIX is at its average (see Figure 3, bottom row). This suggests that the amplification of the uncertainty shock by carry trade reversal could be greater when the level of uncertainty is high.



- **9. Historical decomposition is used to better analyze and disentangle the contributions of each factor to the exchange rate movement.** We use the three episodes of large yen appreciation identified previously to illustrate how the four factors contribute in their own way to the strengthening of the yen against the U.S. dollar. The text figures below show the historical decomposition of cumulative exchange rate movements since the beginning of each episode for all the three episodes.
- Rising risk perception and carry trade reversal in the spring of 2006. In line with the event study, the yen appreciation in the first episode is mostly explained by a carry trade reversal (see figure). The carry trade reversal alone explains over 40 percent of the peak cumulative appreciation of the yen. The impact is somewhat mitigated by the depreciation effects from a decline in the VIX at the beginning of the episode, and a widening in the 10-year interest rate differential between the U.S. and Japan.¹³
- Financial stability concerns and U.S. monetary easing in 2007. As expected, the yen appreciation in the second episode is mainly driven by a narrowing in the two-year interest rate differential between the U.S. and Japan (by about 70 basis points), which contributed about 40 percent of the peak cumulative appreciation in the yen (see figure).
- Heightened uncertainty and China's growth concerns in 2016. In the third episode with a spike in market uncertainty, both VIX and carry trade reversal played a significant role in driving the yen appreciation. These two factors together explained more than 60 percent of the peak cumulative appreciation in the yen. The twoyear interest rate differential also contributed to the yen appreciation although only at a later stage.







10. In addition to amplifying the impact of higher uncertainty on the size of yen appreciation, carry trade may also increase the likelihood of a large appreciation. The leveraged nature of carry trade implies that its impact on the U.S. dollar/yen exchange rate may be

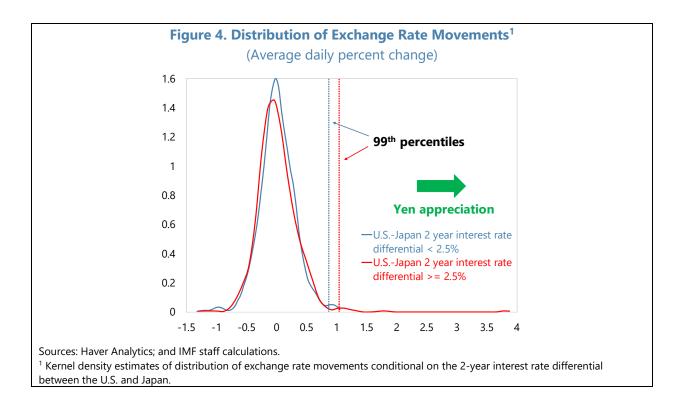
¹³ As mentioned before, the VIX did not rise until mid-May 2006, possibly indicating that the carry trade reversal and exchange rate volatility preceded equity market volatility. In other words, the increased global risk perception before the episode seems to be reflected mainly in non-equity markets, including, for example, foreign exchange markets. In fact, by early 2006, global risk perceptions had risen and the BoJ signaled an exit from quantitative easing. Shocks to foreign exchange markets (excluding shocks to VIX and the interest rate differentials) are captured by the carry trade reversal shock in the VAR model. This may explain the small mitigating impact from the VIX.

asymmetric, as the use of margin calls in the event of adverse movement of the exchange rate (relatively higher value of the yen) can force the unwinding of carry trade positions, but there is no similar forced action when the exchange rate moves favorably (Gagnon and Chaboud, 2007). Therefore, we should expect that the historical distribution of exchange rate movements is skewed towards the appreciation of currencies with low interest rates (such as the yen) and the depreciation of currencies with high interest rates (such as the U.S. dollar). In this context, the skewness of the distribution of exchange rate movement could be an indicator of the likelihood of a large yen appreciation. In particular, if the skewness towards appreciation of yen increases, then we should expect a higher likelihood of large yen appreciations. One may also expect that carry trade activities could affect the skewness.

11. A higher U.S.-Japan interest rate differential could encourage unhedged carry trade activities and increase the likelihood of a large yen appreciation as those carry trade positions are rapidly reversed. Given that interest rate differentials are the key underlying factor for carry trade activities, they may also affect the likelihood of a large yen appreciation. Figure 4 plots the estimated kernel density of the daily U.S. dollar/yen exchange rate movement conditional on the two-year interest rate differential between the U.S. and Japan. The two densities correspond to two conditional distributions when the interest rate differential is low (below 2.5 percent) and when it is high (greater than or equal to 2.5 percent), respectively. In line with Brunnermeier and others (2008), the figure also suggests that the distribution is skewed towards appreciation of the yen. More specifically, there was almost no daily appreciation in the yen of over 1 percent when the interest rate differential was low, but such a likelihood increases to about 1 percent when the interest rate differential is high.

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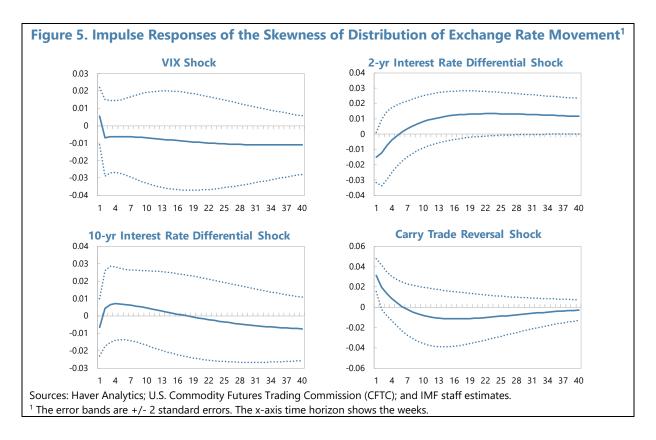
¹⁴ The skewness of the distribution of exchange rate movement measures the 'fatness' of the tail of the distribution toward large yen appreciations, and hence could indicate the likelihood of a large yen appreciation.



12. A measure of the skewness of the distribution of exchange rate movement is added to the baseline VAR model to estimate the impact of each factor on the likelihood of a large yen appreciation. We calculate the skewness of the time series of the daily U.S. dollar/yen movement on a three-month rolling basis as a measure of the likelihood of a sharp yen appreciation. We then average the daily skewness measure to the weekly frequency and, following Brunnermeier et al (2008), add it to the vector Z in the baseline VAR model to analyze the impact of the four factors discussed above. We find that both the two-year interest rate differential and the carry trade reversal had statistically significant effects on the skewness measure (Figure 5). In particular, the effect of the two-year interest rate differential on skewness is only significant in the medium term (a few months after the shock), while that of the carry trade reversal is very short lived. We find that the carry trade reversal is very short lived.

¹⁵ The skewness measure is ranked last in the Cholesky ordering.

¹⁶ The significant impact of the two-year interest rate differential is robust to Cholesky orderings as expected, but the impact of a shock to the net futures position in yen could become statistically insignificant, depending on the specific Cholesky ordering.



E. Conclusions

- 13. Based on an event study and impulse responses from a VAR model, this chapter highlights the importance of carry trade as an amplifier of yen appreciations. Heightened uncertainty can lead to an appreciation in the yen through so-called "safe-haven effects", which tend to be amplified by carry trade reversals as exchange rate uncertainty rises. Moreover, the same increase in uncertainty could have a larger impact on the yen-U.S. dollar exchange rate movement when the level of uncertainty is high, which can be attributed partly to a greater amplification by carry trade reversal. Purely speculative shocks that cause a carry trade reversal can also lead to a self-fulfilling appreciation cycle, as the yen appreciation leads to further unwinding of carry trade positions
- 14. U.S. monetary policy normalization and a continuation of Japan's Yield Curve Control policy may encourage unhedged carry trade activities and increase the likelihood of large yen appreciations as those carry trade positions are rapidly reversed. The empirical results suggest that higher interest rates in the U.S. tend to depreciate the yen and encourage carry trade activities, which, however, increases the likelihood of a large yen appreciation later on. Although the depreciation trend of the yen amid widening interest rate differentials could benefit the Japanese economy going forward, an unwinding of the increased carry trade positions could reverse the depreciation and lead to rapid appreciations. The authorities should keep in mind this exchange rate risk and closely monitor carry trade activities.

References

Botman, D., I. de Carvalho Filho, and W.R. Lam, 2013, "The Curious Case of the Yen as a Safe Haven Currency: A Forensic Analysis," IMF Working Paper 13/288.

Brunnermeier, M.K., S. Nagel, and L.H. Pedersen, 2008, "Carry Trades and Currency Crashes," *NBER Macroeconomics Annual*, Vol. 23, pp. 313–47.

Fama, E., 1984, "Forward and Spot Exchange Rates," *Journal of Monetary Economics*, Vol. 14, pp. 319–38.

Gagnon, J.E. and A.P. Chaboud, 2007, "What Can the Data Tell Us about Carry Trades in Japanese Yen?" International Finance Discussion Papers, Board of Governors of the Federal Reserve System.

Galati, G., A. Heath, and P. McGuire, 2007, "Evidence of Carry Trade Activity," BIS Quarterly Review, Bank for International Settlements: Basel.

Habib, M.M. and L. Stracca, 2012, "Getting Beyond Carry Trade: What Makes a Safe Haven Currency?" *Journal of International Economics*, Vol. 87, pp. 50–64.

Hossfeld, O. and R. MacDonald, 2015, "Carry Funding and Safe Haven Currencies: A Threshold Regression Approach," *Journal of International Money and Finance*, Vol. 59, pp. 185–202.

International Monetary Fund, 2006, Financial Market Update, International Capital Markets Department.

Ito, T., 2015, "The Plaza Agreement and Japan: Reflection on the 30th year Anniversary," Working Paper, Rice University's Baker Institute for Public Policy, Houston.

Ranaldo, A. and P. Soderlind, 2009, "Safe Haven Currencies," Review of Finance, Vol. 14, pp. 385–407.

JAPAN—OPTIONS FOR HEALTHCARE REFORM¹

The rapid aging of Japan's population has raised concerns about the fiscal sustainability of the current healthcare system. Japan's universal approach to health coverage has produced relatively strong outcomes. However, several indicators point to inefficiencies, over-supply, and excess demand. These weaknesses pose fiscal risks as Japan's baby-boom generation crosses over the 75-year of age benchmark, private contributions to health insurance and out-of-pocket costs decline, and the burden of supporting the healthcare system shifts to the government. Under status quo policies, public expenditure on healthcare could rise beyond 16 percent of GDP over the long-term—well beyond what the current tax framework could likely finance. Managing healthcare costs in the context of ongoing demographic challenges will require a combination of measures to contain supply and demand, as well as additional tax revenue over the medium and long-term.

A. Introduction

- 1. The convergence of adverse demographics and a generous universal healthcare system pose challenges for Japan's future fiscal sustainability. Japan's healthcare system—broadly in place since the 1920s—has generated strong outcomes in terms of life expectancy. However, the projected fiscal costs in the context of a rapidly aging population are a clear concern—particularly given lower premiums paid by those over 75 years, a declining contribution base, and Japan's already unsustainable level of public debt. Taken together, public spending on medical and long-term care has risen from about 5 percent of GDP in 1995, to 11 percent currently, and is projected to increase to near 20 percent of GDP by 2050—well beyond what could be sustained without radical and potentially disruptive increases in tax rates. Japan must act quickly to ensure that its health care system can be financially sustainable within a broader macro-fiscal framework that is geared to gradual consolidation.
- 2. A credible medium- to long-term framework for fiscal sustainability must encompass reforms to Japan's social security system. With growth and inflation prospects relatively constrained in the face of adverse demographics and backward-looking inflation expectations, a meaningful policy framework to bring public finances and public debt to a sustainable path will require a combined revenue and expenditure effort. Social security spending (which in Japan encompasses the public pension system together with public expenditure on health and long-term care), is already the single largest item under current expenditure at close to 19 percent of GDP—up nearly 6 percentage points of GDP since the beginning of the century. Pension reform is already underway, but healthcare system reform has lagged. Addressing the structure of Japan's healthcare system to achieve durable fiscal savings (while preserving health outcomes) is a key priority within the larger task of fiscal consolidation.
- 3. This chapter seeks to lay out a range of potential healthcare system reforms and quantify their potential fiscal savings. In doing so, the chapter seeks only to estimate fiscal savings, without taking a position on their relative priority. The chapter's emphasis is on measures to

¹ Prepared by Naoko Miake (OAP), Masahiro Nozaki, and Todd Schneider (both APD).

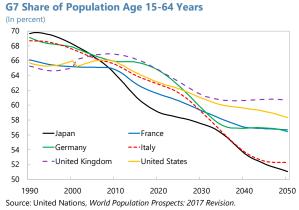
increase efficiency and eliminate wasteful spending, and to bring Japan more in line with practices and spending levels prevalent in the rest of the OECD. Three broad areas are considered here: (i) measures to control costs; (ii) measures to rationalize demand; and (iii) measures to raise the level of private contributions.

4. The estimates presented in this chapter suggest that a combination of reforms to Japan's healthcare framework could generate fiscal savings in the range of up to 2 percent of GDP by 2030. This relatively large range stems from the multiplicity of options on individual cost saving measures (such as differences in application to age cohorts, adjustment of premiums or copayment rates, and other scalable parameters), and potential differences in the timing of reforms (front or back-loaded).

B. Japan's Healthcare System in Perspective

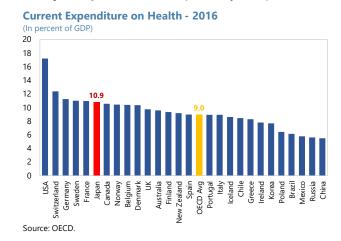
5. Japan is not alone among advanced economies in facing demographic headwinds, but

it is certainly at the front of the pack. After peaking in 2010 at 128 million, the country's population has fallen to 127 million and will continue to decline. Population is set to shrink by 0.6 percent annually for the next two decades, and the decrease will accelerate to 0.9 percent annually into the 2050s. By 2060, Japan will have nearly 27 percent fewer citizens if current trends continue.² Aging of the population (and the shrinking of the working age cohort) is also most prominent in Japan. The closest comparator among the G7 in terms of population decline is Italy, followed by Germany and France.



Japanese health care performs well in cross-country comparisons. Life expectancy in Japan is

long, at 83.2 years compared to an OECD average of 80.2 years. As well as long life expectancy, some indicators of the quality of health care are amongst the best in the OECD. Five-year relative survival estimates after a diagnosis of breast, cervical or colorectal cancer are all high, and the 30-day case fatality after stroke is the lowest in the OECD, at 3 percent.³ Comparatively low costs are enabled by a nationally-binding price list based on a fee schedule that is revised every other year. In cross-country comparisons on health expenditure per capita, Japan ranks below the rest of the G-7 and under the OECD



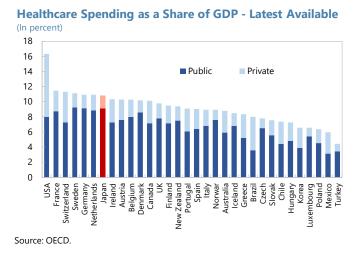
² Source: Bureau of the Ministry of Internal Affairs and Communications.

³ OECD Review of Healthcare Quality, Japan, 2015.

average. However, as a share of GDP, current expenditure on healthcare is among the top six in the OECD, which reflects a number of factors including demographics (rapid aging and depopulation).

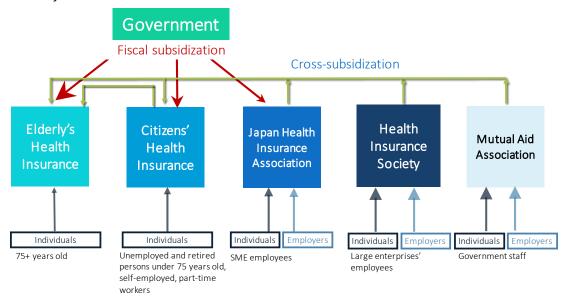
7. Japan's healthcare financing is based on a highly-fragmented social insurance system and is

subsidized with government spending. The healthcare system in Japan features 3,422 health insurers as of March 2017. Insurance payments accounted for 48.8 percent of Japan's total health expenditure, followed by government subsidies to various health insurance schemes at 38.8 percent and copayments by the insured 11.7 percent. Enrollment in the health insurance system is compulsory and applies to all residents including foreigners (short-period visitors are excluded) on condition that they are legally residing in the country. Participants are



covered under one of the following categories of insurance:

- Employee Health Insurance provided by their employers;
- Community-based Citizen's Health Insurance for the self-employed, part-time employees, retirees, and the unemployed, provided by prefectures where they live; and
- Elderly's Health Insurance for people aged 75 years and above provided by the prefectures where they reside.



- 8. Employee Health Insurance can be broadly separated into self-financed Health Insurance Societies (HIS) and the subsidized Japan Health Insurance Association (JHIA). HIS is a corporate-managed program for employees of large corporations (with more than 700 workers) and their dependents. Mutual Aid Associations (MAA) for government staff and their dependents fall under this category. Under the Health Insurance Act, large employers can establish an insurance society to establish and manage its own health insurance program. These insurance societies operate within government regulations to determine their own benefits and contributions. In Japan, there are approximately 1,409 HIS and 85 MAAs managed and funded by employers and employees. Premium rates range from 5.4–12.2 percent of the salary of workers (with a ceiling), reflecting different income levels of those insured, averaging 9.2 percent for FY2018 (Kenporen, 2018). Monthly contributions are shared by employers and employees. Premium rates for HIS and MAA are on the rise, mainly driven by the cross-subsidization required to support the elderly. Some societies whose premium exceeded 10 percent of salary have decided to dissolve and moved into JHIA, as JHIA can receive more fiscal support.
- **9.** JHIA is a quasi-government-managed program covering employees of small and medium-sized firms (between 500 and 700 workers) and their dependents. JHIA is managed by a public corporation established in October 2008 the Japan Health Insurance. The premium rates, ranging from 9.26 percent to 9.42 percent of the monthly salary of workers, are determined based on the health expenditure, demographic structure and income level of each prefecture. Since employees of small and medium-sized firms tend to have lower salaries than those in large corporations, premium revenue alone is not enough to sustain the operation of JHIA. To supplement the deficit incurred, the Japanese government provides subsidy support to JHIA (currently set at 13 percent of its healthcare benefits). Monthly contributions to JHIA are shared equally by employers and employees.

10. Citizen's Health Insurance (CHI) and Elderly's Health Insurance (EHI) are prefecture-based insurers, both exposed to demographic pressures. CHI covers the self-employed, part-

timer workers, the unemployed, and retired persons aged under 75 years. In April 2018, the administration of CHI was consolidated from municipalities to prefectures. More than half of CHI's benefit payment is supported by tax subsidies, reflecting the increasing number of enrollees with low or no income. CHI also receives cross-subsidization from employment-based insurance schemes for their retirees. EHI was created in 2008 to cover all persons aged 75 years or older, including the

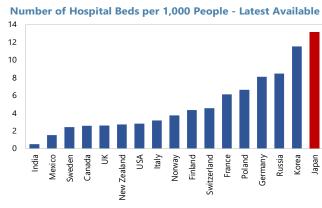


employed and dependent, to increase the transparency of elderly healthcare financing. Half of EHI's benefit is covered by tax subsidies, and 40 percent is funded by cross-subsidization from

employment-based insurers and CHI, as out-of-pocket payment of EHI insured is limited to 10 percent.

11. While Japan's universal healthcare system has provided strong health outcomes, it is **important to take a closer look at overall costs.** Healthcare provision and access are not strongly

regulated, contributing to over-supply and physician maldistribution. From a crosscountry perspective, some elements of supply and demand in the Japanese healthcare market highlight inefficiencies. Japan leads the OECD in terms of both length of hospital stay, and number of hospital beds (per 1,000 people) by substantial margins and is second only to Korea in number of medical consultations per year. This likely reflects supplier-induced demand (Sekimoto and Ii, 2016), partly resulting from the fee-for-service reimbursement system combined with nationally fixed fee schedule for medical services and pharmaceuticals⁴. Physicians may practice wherever they choose, in any area of medicine, resulting in uneven (and potentially inefficient) physician distribution both by specialty and geography. Similarly, Japan places few controls over demand and allows free access for patients; there is no gatekeeper (such as a primary physician) – patients can consult any provider at any time, without proof of medical necessity and with full insurance coverage. Additional out-of-



Source: OECD.



Medical Consultations Per Capita - Latest Available

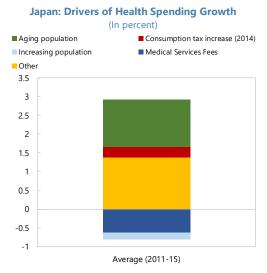
pocket payment has been imposed on visits to tertiary care hospitals without referral since 2016, however, it has had little impact on limiting access (non-referral outpatient ratio decreased by only 1-3 percent). Also, patients often do not recognize the total healthcare cost occurred, due to low copayment ratios and capping of out-of-pocket payments depending on age and income.

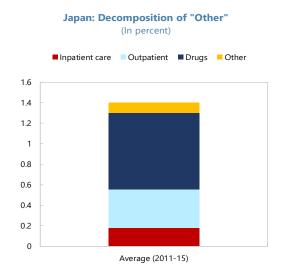
C. Fiscal Dimensions of an Aging Population and Healthcare Spending

12. Population aging and use of advanced and expensive health-technology have been, and will continue to be, the key drivers of health spending in the decades to come. Aging raises health and long-term care spending because the elderly spend more on health than the

 $^{^4}$ Diagnosis Procedure Combination (DPC, a case-based reimbursement) was introduced by the authorities to address these issues in 2003, and now covers nearly 60 percent of total general hospital beds. However, DPC was insufficient on its own to curb healthcare costs as hospitals increased inpatient turnover, outpatient care, and expensive surgeries that are not covered under DPC.

young. Excess cost growth is defined as the excess of growth in per capita health spending over the growth in per capita GDP, after controlling for the effects of demographic change. Excess cost growth has been positive in many advanced economies, pointing to the importance of non-demographic effects such as technological advances (Clements et al, 2012). Such factors as medical service fees, increased pharmaceutical costs, and outpatient care have also elevated total healthcare expenditure in recent years.

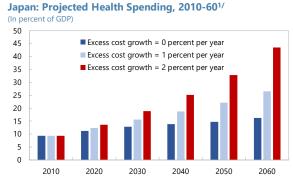




Source: IMF staff estimates.

13. Under status quo policies, healthcare spending (including long-term care) will rise in coming years—presenting a sizeable challenge to Japan's fiscal sustainability. The speed and

magnitude of this increase—abstracting from potential policy changes—is sensitive to assumptions regarding excess cost growth, population dynamics, and healthy versus non-healthy aging (Nozaki et al, 2014). Even with excess cost growth at zero, public expenditure on healthcare in Japan could rise beyond 16 percent of GDP by 2060. By comparison, assuming only 1 percent excess cost growth per year could bring healthcare spending to near 27 percent of GDP in the same period. This would likely be well beyond



Sources: Ministry of Health, Labor, and Welfare; the National Institute of Population and Social Security Research; and IMF staff estimates.

the capacity of tax revenue to finance—the VAT rate would need to be more than double the anticipated 2019 VAT rate of 10 percent (McGrattan, Miyachi, Peralta-Alva, 2018).

14. Rising public expenditure requirements for healthcare have substantial implications for Japan's fiscal sustainability over the medium and long-term. Gross public debt—at an estimated 235 percent of GDP, is already assessed as unsustainable under the IMF's Debt Sustainability Analysis (DSA) framework. Under current policies, it will further increase to more than 245 percent of GDP by 2030, mainly due to increases in health and long-term care. Conversely, to

keep pace with public healthcare spending, the consumption tax rate would need to more than double from its anticipated 2019 level of 10 percent.

D. Potential Reform Options and Future Health Spending

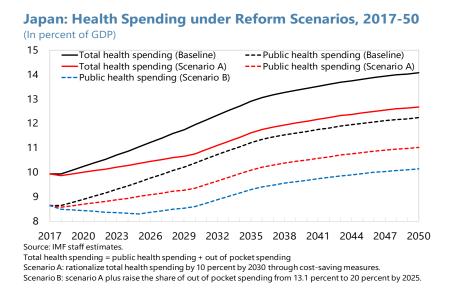
Analytical Framework

- 15. While healthcare system reform can encompass a range of different possibilities,⁵ this chapter examines two main ways to reduce the level of public health expenditure: (i) measures to rationalize the overall level of spending (public and private); and (ii) measures to reduce public spending.
- Measures to rationalize the overall level of spending (both private and public) on healthcare. Some potential reform measures would affect and rationalize the supply of medical services and products. Other measures would reduce excess demand for these services and products. A third group could raise the efficiency of supply and administration. To the extent that measures rationalize total spending with minimum welfare impact, they can be attributed to efficiency gains.
- Measures to reduce the share of public spending on healthcare. For a given level of total health spending, raising the share of private out-of-pocket spending reduces public health spending (i.e., the part of health spending financed by premium contributions and subsidies from the central government). These measures would also reduce healthcare demand, thereby reducing total spending (e.g., higher copayment rates would likely induce citizens to reduce unnecessary or low-priority doctor visits). The degree to which overall demand would be affected is unclear, given differing demand elasticities across products and services and the long history of universal healthcare in Japan. However, some evidence suggests that Japanese healthcare demand elasticity would be similar to that in other advanced countries without price controls or universal care (Iwamoto and Kishida, 2001).
- 16. To illustrate the potential savings in public health spending from healthcare reforms, two quantitative scenarios are presented:
- Scenario A: Reduce total healthcare spending by 5 percent and increase the share of outof-pocket spending from the current 12 percent to 20 percent by 2030. Japan's health
 expenditure per capita varies considerably between prefectures, even accounting for age
 differentials. Under this scenario, total health spending is reduced by 5 percent by 2030,
 assuming cost saving measures to bring all prefectural health spending in line with the most
 efficient prefectures. In addition, it is assumed that Japan's out-of-pocket share (estimated at an
 average of 12 percent of total costs) is brought to 20 percent—roughly the OECD average and in
 line with most other advanced economies—by 2030. The net effect would be to reduce overall

⁵ See, for example, Botman and Porter, The Macroeconomic Impact of Healthcare Financing Alternatives: Reform Options for Hong Kong SAR, IMF Working Paper 08/272, 2008; and Jones, Health Care Reform in Korea, OECD Economics Department Working Paper 797, 2010.

and public healthcare spending from 11.8 percent and 10.4 percent of GDP (under the baseline) to 11.2 and 9.1 percent of GDP by 2030, respectively. By 2050, the differential would increase—from total and public health spending of 13.9 and 12.2 percent, respectively (under the baseline) to 13.2 and 10.6 percent of GDP under the combined reform scenario.

• Scenario B: Reduce total healthcare spending by 10 percent by 2030 and increase the share of out of pocket spending to 20 percent by 2025. This would require deeper reforms with across-the-board cuts equivalent to 5 percent of total healthcare spending in addition to eliminating inefficiency across prefectures, and a faster timetable to increase copayment rates. The net effect would be to reduce overall and public healthcare spending to 10.8 and 8.6 percent of GDP by 2030, respectively. By 2050, the differential would increase—from total and public health spending of 13.9 and 12.2 percent, respectively (under the baseline) to 12.7 and 10.1 percent of GDP under the combined reform scenario.



17. Scenario B would avoid a large increase in taxation to meet fiscal consolidation objectives. Using the model-based approach outlined in McGrattan, Miyachi, and Peralta-Alva (2018), the consumption tax rate would need to be increased to about 20 percent by 2050 to keep public debt at the current level. In contrast, under a scenario comparable to scenario B (the combination of improving healthcare efficiency and increasing the share of out-of-pocket spending), the required increase in the consumption tax rate would be smaller by about 5 percentage points (halving the required increase).

Reform Options

18. The potential range of measures to reform Japan's healthcare system is broad. Table 1 identifies possible measures to rationalize total healthcare spending and increasing the share of out-of-pocket spending. It is not possible here to compile a comprehensive list of reforms or, in many cases, estimate potential savings, as some parameters (such as relative elasticity of demand across

different products and services) is not known, but likely highly variable.⁶ Further, estimates of savings are subject to uncertainties surrounding the final impact on supply and demand. However, based on available data and estimates, the measures shown here and elaborated below, could reduce total spending by as much as 35 percent—potentially enough to realize Scenario B above.

Table 1. Potential Healthcare System Reform Measures and Their Estimated Impact

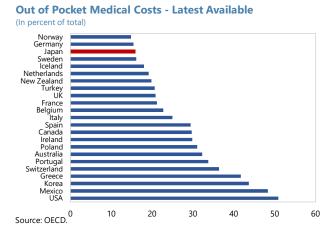
Tubic III otel	iciai i i caiciic	are bystem	Reform Measures and Their Estimated impact			
	Potential savings (percent of THC)	Potential savings (percent of GDP)	Potential measures			
I. Reduce total health spending						
Pationaliza innationt care	2.28-7.79	0.17-0.58	Reduce number of hospital beds			
Rationalize inpatient care			Reduce length of hospital stay			
Rationalize outpatient care	1.07-4.57	0.08-0.34	Require primary care referral for secondary care (gatekeeping)			
Rationalize drug cost	3.42-4.32	0.26-0.32	Require first option of generic drugs as default			
			Reduce duplicates with the patients unused medicines			
			Reduce branded drugs' unit cost			
			Reduce generic drugs' unit cost (from x0.5 of brands' price to x0.3-0.4)			
Other	4.47-4.60	0.33-0.34	Reducing administrative costs (by eliminating dispensary fee, introducing Al-based			
Other	4.47-4.00	0.55-0.54	receipt examination and municipality-based insurers' consolidation)			
II. Reduce share of public spending						
Reduce coverage costs	0.67-1.88	0.05-0.14	Eliminate nonessential services and drugs from public health insurance (such as			
			massage therapy, vitamin, protein etc.)			
III. Reduce share of government subsidies						
Raise premiums		0.08-0.15	Collect premiums from dependent spouses			
TOTAL SAVINGS	11.91-35.07	0.97-1.87				

Source: IMF staff calculations.

19. Reforms to reduce total healthcare spending focus primarily on efficiency. As noted in Section C, Japan is an outlier with respect to several indicators of healthcare system use. The high number of hospital beds, long length of hospital stays, and high number of medical consultations (relative to the OECD average or figures for other advanced economies with aging populations) suggest potential inefficiencies that could be addressed without affecting health outcomes. Similarly, the per capita consumption of pharmaceuticals in Japan is high relative to the OECD average, while use of lower-cost generic drugs is low. Steps to reduce hospital supply and length of stay, use of "gatekeeper" function of primary physicians, making more use of generic drugs and otherwise reducing administrative costs could reduce total healthcare spending by 8–9 percent.

⁶ Demand for critical life-saving or life-maintaining procedures such as dialysis are likely to be inelastic, while more optional treatments, such as massage therapy, are likely to be more elastic.

20. Increasing the share of out-of-pocket spending can be achieved by a combination of higher copayment rates, raising the monthly cap, and introducing a flat fee per medical consultation. Increasing out-of-pocket spending to 20 percent can be achieved by raising copayment rates for those aged over 75 from the current 10 percent to 20–30 percent, and by raising the monthly payment cap for each age group and income level. These measures can be complemented by a small flat fee per medical consultation.



- 21. A more top-down approach to set a hard budget limit could be considered over the medium- to long-term. Budget caps can potentially be effective in reducing spending growth and containing costs. Both econometric analysis and case studies indicate that with the implementation of budget caps, excess cost growth slowed (Tyson, et al, 2012). However, budget caps also come with some downsides. They can inequitably limit access to health care (through growing waiting times), and by themselves are unlikely to spur greater efficiency. Budget caps would be challenging to implement in Japan's current setting, especially because public hospitals account for only about 30 percent of total hospital beds in Japan. Nevertheless, health budget targets also exist in countries where health services are mainly provided privately. There would be scope for Japan to draw from successful practices in other advanced countries—for example, they can also be combined with automatic adjustment mechanisms, as has been done in Italy.⁷
- **22.** Addressing the costs of long-term care is another essential element in reining in overall expenditures. Although not directly addressed in this chapter, the co-mingling of healthcare with long-term care and daily assistance is one of the factors driving up utilization of health-related infrastructure and government spending. This relates directly to Japan's exceptionally long hospital stays compared with other OECD and advanced countries—driven in part by the provision of long-term care in hospitals rather than centers dedicated to long-term and less acute care. Available data indicates that this is an expensive option for long-term care, as such care in standard hospitals (governed by staffing, equipment and other requirements attached to their status as acute care facilities) is roughly double the cost of beds in long-term care facilities. To reduce the number of such beds, the government decided in 2016 to tighten the definition of acute care. To further remedy this misallocation of resources, the reimbursement of long-term care beds by public health insurance also needs to be reduced.

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⁷ Suzuki (2018) proposes to de-link public subsidy from the healthcare cost growth, as it is not sustainable to fund half of healthcare benefits for CHI and EHI which will grow with aging; he suggest limiting public subsidies to the nominal GDP growth rate without adjusting for demographic factors.

E. Conclusions

- 23. Japan's universal healthcare system has produced good health outcomes but appears financially unsustainable given projected population dynamics. The combination of an aging and shrinking population will pose significant challenges. Nonetheless, given Japan's already unsustainable level of public debt and the need to put public finances on a stronger footing, measures to reduce public expenditure on healthcare are needed in the context of a credible, well specified plan for fiscal consolidation.
- **24.** The design of the current healthcare system encourages supply as well as demand (which is also supported by cultural norms). Japan relies primarily on a system of private hospitals, where physicians are paid on a fee-for-service basis in a price-controlled environment—encouraging a high-volume business model. Patients have access to any physician, at any time, with limited or no central control, and no requirement for a referral from a primary care physician. The resulting oversupply (visible in the number of hospital beds per capita) and over-demand (number of medical consultation and length of hospital stays) explain at least part of the excess cost growth of recent years and signal a high level of risk for future additional spending as the population ages.
- **25. Quantitative scenarios suggest that potential savings from a discrete set of measures could range up to 2 percent of GDP by 2030**. Analysis is hampered by insufficient data and uncertainty over the behavior of key supply and demand variables. Working through the analytical framework provided by McGrattan, Miyachi, and Peralta-Alva (2018), this suggests an increase in consumption tax rate by 5 to 10 percentage points over the medium and long-term to meet fiscal consolidation needs under a realistic macroeconomic scenario. Further rebalancing between expenditure and taxation could be achieved through a broader range of reforms, and by a more front-loaded approach—particularly for increasing out-of-pocket costs.

References

Clements, B., D. Coady, and S. Gupta, 2012, *The Economics of Public Health Care Reform in Advanced and Emerging Economies*, International Monetary Fund.

Hayashi, M. and A. Oyama, 2014, "Factor Decomposition of Inter-Prefectural Health Care Expenditure Disparities in Japan," PRI Discussion Paper Series (No.14A-10).

Innami, I., 2016, Rethinking Healthcare Cost Containment: Policy Suggestions Based on Empirical Analyses and Justice Theory, Yuhikaku.

Iwamoto, Y. and K. Kishida, 2001, "An Estimation of Price Elasticity of Medical Care Demand: Evidence from Japanese Policy Reforms During 40 Years," mimeo, Kyoto University.

Jones, R.S. and K. Fukawa, 2017, "Ensuring Fiscal Sustainability in Japan in the Context of a Shrinking and Ageing Population," OECD Economics Department Working Papers No. 1413.

Kenporen, 2018, *Preliminary Report on Health Insurance Societies FY2018*. https://www.kenporen.com/include/press/2018/20180423.pdf (available only in Japanese).

Legislative Council Secretariat, 2010, "Healthcare Financing in Japan, Fact Sheet," Research and Library Services Division, Tokyo.

McGrattan, E., K. Miyachi, and A. Peralta-Alva, 2018, "On Financing Retirement, Health, and Long-Term Care in Japan," IMF Working Paper 18/249.

Nozaki, M., K. Kashiwase, and I. Saito, 2014, "Health Spending in Japan: Macro-Fiscal Implications and Reform Options," IMF Working Paper 14/142.

Sekimoto, M. and M. Ii, 2015, "Supplier-Induced Demand for Chronic Disease Care in Japan: Multilevel Analysis of the Association between Physician Density and Physician-Patient Encounter Frequency," *Value in Health Regional Issues*, Vol. 6, pp. 103–110.

Suzuki, W., 2016, "Japan's Long-term Care Insurance after 15 Years: Shall We Return to the Welfare Program System or Keep Pursuing Market Mechanisms?" RIETI Policy Discussion Paper 16-P-014.

Suzuki, W., 2018, How to Manage Social Security Budget – Abolish Fixed Rate Fiscal Injection, Nikkei.

Tyson, J., K. Kashiwase, M. Soto, and B. Clements, 2012, "Containing Public Health Spending: Advanced Economies," in *The Economics of Public Health Care Reform in Advanced and Emerging Economies*, International Monetary Fund, pp. 101–23.