



FINLAND

SELECTED ISSUES

November 2016

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November 4, 2016

Approved By
European Department

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A SECTORAL BALANCE SHEET ANALYSIS OF FINLAND¹

Debt levels have climbed considerably in Finland in recent years, raising concerns about the extent to which financial vulnerabilities have grown in different sectors. This chapter looks at financial balance sheets for the main sectors of the economy to assess their financial vulnerabilities and highlights policy options to contain the risks.

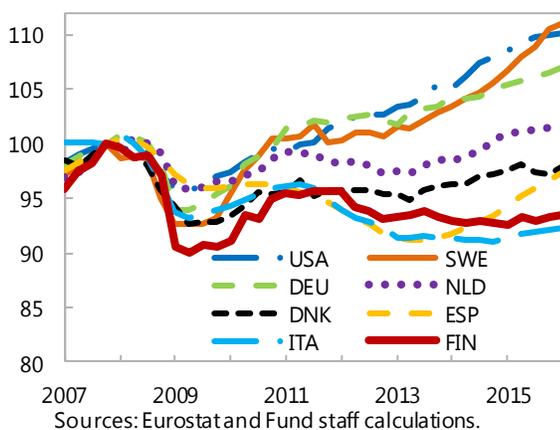
A. Introduction

1. Finland's economy has performed poorly since the 2008–09 global financial crisis.

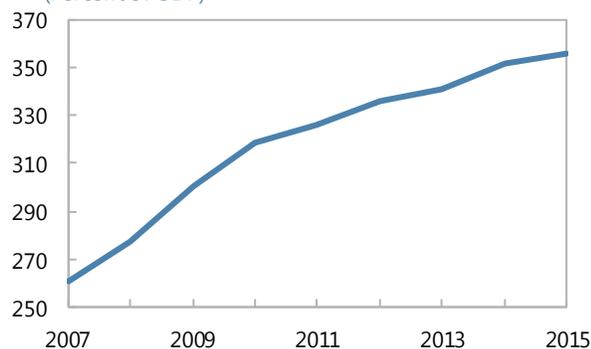
While Finland's economy initially rebounded from the crisis in 2010–11, it sank back into recession in 2012–14, as external and domestic demand weakened. The economy finally began to recover in just remains and unemployment is elevated.

2. The prolonged economic weakness has contributed to a significant rise in debt. The total debt level (excluding bank deposits) has increased by 95 percentage points of GDP since 2007, reaching about 355 percent of GDP in 2015. Most sectors have contributed to this increase in indebtedness, including the general government, households, nonfinancial corporations, and banks.

Real GDP Developments
(Index: 2007Q4=100)



Total Economy's Debt
(Percent of GDP)



Sources: Statistics Finland and Fund staff calculations.
Note: "Debt" is sum of bonds, loans, and other accounts payable.

3. To assess the extent of financial vulnerabilities in different sectors, this chapter examines sectoral balance sheets and how they have evolved since the global financial crisis.

The analysis is primarily based on the Finnish annual Financial Accounts, which covers 1995–2015 and contains data on the different types of financial assets and liabilities of the main sectors of the economy, including the sectors on which those assets are a claim or to which liabilities are owed. This allows for a detailed view of the balance sheets of the different sectors, how they are linked,

¹ Prepared by Nathaniel Arnold and Borislava Mircheva.

and how they have evolved in recent years. Such an assessment can reveal a sector's degree of financial fragility and vulnerability to different shocks.

4. Subsequent sections explore the details of developments in sectoral balance sheets.

Specifically, the next section looks at the nonfinancial private sector (firms and households), while the following sections examine the public sector (government and central bank) and the financial sector (banks and nonbank financial institutions), respectively. The concluding section highlights key findings and related policy advice.

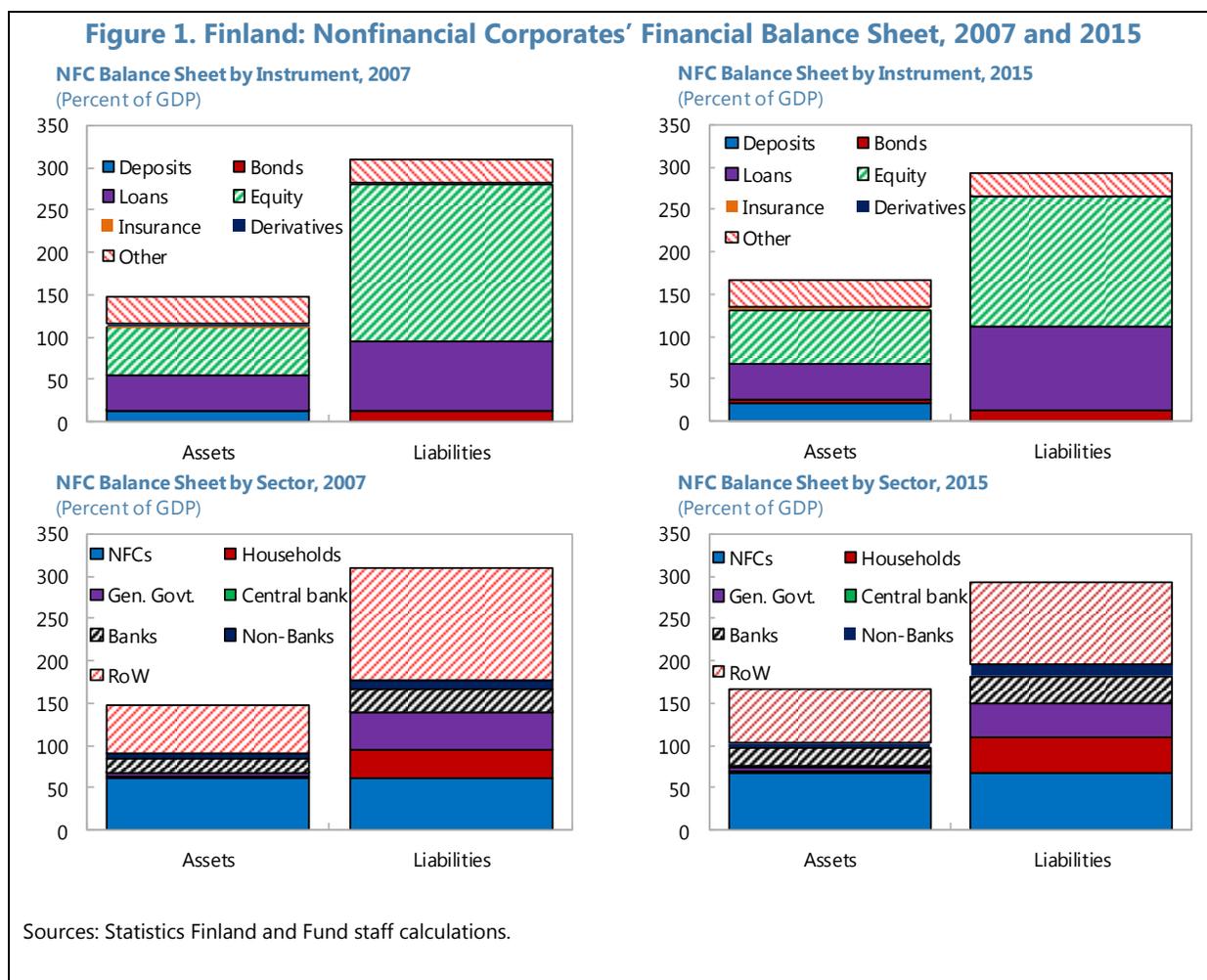
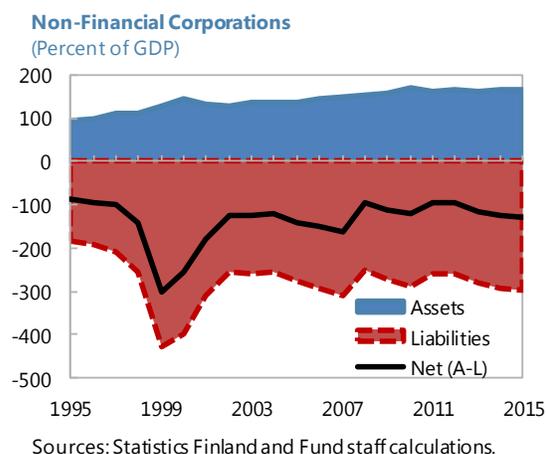
B. Nonfinancial Private Sector

Both nonfinancial corporations and households have increased their indebtedness since 2007, increasing their financial vulnerability to shocks. However, households are better shielded than firms from the risk of an interest rate shock that significantly pushes up debt service costs.

Nonfinancial Corporations

5. Nonfinancial corporations (NFCs) have a significant negative net financial position because debt and equity issuance are used in part to finance real assets. NFCs net financial position in 2015 was -126 percent of GDP, with financial assets of 167 percent of GDP and financial liabilities of 293 percent of GDP. However, NFCs also owned non-financial assets valued at 165 percent of GDP, giving them total assets (financial and non-financial) of 332 percent of GDP. In terms of financial assets, besides bank deposits, NFCs are most exposed to other domestic NFCs (40 percent of total financial assets), through loans (40 percent), equity stakes (35 percent), and trade credit/other accounts receivable (25 percent). NFCs also have significant foreign financial assets, about two thirds of which are equities and one third of which is debt (Figure 1). On the liability side, one third of NFCs' liabilities are to the rest of the world, with almost 60 percent of that equity. Domestic liabilities to other NFCs constitute about a quarter of the total. Households and the government each hold about 14 percent of NFCs' liabilities, which for households it is almost entirely equity. Banks play a relatively subordinate role in the financing of Finnish corporates and hold only 11 percent of NFCs' total liabilities, which includes about 25 percent of NFCs' bonds and loans, compared to a euro area average of nearly 50 percent (ECB, 2016).

6. NFCs’ net financial position has improved by 36 percent of GDP since 2007, partly due to a fall in the value of equity liabilities. Financial assets increased by 20 percent of GDP from 2007 to 2015, mainly due to a rise in deposits and the value of equity assets. Financial liabilities decreased by 16 percent of GDP in total, driven by a 33 percent of GDP drop of NFCs equity liabilities between 2007 and 2015. Over the same period the market value of Nokia fell from by roughly 44 percent of GDP, more than the total decline in NFCs equity liabilities, implying other Finnish NFCs equity value rose. The part of the improvement in NFCs net financial position that is due to a decline in the value of equity liabilities (i.e. the market value of firms) generally should not be considered a positive development. Incidentally, fluctuations in the value of equity liabilities have been a key driver of the volatility in NFCs’ net financial position over time.



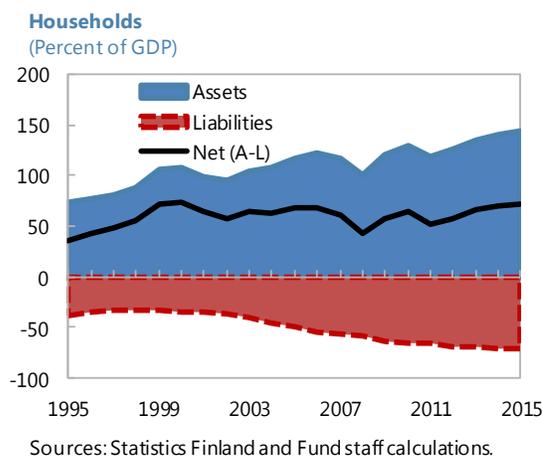
7. While NFCs' net financial position has improved, their debt has risen by nearly 20 percent of GDP since 2007. NFCs debt (bonds, loans, other accounts payable) increased from 120 percent of GDP in 2007 to 138 percent of GDP in 2015. Combined with the decline in the value of equity liabilities, debt now constitutes around half of NFCs financial liabilities, up from 40 percent in 2007. The sectors that have increased their exposure to NFCs debt the most are NFCs themselves (+5.3 percent of GDP), foreign investors (+4.1 percent of GDP), and domestic banks (+3.5 percent of GDP). Even as firms' debt has increased, their interest costs have declined as interest rates fell.

8. The higher debt burden makes NFCs more vulnerable to shocks, especially a rise in interest rates. The effective interest rate (interest expense over total debt) on NFCs' debt has fallen from 4.3 percent in 2007 to 2.2 percent in 2015. If it were to return to its 2007 level, the interest burden would rise from around 11 percent to nearly one quarter of NFCs' gross operating surplus (or from 4.8 percent to 9.4 percent of gross value added). Additionally, the rise in debt exposes firms to greater rollover risks in the event of a severe downturn.

9. The diversity of NFCs' funding sources is a strength, though the high degree of intra-NFC financing is not without risks. NFCs relatively limited reliance on bank financing should make their funding more robust to problems in the banking sector. However, the significant financial links between NFCs suggest that a severe shock to a key industry or bankruptcy of a large firm could propagate through the sector and weaken other firms financially.

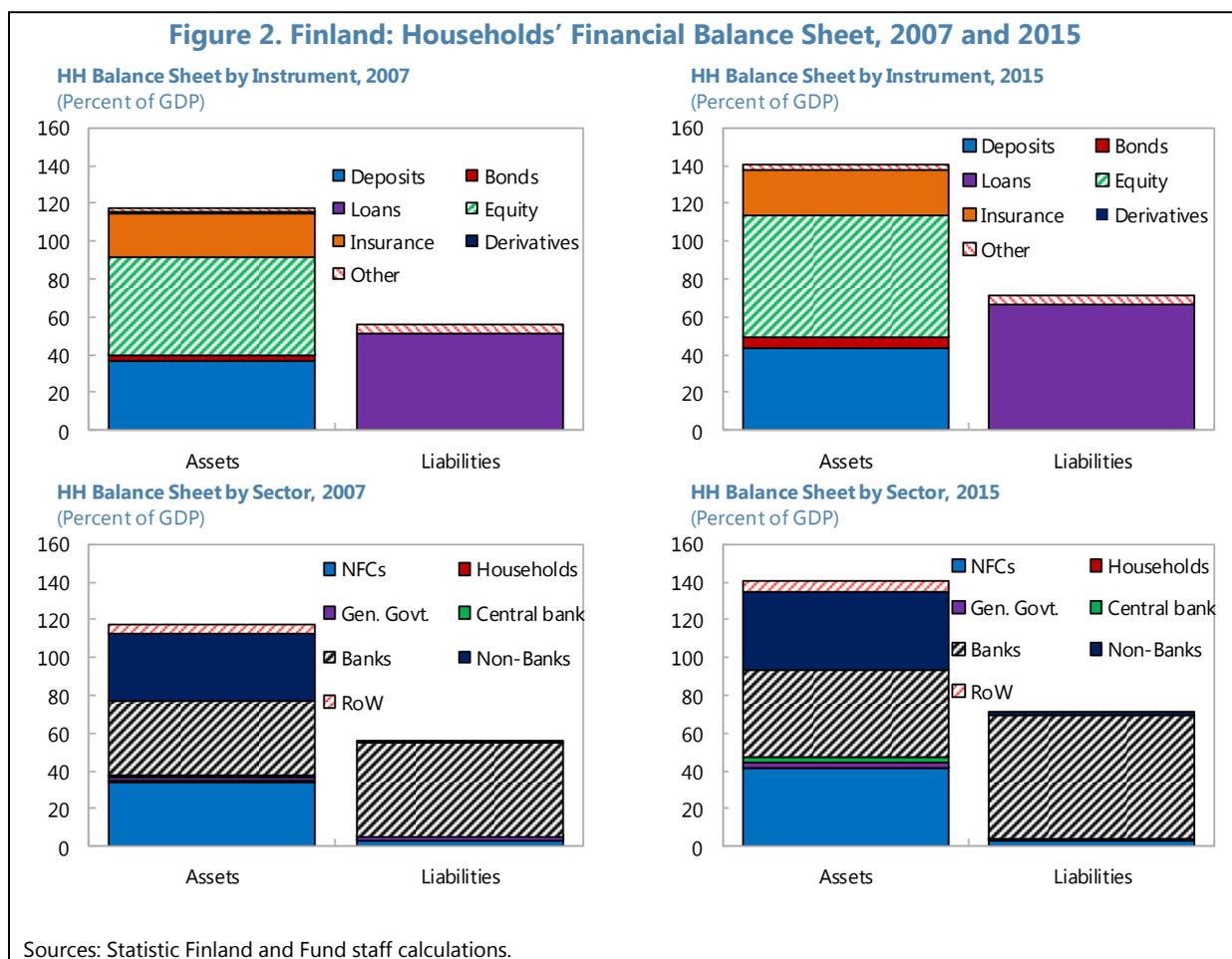
Households

10. Households have a positive net financial position on account of equity and deposits. Households total financial assets were 141 percent of GDP in 2015, while financial liabilities were 72 percent of GDP (Figure 2). Households' equity assets (65 percent of GDP) increased by 13 percent of GDP between 2007-2015, and constitute the largest component of their financial assets. About 60 percent of these equity assets are stakes in domestic NFCs. Households' deposits (44 percent of GDP) were the second largest component of their financial assets and increased by 7 percent of GDP between 2007-2015. Over the same time, insurance and private pension assets have remained stable. On the liability side, loans from banks (66 percent of GDP) represent the majority of liabilities.

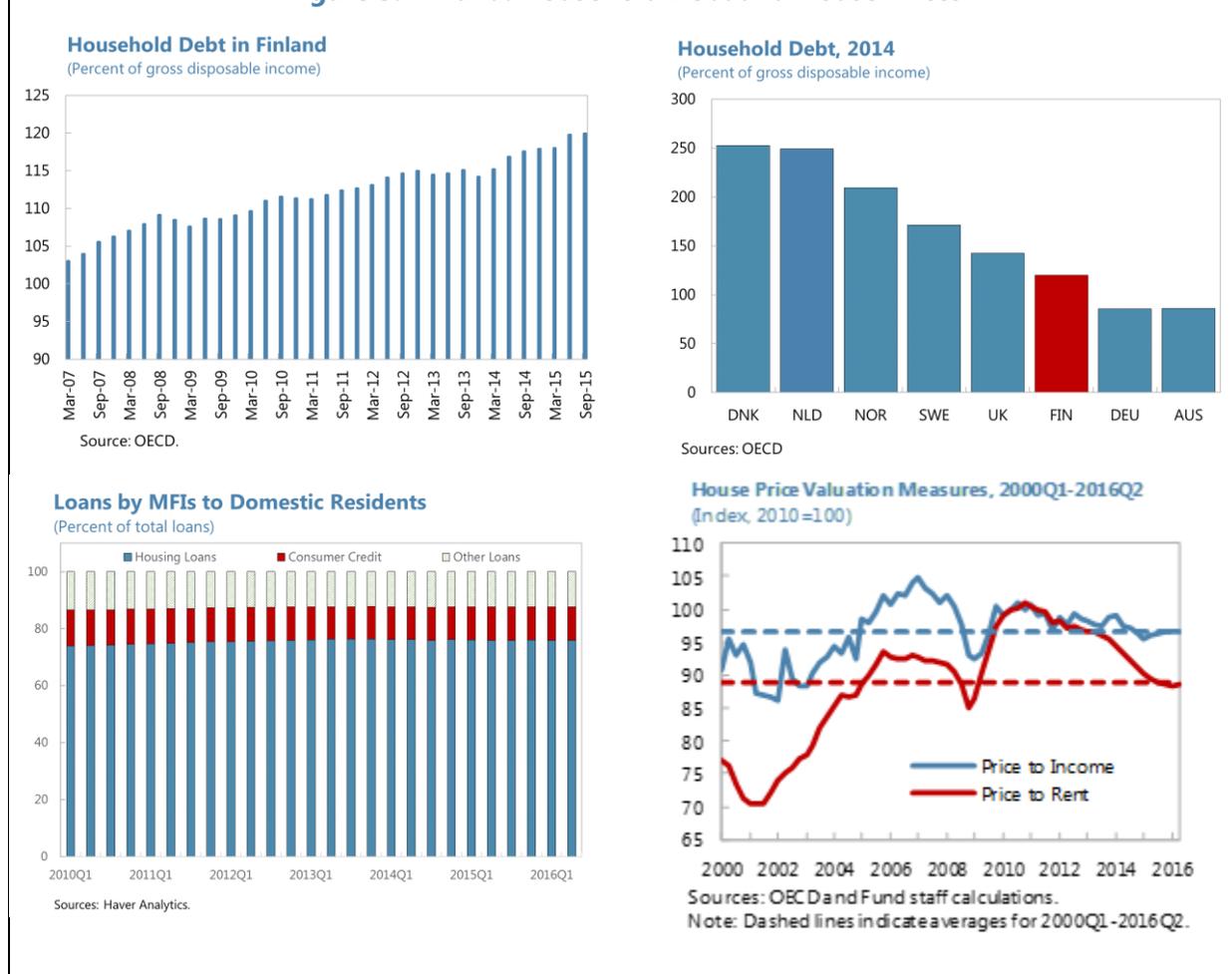


11. However, households' indebtedness has continued to increase gradually. Households' debt to disposable income increased from about 105 percent in 2007 to over 120 percent in 2015—a considerable level even though it remains substantially lower than in other Nordic countries (Figure 3). Unlike in some other European countries, Finnish households have not deleveraged in recent years as there has not been a major housing market correction and interest costs have fallen. Considering that the majority of household debt is in the form of mortgages (about 75 percent of

household debt), households have benefited from a prolonged period of favorable lending conditions and exceptionally low interest rates.



12. Household balance sheets will be affected by house price developments and by the performance of domestic NFCs. Households' sizable real estate assets and related mortgage debt suggest that changes in house prices could have a significant effect on household balance sheets. This said, the risk of an abrupt adjustment seems limited at present as standard metrics of house price valuation (e.g., price-to-income and price-to-rent ratios) suggest that house prices in Finland are broadly in line with fundamentals. The large share of equities in households' financial assets increases the volatility of their net financial position, while the home bias of these equity holdings particularly exposes households to the performance of domestic NFCs.

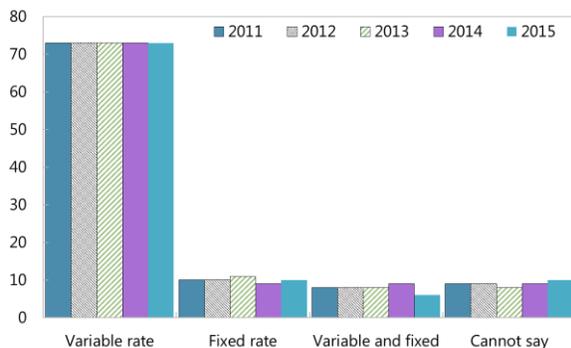
Figure 3. Finland: Household Debt and House Prices

13. Many households are effectively hedged against a future normalization of interest rates. According to a survey conducted by the Federation of Finnish Financial Services, even though most mortgages have variable rates (tied to Euribor or another prime rate), about 70 percent of households have fixed total monthly mortgage payments. Consequently, in the event of an interest rate increase, monthly mortgage payments will not rise but the effective maturity of the loan will increase as a smaller share of the monthly payment will go to amortizing the loan. The risks implied in such a lengthening of the amortization period seem relatively limited as average maturities for new mortgages tend to be low (16.9 years in 2014). The survey also found that nearly 40 percent of households are preparing for a possible increase of interest rates by saving more. On the other

hand, recent and planned changes to the social security system may make households more vulnerable to income shocks, though safety nets will remain generous by international standards.

Interest Rate Type of Housing Loans

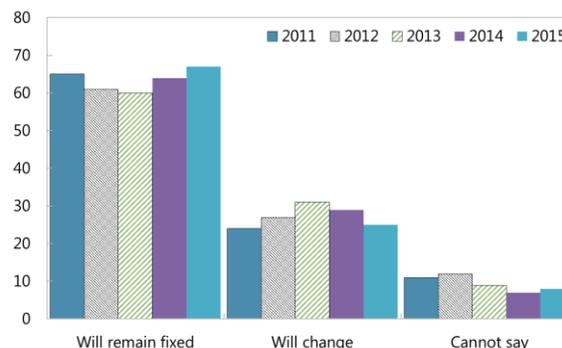
(Sub title - Segoe UI - Size 18)



Sources: Finanssiala

Monthly Mortgage Payments

(Effect from a change in the interest rate)



Sources: Finanssiala

C. Public Sector

General government debt has climbed substantially since the global financial crisis, eroding fiscal space and increasing the vulnerability to macroeconomic shocks. The central banks' balance sheet has also expanded in the wake of the crisis due to aggressive monetary policy easing.

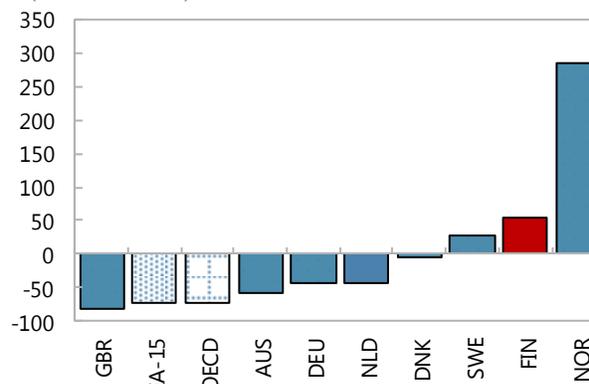
General Government

14. The government maintains a positive net financial position largely due assets held in pension funds.

The general government's (GG) net financial position was 55 percent of GDP in 2015—with assets of 131 percent of GDP and liabilities worth 76 percent of GDP—giving Finland one of the highest positive GG net financial assets positions among OECD countries. Two thirds of the financial assets are held by employment based pension schemes that are counted as part of the general government in the national accounts. Equities constitute about 60 percent of financial assets (Figure 4). Over half of equity assets are foreign assets and about one third are stakes in domestic NFCs, including unlisted state owned enterprises. In addition, foreign assets account for half of GG financial assets. On the liability side, bonds constitute 72 percent of GG liabilities and loans account for another 18 percent, while other accounts payable account for almost all of the remainder. Nearly 70 percent of liabilities are to the rest of the world. As in other countries, future pension liabilities are not reflected on the GG balance sheet even though prefunded pension assets

General Government Net Financial Assets

(Percent of GDP)

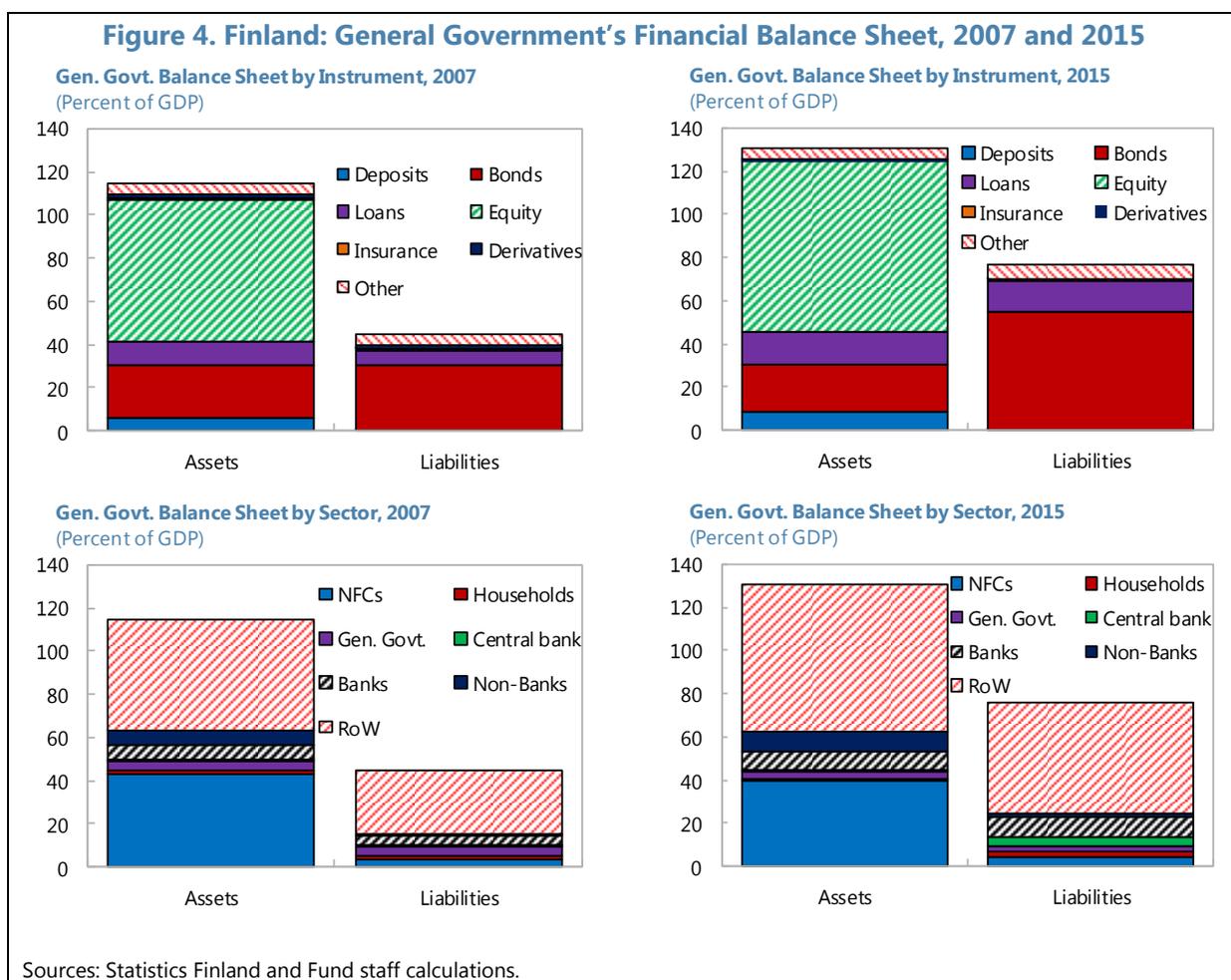


Sources: OECD Economic Outlook 99 database and Fund staff

are counted on the balance sheet, providing a distorted view of the impact of pensions on the GG balance sheet.

15. However, the government’s net financial position has deteriorated since the crisis because debt has increased significantly. GG financial liabilities have risen by over 30 percent of GDP since 2007, primarily due to increased bond issuance to finance fiscal deficits, which has driven a 15 percent of GDP deterioration in the GG net financial position. Three quarters of the increase in debt has been financed by foreign investors, with government bond and loan liabilities to the rest of the world growing from 28 to 52 percent of GDP.

16. The government also accumulated financial assets since 2007. Financial assets increased by 16 percent of GDP between 2007 and 2015 (Figure 4), with most of that rise due to equity assets in the employment based pension schemes. Even though the pension system is partially pre-funded and in surplus, these assets cannot be liquidated to fulfill financing needs. Furthermore, though the pension fund surplus is included in the general government surplus, it does not reduce borrowing needs. In addition, a significant share of the central and local government assets is comprised of equity stakes in unlisted publicly owned enterprises, which are relatively illiquid.



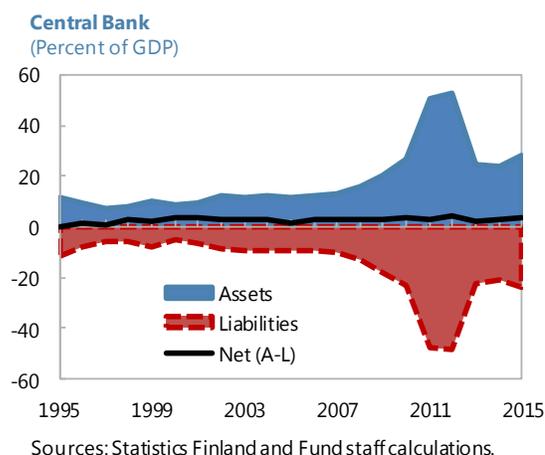
17. The increase in debt raises vulnerabilities in the public sector. Higher debt levels increase the vulnerability to macroeconomic shocks and a negative shock to GDP growth or inflation, or a rapid rise in interest rates could have a sizeable impact on the debt ratio. The increased dependence on foreign financing could also be a source of vulnerability, as it could expose the government to spillovers from shocks in other countries (e.g., foreign banks under financial stress may suddenly stop buying Finnish sovereign debt, impairing liquidity for the bonds). However, the government considers having a diverse group of foreign investors for its debt to be beneficial, since it provides a wider pool of investors and limits the risk of a domestic sovereign-bank crisis loop. In terms of asset allocation, the foreign exposure provides diversification to pension fund portfolios, but also exposes them to spillovers and volatility in global financial markets.

Central Bank

18. The central bank maintains a small positive net financial position and a relatively simple balance sheet. Decisions on the amount of the central bank's net financial assets are taken in accordance with the Agreement on Net Financial Assets (ANFA) between the ECB and the Eurosystem's national central banks. The agreement sets rules and limits for holdings of financial assets and liabilities and has been used to limit the capacity of national central banks to create liquidity in accordance with monetary policy objectives.² The Bank of Finland's net financial assets amounted to nearly 4 percent of GDP at the end of 2015 (Figure 5). Assets, most of which are cross-border claims, amounted to 28 percent of GDP in 2015 and primarily consist of deposits and bonds. Nearly 80 percent are foreign assets. Almost all of the liabilities consist of currency and deposits.

19. Both assets and liabilities have increased significantly since 2007, with a particularly sharp spike during the euro area crisis in 2011–12.

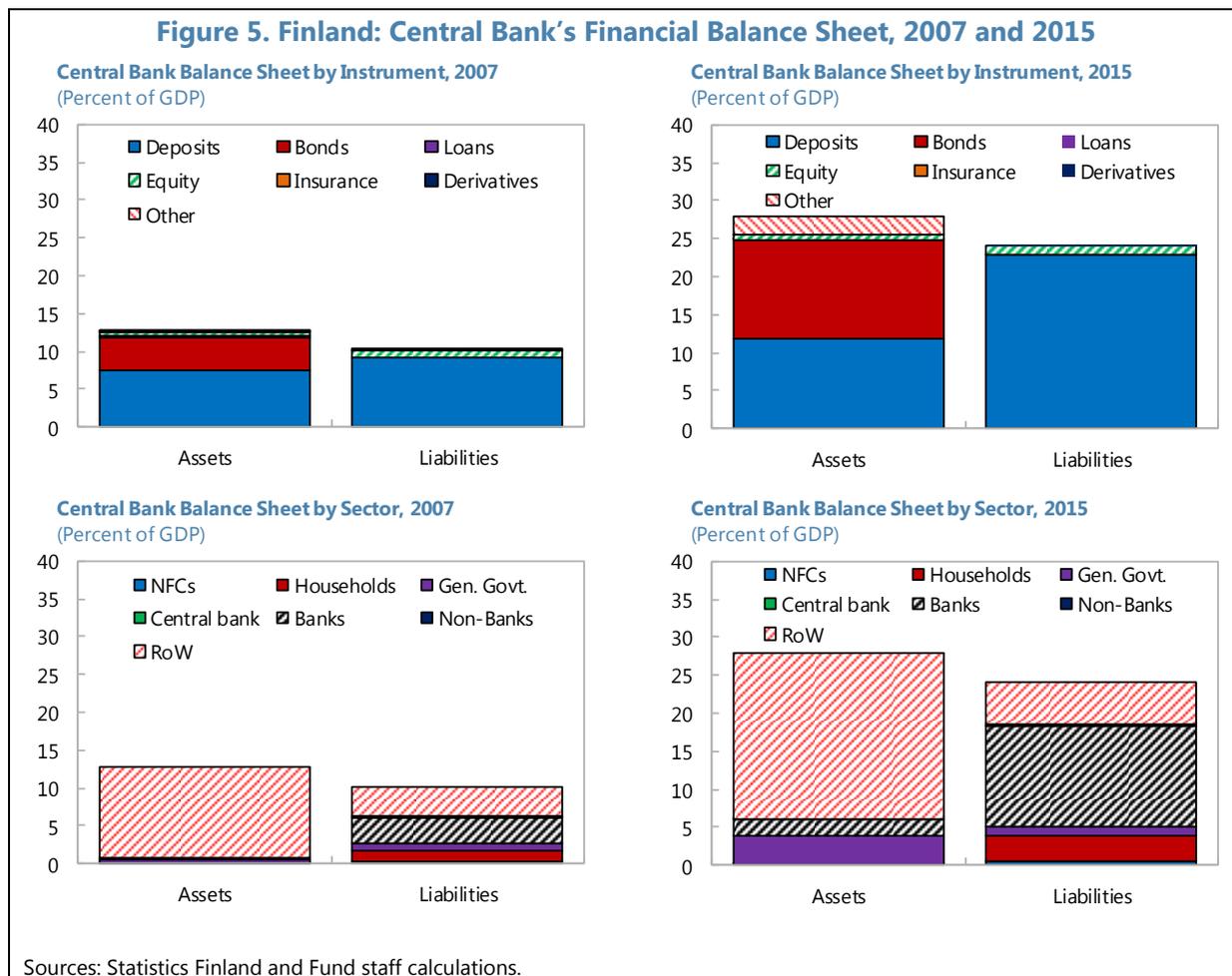
On the asset side the increase was driven mostly by intra-Euro system claims related to Target2 and correspondent accounts. A small share of the increase in assets was due to lending to euro area credit institutions related to monetary operations, specifically longer-term refinancing operations. On the liability side there was a reciprocal increase in the liabilities to euro area credit institutions related to monetary policy operations. While the balance sheet has shrunk relative to 2012, it remains larger than it was before 2007.



20. The central bank's balance sheet appears robust. Liabilities are currency and deposits created in the course of monetary policy operations. Most assets are high-quality sovereign bonds or deposit claims on other national central banks in the Euro system. Also, if the central bank were

² https://www.ecb.europa.eu/explainers/tell-me-more/html/anfa_qa.en.html

to make losses on its assets it has the ability to rebuild its capital by retaining profits from monetary policy instead of remitting them to the government.



D. Financial Sector

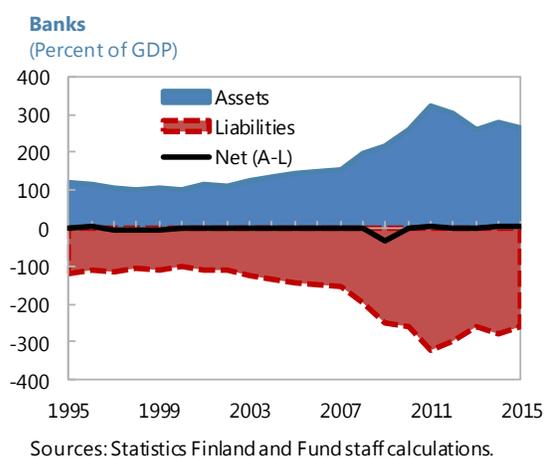
The banking sector's balance sheet is large and has expanded considerably since 2007, including cross-border exposures and foreign financed wholesale funding. This exposes banks to liquidity funding and contagion risks. In turn, banks could create sizable contingent liabilities for the government in a crisis. Non-banks' balance sheet is less financially fragile, but low interest rates are damping returns and foreign asset holdings expose them to global financial market volatility.

Banks

21. The banking sector is large relative to the economy and has a small positive net financial position. The banking systems' financial assets were just over 264 percent of GDP in 2015, while its liabilities were worth slightly less than 262 percent of GDP, resulting in a net financial position of 3 percent of GDP (Figure 6). Loans constitute about 45 percent of banks' financial assets, while deposits and derivatives account for about 20 percent of assets each and bonds account for

another 10 percent. Loans to households account for 54 percent of total loan assets, while loans to domestic NFCs are 22 percent of the total. Cross-border loans are 17 percent. On the liability side, deposits are 55 percent of total and bonds and derivatives account for 17 percent each.

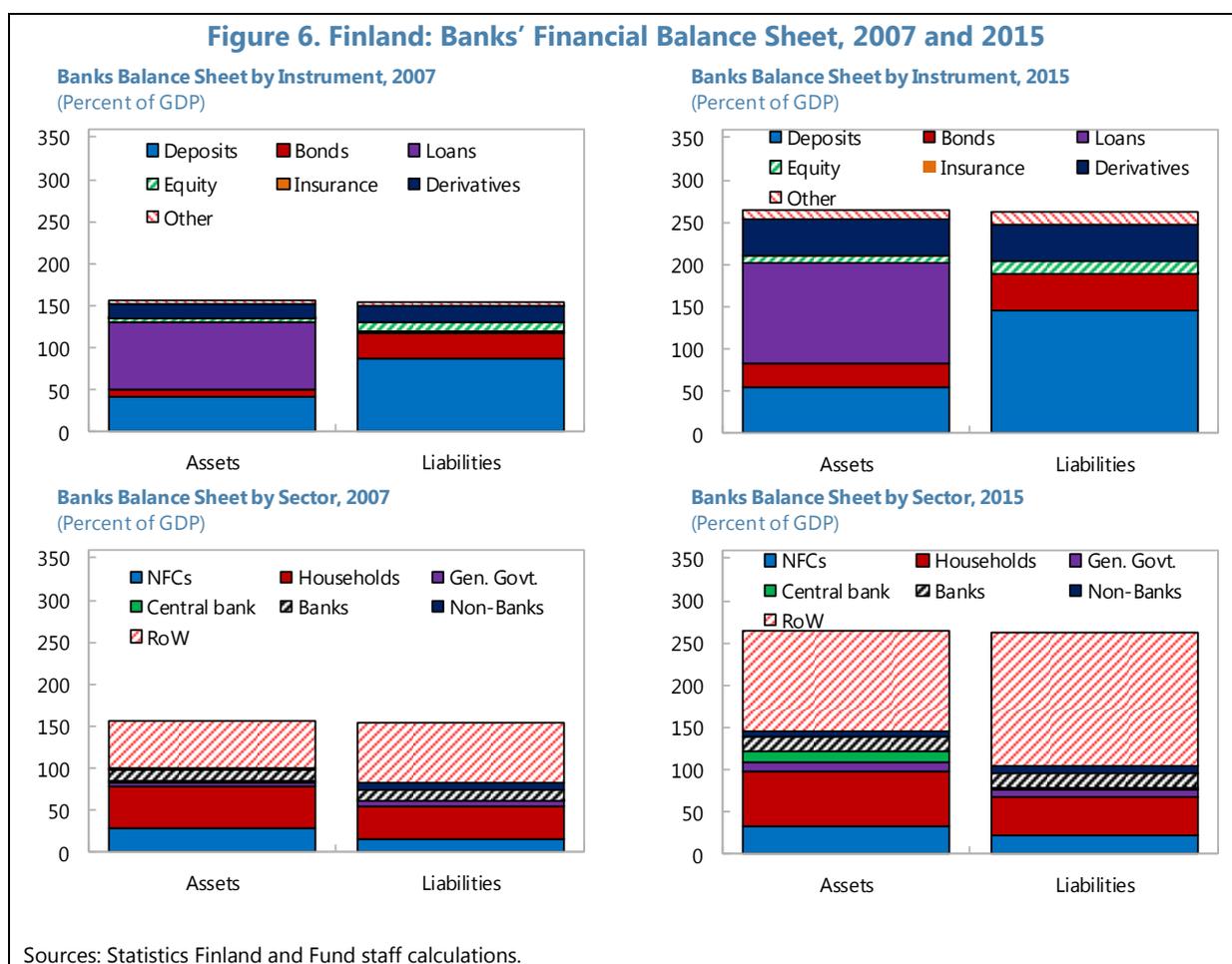
22. The banking sector's balance sheet has grown considerably since 2007. Banks' financial assets and liabilities grew by more than 100 percent of GDP between 2007 and 2015. On the asset side, loans increased 40 percent of GDP, bonds by 20 percent of GDP, and derivatives by 26 percent of GDP. Deposits with the central bank also increased by 10 percent of GDP. On the liability side, deposits increased by 58 percent of GDP, bonds by 13 percent of GDP, and derivatives by 26 percent of GDP. Overall, banks have become more reliant on wholesale funding, including deposits from other banks and covered bonds.



23. Much of the increase in banks' balance sheet is due to larger cross-border exposures, especially on the liability side. Banks' net financial position with the rest of the world deteriorated by about 20 percent of GDP between 2007 and 2015. Out of an increase in total liabilities of 106 percent of GDP, 85 percent of GDP was an increase in foreign liabilities. Of the increase in deposit liabilities, about 60 percent is deposits from the rest of the world, much of it from parent banks of Finnish subsidiaries and other foreign credit institutions. Cross-border derivatives exposures account for nearly the entire increase in banks' derivatives assets and liabilities. Banks' bond liabilities to foreign investors increased by 20 percent of GDP, more than their total bond liabilities increased. On the asset side, in addition to derivatives, bonds and loans account for most of the remaining increase in banks' foreign assets.

24. Banks' external borrowing has helped to finance credit to domestic sectors. Since 2007, banks' net lending to households and the government increased by 13 percent of GDP and the net financial position with the central bank increased by 8 percent of GDP. Combined, this almost exactly offsets the 22 percent of GDP deterioration in banks' net financial position with the rest of the world. Moreover, covered bonds are used specifically to finance mortgage lending to households and nearly all covered bonds are sold to foreign investors, including foreign banks.

25. Reliance on short-term foreign-financed wholesale funding exposes banks to liquidity risks. Wholesale funding accounts for 55 percent of banks' total funding (excluding derivatives and equity). Around 80 percent of banks' wholesale funding is foreign financed and almost half of it has a maturity less than 30 days. This exposes banks' to shifts in foreign investor sentiment and serves as a channel through which shocks in global financial markets can spillover into Finland. In particular, Finnish banks have significant financial linkages with other Nordic countries, so financial sector stress or a downturn in one of the other Nordics could cause financing conditions to tighten in Finland, with deleterious effects on the housing market, consumption, and investment.



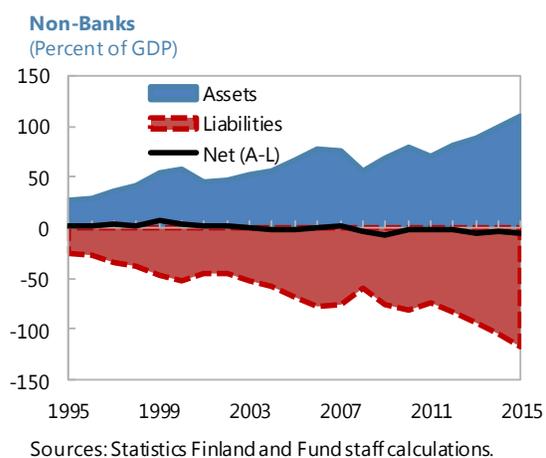
26. The large size of the banking sector implies a significant contingent liability risk for the government. In the event of a financial crisis, support for the financial sector often generates sizable contingent liabilities for the government (IMF 2014). Bova and others (2016) find that the average direct fiscal cost of financial sector contingent liabilities is 10 percent of GDP. This is in line with the fiscal cost estimate from Laeven and Valencia (2012), which found that the direct fiscal cost of the early 1990s financial crisis in Finland—when the banking sector was much smaller than today—was 13 percent of GDP. While the new Bank Recovery and Resolution Directive (BRRD) seeks to reduce contingent liability risks, it does not eliminate them.

27. Nordea's conversion of its Finnish subsidiary to a branch in 2017 should reduce the contingent liability risk. When Nordea converts its Finnish subsidiary to a branch, a large share of the subsidiary's assets and liabilities will be moved onto the balance sheet of the Swedish parent. This is expected to reduce the size of the Finnish banking sector by nearly 100 percent of GDP, which will reduce the potential size of contingent liabilities. It will also reduce the extent of the banking system's cross-border exposures. However, even after the conversion, Nordea's branch will remain systemically important, with about one third of the domestic market for loans and deposits.

Nonbanks

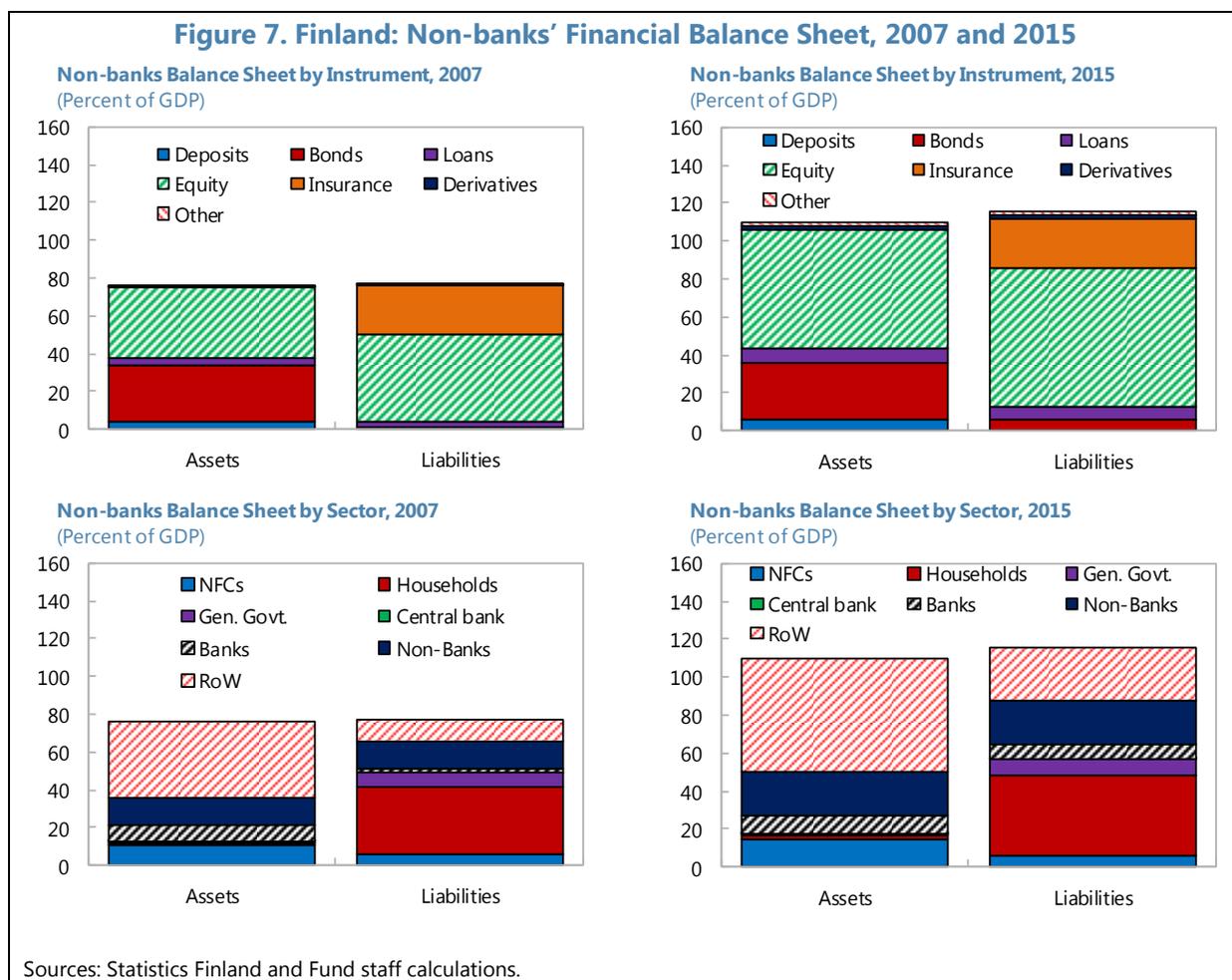
28. Nonbank financial sector's balance sheet is smaller than that of the banking sector, but still sizable. Non-banks include money market funds, investment funds, insurance companies, and pension funds. Their total financial assets amounted to 110 percent of GDP in 2015, while total liabilities were 115 percent of GDP, giving them a small negative net financial position (Figure 7). The negative net position is partly due to real estate funds that issue financial liabilities, but buy nonfinancial assets. About 36 percent of non-banks' liabilities are to households, while 24 percent is to the rest of the world, and 20 percent is to other non-banks. Most of the liabilities are in the form of equity or insurance. Equity and bonds constitute almost 85 percent of non-banks' financial assets.

29. The size of the non-bank sector has grown steadily in recent years. Nonbanks' financial assets have increased by 33 percent of GDP, while liabilities have risen by 38 percent of GDP between 2007 and 2015. Over half of the rise in financial assets is due to an increase in foreign assets. Most of the rest of the increase in non-banks' assets have been growing claims on other non-banks and domestic NFCs. Only 40 percent of the increase in financial liabilities is accounted for by a rise in foreign liabilities. Liability exposures have also increased to households and banks.



30. Nonbanks provide insurance and portfolio diversification benefits to households. More than half of non-banks' assets are foreign assets and 80 percent of those foreign assets are equity. This provides a degree of diversification for households' portfolios, since households' equity holdings exhibit home bias. Overall, households' assets (insurance, pension, and shares) provided by non-banks amounted to 42 percent of GDP in 2015.

31. Nonbanks' vulnerabilities are typically limited, but low interest rates weaken their returns and global financial market turmoil could impact foreign asset valuations. Monetary easing by advanced economies' central banks has driven down interest rates, which has supported asset prices. However, it is problematic for pension funds and insurance companies that need to match long-term liabilities with long duration (relatively) safe assets, as the prolonged period of low interest rates reduces the return on new fixed income assets. This can also cause affected non-banks to increase the riskiness of their portfolios (e.g., by shifting the asset composition towards equities).

Figure 7. Finland: Non-banks' Financial Balance Sheet, 2007 and 2015

E. Conclusion

32. Financial vulnerabilities have risen in most sectors since the global financial crisis.

Indebtedness has increased for NFCs, households, and the government, increasing their financial fragility and vulnerability to shocks. Also, cross-border financial exposures have risen on both sides of Finland's balance sheet. Specifically, banks' balance sheets have grown considerably, largely due to a rise in foreign liabilities. NFCs and the government have also relied in part on foreign investors to finance their debt increases. While cross-border exposures can provide diversification benefits, they can also act as a channel for spillovers from other countries and global financial markets.

33. The government has already taken action to contain risks in some areas. For example, the gradual reduction of the tax deductibility of mortgage debt will reduce households' incentive to borrow more and help limit any misallocation of resources to housing. The introduction of a new macroprudential policy framework last year was also a positive step, but more could be done to contain risks, including the introduction of a systemic risk buffer given the large size of the banking sector. The implementation of the Liquidity Coverage Ratio and Net Stable Funding Ratio will bolster banks' resilience to liquidity funding shocks.

34. Additional policies can help to contain or limit the extent of financial vulnerabilities.

Appropriate macroprudential measures—such as a loan-to-income cap—could also reduce medium-term risks by keeping household debt and debt service capacity in check. In addition, if banks' reliance on wholesale funding grows, the authorities should consider strengthening the liquidity requirements further. Also, the FIN-FSA and ECB should collaborate with financial supervisors in other Nordic countries, including to assess the extent of banks' cross-holdings of covered bonds. Finally, under the government's current fiscal consolidation plan the gross debt-to-GDP ratio should peak in 2019, then begin declining. Appropriate fiscal prudence, including in particular reforms to tackle long-run aging-related fiscal pressures, and a sound debt management strategy are crucial to rebuilding fiscal space.

References

- Bova, Elva, Marta Ruiz-Arranz, Frederik Toscani, and H. Elif Ture, 2016, "The Fiscal Costs of Contingent Liabilities: A New Dataset," IMF Working Paper 16/14 (Washington: International Monetary Fund).
- European Central Bank (ECB), 2016, "Trends in the External Financing Structure of Euro Area Non-Financial Corporations." ECB Economic Bulletin, Issue 5, Box 5, (Frankfurt, Germany).
- International Monetary Fund (IMF), 2014, "From Banking to Sovereign Stress: Implications for Public Debt," IMF Policy Paper (Washington).
- Laeven, Luc, and Fabian Valencia, 2012, "Systemic Banking Crisis Database: An Update," IMF Working Paper 12/163 (Washington: International Monetary Fund).

PRODUCT MARKET REFORM, R&D SPENDING, AND FIRM-LEVEL PRODUCTIVITY IN FINLAND¹

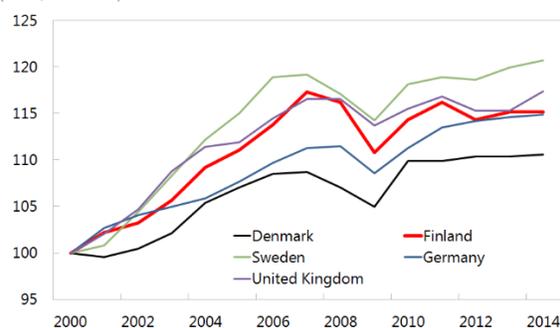
Finland has suffered a unique combination of structural and cyclical shocks since 2007 and boosting productivity growth is crucial to restarting growth. The authorities are already undertaking extensive structural reforms, but there remains scope for improvement in areas of product market regulation and innovation. This paper uses an extensive dataset of Finnish firms to empirically assess the potential productivity gains from product market reform and research and development (R&D) spending.

A. Introduction

1. As cyclical headwinds coincided with large structural shocks, Finland has suffered a sharp fall in productivity growth since 2007. Average labor productivity growth has dropped from about 2½ percent per annum during 2000-07 to negative territory during 2007-14, mainly reflecting the decline in TFP growth in manufacturing and public services, as well as low productivity growth in private services (OECD, 2016). Although the slowdown in productivity has also occurred in other advanced economies, it was exacerbated in Finland by the abrupt decline of the (previously) high-productivity information and communication technologies (ICT) sector in recent years and the effects of the long-run decline in the wood and paper industry (IMF, 2015).² Coupled with rapid wage increases in 2008-10, this has led to a significant deterioration in cost competitiveness, with Finland's unit labor costs (ULC) rising 5-15 percent more than in peer countries over the post-crisis period.

Labor Productivity in Selected Countries

(Index, 2000=100)

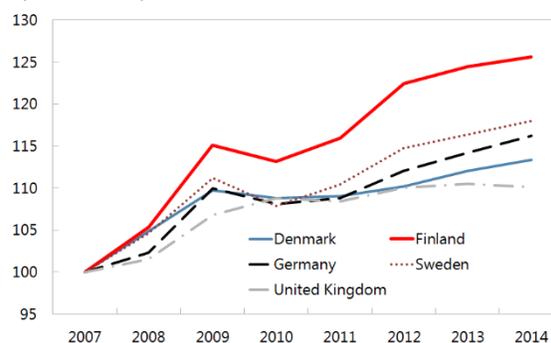


Sources: OECD and Fund staff calculations.

Note: Labor productivity is GDP per hour worked in 2005 international US\$.

Unit Labor Costs

(Index, 2007=100)



Sources: OECD and Fund staff calculations.

¹ Prepared by Nan Geng, Giang Ho, and Rima Turk.

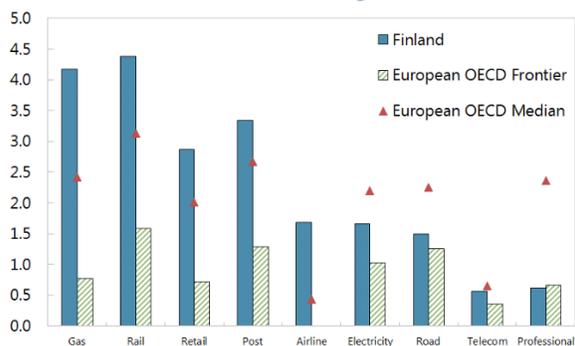
² The collapse of productivity in the ICT sector was largely driven by the decline of Nokia's handset business, which was eventually sold to Microsoft in 2013. The experience highlights the vulnerability of the economy to the performance of a single company.

2. Reforms in several areas are underway to improve productivity and competitiveness.

The government's ambitious structural reform agenda published last year includes key reforms of the labor market and healthcare and social services, and work on implementation has begun. Agreement was reached recently on a *competitiveness pact* which includes a wage freeze in 2017, an unremunerated increase in hours worked, vacation pay cuts for civil servants, and the introduction of more firm-level flexibility in the wage bargaining system—measures that aim to reduce unit labor costs and better align wages with productivity. Draft bills on the critical reforms to improve efficiency in healthcare and social services provision are being discussed with stakeholders and should be submitted to the parliament before the end of the year.

3. There remains scope however for product market reforms and measures to promote innovation. While the OECD's indicator of the overall product market regulation (PMR) in Finland is close to the OECD average, some specific sectors such as retail trade and several network sectors remain highly regulated compared with both the average and the best practice in peer countries.^{3 4 5} In these sectors, regulation may be impeding entry and competition, thereby dampening private sector dynamics and holding back productivity growth. For example, while according to the Global Entrepreneurship Monitor a high proportion of Finns believe that they have the skills and knowledge needed to start a business, both start-up rates and the share of young companies among small businesses are among the lowest in the OECD, which suggests still high barriers to entrepreneurship (OECD, 2016). In addition, there have been substantial reductions in R&D spending by both the private and public sectors—which are down overall by over 10 percent in real terms since 2007. This may also weaken opportunities for future productivity growth.

Finland: Product Market Regulation, 2013

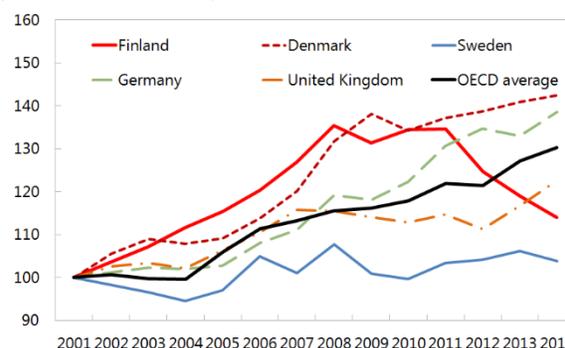


Sources: OECD and Fund staff calculations.

Note: PMR indicators range from 0 to 6, increasing with restrictiveness. Frontier refers to average best three countries in European OECD countries.

Gross Domestic Expenditure on R&D

(Constant PPP USD, 2001=100)



Sources: OECD and Fund staff calculations.

³ The "best practice" or "frontier" is calculated as the average of the three best performing countries in the comparator group. For example, the European OECD frontier for network industries as a whole is set by the UK, Germany, and Austria, while for the retail industry it is set by Sweden, Slovenia, and the Netherlands.

⁴ Network sectors include air transport, electricity, gas, post, rail, road transport, and telecom.

⁵ The most recent update of the OECD product market regulation indicators took place in 2013. Thus it does not take into account recent policy changes such as Finland's liberalization of shop opening hours in 2016.

4. The remainder of the paper is organized as follows. Section B briefly discusses the factors that may be constraining business dynamics in Finland, such as product market regulation, as well as the slippage in research and innovation. Section C offers a quantitative perspective, using an extensive firm-level dataset to estimate the potential productivity gains from reducing regulatory burden or increasing R&D investment. Section D concludes.

B. Potential Obstacles to Productivity Growth in Finland

Product Market Regulation

5. Finland has made substantial progress in deregulating its product markets since the 1990s. Finland's entry into the European Economic Area in 1994 and the European Union in 1995 have accelerated the process of opening up the economy to international competition and foreign direct investment through significant reforms, including the relaxation of regulatory restrictions (including on foreign ownership, market entry, and price setting), the European harmonization of competition laws, and the privatization of a dozen state-owned enterprises (SOEs). Finland was also one of the first countries in Europe to liberalize its telecommunications and electricity markets, with deregulation starting as early as in the late 1980s. As a result of increased competition and improved overall efficiency, the prices of electricity and telecom services decreased considerably, leading to a rapid and widespread expansion of the ICT sector. Also, professional services (e.g., legal, accounting, engineering, architecture) appear comparatively liberalized according to the OECD indicators.

6. However, state ownership remains widespread in Finland. Companies with partial or complete state ownership account for more than 10 percent of total employment (OECD, 2014). SOEs are active in network industries, such as air transport (Finnair Oyj), telecommunications (TeliaSonera), energy (Gasum Oy), postal services (Posti Group), and the railways (VR-group). They compete with private companies in a number of other service sectors, but often have a dominant position in protected domestic markets. In addition, local government participation is widespread in areas like utilities and telecommunications.⁶ The playing field can be uneven if government-owned firms benefit from at least implicit financial guarantees or have a dominant position in the market.⁷

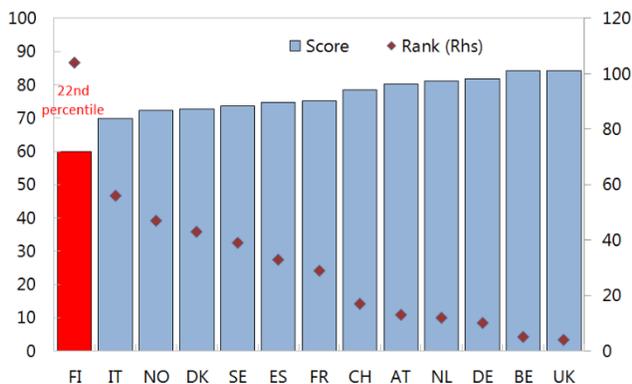
⁶ The telecommunications market was fully opened to competition in 1994. In the electricity market, there are currently two grid systems for the distribution of electricity, a national grid and a local grid system, with the latter being managed by municipalities, associations of municipalities and private companies. The supply of electricity was liberalized in 1998, and every household is, in principle, able to choose between electricity suppliers (OECD, 1999). There is still scope, however, to improve competition in the local supply of electricity. Some local electricity suppliers have acquired local electricity grids and with distribution tariffs accounting for around half of the retail price of electricity, there is concern that such vertical integration risks weakening competition.

⁷ Another concern is that the deterrent effect of sanctions on activities against the competition law is limited if fines are ultimately being paid from public resources.

7. Also, regulation remains extensive in retail trade and some network sectors. While competitive market models are operating reasonably well in telecommunications and electricity, in part due to participation in an integrated open market with other Nordic countries, transportation (including rail, road, and air transport) and postal services have only been partially liberalized. For instance, passenger rail transport has not yet opened up to competition.⁸ Although liberalization of postal services followed the EU postal directive, which implies a de jure opening of the market, de facto competition remains limited as new entry is prevented by high mandatory public service requirements and a range of advantages enjoyed by the incumbent.⁹ In addition, road transport accounts for three quarters of total freight transport but the role of licenses is still important and market entry is relatively tightly regulated.¹⁰ A noncompetitive outcome in practice in the taxi market was caused by several noncost factors, including controlled entry by the incumbents and a monopoly on call centers and taxi tariffs.¹¹ In the retail sector, while shop opening hours have been liberalized since the beginning of 2016, restrictive

Intensity of Local Competition, 2015

(Score range: 0-100; 141 economies)



Sources: Global Innovation Index 2015 and Fund staff calculations.

⁸ There is some competition for freight, but entry in the freight market remains challenging, given the dominant position of the incumbent in the organization of the railway system (Mäkitalo, 2011).

⁹ The Postal Services Act stipulates five-day per week service and next day delivery for 95 per cent of all letters. In addition, the government-owned Posti Group dominates the market and enjoys a range of other advantages over its competitors, including the possibility of collecting a Universal Service Obligation (USO) fee from companies with restricted licenses, that may be as high as 20 percent, creating a cost disadvantage for competitors. Posti also cross-subsidizes its competitive activities with its revenues from the non-contested standard letter market (accounting for about 40 per cent of overall revenue) and the handling charges for VAT payments. Finally, Posti's has ownership of the address register and is not obligated to provide access to its infrastructure to competitors, which is subject to commercial negotiations (OECD, 2003).

¹⁰ Cabotage – transport inside a country by a foreign hauler – accounts for a much lower share of the market than in Denmark and Sweden (European Commission, 2013).

¹¹ The taxi market in Finland operates under a single contact number to a central dispatcher that transmits the order to individual taxi service providers (a so called "call" system). In addition, monopoly membership fees are charged on taxi drivers. In most Finnish cities, the taxis are members of one association, which operates the call system with a uniform tariff regime for all members. The tariffs are regulated under a national maximum tariff system, and the government confirms each year the maximum rates for taxi rides. However, the lack of competition often leads actual tariffs to be equal to the permitted maximum. Moreover, entry is controlled through a licensing system operated by the region. The issuance of new licenses is based on an assessment of demand, customer needs, financial requirements and other market data with the regions often relying on the taxi associations for such information. This reliance on insiders gives new entrants powerful incentives to become members of the associations, diminishing competitive pressures. Finally, there are zoning regulations that affect taxi services. A taxi license is granted for servicing a particular zone. If the ride terminates outside the zone of operation, the taxi must return empty to the zone. Accordingly, taxi driving license includes requirements of knowledge of the local area.

(continued)

zoning regulations and land-use planning limit economies of scale and market entry. For example, building large shops out of town requires special permission from the relevant local government and there is no limit for the processing time. All these factors contribute to a low level of local competition in Finland compared to that in peer countries.

8. Both theory and empirical evidence suggest that product market reforms would boost firm productivity and enhance consumer choice. Regulations that prevent firm entry and exit restrict competition, increase costs and limit choices for consumers. Relaxing barriers to entry (such as licensing requirements) would allow new, potentially more productive, firms to enter the market and increase competitive pressures, thereby encouraging incumbent firms to reduce costs and improve product quality—and thereby to improve productivity. Moreover, such reforms can generate productivity gains that go well beyond the firms in the regulated markets themselves, by affecting also “downstream” producers that rely on inputs from the regulated upstream sectors. For instance, deregulation of network industries would result in cheaper and better quality of network services, producing ripple effects throughout the economy, as exemplified by the strong growth of Finland’s ICT sector following the liberalization of electricity and telecommunications sectors. Indeed, a growing body of literature shows that benefits from reducing anti-competitive regulation extend beyond the immediate sectors being liberalized.¹² In addition, competition-enhancing product market reforms may also boost innovation activity, given that competition induces firms to innovate (Aghion and others, 2005).¹³ Moreover, for a country with limited macroeconomic policy space, such as Finland, product market reforms have the advantage of raising activity and employment without necessarily generating budgetary costs (IMF, 2016).

Research and Innovation

9. R&D spending in both the public and private sector has fallen sharply in recent years. Finland has been one of the most dynamic OECD countries in terms of research intensity, which contributed to the startling economic performance in the period of 1997-2007. While the contraction in R&D spending in recent years was partly due to the collapse of Nokia, direct government R&D funding has also declined by about 14 percent in real terms between 2010 and 2014 (OECD, 2016). Moreover, the 2016 and 2017 budget included further cuts of 0.2 percent of GDP in R&D spending, including the carry-over effects. On the other hand, the government has proposed in the 2015 Strategic Program to improve the effectiveness and commercialization of research results by strengthening cooperation between higher education institutions and business to bring innovations to the market. Even though enhancing efficiency in R&D spending could help mitigate the impact from falling R&D investment, R&D outcomes and Finland’s future growth

¹² A number of papers have documented the presence of adverse effects from upstream inefficiencies using input-output linkages in a single country context (Arnold and others, 2011; Forlani, 2012; Correa-López and Doménech, 2014; Lanau and Topalova, 2016) and across OECD countries (Barone and Cingano, 2011; Bourlés and others, 2013).

¹³ Aghion and others (2005) hypothesize that the relationship between competition and innovation follows an inverted U-shape, with higher competition initially increasing then decreasing the rate of innovation.

potential are likely to be hindered by the spending cuts, especially at a time when private R&D investment is subdued.

10. Evidence from a large body of literature points to a strong link between R&D and productivity. While estimates of the impact of R&D spending on productivity growth vary widely across studies, an empirical consensus has emerged that R&D has productivity-enhancing effects (see e.g., Congressional Budget Office, 2005 for a review). While the private rate of return on R&D has been found to be of about the same size or slightly larger than that for conventional investments, the overall rate of return on R&D for society is much higher, of which private returns account for only a quarter and social returns account for the rest as spillover effects of R&D go well beyond the industry in which it takes place (U.S. Bureau of Labor Statistics, 2007). In this context, public support for R&D investment and innovation is helpful as substantial positive externalities generated by spillover effects of company or industrial R&D activities can lead to socially sub-optimal R&D investment in the absence of government intervention (Westmore, 2013).

C. Data, Empirical Specification and Results

11. In this section, we quantify the productivity gains from relaxing product market regulation and enhancing innovation. While the relationships between product market reforms or innovation and productivity have been widely explored in a cross-country context, to our knowledge they have not recently been investigated for Finland specifically. In addition, our contribution is to utilize the rich information available in new firm-level data.

Firm-Level Data

12. A large firm-level dataset is employed to estimate the productivity payoffs of reforms. The Orbis database compiled by Bureau Van Dijk provides data at the firm level on value added, number of employees, and fixed assets, among other variables, allowing for the computation of firm-level productivity and other indicators of firm performance. We focus on firms in the nonfinancial private sector, and apply a comprehensive procedure to prepare the data for analysis, including removing firms with missing key information or extreme values of financial ratios.¹⁴ The final sample consists of about 78,000 firm-year observations for the period between 2005 and 2014 (see Appendix I).

13. Three different measures of firm productivity are calculated for the analysis. We compute both labor productivity (i.e., real value added per worker) and two measures of total factor productivity (TFP) for each firm using two different methodologies (Box 1). The two measures of firm TFP and labor productivity are highly and significantly correlated with each other, with simple correlations ranging from 0.58 to 0.64.

¹⁴ See Appendix I for a description of the sample and the procedure we implement to prepare the Orbis data for analysis.

Box 1. Measures of Firm-Level TFP

Two measures of firm TFP are computed for the analysis. First, a production function of the following form is estimated using OLS for each 1-digit NACE sector:

$$\ln Y_{ist} = \beta_s + \alpha_s^L \ln L_{ist} + \alpha_s^K \ln K_{ist} + \gamma_t + \varepsilon_{ist}$$

Year fixed effects are included to capture time-varying common shocks to all sectors. We obtain the labor and capital shares from the regressions (instead of simply assuming constant returns to scale), and use them to compute firm TFP as the Solow residual from a Cobb-Douglas production function with labor and capital as factors of production in the following form:

$$A_{ist} = Y_{ist} / [L_{ist}^{\alpha_s^L} K_{ist}^{\alpha_s^K}]$$

Where A_{ist} denotes TFP of firm i in sector s in year t , Y_{ist} is real value added, L_{ist} is the number of employees, K_{ist} is the firm's value of real fixed assets, and α_s^L and α_s^K denote labor and capital shares in sector s , respectively.

Second, we estimate the same production function but using the Levinsohn-Petrin (LP) methodology of instrumenting for the unobserved productivity shock (Levinsohn and Petrin, 2003). The idea is that more productive firms tend to hire more inputs, thus rendering input use correlated with productivity and causing the OLS coefficients to be inconsistent and biased. In line with the literature, we use as instrument the firm's working capital (defined as the difference between current assets and current liabilities), in the absence of good data on intermediate inputs.

Impact of Product Market Regulation on Firm Productivity

14. We measure the burden from PMR on all sectors in the Finnish economy using input-output linkages between regulated and downstream sectors. As a measure of regulation, we use the OECD's indicators for seven network sectors, retail and professional services. While these OECD indicators are not perfect measures of the state of regulation in individual countries, they provide a useful cross-country perspective and are arguably the best available measure for international comparisons of regulation in network sectors and retail trade. Regulation in those industries can affect firms in other sectors of the economy (i.e. the downstream sectors) through their use of upstream inputs. For example, a manufacturer who relies more extensively on the use of railway and postal services would bear a heavier burden from regulation in the railway and postal services sectors, either through paying higher prices or enduring a lack or sub-optimal quality of services. We call this indirect burden from regulation *upstream PMR* and measure it by combining the PMR indicator with the intensity of upstream input usage calculated from Finland's input-output table for the year 2013 (Box 2).

Box 2. Measuring Indirect Regulatory Burdens

The OECD indicators of PMR are used to measure regulatory provisions in seven network sectors, retail trade and professional services covered in the analysis over the sample period. The seven network sectors include air transport, electricity, gas, post, rail, road transport, and telecom, and professional services comprise of accounting, legal, architect, and engineering. The evaluation of the network sector-specific PMRs follows a bottom-up approach, aggregating data on entry regulation, public ownership, vertical integration, market structure, and price controls. Sector regulation of retail trade is assessed by compiling evaluations of six dimensions, i.e. entry regulation, restrictions on shop size, protection of existing firms, regulation of shop opening hours, price controls, and promotions or discounts. Similarly, professional services regulation is examined in two main areas of entry and conduct regulation. The scale of the PMR indicators ranges from 0 to 6, with higher values indicating more regulation. The indicators are provided on a yearly basis for network industries but they are only available every five years in 2003, 2008, and 2013 for retail trade.

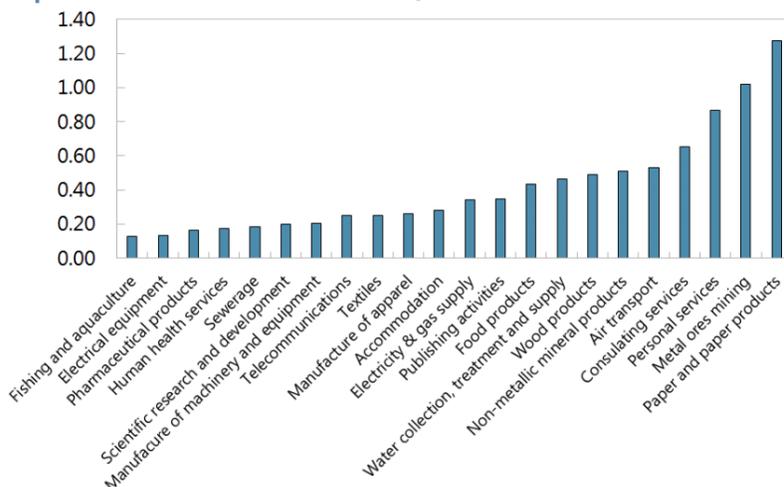
From the Finnish input-output table for 2013, we extract information on the use of inputs for each of the NACE Revision 2 sectors as well as their output. The variation in input usage across industries called input intensity allows us to extend the regulatory burden on network sectors, retail trade, and professional services to the entire economy, thereby capturing the indirect regulatory burden from upstream regulated sectors on all firms. Using both the PMR indicators and input intensities, we follow Bourles and others (2013) to measure the indirect regulatory burden from regulation in upstream industries on downstream sectors. More specifically, we aggregate PMRs and input intensities (from upstream regulated sectors) for each downstream two-digit level sector as follows:

$$Upstream\ PMR_{dt} = \sum_{u=1}^n PMR_{ut} * Intensity_{du}$$

PMR_{ut} is the direct regulatory burden for regulated sector u at time t , and $Intensity_{du}$ refers to sector-specific input intensities of downstream sector d from upstream regulated sector u , measured as the units of regulated product u that are needed to produce one unit of final output in sector d . Thus, $UpstreamPMR_{dt}$ measures the indirect regulatory burden that the downstream sector d is subject to at time t , calculated as the weighted average of the direct regulatory burden in n regulated sectors and the sector-specific input intensities. The text figure below

illustrates the level of *upstream PMR* from the seven network sectors, retail trade, and professional services for selected two-digit-level downstream sectors in Finnish economy. With varying input dependency on product in regulated sectors, the downstream sectors are subject to upstream product market regulation from the seven network sectors, retail trade, and professional services that ranges from 0.05 to 1.27.

Upstream PMR for selected sectors 1/



Sources: Statistics Finland, OECD and Fund staff calculation.

1/ Upstream PMR takes into account regulations in the seven network industries, retail trade, and professional services.

15. The following empirical specification is used to test the hypothesis that upstream PMR has negative impacts on firm productivity:

$$Y_{ist} = \beta * UpstreamPMR_{st} + \gamma' X_{ist} + Z_t + D_s + D_r + \varepsilon_{ist}$$

Where Y_{ist} refers to the natural logarithm of firm productivity (either labor productivity or TFP), $UpstreamPMR_{st}$ denotes the indicator of upstream regulation in the downstream sector s , X_{ist} is a vector of firm-level control variables (e.g., leverage defined as the ratio of total debt to total assets, company size and age¹⁵), Z_t is the output gap to capture the economy's cyclical condition, and D_s and D_r are sector and region fixed effects. The β coefficient is expected to be negative, that is, more restrictive regulation is likely to correlate with lower firm productivity. We run the regressions by two firm size classes (i.e. small and medium (SME), and large) to allow for the impact of deregulation to vary across firms of different sizes and avoid overall results being driven by one or several large companies (e.g., Nokia).¹⁶

16. Estimation results suggest a significant role of regulation in network and retail sectors in shaping developments in firm productivity in downstream sectors. The results point to a negative and significant correlation between *upstream PMR* and firm productivity in downstream sectors, and are robust to multiple specifications and alternative productivity measures (Tables 1).¹⁷ Firms operating in sectors that rely more heavily on inputs from the regulated sectors are likely to be less productive than others. Our results also suggest that PMR affects productivity in SMEs and large firms disproportionately. For network PMR, the impact on downstream productivity is more pronounced for large firms than for SMEs. For example, a one standard deviation reduction in *network PMR* is associated with higher TFP by 2.1 percent for large firms, but only by 1.1 percent for SMEs.¹⁸ Meanwhile, the economic significance of the effect of regulation in retail trade on productivity is higher than for network regulation. However, the impact is only significant for SMEs, with a one standard deviation reduction in *retail PMR* implying about 10 percent higher TFP, whereas there is no evidence that large firms are affected. This possibly reflects the reliance of large firms on wholesale market instead of retail trade. Finally, it is worth noting that the size of the coefficients is similar for results based on different measures of productivity, but the explanatory power of the regressions is higher using TFPs than labor productivity as dependent variable.

¹⁵ We classify firms across four age classes: start-ups, young, mature, and well established (Appendix I).

¹⁶ We classify firms into two major size classes: *SME* = 250 employees or fewer, and *Large* = more than 250. In regressions for SMEs, we further control for firm size by including firm size class dummies, defined as *Micro* = 10 employees or fewer, *Small* = 11 to 50 employees, *Medium* = 51 to 250 employees.

¹⁷ The definitions and summary statistics for the variables entering the regressions are reported in Appendix II. Tables 1 reports the results for labor productivity, OLS measure of TFP, and the Levinsohn-Petrin measure of TFP (our preferred measure), respectively. In addition to regressions by firm size class, we also try alternative specifications of controlling for the logarithm of total assets; the results are qualitatively unchanged.

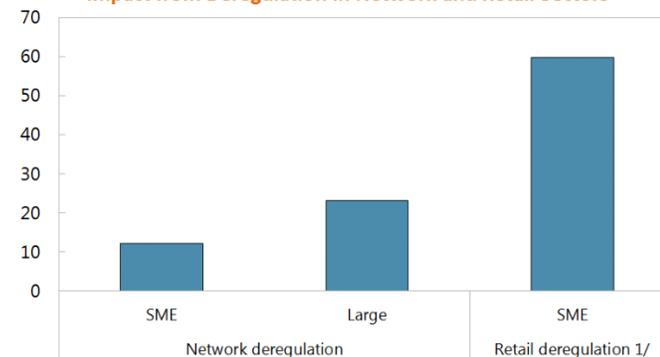
¹⁸ To calculate the average effect on firm productivity from reducing *Upstream PMR*, we keep input use intensity across all sectors constant at the average level.

Variables	Labor Productivity		TFP (OLS method)		TFP (LP method)	
	SME	Large	SME	Large	SME	Large
<i>Upstream PMR - network</i>	-0.020 [0.003]***	-0.041 [0.007]***	-0.017 [0.003]***	-0.038 [0.008]***	-0.020 [0.003]***	-0.038 [0.007]***
<i>Upstream PMR - retail</i>	-0.826 [0.421]**	2.010 [1.656]	-0.750 [0.392]*	2.185 [1.581]	-0.889 [0.412]**	1.426 [1.631]
Observations	74,258	3,013	73,959	3,009	73,959	3,009
R-squared	0.237	0.646	0.594	0.729	0.731	0.867

Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1.

17. Closing half of the gap between PMR in Finland and the European OECD frontier would generate sizable productivity gains. In a stylized policy experiment, we use the estimated coefficients from Table 1 to calculate the average change in steady-state firm TFP from reducing Finland's *upstream PMR* indicator such that the distance between Finland and the frontier is narrowed by half. Our calculations suggest that such deregulation in all seven network sectors would increase average firm TFP in Finland by over 10 percent, with greater benefits accruing to large firms relative to SMEs. Since the regulatory gaps between Finland and the best practice are particularly large in the gas, postal services, railway, airline sectors, these industries present more scope for deregulation than others. In addition, given Finland's exceptionally large regulatory gap in retail sector, productivity gains from reducing regulation in the retail sector are even larger, at over 50 percent on average for SMEs.¹⁹

Impact of Closing Half of the PMR Gap between Finland and the Frontier on Average Firm TFP, by Size (Percent change)
Impact from Deregulation in Network and Retail Sectors



Sources: Fund staff estimates.
1/ Results not significant for large firms.

18. The estimated impact on productivity from deregulation is broadly in line those from similar studies (see e.g. Lanau and Topalova, 2016 for Italy; Geng, Ho and Turk, 2016a for Denmark and 2016b for Norway). The estimated coefficients of upstream network PMR for Finland are smaller than those for Denmark and Norway. This is because, while all three countries have similar variation in firms' productivity, Finland has much wider dispersion in network intensities across industries, thereby resulting in much more variability in upstream network PMR compared to Denmark and Norway. However, owing to Finland's larger average level of network intensity, the estimated impact

¹⁹ To put this into perspective, Finland's regulatory gap in the retail sector is double the size of that for Norway and Denmark, which are generally also viewed as having extensive restrictions on retail trade (Copenhagen Economics, 2013; Norway's Revised National Budget, 2016).

from one unit of deregulation in network sectors—which is the product of the estimated coefficient and network intensity—is broadly comparable for three countries. Hence, differences in the estimated total productivity gains from closing half of the regulation gap between Finland and, for instance, Denmark largely reflect differences in the size of the regulation gaps.

19. Nevertheless, the results should be interpreted with care. The results can only be indicative of potential productivity gains from deregulation for at least four reasons: (i) the impact may have been over- or under-estimated as firm productivity may also be affected by other reforms that may be implemented at or around the same time; (ii) the OECD’s PMR indicators—although widely used in the empirical literature—are only crude proxies for the state of regulation; (iii) some degree of regulation in certain sectors may be justified by other policy considerations or societal preferences, which arguably makes simply lowering regulation to the level of the “best practice” somewhat of a stylized policy experiment; and (iv) deregulation may be constrained by facts outside of the direct control of the country. For example, Finland has a derogation from the EU Gas Directive due to its isolated market, which in part constrained the deregulation of gas sector.²⁰

Impact of R&D Investment on Firm Productivity

20. To gauge the impact of R&D spending on productivity, we estimate an empirical model as follows:

$$Y_{ist} = \beta * RD_{st} + \gamma' X_{ist} + Z_t + D_s + D_r + \varepsilon_{ist}$$

where RD_{st} is the logarithm of R&D expenditure at the sector level from the OECD database, and Y_{ist} is the log of firm productivity (labor productivity or TFP) (other notations remain the same as in the previous section). This specification can be easily derived from a Cobb-Douglas production function with R&D capital as one of the factor inputs. The coefficient β gives the elasticity of firm productivity with respect to R&D investment. As R&D expenditure is measured at the sector level, this elasticity could be interpreted as also capturing the positive spillover effect of the R&D spending undertaken by other firms in the same sector.²¹

21. We find evidence that R&D investment has a positive effect on large firms’ productivity (Table 2). The elasticity of productivity with respect to R&D spending for large firms in Finland is estimated to be about 0.08. That is, a 10 percent increase in the sector’s R&D expenditure is associated with a 0.8 percent improvement in firm’s productivity.²² This magnitude is near the median of estimates in the literature – at about 0.10, and is comparable with findings from cross-country studies using a sample of non-G7 OECD countries (see Appendix III).²³ The productivity

²⁰ Finland has only one principal natural gas supplier and is connected only to the Russian gas network, and not to any networks in the EU.

²¹ The Orbis database also collects information on the firm’s R&D spending. However, this variable has many missing values and was therefore not used in the analysis.

²² Given that the spillover effect of R&D could reach beyond the sector in which it is invested, the overall returns of R&D, including both private and social returns, could be much larger than the estimated firm-level gains here.

²³ Depending on the sample and the methodology, estimates in the literature range from close to 0 to about 0.5.

elasticity for large firms is remarkably stable across different productivity measures. None of the estimated elasticities is statistically significant for SMEs, and this could be due to the industry-level measure of R&D spending not capturing the private returns for SMEs to the extent that the measure is dominated by large firms' spending.

Table 2. Effect of R&D Spending on Firm Productivity

Variables	Labor Productivity		TFP (OLS method)		TFP (LP method)	
	SME	Large	SME	Large	SME	Large
<i>R&D spending</i>	0.000 [0.012]	0.075 [0.029]***	0.005 [0.011]	0.077 [0.028]***	0.004 [0.011]	0.070 [0.028]**
Observations	53,698	2,444	53,550	2,441	53,550	2,441
R-squared	0.260	0.675	0.630	0.760	0.755	0.879

Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1.

D. Conclusion

22. There is scope for boosting Finland's productivity by deregulating product markets and raising R&D spending. The deterioration in Finnish productivity growth over the past decade has had important structural components—in particular the collapse of the ICT sector and the long-run decline in the wood and paper industry—that are difficult to reverse or offset. Moreover, Finland's well-developed policy and institutional framework implies that there are relatively few low-hanging fruits in terms of policy design. Nevertheless, our analysis points to the potential for productivity gains in the areas of product market regulation and research and innovation. In particular, removing the impediments to competition in product markets and raising R&D spending are found to associate with higher firm productivity. The results highlight the importance of further regulatory reforms and maintaining strong government support for R&D to foster a dynamic and productive private sector.

23. In this context, several new government initiatives are encouraging though more can be done. As part of the efforts to boost Finland's medium-term growth prospects, a recent government proposal to reduce the state holding limits for SOEs involving strategic interests, including companies in retail and network sectors, could set the stage for further privatization. The government is also considering relaxing store size limits and opening up the rail passenger transport market to competition during its term. In addition, a Transport Code is under discussion in the parliament to harmonize and simplify current regulations stipulated in the Public Transport Act, Taxi Transport Act, and the Act on Transport of Goods. The code, if passed, would entail a number of important deregulations, including removing entry barriers, zoning and price control in the taxi market, and simplifying licensing requirements for goods and public road transport. These tentative reform plans are promising, but need to be vigorously implemented. Also, further reform efforts are needed to deregulate other network sectors, and particularly the retail sector which is subject to relatively tight zoning and planning restrictions. To support innovation, recent cuts in public R&D

spending should be reverse and private sector R&D should be further incentivized— e.g., through well-designed R&D tax credits.

References

- Aghion P., N. Bloom, R. Blundell, R. Griffith, and P. Howitt, 2005, "Competition and Innovation: An Inverted-U Relationship," *The Quarterly Journal of Economics*, Vol. 120, No. 2, pp. 701-728.
- Aghion, P., and P. Howitt, 2005, "Appropriate Growth Policy: A Unifying Framework," 2005 Joseph Schumpeter Lecture, 20th Annual Congress of the European Economic Association, Amsterdam, August 25. Available via the Internet: <http://www.oecd.org/eco/growth/35912476.pdf>
- Arnold, J., B. Javorcik, Lipscomb, and A. Mattoo, 2011, "Does service liberalization benefit manufacturing firms? Evidence from the Czech Republic," *Journal of International Economics* 85(1). Available via the Internet: <http://www.sciencedirect.com/science/article/pii/S0022199611000523>
- Barone, G. and F. Cingano, 2011, "Service Regulation and Growth: Evidence from OECD Countries," *The Economic Journal* 121(555), 931–957. Available via the Internet: <http://onlinelibrary.wiley.com/doi/10.1111/j.1468-0297.2011.02433.x/abstract>
- Bourlès, R., G. Cette, J. Lopez, J. Mairesse, and G. Nicoletti, 2013, "Do product market regulations in upstream sectors curb productivity growth? Panel data evidence from OECD countries," *The Review of Economics and Statistics* 95(5). Available via the Internet: http://www.mitpressjournals.org/doi/abs/10.1162/REST_a_00338#.Vrjlm7IrKUK
- Correa-López, M. and R. Doménech, 2014, "Does anti-competitive service sector regulation harm exporters? Evidence from manufacturing firms in Spain," BBVA Research, Working Paper, N° 14/13, Spain. Available via the Internet: <https://www.bbva.com/wp-content/uploads/2014/06/WP-14-13.pdf>
- Congressional Budget Office, 2005, "R&D and Productivity Growth," Background Paper, June 2005.
- Copenhagen Economics, 2013, "Barriers to Productivity Growth in the Retail Sector," Background report prepared for the Danish Productivity Commission.
- Cornell University, INSEAD, and World Intellectual Property Organization, 2015, "The Global Innovation Index 2015: Effective Innovation Policies for Development," Fontainebleau, Ithaca, and Geneva. Available via the Internet: <https://www.globalinnovationindex.org/content/page/GII-Home/>
- European Commission, 2013, "Market Functioning in Network Industries, Electronic Communications, Energy and Transport," *European Economy Occasional Papers*, No. 129, Brussels.

- Finnish Government, 2015, Strategic Program of the Finnish Government, Helsinki.
- Forlani, E., 2012, "Competition in Services and Efficiency of Manufacturing Firms: Does 'Liberalization' Matter?" Katholieke Universiteit Leuven, LICOS Discussion Paper No. 311/2012. Available via the Internet: <http://feb.kuleuven.be/drc/licos/publications/dp/dp311.pdf>
- Geng, N., G. Ho, and R. Turk, 2016a, "Product Market Reform and Productivity in Denmark," IMF Selected Issues Papers, Chapter 4, IMF Country Report No. 16/185 (Washington). Available via the Internet: <https://www.imf.org/external/pubs/ft/scr/2016/cr16185.pdf>
- _____, 2016b, "A Firm-level Analysis of Productivity in Norway," IMF Selected Issues, Chapter 2, IMF Country Report No. 16/215 (Washington). Available via the Internet: <https://www.imf.org/external/pubs/ft/scr/2016/cr16215.pdf>
- International Monetary Fund (IMF), 2015, "Finland: Staff Report," IMF Country Report No. 15/311 (Washington). Available via the Internet: <https://www.imf.org/external/pubs/ft/scr/2015/cr15311.pdf>
- _____, 2016, Staff Note for the G20: A Guiding Framework for Structural Reforms, IMF Staff Guidance Note (Washington).
- Lanau, S. and P. Topalova, 2016, "Product Market Reforms and Firm Performance: Evidence from Italy," IMF WP 16/119, (Washington: International Monetary Fund).
- Makitalo, M., 2011, "Why Do Open Rail Freight Markets Fail to Attract Competition? Analysis on Finnish Transport Policy," *European Journal of Transport and Infrastructure Research*, Vol. 11, Issue 1.
- Ministry of Finance, 2015, "National Budget 2015."
- Organization for Economic Cooperation and Development (OECD), 1999, "OECD Economic Surveys: Finland 1999," (Paris).
- _____, 2003, "Reviews of Regulatory Reform – Finland. A New Consensus for Change" (Paris).
- _____, 2016, "OECD Economic Surveys: Finland 2016" (Paris).
- U.S. Bureau of Labor Statistics, 2007, "R&D and Productivity Growth: A Review of the Literature," BLS Working Paper 408, U.S. Bureau of Labor Statistics.
- Westmore, B., 2013, "R&D, Patenting and Growth: The Role of Public Policy," OECD Economics Department Working Paper, No. 1047, OECD Publishing, Paris.

Appendix I. Data Sample and Cleaning Procedure

Our sample includes all firms in Finland over 2005-2014 for which key variables of value added and number of employees are available. We retrieve data on all firm from the Orbis database provided by Bureau Van Dijk over 2005-2014, resulting in a total of 140,644 firm-year observations. Data at the unconsolidated level is considered and, where not available, we use consolidated firms' financial statements, to avoid double-counting of subsidiaries. The firms are distributed geographically across 19 regions, including Uusimaa, Finland Proper, Päijänne-Tavastia, Satakunta, Central Finland, Northern Ostrobothnia, Southern Ostrobothnia, Tavastia Proper, Lapland, Ostrobothnia, and Kymenlaakso.

A number of cleaning procedures were applied to the original sample. In line with the literature, we first drop all firms in the financial services industry (where high leverage is not an indication of distress and liquidity is held to meet regulatory requirements and not to undertake positive net present value investment projects) and in public administration and defense (Fama and French, 1992; Bates and others, 2009).²⁴ We also delete observations with negative values for current assets, fixed assets, total assets, leverage, shareholder funds, sales, and cost of employees and remove outliers by dropping the bottom and top 5 percent of the return on assets and return on equity. Our final sample includes 15,733 firms distributed across 16 major sectors of economic activity that employ close to 815,000 workers. The majority of firms belongs to wholesale and retail trade, followed by manufacturing, construction, professional services, and transportation and storage.

The majority of firms in Finland are very small privately-held companies. We use the number of employees to group firms in different size categories. Small and medium sized firms (SMEs) have less than 250 employees (97 percent of total), and the rest of firms (3 percent) are large establishments with more than 250 employees.²⁵ The overwhelming majority of firms (99.6 percent) are privately-held, suggesting that analyzing only listed firms is likely to provide an incomplete picture of economic activity in Finland, with over 99 percent of firms being active (not dissolved or in liquidation). We keep both active and inactive firms in our sample to capture the dynamics of the market in terms of not just entry but also exit.

Firms of different size have somewhat similar asset composition but different funding structure and profitability. In Finland, micro, small, and medium enterprises carry more liquidity on their balance sheet and they invest less in capital expenditures than the very large firms. As their size increases, companies generally rely more on debt than equity financing, but profitability declines with firm size. Finally, 4 percent of firms in our sample are start-ups (established less than 5 years ago), 30 percent are young (having between 5 and 15 years of operations), 53 percent are mature

²⁴ We also exclude companies in real estate due to their small representation in the sample.

²⁵ We break down SMEs further into three subgroups: micro firm employ less than 10 employees (52 percent of the sample), firms with employees less than 50 but more than 10 are labeled as small (36 percent of total), and medium companies employ between 50 and 250 employees (9 percent of total).

(between 15 and 35 years of age), and the remaining 13 percent have been on the market for more than 35 years.

Table 1.1. Firm Distribution, Value Added, and Employment across Sectors

Sector of Economic Activity	Number of firms	Value Added Share	Employment Share
A - Agriculture, forestry and fishing	210	0.6	0.7
B - Mining and quarrying	63	0.3	0.2
C - Manufacturing	2,785	40.3	40.3
D- Electricity, gas, steam and air cond.	198	5.7	1.2
E- Water supply; sewerage, waste managmt	109	1.2	1.5
F - Construction	2,340	6.0	5.4
G- Wholesale and retail trade; repair	3,691	15.8	16.2
H - Transportation and storage	1,236	4.7	5.0
I- Accommodation and food service activ.	529	1.3	2.3
J - Information and communication	885	5.2	4.0
M- Professional, scientific and technical	1,981	11.1	14.0
N- Administrative and support service	719	4.0	5.3
P - Education	161	0.8	1.0
Q- Human health and social work activit.	524	1.7	1.7
R - Arts, entertainment and recreation	192	0.3	0.4
S - Other service activities	110	0.3	0.4
<i>Total</i>	<i>15,733</i>	<i>100</i>	<i>100</i>

Table 1.2. Asset Composition, Funding Structure, and Profitability across Firm Size

Firm Size	Current Assets / Total Assets	Fixed Assets / Total Assets	Total Debt / Total Assets	Total Equity / Total Assets	Return on Assets	Return on Equity
SME	68.4	31.6	53.4	46.6	9.1	22.2
<i>Obs.</i>	<i>74,909</i>	<i>74,909</i>	<i>74,909</i>	<i>74,909</i>	<i>74,909</i>	<i>74,909</i>
Large	64.5	35.5	58.0	42.0	7.6	18.3
<i>Obs.</i>	<i>3,049</i>	<i>3,049</i>	<i>3,049</i>	<i>3,049</i>	<i>3,049</i>	<i>3,049</i>
All	68.2	31.8	53.7	46.3	9.0	22.0
<i>Obs.</i>	<i>77,958</i>	<i>77,958</i>	<i>77,958</i>	<i>77,958</i>	<i>77,958</i>	<i>77,958</i>

Appendix II. Variables Definition and Key Descriptive Statistics

Description and sources of all variables entering the regressions appear in Table 2.1.

Variable	Description	Source
<i>Labor Productivity</i>	Real value added per employee	Orbis and authors' calculations
<i>TFP - OLS</i>	OLS residual (Box 1)	Orbis and authors' calculations
<i>TFP - Levinsohn-Petrin</i>	Levinsohn-Petrin residual (Box 1)	Orbis and authors' calculations
<i>Upstream PMR - Network</i>	Upstream PMR: 7 Network industries	OECD, Statistics Finland, and authors' calculations
<i>Upstream PMR - Retail</i>	Upstream PMR: Retail trade	OECD, Statistics Finland, and authors' calculations
<i>Research & Development</i>	Research & Development	OECD and authors' calculations
<i>Firm Leverage</i>	Debt to total assets	Orbis and authors' calculations
<i>Output Gap</i>	GDP	WEO database

Summary statistics on the key variables entering the empirical specification appear in Table 2.2. Since we keep both active and inactive or dissolved firms, the latter typically may have negative equity and hence the debt-to-assets ratio that exceeds 100 percent.

Variable	Obs	Mean	Std. Dev.	Min	Max
<i>Labor Productivity</i>	77,399	10.9	0.7	5.0	16.4
<i>TFP - OLS</i>	77,094	9.6	0.8	3.5	15.1
<i>TFP - Levinsohn-Petrin</i>	77,094	10.8	1.1	-0.3	16.2
<i>Upstream PMR - Network</i>	77,830	22.5	18.4	3.4	131.2
<i>Upstream PMR - Retail</i>	77,830	1.8	0.9	0.1	5.0
<i>Research & Development</i>	69,501	18.2	1.1	12.8	21.8
<i>Firm Leverage</i>	77,958	52.5	24.8	0.0	112.3
<i>Output Gap</i>	77,958	0.0	3.4	-4.3	6.1

¹ *Labor Productivity*, *TFP*, and *R&D* variables are in logs; *PMR* variables are indices (0-6); *Upstream PMR*, *Firm Leverage*, and *Output Gap* variables are in percent.

Appendix III. Selected Estimates of the Elasticity of Private R&D from Literature

Table 3.1. Selected Estimates of the Elasticity of Private R&D from Literature

Study	R&D elasticity	Sample
Griliches (1980a)	0.03 - 0.07	39 U.S. manufacturing industries; 1959 to 1977
Griliches (1980b)	0.07-0.08	883 U.S. firms, 1957 to 1965
Nadiri (1980)	0.06 - 0.10	United States; 1949 to 1978
Griliches and Mairesse (1984)	0.09	133 U.S. firms; 1966 to 1977
Englander, Evenson, and Hanazaki (1988)	0.0 - 0.50	16 industries across six countries; 1970 to 1983
Mansfield (1988)	0.42	17 Japanese manufacturing industries
Hall and Mairesse (1995)	0.0 - 0.07	197 French firms; 1980 to 1987
Coe and Helpman (1995)	0.23	G7 countries; 1971 to 1990 1/
Coe and Helpman (1995)	0.08	Non-G7 OECD countries; 1971 to 1990
Commission (1995)	0.02	Australia; 1975 to 1991
Wang and Tsai (2003)	0.19	136 Taiwanese manufacturing firms; 1994 to 2000

1/ G7 includes Canada, France, Germany, Italy, Japan, the United Kingdom and USA.

Source: Congressional Budget Office (2005).