IMF Working Paper

Macroeconomic Effects of Japan's Demographics: Can Structural Reforms Reverse Them?

by Mariana Colacelli and Emilio Fernandez Corugedo

INTERNATIONAL MONETARY FUND

IMF Working Paper

Asia Pacific Department and Research Department

Macroeconomic Effects of Japan's Demographics: Can Structural Reforms Reverse Them?

Prepared by Mariana Colacelli (APD) and Emilio Fernandez Corugedo (RES) [1]

Authorized for distribution by Paul Cashin and Benjamin L. Hunt

November 2018

ABSTRACT

Yes, partly. This paper studies the potential role of structural reforms in improving Japan's outlook using the IMF's Global Integrated Monetary and Fiscal Model (GIMF) with newly-added demographic features. Implementation of a *not-fully-believed* path of structural reforms can significantly offset the adverse effect of Japan's demographic headwinds — a declining and ageing population — on real GDP (by about 15 percent in the next 40 years), but would not boost inflation or contribute substantially to stabilizing public debt. Alternatively, implementation of a *fully-credible* structural reform program can contribute significantly to stabilizing public debt because of the resulting increase in inflation towards the Bank of Japan's target, while achieving the same positive long-run effects on real GDP. If no reforms are implemented, severe demographic headwinds are expected to reduce Japan's real GDP by over 25 percent in the next 40 years.

Contents   Page

I. INTRODUCTION

After nearly three challenging decades, Japan's economic prospects remain weak in the face of strong demographic headwinds. The economy has experienced almost three decades of sub-par economic performance since the 1992 bursting of the financial and property bubble, with weak real GDP growth and repeated deflationary episodes. There have been several attempts to reflate the economy prior to the ongoing "Abenomics," but none were sustained. With the effectiveness of monetary policy constrained by the Effective Lower Bound (ELB) and repeated fiscal stimuli building an unprecedented increase in public debt, there is now less room to stimulate the economy. Moreover, structural bottlenecks in the labor market limit productivity growth and hamper the pass-through of demand stimulus to real wages and prices. Importantly, a rapidly shrinking and ageing population and labor force constitute severe demographic headwinds to future productivity and growth, with official projections anticipating that Japan's population will decline by just over 25 percent in the next 40 years (Figure 1). Weak growth and inflation prospects, together with growing age-related government spending, pose serious challenges to fiscal prospects as well.

Model simulations point to significant adverse effects on economic activity and further deterioration of government finances due to Japan's unfavorable demographics. Simulations using the IMF's Global Integrated Monetary and Fiscal Model (GIMF) —— incorporating the authorities' demographic projections plus associated age-related health and pension spending projections — point to significant declines in real GDP, consumption, investment, and real wages, with a notable increase in the public-debt-to-GDP ratio and a deterioration of the external current account (Figure 1).[2,3,4] For example, IMF staff simulations estimate that the level of real GDP will decline by over 25

---

[2] Simulations use a recently updated version of GIMF that includes demographics. See forthcoming IMF Working Paper by Carton and others (2018) for more details.

[3] Throughout the paper, the baseline simulation (or "current policies" scenario) assumes that: (i) BoJ follows a calibrated monetary policy reaction function (see Appendix C for more details), (ii) the planned 2019 consumption tax hike takes place with no subsequent additional hikes or other fiscal consolidation measures, (iii) authorities' demographic projections and associated fiscal age-related spending projections, (iv) non-age-related government spending remains constant in per capita terms, and (v) female labor force participation and migration do not mitigate the anticipated decrease in the labor force. Note that the baseline simulation is computed relative to a simulation where the economy continues to grow at the average pace observed in 2012-17 (1.3 percent). Given that 2017 population growth was -0.24 percent, GDP per capita growth is assumed to be close to 1.5 percent, which is the assumed TFP growth rate.

[4] Demographic projections are produced by the National Institute of Population and Social Security Research. Health and pension spending projections follow McGrattan and others (2018). They estimate the impact of population ageing on government expenditure in a closed-economy overlapping-generations DSGE model, using authorities' demographic projections. In their analysis, McGrattan and others (2018) examine fiscal policy options given the declining and ageing population and find that consumption tax increases that stabilize net government debt are welfare improving (relative to the use of other tax instruments or temporarily higher government net debt).

percent in about 40 years due to demographics under current policies (with an average annual GDP growth rate of about -0.8 percent) relative to a projection where productivity and population grow at their recent pace. In response to a shrinking and ageing population, GDP growth declines not only due to the direct effect from the decline in labor inputs, but also because the capital stock declines in response to the shrinking labor inputs.[5,6] As a result, private savings fall, leading to a deterioration of the current account which is further exacerbated by the reduction in tax revenues and increased government dissaving.[7]

Figure 1. Japan: Impact of Demographic Projections
(Baseline Simulation)
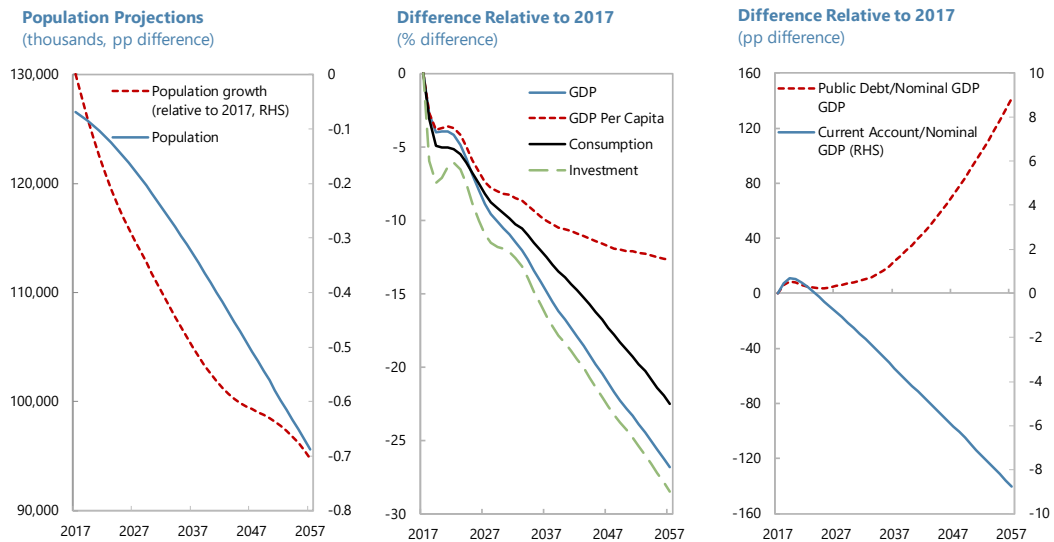
Sources: GIMF simulations and IMF staff's calculations.

This paper studies the potential role of structural reforms in lifting Japan's outlook. Facing challenging economic prospects, Prime Minister Abe launched Abenomics at end-2012 to boost growth and inflation and bring government debt to a sustainable level. The economic plan of

---

[5] The direct effect on GDP, consumption and investment from the decline in labor inputs is due to the decline in both population and total hours worked. Per capita GDP, consumption and investment also fall, but by less than their aggregate counterparts. The per capita decline occurs because as households age, per capita productivity growth and hours worked decline as the models assumes that these decline throughout the worker's lifetime. This assumption is consistent with observed profiles of wages and hours worked in Japan.

[6] Capital declines since the existing capital stock is relatively large vis-a-vis a declining labor input, resulting in a declining return to capital and thus lower investment. Consumers, who ultimately own the capital stock, lower their savings and decumulate capital. They do so at a slow pace since they are expected to live longer and be able to work less hours in their old age.

[7] With lower output, exports fall. Imports fall by less than exports as households support consumption and thus imports by dissaving. The real exchange rate appreciates as the economy requires fewer exports in response to declining imports and potential output.

Abenomics is anchored on "three arrows"⸺bold monetary easing, flexible fiscal policy and structural reforms.[8] Whereas the first two arrows were launched in earnest and met with initial success in 2012-13, the third arrow of structural reforms has yet to be fully implemented. In this paper we consider the set of structural reforms proposed by past IMF Japan Article IV Consultations and evaluate their impact on the economy.[9] The set of studied reforms can loosely be classified into three broad categories: reforms to the labor market, reforms to product market and corporates, and international trade reforms.

This paper estimates the possible impact of structural reforms in Japan using GIMF, highlighting the importance of reform credibility. The analysis studies the conditions needed for structural reforms to maximize growth and inflation, while also stabilizing debt dynamics in the face of severe demographic headwinds. The paper therefore focuses on the nexus between structural reforms and debt sustainability, and as a consequence it highlights the effects on the level of GDP rather than GDP per capita. While the reform agenda has trade-offs and synergies, results show that some of the trade-offs can be eased when policy is coordinated and decisive ("fully-credible" scenario).[10] The largest possible reform impact arises when efforts are fully credible, boosting the level of real GDP by about 15 percent in 40 years relative to the "current policies" scenario, while accounting for monetary accommodation and debt stabilization (with reforms mitigating 0.5 of the 0.8 percentage point drag to annual GDP growth from demographic factors).[11,12] However, when the path of structural reforms is "not-fully believed" by agents, reforms deliver a smaller near-term GDP boost and lead to weaker improvements in inflation and public debt dynamics.

The paper first describes the proposed reforms and how these are implemented in GIMF, followed by a description of key results. Section II describes the proposed reform program and summarizes "off-model" estimates of the possible impact of the reforms on key variables (including labor productivity, labor supply, investment and trade costs) that serve as inputs into GIMF. Section III discusses the calibration strategy used and how the reforms are implemented in the model. Section IV presents the simulation results and emphasizes the differences between

---

[8] See for example Botman et al (2015).

[9] See IMF (2012a), IMF (2012b), IMF (2013a), IMF (2013b), IMF (2014), IMF (2015), IMF (2016a), IMF (2016b), IMF (2017a), and IMF (2017b).

[10] Synergies arise, for example, when reforms raise the return on investment and hence boost the capital stock and the real interest rate (since investment will exceed savings). In addition, reforms that lift labor supply – and potential growth in general – will also raise the return on investment and thereby the natural real interest rate, making a monetary policy accommodation more effective.

[11] These results should be interpreted as the upper bound of the structural reform impact as they assume that economic agents fully believe the structural reform path.

[12] Parallel results for GDP per capita show that fully credible structural reforms can compensate the decline in GDP per capita (by over 10 percent in around 40 years) due to demographics under current policies.

fully-credible and *not-fully-believed* reforms. It also describes the role that monetary and fiscal policies have in supporting the reforms. Section V concludes. Appendices cover: how mitigating labor market duality increases labor productivity; an overview of GIMF; detailed discussion of GIMF calibration and simulation strategies; a detailed decomposition of each of the labor and product market reforms; and the drivers of public debt reduction.

II. THE PROPOSED STRUCTURAL REFORM PROGRAM

The studied structural reform package encompasses three broad categories of proposed reforms, taken from the IMF's 2017 Japan Article IV Consultation: labor market reforms to address duality and boost labor supply; corporate and production sector reforms; and trade agreements (IMF, 2017a).

A. Labor Market Reforms

The proposed labor market reforms are designed to eliminate labor market duality over time and increase labor supply. Reforms to address labor market duality are designed to increase productivity by providing training and career opportunities across the workforce, while delivering balanced overall employment protection and compensation. Reforms that lead to an increase in labor supply are designed to partly offset the effects of an ageing and declining population and labor force. The labor supply expansion is predicated on an increase in labor force participation by female and older workers and by increased foreign human resources, whereas reforming the dual labor market proposes contract reform to boost overall productivity and real wages. More specifically:

a. **Gradual replacement of regular and non-regular contracts by "intermediate" contracts to boost labor productivity.**[13] With employment protection for regular workers being relatively high in Japan, firms have made use of non-regular workers to contain wage costs and satisfy cyclical upsurges in demand.[14] A consequence of the rapid increase in non-regular workers has been a decline in productivity as non-regular workers are subject to temporary contracts that typically result in less training, worse career prospects and reduced job security, relative to regular workers.[15] We estimate that a gradual introduction of intermediate contracts (replacing regular and non-regulars over time), where intermediates are assumed to be as productive as regular workers, would *boost the level of labor*

---

[13] In Japan, labor market duality refers to the presence of regular and non-regular workers. Regular workers have contracts regarded as lifetime contracts, while non-regular workers have temporary contracts and reduced benefits.

[14] See for example the Ministry of Health, Labor and Welfare's "General Survey on Diversified Types of Employment" (2010) or "Trends in Non-Regular Employment in Japan and Analysis of Several Related Themes" (2015) by the Japan Institute of Labor Policy and Training.

[15] See for example, the Japan Institute of Labor Policy and Training Research Report No 117, Higuchi (2013) or Hara (2014), Fukao and others (2012).

productivity (currently growing by around 1.5 percent per annum) by over 7 percent in the long-run (see Appendix A for details).[16,17] This reform makes the crucial assumption that firms would provide training to intermediate workers as they do for regulars, to boost intermediates' productivity to the same level as existing regular workers, thereby delivering an upper bound in terms of potential productivity gains. Meanwhile, the reform does not assume a significant change in workers' bargaining power.

b. **Increased labor force participation of females and older workers**. While, by definition, there is a limit to the growth effect from higher labor force participation, research by IMF (2012b, 2013a) suggests that increasing female labor force participation from 2010 levels (63 percent) to the average of the G7 (equal to 70 percent when excluding Italy and Japan) by 2030 would increase potential growth by up to 0.2 percentage points per year. An additional increase to northern European levels (75 percent) would increase potential growth by an additional 0.2 percentage points. As the actual level of female participation in Japan is just shy of 70 percent in 2017, we assume that increasing female labor force participation towards northern European levels would lift potential growth by around 0.2 percentage points each year over 20 years (in line with Steinberg and Nakane, 2012). Older workers' participation (those aged 60 and above) is already high in Japan relative to OECD levels, and it is assumed that a further 3 percentage point increase in participation would increase the labor force by around 0.5 percentage points, with a small impact on potential output growth. All in all, *increased labor force participation of females and older workers is estimated to lift potential growth by 0.2 percentage points over 20 years.*

c. **Increased migration by one percent of the labor force**. IMF (2012b, and 2013a) studies suggest that *increased migration that lifts the labor force in Japan by 1 percent would increase potential growth by 0.15 percentage points over 10 years*.

B. Corporate and Product Market Reforms

Three types of corporate and product market reforms are considered, designed to increase both productivity and investment. Product market and small and medium enterprise (SME) reforms will boost productivity and investment, while reforms to corporate governance will help unleash excessive cash holdings and use them for investment. More specifically:

---

[16] Intermediate workers are defined as those with intermediate contracts. Japan presently has intermediate or "limited regular" contracts ("gentei seishain" in Japanese), though these are not widely adopted partly because their legal framework is not clear. While intermediate contracts are specific to a position/location (unlike regular contracts which are regarded as lifetime contracts with possible changes in position and location), the court-based system in Japan, under the current legal framework, could regard intermediate contracts as regular contracts. Therefore, the present legal framework may prevent firms from dismissing intermediate workers (as it currently does for regulars).

[17] The productivity growth increase amounts to 0.3 percentage points per year over twenty years.

a. **Product market reform**. These reforms envisage an easing of barriers to entry and removal of protections to incumbents in some industries (such as telecom and gas sectors), and deregulation of professional services (IMF, 2017b). These reforms are expected to increase productivity and investment. Egert and Gal (2017), building on the framework of Barnes (2014), suggest that a 20 percent reduction in product market regulation can deliver a 2.4 percent increase in multi factor productivity (MFP) after five years.[18] It is therefore assumed that this *reform gradually boosts MFP, resulting in a 2.4 percent improvement after five years*.

b. **Reforms to SMEs**. Lam and Shin (2012) and IMF (2012b, 2013a) suggest that restructuring of the SME sector could lift the productivity of smaller firms, allowing it to increase to about 80 percent of that of large firms.[19] *This translates to increases in overall productivity (TFP), achieving a 2.5 percent improvement after ten years*.

c. **Corporate governance reform**. Research by IMF (2013a), Aoyagi and Ganelli (2017) and Sher (2014) suggest that firms in Japan hold too much cash. *Corporate governance reform, by allowing that surplus cash is used for investment, could boost the level of investment by 5 percent* according to Sher (2014). Accordingly, we assume a reform that increases the level of investment by 5 percent after ten years.

C. International Trade Reforms

International trade reforms relate to two recently-agreed trade agreements: The Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP or TPP-11) and the Japan-European Union (EU) trade agreement.[20] To approximate the impact of the reforms, we consider a reduction of all tariff and non-tariff barriers between Japan and signature countries in CPTPP (Australia, Brunei, Canada, Chile, Malaysia, Mexico, New Zealand, Peru, Singapore and Vietnam), and between Japan and the European Union.

We use the trade restrictiveness measures of Kee and others (2009) to compute the impact of the trade agreements. Kee and others (2009) estimate ad-valorem equivalents of all non-tariff barriers for nearly eighty countries, and they merged them with tariff measures to obtain an aggregate trade restrictiveness measure. *The simulations assume that all trade measures are unwound over five years, such that all barriers on all goods and services between Japan, EU and the*

---

[18] Estimate computed as the average for OECD advanced economies for the period 1985-2011.

[19] Colacelli and Hong (2018, forthcoming) estimate that boosting laggard SMEs' productivity growth (output per worker) to that of the average non-laggard Japanese firm, would significantly increase average annual productivity growth of Japanese firms. In light of this work, the SME reform impact used in the present paper is conservative.

[20] TPP-11 was signed in March 2018 and ratified by Japan's Diet in July 2018, and it will come into force in December 2018 as it has been ratified by six (out of eleven) countries in October 2018. Japan and the EU concluded EPA negotiations in December 2017.

countries that signed the CPTPP vanish entirely.[21] These barriers result in an equivalent reduction of tariffs of 9 percent by Japan and 6 percent for Europe, and around 10 percent by CPTPP countries; and reductions of non-tariff barriers by 23 percent in Japan, 6 percent in Europe and around 9 percent by CPTPP countries.

III.   GIMF CALIBRATION, ASSUMPTIONS, AND SCENARIOS

A.   GIMF Calibration

The structural reforms are implemented in a six-region version of GIMF which allows for demographics and matches Japan's stylized facts. The six regions comprise Japan, the United States, the Euro Area, Emerging Asia, Latin America plus the rest of the world.[22] One salient feature of the Japan calibration is the high degree of nominal rigidity in the economy, which plays a key role in the estimated short-run impact of proposed structural reforms. Additional details on how GIMF is calibrated for Japan are provided in Appendix C.

To quantify the impact of the reforms in GIMF, the reforms are mapped to changes in GIMF's structural parameters and shocks. Appendix C discusses details on how the reforms are mapped to the various shocks (total factor productivity shocks, labor supply, and investment and trade shocks), with guidance stemming from the "off-model" analysis that was presented in Section II. As Andrle and others (2018) note in a related exercise for Italy, several papers provide guidance on how to produce such a mapping in GIMF.

B.   Assumptions

Different implementations of the reforms are considered, depending on whether economic agents fully believe the announced reform path (fully credible) or do not fully believe the announced reform path (not fully believed):[23]

o   When reforms are deemed **fully credible**, it is assumed that all (private sector) agents expect the reforms to be *fully implemented over several years* (i.e. there is perfect foresight of the path of the reform).[24] Therefore, a fully credible reform program entails anticipation effects

---

[21] The assumed full removal of tariff and non-tariff trade barriers is larger than envisaged under the trade agreements and thus, the simulations provide an upper bound for the impact of the trade agreements.

[22] The calibration of GIMF is discussed at length in Kumhof and others (2010), Anderson and others (2013) and Carton and others (2017), which emphasize the calibration of key global variables that pin down parameters associated with household preferences and production.

[23] While assumptions are made about the credibility of structural reforms, possible commitment devices to achieve credibility are not modeled in this exercise.

[24] This implies, for example, that in the case of increased female labor force participation, agents know that potential growth will be 0.2 percentage points higher every year for twenty years, or in the case of corporate governance reform, agents know that the level of investment will be 5 percent higher after ten years. Hence

that support near-term economic activity and inflation because the implied demand boost (as firms and households increase investment and consumption due to higher expected capital returns and permanent income) exceeds the contemporaneous supply boost from the reform plan.

o We compare the impact of fully-credible reforms with **not-fully-believed reforms**, in the sense that *agents only believe the reforms at the time when these are implemented and realized* (implying imperfect foresight of the reform path).[25]

Bank of Japan's credibility: We assume that any persistent increase in inflation above the "perceived" inflation target (of one percent), improves the credibility of the Bank of Japan's two-percent inflation target, thereby resulting in higher inflation in the long-run.[26,27]

Fiscal assumptions: Two sets of fiscal assumptions are used. First, all scenarios assume that age-related government spending grows with ageing while non-age-related government spending remains constant over time in per capita terms. This implies that overall government spending is the same under the baseline and under all reform scenarios. Second, all scenarios assume that all tax rates are constant (resulting in higher tax revenue due to structural reforms which is assumed to be used to reduce the public debt), except for one scenario where debt stabilization is achieved by a higher consumption tax rate (as proposed by McGrattan and others, 2018).

C. Four Scenarios

Four sets of simulation results are presented to show a range for the plausible effects of the various structural reforms. In the first case (labelled Case A), we consider the impact of the fully-credible reforms without monetary policy support or full stabilization of the public debt. To evaluate the impact of credibility, we next examine Case B where the reforms are not fully believed. In the final two cases we revert to the case of fully-credible reforms and allow for monetary policy accommodation (labelled Case C) and then add in full public debt stabilization

---

agents are only surprised by the announcement of the reform plans, and are not subsequently surprised when the reforms take place over time.

[25] This implies, for example, that in the case of increased female labor force participation, agents will observe an annual increase in potential growth of 0.2 percentage points in the first year of the reform and would not expect further increases thereafter. In the subsequent year they are surprised by another 0.2 percentage points increase but do not expect further increases. Hence agents will be surprised each year that the reform takes place.

[26] This assumption implies that private agents update their beliefs' (increase them) about the Bank of Japan's inflation target when realized inflation increases above previously expected levels, and is loosely based on the framework of Alichi and others (2009), Demertzis and others (2012) and Davis (2012).

[27] Unlike in the case of structural reforms, the analysis models a specific mechanism to improve the credibility of BoJ's inflation target.

(labelled Case D or "Abenomics Redux").[28] In all cases we discuss the impact on key macroeconomic variables such as GDP, consumption, investment, real wages, inflation, the nominal interest rate, the real exchange rate, the current account, and public debt.

IV. RESULTS

A. "Plain Vanilla" Fully-Credible Reforms

Credible structural reforms boost GDP by over 10 percent above the baseline after ten years, and help inflation reach the Bank of Japan's two-percent inflation target. Figure 2 presents the marginal impact of the structural reforms relative to the baseline from Figure 1 (or "current policies"). Each reform is layered on top of each other, starting with reforms to the labor market (blue), then the corporate/product market (red), and ending with the impact of trade agreements (black).[29] We show the impact of the reforms on the level of GDP, consumption, investment, real wages, nominal interest rates, inflation, the real exchange rate, and both the current account and public debt as a percent of GDP. Appendix D further decomposes the impact of each of the labor and corporate/product market reforms.

The main channels of Case A unfold in the near term as follows: Anticipating the prolonged nature of both labor market and product market reforms that boost the return to capital, firms immediately increase their investment to build up their capital stock.[30] At the same time, in anticipation of higher permanent income, households increase consumption. The demand increase stemming from higher consumption and investment exceeds the increase in potential output, putting pressure on production costs (real wages, cost of capital) and hence inflation. The nominal interest rate increases as the central bank seeks to contain inflationary pressure in the near term. A relative increase in imports results in a deterioration of the current account balance relative to baseline in the first seven years. Public-debt-to-GDP declines in response to the GDP increase and in response to the reforms-generated higher tax revenue which is used to reduce the public debt.

---

[28] Relative to the baseline policy rule, further monetary accommodation is achieved by slightly reducing the feedback coefficient on expected inflation and by increasing the coefficient on lagged interest rate. More specifically, we assume a coefficient on lagged interest rates of 1 and a coefficient on inflation of 0 for two years (implying full accommodation of the reforms). In the subsequent five years we move the coefficients towards the baseline policy rate, that is by lowering the degree of interest rate inertia from 1 to 0.4 and increasing the coefficient on inflation from zero to 0.9.

[29] The black line shows the total impact of the reforms while the difference between the various lines shows the impact of each of the reforms: labor market reforms (blue vs axis), product/corporate reforms (red vs blue) and trade agreements (black vs red).

[30] Return to capital increases because many of the reforms lead to: increases in multifactor productivity (duality, product market and SME reforms); increased size of the labor force (more female, older and migrant workers); or the cost of investment declines (corporate governance reforms).

Beyond the near term, consumption, investment and GDP continue to increase, but only gradually as potential output continues to expand. Inflation increases in the long run as the persistent inflationary increases result in increased credibility of the Bank of Japan's inflation target.[31] Public-debt-to-GDP ratio declines in the long run due to the interest savings from the reduced debt (on top of the reduced debt from primary surpluses) The current account improves in the long run as exports increase in response to higher potential output (leading to a real depreciation of the yen in the long run) and also, in response to the significant decline in public debt, households substitute domestic assets for foreign ones increasing the net foreign asset position.

Trade agreements also boost output and inflation. While tariffs are relatively low in Japan, there are important non-tariff restrictions according to Kee and others (2009). Removing both tariff and non-tariff trade barriers therefore results in a sizeable reduction to import prices which boosts investment (and hence potential output) and consumption.[32] Accordingly, in response to the trade agreements, imports increase and the real exchange rate must depreciate to bring the trade balance back to equilibrium (by boosting exports and partly reducing imports).[33] The current account, due to trade agreements, remains weakened in the long run (the difference between the black and red lines) given the large trade balance deterioration in the short run which lowers both the net foreign asset position and associated income flows from those assets.

---

[31] Absent the assumptions made about the credibility channel, the inflation increase would be temporary, and inflation would return to its initial steady-state in the long run (one percent).

[32] A reduction in tariff and non-tariff barriers lowers the price of imported investment, thereby boosting investment and potential output.

[33] This occurs because Japan has relatively larger non-tariff trade barriers than other signatures of the trade deals.

Figure 2. Japan: Credible Structural Reforms
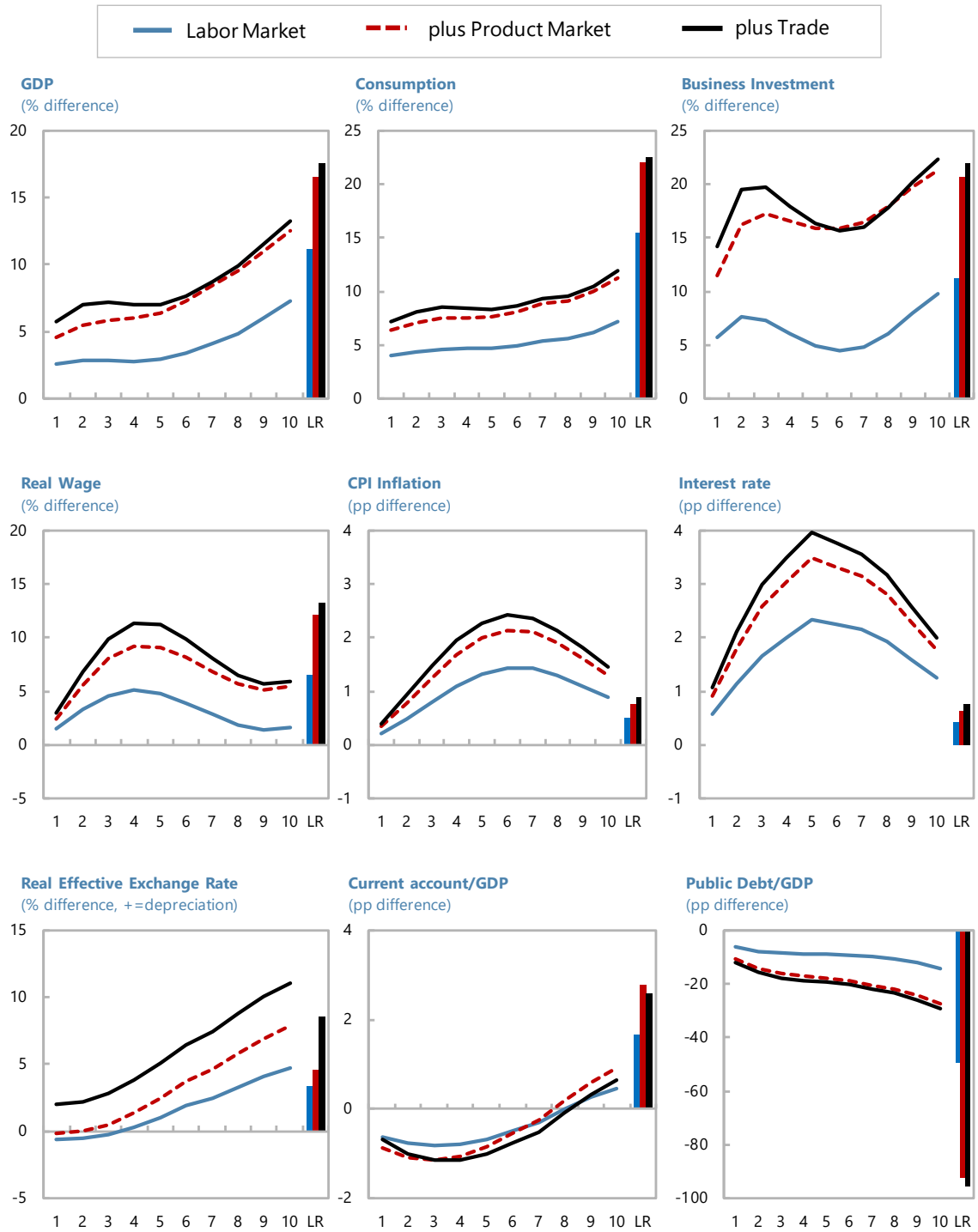
Labor Market —— plus Product Market ----- plus Trade ——

GDP
(% difference)

Consumption
(% difference)

Business Investment
(% difference)

Real Wage
(% difference)

CPI Inflation
(pp difference)

Interest rate
(pp difference)

Real Effective Exchange Rate
(% difference, +=depreciation)

Current account/GDP
(pp difference)

Public Debt/GDP
(pp difference)

Note: Reported effects are changes relative to the baseline reported in Figure 1.
Source: GIMF simulations and IMF staff's calculations. X-axis denotes years, LR=Long-run/steady-state (40+ years).

Labor market reforms, driven primarily by reforms to the dual labor market, have the largest output effect, followed by the corporate/product market reforms (Figures 2 and 3). The significant impact from reforms to the dual labor market, which contribute almost 6.5 percent to the level of output, stems from the impact of the reform on labor productivity, as non-regular workers are gradu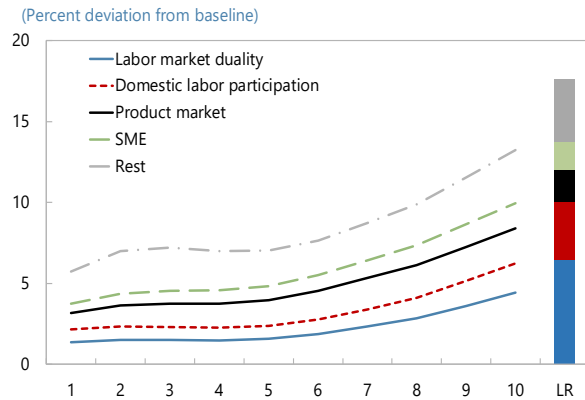ally replaced by more productive intermediate workers. Increased domestic labor force participation has the second-largest impact of all other reforms, contributing 3.5 percent to the level of GDP. Within the product market/corporate reforms, the largest impact stems from reforms to the product market, closely followed by reforms to small and medium enterprises which yield output increases of 2 percent and 1.7 percent, respectively.

Figure 3. Japan: GDP Effect of Credible Structural Reforms

(Percent deviation from baseline)

Sources: GIMF simulations and IMF staff's calculations.
Notes: X-axis denotes years and LR = long-run. Bars are stacked so that grey shows overall effect.

There is a range of uncertainties around such long-run model simulations. For example, there is uncertainty over the magnitude of the labor market reform estimates. Our results assume that the productivity of non-regular workers catches up fully with that of regulars and may therefore represent an upper bound to associated GDP gains. Previous research on labor market reforms that consider a reduction in job protection (e.g. IMF, 2016c; Duval and Furceri, 2018; Bassini et al., 2009) point to smaller gains driven by job protection reforms. However, the labor market duality reform studied in

Figure 4. Japan: GDP Effect of Credible Structural Reforms Under Full and Partial Labor Duality Reform

(Percent deviation from baseline)

Sources: GIMF simulations and IMF staff's calculations.
Notes: X-axis denotes years and LR = long-run.

this paper is Japan-specific as it focuses on Japan's potential productivity gains, not job protection reforms which have been the focus of the existing literature (see Appendix A). Nevertheless, to show the uncertainty associated with the reform, Figure 4 presents estimates that assume that only half of the productivity gap (between non-regular and regular workers) is closed, delivering a smaller real GDP gain (by about 3 percentage points in the long run).
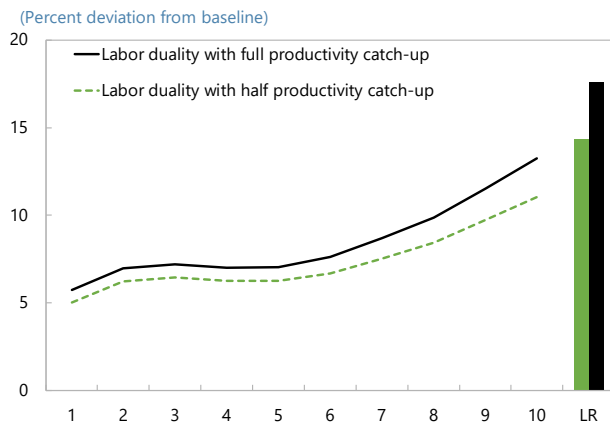
B. Not-Fully-Believed Reforms

Not-fully-believed reforms have a significantly lower impact on GDP in the near term, do not help inflation reach the Bank of Japan's target, and result in less government debt reduction in the long run. The GDP, consumption, investment and real wage impact, in the long run, is nevertheless close to the fully-credible reform scenario. Figure 5 presents the marginal impact of the structural reforms relative to the baseline, with each reform layered on top of each other, starting with reforms to the labor market (blue), then to the corporate/product market (red), and ending with the impact of trade agreements (black).

The main channels of Case B unfold as follows: While consumption, investment and GDP are all higher, not-fully-believed reforms clearly result in a weaker short-term boost relative to Case A. The reforms have a lower impact in the near term because at that time both firms and households do not expect further reform efforts to materialize and hence do not expect their permanent income or the return to investment to be as high as in the fully-credible reform scenario. Subsequent reform "surprises" deliver only gradual increases in investment and consumption. Hence demand increases broadly in line with potential output through the period over which the reforms are implemented, which results in less inflationary pressure. The increase in GDP, brought about by increases in labor and capital, requires an exchange rate depreciation to export part of the additional output and to be able to bring the trade balance into equilibrium in the face of additional imports. In the long run, the impact of the reforms is very similar to the fully-credible case, except, importantly, for inflation and public debt. Without the sustained pickup in near-term inflation, the central bank is not able to increase inflation expectations towards the two-percent target, and inflation remains at one percent in the long run. As *nominal* GDP increases by less in this scenario (relative to Case A), the reduction in the public-debt-to-GDP ratio is lower.

Figure 5. Japan: Not-Fully Believed Structural Reforms
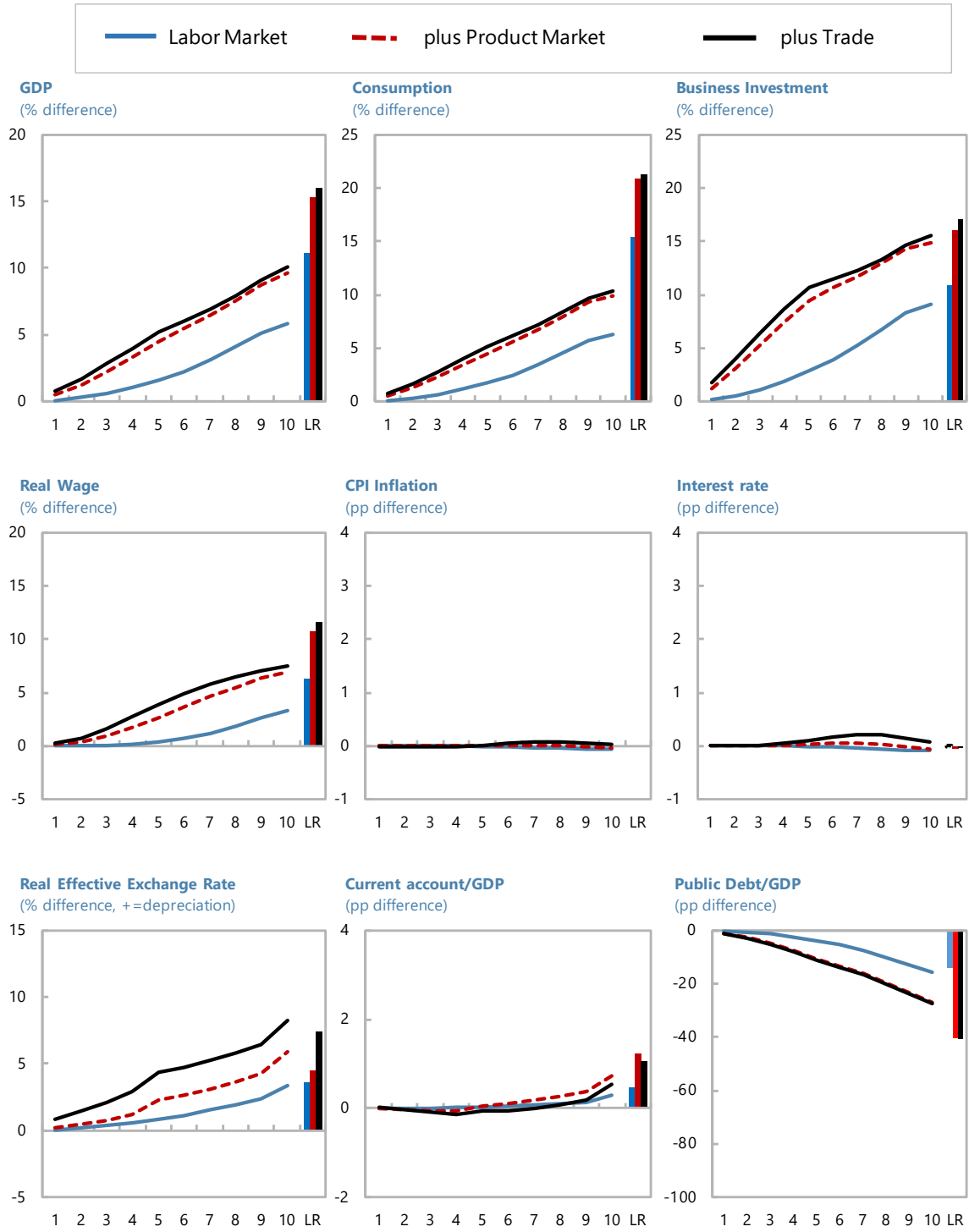
Labor Market — — plus Product Market — plus Trade

GDP
(% difference)

Consumption
(% difference)

Business Investment
(% difference)

Real Wage
(% difference)

CPI Inflation
(pp difference)

Interest rate
(pp difference)

Real Effective Exchange Rate
(% difference, +=depreciation)

Current account/GDP
(pp difference)

Public Debt/GDP
(pp difference)

Note: Reported effects are changes relative to the baseline reported in Figure 1.

Sources: GIMF simulations and IMF staff's calculations. X-axis denotes years, LR=Long-run/steady-state (40+ years).

C. Fully-Credible Reforms with Monetary Accommodation

Monetary policy accommodation, in addition to fully-credible structural reforms, results in stronger near-term activity which further boosts inflation. Figure 6 presents the marginal impact of structural reforms relative to the baseline, including monetary accommodation, again with each reform layered on top of each other. For Case C, when the monetary policy authority accommodates the structural reforms, the near-term real interest rate falls which further boosts activity by incentivizing households and firms to bring forward their consumption and investment plans. Additionally, the exchange rate depreciates in the near term in response to a lower near-term real interest rate. In response, inflation increases by more and public debt declines more rapidly. In the long run, the impact of the reforms is the same as in the credible simulations from Case A.

Figure 6. Japan: Credible Structural Reforms Plus Monetary Policy Accommodation

— Labor Market   - - - plus Product Market   — plus Trade

GDP
(% difference)

Consumption
(% difference)

Business Investment
(% difference)

Real Wage
(% difference)

CPI Inflation
(pp difference)

Interest rate
(pp difference)

Real Effective Exchange Rate
(% difference, +=depreciation)

Current account/GDP
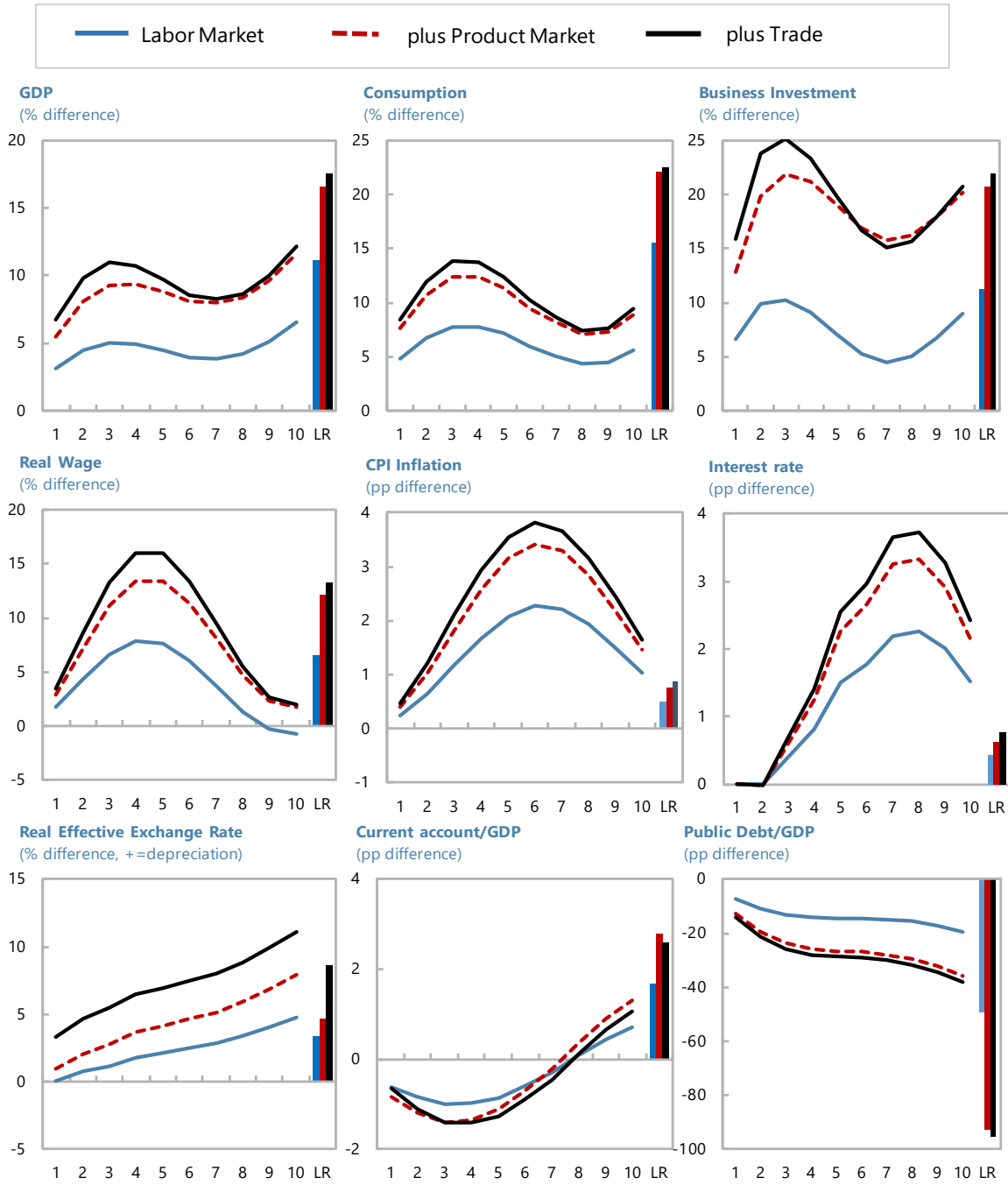(pp difference)

Public Debt/GDP
(pp difference)

Note: Reported effects are changes relative to the baseline reported in Figure 1.

Sources: GIMF simulations and IMF staff's calculations. x-axis denotes years, LR=Long-run/steady-state (40+ years).

D.   Abenomics Redux: Fully-Credible Reforms with Monetary Accommodation and Public Debt Stabilization

Structural reforms together with monetary accommodation and public debt stabilization can partially offset demographic headwinds. To present simulation results for this final scenario (Case D), we add the estimated effects to the baseline or "current policies" scenario (summarized in Figure 1). This final scenario includes fully-credible structural reforms with monetary policy accommodation (as in Case C) but also increasing the consumption tax rate to stabilize public debt fully.[34] This presentation of results (that include in the same figure the baseline together with Abenomics Redux) delivers an estimate for *how much of the demographic headwinds can be undone via reforms*. As before, all simulations are being added up in Figure 7. The blue line presents the baseline or "current policies" scenario that captures the effects from the demographic headwinds. The red line adds the impact of credible structural reforms together with monetary accommodation (from Case C). The difference between blue and red lines (and bars) shows how much of the demographic headwinds can be undone with both fully-credible structural reforms and monetary accommodation. The black line (Abenomics Redux) adds further fiscal consolidation, such that the difference between the red and black lines (and the bars) denotes the impact of the debt-stabilizing consumption tax increases.

In particular, simulations show that fully-credible structural reforms boost the level of GDP by about 15 percent in 40 years relative to the demographic headwinds from the "current policies" scenario (that showed a 25 percent decline), while accounting for monetary accommodation and debt stabilization.[35,36] As expected, activity is lower in response to public debt stabilization (black versus red lines), with the increase in national savings increasing the current account (though it still shows a small decrease in the long-run). Inflation exhibits a similar boost as that from Case C (black versus red lines), with consumption rate hikes only slightly

---

[34] To stabilize public debt at present levels, we increase consumption tax rates by 50 percent of the consumption tax rate path envisaged by McGrattan and others (2018). Our reduced rate hikes take into account that structural reforms, present in our scenario, boost nominal growth and tax revenues which are used to reduce the public debt, and therefore require smaller consumption tax rate hikes to stabilize public debt.

[35] Cited 15 percent is the difference between the blue and black bars in the GDP panel in Figure 7.

[36] Estimates of the GDP boost for Japan are of the same order of magnitude as those from similar exercises using GIMF and FSGM models for other countries, though somewhat larger. Using GIMF for Italy, Andrle and others (2018) point to reforms that boost the GDP level by 6-13 percent, whereas Lusinyan and Muir (2013), find that announced reforms could boost the level of GDP by 10.5 percent in the long-run. Using FSGM for Japan, Arbatli and others (2016) investigate a less ambitious reform package which includes components of the labor and product market reforms examined in this paper and find that those could boost annual GDP growth by 0.5 percent for five years only (as opposed to the 40 years boost in this paper). The Poland Article IV consultation (IMF, 2017c), using FSGM, points to possible long-run gains between 6.8-11.4 percent from various reform packages.

upgrading inflation. Overall, fully-credible structural reforms (plus public debt stabilization and monetary accommodation) are shown to undo much of the damaging demographic effects.

Figure 7. Japan: Abenomics Redux Against Demographics
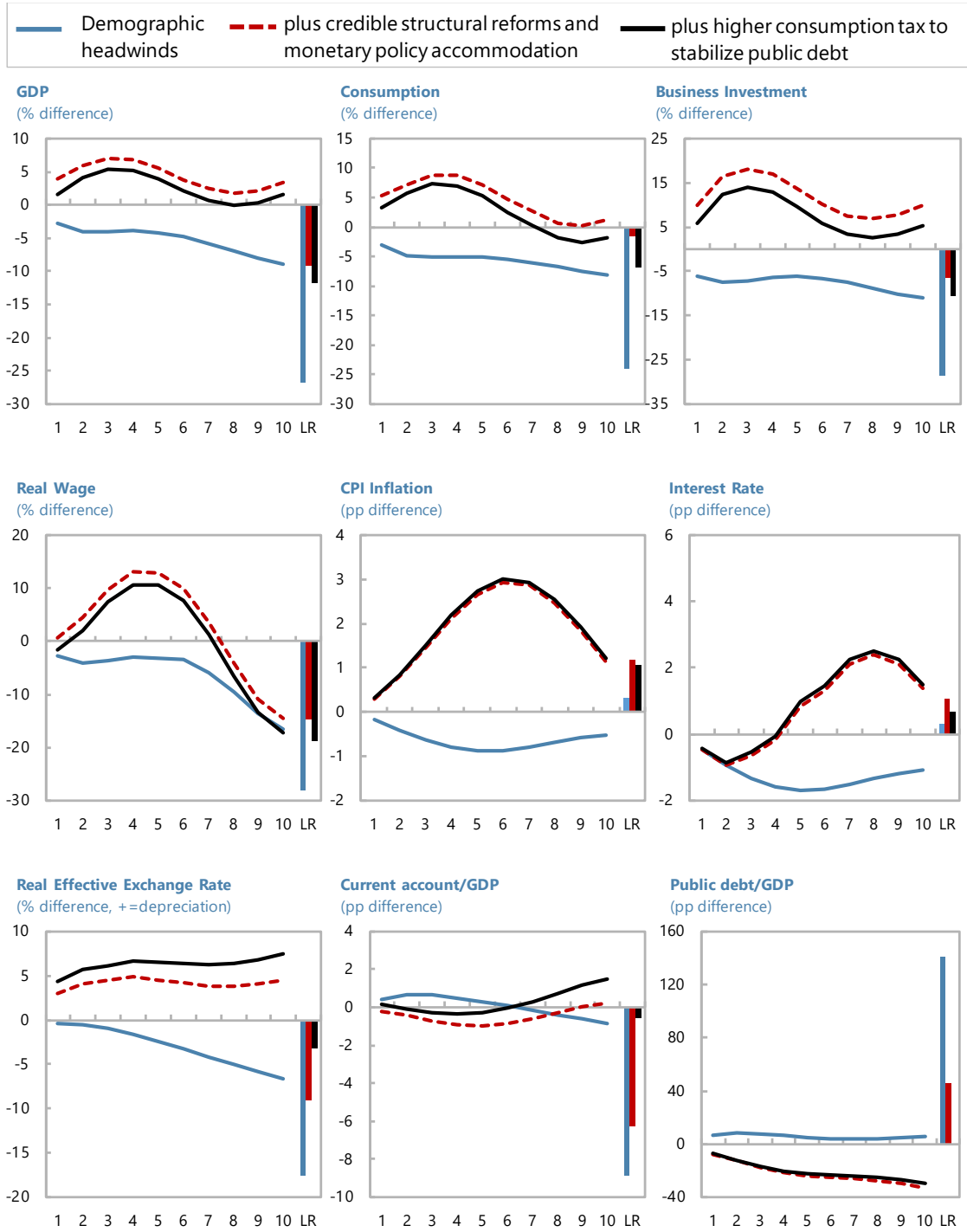
Legend:
- Demographic headwinds
- plus credible structural reforms and monetary policy accommodation
- plus higher consumption tax to stabilize public debt

GDP
(% difference)

Consumption
(% difference)

Business Investment
(% difference)

Real Wage
(% difference)

CPI Inflation
(pp difference)

Interest Rate
(pp difference)

Real Effective Exchange Rate
(% difference, +=depreciation)

Current account/GDP
(pp difference)

Public debt/GDP
(pp difference)

Sources: GIMF simulations and IMF staff's calculations. X-axis denotes years. LR = Long-run/steady-state (40+ Years)

The stabilization of the public debt ratio under Abenomics Redux is achieved mainly through higher nominal GDP growth in the near term, with interest costs savings and primary surpluses also contributing in the long run. The drivers of the public-debt-to-GDP ratio reduction from Figure 7 are shown in Figure 8. The black line in Figure 8 shows the overall reduction in the public debt ratio brought about by the structural reforms and the fiscal consolidation via consumption tax rate increases, with the last period (bar) showing the consolidation effects in the long run. In the near term, higher nominal growth stemming from the structural reforms and monetary policy accommodation drive the reduction in the public debt ratio, with primary surpluses and lower debt interest costs also contributing to the reduction in the public debt ratio in the long run.[37] Appendix E shows the derivation of each driver of the public-debt-to-GDP ratio reduction.

Figure 8. Japan: Public Debt Consolidation from Credible Structural Reforms and Consumption Tax Increase

Public debt/GDP
(pp difference)
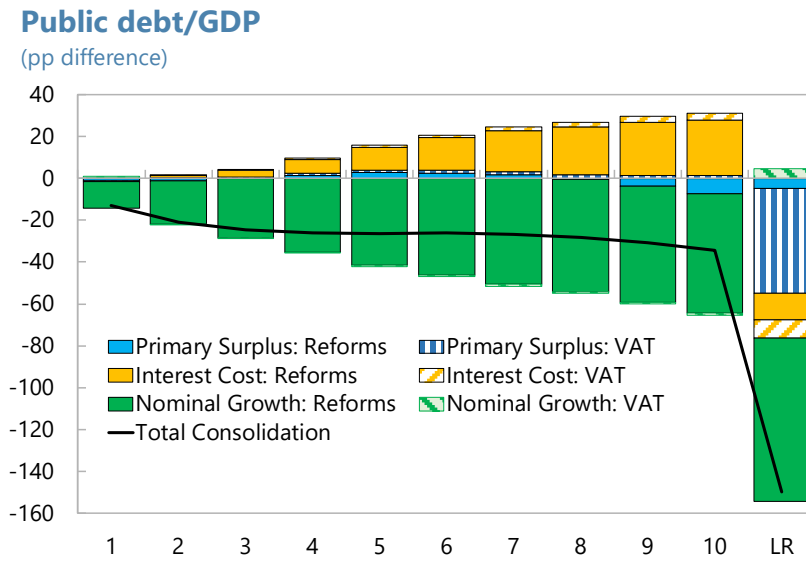
Note: Reported effects are changes to the baseline reported in Figure 1.
Sources: GIMF simulations and IMF staff's calculations.

---

[37] Interest costs associated with the public debt do not increase in the first two years after the structural reforms because monetary policy accommodates the reforms under Abenomics Redux. However, interest costs increase as the policy rate is gradually lifted after the first two years.

V. CONCLUSION

Japan's economic prospects remain weak in the face of strong demographic headwinds. Baseline model simulations show that Japan's demographics — the declining and the ageing of the population — are expected to reduce real GDP by over 25 percent in about 40 years under current policies, relative to a projection where productivity and population continue to grow at their recent pace.

This paper focused on the potential role of structural reforms in lifting Japan's outlook using the IMF's Global Integrated Monetary and Fiscal Model and highlights the importance of reform credibility. The analysis focused on the conditions needed for structural reforms to maximize growth and inflation, while also stabilizing debt dynamics in the face of severe demographic headwinds.

The upper bound for the estimated benefits of reforms arises when reform efforts are fully credible, boosting real GDP by about 15 percent in 40 years relative to the baseline scenario, while accounting for monetary accommodation and public debt stabilization. However, when the path of structural reforms is not-fully-believed by agents, reforms deliver a smaller near-term boost to real GDP and lead to weaker improvements in inflation and public debt dynamics. In practice, the impact of implementing all the outlined reforms is likely to lie somewhere between the fully-credible and not-fully-believed cases, given the difficulty in achieving full credibility of reforms. Therefore, higher consumption tax rates are likely to be needed to stabilize Japan's public debt, relative to those rates estimated under the scenario with fully-credible reforms with monetary accommodation and public debt stabilization.

REFERENCES

Alichi, A., Chen, H., Clinton, K., Freedman, C., Johnson, M., Kamenik, O., Kisinbay, T. and Laxton, D. (2009), "Inflation targeting under imperfect credibility", IMF Working Paper 09/94.

Anderson, D., Hunt, B., Kortelainen, M., Kumhof, M., Laxton, D., Muir, D., Mursula, S. and Snudden, S., (2013), "Getting to Know GIMF: The Simulation Properties of the Global Integrated Monetary and Fiscal Model", IMF Working Paper 13/55.

Andrle, M., Kangur, A. and Raissi, M. (2018), "Italy: Quantifying the Benefits of a Comprehensive Reform Package", IMF Working Paper 18/60.

Aoyagi, C. and Ganelli, G. (2013), "The Path to Higher Growth; Does Revamping Japan's Dual Labor Market Matter?", IMF Working Paper 13/202, International Monetary Fund.

Aoyagi, C., and Ganelli, G. (2017), "Unstash the Cash! Corporate Governance Reform in Japan," Journal of Banking and Financial Economics, University of Warsaw, Faculty of Management, vol. 1(7), pages 51–69, May.

Arbatli, E., Botman, D., Clinton, K., Cova, P., Gaspar, V., Jakab, Z., Laxton, D., Lonkeng Ngouana, C. D. Mongardini J. and Wang H. (2016), "Reflating Japan: Time to Get Unconventional?" IMF Working Paper 16/157.

Barnes, S., (2014), "Reforms and Growth: A Quantification Exercise," OECD, Nero Meeting.

Bassini, A., Nunziata, L. and Venn, D. (2009), "Job Protection Legislation and Productivity Growth in OECD Countries", Economic Policy, Vol. 24, No. 58, pp. 349–402.

Blanchard, O. (1985), "Debt, Deficits, and Finite Horizons", Journal of Political Economy, Vol. 93, pp. 223–47.

Botman, D., Danninger, S., and Schiff, J. (2015), "Can Abenomics Succeed? Overcoming the Legacy of Japan's Lost Decades," International Monetary Fund: Washington DC.

Carton, B., Fernandez-Corugedo, E., and Hunt, B. (2017), "No Business Taxation without Model Representation", IMF Working Paper No 17/259.

Carton, B., Fernandez-Corugedo, E., Hunt, B., and Portillo R. (2018), "Introducing Demographics into GIMF", forthcoming IMF Working Paper.

Coenen, G., C. Erceg, C. Freedman, D. Furceri, M. Kumhof, R. Lalonde, D. Laxton, J. Lindé, A. Mourougane, D. Muir, S. Mursula, J. Roberts, W. Roeger, C. de Resende, S. Snudden, M. Trabandt, J. in't Veld (2010), "Effects of Fiscal Stimulus in Structural Models," American Economic Journal: Macroeconomics, Vol. 4(1), pp. 22–68.

Colacelli, M., G.H. Hong (2018), "Productivity Drag from Small and Medium-Sized Enterprises in Japan?" forthcoming IMF Working Paper.

Davis, J. S. (2012), "Re-establishing Credibility: The Behavior of Inflation Expectations in the Post-Volcker United States", Federal Reserve Bank of Dallas Globalization and Monetary Policy Institute, WP No. 117.

Demertzis, M., Marcellino, M. and Viegu, N. (2012), "A Credibility Proxy: Tracking US Monetary Developments", The B.E. Journal of Macroeconomics Topics, Vol 12 (1).

Dolado, J. J., Ortigueira, Stucchi, R. (2012), "Does dual employment protection affect TFP? Evidence from Spanish manufacturing firms", CEPR Working Paper No. 8763.

Dolado, J. J. (2015), "EU Dual Labor Markets: Consequences and Potential Reforms", mimeo.

Duval, R., Furceri, D. (2018), "The Effects of Labor and Product Market Reforms: The Role of Macroeconomic Conditions and Policies," IMF Economic Review, Vol. 66, pp.31–69.

Egert, B. and Gal, P. (2017), "The Quantification of Structural Reforms in OECD Countries: A New Framework", OECD Economics Department WP 1354.

Fueki, T., Fukunaga, I., Ichiue, H., and Shirota, T. (2016), "Measuring Potential Output with an Estimated DSGE Model of Japan's Economy", IJCB.

Fukao, K. (2013), "Explaining Japan's Unproductive Two Decades" Asian Economic Policy Review, Japan Center for Economic Research, vol. 8(2), pp. 193–213.

Fukao, K., Kambayashi, R., Kawaguchi, D., Kwon, H. Kim, Y G, and Yokomaya, I. (2006), "Deferred Compensation: Evidence from Employer-Employee Matched Data from Japan," Hi-Stat Discussion Paper Series, no. 187, Hitotsubashi University.

Hara, H. (2014), "The Impact of Firm-provided Training on Productivity, Wages, and Transition to Regular Employment for Workers in Flexible Arrangements," Journal of The Japanese and International Economies, Vol. 34, pp. 336–59.

Higuchi, Y. (2013), "Effects of Minimum Wage and Job Training Support", Japanese Economic Review, Vol. 64, pp. 147–200.

International Monetary Fund (2012a), "Japan: Article IV Consultation Staff Report," IMF Country Report No. 12/208.

International Monetary Fund (2012b), "Japan: Selected Issues," IMF Country Report No. 12/209.

International Monetary Fund (2013a), "Japan: Article IV Consultation Staff Report," IMF Country Report No. 13/253.

International Monetary Fund (2013b), "Japan: Selected Issues," IMF Country Report No. 13/254.

International Monetary Fund (2014), "Japan: Article IV Consultation Staff Report," IMF Country Report No. 14/236.

International Monetary Fund (2015), "Japan: Article IV Consultation Staff Report," IMF Country Report No. 15/197.

International Monetary Fund (2016a), "Japan: Article IV Consultation Staff Report," IMF Country Report No. 16/267.

International Monetary Fund (2016b), "Japan: Selected Issues," IMF Country Report No. 16/268.

International Monetary Fund (2016c), "Time for a Supply-Side Boost? Macroeconomic Effects of Labor and Product Market Reforms in Advanced Economies," April World Economic Outlook.

International Monetary Fund (2017a), "Japan: Article IV Consultation Staff Report," IMF Country Report No. 17/242.

International Monetary Fund (2017b), "Japan: Selected Issues," IMF Country Report No. 17/243.

International Monetary Fund (2017c), "Republic of Poland: Article IV Consultation Staff Report," IMF Country Report No. 17/220.

Japan Institute of Labor Policy and Training Research (2010), "Career Development of Contingent Workers - The Current Status of Ability Development and the Transition to Regular Employees" available at http://www.jil.go.jp/english/reports/documents/jilpt-research/no.117.pdf

Japan Institute of Labor Policy and Training Research (2015), "Trends in Non-regular Employment in Japan and Analysis of Several Related Themes" in Labor Situation in Japan and Its Analysis: Detailed Exposition 2014/2015, available at www.jil.go.jp/english/lsj/detailed/2014-2015/all.pdf

Lam, R. and Shin, J. (2012), "What Role Can Financial Policies Play in Revitalizing SMEs in Japan?", IMF Working Paper 12/291.

Looi Kee, H., Nicita, A. and Olarreaga, M. (2009), "Estimating Trade Restrictiveness Indices", Economic Journal, 119, pp. 172–199.

Lusinyan, L. and D. Muir (2013), "Assessing the Macroeconomic Impact of Structural Reforms: The Case of Italy," IMF Working Paper 13/22 (Washington: IMF).

Madera Holgado, R. (2012) "Dual Labor Markets and Productivity", Master Thesis CEMFI, January.

Mauro, P. and J. Zilinsky (2016), "Reducing Government Debt Ratios in an Era of Low Growth", Peterson Institute for International Economics Policy Brief No. 16-10.

McGrattan, E. R., Miyachi, K. and Peralta-Alva, A. (2018), "On Financing Retirement, Health, and Long-term Care in Japan", forthcoming IMF working paper.

Ministry of Health, Labour and Welfare (2010), "Comprehensive Survey on Diversification of Employment".

Kumhof, M., D. Laxton, D. Muir and S. Mursula (2010), "The Global Integrated Monetary Fiscal Model (GIMF) - Theoretical Structure", IMF Working Paper 10/34.

Sher, G. (2014), "Cashing in for Growth; Corporate Cash Holdings as an Opportunity for Investment in Japan", IMF Working Paper 14/221

Steinberg, C. and Nakane, M. (2012), "Can Women Save Japan?", IMF Working Paper Series, WP/12/248

Sugo, T. and Ueda, K. (2008), "Estimating a Dynamic Stochastic General Equilibrium Model for Japan", Journal of the Japanese and International Economies, 22, pp 476–502.
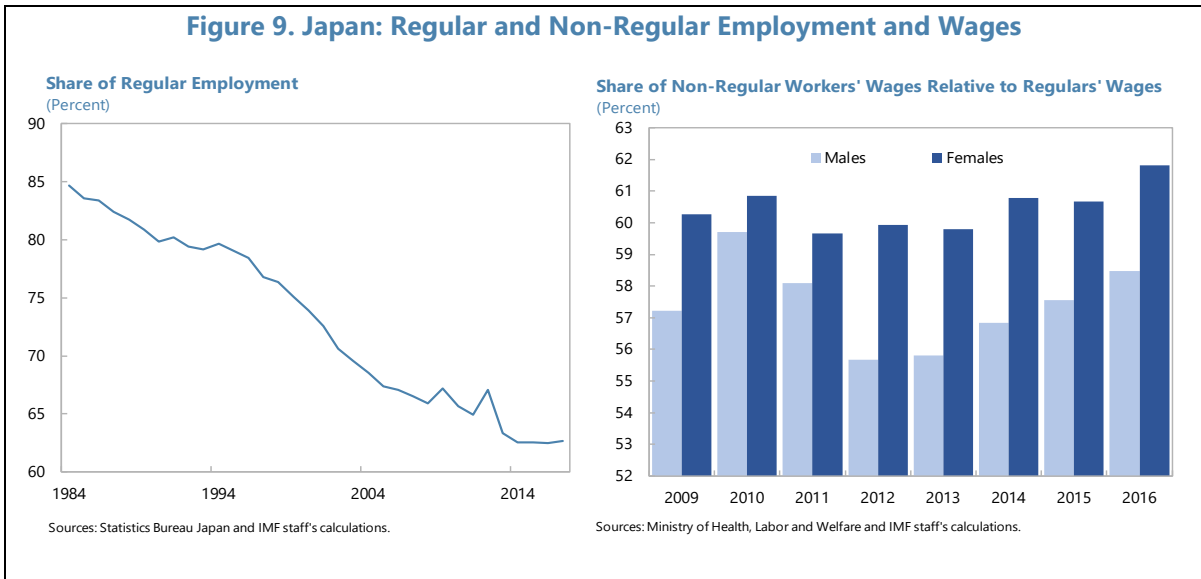
Takahashi, Koji (2014), "Regular/Non-regular Wage Gap Between and Within Japanese Firms." Paper presented at the Section on Organizations, Occupations and Work, 109th American Sociological Association Annual Meeting, San Francisco, August 16, 2014.

Watanabe, K. and Watanabe, T. (2018), "Why has Japan Failed to Escape from Deflation?", Asian Economic Policy Review, Vol. 13, pp. 23–41.

APPENDIX A. ESTIMATION OF THE IMPACT OF MITIGATING DUALITY: AN ACCOUNTING EXERCISE

This Appendix describes the estimation of the impact from introducing intermediate contracts – found to boost productivity by about 7 percent after 30 years. It details the data used and assumptions made to arrive at the pertinent productivity estimates.

The sharp increase in the use of non-regular workers has reduced labor productivity in Japan. With relatively high employment protection for regular workers in Japan, firms have made use of non-regular workers to contain wage costs and satisfy cyclical upsurges in demand.[1] A consequence of the rapid increase in non-regular workers has been a decline in productivity as non-regular workers typically receive temporary contracts with little training, few career opportunities, and low job security.[2] The left panel of Figure 9 shows the rapid increase in non-regular workers, whereas the right panel shows that wages of non-regular workers are significantly weaker than those of regular workers. Part of the wage differential reflects productivity, although other factors are also at play. [3, 4]

Figure 9. Japan: Regular and Non-Regular Employment and Wages

Share of Regular Employment (Percent)

Sources: Statistics Bureau Japan and IMF staff's calculations.

Share of Non-Regular Workers' Wages Relative to Regulars' Wages (Percent)

Sources: Ministry of Health, Labor and Welfare and IMF staff's calculations.

---

[1] See for example the Ministry of Health, Labor and Welfare's "General Survey on Diversified Types of Employment" (2010) or "Trends in non-regular employment in Japan and Analysis of several related themes" (2015) by the Japan Institute of Labor Policy and Training.

[2] See for example, the Japan Institute of Labor Policy and Training Research Report No 117, Higuchi (2013), Hara (2014), or Fukao and others (2012).
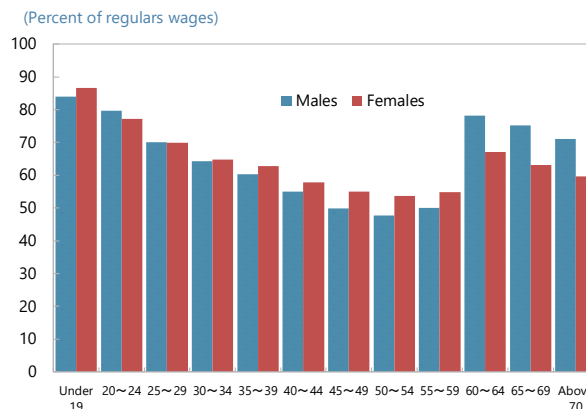
[3] Fukao and others, (2006) and Shinada (2011).

[4] Hara (2014) and Higuchi (2013) find that non-regular workers that receive training have productivity improvements that do not result in higher wages but instead on a higher probability of transitioning towards a regular contract. Almost 70 percent of non-regular workers are females.

Regular to non-regular wage differentials vary by age and gender. Figure 10 shows that non-regular young workers (those below 25 years old) are paid between 80 and 85 percent of regular workers' wages. More strikingly, the pay gap increases rapidly in middle age, demonstrating in part the lower training received by non-regular workers. The wage discrepancy declines for older workers, largely reflecting that retired former regular workers remain in employment as non-regular workers.

Figure 10. Japan: Relative Wages of Non-Regular Workers, 2016

(Percent of regulars wages)

Sources: Ministry of Health, Labor and Welfare and IMF staff's calculations.

The weighted average wage differential (i.e. the ratio between non-regular and regular workers' wages) for all cohorts is about 0.6, implying a 40 percent overall wage gap between regulars and non-regulars.

It is assumed that "intermediate" labor market contracts are gradually introduced to replace both regular and non-regular contracts over time. More specifically, it is assumed that starting in 2019 all new contracts are intermediate contracts, with existing contracts remaining as they are for the duration of that contract. This means that employees who had regular contracts before 2019 are assumed to remain as regular workers (i.e. grandfathering of existing regular contracts). For existing non-regular contracts before 2019, we assume that those workers would remain as non-regulars for around 4 years.

The introduction of "intermediate contracts" is assumed to result in no significant changes to overall employment protection. While employment protection of intermediates is assumed to be higher than that of non-regulars, it is lower than regulars', such that overall employment protection is left unchanged.[5] The switch to hiring intermediate workers implies a transition towards a unique type of contract that will reduce labor market duality, consistent with the empirical evidence of Aoyagi and Ganelli (2013) who show that a reduction of employment protection legislation of regular workers in Japan (to levels consistent with those observed in the United Kingdom and the United States) would eradicate non-regular contracts.[6]

The gradual replacement of non-regular workers by intermediate workers will increase productivity. It is assumed that intermediate workers eventually become as productive as

---

[5] In parallel, we have assumed unchanged economy-wide wage mark ups. In other words, it is assumed that any wage markup change for regulars is counterbalanced by that of non-regulars.

[6] Empirical evidence by Bassini and others (2008), Dolado and others (2012), Dolado (2015), Egert and Gal (2017), Madera Holgado (2012), and Aoyagi and Ganelli (2013).

regular workers, as intermediates are expected to receive as much training and human capital investment as regular workers. To quantify the productivity increase, we use estimates from Fukao and others (2006) who find a 20 percent productivity gap between regular and non-regular workers (estimated for Japan's manufacturing sector).[7] Assuming that the productivity of intermediate workers is the same as that of regular workers, the gradual introduction of intermediate workers implies that overall productivity will grow as shown in Figure 11. In other words, the estimation assumes a full catch up of the 20 percent productivity gap. The estimated productivity gain traces the replacement of non-regular workers with intermediate workers, starting from 2019. The estimated productivity improvement over time exceeds 7 percent by 2035. [8,9]

Figure 11. Japan: Productivity Improvement Under Labor Market Duality Reform
(Percent)
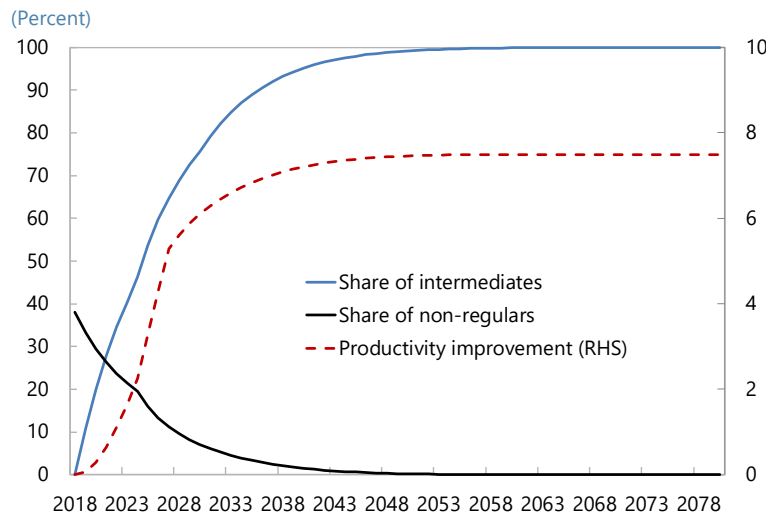
Sources: IMF staff's calculations.

To determine the number of workers in each type of contract, and hence compute the productivity improvement, several stylized facts were used and matched. First, we looked at the total number of individuals in each age cohort (16 to 75 years of age) for both females and males. Data come from the National Institute of Population and Social Security Research and include projections to the year 2100. We also considered the employment rates from Statistics Bureau in Japan which provides data for each cohort, where the cohorts are aggregated into the

---

[7] While the wage gap between regulars and non-regulars is about 40 percent, estimates from Fukao and others (2006) suggest that half of it reflects productivity differences. The rest of the wage gap likely reflects other factors (see for example Hara, 2014 and Higuchi, 2013).

[8] This increase corresponds to an increase in TFP growth of 0.3 percentage points per year over twenty years.

[9] This estimate would be an upper bound if intermediate workers' productivity is not to reach that of regular workers.

15-24, 25-34, 35-44, 45-54, 55-64 and 65+ categories. It is assumed that the participation rates remain constant, as these are explicitly covered by other labor market reforms in this study.[10] We multiply the participation rate of cohorts by the population estimates to determine the number of workers by age and gender. To the resulting number we apply the share of workers in regular (and non-regular) contracts from the Statistics Bureau. Table 1 provides values for participation rates and shares of regular/non-regular contracts by age and gender.

Table 1. Japan: Employment Rates and Share of Regular Workers, 2017

	Males		**Females**	
Age	Employment rate	Share regulars	Employment rate	Share regulars
15-19	15.9	54.8	16.4	49.5
20-24	67.4		68.8	
25-29	89.8	84.7	78.9	61.1
30-34	92.3		72.9	
35-39	93.5	90.7	71.4	47.6
40-44	93.8		75.1	
45-49	93.5	91.2	77.5	41.4
50-54	92.6		76.4	
55-59	91	69.7	70.5	32.6
60-64	79.1		53.6	
65-69	54.8	28.6	34.4	21.7
70+	20.9		10	

Sources: National Institute of Population and Social Security Research, Statistics Bureau, and
IMF staff calculations.

Transition probabilities for Japan are used to approximate the number of individuals by age, gender and type of contract. Transition probabilities (or hazard rates) of remaining in employment, unemployment, and inactivity, plus transitioning between those states, estimated by Esteban-Pretel and others (2011), were used to approximate the total number of individuals by type of contract, age and gender. Annualized transition rates are replicated in Table 2. Using these probabilities plus information from Table 1, we matched observed data on the total number of regular/non-regular contracts by broad age ranges and gender in both 2015 and 2016, and then projected the total number of regular, non-regular and intermediate contracts.

---

[10] This is consistent with the assumption that overall employment protection legislation remains unchanged for the overall economy.

Table 2. Japan: Annualized Transition Probabilities in the Labor Market

	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65+	M	F	R	NR
EE	0.39	0.76	0.88	0.89	0.90	0.91	0.91	0.90	0.87	0.73	0.53	0.87	0.75	0.89	0.49
EU	0.03	0.05	0.04	0.03	0.02	0.02	0.02	0.02	0.02	0.03	0.01	0.03	0.02	0.02	0.06
EI	0.57	0.19	0.08	0.08	0.08	0.07	0.07	0.08	0.11	0.25	0.46	0.10	0.23	0.09	0.44
UE	0.30	0.61	0.64	0.58	0.58	0.58	0.58	0.51	0.46	0.33	0.20	0.54	0.44	0.12	0.09
UU	0.04	0.08	0.10	0.09	0.08	0.08	0.08	0.09	0.10	0.06	0.01	0.11	0.03	0.08	0.09
UI	0.66	0.30	0.26	0.32	0.35	0.35	0.33	0.39	0.44	0.61	0.79	0.35	0.52	0.80	0.83
IE	0.14	0.41	0.40	0.33	0.34	0.36	0.37	0.31	0.27	0.20	0.09	0.23	0.20	0.03	0.03
IU	0.02	0.06	0.08	0.06	0.05	0.05	0.05	0.05	0.05	0.04	0.00	0.04	0.02	0.03	0.03
II	0.84	0.53	0.52	0.61	0.62	0.59	0.58	0.64	0.68	0.76	0.91	0.73	0.78	0.94	0.93

Notes: E = employed, U = unemployed, I = inactive, so EE is probability of staying in employment when employed. M = Male, F = Female, R = Regular and NR = Nonregular. Source: Esteban-Pretel and others (2011).

Employment rates, shares in types of contract and transition probabilities are used to project the number of workers in regular, non-regular and intermediate contracts by age and sex. It is assumed that employees on regular contracts in a given year had an 89 percent probability of remaining regular in the following year, though there are smaller probabilities of 6 and 44 percent of transitioning to unemployment or inactivity, respectively. It was then assumed that those workers that were inactive or unemployed in the previous period would be offered intermediate contracts with 100 percent probability. Similar assumptions were made for non-regular workers, but in this case, it is worth noting that the probability of remaining in non-regular employment is significantly lower (at 49 percent) relative to a regular worker (at 89 percent). The first panel of Figure 10 shows the different shares of regulars, non-regulars and intermediates, whereas the second panel breaks that share by age. Estimations deliver that, by assuming that all "new" contracts are intermediate while existing regular contracts are maintained until retirement, given projected demographics, the share of intermediate contracts reaches around 90 percent of all contracts by 2035.

Figure 12. Japan: Share of Intermediate Contracts Under Labor Market Duality Reform

Contract Type
(shares, in percent)

Contribution to Intermediate Contracts by Age Cohort
(in percent)
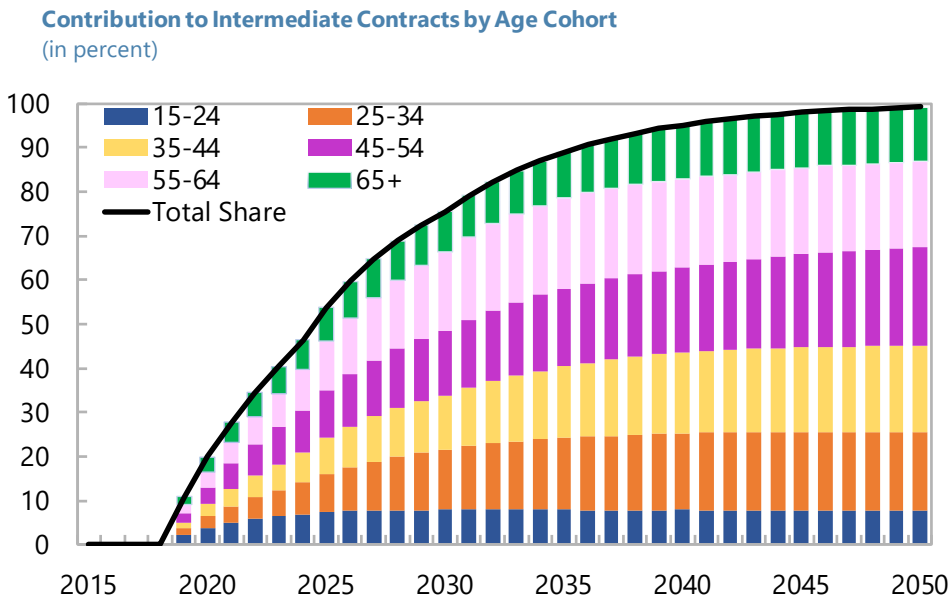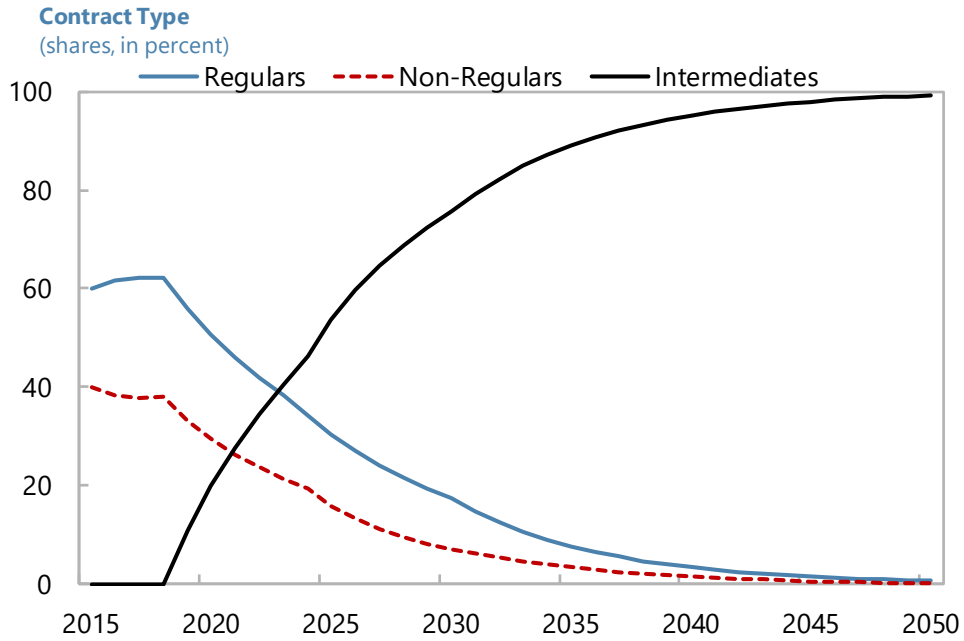
Source: IMF staff's calculations.

APPENDIX B. GIMF MODEL SUMMARY[1]

The IMF's Global Integrated Monetary and Fiscal Model (GIMF) is a multi-country DSGE model with optimizing behavior by households and firms, and full intertemporal stock-flow accounting. Frictions in the form of sticky prices and wages, real adjustment costs, liquidity-constrained households, along with finite-planning horizons of households, provide a role for monetary and fiscal policy in economic stabilization.

The assumption of finite horizons separates GIMF from standard monetary DSGE models and allows it to have well-defined steady states where countries can be long-run debtors or creditors. This allows users to study the transition from one steady state to another where fiscal policy and private saving behavior play a critical role in both the dynamics and long-run comparative statics.[2]

The non-Ricardian features of the model provide non-neutrality in both spending-based and revenue-based fiscal measures, which makes the model particularly suitable to analyze fiscal policy questions. Fiscal policy can stimulate the level of economic activity in the short run, but sustained government deficits crowd out private investment and net foreign assets in the long run.[3] Sustained fiscal deficits in large economies can also lead to a higher world real interest rate, which is endogenous.

Asset markets are incomplete in the model. Government debt is only held domestically, as nominal, non-contingent, one-period bonds denominated in domestic currency. The only assets traded internationally are nominal, non-contingent, one-period bonds denominated in U.S. dollars that can be issued by the U.S. government and by private agents in any region. Firms are owned domestically. Equity is not traded in domestic financial markets; instead, households receive lump-sum dividend payments.

Firms employ capital and labor to produce tradable and nontradable intermediate goods. There is a financial sector a la BGG that incorporates a procyclical financial accelerator, with the cost of external finance facing firms rising with their indebtedness.

GIMF is multi-region, encompassing the entire world economy, explicitly modeling all the bilateral trade flows and their relative prices for each region, including exchange rates. The

---

[1] For detailed documentation on the structure of the model see Kumhof and others (2010) and the updates on corporate taxation of Carton and others (2017) and of demographics by Carton and others (2018). For details on the model's properties see Anderson and others (2013), Carton and others (2017, 2018).

[2] See Blanchard (1985) for the basic theoretical building blocks and Kumhof and Laxton (2007, 2009a, 2009b) to understand their fiscal policy implications.

[3] Coenen and others (2010) show that GIMF fiscal multipliers for temporary shocks are similar to standard monetary business cycle models, but more importantly, GIMF can handle a much broader array of permanent shocks that can be used to study transitions from one steady state to another caused by permanent changes in the level of government debt.

version used in this paper comprises six regions. The international linkages in the model allow the analysis of policy spillovers at the regional and global level.

A. Household Sector

There are two types of households, both of which consume goods and supply labor. First, there are overlapping-generation households (OLG) that optimize their borrowing and saving decisions over a 20-year planning horizon. Second, there are liquidity-constrained households (LIQ), who do not save and have no access to credit. All households pay direct taxes on labor income, indirect taxes on consumption spending, and a lump-sum tax.

OLG households save by acquiring domestic government bonds, international U.S. dollar bonds, and through fixed-term deposits. They maximize their utility subject to their budget constraint. Aggregate consumption for these households is a function of financial wealth and the present discounted value of after-tax wage and investment income. The consumption of LIQ households is equal to their current net income, so their marginal propensity to consume out of current income is unity. A high proportion of LIQ households in the population would imply large fiscal multipliers from temporary changes to taxes and transfer payments.

For OLG households with finite-planning horizons, a tax cut has a short-run positive effect on output. When the cuts are matched with a tax increase in the future, to leave government debt unchanged in the long run, the short-run impact remains positive, as the change will tilt the time profile of consumption toward the present. In effect, OLG households discount future tax liabilities at a higher rate than the market rate of interest. Thus, an increase in government debt today represents an increase in their wealth, because a share of the resulting higher taxes in the future is payable beyond their planning horizon. If the increase in government debt is permanent (tax rates are assumed to rise sufficiently in the long run to stabilize the debt-to-GDP ratio by financing the higher interest burden) this will crowd out real private capital by raising real interest rates.

Increases in the interest rate have a negative effect on consumption, mainly through the impact on the value of wealth. The intertemporal substitution effect from interest rate changes is moderate and has been calibrated to be consistent with the empirical evidence. The intertemporal elasticity of substitution determines the magnitude of the long-run crowding-out effects of government debt since it pins down how much real interest rates have to rise to encourage households to provide the required savings.

Demographics have been recently added to GIMF to capture features of economies with an ageing and declining population (see Carton and others, 2018). Earlier vintages of GIMF assumed constant population growth, such that each generation faced a constant probability of death (which together with population growth determined the birth rate), and the time endowment for working declined with age. In this updated version of GIMF, population growth, the probability of surviving each period and the work time endowment can be time varying to

match characteristics of an ageing and shrinking population. Demographics then affect the model through household consumption and leisure decisions, as well as through the stochastic discount factor in the model which affects investment.

B. Production Sector

Firms produce tradable and nontradable intermediate goods. They are managed in accordance with the preferences of their owners, finitely-lived households. Thus, firms also have finite-planning horizons. The main substantive implication of this assumption is the presence of a substantial equity premium driven by impatience.[4] Firms are subject to nominal rigidities in price setting as well as real adjustment costs in labor hiring and investment. They pay capital income taxes to governments, wages to all households, and dividends to OLG households.

Retained earnings are insufficient to fully finance investment, so firms must borrow from financial intermediaries. If earnings fall below the minimum required to make the contracted interest payments, the financial intermediaries take over the firm's capital stock, less any auditing and bankruptcy costs, and redistribute it back to their depositors (households).

Firms operate in monopolistically competitive markets, and thus goods' prices contain a markup over marginal cost. Exports are priced to the local destination market and imports are subject to quantity adjustment costs. There are also price adjustment costs which lead to sticky prices.

Firms use public infrastructure (which is the government capital stock) as an input, in combination with tradable and nontradable intermediate goods. Thus, government capital adds to the productivity of the economy.

C. Financial Sector

GIMF contains a limited menu of financial assets. Government debt consists of one-period bonds denominated in domestic currency. Banks offer households one-period fixed-term deposits, their source of funds for loans to firms. These financial assets, as well as ownership of firms, are not tradable across borders. OLG households may, however, issue or purchase tradable U.S.-dollar-denominated obligations.

Banks play a role in the model via the financial accelerator mechanism. Banks pay a market rate of return on deposits, and charge a risk premium on loans. Because of the costs of bankruptcy (capital can only be liquidated at a discount), the lending rate includes an external financing premium, which varies directly with the debt-to-equity (leverage) ratio—the financial accelerator effect. Non-linearities imply steep increases in the risk premium for large negative shocks to net worth.

---

[4] This feature would disappear if equity was assumed to be traded in financial markets. The assumption of myopic firm behavior, and the resulting equity premium, are more plausible.

Uncovered interest parity may not hold, due to the presence of country risk premiums. The premiums can create deviations, both in the short run and the long run, between interest rates in different regions, even after adjustment for expected changes in exchange rates.

D.   International Dimensions and Spillovers

All bilateral trade flows are explicitly modeled, as are the relative prices for each region, including exchange rates. These flows include the export and import of intermediate and final goods. They are calibrated in the steady state to match the flows observed in the recent data. International linkages are driven by the global saving and investment decisions, a by-product of consumers' finite horizons. This leads to uniquely defined current account balances and net foreign asset positions for each region. Since asset markets are incomplete, net foreign asset positions are represented by nominal non-contingent one-period bonds denominated in U.S. dollars.

Trade linkages are important for quantifying spillovers in GIMF. Along with uncovered interest parity, and long-term movements in the world real interest rate, the magnitude of the international trade linkages is the main determinant of spillover effects from shocks in one region to other regions in the world.

E.   Fiscal and Monetary Policy

Fiscal policy is conducted using a variety of expenditure and tax instruments. Government spending may take the form of either consumption or investment expenditure, or lumpsum transfers to either all households or targeted towards LIQ households. In previous versions of GIMF, revenue accrued from the taxes on labor income and capital returns, consumption taxes, and lumpsum taxes. Recent versions of GIMF (Carton and others, 2017) also allow revenue to accrue from corporate income and from cash flow taxes (CFT) which also permit a destination-based component. A CFT taxes the cash flows of corporates from sales after deducting the cost of labor, investment, and intermediate inputs. Under a DBCFT, revenues from exports are not subject to tax, while the cost of imports cannot be deducted, both of which relate to the destination based component of the tax. Carton and others (2017) document all the changes that were made to introduce CFTs as well as other corporate taxes.[5]

---

[5] An important disclaimer pertains to the assumptions made when introducing the corporate taxes in GIMF (Carton and others (2017)), which were driven by the existing structure of GIMF and by the need to simplify the computational burden of solving the model. Thus, several channels that could affect the macroeconomic outcomes following changes in these taxes are omitted. For instance, one may expect to find that multinational firms may modify transfer prices, relocate patents, change their financial structure, or relocate production towards the country with the less distortionary tax system. In addition to the broad macroeconomic implications, the resulting tax-base shifts could potentially have large implication for corporate tax revenue in different countries. However, because the model's framework does not incorporate multinational firms, these potential transmission channels are absent. Additionally, owing to simplifying assumptions related to the currency denomination of foreign liabilities, the model-based analysis cannot capture the balance sheet effects of exchange rate movements.

The model also allows for tariffs on imported goods to be a potential source of public revenue. Government investment spending augments public infrastructure, which depreciates at a constant rate over time.

There is a fiscal policy rule which ensures long-run sustainability, while allowing for short-run counter-cyclical policies. Changes in both labor and capital income taxes provide the instrument to put the rule into effect, but this can be replaced with other tax, transfer or spending instruments if that is considered more realistic for a specific region. First, the fiscal rule ensures that in the long run, the government debt-to-GDP ratio—and hence the deficit-to-GDP ratio—eventually converges to its target level. This excludes the possibility of sovereign default, as well as the risk that out-of-control financing requirements of the government will override monetary policy. Second, the rule allows for countercyclical fiscal policy as it embodies automatic stabilizers.

When conducting monetary policy, the central bank uses an inflation-forecast-based interest rate rule. The central bank varies the gap between the actual policy rate and the long-run equilibrium rate to achieve a stable target rate of inflation over time.

APPENDIX C. GIMF CALIBRATION AND SIMULATION STRATEGY

This Appendix provides more details on the calibration of parameters that are important for the Japan block of the IMF's Global Integrated Monetary and Fiscal Model (GIMF). Parameters were chosen to match several key stylized facts reported in Table 3. On the expenditure side we match the "great ratios" for Japan: consumption, private investment, government spending and trade-to-GDP. On the income side we match the labor share in total income and tax revenues to GDP. On the output side we match the share of tradeables in production.

Table 3. Japan: "Great Ratios" and Other Shares (2012–16 average)

Expenditure shares	Ratios to GDP (percent)	Other Shares	Ratios to GDP (percent)
Consumption	57.0	Labor	64.0
Private Investment	16.4	Tradeables	40.0
Government Consumption	21.1	Tax Revenue	31.2
Government Investment	5.4	Net government debt	194.0
Exports	15.6		

Sources: Haver Analytics and IMF staff's calculations.
Note: Reported net debt corresponds to 2017 levels.

An important determinant of the short-run impact of the proposed structural reforms on nominal and real variables is the degree of nominal rigidity in the economy. There is ample evidence that prices are very sticky, that inflation expectations are not anchored at the Bank of Japan's two percent target, and that the Phillips curve is relatively flat, in response to two decades of weak price growth in Japan (eg Sugo and Ueda, 2008, Fueki et al, 2016, Watanabe and Watanabe, 2018, and IMF, 2015). Two model parameters are used to capture these stylized facts. First, we set the nominal rigidities' GIMF parameter (i.e. Rotemberg price adjustment cost) such that prices are changed on average every three years, consistent with the estimated DSGE parameters of Sugo and Ueda (2008).[1,2] Second, we calibrate the inflation target parameter (which pins down long term inflation expectations) to one percent.[3] The perception of a one percent inflation target implies that the Bank of Japan does not have full credibility on attainment of its two-percent inflation target. In terms of the monetary policy reaction function,

---

[1] While Sugo and Ueda (2008) estimate Calvo parameters, we map them into Rotemberg parameters.

[2] Note that the Rotemberg parameter is set at this high value in most equations that have nominal rigidities (for tradeables, non-tradeables, final consumption and investment goods and wages). Overall, this implies a high degree of nominal rigidity in the model, as is seen in Japan.

[3] This corresponds with Consensus Economics' inflation expectations which stood at 0.9 percent for five-years' ahead and 1.2 for ten years' ahead as of April 2018.

we employ the estimated parameters of Kumhof and others (2010), implying a degree of interest rate inertia of 0.4 and a coefficient on (expected one-year ahead) inflation of 1.9.

Table 4 presents a summary of the GIMF simulation strategy detailed in Section II, noting the quantities and shocks used. For the case of duality, total factor productivity was increased by 7 percent (per calculations presented in Appendix A) gradually over 25 years. Product market and SME reforms also used TFP shocks. For the case of increased female (and older worker) labor force participation, labor supply was increased using labor supply shocks in GIMF such that growth rose by 0.2 percent per year over 20 years (in line with estimates reported in IMF 2013a). Labor supply shocks were also used for increased migration. For the case of corporate governance reform, shocks to borrower riskiness (to lower it) in the financial accelerator mechanism were used to increase the level of investment after 10 years (in line with estimates by Sher, 2014 and Aoyagi and Ganelli, 2017). Finally, tariff and non-tariff trade barriers shocks were used to capture trade agreements. Notably, the simulations do not assume complementarity or substitutability between structural reforms, and therefore potential interactions between them are not accounted for.

### Table 4. Japan: Structural Reform Package and GIMF Simulation Strategy

Reform area	Shock	Magnitude	Reference
Labor market duality	TFP	7.5 percent increase after 30 yrs	Authors' calculation (Appendix A)
Labor Force Participation	Labor supply	0.2pp output growth for 20 yrs	IMF AIV (2013)
Migration Participation	Labor supply	0.1pp output growth for 10 yrs	IMF AIV (2013)
Product Market	TFP	2.4 percent increase after 5 yrs	OECD (2017)
SME	TFP	0.2pp potential output growth increase for 10 yrs	IMF AIV (2013)
Corporate Governance	Investment/Credit	5 percent increase in level of investment after 10 yrs	Sher (2014), Aoyagi and Ganelli (2017)
Trade Policy	Tariff, NTB	Tariff and NTBs removal wrt CPTPP and EU countries over 5 yrs	Kee et al (2009)

Sources: IMF staff's calculations and cited sources.

APPENDIX D. DECOMPOSITION OF THE LABOR AND PRODUCT MARKET REFORMS (FULLY-CREDIBLE)
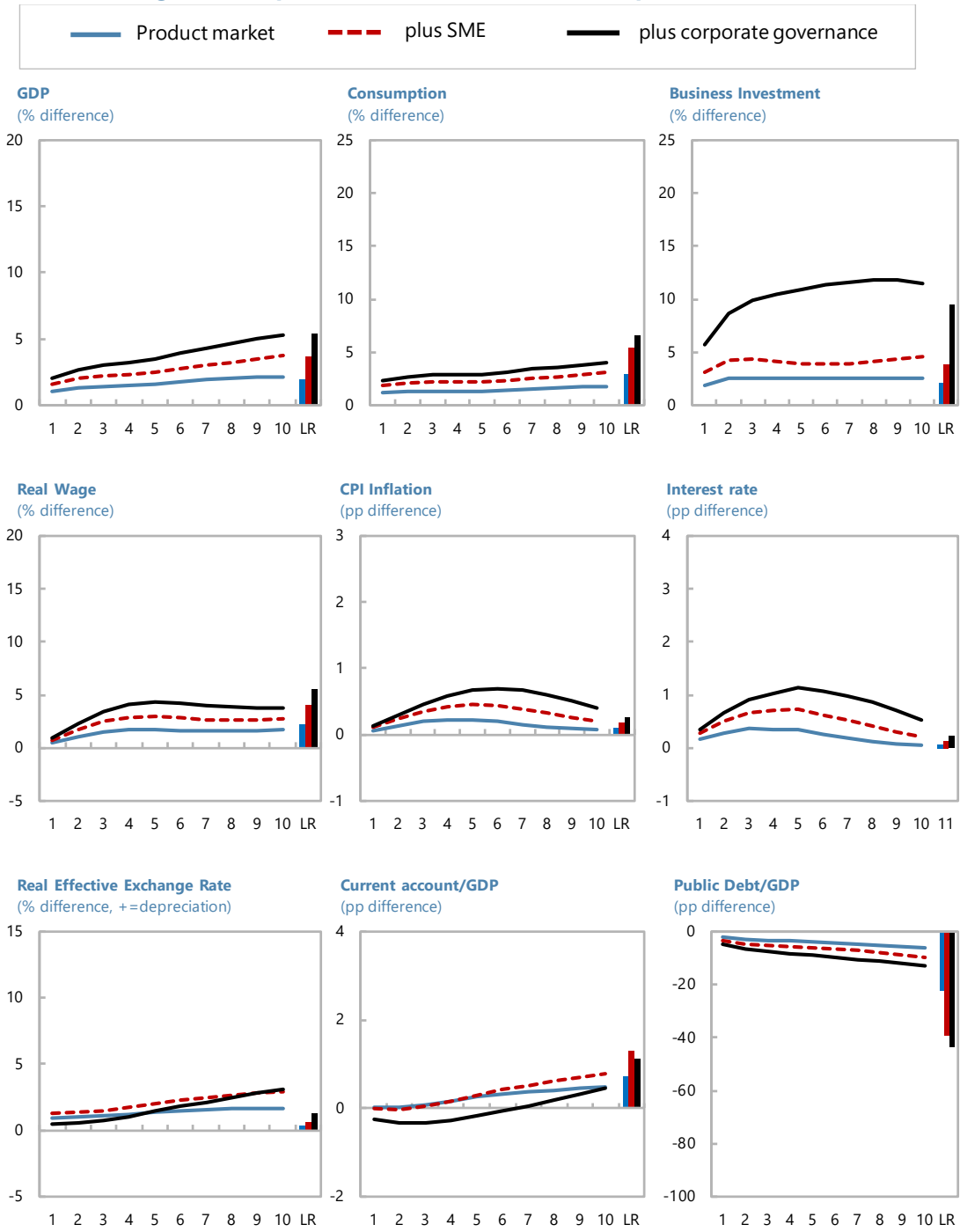
Figures 13 and 14 present a decomposition of the fully-credible labor market and product market reforms.

Figure 13. Japan: Credible Labor Market Reforms
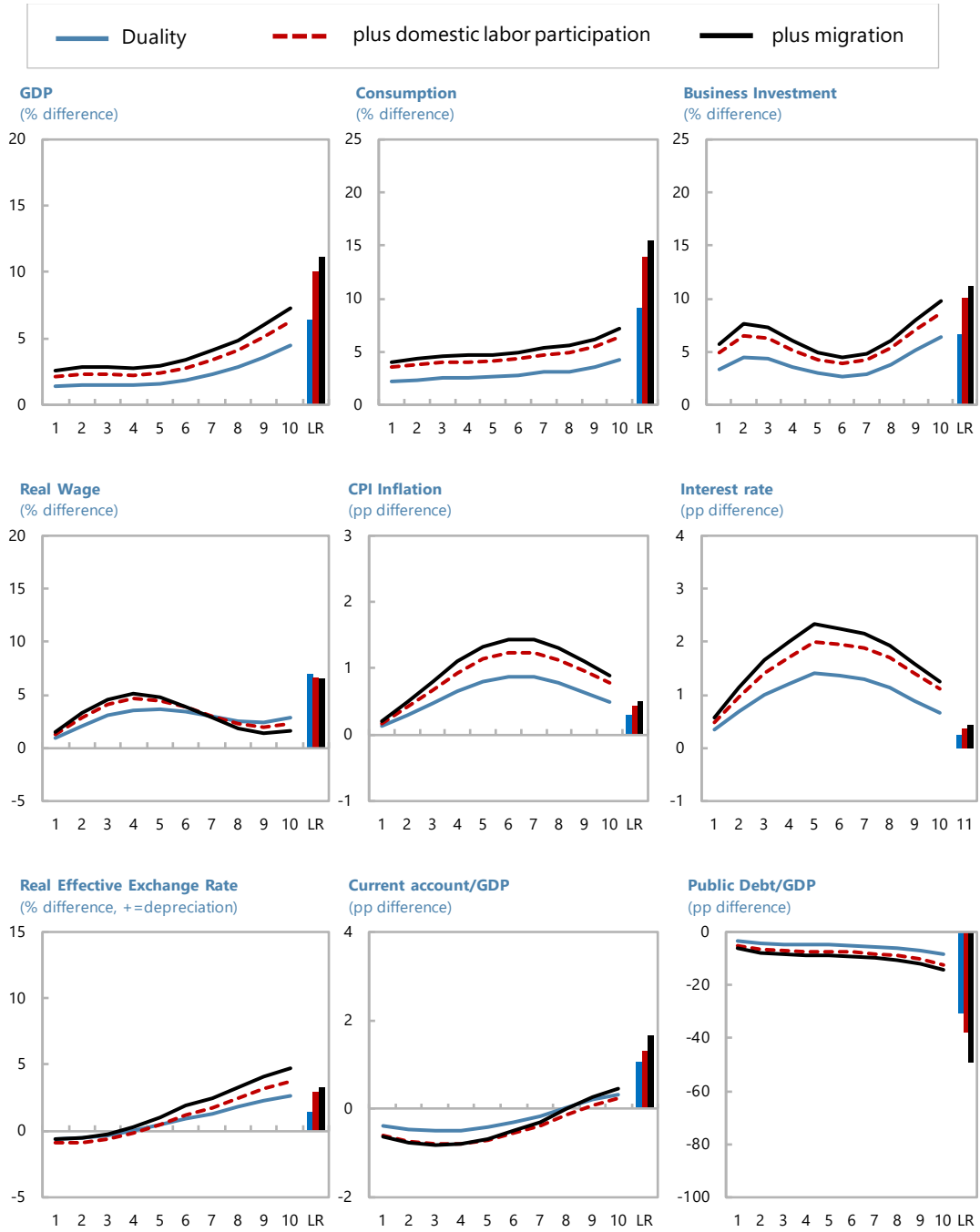
Note: Reported effects are changes relative to the baseline reported in Figure 1.
Sources: GIMF simulations and IMF staff's calculations. X-axis denotes years, LR=Long-run/steady-state (40+ years).

Figure 14. Japan: Credible Reforms in the Corporate Sector

— Product market   --- plus SME   — plus corporate governance

GDP
(% difference)

Consumption
(% difference)

Business Investment
(% difference)

Real Wage
(% difference)

CPI Inflation
(pp difference)

Interest rate
(pp difference)

Real Effective Exchange Rate
(% difference, +=depreciation)

Current account/GDP
(pp difference)

Public Debt/GDP
(pp difference)

Note: Reported effects are changes relative to the baseline reported in Figure 1.
Source: GIMF simulations and IMF staff's calculations. X-axis denotes years, LR=Long-run/steady-state (40+ years).

APPENDIX E. DRIVERS OF PUBLIC DEBT REDUCTION UNDER "ABENOMICS REDUX" SCENARIO

This appendix presents the algebra and intuition behind the results presented in Figure 8. The analysis starts with the public debt accumulation equation:

$$D_t = D_{t-1} + i_t D_{t-1} - PS_t \tag{1}$$

where D is nominal public debt, i is the interest associated with the debt and PS is the public sector nominal primary surplus defined as the difference between the public sector expenditures (excluding interest payments associated with the public debt) and public sector revenues. Dividing both sides by nominal GDP, yields:

$$\frac{D_t}{GDP_t} = \frac{D_{t-1}}{GDP_{t-1}} \frac{GDP_{t-1}}{GDP_t} + i_t \frac{D_{t-1}}{GDP_{t-1}} \frac{GDP_{t-1}}{GDP_t} - \frac{PS_t}{GDP_t} \tag{2}$$

Defining ratios to nominal GDP in lower case letters and the growth rate of nominal GDP as φ, equation (2) is written as:

$$d_t = \frac{d_{t-1}}{1+\varphi_t} + \frac{i_{t-1}d_{t-1}}{1+\varphi_t} - ps_t \tag{3}$$

Equation (3) is re-written as:

$$d_t - d_{t-1} = \frac{i_t d_{t-1}}{1+\varphi_t} - \frac{\varphi_t d_{t-1}}{1+\varphi_t} - ps_t \tag{4}$$

Equation (4) is close to the public debt decomposition shown in Figure 8 and has been used by others (e.g. Mauro and Zilinsky, 2016) as a framework to decompose public debt accumulation. However, this decomposition is not ideal in our case since the component typically used to measure interest costs is deflated by nominal growth, and this is an important component that dampens the interest cost (and boosts output growth terms under structural reforms). As a result, we define an alternative decomposition that we consider more appropriate in this case as follows:

$$intcosts_t \equiv i_{t-1}d_{t-1} \tag{5}$$
$$primary\ surplus_t \equiv ps_t \tag{6}$$
$$growth_t \equiv d_t - d_{t-1} - i_{t-1}d_{t-1} + ps_t \tag{7}$$

The growth contribution in (7) is computed as the residual for given values of interest costs on debt and the primary surplus. To produce Figure 8 we consider deviations from the baseline (labeled "base" below), hence:

$$d_{t+j} - d_{t+j}^{base} =$$

$$d_{t-1} - d_{t-1}^{base} + \sum_{k=0}^{j} \left[\left(intcosts_{t+k} - intcosts_{t+k}^{base} \right) - \left(growth_{t+k} - growth_{t+k}^{base} \right) - \left(ps_{t+k} - ps_{t+k}^{base} \right) \right]$$

$$= \sum_{k=0}^{j} \left[\left(intcosts_{t+k} - intcosts_{t+k}^{base} \right) - \left(growth_{t+k} - growth_{t+k}^{base} \right) - \left(ps_{t+k} - ps_{t+k}^{base} \right) \right] \tag{8}$$

Figure 8 shows the right-hand side of equation (8), where it is observed that $d_{t-1} - d_{t-1}^{base} = 0$ (as the level of public debt is the same as that from the baseline for the period before structural reforms and consumption tax hikes start). Note that as the level of public debt declines (as structural reforms and higher consumption tax rates take place), the contribution from interest costs can change sign despite the fact that nominal interest rates may be higher.