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Finland's Public Sector Balance Sheet:
A Novel Approach to Analysis of Public Finance

by Maren Brede and Christian Henn

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Finland's Public Sector Balance Sheet: A Novel Approach to Analysis of Public Finance

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Abstract

We construct a comprehensive public sector balance sheet for Finland from 2000 to 2016 by complementing general government statistics with data on public corporations and public pensions. We show that exposure to valuation changes in equity markets through asset holdings and increases in pension liabilities relative to GDP amplify crisis impacts on public finances. We expand the balance sheet by including present value estimates of future fiscal flows; this allows us to perform fiscal stress tests and policy experiments. These analyses suggest that Finland's public finances will remain sound provided ongoing reform and consolidation efforts to address aging pressures are implemented as planned.

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I. A COMPREHENSIVE VIEW OF PUBLIC FINANCES

1.   **Most fiscal sustainability analyses focus on gross general government debt, even though broader measures are often more relevant.** This holds true for most debt sustainability analysis frameworks, e.g., within the EMU, attention is predominantly paid to Maastricht debt. However, broader concepts of government *net worth* have been found to be superior to gross debt. Most importantly, the information they supply is more relevant for decisions. For instance, an increase in public investment would increase debt, ceteris paribus. But it could positively affect net worth, because it would also add to the public asset stock and may strengthen future public revenues. A balance sheet approach allows to account comprehensively for these offsetting factors. In addition, net worth measures from public balance sheets have been shown to outperform debt measures in predicting long-term sovereign spreads both in advanced and emerging economies (Gruber and Kamin, 2012; Hadzi-Vaskov and Ricci, 2017). The balance sheet approach holds several more advantages (¶3,4).

2.   **Public sector balance sheet analysis proceeds in two steps.** Deriving a static balance sheet represents the first step (Section II). This requires intense data work, which we describe more in Annex I. In a second step, the static balance sheet is augmented with future fiscal flows into an intertemporal balance sheet (Section III), which can then be subjected to stress tests to determine the size of a prudent fiscal buffer (Section IV).

3.   **The static fiscal balance sheet includes the following in addition to gross debt:**

- **Assets.** Accounting for assets allows one to distinguish between structural and non-structural debt reduction measures. Non-structural measures reduce debt via decumulation of assets (e.g., privatization, running down assets). Structural measures in contrast increase net worth, either by decreasing debt stocks or via issuance).[2] Thus, incorporating assets could discourage 'creative accounting'. Milesi-Feretti (2004) points out that fiscal rules such as the Maastricht criteria can indeed lead governments to embellish fiscal variables of interest. Government debt reductions in EU countries in the run-up to the introduction of the euro in 1999 were accompanied by a decumulation of assets (Milesi-Feretti and Moriyama, 2006). In contrast, the authors find that debt reductions after the 1998–2002 period were accompanied by commensurate improvements in net worth in most EU countries. Several more studies provide empirical evidence for creative accounting in the EU and elsewhere.[3]

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[2] Easterly (1999) calls fiscal adjustment an illusion when the budget deficit or public debt is reduced but net worth stays virtually the same and provides various interesting anecdotes of creative accounting or 'financial engineering' from the second half of the last century.

[3] A non-exhaustive list of papers on creative accounting within the EU framework includes Koen and Van den Noord (2005), Von Hagen et al. (2006), Buti et al. (2007), Bernoth and Wolff (2008), and Beetsma et al. (2009). Early empirical evidence by Easterly (1999) suggests that in various developing countries with IMF or World

- **Public Corporations.** Including the accounts of financial and non-financial public corporations further enhances the comprehensiveness of fiscal analysis. Public corporations are those over which the state directly exerts control.[4] They can be an important source of revenue to the public sector. However, they might also comprise risks that would not be accounted for in general government statistics, in the form of quasi-fiscal deficits or other (explicit or implicit) support mechanisms. Including the balance sheets and operations of enterprises in public sector accounts delivers a more comprehensive view of fiscal sustainability and eliminates the possibility of governments shifting deficits or debt to public corporations not subject to standard debt sustainability analyses.

- **Existing pensions liabilities.** Another aspect that is largely ignored in standard government statistics is obligations related to public and private sector employees' pensions. "Existing" here means that they relate to work that has already been performed in the past. These liabilities can be to public or private sector employees. Those to public employees would represent *contractual* obligations for the government in most countries. In Finland, this is only the case for public pensions accrued before 1993. Those accrued thereafter are *statutory* obligations, i.e., imposed by law. This implies that payout rules could be changed, albeit at a political cost. Likewise, pension obligations to private sector employees are also a statutory obligation in Finland.[5]

Contingent liabilities are not explicitly reflected in the balance sheet, but will be covered later through fiscal stress tests **(¶30).**

4.   **The intertemporal public sector balance sheet adds net present values of all future fiscal balances.** Therefore, some authors also refer to it as the comprehensive balance sheet. Including revenues is important as the power to tax is the largest asset of most states. But on the other hand, future expenditures need to be included and appropriately reflect future aging pressures.[6] To the extent that future fiscal positions are strong, they can offset negative static net worth. While the intertemporal balance sheet provides the most

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Bank programs government liabilities were reduced by selling government assets, leaving net worth in those countries largely unchanged.

[4] Note that public sector equity holdings in companies in which the state does not exert control do not comprise public corporations. Such equity holdings are instead recorded as financial assets of the general government.

[5] The Finnish government received pension contributions also from private sector employees and administrates the corresponding pension funds.

[6] Future payment streams on already existing pension liabilities (which are included in the static balance sheet) need to be excluded from expenditures to avoid double counting. However, expenditures need to include payments for future pension liabilities.

comprehensive view on public finances, it obviously involves many assumptions (e.g., in constructing the future fiscal path). It is therefore subject to considerable uncertainty, unlike the static balance sheet. It, however, lends itself to scenario analysis of different future fiscal paths and therefore the quantification of policies' impact on fiscal sustainability.

5.   **Constructing a public sector balance sheet is data intensive.** Even for an advanced country like Finland with very good data reporting, it requires gathering and consolidating data from various sources. In addition, we relied on extensive assistance from the Finnish authorities. More detail on the data and methodology is provided in Annex I. Data on public corporations had to be gathered from individual corporations' balance sheets going back to 2000. While the data cover over 90 percent of the assets of nonfinancial public corporations owned by the central government, local government-owned corporations could not be covered due to data constraints. Estimates of pension liabilities were taken from the ETK Finnish Centre for Pension and extended forward and backwards.

6.   **The public sector balance sheet analysis shows that Finland's fiscal position is solid, but stresses the importance of continuing reforms and using opportunities for early rebuilding of buffers.** Static public sector net worth for Finland is negative at some - 160 percent of GDP. But the intertemporal balance sheet shows that Finland's future fiscal balances are sufficiently strong to compensate, if reform implementation continues as planned. Especially health and social services reform will be important to address future spending pressures from rising health and long-term care. In light of numerous risks—macroeconomic, but also to the savings potential of the reform itself—it would be prudent to use the present economic upswing to make early headway in rebuilding buffers.

7.   **Forthcoming public sector balance sheet analyses of other countries should be helpful to put Finland's situation in international perspective.** The October 2018 IMF Fiscal Monitor plans to extend the analysis to a series of countries for which such balance sheets are not yet available. However, comparison to existing work, for instance in IMF (2006a,b; 2008; 2009). and countries that already produce such balance sheets routinely (e.g., Australia, New Zealand), seems to confirm that Finland's net worth is quite satisfactory.

II.   FINLAND'S STATIC PUBLIC SECTOR BALANCE SHEET FOR 2000–16

8.   **Historically, Finland's fiscal policies have been prudent.** Finland's fiscal surplus was large both before the global financial crisis (GFC) and the Nordic banking crisis of the early 90s. This created fiscal space to respond to the crises. Between the two crises, the government was able to reconstitute buffers by running relatively large surpluses. This helped limit fiscal deficits to 2–3 percent of GDP in the years after the global financial crisis, which were also marked by additional idiosyncratic shocks (Nokia's restructuring, Russia sanctions).

General Government Balance
(Percent of GDP)

Source: Statistics Finland.
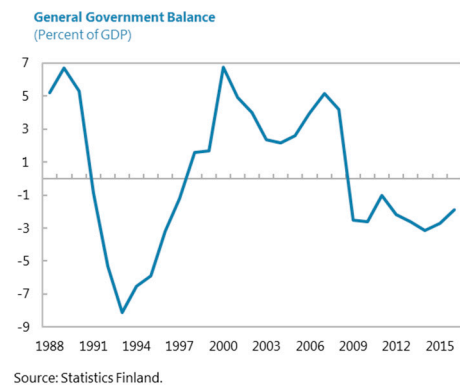
9.   **While Finland's gross debt increased significantly in the post-GFC period, static net worth has remained quite stable** (Figure 1). Finland's experience shows that dynamics of debt and of net worth can differ considerably, highlighting the merit of a more comprehensive balance sheet approach. Debt ratios increased continually from 33 percent of GDP in 2008 to 63 percent of GDP in 2016,[7] driven by the moderate post-crisis fiscal deficits and subdued growth. The prolonged downturn after the GFC increased debt ratios significantly, as real GDP remained some 4½ percent below its pre-GFC peak in 2016. In contrast, static net worth remained quite stable. As we will show, this largely resulted from the sizable asset positions in Finland's balance sheet posting positive valuation gains.

Figure 1. Finland: Gross Debt Versus Static Net Worth

Large fiscal surpluses before the Nordic and Global Financial Crises helped buffer their impact.

Nonetheless, the fallout of these crises, including low growth has increased debt.

General Government Gross Debt
(Percent of GDP; EMU definition)

Source: Statistics Finland.

Public Sector Static Net Worth, 2000-16
(Percent of GDP)

— Excluding Pension Liabilities
---- Including only Existing Public Pension Liabilities
— Including All Existing Pension Liabilities

Sources: Finnish Authorities and IMF Staff estimates.

A.   Structure of Finland's Public Sector Balance Sheet

10.   **The public sector balance sheet shows that assets, public corporations, and pension liabilities play a large role in determining net worth for Finland.** Given that these three components added by the balance sheet approach are all quite sizable for Finland, they are worth discussing in detail. Data sources and construction of the balance sheet (Table 1) is discussed further in Annex I.

- **Non-financial assets stood at 75 percent of GDP at end 2016.** The value of general government non-financial assets divides quite evenly into three parts: (i) buildings, including schools, hospitals, prisons,

General Government Non-Financial Assets by Type, 2016
(Percent of GDP)

Other structures 2/, 24.9
Land, 17.2
Machinery and equipment and weapons systems, 5.6
Intellectual property, 4.4
Inventories and Valuables, 0.9
Buildings other than dwellings 1/, 21.2
Dwellings, 0.7
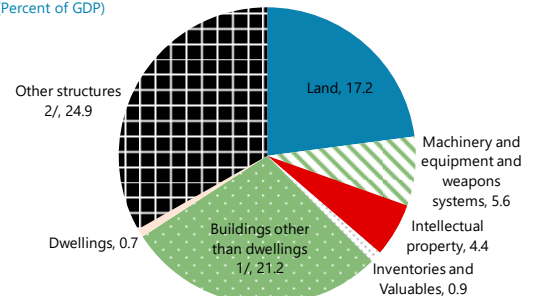
Sources: Eurostat and Statistics Finland.
1/ Includes e.g. schools, hospitals, prisons, libraries.
2/ Includes e.g. road and rail infrastructure; water, power and communication lines.

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[7] These figures refer to the Maastricht debt definition.

agencies; (ii) other structures, including roads, rail, power lines, sewage; (iii) other real assets, including chiefly land, but also machinery and intellectual property.

- **Financial assets are large (170 percent of GDP) in light of Finland's partially funded pension system, and skewed toward equities.** Pension funds account for 90 percent of GDP in financial assets. Thereof, they invest about two thirds of in equities. Central and local government together hold another 40 percent of GDP in financial assets,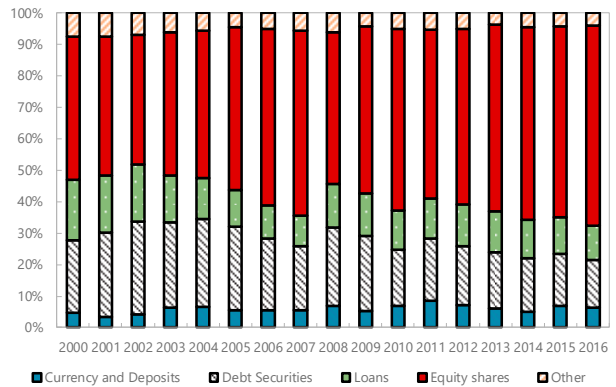 including through equity participation in firms. Public sector static net worth is thereby considerably affected by equity price fluctuations.

General Government Financial Assets by Type, 2016
(Share of total financial assets)

■ Currency and Deposits ▨ Debt Securities ▨ Loans ■ Equity shares ▨ Other

- **Public corporations add 10 percent of GDP to net worth.** The analysis considers the six largest non-financial and three largest financial SOEs owned by the Central Government (aside from the Bank of Finland which is incorporated separately in the analysis). Individually, they all exhibit positive net worth. Public corporations contribute almost 10 percentage points of GDP to public sector wealth, two thirds of which is accounted for by non-financial SOEs (Table 1). The composition of SOEs' financial assets is skewed towards loans and debt securities driven by the financial sector SOEs. Annex Figure IV.1 provides the breakdown separately for financial and non-financial SOEs.

Public Corporations' Financial Assets by Type, 2016
(Share of total financial assets, excludes Bank of Finland)

■ Currency and Deposits ▨ Debt Securities and Loans ■ Equity shares ▨ Financial Derivatives ▨ Other
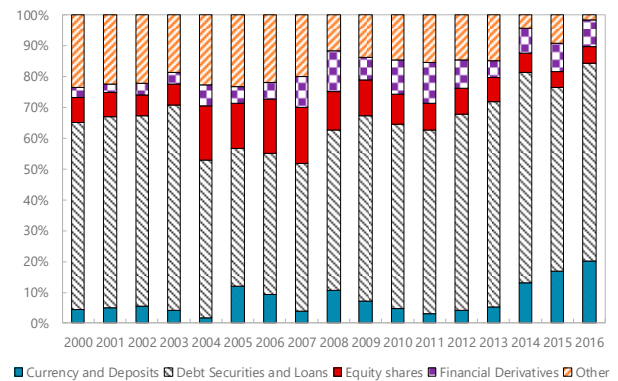
- **Existing pension liabilities (301 percent of GDP) are particularly important items of the public sector balance sheet.** In Finland, pension schemes for both public and private sector employees are administered by the government, and pension claims of both represent a statutory obligation for the Finnish government (¶3). While the 2017 pension reform ensures that pension contributions going forward will completely finance any further accrual of further pension liabilities, this was not the case in the past. The *existing* pension liabilities figure of 301 percent of GDP is the present value of all future pension payments related to work performed up until 2016. To obtain this present value, the future payment stream is discounted using a real

interest rate of 3 percent.[8] This real interest rate has been revised down gradually from 4 percent in 2007, explaining some of the increase in the present value of pension liabilities since then.

Finally, most standard assessments of fiscal sustainability in EU countries would be based on Maastricht debt, which for Finland stood at 63.1 percent of GDP in 2016. The stock of financial liabilities included in the balance sheet (75 percent of GDP) uses a more comprehensive definition.[9]

Table 1. Finland: Public Sector Balance Sheet, Dec 31, 2016

	General Government					Public Corporations				Public Sector
	Central Government	Social Security Funds	Local Government	Consolidation	Total	Non-financial	Financial	Central Bank	Consolidation 1/	Total
Assets	52.8	90.9	62.3	-2.8	203.4	17.9	20.2	36.9	-23.3	255.1
Nonfinancial	24.4	0.7	49.8	0.0	74.9	9.6	0.0	0.1	0.0	84.6
Financial	28.3	90.0	12.4	-2.8	127.9	8.3	20.2	36.9	-23.3	170.5
Liabilities	59.7	304.9	14.3	-2.8	376.1	11.9	19.8	33.7	-23.3	418.2
Financial 2/	59.7	3.8	14.3	-2.8	75.0	11.9	19.8	33.7	-23.3	117.1
Pension liabilities 3/		301.1			301.1					301.1
To public employees		103.3			103.3					103.3
To private employees		197.8			197.8					197.8
Net Worth	-6.9	-214.0	48.0		-172.7	6.0	0.4	3.2		**-163.1**
Net Worth, excl. all pensions liabilities	-6.9	87.1	48.0		128.4	6.0	0.4	3.2		138.0
Net Financial Worth	-31.3	-214.7	-1.8		-247.6	-3.6	0.4	3.1		-247.7

Net Financial Worth (NFW) = Financial assets - Liabilities
Net Worth (NW) =Net financial worth + Nonfinancial assets
Sources: Statistics Finland, Eurostat, Bank of Finland, Finish Center for Pensions, Financial Statements of Corporations listed in Table 1, author's calculations.
1/ The consolidation on the public sector level is an approximation based on available information in the financial statements of the public corporations. The consolidation relates equity, loans and deposits. The consolidation of non-financial public corporations with general government accounts relates to equity held by the general government according to their shareholdings. On the financial corporations, MuniFin and Finnvera reported explicitly on the interactions with government units, in particular with loans that had to be consolidated. Information on central banks accounts interacting with general government units that have to be consolidated was obtained from Statistics Finland.
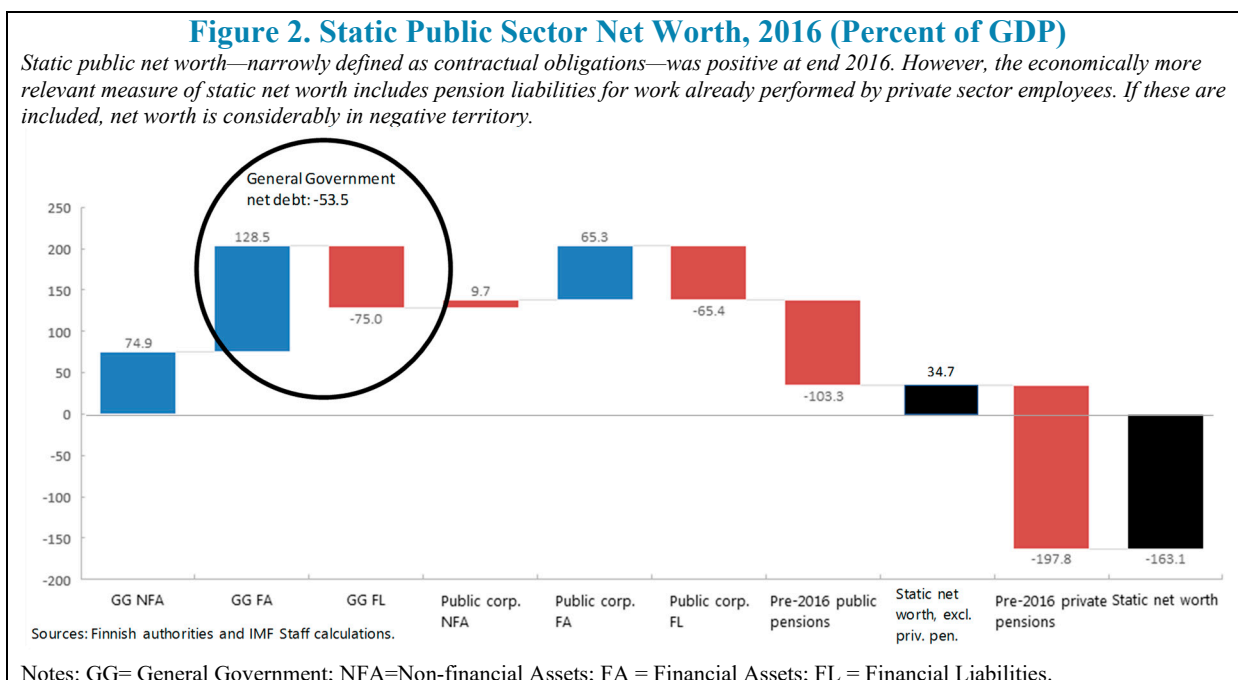*2/ Maastricht debt of 63.1 percent of GDP in 2016 varies from the 75 percent financial liabilities figure as the former inter alia excludes financial derivatives and accounts payable.*
3/ These refer to existing pension liabilities only, i.e. depict the present value of future pension payments relating to work performed until end 2016.

11.   **A schematic overview of Finland's balance sheet illustrates that net (and gross) debt measures are deceptive.** Therefore, care should be taken in drawing policy recommendations based on these measures alone. For Finland, general government net debt was -53 percent of GDP in 2016, i.e., there was a positive net asset position. This results from large stocks of financial assets—given that pension funds are considered part of general government—being included in net debt, while associated pension liabilities (301 percent of GDP) are not included. General government net debt measures also neglect its non-financial assets (75 percent of GDP) and the SOE sector (net worth of 10 percent of GDP).

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[8] Up to 2026 and 3.5 percent from 2027 forward, based on calculations by the ETK Finnish Centre for Pensions.

[9] The difference arises due to two reasons. First, Maastricht debt excludes accounts payable and financial derivatives (6.4 percent of GDP at end 2016). Second, debt under the Maastricht definition is evaluated at nominal value instead of market value.

Figure 2. Static Public Sector Net Worth, 2016 (Percent of GDP)

Static public net worth—narrowly defined as contractual obligations—was positive at end 2016. However, the economically more relevant measure of static net worth includes pension liabilities for work already performed by private sector employees. If these are included, net worth is considerably in negative territory.

Sources: Finnish authorities and IMF Staff calculations.

Notes: GG= General Government; NFA=Non-financial Assets; FA = Financial Assets; FL = Financial Liabilities.
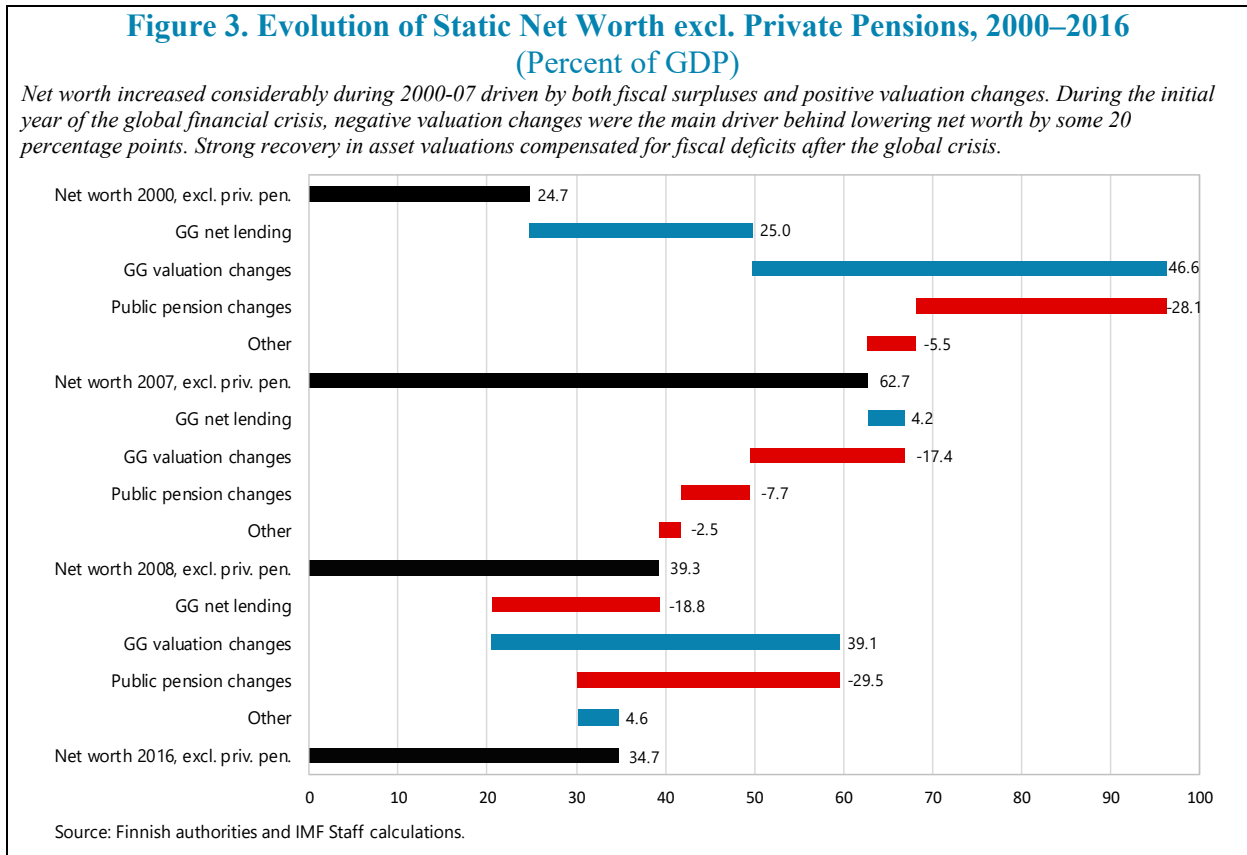
B. Evolution of Finland's Public Sector Net Worth Since 2000

12.   **The historical analysis focuses on the evolution of public sector net worth before, during, and after the GFC.** We decompose changes in public sector net worth into effects due to fiscal balances, investment, and valuation changes for both the general government and public corporations; changes in public pension liabilities; and a denominator effect resulting from changes in nominal GDP over time. This allows us to identify the main drivers and risk exposure of Finland's fiscal balance sheet over the past 16 years, summarized by Figure 3. (Annex figures IV.2-IV.4 provide further detail.)

13.   **Public sector net worth increased considerably from 2000 to 2007 driven by fiscal surpluses, but also by net positive valuation changes, which are not typically analyzed.** From end 2000 to end 2007 net worth increased from 25 to 63 percent of GDP. Fiscal surpluses contributed positively, increasing net worth by 25 percent of GDP during this period. But elements not typically analyzed made much larger contributions. Positive asset valuation changes increased net worth by 47 percent of GDP. This outstripped a rise in nominal public pension liabilities of 28 percentage points of GDP. Finally, new public investment exceeded depreciation, thereby also making a small positive contribution to net worth (Annex Figure IV.2).

14.   **Detailed data are useful to further break down changes in net worth into those caused by transactions and by valuation changes** (Annex Figure IV.2). Fiscal surpluses before 2007 found their reflection in a strengthening financial asset position in general government, more so than through reductions in debt. Meanwhile, public corporations considerably reduced their financial liabilities. Positive valuation changes materialized in

non-financial and, particularly, financial assets throughout the public sector. Within financial assets of the general government, equity shares were behind the large valuation gains as equity prices rose prior to the financial crisis. Lastly, the reductions in public sector net worth due to changes in pension liabilities were mainly driven by the interest rate effects. These capture that pensions nearing their payment increase in present value. In contrast, pension flows (i.e., new pension accrued minus pensions paid) balanced out.

Figure 3. Evolution of Static Net Worth excl. Private Pensions, 2000–2016
(Percent of GDP)

Net worth increased considerably during 2000-07 driven by both fiscal surpluses and positive valuation changes. During the initial year of the global financial crisis, negative valuation changes were the main driver behind lowering net worth by some 20 percentage points. Strong recovery in asset valuations compensated for fiscal deficits after the global crisis.

	Value
Net worth 2000, excl. priv. pen.	24.7
GG net lending	25.0
GG valuation changes	46.6
Public pension changes	-28.1
Other	-5.5
Net worth 2007, excl. priv. pen.	62.7
GG net lending	4.2
GG valuation changes	-17.4
Public pension changes	-7.7
Other	-2.5
Net worth 2008, excl. priv. pen.	39.3
GG net lending	-18.8
GG valuation changes	39.1
Public pension changes	-29.5
Other	4.6
Net worth 2016, excl. priv. pen.	34.7

Source: Finnish authorities and IMF Staff calculations.

15.   **The GFC illustrates that—given Finland's asset holdings—its net worth tends to decline faster and more immediately during crisis than debt increases.** This is due to valuation losses which tend to be realized immediately, while cyclical fiscal deficits only increase debt over time. From end 2007 to end 2008, public sector net worth decreased by more than 20 percent of GDP, driven mainly by such valuation losses not covered in conventional assessments of the fiscal position. In contrast, the fiscal balance and investment still remained positive throughout the public sector in 2008. Unsurprisingly, the large negative valuation changes in general government accounts were driven by financial assets, in particular by equity shares losing value when the crisis hit (Annex Figure IV.3). For public corporations, valuation changes in financial assets and liabilities roughly balanced out on aggregate. Again, valuation effects of pensions nearing disbursement drove the increase in public pension liabilities.

16.   **In the years after the GFC, Finnish public sector net worth has remained broadly stable, despite the notable increase in gross debt.** Public net worth excluding private pensions only slightly declined from 39 percent of GDP at end 2008 to 35 percent of GDP at end 2016. Despite this relative stability, a decomposition of overall evolution of net worth shows the interplay of various sizable factors. First, fiscal deficits decreased net worth by 19 percent of GDP on net: Acquisition of financial assets through pension funds continued (18 percent of GDP), but new debt contraction by general government increased financial liabilities by 37 percent of GDP (Annex Figure IV.4). Public corporations kept investment and profits positive in the post-crisis years and managed to further reduce financial liabilities and acquire financial assets. The recovery of financial markets after the financial crisis is displayed in the large positive valuation changes in the account of the general government driven by recovering equity shares. The reduction of public sector net worth due to increasing public pension liabilities is comparable to the pre-crisis period and largely due to pensions near their payment period.[10]

C. Risks and Hedges in Finland's Public Sector Balance Sheet

17.   **Valuation changes of financial assets tend to lead to more immediate drops in net worth in crisis situations, if asset stocks are large as in Finland.** In particular, equity shares, which are held predominantly by social security funds, are subject to large valuation changes due to their high sensitivity to financial market conditions. These variations can pose short-run risks to the balance sheet, as valuations of debt liabilities are much more stable. Over the medium- to long-term, however, equity portfolio valuation has contributed positively to net wealth.

18.   **But asset stocks may stabilize net worth in the period after a large shock.** If—as after the GFC—equity prices recover during the post crisis years, such favorable valuation changes will help offset the impact of post-crisis fiscal deficits.

19.   **Mismatch risks can result from asynchronous changes in pension assets and liabilities.** Public pension liabilities in nominal terms increase gradually over time, while the corresponding pension fund assets are subject to financial market fluctuations. As discussed, this risk was realized during the 2008.

20.   **But a natural hedge dampens the effects of interest rate changes on public sector net worth.** Low interest rates increase the present value of pension liabilities, as (i) the discount factor decreases and (ii) they coincide with low growth which increase pension liabilities relative to GDP. On the other hand, low interest rates also underpin higher equity

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[10] The revision in pension liability estimates in this period also includes a change in discount factor from 4 percent to 3.5 percent between 2009 and 2010, a revision between 2014 and 2015 due to inclusion of the effects of the 2017 pension reform, and at the same time a further reduction of the discount factor to 3.0 percent (for the 2017–26 period).

and bond prices and thus valuations of pension funds' assets. Finland experienced this effect in post-GFC years, when asset valuations increased amid low interest rates, offsetting increases in pension liabilities.

21.   **Risks of emergence of hidden deficits in Finnish public corporations seem low, but the large and rising stock of government guarantees and implicit liabilities needs to be closely managed.** Finland's SOEs have been profitable, maintaining a solid financial position throughout the years, and are subject to regular monitoring. Finland's stock of government guarantees is the highest in the EU and risks are concentrated. While provisioning and risk management are adequate, close monitoring is essential (Box 1). Although Finland's banking sector is well capitalized, the planned relocation of Nordea Group's headquarters to Helsinki in late 2018 will more than triple the current size of bank assets under supervision and expand implicit contingent liabilities.

22.   **The maturity structure of public debt mitigates interest rate risks.** Average maturity of central government debt is 6.5 years. Annual gross financing needs remained below 12½ percent of GDP throughout 2000–16 and, looking forward, rollover needs do not exhibit overly large spikes in any particular future years. Public corporations' financial assets and liabilities could be sensitive to interest rate changes, but they have historically not varied much in value.

23.   **The Finnish public sector's exposure to currency fluctuations is small.** Around 98 percent of financial liabilities of the general government are issued in euros while the remainder is hedged against currency fluctuations by the state treasury.[11] From the annual financial reports of the public corporations we can summarize that exposure to foreign currency liabilities are usually hedged and that maturity mismatches are minimal. Exposure to currency risk is thereby limited to financial assets held by social security funds, half of which are foreign equity shares.

III.   THE INTERTEMPORAL BALANCE SHEET

24.   **The intertemporal balance sheet adds present values of future revenues and expenditures to the static balance sheet.** It thereby recognizes that the largest asset for any government is its power to raise taxes, but also that future expenditures will need to be financed. The intertemporal balance sheet is subject to considerably more uncertainty than the static balance sheet, given that assumptions need to be made on a future fiscal path and underlying macroeconomic variables. On the upside, however, this also allows for simulation of different policy and stress scenarios to gauge their effects on net worth measures.

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[11] For further information, see the Finnish State Treasury's website: http://www.treasuryfinland.fi/en-US/Funding_and_cash_management.

25.   **To devise a long-term fiscal path, October 2017 WEO projections are extended and supplemented by estimates of aging costs.** The October 2017 WEO projections for Finland cover the period through 2022. They are updated with medium-term fiscal assumptions of the 2018 budget and, for the purpose of stress testing, supplemented by asset price projections. Long-term projections (beyond 2022) rely on simple growth accounting. They assume that real GDP growth would stabilize at around 1½ percent, based on Statistics Finland's population projections, a constant labor force 15–64 labor participation rate, and labor productivity growth of 1.5 percent. Fiscal revenues are assumed to remain constant relative to GDP and the expenditure ratio is assumed to vary in line with aging costs. Annex II provides further details.

26.   **Intertemporal financial net worth (IFNW) is our preferred indicator of long-run sustainability of current fiscal policies.** Negative IFNW is an indication that fiscal policies will need to be eventually changed to fulfill the budget constraint. It could also provoke adverse financial market reaction, if agents' confidence in such future policy adjustment deteriorates. Compared to net worth, which has been our focus when we analyzed the static balance sheet, IFNW excludes non-financial assets. This is preferable, in our view, to avoid double counting, given that most of these non-financial assets facilitate the generation of tax revenues by underpinning economic activity. While some public non-financial assets could be sold without large repercussions to economic activity (e.g., converting a public highway to a private toll highway), most are difficult or impossible to sell (e.g., in-city roads, sewage infrastructure, land in remote areas). Selling non-financial assets, such as buildings, could be expected to negatively affect a country's institutional framework and lower future tax values (e.g., if it results in worse education via less schools or less rule of law via less courthouses). If buildings were sold and leased back, future expenditures would increase to offset income from the sale.

27.   **Different assumptions on the future fiscal path provide five scenarios.** Fiscal paths for all scenarios feature a wave pattern over the long run, which is driven by Finland's rapid population aging through 2030, followed by a respite during 2030–50 (see Figure II.2 in Annex II). For the medium-term, there are three variations: a baseline, a 2018 budget scenario with somewhat slower immediate fiscal consolidation, and a scenario in which all ongoing consolidation efforts would be abandoned. For the first two scenarios, we add additional variants in which health and social services reform is fully implemented as envisaged by the Finnish authorities. This leaves us with the five scenarios:

- **Baseline (Fiscal Position near balance by 2020).** The baseline scenario is based on the 2017 October WEO projections. It includes fiscal projections which suppose that Finland would achieve its medium-term objective of a structural fiscal deficit of ½ percent of GDP by 2020.

- **Baseline with health and social services reform.** This is the same as the baseline, but includes an improved fiscal path between 2023 and 2030 supposing gradual realization of savings of 1½ percent of GDP through health and social services reform.
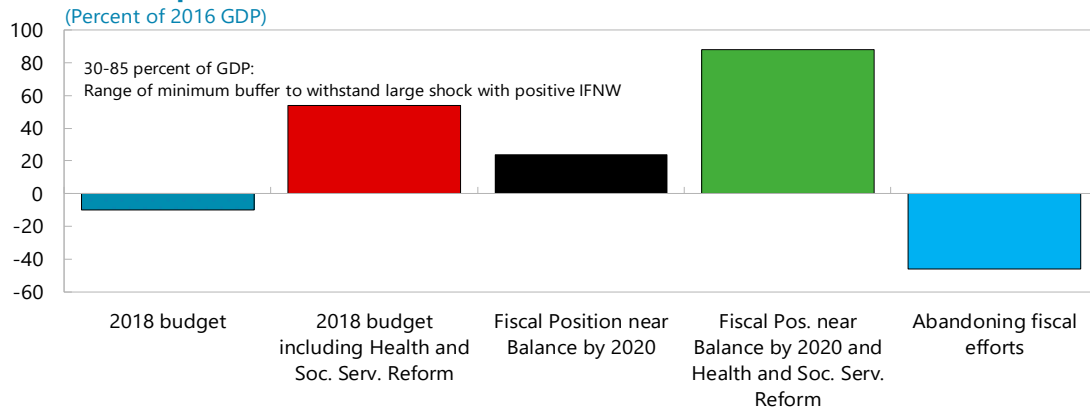

Fiscal primary balance under various scenarios
(Percent of GDP)
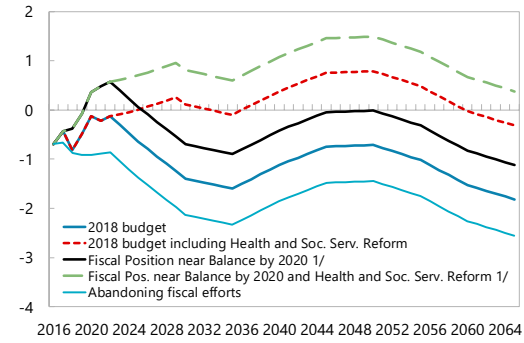
Sources: Authors' calculations and Fund staff projections.

- **Moderated consolidation (2018 budget).** The 2018 budget proposal's medium-term fiscal framework includes more modest fiscal consolidation at a slower pace than that envisaged under the baseline. By the early 2020s, the overall fiscal deficit would be around 1 percent of GDP,[12] or ½ to ¾ percent of GDP higher than under the baseline.[13]

- **Moderated consolidation (2018 budget) with health and social services reform.** This scenario combines the moderated medium-term consolidation with the health and social services reform savings over the longer term.

- **Abandoned consolidation.** This scenario supposes that the ongoing expenditure-based fiscal consolidation were abandoned. The overall fiscal deficit is assumed to stand at 1¾ percent of GDP throughout 2022, after which it changes only in line with age-related spending. This scenario also assumes that health and social services reform will *not* be implemented.

Intertemporal Financial Net Worth Under Various Scenarios
(Percent of 2016 GDP)

30-85 percent of GDP:
Range of minimum buffer to withstand large shock with positive IFNW

Sources: Authors' calculations.

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[12] Finland's interest expenditure was 1.1 percent of GDP in 2016 and is projected to decrease to 0.8–0.9 percent by the early 2020s.

[13] Note that Finland has considerably overperformed its fiscal projections in the recent past and, with economic growth continuing to be strong, it is quite possible that the baseline may be achieved.

28.   **Under all scenarios, IFNW exceeds static net worth** (Figure 4). Therefore, Finland's future fiscal path is a source of strength, which offsets its negative static net worth of -160 percent of GDP. In three of the five scenarios, IFNW is positive. It is highest under the most ambitious fiscal consolidation scenario, which is the baseline including health and social services reform. Under the baseline without health and social services reform, it is also still positive, but barely so. Under the current more moderate medium-term consolidation, health and social services reform is needed to achieve positive IFNW. Successful implementation of this reform would boost IFNW by some 65 percent of GDP.

Figure 4. Finland's Intertemporal Balance Sheet at End-2016

The ongoing expenditure-based fiscal consolidation, if fully implemented as planned, would be sufficiently strong to ensure positive comprehensive financial net worth, …
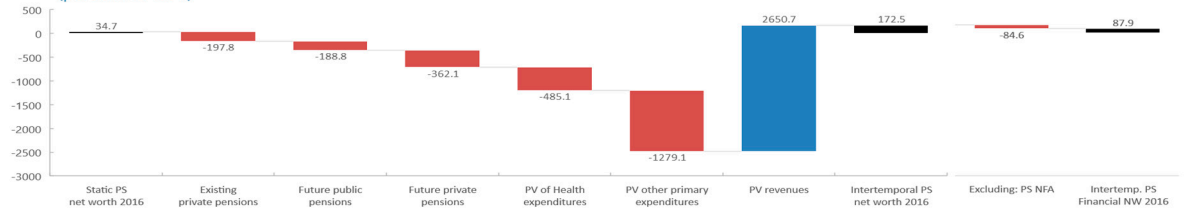
Under Baseline Assumptions
(percent of GDP)
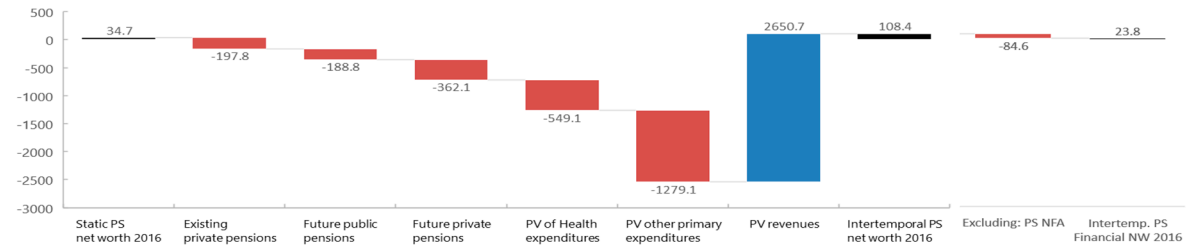
Sources: Finnish authorities and IMF Staff calculations.

… but ambitious implementation of the health and social services reform would remain crutical to build a fiscal buffer sufficiently large to absorb a major shock.
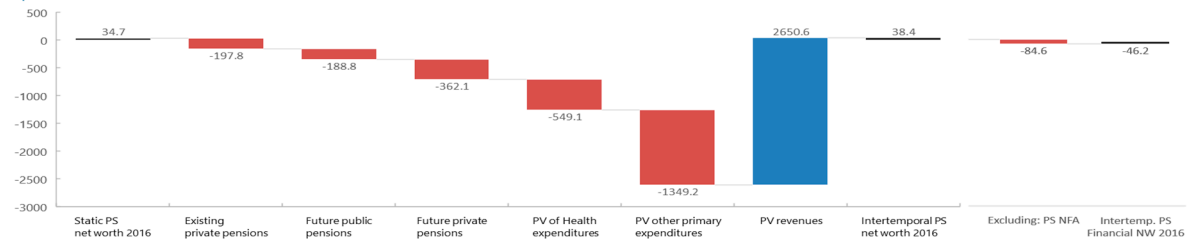
Health and Social Services Reform Scenario
(percent of GDP)

Sources: Finnish authorities and IMF Staff calculations.

If instead, all fiscal consolidation initiatives were abandoned, comprehensive financial worth would be negative, leaving Finland vulnerable to shocks.
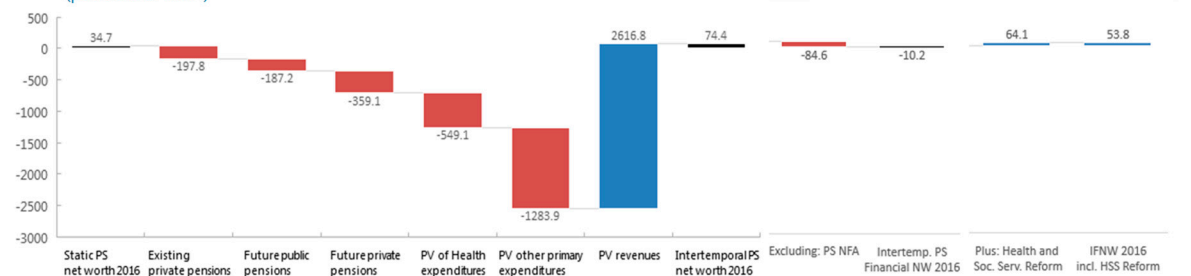
"Abandoned Consolidation" scenario
(percent of GDP)

Sources: Finnish authorities and IMF Staff calculations.

Under more gradual medium-term consolidation envisaged under the 2018 budget proposal, health and social services reform will be imperative to build a sufficiently large fiscal buffer.

Under the 2018 budget proposal scenario
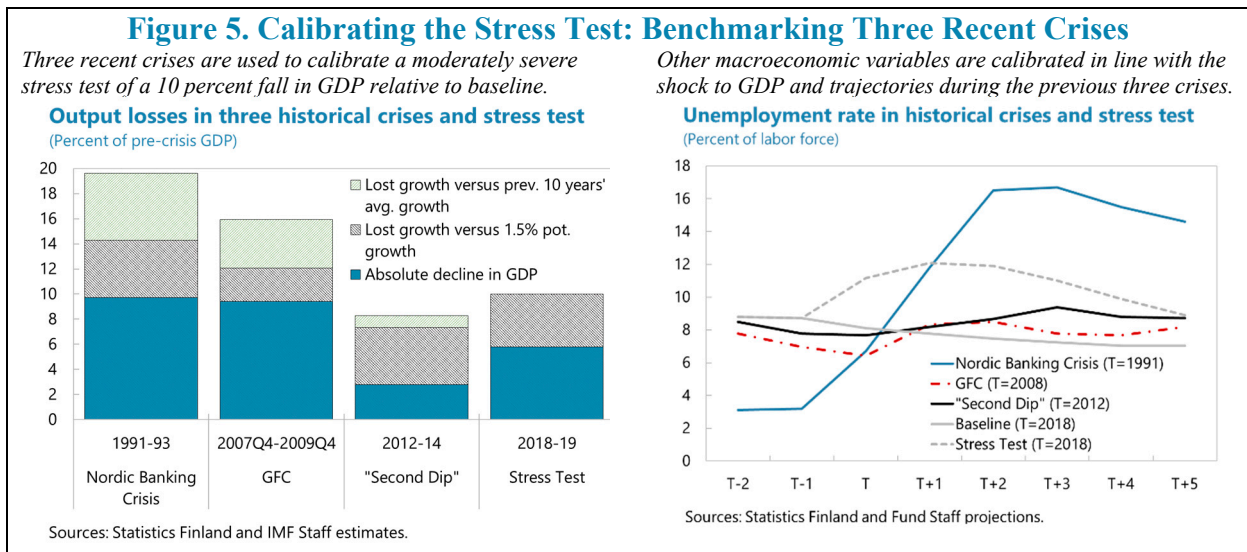(percent of GDP)

Sources: Finnish authorities and IMF Staff calculations.

Notes: PS = Public sector; NW = Net worth; PV = Present value.

IV.   STRESS-TESTING THE BALANCE SHEET

29.   **Stress tests can answer the question how much a severe shock would decrease IFNW.** They thereby provide an important yardstick for the size of fiscal buffer that Finland would need to maintain to withstand such a shock with positive IFNW. This section calibrates such a stress test for Finland and concludes that a buffer in the range of 30–85 percent of GDP would be needed to withstand a severe shock.

30.   **For the stress scenario, we calibrate a severe shock by taking an average of the three most recent crises Finland experienced** (Figure 5). These are the early 1990s Nordic Banking crisis, the Global Financial Crisis of 2008–09 and the second dip of the ensuing double dip recession (in 2012–14). Our severe shock therefore assumes that GDP would fall by 5.8 percent in 2018 and 1 percent in 2019. Relative to the baseline, GDP would be 10 percent lower in 2019 (Figure 11). The stress test also assumes that, in 2018, equity prices would fall by 40 percent and housing prices by 25 percent. On top of this macro-fiscal shock, we assume that three types of contingent liability realizations could occur. In order of increasing severity, they are: (i) some explicit contingent liabilities, such as government guarantees, could be called; (ii) in addition, limited recapitalization of banks may become necessary; (iii) and an extreme scenario assumes that full recapitalization of domestic banks (OP and Municipality Finance) would be needed. Annex III provides further details on the stress test calibration.

Figure 5. Calibrating the Stress Test: Benchmarking Three Recent Crises

Three recent crises are used to calibrate a moderately severe stress test of a 10 percent fall in GDP relative to baseline.

Other macroeconomic variables are calibrated in line with the shock to GDP and trajectories during the previous three crises.

Sources: Statistics Finland and IMF Staff estimates.

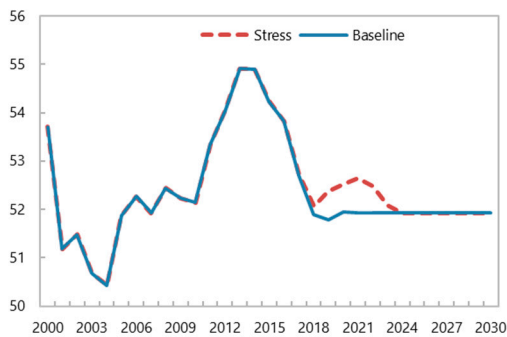Sources: Statistics Finland and Fund Staff projections.

31.   **The fiscal balance deteriorates under the stress scenario, mainly driven by higher expenditures.** Figure 6 summarizes how fiscal flows are affected under the stress scenario. While falling in absolute terms, general government revenues initially increase relative to GDP, labor compensation drops less than GDP as firms retain some labor. Revenues will, however, revert back to the baseline as the economy recovers. Expenditures increase during the crisis on account of automatic stabilizers, such as higher expenditures on

unemployment benefits. Expenditures also remain above the baseline in the long term, because (i) GDP in levels suffers a permanent loss as typical as a result of crises (e.g., as human capital of the unemployed depreciates) and (ii) some expenditures' growth is independent of GDP (e.g., health care expenditures, which are mainly driven by aging, remain the same in nominal terms). Therefore, absent additional post-crisis fiscal consolidation efforts, fiscal deficits would remain elevated compared to the baseline.

Figure 6. Fiscal Flows Under the Baseline and Stress Scenarios

The revenue ratio increases during crises as labor compensation (and thereby income tax receipts) drop less than GDP.
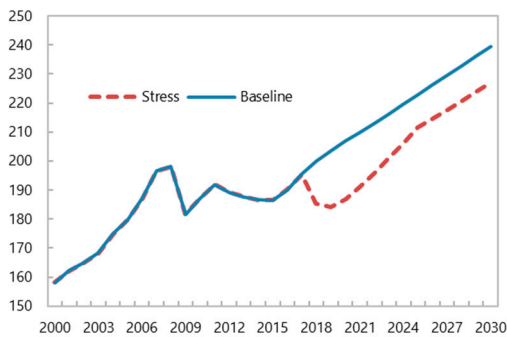
General Government Revenue
(Percent of GDP)

Expenditures would spike and, absent fiscal adjustment, would remain above baseline. This is because some expenditures are fixed in nominal terms (e.g. health care spending) and ...

General Government Primary Expenditure
(Percent of GDP)

Sources: Statistics Finland, IMF World Economic Outlook, and IMF Staff estimates

... real GDP suffers a permanent loss, as is typical in the aftermath of severe shocks.
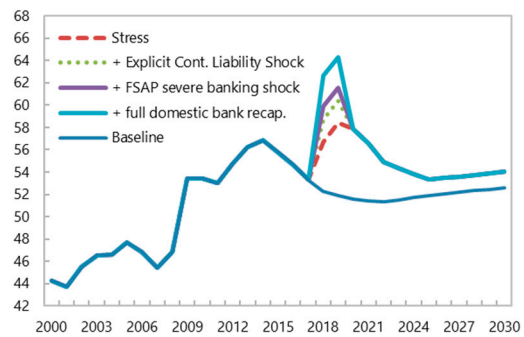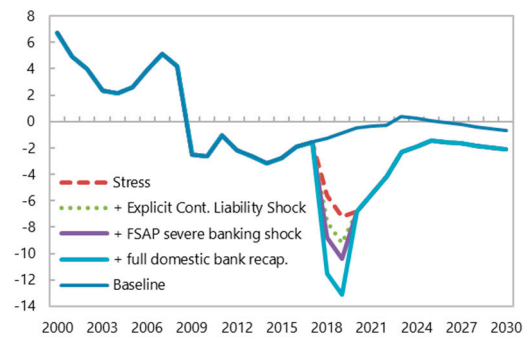
Real GDP
(Billions of 2010 constant Euros)

Sources: Statistics Finland, IMF World Economic Outlook, and IMF Staff estimates.

This opens up a long-term shortfall in the primary balance.

General Government Primary Balance
(Percent of GDP)

Sources: Statistics Finland, IMF World Economic Outlook, and IMF Staff estimates

Sources: Statistics Finland, IMF World Economic Outlook, and IMF Staff estimates.

32.   **The decline in net worth is more sudden and pronounced than the debt dynamics.** Figure 7 summarizes how fiscal stock variables are affected in the stress scenario. The peak decline of net worth is reached in 2019 and amounts to 45 percent of GDP. Including contingent liability realization in the most adverse stress scenario would lower net worth by an additional 12 percent of GDP. In comparison, gross debt—often the focus of sustainability analyses—stands "only" 20 percent above baseline in 2019. But it continues to rise through 2022, opening a 30 percent of GDP differential, as fiscal deficits remain elevated for some time after the shock.

Figure 7. Fiscal Stocks Under the Baseline and Stress Scenarios

Debt rises to an initial 2022 peak 30 percent of GDP above baseline, but debt dynamics are sluggish compared to …

,,, static net worth, which declines much more quickly as it is additionally driven by asset prices.

General Government Gross Debt
(Percent of GDP; EMU definition)

Public Sector Static Net Worth, excl. Private Pensions
(Percent of GDP)

Sources: Statistics Finland, IMF World Economic Outlook, and IMF Staff estimates.

Sources: Statistics Finland, IMF World Economic Outlook, and IMF Staff estimates.

33.   **The difference is explained by net worth accounting for impacts of asset prices and through pension liabilities.** Adverse asset price fluctuations decrease net worth by 26 percent of GDP by 2019 and pensions liabilities increase by a similar amount relative to GDP (see Annex Table IV.2). These effects are usually ignored when assessing the fiscal position, as a balance sheet approach is required to capture them. This illustrates that government finances in Finland are hit hard in the short-run through the asset portfolio. In the medium- to long-run though, when debt dynamics take over, the recovery would be supported if asset values recover, as assumed here. However, even if asset prices recover quickly, it is important to note that large valuation losses might pose constraints on the fiscal position in the short run.[14] Existing pension liabilities increase relative to GDP due to the decrease in GDP. Finally, a realization of contingent liabilities reduces public sector net worth further; our most adverse scenario would suggest by another 12 percent of GDP.

34.   **Intertemporal financial net worth deteriorates more than static net worth under the stress scenario.** In the stress scenario, 2019 IFNW is -80 percent of GDP relative to 27 percent of GDP under the baseline (Figure 8). This 107 percent of GDP deterioration is considerably larger than the 45 percent of GDP decline in static net worth. This difference results from expenditures remaining higher than in the baseline ad infinitum (for reasons explained in ¶31). One option therefore to support IFNW would be to undertake post-crisis fiscal consolidation to offset this effect. Another option would be to realize savings already before a crisis to constitute a sufficiently high IFNW buffer to neutralize higher future fiscal deficits.
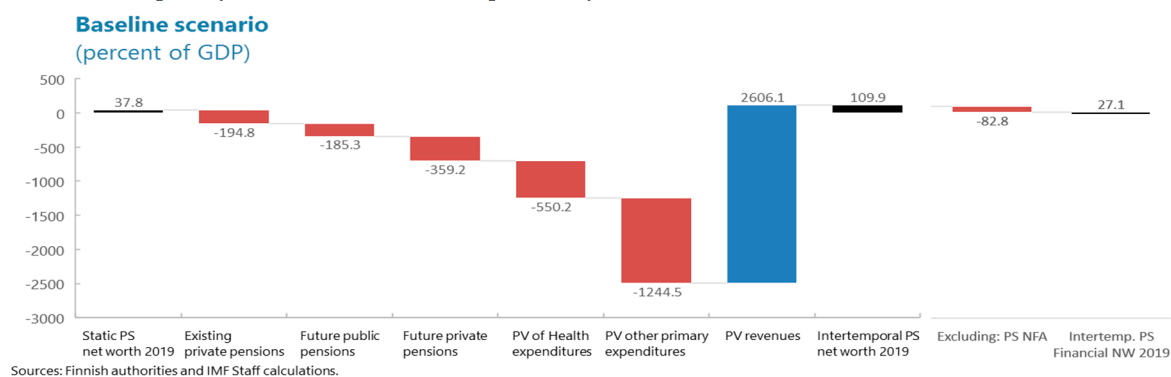
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[14] For instance, in order to avoid liquidation of assets at low prices, the central government may want to assume a larger share of pension payouts, relative to those paid from the pension funds.

35.   **A buffer of around 85 percent of GDP would allow Finland to withstand a severe shock without need for post-crisis fiscal adjustment.** Given that IFNW deteriorates by 107 percent, a buffer of this magnitude would be needed to withstand a severe shock and maintain positive IFNW throughout without any post-crisis fiscal adjustment. However, further analysis shows that IFNW would increase by about 25 percent of GDP until 2022 if the projected asset price recovery materializes in the aftermath of the crisis (Annex Table IV.2). Thus, a buffer of 85 percent of GDP would likely be sufficient to ensure a zero IFNW in the absence of post-crisis fiscal adjustments.
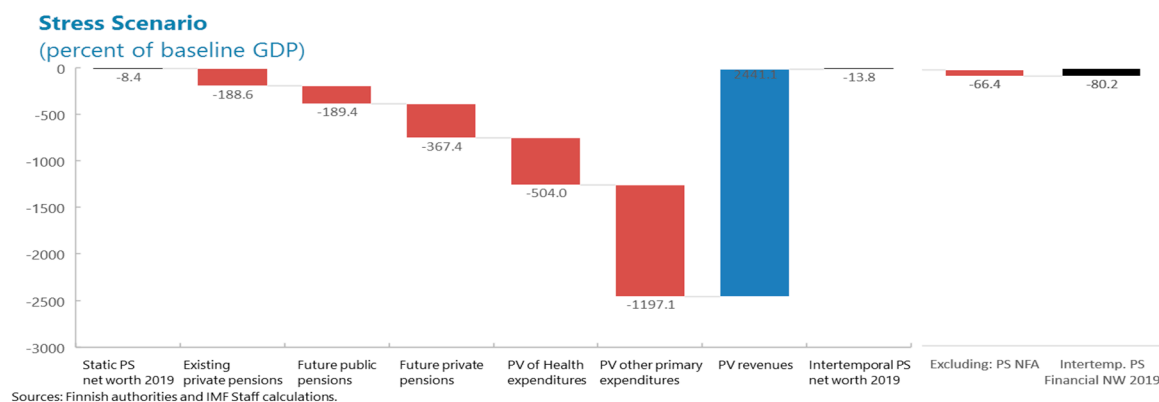
36.   **A buffer of approximately 30 percent of GDP would be sufficient to offset net worth deterioration of the crisis years, but implies need for post-crisis consolidation.** Such consolidation would be needed to return fiscal balances back to the baseline path after the crisis. We explore a variation of the stress scenario where fiscal consolidation is undertaken after the crisis to return the fiscal balance back to its baseline path by 2027. We find that IFNW would decrease to around 0. This would be a drop of some 26½ percent of GDP compared to the baseline. We therefore judge that a 30 percent of GDP buffer would suffice to withstand the most immediate impacts of a large shock. However, sufficient fiscal effort will be required post crisis to again bring fiscal deficits back to the baseline (and cover the higher interest expenditures emanating from a larger debt stock).

Figure 8. Intertemporal Public Sector Net Worth, 2019

While intertemporal financial net worth is 27 percent of GDP in 2019 under the baseline scenario, ...

Baseline scenario
(percent of GDP)

Sources: Finnish authorities and IMF Staff calculations.

... it would deteriorate to -80 percent of GDP under our stress scenario in 2019.

Stress Scenario
(percent of baseline GDP)

Sources: Finnish authorities and IMF Staff calculations.

37.   **The stress tests illustrate that health and social services reform is essential for Finland to build sufficient buffers to withstand a severe shock with positive IFNW.** Among the policy scenarios of Section III (¶29), the only two scenarios that achieve an IFNW in the range of 30–85 percent of GDP are those including health and social services reform. This underlines how crucial the reform is to fiscal sustainability.

V. CONCLUSIONS

38.   **The public sector balance sheet approach provides a more comprehensive tool than debt sustainability analyses.** The static public sector balance sheet analysis expands the analysis beyond debt by adding government assets, balance sheets of public corporations, and existing pension liabilities. The intertemporal balance sheet also includes present values of all future fiscal balances, bringing together all stocks and flows in a single comprehensive framework. It provides the measure of intertemporal financial net worth (IFNW), which is equivalent to the public sector's intertemporal budget constraint. If IFNW drops considerably below zero, the risk of a loss of confidence could increase. While governments should abstain from immediate policy reactions in response to asset price-induced plunges in net worth, they should stand ready to act if net worth stays persistently depressed.

39.   **Besides enhanced monitoring of valuation changes, public pensions and public corporations, the approach delivers a comprehensive tool for fiscal policy analysis.** The framework allows for the analysis of various reforms concerning pensions, health, the labor market, or tax and expenditure reforms and their impact on intertemporal financial net worth. In our stress scenario of an idiosyncratic shock, i.e., we implicitly assumed no feedback from the European Central Bank. One could expand the framework, e.g., by analyzing such interactions with monetary policy in a euro area-wide stress scenario. Lastly, one could think of a stress scenario in which monetary policy is constrained by the zero lower bound.

40.   **For Finland, the balance sheet approach provides new macroeconomic insights, given the country's substantial government assets and pension liabilities.** We find that public corporations are profitable and that their balance sheets are strong. They therefore do not represent a large source of fiscal risks. Pension liabilities, on the other hand, are of paramount importance due to their size, continuing steady accumulation, and the aging profile of Finland's population. Large stocks of financial assets, accounted for mainly by social security funds, are subject to considerable valuation changes. Due to these valuation changes, in a crisis situation, net worth would fall by more than the increase in debt amplifying the crisis's impact in the short-run.

41.   **For Finland a positive intertemporal financial net worth in the range of 30–85 percent of GDP would be desirable.** A buffer at the lower end of this range could absorb the immediate impact of a large shock, while maintaining positive intertemporal financial net worth. Nevertheless, it would require fiscal adjustments after the crisis to bring fiscal balances back onto the projected baseline. A buffer of 85 percent of GDP would be sufficient

to weather a large shock without need for subsequent fiscal adjustment, while maintaining a positive intertemporal financial net worth.

42.   **However, making early headway in building buffers would be prudent in light of risks.** This would be in line with long-standing practice that has served Finland well in the past. It would also help provide insurance against risks:

- First, as a small open economy, economic growth in Finland is relatively volatile.

Volatility
(Standard deviation of 2000Q1-2016Q4 y/y growth in percent)

Sources: Eurostat and Fund Staff calculations.

- Second, it is uncertain how much savings health and social services reform will ultimately yield. Economic literature suggests that demands for and relative prices of social and health services could well increase more than envisaged (Andersen et al, 2007).[15]

- Third, the size of Finland's balance sheet is quite large, with sizable pension assets counterbalancing liabilities. While this can in certain situations attenuate fluctuations in net worth, it does imply vulnerability to asynchronous valuation changes. Governments are well advised to abstain from immediate policy reactions in response to valuation changes, but would need to act if they leave net worth persistently depressed.

- Fourth, relatively large contingent liabilities represent a risk.

- Fifth, the analysis presented here is inevitably subject to considerable uncertainty inherent in macroeconomic and demographic projections and relating to future interest rates.[16]
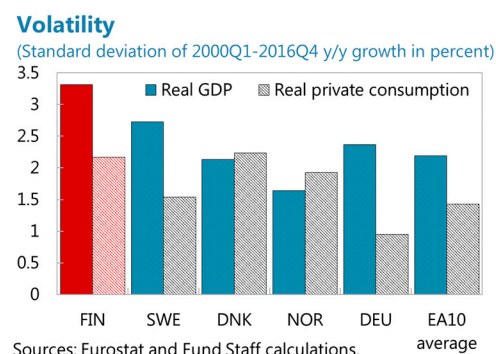
43.   **As public sector balance sheet analysis can provide early warning signals of fiscal imbalances, it would be desirable to apply it to other countries.** Our Finnish example shows that—if envisaged reforms are carried out as planned—that the country's fiscal position is robust despite strong aging pressures. But this may not be the case for many other countries facing such pressures, in Europe and elsewhere. We find that public corporations are not a source of severe balance sheet risks in Finland, but incorporating them into the analysis

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[15] Wagner's law suggests that demand for some welfare services tends to increase faster than income and Baumol's law suggests that productivity in production of welfare services tends to increase at a lower rate than in production of goods and other services. While demographic projections attempt to account for these effects, they may prove stronger.

[16] The balance sheet analysis implicitly assumes that yields on assets and liabilities would move in line with each other in the future. But if interest rates on liabilities rose faster than on assets, the fiscal position would be negatively affected.

in other countries, especially those with weaker institutional frameworks, may have strong sustainability implications. Given that challenges in data compilation can be insurmountable for individual researchers, it is our hope that governments find such analysis sufficiently useful to put in place reporting systems to enable them to compile such balance sheets.

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ANNEX I: STATIC PUBLIC SECTOR BALANCE SHEET—DATA AND METHODOLOGY

44.   **Data on general government accounts are readily available for Finland and include information on non-financial assets.** Detailed consolidated balance sheet account data for the general government and its subunits—local and central government and social security funds—are taken from Statistics Finland and Eurostat.

45.   **We add public pension liabilities to the balance sheet of the general government as they represent a contractual obligation of the government.** We obtain estimates of public and private pension liabilities accrued by the end of year t from the ETK Finnish Centre for pensions for 2008–2015.[1] These estimates represent existing pension obligations accrued due to work performed to date. They do not include pension liabilities that will accrue from future work. We do not have detailed data for the years 2000–2007 and 2016. For these years, we estimate the stock of pension liabilities using the three flows that make up the changes in the stock:[2] (i) fiscal data on earnings-related pension expenditures, (ii) estimating pension accrual based on real GDP growth and nominal compensation of employees (taken from Statistics Finland), and (iii) estimating interest expenditure on accrued pension liabilities using the ETK's discount factor and observed inflation.[3]

46.   **The focus on government assets raises various accounting issues.** Several countries include non-financial assets—mainly land, buildings, roads, other network infrastructure—in their balance sheets. But their valuation can be difficult (historical costs, market value or replacement costs) and subject to variation across countries.[4] For Finland, data on financial and non-financial assets are taken from Eurostat; their valuation follows Eurostat's ESA2010 guidelines (Eurostat, 2013). It is also important to bear in mind that speedy liquidation of those assets to reduce general government debt might be difficult, particularly in a crisis situation, and more so if a subnational entity of the government is the owner.[5]

47.   **To complete the public sector balance sheet, we collect data of a sample of the largest non-financial and financial public corporations.** To expand the balance sheet from the general government to the entire public sector, we collect data from annual financial

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[1] See http://www.etk.fi/en/publications/

[2] Total accrued pension liabilities at the end of year t are equal to total pensions accrued in $t-1$ less pensions paid in t, plus new pensions accrued and interest on existing pensions.

[3] The projection is for total pension liabilities. To divide it into public and private pensions, we assume a fixed ratio of private to total pensions of 64.4 percent (as observed in 2008) for the 2000–07 period.

[4] The same applies to a lesser extent also to financial assets.

[5] A separate strand of literature (e.g. Bova et al., 2013) highlights that the analysis of the operations of non-financial assets is important since a change in management of those existing assets could improve the budget balance.

statements (balance sheet, income and cash flow statement). We include only state-owned enterprises (SOEs) that are under control of the central government, as data on local government owned SOEs is not available. We choose to include the biggest nine non-financial SOEs, three financial SOEs, and the Bank of Finland for the years 2000–2016. Coverage is good: The nine non-financial SOEs represent around 90 percent of total assets of the Finnish central government SOEs throughout the sample period.[6] Public corporations that were privatized are excluded from the sample for the years they were not under government control. As for the other SOEs, we collect annual financial account information from the publicly available balance sheets of the Bank of Finland. Table 1 provides an overview of the SOEs in the sample.

48.   **Public corporation and central bank accounts are consolidated with general government accounts.** Consolidated general government accounts are provided from Eurostat. Equity from non-financial SOEs is consolidated with general government accounts given that they are also counted in the latter data. Financial SOEs' accounts are consolidated with general government accounts to the extent we have explicit creditor-debtor information in the corporations' annual financial statements.[7] Accounts of the Bank of Finland were consolidated using creditor-debtor information provided by Statistics Finland.[8]

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[6] The coverage measure is calculated using the State Shareholding and Ownership Steering reports of the Finnish Prime Minister's Office.

[7] Municipality Finance and Finnvera give information on interactions of their accounts with government entities. Only Industry Investment does not report explicitly their engagement with government entities in their balance sheets.

[8] Statistics Finland compiles information on debt and credit positions and flows between local government, central government and the Bank of Finland.

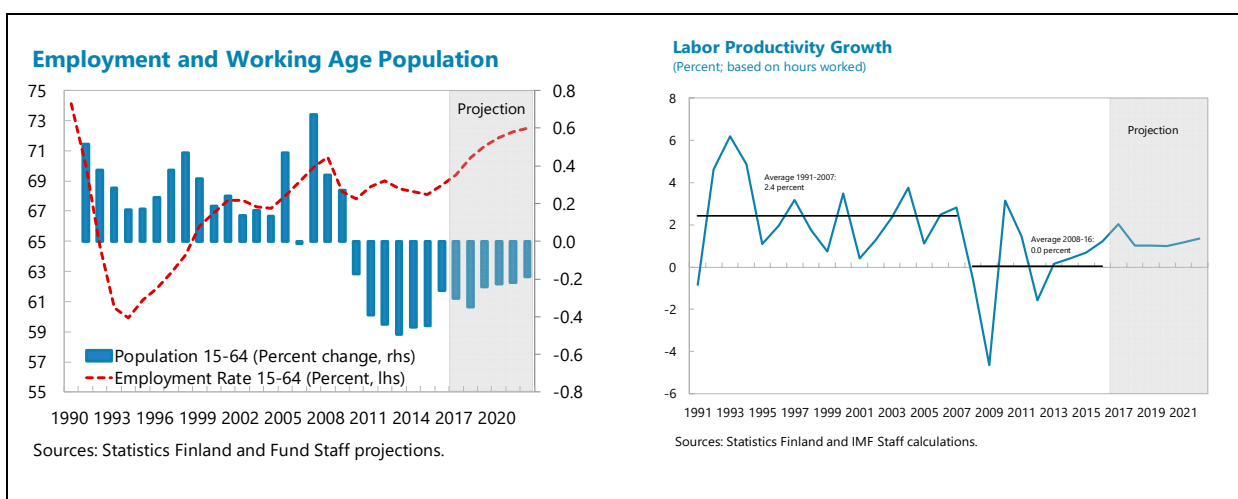| Table I.1. Public Corporations Covered in Finland's Public Sector Balance Sheet			
	Sector	Total assets, 2016 (In EUR millions)	Central government shareholding, 2016
Non-Financial Corporations:			
Fingrid	Electricity transmission grid operator	2,101.8	53.1%
Finnair	Airline	2,528.8	55.8%
Fortum	Electricity and energy	21,964.0	50.8%
Gasum	Transmission system operator of natural gas grid	1,461.5	100%
Kapiteeli	Property management	1,091.4 (in 2005)	0% (sold in 2006)
Kemira	Chemicals	2,043.0 (in 2004)	0% (sold in 2005)
Neste Oil	Oil refinery and marketing	7,444.0	50.1%
Posti (Itella)	Postal service	1,185.5	100%
VR	Railway	2,002.2	100%
Financial Corporations:			
Municipality Finance	Credit institution for municipalities	34,052.2	16% Central Government; 30.7% Social Security Funds; 53.3% Local Governments
Industry Investment TESI	Investment company	561.5 (in 2013)	Is included in general government accounts from 2014 onwards
Finnvera	Export credit agency	9,497.8	100%

Sources: Various years of Financial Statements of abovementioned companies and Central Government Shareholding Reports.

ANNEX II: PROJECTIONS UNDERLYING THE INTERTEMPORAL BALANCE SHEET

Medium-Term Projections (through 2022)

49.   **We construct a baseline forward projection of the PSBS.** We project the public sector balance sheet forward to 2022 (medium-term) using the WEO projections of macro and fiscal variables. Table 3 summarizes the October 2017 WEO projections for key variables. They incorporate the 2 percent of GDP multi-year fiscal consolidation that is currently underway in Finland. Over the medium-term, healthy growth is projected to continue, which would increase employment.

Sources: Statistics Finland and Fund Staff projections.

Sources: Statistics Finland and IMF Staff calculations.

50.   **We make the following assumptions on future asset and liability transactions.**

• **General government.** Given the asset portfolio of the general government we assume that investments in debt securities, loans and equities follow the last 5 years' average, while the stock of currency and deposits is assumed to remain constant relative to GDP. Transactions in other assets are assumed to be zero. Transactions in liabilities are determined as the residual from the projected net lending path less transactions in financial assets.

• **Public corporations.** We assume that the operating balance of public corporations (excluding the central bank) remains at a constant 1 percent fraction of 2016 GDP, while net acquisition of non-financial assets are assumed to grow in line with private sector investment forecasts. The operating balance of the Bank of Finland is held constant at its nominal value in 2016 and BoF net acquisitions of non-financial assets are assumed to be zero. Transactions in financial assets are assumed to be growing with nominal GDP so that transactions in financial liabilities are determined as a residual from public corporations' net lending.

51.   **To set up the complete PSBS, we also need to project valuation changes of public sector assets and liabilities** (Figure II.1). Setting up a baseline scenario of valuation changes allows us to simulate the impact of shocks through valuation changes, e.g., on equity prices. For the general government we proxy valuation changes of non-financial assets with the house price index and assume that valuation changes of financial liabilities are zero.[1] Valuation changes of currency and deposit and other accounts receivable are proxied by the short-term interest rate. Debt securities' valuation varies inversely with the long-term bond yield. Valuation gains and losses of equities and financial derivatives are projected using equity price changes times a historical beta with the Helsinki OMX stock market index of 0.7 (see Figure II.1).[2] Other accounts are assumed to stay constant in nominal value. We project public corporations' balance sheets along the same lines.

Figure II.1. Projections of Medium-Term Valuation Changes (Under Baseline Assumptions)

Valuation changes of general government's equity holdings track those of the equity markets well with a beta of around 0.7.


Valuation of GG equity holdings and OMX index
(Annual percentage changes)

Correlation: 0.96
Historical beta: 0.7

OMX Helsinki 25 index
GG equity holdings
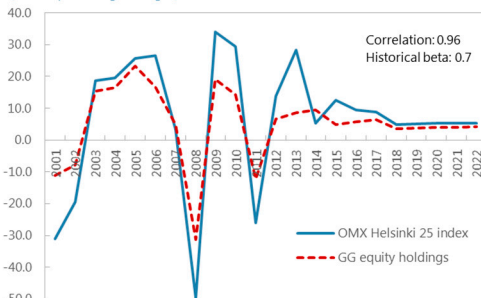
Sources: Eurostat, Statistics Finland, and Fund Staff projections.

Valuation changes of the government's non-financial assets are hard to project, but their importance is much smaller than equities'.
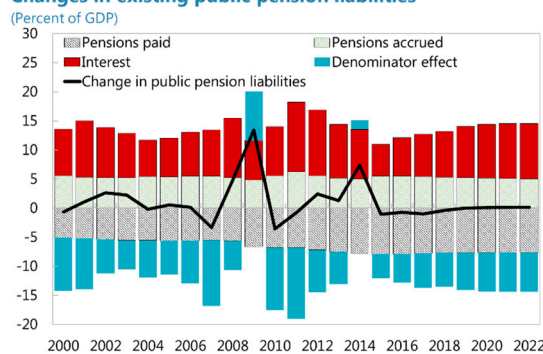

Valuation of GG non-financial assets and house prices
(Annual percentage changes)

Correlation: 0.22

House prices
Valuation of GG NFAs
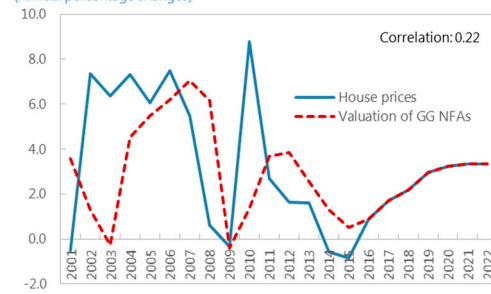
Sources: Eurostat, Statistics Finland, and Fund Staff projections.

Pension liabilities' value relative to GDP is affected by four factors. Their relative value increases during crises as GDP growth cannot offset increases in value of nominal liabilities.

Changes in existing public pension liabilities
(Percent of GDP)

Pensions paid   Pensions accrued
Interest   Denominator effect
Change in public pension liabilities

Sources: ETK Finnish Centre for Pensions and IMF Staff estimates.

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[1] We project house price inflation to be equal to CPI inflation plus 2/3 of real GDP growth. Historically, valuation changes of general government liabilities have been small. This is because the majority of liabilities are debt securities whose values are less prone to vary a lot in the short- to medium-run.

[2] We project that the OMX would yield as much as long-term bond yields (taken from WEO Fall 2017 projections) plus a risk premium of 4 percent.

Table II.1. Key Variables Under Baseline Assumptions						
	2017	2018	2019	2020	2021	2022
(Percent)						
Real GDP growth	2.8	2.3	1.8	1.6	1.5	1.5
Nominal GDP growth	3.4	3.6	3.6	3.6	3.5	3.5
HICP inflation	0.8	1.2	1.7	1.9	2.0	2.0
Employment growth	0.7	1.3	0.8	0.6	0.3	0.1
Unemployment rate	8.7	8.1	7.8	7.5	7.2	7.0
(Percent of GDP)						
Fiscal balance	-1.5	-1.2	-0.9	-0.5	-0.4	-0.3
Primary balance	-0.6	-0.4	-0.1	0.4	0.5	0.6
Revenue	52.7	51.9	51.8	52.0	51.9	51.9
Expenditure	54.3	53.1	52.7	52.4	52.3	52.2
Primary expenditure	53.3	52.3	51.9	51.6	51.4	51.4
Interest expenditure	0.9	0.9	0.8	0.8	0.8	0.9
General government gross debt (Maastricht definition)	63.3	62.6	61.8	60.6	59.5	58.3
PS static net worth	36.4	36.6	37.8	39.9	42.7	45.6
PS static net financial worth	-47.1	-46.2	-45.0	-43.2	-41.1	-38.8
PS static net worth including private pensions	-159.9	-158.4	-156.9	-154.9	-152.5	-149.8
PS static net financial worth including private pensions	-243.4	-241.2	-239.8	-238.0	-236.2	-234.2
Memorandum item:						
Nominal GDP (EUR billions)	223.0	231.1	239.3	247.9	256.6	265.5
Source: IMF Staff projections.						

52.   **For the medium-term projection of the stock pension liabilities, we forecast underlying flows.** We proceed in the same way as for the backward projection earlier. First, we use WEO forecasts of employee compensation and real GDP growth to determine new pension liabilities accrued. Second, for pension expenditure over the next years, we rely on the Finnish authorities' fiscal forecasts. Third, we fix the real discount factor at 3 percent to compute interest on existing pensions that near their payment and augment it by the WEO inflation projection. Taken together, this implies that public pension liabilities as a share GDP are projected to remain stable until 2022.

Long-term projections (beyond 2022)

53.   **We use a growth accounting approach based on population, productivity and the participation rate to construct future revenue and expenditure series up to 2065.** We use working age population projections from Statistics Finland, and fix the labor force participation rate at its 2022 level.[1] We assume annual labor productivity growth of 1.5 percent; this is

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[1] This is a simplification, as the 2017 pension reform (and other policies) would be expected to positively impact participations rates.

below Finland's pre-crisis average during 2000–07 of 2.4 percent, but higher than that observed over the last decade (0 percent). Using these inputs we project real GDP. Nominal GDP results from adding an annual inflation rate of 2 percent. We assume that fiscal revenues remain at the projected 2022 level of 51.9 percent of GDP until 2065. We decompose primary expenditures into pension (for private and public employees), health, and other primary expenditures. Pension and health expenditures as a share of GDP are adjusted using the Finnish Ministry of Finance's (MoF, 2017a) demographic projections of aging costs (Figure II.2). Given these long-run projections, we calculate present values of future revenues and expenditures using a 5 percent discount rate. This is in line with 2 percent annual inflation over the long term and the current 3 percent real discount factor assumed by the ETK Finnish Centre for Pensions for their pension projections through 2026.[2]

Figure II.2. Long-term Projections (Under Baseline Assumptions)

Aging pressures are intense until the early 2030s, but then slow the early 2050s ...

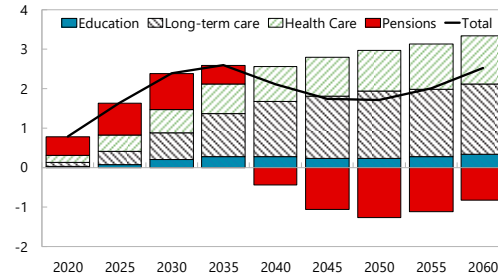**Population by age group**
(Index, 2015=100)
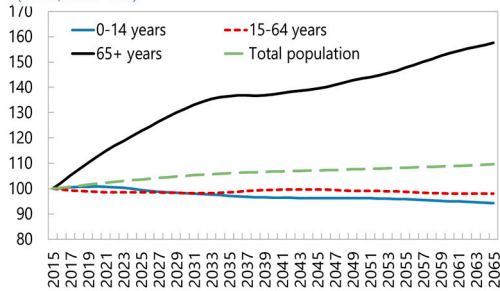
Sources: Statistics Finland Population Projections.

... implying that aging imposes a wave pattern on primary expenditure pressures.

Change in age-related expenditure
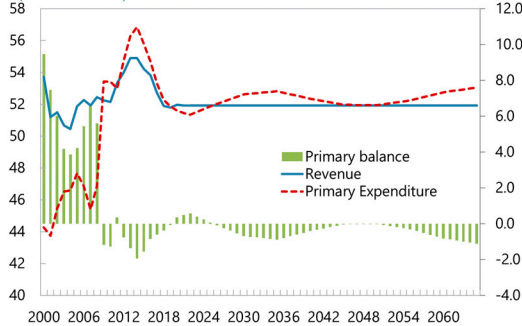(Relative to 2015; in percent of GDP)

Sources: Finnish Ministry of Finance (2017a) based on the model by the Ministry of Social Affairs and Health.

Ongoing fiscal consolidation until the early 2020s would offset initial aging effects.

Main fiscal variables
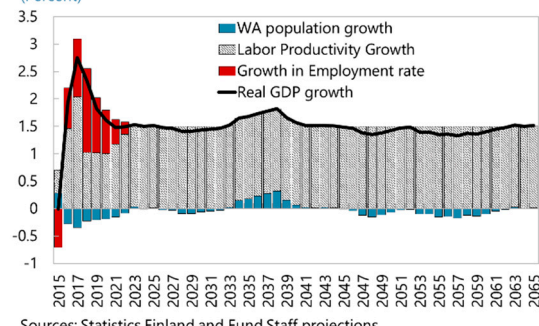(Percent of GDP)

Sources: Statistics Finland and Fund Staff projections.

A stable working age population implies productivity needs to drive GDP growth.

Long-run real GDP growth assumptions
(Percent)

Sources: Statistics Finland and Fund Staff projections.

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[2] From 2027 onwards, ETK assumes a 3.5 percent discount factor.

ANNEX III: CALIBRATION OF THE STRESS TEST

54.   **We calibrate a stress scenario, somewhat similar but slightly less severe than the global financial crisis, that hits in 2018.** In designing the stress scenario, we design a path for macro variables that mirrors the average of the last three major downturns experienced by Finland: the early 1990s Nordic banking crisis, the 2008–09 GFC, and the second dip of the double dip recession in 2012–14 following the European debt crisis. In line with this, we assume that real GDP would drop by 5.2 percent in 2018 and an additional 0.7 percent in 2019 (Table III.1). Relative to a longer-term potential growth rate of 1.5 percent, this stress scenario implies lost growth of 10 percent. Overall, our stress scenario is thus similar but somewhat less severe than the GFC. In terms of the labor market response, we assume that unemployment will peak at around 12 percent in 2019–20, from the current level of slightly below 9 percent. Compared to the two most recent downturns, this implies less labor retention by firms. However, the labor market response would still be muted compared with that in the aftermath of the Nordic banking crisis.

Table III.1. Key Variables Under Stress Assumptions (Excluding Contingent Liability Shocks)

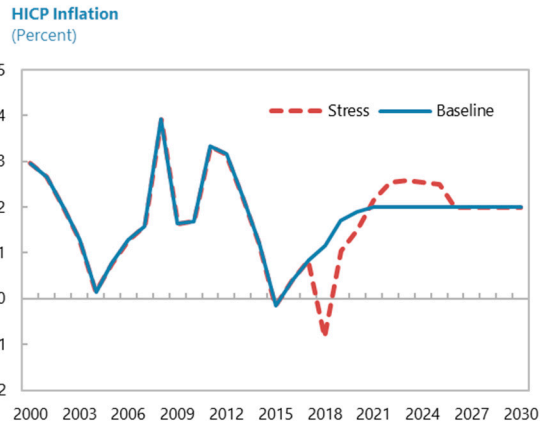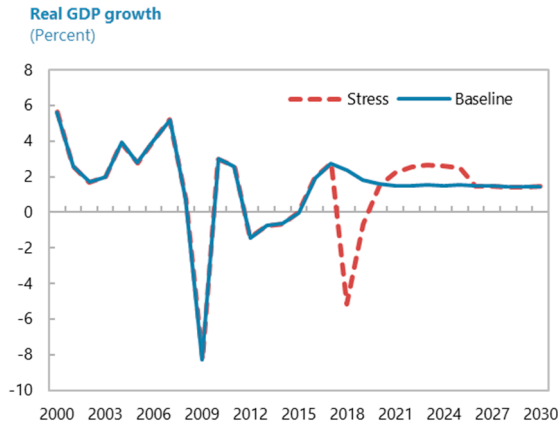|	2017	2018	2019	2020	2021	2022
		(Percent)				
Real GDP growth	2.8	-5.2	-0.7	1.5	2.2	2.6
Nominal GDP growth	3.4	-6.0	0.4	3.0	4.4	5.2
HICP inflation	0.8	-0.8	1.0	1.5	2.2	2.5
Employment growth	0.7	-2.1	-0.6	0.5	1.0	1.2
Unemployment rate	8.7	11.1	11.9	11.9	10.9	10.0
		(Percent of GDP)				
Fiscal balance	-1.5	-5.6	-7.2	-6.8	-5.5	-4.2
Primary balance	-0.6	-4.7	-6.0	-5.4	-3.9	-2.4
Revenue	52.7	52.1	52.4	52.5	52.6	52.5
Primary expenditure	53.3	56.7	58.4	57.9	56.5	54.9
Interest expenditure	0.9	1.0	1.2	1.4	1.6	1.7
General government gross debt (Maastricht definition)	63.3	73.2	80.7	85.6	88.2	88.5
PS static net worth	36.4	-5.7	-8.4	-3.3	3.2	8.9
PS static net financial worth	-47.1	-74.3	-74.8	-69.0	-63.3	-59.6
PS static net worth including private pensions	-159.9	-196.1	-197.1	-191.0	-185.0	-180.4
PS static net financial worth including private pensions	-243.4	-264.8	-263.4	-256.7	-251.5	-249.0
Memorandum item:						
Nominal GDP (EUR billions)	223.0	209.7	210.5	216.8	226.4	238.1

Source: IMF Staff projections.
Note: Table II.1 in Annex II provides the analog baseline projections.

55.   **With firms retaining some labor, output falls more than employment in the stress scenario; this results in an increase in the fiscal revenue ratio.** In comparison to the baseline October 2017 WEO projections, both growth and inflation dip, but then rebound above baseline as the economy recovers and employment and unemployment converge toward the baseline by the mid-2020s (Figure III.1). Due to labor retention, the drops in employment and in labor compensation are more muted than that in GDP. This has important implications for fiscal revenues; while falling in nominal euro terms, they are projected to rise in proportion to GDP in the stress scenario.

## Figure III.1. Calibrating the Stress Test: Macroeconomic Variables

Real GDP is assumed to fall by 5.8 and 1 percent in 2018 and 2019, before surpassing the baseline as labor is reabsorbed.

Real GDP growth
(Percent)

Sources: Statistics Finland, IMF World Economic Outlook, and IMF Staff estimates

Inflation displays a similar path.

**HICP Inflation**
(Percent)

Sources: Statistics Finland, IMF World Economic Outlook, and IMF Staff estimates

Employment falls by 2.1 and 0.6 percent in 2018 and 2019, before recovering back to baseline.

Employment
(Millions of Persons)

Sources: Statistics Finland, IMF World Economic Outlook, and IMF Staff estimates

Unemployment peaks at 12 percent before returning back to the baseline.
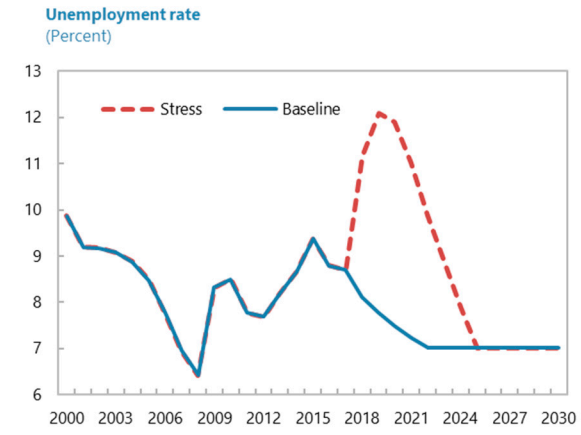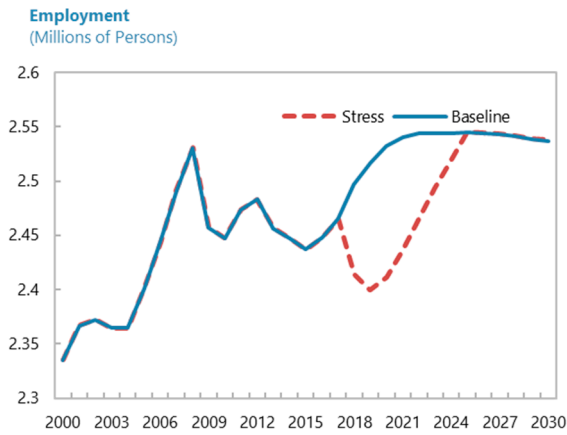
Unemployment rate
(Percent)

Sources: Statistics Finland, IMF World Economic Outlook, and IMF Staff estimates

Real GDP falls by close to 6 percent between 2017 and 2019…

Real GDP
(Billions of 2010 constant Euros)

Sources: Statistics Finland, IMF World Economic Outlook, and IMF Staff estimates

… while labor compensation drops by only 3.3 percent as firms retain some labor.
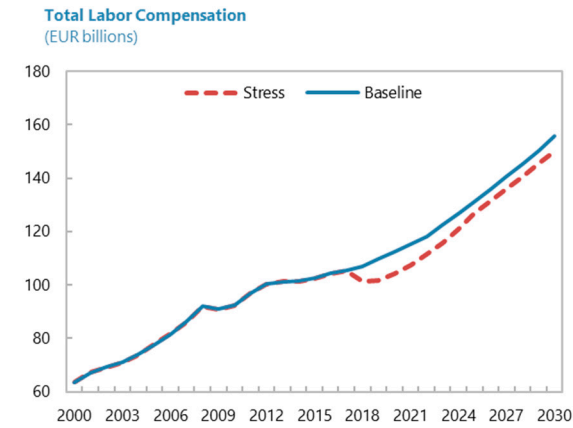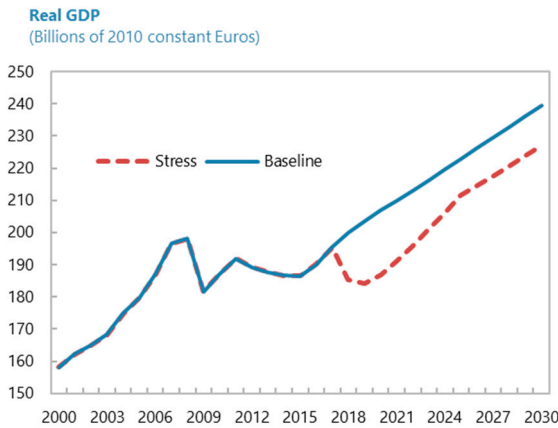
**Total Labor Compensation**
(EUR billions)

Sources: Statistics Finland, IMF World Economic Outlook, and IMF Staff estimates

56.   **Asset prices are also adversely affected in the stress scenario** (Figure III.2). We assume that house prices fall by 15 percent relative to the baseline in 2018 followed by a slow recovery. This is broadly in line with experiences of countries suffering housing price collapses after the global financial crisis. Again in line with the GFC experience, we assume for equity prices a drop of 40 percent relative to the baseline in 2018 and a comparatively quick recovery compared to that of housing prices. Together with our baseline for changes in asset prices, this allows us to also include the impact of valuation changes on the public sector balance sheet during a crisis.

Figure III.2. Calibrating the Stress Test: Valuation Changes and Contingent Liability Shock

Equity prices are assumed to drop by 40 percent in 2018, but recover quickly anticipating the economy's return to baseline.

Nominal equity prices
(Index)
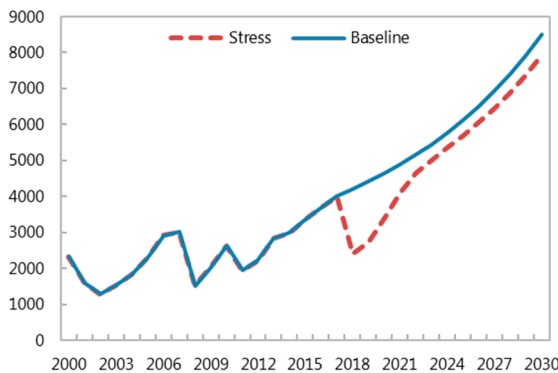
Sources: Statistics Finland, IMF World Economic Outlook, and IMF Staff estimate

Nominal growth of pension liabilities is attenuated by lower activity, but they increase relative to GDP.

Changes in total existing pension liabilities by components
(Percent of GDP)
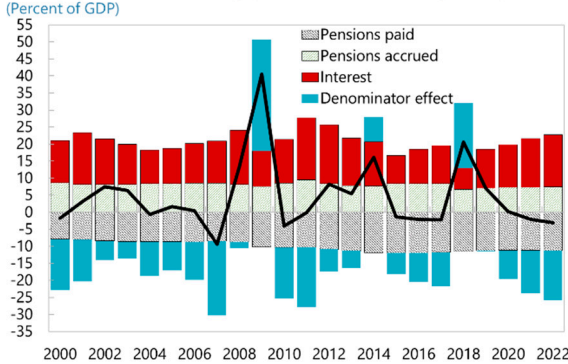
Sources: ETK Finnish Centre for Pensions and IMF Staff estimates.

Recovery of housing prices from their assumed 15 percent drop in 2018 is slower.

Nominal housing prices
(Index, 2000=100)
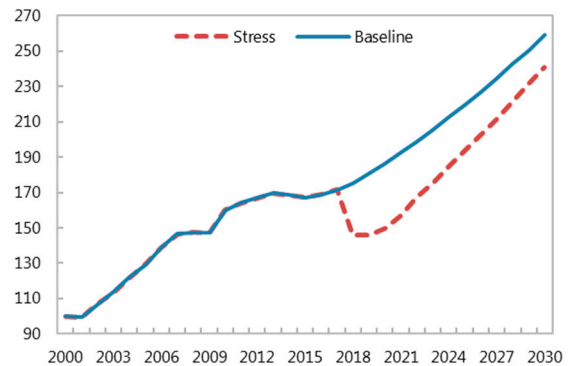
Sources: Statistics Finland, IMF World Economic Outlook, and IMF Staff estimate

Contingent liability shocks are likely to be relatively small compared to macroeconomic impacts of a severe shock.

Stress Scenario: Size of Contingent Liability Shocks
(Percent of 2016 GDP)
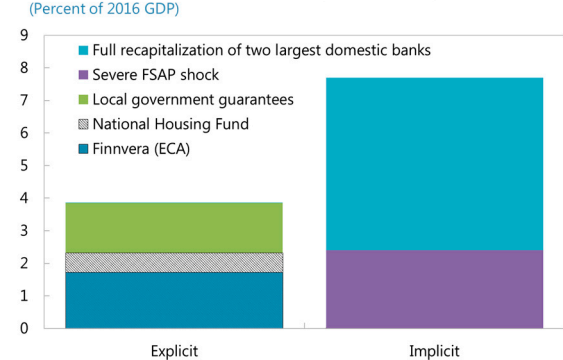
Sources: IMF Staff.

57.   **We further consider two types of contingent liability realizations in the stress scenario.**

- **Explicit contingent liabilities.** These consist mainly of government guarantees to local governments, the national housing fund, and the export credit agency Finnvera.

At more than 28 percent of GDP in 2015, the stock of such guarantees is high in Finland relative to peers, even though the guarantees are relatively well provisioned (Box 1). We assume that 15 percent of these exposures will transform into explicit government liabilities in the crisis scenario.[1]

- **Implicit contingent liabilities.** These relate mainly to risks emanating from the banking sector. In a crisis, the government may see itself forced to (partly) backstop the banks, despite considerable safeguards being introduced after the GFC. We first consider a severe FSAP stress scenario, which is a shock equivalent in size to the GFC (IMF, 2016). The impact of such a shock is estimated to a rather limited 2¼ percent of GDP, thanks to high capitalization of Finnish banks.[2] We also set out an extreme tail risk scenario under which the two largest domestic financial institutions (OP Financial and Municipality Finance) would need to be recapitalized in an amount equivalent to their equity position at the end of 2016.

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[1] Our own calculations for the stress test show that if the three top customers were to fail and Finnvera could only recover 30 percent of its exposure, the remaining contingent liability to be covered by the government would only be slightly higher than 1 percent of GDP (and this assumes that the government would preserve half of Finnvera's current reserve funds as a buffer for future shocks).

[2] The FSAP estimates that in such a scenario, two banks' capital would fall below the CET1 requirement of 4.5 percent, by 0.2 percent of GDP. Four banks' leverage ratio would fall below the 3 percent hurdle ratio, by an amount of 2 percent of GDP.

Box 1. Government Guarantees

Finland's general government guarantee-to-GDP ratio is the highest of all EU countries and has been rising rapidly in recent years. According to the harmonized definition used by Eurostat, it stood at 28.3 percent of GDP in 2015.

The rapid rise in recent years is largely driven by a government commitment to keep up with competitor countries with regards to availability of export credit and export guarantees. Such credit is provided by Finland's export credit agency Finnvera. It has expanded by 55 percent from 2013 to 2016 and accounts now for 9½ percent of GDP, although only a part of the resources have already been drawn (and further repayments will come in before all committed funds will be disbursed). The high stock of guarantees is caused by certain industries in Finland—chiefly shipbuilding—being very working capital intensive and the final export product value is high and deliveries lumpy.

Finnvera's reserves seem to be adequate to cover losses, but continued monitoring and risk management are important, as exposures are concentrated. Finnvera's top 1, 3, and 10 clients make up 10, 24, and 41 percent of its lending portfolio (Finnish Ministry of Finance, 2017b). Risks are partly mitigated due to three reasons. First, 70 percent of its guarantees being related to export credit, which are backed by the export merchandise as collateral. Second, Finnvera purchases reinsurance to limit counterparty risk. Third, there are dedicated reserves of 0.6 percent of GDP to cover losses, which be sufficient to cover losses in 99 percent of possible scenarios, as Value at Risk calculations by Finnvera suggest.

Non-export related guarantees consist mainly of those for the National Housing Fund and local government guarantees.

- Guarantees to the National Housing Fund stood at 6 percent of GDP in 2016 and mainly underpin interest-subsidized loans for housing corporations. The increase in such guarantees since 2008 has been mainly driven by a switchover in the housing loan system from direct loans to subsidizing and guaranteeing loans given by private banks (Finnish Ministry of Finance, 2017b). The Housing Fund is well capitalized, given that repayments of heritage loans accrue to its liquid reserves, which amount to around 0.5 percent of GDP and should grow to about 1 percent of GDP by 2020. It also generates income by charging fees for all guarantees other than those related to social housing.

- Local government guarantees mainly support borrowing by local public corporations. They stood at 10½ percent of GDP in 2015 and have been increasing relatively gradually in recent years.

Government Guarantees, 2015 (Percent of GDP). Source: Eurostat.
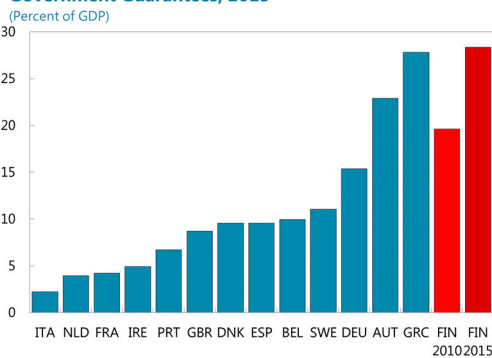
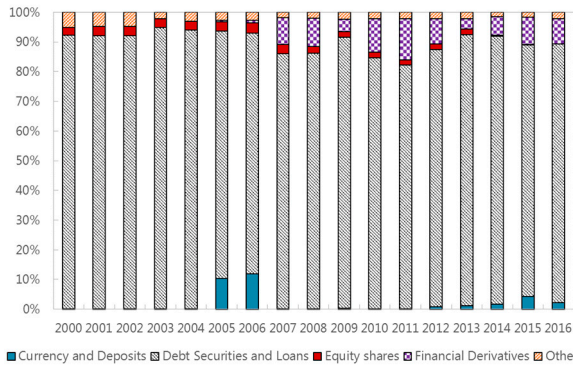Central government guarantees by type, 2005-16 (Euro billions). Source: Finnish Ministry of Finance (2017b).

ANNEX IV: SUPPLEMENTARY FIGURES AND TABLES

Figure IV.1. Financial Asset Composition of Financial and Non-Financial SOEs, 2000– 2016
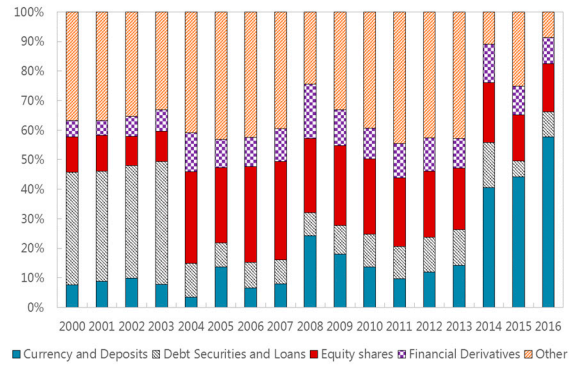
Sources: SOEs' Annual Reports and IMF Staff calculations.

Figure IV.2. Finland: Public Sector Net Worth Evolution 2000–2007

Net worth increased considerably during 2000-07 driven by both fiscal surpluses and positive valuation changes.

Overall evolution of net worth
(percent of GDP)

Sources: Finnish authorities and IMF Staff calculations.
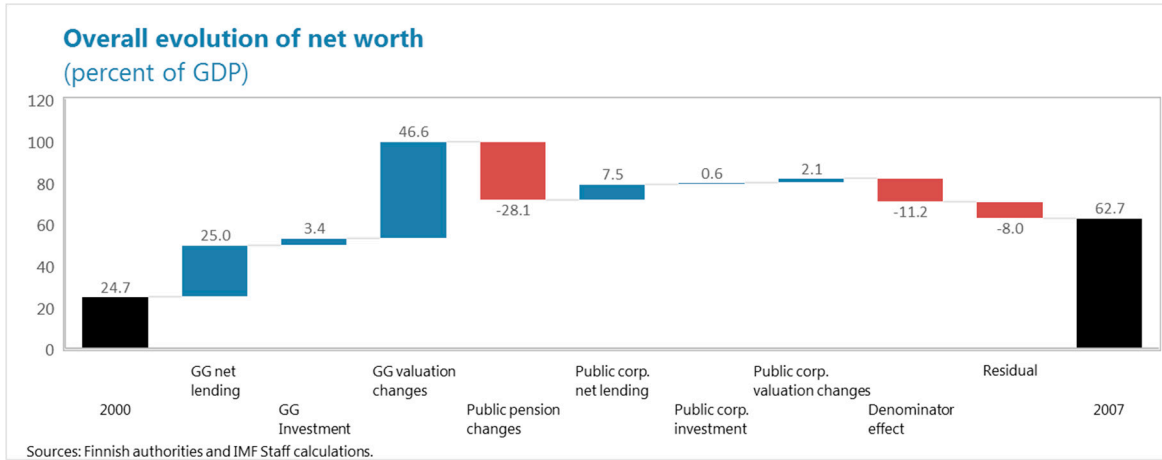
Fiscal surpluses allowed asset accumulation by general government.

Detail of net lending
(percent of GDP)

Sources: Finnish authorities and IMF Staff calculations.
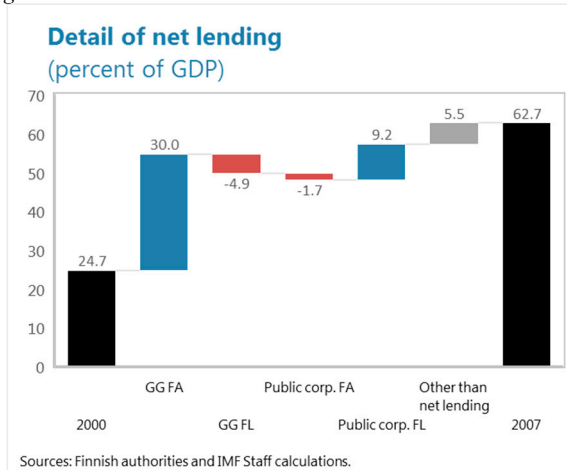
Positive valuation changes centered on general government non-financial and financial assets, …

Detail of valuation changes
(percent of GDP)

Sources: Finnish authorities and IMF Staff calculations.
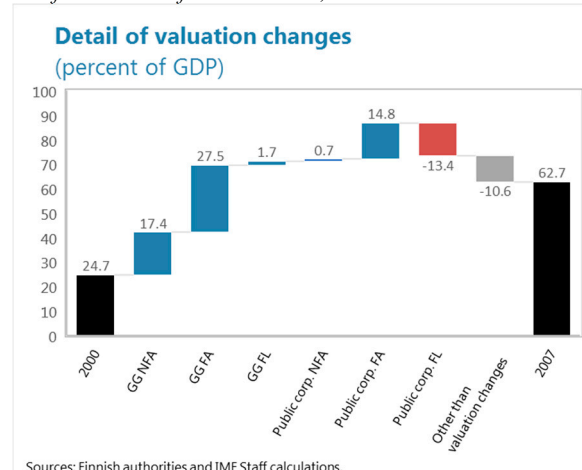
…with positive equity valuations driving the latter.

Detail of GG FA valuation changes
(percent of GDP)

Sources: Finnish authorities and IMF Staff calculations.
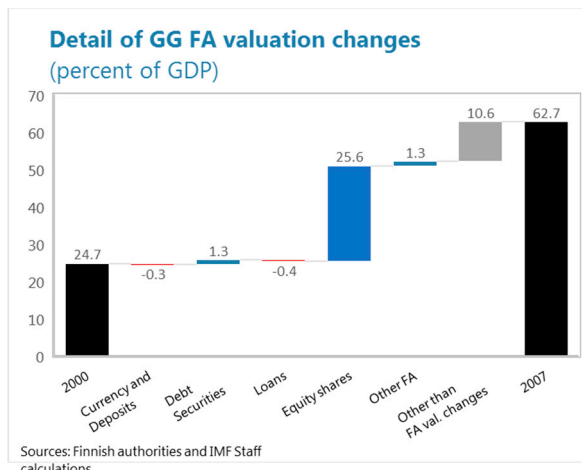
Pension liabilities increased considerably, given relatively high interest rates during the pre-crisis period.
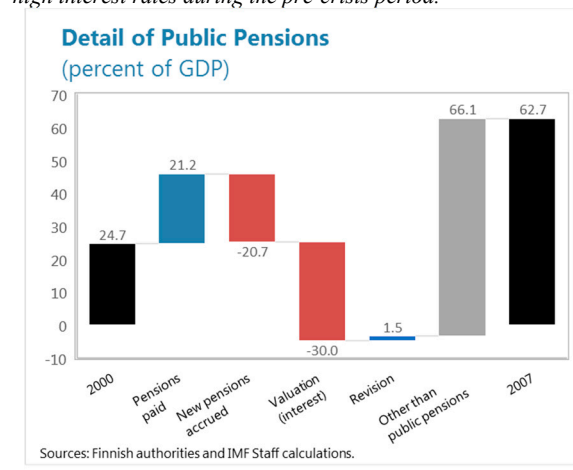
Detail of Public Pensions
(percent of GDP)

Sources: Finnish authorities and IMF Staff calculations.

Notes: GG= General Government; NFA=Non-financial Assets; FA = Financial Assets; FL = Financial Liabilities.

Figure IV.3. Finland: Public Sector Net Worth Evolution 2007–2008

During the initial year of the global financial crisis, negative valuation changes were the main driver of lowering net worth by some 20 percentage points.

Overall evolution of net worth (percent of GDP)

Sources: Finnish authorities and IMF Staff calculations.
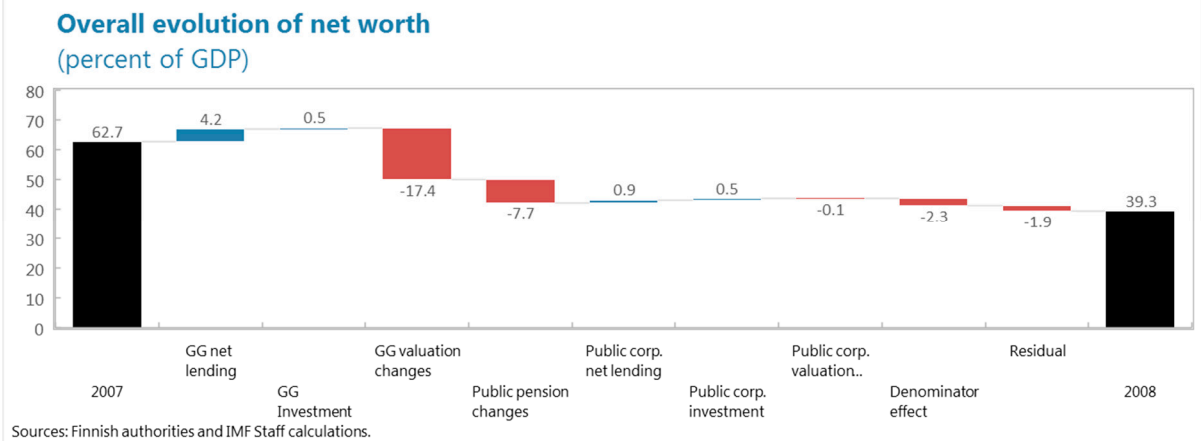
Meanwhile, the fiscal balance was still positive in 2008, given large fiscal surpluses before the global financial crisis.

Detail of net lending (percent of GDP)

Sources: Finnish authorities and IMF Staff calculations.

Valuation losses were driven by the general government's financial assets, …

Detail of valuation changes (percent of GDP)

Sources: Finnish authorities and IMF Staff calculations.
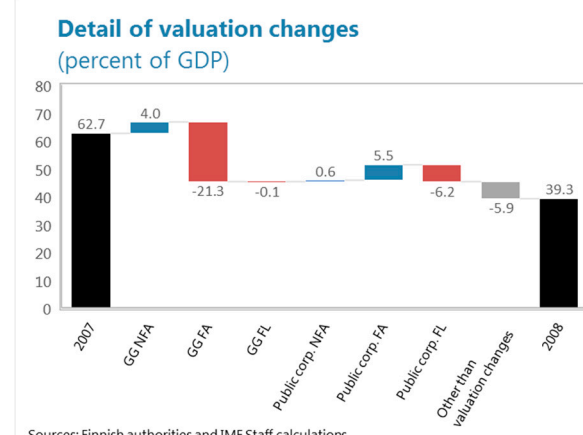
… mainly the social security funds' investments in equities.

Detail of GG FA valuation changes (percent of GDP)

Sources: Finnish authorities and IMF Staff calculations.
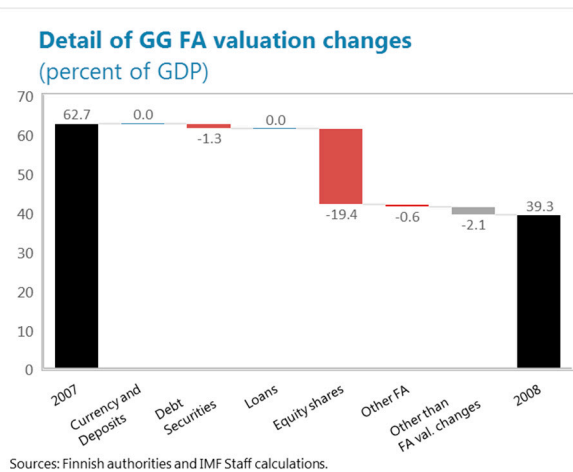
Public pension liabilities continued to steadily in nominal terms, thereby increasing considerably relative to GDP.
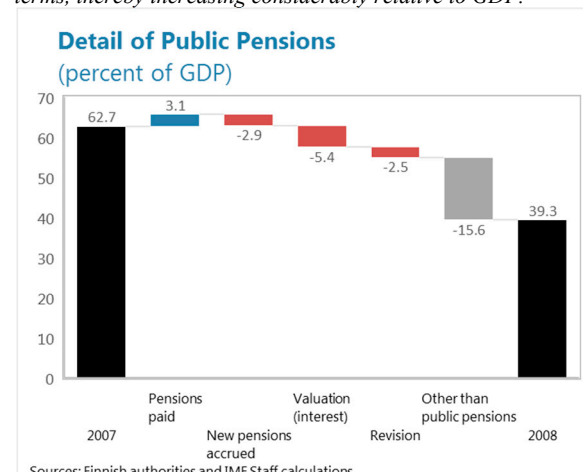
Detail of Public Pensions (percent of GDP)

Sources: Finnish authorities and IMF Staff calculations.

Notes: GG= General Government; NFA=Non-financial Assets; FA = Financial Assets; FL = Financial Liabilities.

Figure IV.4. Finland: Public Sector Net Worth Evolution 2008–16

Despite persistent moderate fiscal deficits in the post-GFC period, net worth remained quite stable in light of large valuation gains.

Overall evolution of net worth
(percent of GDP)

Sources: Finnish authorities and IMF Staff calculations.
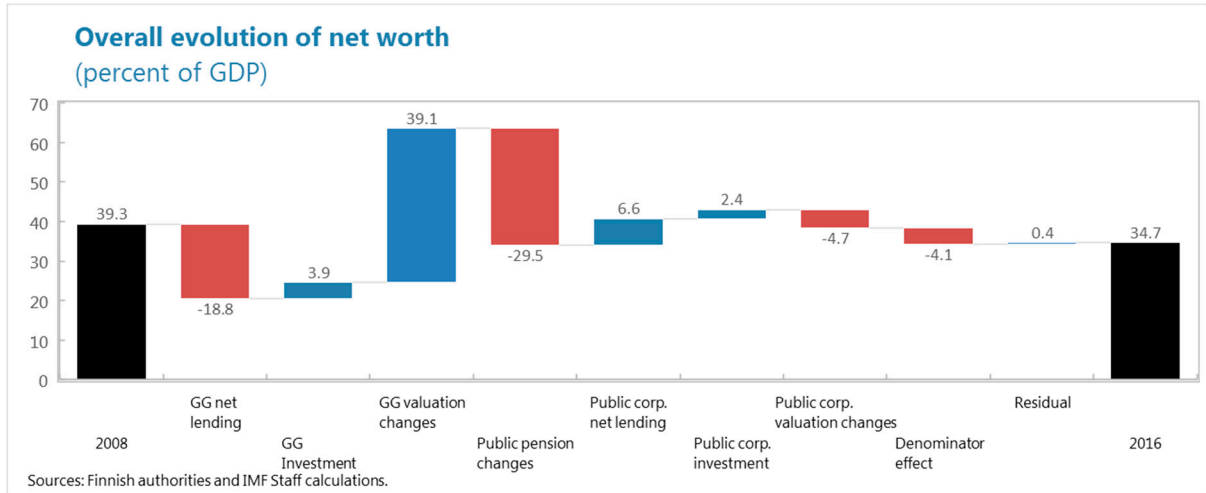
Social security funds continued to accumulate assets, offsetting increases in debt by central and local government.

Detail of net lending
(percent of GDP)

Sources: Finnish authorities and IMF Staff calculations.

The value of general governments' financial assets increased …

Detail of valuation changes
(percent of GDP)

Sources: Finnish authorities and IMF Staff calculations.
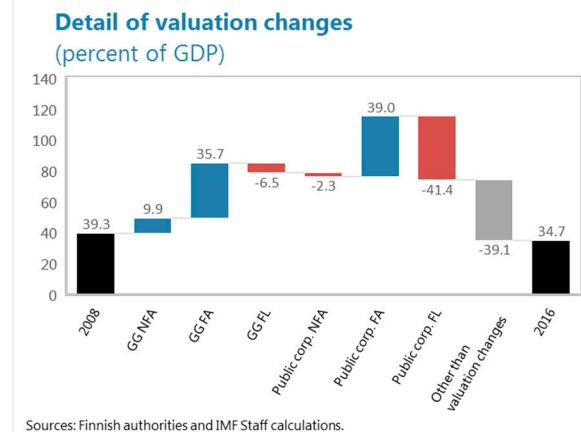
… as equity valuations recovered after the GFC.

Detail of GG FA valuation changes
(percent of GDP)

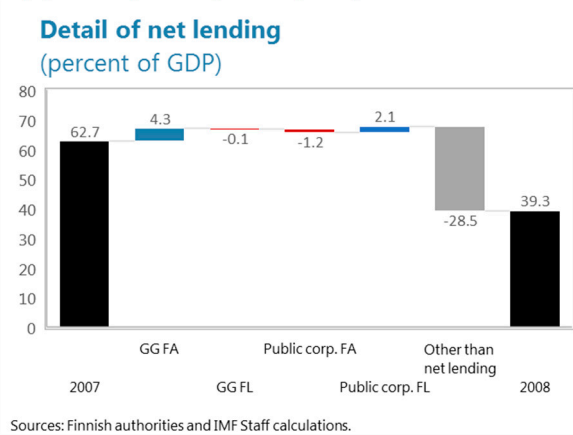Sources: Finnish authorities and IMF Staff calculations.
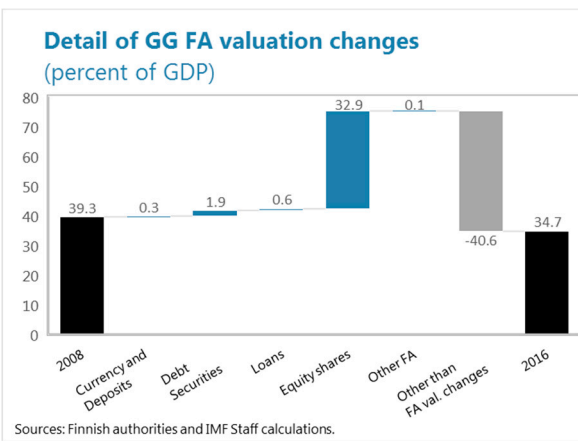
Public pension liabilities increased quite strongly, as lower interest rates contributed to raise their present value.
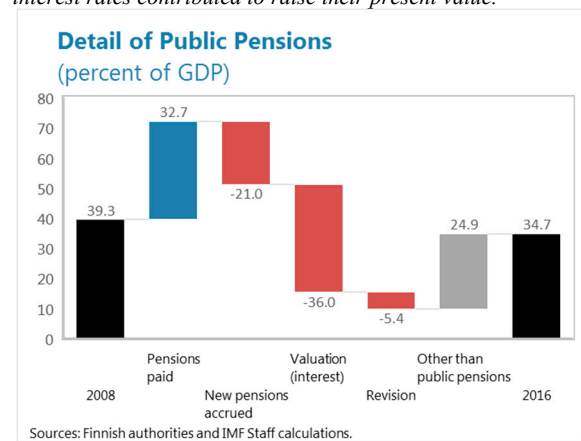
Detail of Public Pensions
(percent of GDP)

Sources: Finnish authorities and IMF Staff calculations.

Notes: GG= General Government; NFA=Non-financial Assets; FA = Financial Assets; FL = Financial Liabilities.

Table IV.1. Finland's Historic Public Sector Balance Sheets 2000–16
(Percent of GDP)

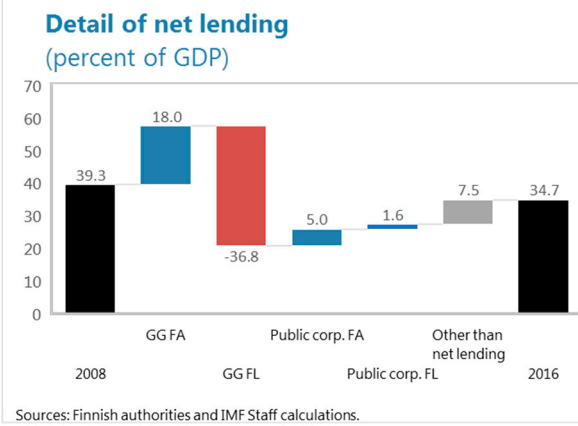|		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
A (=B+D-F)	**Static Public Sector Net Worth**	**-114.6**	**-117.7**	**-125.6**	**-126.4**	**-116.5**	**-103.4**	**-94.5**	**-82.3**	**-114.3**	**-138.7**	**-133.2**	**-146.4**	**-151.6**	**-152.1**	**-166.1**	**-163.6**	**-163.1**
B	**General Government**	**96.4**	**95.6**	**95.1**	**100.7**	**109.3**	**122.2**	**133.7**	**136.7**	**118.9**	**133.8**	**134.8**	**121.3**	**124.2**	**129.0**	**130.6**	**129.9**	**128.4**
	Assets	147.3	143.9	143.1	150.2	158.9	168.7	177.6	176.7	157.7	183.3	190.8	178.4	188.0	193.5	202.0	204.0	203.4
C	Nonfinancial	66.3	65.2	64.9	63.9	64.6	66.2	67.2	66.9	68.9	74.1	73.1	72.5	74.8	75.9	76.7	76.0	74.9
	Financial	81.0	78.7	78.3	86.3	94.3	102.5	110.5	109.8	88.8	109.2	117.7	105.9	113.3	117.5	125.3	128.0	128.5
	Liabilities	50.9	48.2	48.0	49.5	49.6	46.4	43.9	40.1	38.8	49.5	55.9	57.1	63.8	64.5	71.4	74.1	75.0
D	**Public Corporations and Central Bank**	**5.1**	**5.8**	**5.9**	**5.9**	**6.6**	**8.4**	**6.3**	**6.1**	**5.3**	**6.5**	**6.9**	**7.1**	**7.3**	**7.4**	**7.9**	**9.7**	**9.6**
	Assets	30.1	29.4	34.2	32.7	32.7	32.6	32.9	34.8	38.9	44.9	56.6	83.2	81.3	61.6	56.3	74.0	75.1
E	Nonfinancial	12.5	12.1	13.5	12.4	12.1	10.9	11.0	10.3	10.9	12.6	13.5	13.3	13.7	12.7	10.5	9.0	9.7
	Financial	17.6	17.3	20.7	20.2	20.6	21.7	21.9	24.5	28.0	32.3	43.2	69.9	67.6	48.9	45.8	65.1	65.3
	Liabilities	25.0	23.6	28.3	26.8	26.1	24.1	26.6	28.7	33.6	38.4	49.8	76.1	74.0	54.2	48.4	64.4	65.4
F	**Existing Pension Liabilities**	**216.1**	**219.1**	**226.6**	**233.0**	**232.4**	**234.0**	**234.4**	**225.0**	**238.5**	**279.0**	**274.9**	**274.8**	**283.1**	**288.5**	**304.6**	**303.2**	**301.1**
	Existing Public Pension Liabilities	76.8	77.9	80.6	82.9	82.6	83.2	83.4	80.0	84.8	98.3	94.7	93.9	96.4	97.7	105.1	104.1	103.3
	Existing Private Pension Liabilities	139.2	141.2	146.0	150.1	149.7	150.8	151.1	145.0	153.7	180.7	180.2	180.9	186.7	190.8	199.5	199.1	197.8
G (=H-I-J-K)	**Intertemporal Component (under Baseline assumptions)**	**229.9**	**225.3**	**226.9**	**229.2**	**224.7**	**222.0**	**217.0**	**201.6**	**209.2**	**247.2**	**244.0**	**243.6**	**251.5**	**257.3**	**274.1**	**273.3**	**271.5**
H	PV of Revenues	2662.6	2586.3	2593.6	2613.6	2574.3	2553.9	2501.5	2378.0	2352.6	2591.1	2580.2	2521.4	2554.7	2580.8	2626.8	2649.8	2650.7
I	Future Pension Liabilities	591.6	569.4	567.8	570.7	562.4	558.1	545.4	520.7	503.8	541.0	543.7	527.9	532.6	537.5	537.5	547.4	550.9
	Future Public Pension Liabilities	205.5	197.5	196.6	197.3	194.2	192.3	187.6	178.9	172.6	185.7	188.4	183.4	185.0	186.8	184.5	188.0	188.8
	Future Private Pension Liabilities	386.1	371.9	371.2	373.4	368.3	365.8	357.8	341.9	331.2	355.3	355.3	344.6	347.7	350.7	353.0	359.4	362.1
J	PV of Health Expenditure	498.6	488.1	493.0	500.0	495.5	494.8	488.0	467.4	465.8	515.4	515.8	506.9	516.2	524.3	536.5	545.1	549.1
K	PV of Non-Pension, Non-Health Primary Expenditure	1342.5	1303.5	1305.9	1313.7	1291.6	1278.9	1251.1	1188.3	1173.9	1287.5	1276.7	1243.1	1254.4	1261.8	1278.7	1284.0	1279.1
L (=A+G-C-E)	**Intertemporal Financial Net Worth, IFNW (under Baseline)**	**36.5**	**30.4**	**22.9**	**26.4**	**31.6**	**41.6**	**44.4**	**42.1**	**15.0**	**21.8**	**24.2**	**11.3**	**11.5**	**16.5**	**20.7**	**24.8**	**23.9**
	Memorandum items:																	
	PV of Primary balance	10.9	3.4	-2.6	-6.8	-10.7	-15.0	-20.5	-26.4	-32.3	-35.1	-34.4	-34.7	-35.1	-34.9	-34.2	-33.7	-33.6
	PV of Primary Expenditure	2633.1	2564.5	2577.3	2601.1	2565.5	2549.3	2502.3	2385.4	2365.6	2604.5	2592.6	2534.1	2567.1	2592.2	2636.6	2658.4	2658.5
	Nominal GDP (Euro billions)	136.3	144.4	148.3	151.6	158.5	164.4	172.6	186.6	193.7	181.0	187.1	196.9	199.8	203.3	205.5	209.6	215.6

Source: Authors' calculations and projections.

Annex Table IV.2. Projections of Finland's Public Sector Balance Sheets 2017–22
(Percent of GDP)

		Baseline Scenario						Stress Scenario					
		2017	2018	2019	2020	2021	2022	2017	2018	2019	2020	2021	2022
A (=B+D-F)	**Static Public Sector Net Worth**	**-159.3**	**-157.5**	**-155.9**	**-154.0**	**-151.7**	**-149.4**	**-159.9**	**-216.1**	**-224.2**	**-218.6**	**-210.0**	**-201.7**
B	**General Government**	**129.1**	**128.0**	**128.3**	**129.4**	**131.2**	**133.1**	**128.5**	**93.5**	**91.9**	**96.9**	**102.3**	**106.2**
	Assets	203.0	200.9	200.0	199.7	200.1	200.7	202.9	178.0	183.6	193.2	200.7	204.5
C	Nonfinancial	73.8	73.1	73.1	73.3	73.8	74.3	73.7	66.6	66.3	65.8	65.8	66.5
	Financial	129.2	127.8	126.9	126.4	126.3	126.4	129.2	111.3	117.3	127.4	134.9	138.0
	Liabilities	73.8	72.9	71.8	70.3	69.0	67.6	74.4	84.5	91.7	96.3	98.3	98.3
D	**Public Corporations and Central Bank**	**10.5**	**11.4**	**12.4**	**13.4**	**14.4**	**15.4**	**10.5**	**9.9**	**10.5**	**11.3**	**12.4**	**13.6**
	Assets	74.9	73.6	72.7	72.0	71.5	71.1	74.9	64.9	67.5	72.0	75.3	76.5
E	Nonfinancial	9.7	9.8	10.0	10.2	10.4	10.6	9.7	9.0	9.2	9.4	9.6	10.0
	Financial	65.1	63.8	62.7	61.8	61.1	60.5	65.1	55.9	58.3	62.7	65.7	66.5
	Liabilities	64.4	62.2	60.3	58.6	57.1	55.7	64.4	55.0	57.0	60.7	62.9	62.8
F	**Existing Pension Liabilities**	**298.9**	**296.9**	**296.5**	**296.7**	**297.3**	**297.9**	**298.9**	**319.5**	**326.5**	**326.7**	**324.7**	**321.5**
	Existing Public Pension Liabilities	102.6	101.9	101.8	101.8	102.0	102.3	102.6	109.7	112.1	112.1	111.4	110.4
	Existing Private Pension Liabilities	196.3	195.0	194.8	194.9	195.2	195.7	196.3	209.8	214.5	214.6	213.2	211.2
G (=H-I-J-K)	**Intertemporal Component**	**269.5**	**267.5**	**266.8**	**266.1**	**265.6**	**265.0**	**188.4**	**200.8**	**208.4**	**211.6**	**212.9**	**212.3**
H	PV of Revenues	2638.5	2621.7	2606.1	2589.9	2575.3	2560.7	2467.8	2703.1	2775.6	2776.5	2739.0	2682.4
I	Future Pension Liabilities	550.3	548.0	544.5	540.4	536.4	532.5	552.5	614.1	633.1	634.2	624.5	609.4
	Future Public Pension Liabilities	188.1	186.9	185.3	183.4	181.6	179.9	188.8	209.4	215.4	215.3	211.5	205.9
	Future Private Pension Liabilities	362.2	361.1	359.2	357.0	354.8	352.7	363.7	404.7	417.7	418.9	413.0	403.5
J	PV of Health Expenditure	550.2	550.1	550.2	550.2	550.5	550.7	503.6	554.9	573.0	576.5	572.0	563.4
K	PV of Non-Pension, Non-Health Primary Expenditure	1268.5	1256.1	1244.5	1233.2	1222.7	1212.5	1223.3	1333.4	1361.1	1354.2	1329.6	1297.2
L (=A+G-C-E)	**Intertemporal Financial Net Worth(under Baseline)**	**26.6**	**27.0**	**27.8**	**28.7**	**29.7**	**30.7**	**-55.0**	**-91.0**	**-91.3**	**-82.1**	**-72.5**	**-65.8**
	Memorandum items:												
	PV of Primary balance	-34.2	-34.4	-34.9	-35.7	-36.6	-37.6	-110.5	-118.7	-118.2	-115.1	-111.8	-109.2
	PV of Primary Expenditure	2645.8	2628.6	2613.1	2597.6	2583.8	2570.4	2578.3	2821.9	2893.7	2891.6	2850.8	2791.6
	Nominal GDP (Euro billions)	223.0	231.1	239.3	247.9	256.6	265.5	223.0	209.7	210.5	216.8	226.4	238.1

Source: Authors' calculations and projections.