

Nordic Regional Report 2013 Cluster Consultation



NORDIC REGIONAL REPORT

2013 CLUSTER CONSULTATION

September 2013

Selected Issues

This paper on the Nordic Regional Report was prepared by a staff team of the International Monetary Fund as background documentation for discussion with the member countries. It is based on the information available at the time it was completed on July 31, 2013. The views expressed in this document are those of the staff team and do not necessarily reflect the views of the governments of Denmark, Finland, Norway, and Sweden or the Executive Board of the IMF.

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NORDIC REGIONAL REPORT

SELECTED ISSUES

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Approved By
European Department

Prepared By R. Agarwal, A. Aslam, A. Mordonu, K. Shirono
(all EUR), E. Cerutti (RES), and F. Vitek (SPR).

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I. NORDIC MODEL¹

The four Nordic countries share similar institutions and policies, with high income equality, high employment and low public debt. The countries have close economic and financial ties and face some common challenges and shared risks, such as large banking sectors and high household debt.

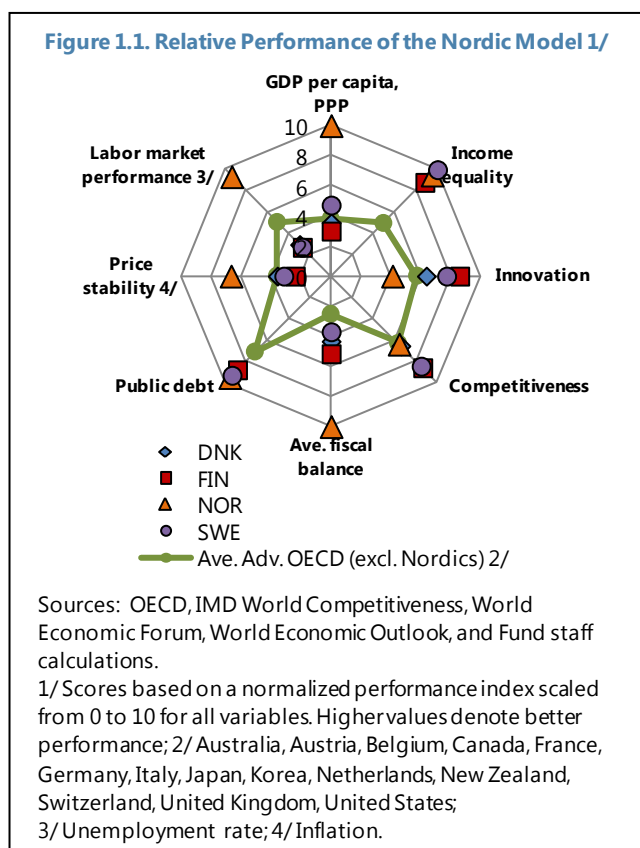
A. Key Features

1. The economic performance of the four continental Nordic economies (Denmark, Finland, Norway, and Sweden—the *Nordic-4*) stands out among advanced OECD economies

(see Figure 1.1).² They combine high income levels with very low levels of inequality, a performance underpinned by a very competitive and innovative business environment, and sound public finances. At about 40 percent of GDP, on average, gross government debt is very low, owing in large part to a history of very prudent pre-crisis deficit levels—another landmark for the Nordic model. At the same time, macroeconomic performance is good, with low rates of inflation and levels of unemployment around the average of their OECD peers.

2. Lessons learned from past crises led to important reforms and sound macroeconomic frameworks that served the *Nordic-4* well.

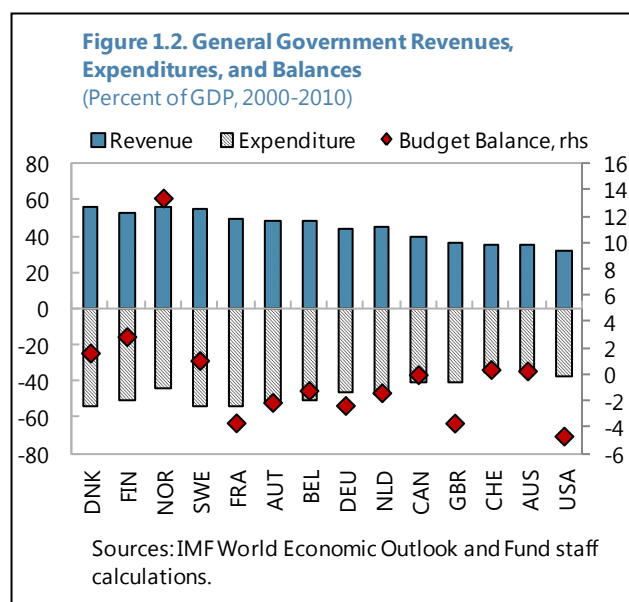
Finland, Norway, and Sweden suffered from large contractions in output and a surge in unemployment in the early 1990s as a consequence of severe banking crises. From surpluses, public finances shifted into large deficits. The collapse of the Soviet Union exacerbated the strains on the



¹ Prepared by Aurora Mordonu.

² Where possible, the chapter compares the Nordics to a set of advanced OECD countries including: Australia, Austria, Belgium, Canada, France, Germany, Italy, Japan, Korea, Netherlands, New Zealand, Switzerland, U.K., and U.S.

Finnish economy, while Denmark was spared a more severe crisis—in part because of earlier reform efforts. In response, the Nordics worked on strengthening their banking systems, rendered central banks independent and set clear monetary policy targets, restored fiscal discipline (see Figure 1.2), and enacted employment and pension reforms. Hence, when the current crisis hit, fiscal buffers accumulated before the crisis offered crucial fiscal space. Ultimately, the good performance anchored in the reforms of the 1980s and 1990s also help explain the emergence of the Nordics as “safe havens” during the crisis (see below).



3. While keeping fiscal buffers intact, the four economies operate large public sectors underpinning still-robust welfare states. The sizes of government are among the largest relative to other advanced OECD countries. A large degree of redistribution (via taxes and transfers) ensures strong and fair social outcomes.

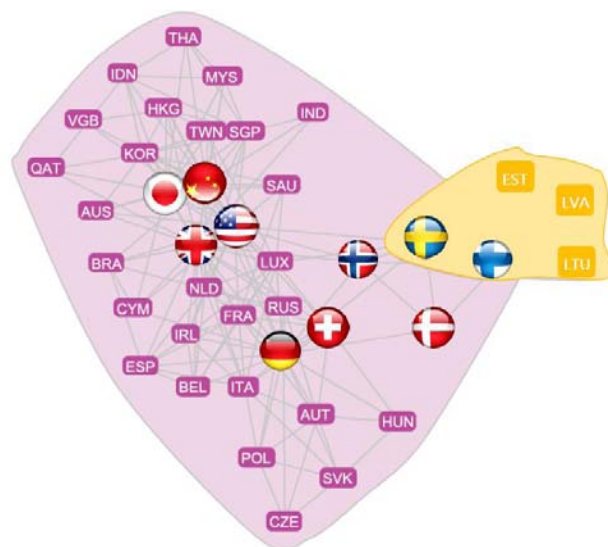
B. The Region in the Global Economy

4. The Nordics are tightly interconnected and open to global markets. Recent Fund work on interconnectedness based on network analysis identifies clusters of countries with close economic ties (see Box 1). This analysis confirms that the four Nordic economies are bound by close economic linkages, which are only partly due to geographical proximity. At the same time, however, they are deeply integrated into the global trade and financial network, leaving them susceptible to contagion from local, regional, and global shocks. The *Nordic-4* are also very open economies, with the sum of exports and imports to GDP at 62 and 70 percent for Norway and Sweden, respectively.

5. In addition to stressing strong intra-Nordic financial ties, cluster analysis also shows that Sweden and Finland act as gate keepers for the Baltics, which makes them an important intermediary for the propagation of shocks (see Chapter IV of Selected Issues). This result reflects strong banking ties and strong portfolio investment links. The fact that they belong to a cluster implies also that financial links are relatively much stronger than with the rest of the world, and that shocks can propagate more easily within the region.

Box 1.1. The Nordic-4 and the Global Network¹

The analysis is based on a network of bilateral trade (DOTS), portfolio asset (CPIS), FDI stocks (CDIS) and banking exposures (BIS locational and BIS consolidated data). A trade link between countries A and B is defined as the share of bilateral trade (exports plus imports) of the average of total trade in country A and total trade in country B. For example, the trade link in 2010 between the U.S. and U.K. would be the trade between the two (US\$97 billion) as a share of average total trade of the U.S. (US\$3.6 trillion) and the U.K. (US\$1 trillion), i.e., 5 percent. In the banking and portfolio investment networks, the links are defined as the higher of the two mutual bilateral exposures between countries A and B as shares of the average of total exposures of country A and of country B. A common algorithm (Palla et al., 2005) identifies groups of mutually interconnected countries.² Through their common members, these small groups are joined—like elements of an interlocking chain—into larger clusters. Some clusters overlap and have common members (“gatekeepers”). Gatekeepers have the potential to transmit shocks from one cluster to another. The more extensive a country’s trade and financial links (i.e., the greater its centrality), the closer it is positioned towards the center.



Shock propagation. One way of illustrating the mapped linkages is to track shock propagation if policy buffers are not used (as in Chapter II of the 2012 Spillover Report). Three to four scenarios are considered for each of the three networks: shocks originating in the U.S., in large Euro Area countries, and in other important partner countries of the Nordics (depending on the network). Whether the source country of the initial shock passes it on depends on the strength of its links to its counterparties: the stronger each link, the greater the probability that it will transmit the shock.

The shock propagation model confirms the deep integration of the Nordics into the global trade and financial network.

- In the trade and portfolio debt and equity investment networks, especially, the Nordics are among the first countries to be affected by a shock in their partner countries.
- In the banking network, global shocks would only reach the Nordics after first travelling through a more immediately exposed set of countries.

In the trade network, shocks in all scenarios are transmitted to all Nordics simultaneously. In contrast, the number of steps in which shocks in portfolio assets or banking exposures affect the Nordics vary depending on the source of the shock.

¹ Prepared by Franziska Ohnsorge.

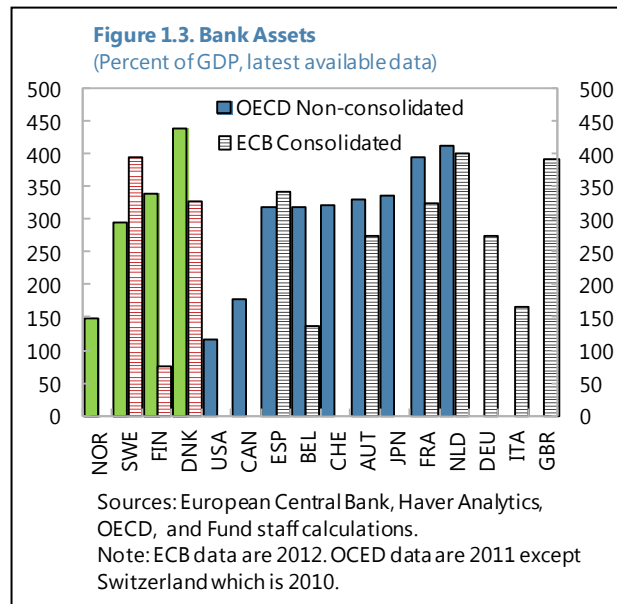
² Palla, Gergély, Imre Derényi, Illes Farkas, and Tamás Vicsek (2005), “Uncovering the overlapping community structure of complex networks in nature and society,” *Nature* 435, pp. 814–818.

6. The fact that all of the *Nordic-4* became “safe havens” during the crisis both illustrates and reinforces their ties to global financial markets. Since the beginning of the euro area crisis, whereas spreads of other advanced economies including some core euro area countries have increased substantially, Nordic spreads to U.S. interest rates have declined. Another way to look at their co-movement is the 10-year bond yield correlation. On this metric, the correlation increased substantially for Denmark and Finland, but Norway and Sweden made the largest leap to “safe haven” status, given initial positions. The region’s relative macroeconomic stability and history of fiscal prudence provides a strong shield for its sovereigns’ credit ratings (all of the Nordics are rated triple-A). That said, the fact that the region seems to present a common “prospectus” to investors also entails risks. A sudden change in the perception of any one of the *Nordic-4* could lead to an excessive reversal of capital flows beyond the normalization of market conditions for the entire region, in spite of possible differences in fundamentals or policies.

C. A Large Financial Sector

7. The *Nordic-4* are exposed to vulnerabilities coming from close regional financial linkages as well as the size of their financial sectors.

Not only are financial ties strong between the Nordics, but their banking sectors are also large with respect to GDP, implying large possible contingent liabilities for the sovereigns. The banking sectors in Sweden and Denmark hold financial assets worth three to four times of GDP (on a consolidated basis)—which places them ahead of most of their OECD comparators with the exception of the U.K. and The Netherlands. On a nonconsolidated basis, Finland’s banking sector assets are almost three and a half times the size of GDP (see Figure 1.3).¹ The banking sector is somewhat smaller in Norway.

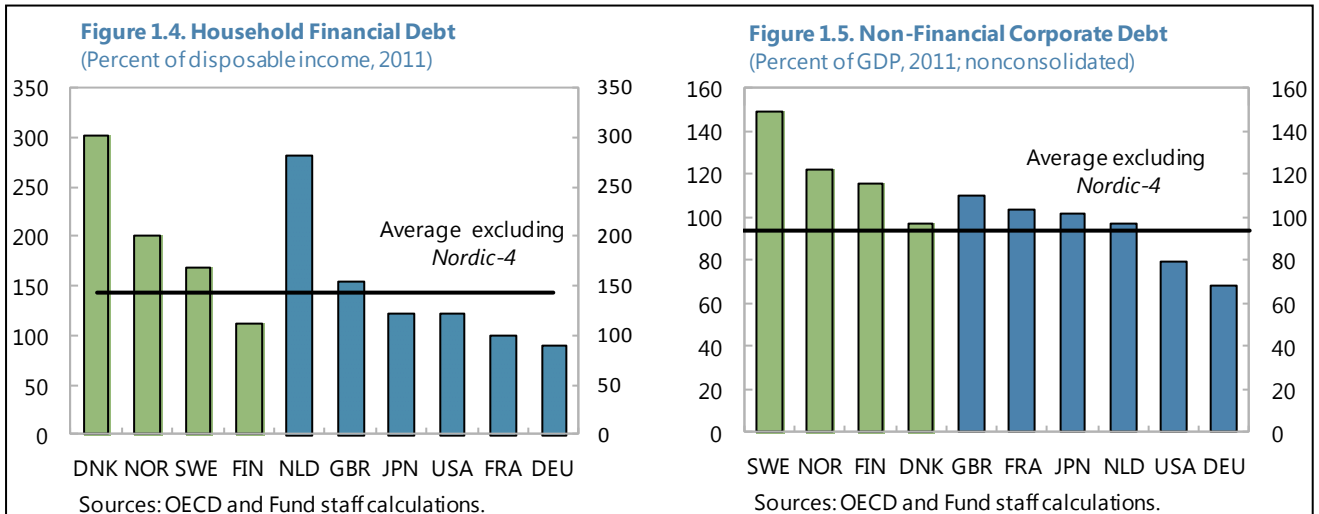


8. The large Nordic banking systems support relatively high levels of private sector debt.

Denmark’s household debt-to-disposable income is twice the average of six of its OECD peers (see Figure 1.4). Households are also highly leveraged in Sweden and Norway, although to a lesser extent. Turning to nonfinancial corporations, Sweden stands out, while debt ratios in Norway and Finland are also still above average (see Figure 1.5). A high private sector debt overhang adds to vulnerabilities stemming from the banking system. While households have assets such as real estate

¹ The data used come from the ECB Statistics on Consolidated Banking Data, Domestic banking groups and stand alone banks, foreign (EU and non-EU) controlled subsidiaries and foreign (EU and non-EU) controlled branches. The OECD dataset provides somewhat different data (nonconsolidated assets) for other monetary financial institutions, ESA S.122.

and pension fund holdings, these are less liquid and subject to valuation effects. In the event of house price declines, deleveraging pressures could accelerate, potentially setting in motion a negative feedback loop with the banking sector. Similarly, high private sector debt can constrain corporations' balance sheets with the potential to slow down growth and generate another adverse feedback loop with the banking sector (see Chapter II of Selected Issues).



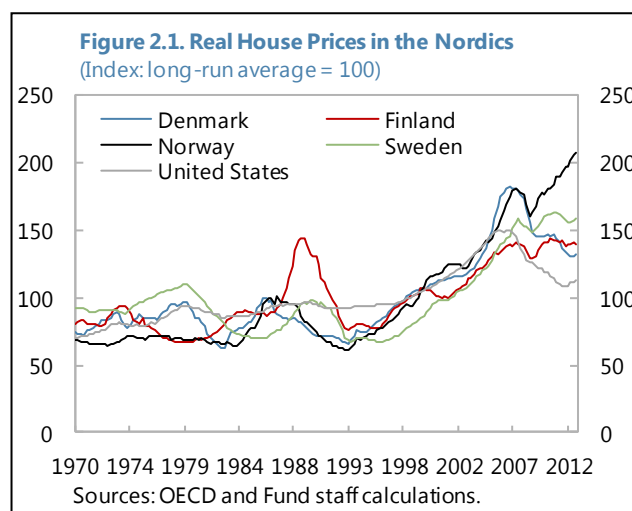
II. HOUSE PRICES AND HOUSEHOLD DEBT¹

This chapter examines common challenges facing the Nordic-4 from recent house price appreciation. Estimates suggest house prices could be overvalued to varying degrees and that a house price correction could impact consumption, investment, and growth, both directly and through negative repercussions for the financial sector given the high level of household debt. Private assets may be ample in the aggregate but most are illiquid (e.g., housing wealth and pension accounts). Also, net worth is not evenly distributed across households and some (e.g., young families) may be particularly exposed to shocks.

A. Background

1. House prices in the Nordic-4 rose in tandem from the mid-1990s until the recent peaks in 2007 but diverged afterwards.

House prices increased by more than 120 percent on average in the Nordic countries between 1995 and 2007 (see Figure 2.1). Since 2007 peaks, house price co-movements seem to have dissipated. The real house price in Norway increased by more than 10 percent relative to the 2007 peak level, while house prices fell by close to 30 percent in Denmark. In Finland and Sweden, house prices have remained broadly constant around 2007 levels.

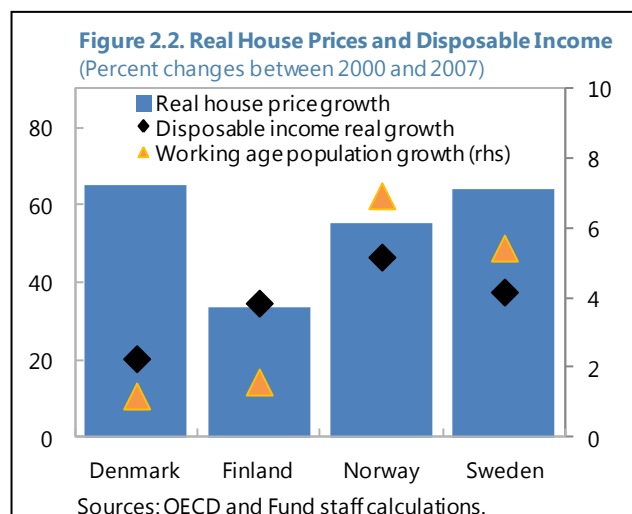


2. House price developments in the Nordic-4 pose a risk to broader macroeconomic stability in the context of strained household balance sheets. High levels of household debt are the prime concern, and these increased by more than 60 percentage points of disposable income between 2000 and 2011 on average in the Nordics. The pace of debt accumulation was particularly fast in Denmark—which has already experienced a housing bust—with household debt levels reaching roughly 300 percent of disposable income, among the highest in the OECD.

¹ Prepared by Ruchir Agarwal, Eugenio Cerutti, and Kazuko Shirono.

B. House Price Valuation Gaps

3. Changing fundamentals seem to explain only part of the house price increase. On the demand side, household disposable income rose at the speed of house prices in Finland and Norway during 2000–07, but prices clearly outpaced income in Sweden and Denmark (see Figure 2.2). In contrast, the growth of the working age population seems correlated with house price dynamics in Norway and Sweden but this holds to a lesser degree in Finland and Denmark. On the supply side, demand for housing outstripped supply in some countries, particularly in urban areas, due to various constraints such as strict planning and zoning regulations, lengthy processes for building permits, and highly regulated rental markets (see Box 2.1). At the same time, the increasingly liberal use of interest-only and flexible-rate loans since the early 2000s contributed to higher housing demand and prices—in particular in Denmark.²



4. To what extent is housing reasonably valued now? We use three measures to obtain a range of valuation gaps for the level of house prices in 2012 using data for OECD countries: (i) a time-series model; (ii) deviations from a long-run price-to-income ratio; and (iii) deviations from a long-run price-to-rent ratio.

- *Time Series Model:* A time-series model, which regresses growth in house prices on price-to-income ratio growth, construction costs, credit growth, changes in income per capita, share prices, the proportion of working age population, and the level of short- and long-term interest rates, is used to estimate “fair value.”³ The difference between the fair value and the latest actual is an estimate of over- or undervaluation. Five base years (1997–2001) are considered, and an average of the five is used to help ensure a robust estimate.
- *Deviation from long-run price-to-income/price-to-rent ratio:* The price-to-income and price-to-rent ratios in 2013:Q1 (or latest available period) are used to analyze the deviation of this measure from the long-term average of the series. The long-run average is computed using the entire sample period from 1970:Q1 to 2013:Q1.

² Denmark introduced deferred-amortization loans in 2003.

³ This is based on the approach used in the IMF’s Vulnerability Exercise for Advanced Economies (VEA) with estimates based on data for 22 OECD countries.

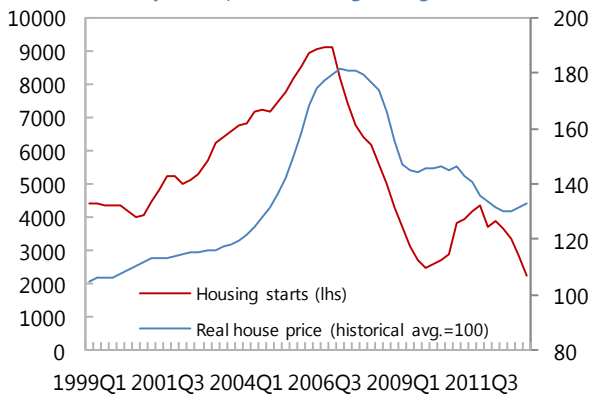
Box 2.1. Supply Side Constraints

Supply side conditions of housing markets vary across Nordics countries, and these differences partly explain house price developments since 2007.

- In Denmark, house price increases triggered a construction boom during the early 2000s. While relieving possible supply side constraints, the surge in construction activity also added to income growth and, thereby, to house price pressures from the demand side. When the crisis hit, both the slowdown and the housing glut amplified the downward price movement in the real estate market. In Finland, house price increases were milder than its regional neighbor. Housing starts were relatively stable despite rising house prices during 2000-2007.

Denmark: Housing Starts

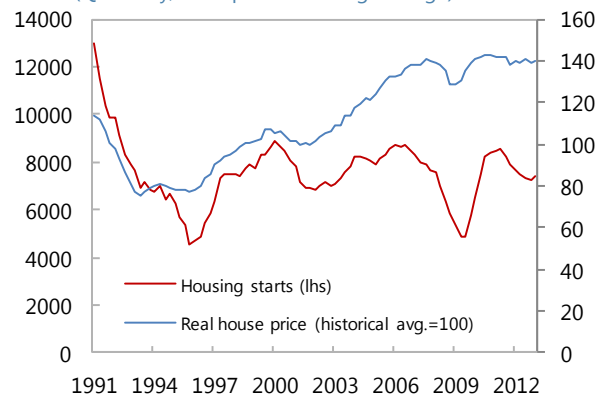
(Quarterly, four-quarter moving average)



Sources: Statistics Denmark and Fund staff calculations.

Finland: Housing Starts

(Quarterly, four-quarter moving average)

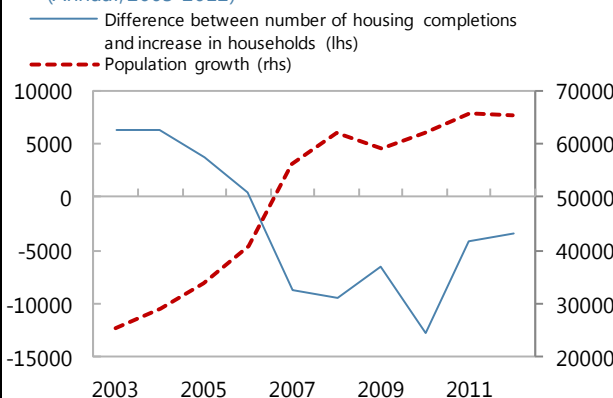


Sources: Statistics Finland and Fund staff calculations.

- The elasticity of housing supply has been limited in Norway and Sweden, largely due to strict regulations and lengthy processes for obtaining permits. As a result, the number of housing completions has been lagging population growth, including from immigration. These supply side constraints tend to support high house prices.

Norway: Housing Completions and Population Growth

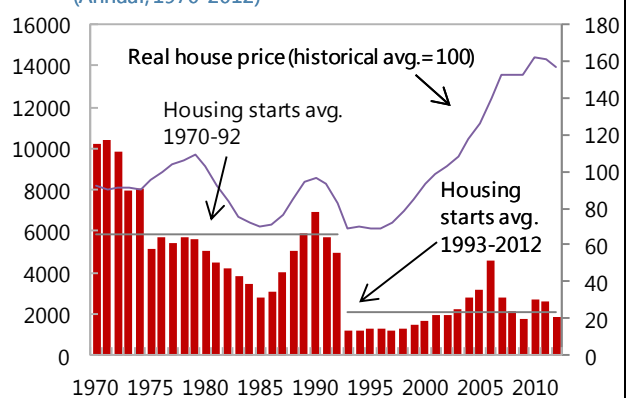
(Annual, 2003-2012)



Sources: Norqes Bank and Fund staff calculations.

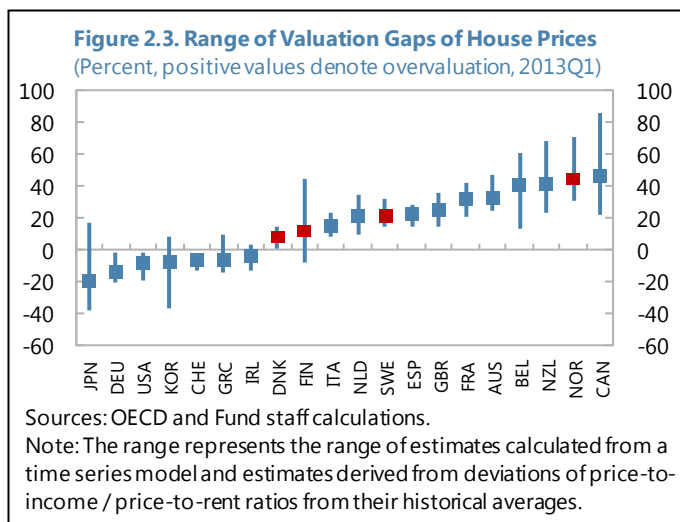
Sweden: Housing Starts

(Annual, 1970-2012)



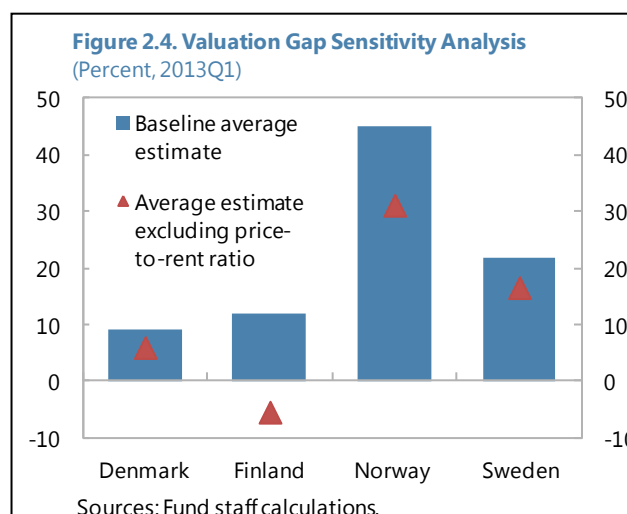
Sources: Statistics Sweden and Fund staff calculations.

5. The estimates suggest house prices are overvalued in the *Nordic-4*, but the extent of overvaluation varies (see Figure 2.3). The chart shows both the range and the mean of house price gaps based on the three different measures discussed above. The average estimate of the valuation gap for Norway is just over 40 percent while the estimated valuation gap is less than 10 percent in Denmark. Average estimates for Finland and Sweden suggest that house prices are moderately overvalued, by 12 and 22 percent, respectively.



6. A caveat for this approach is that the price-to-rent ratio may overestimate house price valuation gaps. Rental markets are highly regulated in some of the *Nordic-4*, and rent controls may limit fluctuations in rent. Measured rent series may also not fully capture actual changes in rent if rental survey used to measure rental prices covers only part of new leases (rent is likely to change at the time of a new lease). In such cases, the price-to-rent ratio is likely to overstate house price valuation gaps because rent will not adjust even when housing demand is rising and pushing up house prices.

7. Robustness checks show that these estimates are sensitive to the choice of measures, but the overall picture does not change substantially. An alternative average measure was calculated by excluding the price-to-rent ratio from the baseline estimate to take account of the possibility of rigidity in rental prices (see Figure 2.4). Once the price-to-rent ratio is excluded, average valuation gaps become lower for all four countries than in the baseline estimate reported above. The impact of the price-to-rent ratio is most pronounced in Finland, where the level of social housing provision is high. For Norway, the average estimate of overvaluation comes down to 30 percent, but this does not change the conclusion from the baseline estimate that house prices in Norway are likely to be more overvalued than others. Average estimates for Sweden and Denmark also become smaller without the price-to-rent ratio, but the impact is relatively moderate.



C. Assessing Vulnerabilities: Possible Impact of House Price Corrections

Transmission channels

8. House price corrections could have a strong impact on the economy through several channels:

- **Private consumption.** Declining house prices generally reduce private consumption through their negative impact on household wealth and access to finance—the latter because household borrowing capacity depends on the value of their collateral and real estate is generally the main form of collateral. Further, declining house prices may depress consumer confidence and promote greater risk aversion, depressing consumption further.
- **Private investment.** A decline in property prices can impact investment both through lower access to finance (due to lower value of collateral) and the reduced attractiveness of investment in new housing for home builders and potential buyers.
- **Government revenue.** A decline in house prices generally reduces housing-related fiscal revenue (e.g., property taxes and construction-related income taxes) which can constrain government spending for entities subject to balanced-budget or other fiscal rules.
- **Bank lending.** Disruptions in funding and balance sheet effects will reduce banks' ability to lend. Declines in house prices are often linked to higher bank losses and declines in the quality of their collateral—triggering rollover problems and funding/liquidity pressures, and banks with concentrated mortgage exposures might see their funding costs rise more sharply. The capacity of the banking sector to absorb house-price related losses is important since the literature suggests (see Claessens et al., 2008) that recessions in advanced economies that coincide with house price busts and credit crunches tend to be longer and deeper.⁴ On the other hand, recent FSAPs for the Nordics (Denmark 2007 and Sweden 2011) suggest that bank capital buffers would be sufficient to deal with the direct impact of lower house prices through credit losses.⁵ Also, a recent study conducted by Sveriges Riksbank find that a fall in house prices is not expected to seriously affect financial stability through credit losses in Sweden, even though funding problems would have the potential to create more serious difficulties.⁶

⁴ Claessens, Stijn, M. Ayhan Kose, Marco E. Terrones, 2008, "What Happens During Recessions, Crunches, and Busts?" IMF Working Paper 08/274.

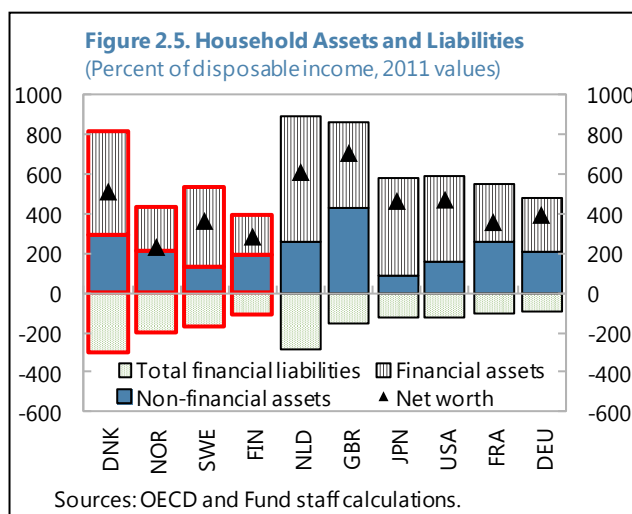
⁵ The precise assumptions used in the FSAP are confidential and not available to the NRR team. However, aggregate estimates suggest that Nordic banking systems would currently have sufficient buffers to absorb the potential increase in NPLs triggered by a full correction of our estimated house price misalignment. These calculations are based on banks' current capital buffers, standard GDP-to-NPL elasticities, and the largest estimated loss-given default figures used in the Swedish 2011 FSAP, but they do not include the potential impact of large increases in banks' funding costs that could trigger additional losses if these increases cannot be passed through to borrowers.

⁶ "The Riksbank's inquiry into the risks in the Swedish housing market," Sveriges Riksbank, 2011.

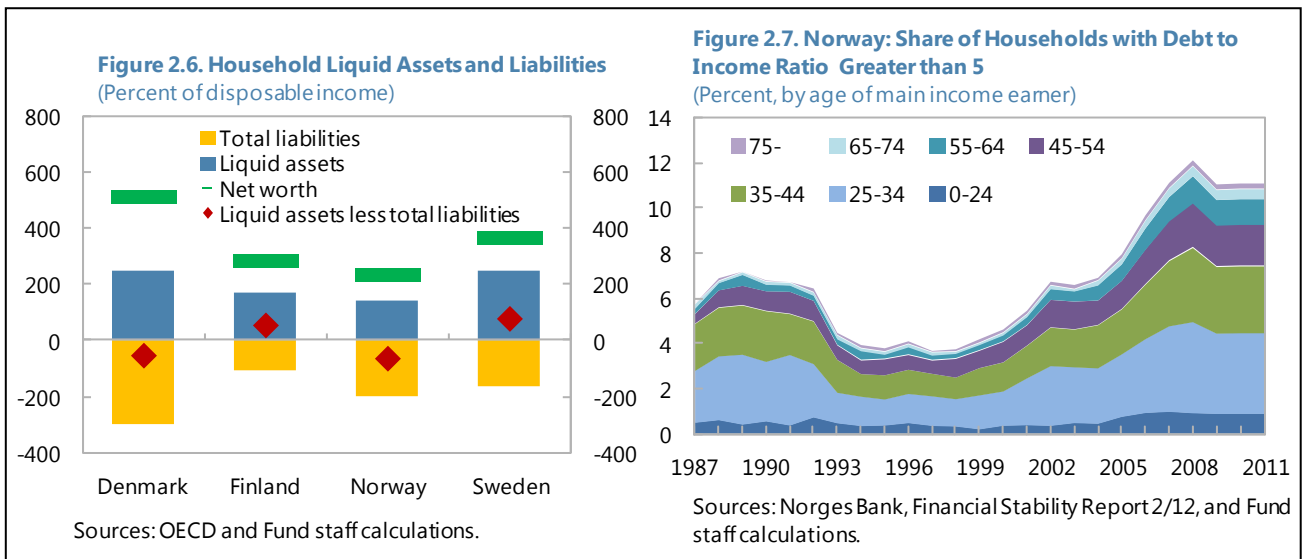
9. These channels do not work in isolation and can amplify one another generating feedback loops. For example, wealth effects from a fall in house prices can lower consumption and investment, and these together will amplify the fall in aggregate demand. The associated increase in unemployment would reduce demand further. And the deterioration both in asset quality (house prices) and borrowers’ ability to service debts will weaken bank balance sheets and, especially if associated with funding complications, reduce their ability to extend credit.

10. On balance, there is reason for prudence given the recent experience in other advanced European countries and ongoing changes in Nordic mortgage markets. Mortgage lending in Nordic countries has historically exhibited both low default rates and low loss given default (LGD) rates. Most loans are for financing primary residences, and they are subject to full recourse from lenders. Moreover, a generous system of social benefits and high and rising house prices in most *Nordic-4* have helped to insulate households from shocks. However, continued low default and loss rates cannot be taken for granted. In particular, banks’ heavy dependence on foreign or short-term wholesale funding makes them vulnerable to sudden changes in funding markets and house price corrections and these could trigger additional losses if these higher funding costs materialize. The Riksbank (2011) reports that house price corrections are associated with an increase in spread over swap for covered bonds issued in euro during the recent financial crisis (2007–10). The same study also shows that the cost of issuing covered bonds could rise even without a fall in house prices if risks in financial markets elsewhere increase. Given recent increases in the use of covered bonds, the funding costs could also be driven up by banks’ needs to increase overcollateralization should the decline in house prices substantially raise loan-to-value ratios of existing mortgages.

11. Household gross debt is high in the *Nordic-4* and household balance sheet constraints can also interact with house price changes to affect the economy. High gross debt itself may not necessarily pose problems if gross assets are sufficiently large. Indeed, household total assets are higher than gross liabilities in the *Nordic-4*. However, household assets as a share of disposable income are not as high in most *Nordic-4* (see Figure 2.5) as in many other advanced economies and household debt in Denmark is among the highest in the OECD.



12. A large share of household assets in the Nordics are illiquid, subject to price risk, or both. Nonfinancial assets consist largely of housing—which has diminishing value as a buffer in the event of house price declines—and a large share of financial assets are in pension accounts which are not readily available for other uses. If housing and pension/insurance assets are excluded, net liquid assets as a share of disposable income are negative in Denmark and Norway and low in Finland and Sweden (see Figure 2.6). Also, household assets and debt may not be distributed symmetrically and debt levels have been rising particularly for younger households (see Figure 2.7 and Box 2.2).



Possible impact

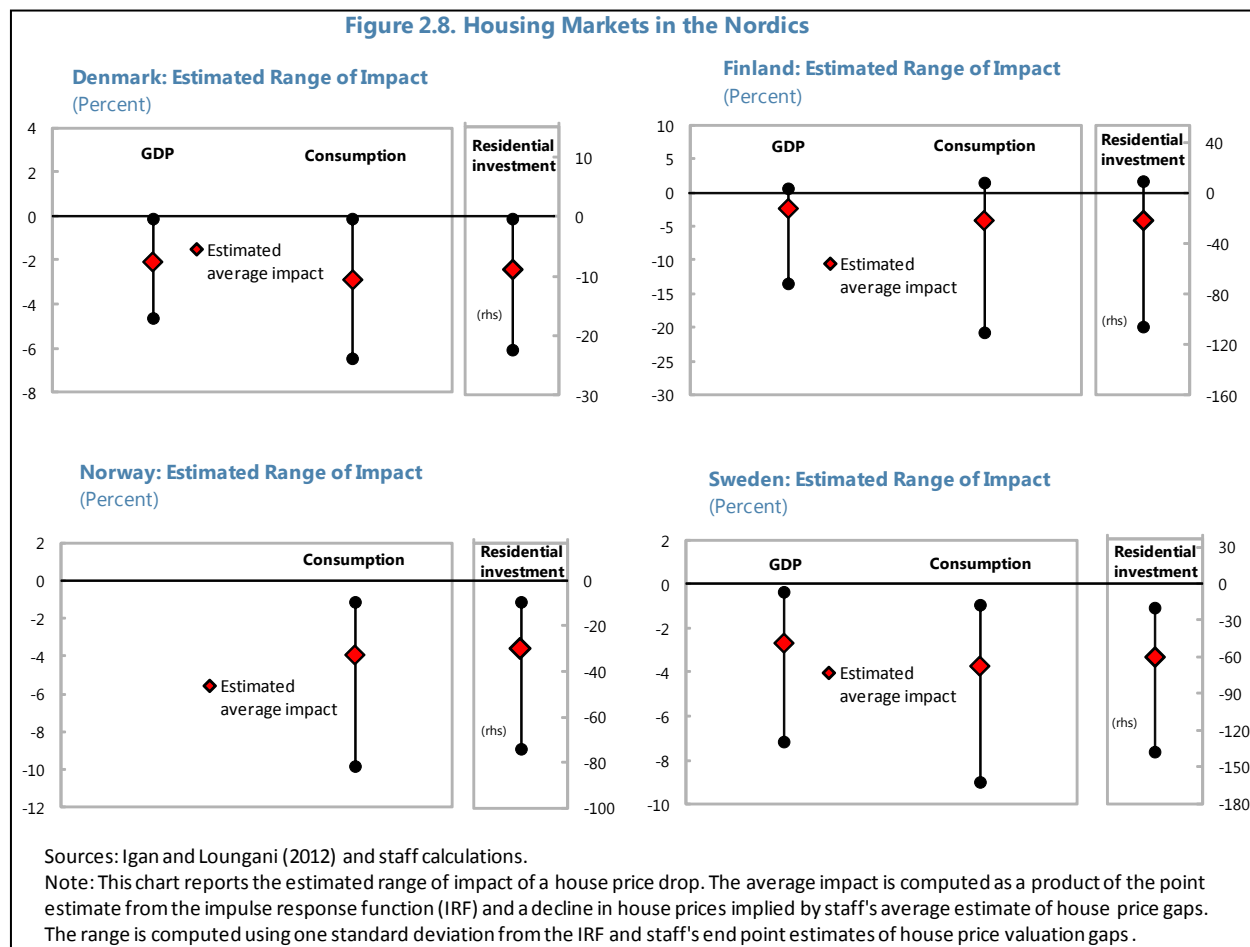
13. Empirical estimates taking into account all channels through which house price corrections affect the economy suggest effects in line with other advanced economies. Based on a VAR analysis, Igan and Loungani (2012) report point estimates for the impact on GDP, consumption, and investment.⁷ The estimates for the *Nordic-4* are broadly in line with the results for other OECD economies (with the zero effect for Norwegian GDP mostly due to difficulty of controlling for the effects of oil exports)—and not trivial. A 10 percent decline on property prices will reduce aggregate GDP by as much as 2½ percent and private consumption and private residential investment by as much as 3½ and 28½ percent, respectively (see Table 2.1).⁸

14. Combining these estimates with house valuation gaps suggests potentially material declines in economic activity. Bringing together Igan and Loungani’s (2012) results with our average estimates of country-specific house price valuation gaps reported above suggests that corrections in house price overvaluations that would bring prices back to our estimated equilibrium level would trigger declines in GDP of about -2.6, -2.3, and -2.1 percent in Sweden, Finland, and

⁷ Igan, Deniz, and Prakash Loungani, “Global Housing Cycle,” IMF Working Paper, WP/12/217, August 2012.

⁸ The estimated impact on GDP for Norway is not available.

Denmark, respectively, with larger relative declines in private consumption and residential investment (see Figure 2.8).



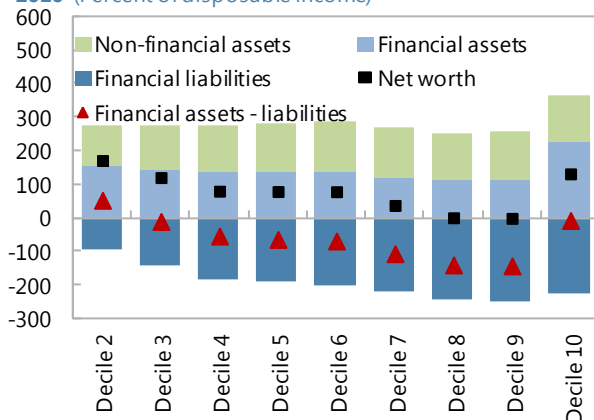
15. These estimates entail substantial uncertainty. The sensitivity of the *Nordic-4* economies to house price corrections may be higher than estimated (e.g., because recent increases in the share of nonamortizing mortgages and elevated household indebtedness or stemming from confidence or funding effects). Estimated ranges of effects incorporate this uncertainty by taking the elasticity estimates of a house price decline on GDP, consumption, and residential investment plus or minus one standard deviation from Igan and Loungani (2012). This is combined with a house price correction based on our average, maximum, and minimum country-specific estimates of overvaluation. Impacts at the adverse end of the scenarios could be a decline in GDP by 5 to 13 percent.

Box 2.2. Micro-level Evidence on Household Balance Sheets

Comparable micro-level data on household balance sheet is not readily available across the *Nordic-4* countries. However, the available country-specific data suggests that certain households could be vulnerable to adverse shocks such as a house price correction and high interest rates.

- Denmark’s central bank used micro data on household assets and liabilities (e.g. Monetary Review 2nd Quarter 2012, Part 2, and Monetary Review 4th Quarter 2012, Part 2) to find that high levels of household debt are offset by their asset holdings, and therefore household indebtedness does not pose a major risk in Denmark. However, the data highlights that the share of highly indebted households whose debts are more than 500 percent of their incomes has risen over time in Denmark, reaching 10 percent in 2010 (comparable to Norway—see Figure 2.7). This trend is apparent in all income quartiles.
- Micro-level data on household balance sheet for Norway show that debt burdens are relatively evenly distributed across income groups and that most groups tend to have relatively limited buffers in the event of adverse shocks (see Chapter 2 of 2013 Norway Selected Issues for details).

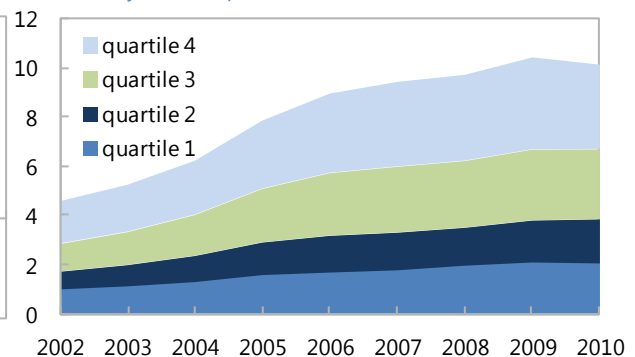
Norway: Household Balance Sheets by Income Deciles in 2010 (Percent of disposable income)



Sources: Norges Bank, Statistics Norway, and IMF staff calculations.

Note: Decile 1 is not reported due to heterogeneity of this lowest income group.

Denmark: Share of Households with Debt to Income Ratio > 5 (Percent, by income quartile)



Sources: Danmarks Nationalbank and Fund staff calculations.

D. Policy Implications

6. The Nordic authorities are starting to take policy measures to contain risks associated with elevated house prices. For example, the FSA in Sweden proposed increasing risk weights for mortgage loans to 15 percent. In Norway, stricter proposals for risk weights are also under consideration and the FSA has proposed further measures.

7. To contain common vulnerabilities and enhance effectiveness, the Nordic countries could coordinate in some policy areas. In particular:

- Regulatory risk weights on residential mortgages could be raised, but in a coordinated way. Higher risk weights could be undermined if implemented independently of the regulatory treatment of the same asset in the rest of the region. For example, Norwegian regulation does not apply to branches of banks based elsewhere in the European Economic Area. To prevent regulatory arbitrage, all the *Nordic-4* countries could raise risk weights on mortgages in a coordinated manner, given that almost all major banks are based in a few Nordic countries. To the extent that different market conditions prevail across the *Nordic-4*, coordination could also take the form of agreeing that home country supervisors would align policies in individual host country markets.
- Mechanisms for cross-border bank resolution could be further improved at the regional level. The *Nordic-4* financial systems are closely interlinked with each other. Mechanisms to ensure orderly resolution of cross-border institutions in the event of a crisis will be critical in promoting financial stability in the region.

Table 2.1. Maximum Impact of a Negative Shock to House Prices

	Decline of 10 percent 1/		
	GDP	Consumption	Residential Investment
<i>Denmark</i>	-2.5	-3.5	-10.8
<i>Finland</i>	-1.9	-3.4	-18.0
<i>Norway</i>	-	-0.9	-6.8
<i>Sweden</i>	-1.2	-1.7	-28.3
Australia	-1.0	-1.8	-13.1
Belgium	-1.1	-0.2	-8.4
Canada	-1.2	-1.3	-2.1
France	-2.1	-1.1	-9.8
Germany	-4.6	-5.7	-38.5
Italy	-0.1	-0.5	-9.5
Netherlands	-0.3	-0.4	-9.8
New Zealand	-4.2	-5.7	-28.8
Spain	-1.8	-2.5	-7.0
Switzerland	-0.5	-0.5	-4.2
UK	-1.0	-1.4	-12.2
<i>Average</i>	-2.1	-2.2	-14.0

Source: Igan and Loungani (2012, IMF WP 12/217).

1/Based on VAR estimated by Igan and Loungani (2012) for the period 1986:Q1-2010:Q1. Identification is through a Cholesky decomposition with ordering of variables as follows: real GDP, real private consumption, real private residential investment, CPI, nominal short-term interest rates, and real house prices. For the four Nordics the estimates come from an updated dataset that ends in 2012Q4 used in IMF EWE.

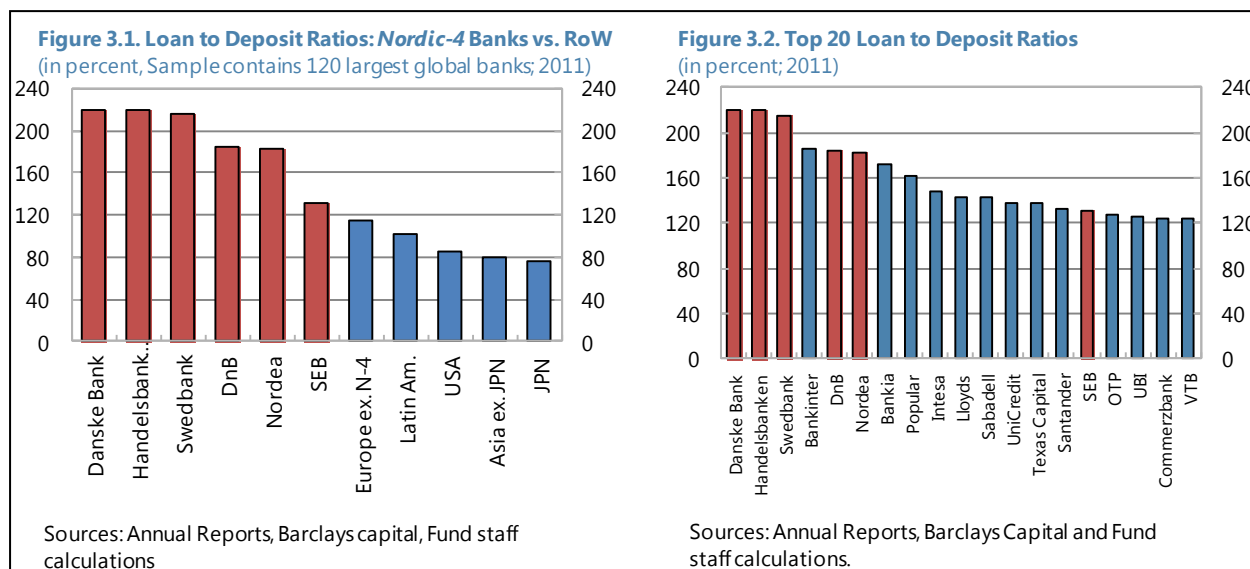
III. VULNERABILITIES IN THE NORDIC BANKING SYSTEM¹²

A small group of large pan-Nordic banking institutions dominate the publicly-listed banking business in the region. These institutions are large relative to GDP and rely heavily on wholesale funding. In the event of significant stresses, any of these large banks would create a substantial economic and fiscal burden that could spread across the Nordic region due to the operational features of these institutions. This highlights the need for maintaining sufficient fiscal buffers and possibly establishing a coordinated pan-Nordic resolution framework.

1. **We describe key features of the banking systems in Denmark, Finland, Norway, and Sweden** (henceforth the *Nordic-4*). We analyze the balance sheets and business models of the six largest banks across the *Nordic-4* (see Table 1). These banks account for approximately 90 percent of all publicly-listed Nordic banks and around 185 percent of combined *Nordic-4* GDP.¹³ This chapter also examines the liabilities that the four governments could face should a large regionally-systemic bank fail.

A. Reliance on Wholesale Funding

2. **The large size of the Nordic banking system implies a considerable need for external funding.** When compared to the largest global banks, the six largest banks stand out in terms of their reliance on nondeposit funding. Their loan-to-deposit (LTD) ratios are almost twice as high as



¹² Prepared by Ruchir Agarwal and Aqib Aslam.

¹³ While there are banks in each of the other *Nordic-4* countries that are not publicly traded, in particular in Denmark, the six largest banks clearly represent the systemic part of the regional banking system.

the average of the largest banks in all other regions of the world (see Figure 3.1).

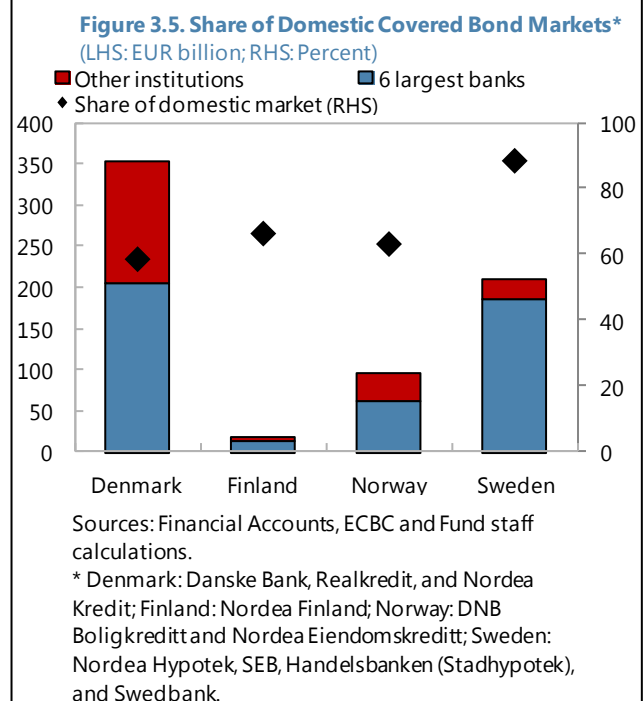
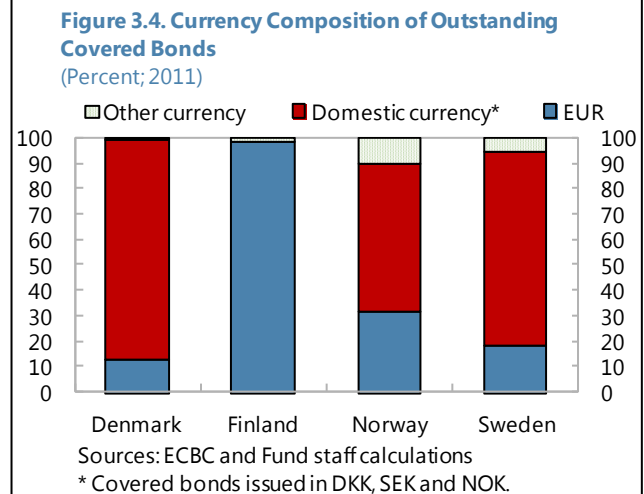
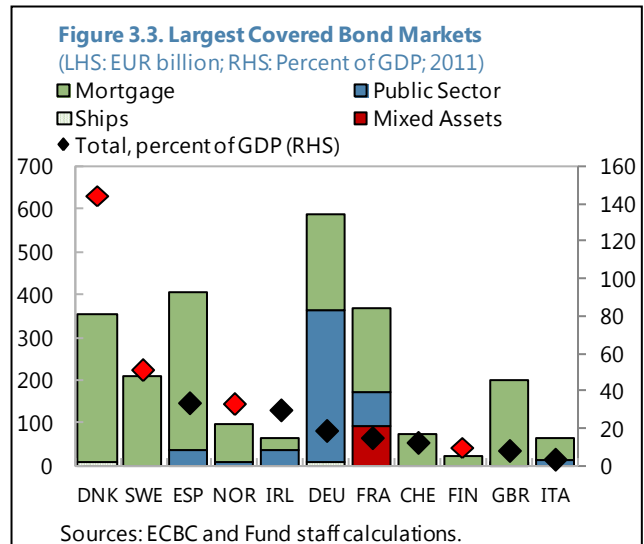
3. Despite some heterogeneity within the big six banks, their LTD ratios rank highest on an individual basis among global banks.

Danske Bank, Svenska Handelsbanken (SHB), and Swedbank top the list of the world’s 120 largest banks with LTD ratios of about 220 percent, DNB and Nordea at about 180 percent, and SEB somewhat lower at about 130 percent (see Figure 3.2). Nevertheless, five of the largest banks rank among the top six, while SEB comes in at number 15. As the financial crisis of 2008 demonstrated, this heavy reliance on wholesale funding increases the vulnerability of the Nordic banking system to liquidity shocks and funding risks.

4. However, these high LTD ratios have emerged due to a unique savings-borrowing dynamic that has developed over time between households and banks.

Loan-to-deposit (LTD) ratios are almost twice as high as the average of the largest banks elsewhere in the world. This is driven by the fact that—due to, among other things, tax incentives (e.g., MID)—households tend to save through pension and mutual funds rather than deposits or mortgage amortization. While households increase their leverage through mortgage borrowing, their savings are channeled back via institutional investors to the banks that extended them credit, mostly in the form of covered bonds and often through international (swap) markets. As a consequence, a self-reinforcing cycle between credit growth and increasing wholesale funding needs has developed.

5. Covered bonds are an important source of wholesale financing, not just for the largest banks, both in domestic and



foreign currency. The six largest banks have issued close to EUR 460 billion in covered bonds as of end-2012 accounting for 70 percent of covered bonds issued across the *Nordic-4* (see Figure 3.5). Overall, the four Nordic countries account for 33 percent of global outstanding covered bonds and 60 percent of global issuance in 2011, with Denmark having one of the oldest markets, together with Germany (see Figure 3.3). The Danish and Swedish markets are the largest as a percent of GDP and over three quarters of outstanding bonds in the Nordics were issued in domestic (noneuro) currencies while 20 percent were issued in euros (see Figure 3.4).

6. The increasing use of covered bonds has raised concerns over asset encumbrance and the availability of capital for bailing in creditors during bank resolution. As secured assets, covered bonds provide an attractive investment opportunity to creditors. They help to provide low and stable long-term funding costs for banks, while reducing the probability of default and the risk to taxpayers. That said, asset encumbrance can raise the loss-given-default as covered bonds deplete capital available for deposit insurance funds, which in the case of a bank default would typically be the single biggest senior unsecured creditor—this conversely increases the risk to taxpayers. In addition, excessive covered bond issuance reduces the funds available for all types of senior unsecured creditor, forcing them to demand higher rates in return for holding other types of bonds and therefore instead actually raises the probability of default.

7. As covered bonds deplete security for remaining unsecured creditors, their overuse could cause markets to penalize banks with higher funding costs. As banks set aside an increasing share of their collateral to back these bonds in an effort to reduce funding costs, excessive use could actually increase the returns required by unsecured creditors. In addition, banks could also be vulnerable to interruptions in funding due to adverse exchange rate developments given the share of foreign currency-denominated covered bonds.¹⁴

B. Geographical Exposure

8. Despite being global banks, an overwhelming majority of the credit exposures and the depositor base of the largest *Nordic-4* banks are concentrated in the region. For instance, about 85 percent of both total credit exposures and customer deposits in the six largest banks originate from one of the *Nordic-4*. The same pattern is observed with respect to other features of these banks, with about 80 percent of their operating income coming from the Nordic countries, 74 percent of their full-time employees located in the Nordic countries (see Panel 1), and about 75 percent of their total sovereign bond holdings in Nordic sovereigns (further discussed below).

9. Almost all of the six largest banks have extensive cross-border operations within the Nordics, suggesting that they operate more as regional banks rather than national banks.

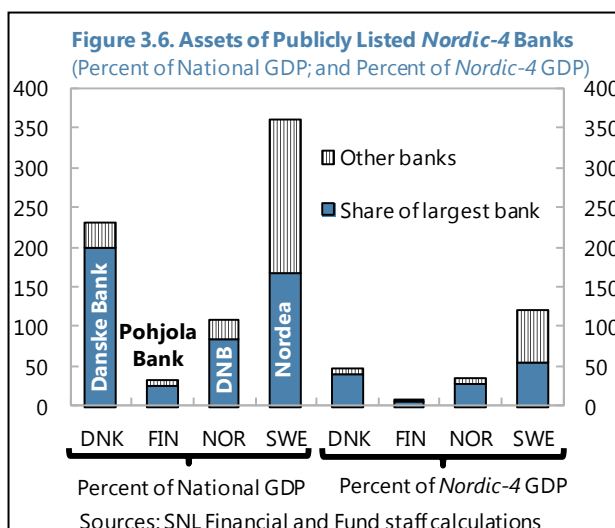
¹⁴ The overall size of Finland's covered bond market is under 3 percent of the total Nordic market. Therefore euro-denominated issuance is primarily undertaken by banks in Denmark, Norway, and Sweden.

Nordea and Danske Bank have the most geographically dispersed credit exposure and depositor base across the region, while DNB limits almost all of its operations to Norway.

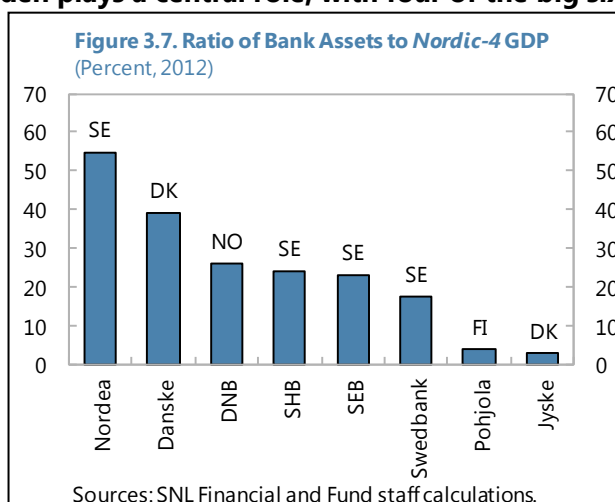
Concentration of risks

10. The Nordic banking system, as proxied by the six largest banks, is very large in economic terms, with total assets to respective home country GDP ranging from 50 to 200 percent. For instance, Nordea’s total assets relative to Swedish GDP in 2012 was about 160 percent, whereas Danske Bank’s total assets relative to Danish GDP was at 200 percent. Since each of the six largest banks operates as a pan-Nordic bank (as discussed above), it is also

informative to examine their total assets relative to total Nordic area GDP. Figure 3.6 shows the share of the publicly-listed banking system in each of the four countries relative to Nordic GDP (in contrast to the left-hand-side display, which normalizes by home GDP). The figure also illustrates that the total assets in each of the three largest home banks (Nordea, Danske Bank, and DNB) represent over 30 percent of Nordic GDP, once again illustrating the systemic importance of these institutions.



11. Within the Nordic banking system, Sweden plays a central role, with four of the big six having parent banks in Sweden, with combined assets representing about 120 percent of Nordic area GDP. Sweden has just four out of the 53 publicly-listed banks in the Nordic area (Nordea, Swedbank, Svenska Handelsbanken, and SEB), but these banks also happen to be among the six largest banks in the entire Nordic area (see Figure 3.7). This suggests that possible risks from contingent liabilities of the government emanating from the banking system may be particularly high for Sweden.



C. Determining Fiscal Costs Using Bank Balance Sheets

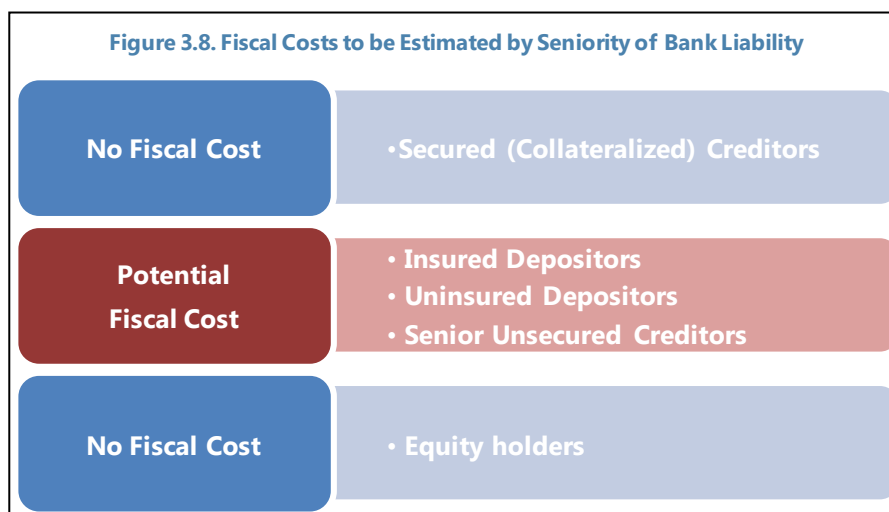
An Experiment

12. Analysis suggests that a problem in any one of these large banks is likely to reverberate across the financial sectors of the *Nordic-4*—and vice versa. For example, a dramatic shift in credit risk in Sweden may affect the balance sheet of these large banks. In turn, a deterioration in the health of any of the big 6 banks would feed back to the financial systems of all four economies.

13. In order to assess the potential impact of such a scenario, we consider an experiment involving the failure of a hypothetical large regional bank. This hypothetical bank is designed to mimic the characteristics of a typical large regional bank and is constructed using the weighted-average of the various features of the big 6 banks (Table 2). For example, given that each of the big 6 banks is large, the hypothetical synthetic bank is also sizeable with assets of EUR 444 billion (or 36 percent of the combined *Nordic-4* GDP), a credit exposure of EUR 336 billion, and total deposits of around EUR 99 billion.

14. The experiment makes a number of assumptions on the timeline of the resolution of the synthetic bank. When a given bank fails, the assets of the bank are placed in a bankruptcy estate (BE), while insured depositors are reimbursed by the government through the depositor insurance fund (DIF). The eventual cost to the government arising from bailing out depositors is then derived as the residual amount payable to secured creditors (e.g., secured bondholders, insured depositors) after offsetting the liquidation value of the bankruptcy estate. This residual cost can be larger should the government choose to bail out an increasing set of creditors (e.g., uninsured depositors and unsecured bondholders). Tables 3 and 4 summarize the assumptions and the timeline of the experiment.

15. The impact of a failure of the synthetic bank on the region is considered under three alternative scenarios (see Figure 3.8). In scenario A, only insured depositors are bailed out; in scenario B, uninsured depositors are also bailed out completely, and in scenario C, senior unsecured creditors are also compensated. We assume that insured depositors will be bailed out with certainty



due to the explicit coverage by deposit insurance. Therefore, the costs under scenario A should be interpreted as the minimum bail-out cost to governments from the synthetic bank's failure and it assumes that uninsured depositors and unsecured creditors are fully expropriated ("bailed in" 100 percent or subject to a "haircut" of 100 percent). It is, however, likely that the government might choose to bail out uninsured depositors partially and therefore scenario B estimates the upper bound for such costs by factoring in the additional liabilities from bailing out all uninsured depositors. Finally, in order to contain systemic risks, the authorities may also consider extending the bailout to senior unsecured creditors, and scenario C adds this cost to the total bill.¹⁵

16. The results in Table 5 suggest that both the liquidity costs and eventual losses to the sovereign emanating from the failure of the hypothetical synthetic bank could be substantial (even when not accounting for systemic linkages and contagion). The key results are as follows:

- The liquidity costs (i.e., initial payout required from the deposit insurance funds) are around 3.5–5.5 percent of GDP across the *Nordic-4* in scenario A and from 6–8 percent of GDP in each country in scenarios B.
- The total deposit insurance funds are insufficient to meet these liquidity costs, and this experiment finds that when the synthetic bank fails, substantial additional funds will need to be raised by the four sovereigns (around 2.5–5 percent of GDP in scenario A, and around 5–7.5 percent of GDP in scenarios B).
- The eventual loss to the government—after taking into account a recovery from the bankruptcy estate of the failed bank of 50 percent in Scenario A and 40 percent in Scenario B—is of the order of 1.5–2.5 percent of GDP for each of the *Nordic-4* under Scenario A and between 3.5–5 percent in Scenario B.
- Finally, under scenario C, the bail-out of senior unsecured creditors raises the fiscal costs computed for scenario B substantially (by over 130 percent) to approximately 6.5–10 percent across the four countries.

Further Factors that Can Amplify the Fiscal Burden and Systemic Linkages

17. The fiscal burden could be even higher when one considers the interlinkages between the big 6 banks and the four sovereigns. As shown in the first panel of Figure 4, the *Nordic-4* sovereigns have large equity stakes in the large banks, both directly and through the state pension funds. Norway and Sweden are particularly exposed to the big 6 banks and are among the largest shareholders. Investment in DNB is a prime example, with around 40 percent of equity held by the Norwegian government, mostly through a direct stake of 34 percent. However, the Swedish

¹⁵ Scenario III, where all senior unsecured creditors beyond depositors are fully expropriated is closest in spirit to Danish legislation introduced in 2010.

government reduced their direct stake in Nordea from 13.5 percent to 7 percent in June 2013, raising approximately EUR 3 billion.

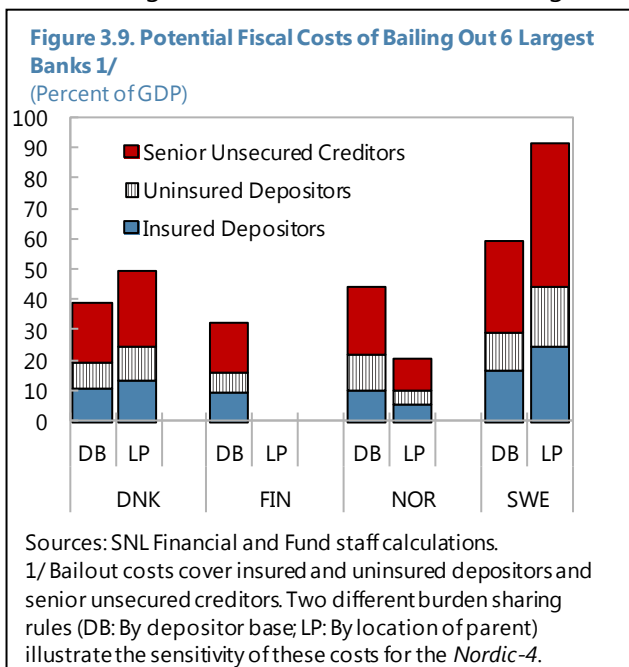
18. Cross-border holdings of sovereign debt by banks are also prevalent. As shown in the second chart of Panel 2, in 2012 the amount of *Nordic-4* sovereign debt held by the six largest banks constituted roughly 75 percent of their total sovereign debt holding (amounting to EUR 66 billion of gross direct long sovereign debt exposure).

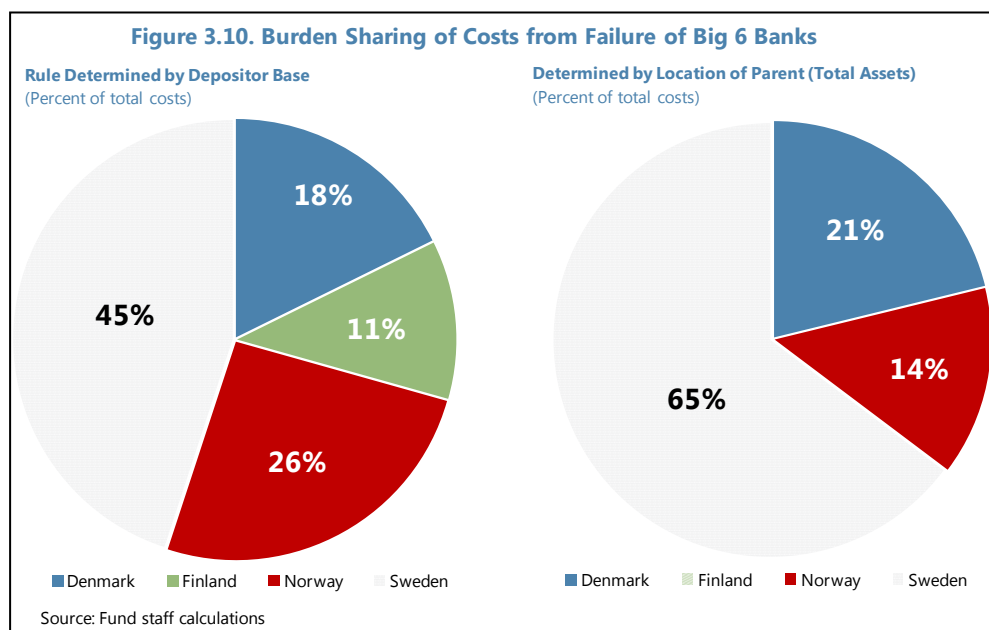
19. The systemic risk in the banking system could be further compounded by large cross equity holdings of Nordic banks. The last figure in Panel 2 shows that with the exception of Danske Bank and DNB, between 6 and 8 percent of the equities of the large Nordic banks are held by other Nordic banks.

The Fiscal Costs from a Failure of the Big Six Banks

20. Given the regional integration of banks, we estimate the fiscal burden from a tail event failure of all of the six largest banks. For simplicity, we repeat the experiment above by aggregating all six banks into a single entity and compute the fiscal costs of its failure. In addition, we look at two alternative burden-sharing arrangements to see how costs can vary for each country: one sharing rule determined by the share of depositors in each country, and a second rule determined by the country in which the parent bank is incorporated (asset weights).

21. The results confirm both the magnitude of costs from such a systemic failure, as well as the sensitivity of each country’s burden to the sharing rule applied (Table 6 and Figures 3.9 and 3.10). As anticipated, the potential costs to the four governments vary substantially depending on both the creditor bail-out scenario and the burden sharing rule. For Sweden, costs can range from 17–62 percent of GDP using a depositor base approach to burden sharing and 24–92 percent of GDP by the location of parent approach. Sweden’s share under the second burden-sharing rule is much larger as four of the six largest h four of the six banks are headquartered in Sweden (Nordea, Swedbank, SEB, and Svenska Handelsbanken). Finland, on the other hand, has a share of zero under the second rule since its financial sector is dominated by foreign subsidiaries. It is interesting to note that, Norway’s estimated fiscal costs are the second largest calculated by depositor base. This is because approximately 30 percent of the regional deposits held at the big 6 banks are recorded in Norway.





22. These costs are subject to uncertainty due to the competing strategies for bailing in and bailing out depositors and creditors. The contribution to the overall fiscal costs from bailing out unsecured bondholders are significant and will depend on the approach taken by governments. Overall, these estimates are very large relative to the ex-post cost of the 1990s Nordic banking crises. The difference can be explained mostly by the much larger size of the banking system, increased asset encumbrance due to a heavy reliance on collateralized debt (covered bonds), and complications for resolution associated with cross-border operations.

D. Policy Implications

23. The analysis suggests that sovereigns need to accumulate sufficient fiscal buffers to insure against potential problems arising in the banking system, especially in the large banks. For the *Nordic-4*, risk is concentrated in a handful of pan-regional banking institutions, which in turn heavily rely on external sources of funding. In the event of a failure of any of these six large banks, the fiscal burden could be large, and may lead to a substantial increase in sovereign debt levels within a very short period of time. Moreover, the total economic costs in terms of GDP growth and contagion are likely to be much larger than the direct costs calculated here. Sufficient fiscal buffers are key to meet these types of risk.

24. As problems in any of the big 6 banks could affect the entire region, there are strong advantages from instituting a coordinated pan-Nordic resolution framework and a well-defined burden sharing arrangement. Also, as highlighted in some of the results, the exposure to other regions, such as the Baltic countries (Estonia, Latvia, and Lithuania), Poland, and other parts of Europe are nonnegligible. Thus, the advantages of cooperation are not limited to the continental Nordic region, but extend more broadly to other European markets. Equally important are clearly defined ex ante burden sharing arrangements, so as to minimize policy uncertainty ex post, and facilitate a quick resolution should the need arise.

Table 3.1. Big Six Nordic-4 Banks

Largest Publicly-Listed Banks	Location of Parent	Total Assets		Share of Total Market
		(EUR bil.)	(Percent of GDP)	(Percent)
Nordea	Sweden	677.4	164.9	26.9
Danske Bank	Denmark	482.8	197.7	19.1
DNB	Norway	321.8	81.5	12.8
Svenska Handelsbanken	Sweden	297.7	72.5	11.8
Skandinaviska Enskilda Banken	Sweden	285.7	69.5	11.3
Swedbank	Sweden	215.0	52.3	8.5
Total Big 6 banks		2280.4		90.4

Sources: SNL Financial and Fund staff calculations.

Table 3.2. Synthetic Bank Characteristics by Geography

	Credit Exposure	Total Deposits	Operating Income	Employees
	(EUR mil.)	(EUR mil.)	(EUR mil.)	(persons)
Denmark	71,281	18,919	1,301	5,684
Finland	48,313	13,427	676	3,029
Sweden	104,249	30,245	1,778	5,211
Norway	61,613	23,827	1,331	2,655
Other Europe	28,268	5,994	678	1,257
Baltics + Poland	10,875	5,478	400	3,016
Rest of World	9,925	1,065	211	721
<i>Total</i>	<i>335,559</i>	<i>98,954</i>	<i>6,376</i>	<i>21,573</i>
<i>Memorandum item:</i>				
Total assets				
Hypothetical Synthetic bank	443,780			
Nordea	677,420			
Danske bank	482,779			

Source: Fund staff calculations.

Table 3.3. Assumptions and Calibration**Scenario A.** *Insured Depositors Bailed Out; Uninsured Depositors Bailed In; Senior Unsecured Creditors Bailed In*

Assumptions		Notes
Fraction of deposits that are insured (SWE, DNK, FIN)	70%	Deposit insurance coverage is €100,000
Fraction of deposits that are insured (NOR)	56%	Deposit insurance coverage is approx. €264,000
Fraction eventually recovered by DIF from BE of failed bank	40%	Relatively high due to senior secured liabilities
Levy on uninsured depositors	100%	
Haircut on senior unsecured creditors	100%	

Scenario B. *Insured Depositors Bailed Out; Uninsured Depositors Bailed Out; Senior Unsecured Creditors Bailed In*

Assumptions		Notes
Fraction of deposits that are insured (SWE, DNK, FIN)	70%	Deposit insurance coverage is €100,000
Fraction of deposits that are insured (NOR)	56%	Deposit insurance coverage is approx. €264,000
Fraction eventually recovered by DIF from BE of failed bank	40%	Relatively high due to senior secured liabilities
Levy on uninsured depositors	0%	
Haircut on senior unsecured creditors	100%	

Scenario C. *Insured Depositors Bailed Out; Uninsured Depositors Bailed Out; Senior Unsecured Creditors Bailed Out*

Assumptions		Notes
Fraction of deposits that are insured (SWE, DNK, FIN)	70%	Deposit insurance coverage is €100,000
Fraction of deposits that are insured (NOR)	56%	Deposit insurance coverage is approx. €264,000
Fraction eventually recovered by DIF from BE of failed bank	40%	Relatively high due to senior secured liabilities
Levy on uninsured depositors	0%	
Haircut on senior unsecured creditors	0%	

Sources: Fund staff calculations.

Table 3.4 Timeline of Events Under Alternative Scenarios

Time, <i>t</i>	Actions
1	Bank fails
2	Assets put into Bankruptcy Estate (BE)
3	Bailed out depositor claims moved to health bank; financed by DIF/State ("Liquidity Payout")
4	DIF/State is senior-most claimant against the BE (after secured creditors claimed collateral)
5	Payout by BE to DIF/State (Liquidity Payout minus this payment determines "Eventual Payout")

Sources: Fund staff calculations.

Table 3.5. Synthetic Bank Failure Experiment Results

	Existing Equity in Deposit Insurance Fund (DIF)	Deposit Insurance Payout		DIF Shortfall		DIF's Recovery from Bankruptcy Estate		Cost of Bailing out Senior Unsecured Creditors	Estimated Fiscal Costs 1/		
	(1)	Scenario A (2a)	Scenario B (2b)	Scenario A (3a) = (2a) – (1)	Scenario B (3b) = (2b) – (1)	Scenario A (4a)	Scenario B (4b)	Scenario C (5)	Scenario A (3a) – (4a)	Scenario B (3b) – (4b)	Scenario C (3b) – (4b) + (5)
	<i>(Percent of GDP)</i>										
Denmark	0.3	5.4	7.7	5.1	7.4	2.2	3.1	5.6	2.9	4.3	9.9
Finland	0.4	4.8	6.9	4.4	6.5	1.9	2.8	4.9	2.5	3.7	8.6
Norway	0.8	3.4	6.1	2.6	5.3	1.4	2.4	3.8	1.3	2.9	6.7
Sweden	0.8	5.2	7.4	4.4	6.6	2.1	3.0	4.8	2.3	3.6	8.4
Nordic-4 Region	0.6	4.6	7.0	4.0	6.3	1.8	2.8	4.7	2.1	3.5	8.2

Source: Fund staff calculations.

1/ Excluding Deposit Insurance Funds

Table 3.6. Estimated Fiscal Costs from the Failure of the Big 6 Banks

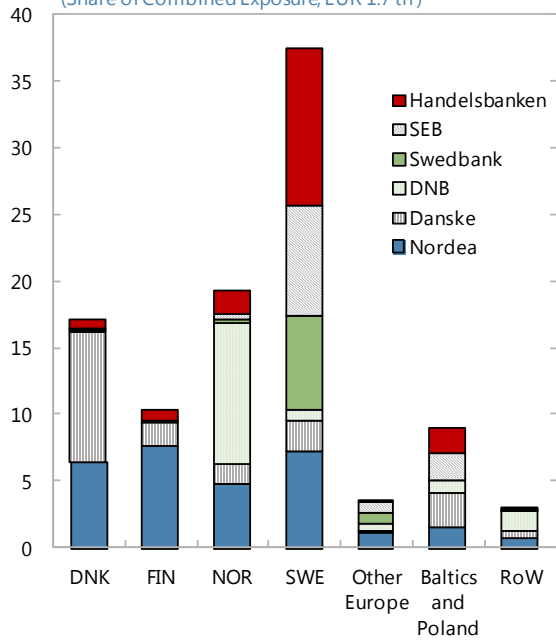
Country	2012 National GDP	Total Assets of Big 6 Banks (consolidated basis)	Estimated Fiscal Costs					
			By Depositor Base			By Location of Parent		
			Scenario A	Scenario B	Scenario C	Scenario A	Scenario B	Scenario B
		<i>(EUR bil.)</i>	<i>(Percent of GDP)</i>					
Denmark	245.0	482.8	11.2	19.1	39.2	13.3	24.3	50.0
Finland	194.5	0.0	9.3	15.9	32.6	0.0	0.0	0.0
Norway	390.0	321.8	10.2	21.8	44.7	5.6	10.2	20.9
Sweden	409.2	1475.9	17.0	29.1	59.7	24.4	44.6	91.5
Nordic-4	1238.7	2280.4	12.5	22.7	46.7	12.5	22.7	46.7

Source: Fund staff calculations.

Panel 3.1. Exposure of Six Largest Banks by Geography, 2012

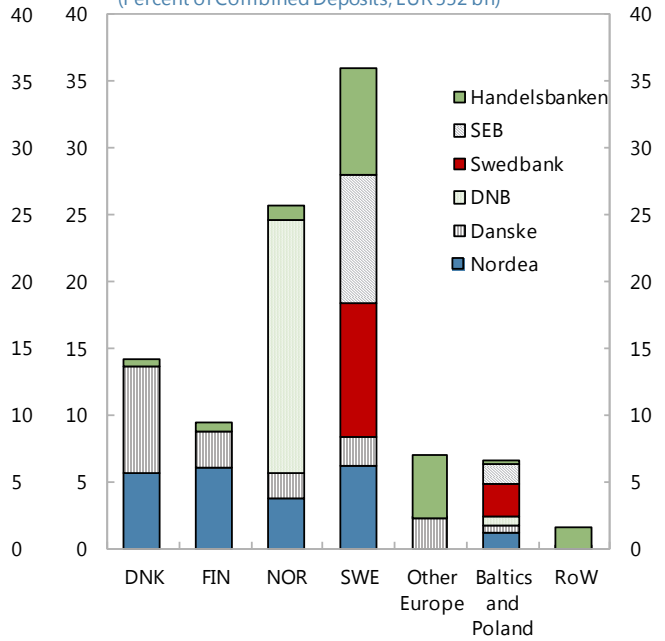
Credit Portfolio Exposure

(Share of Combined Exposure, EUR 1.7 tn)



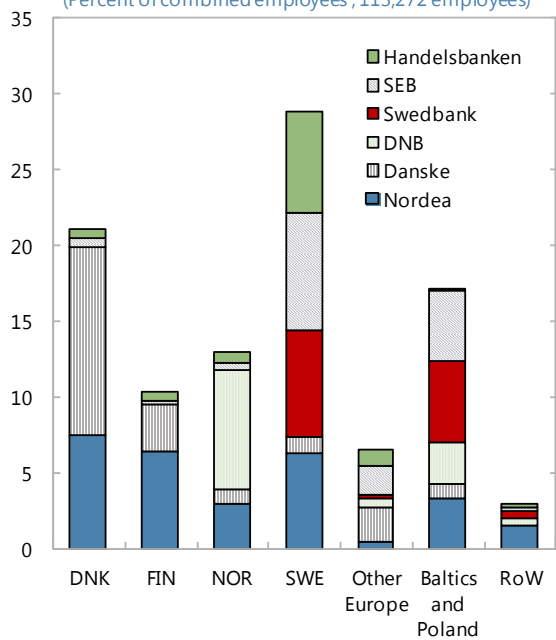
Total Deposits

(Percent of Combined Deposits, EUR 552 bn)



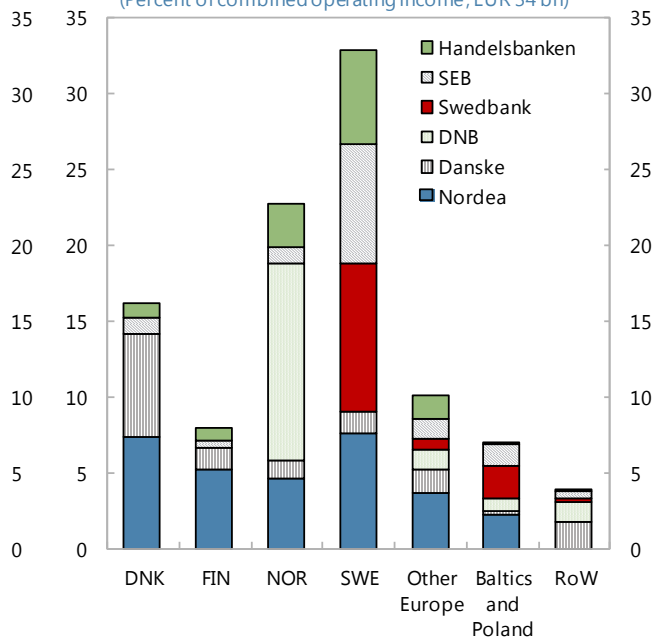
Full-Time Employees

(Percent of combined employees, 113,272 employees)



Total Operating Income

(Percent of combined operating income, EUR 34 bn)

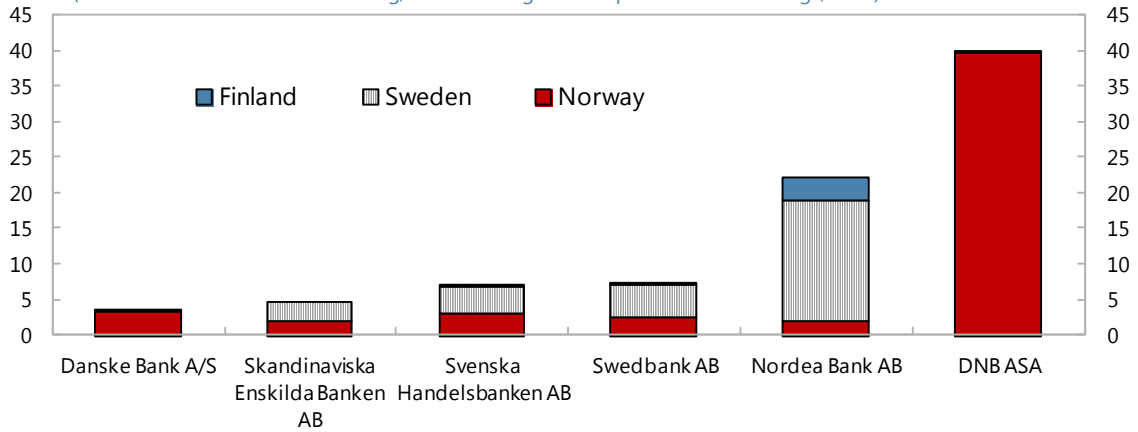


Sources: 2012 Annual Reports and Fund staff calculations.

Panel 3.2. Bank-to-Bank and Government-Bank Interlinkages

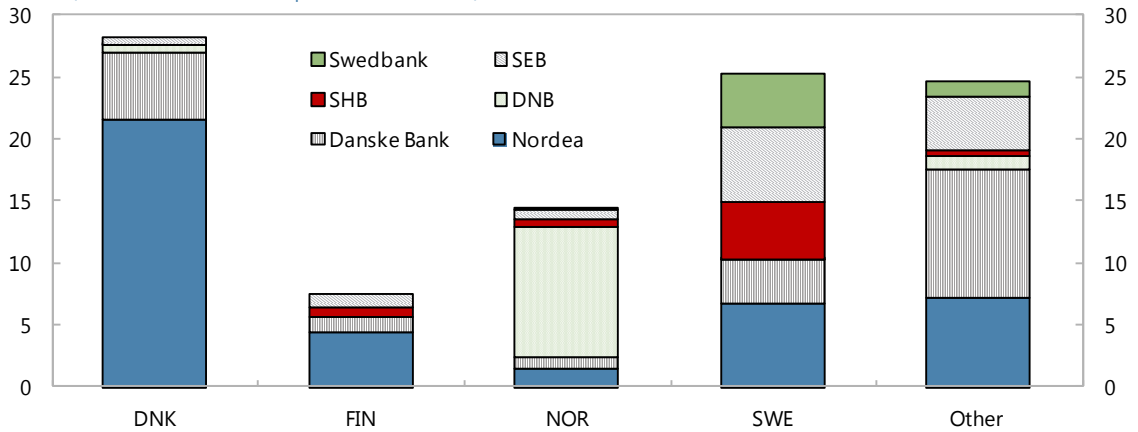
Government Ownership

(Percent of total shares outstanding; direct holdings + state pension fund holdings, 2012)



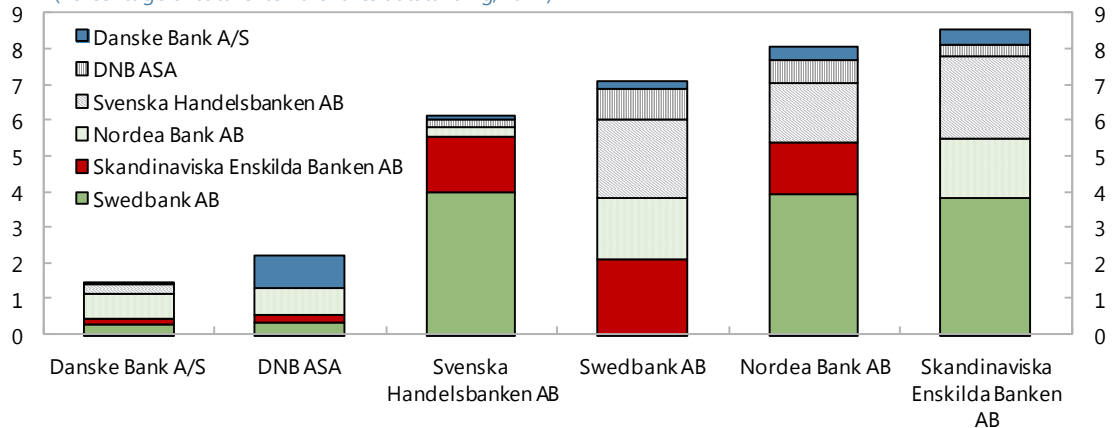
Gross Direct Long Sovereign Exposures, by Geography 2012

(Percent of combined exposure, EUR 87.8 bn)



Bank-to-Bank Ownership

(Percentage of total external shares outstanding, 2012)



Sources: European Banking Authority, SNL Financial, and Fund staff calculations.

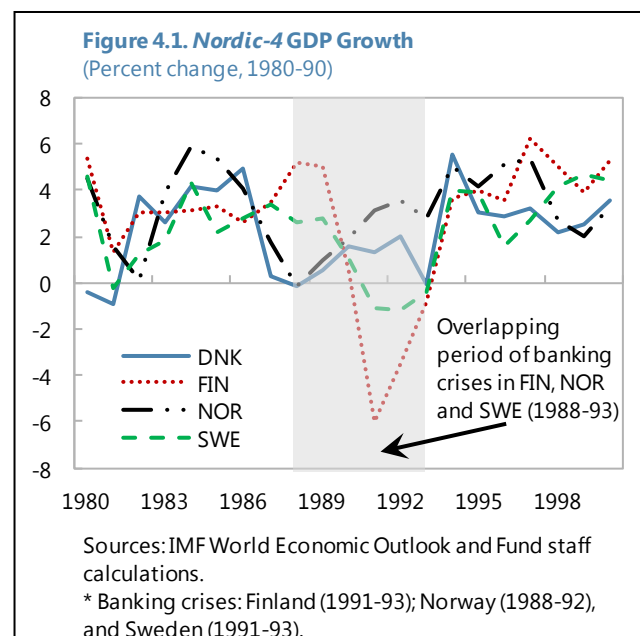
IV. SHOCKS AND PROPAGATION: ASSESSING NORDIC RESILIENCE¹

Extensive regional linkages in the Nordic region and a high degree of openness to the world should, in principle, imply substantial sensitivity of economic outcomes in one country to developments in the rest of the region as well as global shocks. Using two sets of models, we show that macroeconomic and financial shocks emanating from within and beyond the region can generate spillovers to the four economies while regional factors can explain much of the variation in excess returns across Nordic asset markets. Notably, inward spillovers to output from neighbors within the region dominate spillovers from countries outside the region, with the exception of those from the large systemic economies such as the United States, Germany, and the United Kingdom.

A. Background

1. Both global and regional shocks should matter for the *Nordic-4* countries. The *Nordic-4* are deeply integrated into global markets and, at the same time, linked to one another by strong financial and trade ties (see Chapters I and III of Selected Issues). Therefore, regional systemic events (such as a possible regional banking crisis), aside from global crises, can have significant effects on the real economy.

2. The *Nordic-4* are no strangers to banking crises. At the start of the 1990s, Finland, Norway, and Sweden experienced systemic banking crises, which lead to negative economic growth and bank failures affecting most of the region (see Figure 4.1). As noted by Schwierz (2003), the three crises were broadly similar and were preceded by a period of financial liberalization, which triggered massive credit expansion, soaring asset prices, increases in investment and consumption, and unsustainably high levels of debt accumulation by firms and households. The following economic downturn resulted in a collapse of the overvalued stock and real estate markets and severe difficulties for banks that had based their lending on inflated asset values. Finally, the governments were



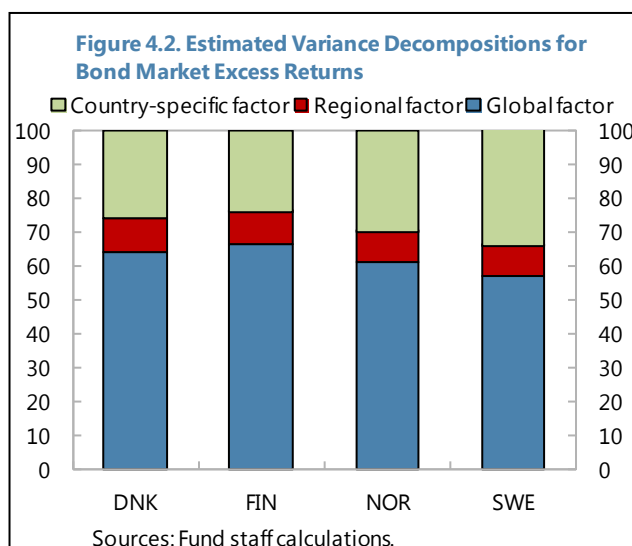
¹ Prepared by Aqib Aslam and Francis Vitek.

forced to intervene in the banking sector.

3. The banking crisis of the 1990s generated significant cumulative output losses, in particular in Finland, Norway, and Sweden.² Previous IMF estimates of the gross output losses vary from just under 10 to over 20 percent of GDP for the three countries. In addition, the quasi-fiscal costs from restructuring the financial sector ranged from 3 to 10 percent of GDP for the three countries. This and the still substantial size of the Nordic banking system suggests that gauging the potential for spillovers from financial shocks is of particular importance for the region. Not only could regional links transmit and amplify shocks but they could generate protracted effects for the region over the medium term.

B. Financial Market Contagion

4. A factor model can illustrate the sensitivity of the Nordic economies to regional and global financial market contagion. An asset pricing approach is taken to decompose risk premia (“excess returns” derived as rates of return less a risk-free rate) in *Nordic-4* money, bond, and stock markets into global, regional, and country-specific factors. The aim is to understand what drives risk premia in each country: are regional components important determinants and therefore an important channel for contagion? The global factor is the excess return on the value-weighted global portfolio for each asset class, while the regional factor captures comovement in excess returns across *Nordic-4* economies that are not explained by the global factor. This, arguably, reflects the high level of trade and financial integration across the region. The equations for the money, bond, and stock markets are estimated via ordinary least squares and the data consist of annual observations on several financial market variables observed for thirty five economies over the sample period 2000 through 2012.³



² See Chapter 4 of the World Economic Outlook (1998, 2009), *International Monetary Fund*, and Schwierz, C., (2003), “Economic Costs of the Nordic Banking Crises”, *Norges Bank*.

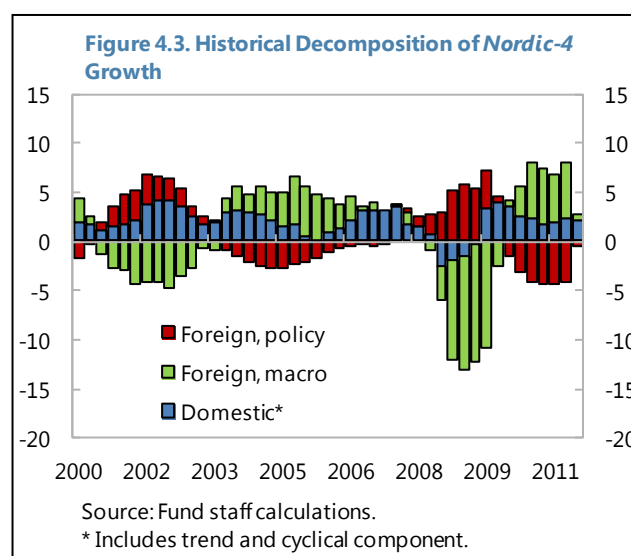
³ The 35 advanced and emerging economies include Argentina, Australia, Austria, Belgium, Brazil, Canada, China, the Czech Republic, Denmark, Finland, France, Germany, Greece, India, Indonesia, Ireland, Italy, Japan, Korea, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, Russia, Saudi Arabia, South Africa, Spain, Sweden, Switzerland, Thailand, Turkey, the United Kingdom, and the United States.

5. While regional factors matter, most of the variation in excess returns on the money, bond, and stock markets of the four Nordic economies is explained by global factors (see Figure 4.2). Variation in the *Nordic-4* regional factor accounts for approximately 9 to 11 percent of money, bond, and stock market variation while variation in the global factor accounts for 60 to 70 percent of bond, money, and stock market variation, on average across the four countries. This implies that variation in the economy-specific factor accounts for the remaining 20 to 30 percent for the three markets. Though the global factor dominates, this asset price approach to understanding contagion shows that shared regional risks have nevertheless been relevant since 2000. However, any shock, be it idiosyncratic or more systemic in origin can still propagate across the *Nordic-4* and therefore we turn to understanding the extent of spillovers within the region.

C. Propagation

6. Shocks have the potential to reverberate across the region. The region's strong ties to global markets and its interconnectedness also explain why external shocks, be it from global or neighboring markets, tend to drive most of the cyclical variation of *Nordic-4* output growth (see Figure 4.3). A macroeconomic model is used to show how inward spillovers to GDP to the Nordic economies come predominantly from neighbors and systemic advanced economies.

7. How is the propagation of shocks between the Nordics estimated? The estimation is carried out using an unobserved components model on the same panel of 35 economies, which helps identify bilateral spillovers between Sweden, Norway, Finland, and Denmark, and their main trading partners.⁴ By modeling macro-financial linkages and policy transmission through trend and cyclical components, the model estimates spillovers generated by trade channels, financial markets, and commodity prices between the world's largest economies, with a special focus on the *Nordic-4*. To capture the variation in variables in different sectors of the economy, the cyclical components of the model are defined using linear relations and standard accounting identities in which, for example, output, inflation, and domestic demand are determined

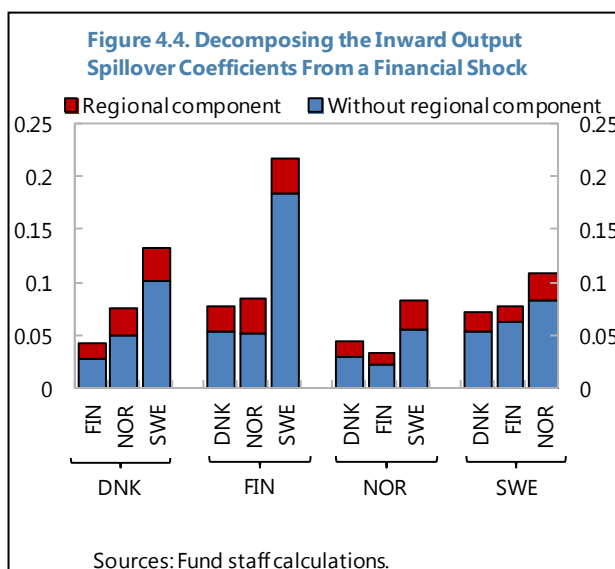


⁴ See Vitek, F. (2013), "Spillovers to and from the Nordic Economies: A Macroeconometric Model Based Analysis," *International Monetary Fund*, Working Paper, forthcoming. This model is also used as part of the IMF's quarterly Vulnerability Exercise Assessment (VEA) and Global Risk Assessment Matrix (G-RAM).

by their own lags as well as interest rates, the terms of trade, and other key macro-financial variables. The trend components, which capture the natural tendency of the economy to drift in a certain direction, are assumed to follow a random walk.

8. The model distinguishes between regional financial shocks, which are globally and regionally correlated, versus specific financial shocks, which are only globally correlated. Once the model has been solved, the equilibrium system is perturbed by different types of macroeconomic and financial shocks. Coefficients for inward and outward spillovers to output to and from the *Nordic-4* economies can then be retrieved from the resulting impulse responses. In particular, peak impulse response functions are used to report the maximum effects of selected structural macroeconomic and financial shocks on output. The macroeconomic shocks under consideration are composites of selected real, monetary policy and fiscal policy shocks, where applicable. The financial shocks under consideration are composites of credit risk premium, duration risk premium, and equity risk premium shocks.

9. Inward output spillovers to the *Nordic-4* economies come predominantly from neighbors and systemic advanced economies (see Panel 1). This primarily reflects relatively higher export exposures within the region. While estimated inward output spillover coefficients from financial shocks are highest for all of the *Nordic-4* economies from the U.S., Germany, and the U.K., the *Nordic-4* themselves mostly dominate the remaining economies in the sample. The *Nordic-4*, therefore, are an important source of spillovers to one another. The importance of systemic economies reflects high direct financial exposures through cross-border debt and equity portfolio asset holdings, together with high indirect financial exposures through international money, bond, and stock market contagion.



10. Regional comovement across financial shocks is found to amplify inward output spillover coefficients by about 42 percent on average across the Nordics (see Figure 4.4). The model demonstrates the extent to which shocks, especially in the financial sphere, propagate across the region. The amplification is particularly large for Norway, where, for example, the output effects of incoming financial shocks transmitted from Sweden increases by about approximately 50 percent given that Sweden’s shock, at the same time, feeds back to Norway through its Nordic neighbors.

11. Within the Nordics, inward spillovers are dominated by Sweden. As the largest economy in the region (accounting for one third of total Nordic GDP), shocks emanating from Sweden have the greatest output impact on the others. Finland is particularly susceptible to spillovers from Sweden, which are between 2.5 and 3 times greater than those from Denmark and Norway. Sweden

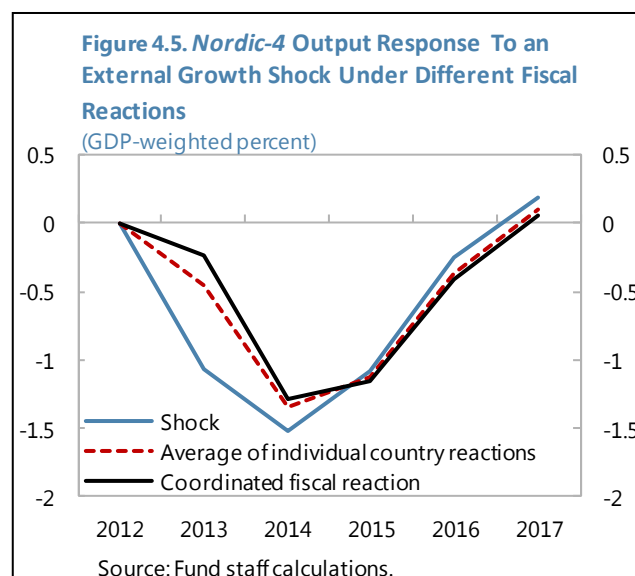
itself is primarily affected by spillovers from Norway, which are one quarter larger than those from Denmark and Finland.

12. Outward output spillovers to the rest of the world from the Nordics, arising from macroeconomic and financial shocks within the Nordic economies, are small to moderate, commensurate with each economy's small size. These outward spillovers are largely concentrated within the *Nordic-4* region due to their high trade and financial integration. For macroeconomic shocks, estimated outward output spillover coefficients are highest from all other countries to Sweden, while highest from Sweden to Denmark. The former reflects Sweden's high import dependencies on these source economies. For financial shocks, the estimated outward output spillover coefficients are greatest to Sweden from Norway and Finland, but differ from Denmark to Finland and Sweden to Finland. Therefore Sweden remains an important nexus within the region as the key originator of (inward) spillover into its neighbors and the primary recipient of (outward) spillovers from its neighbors.

D. Policy Coordination Experiments

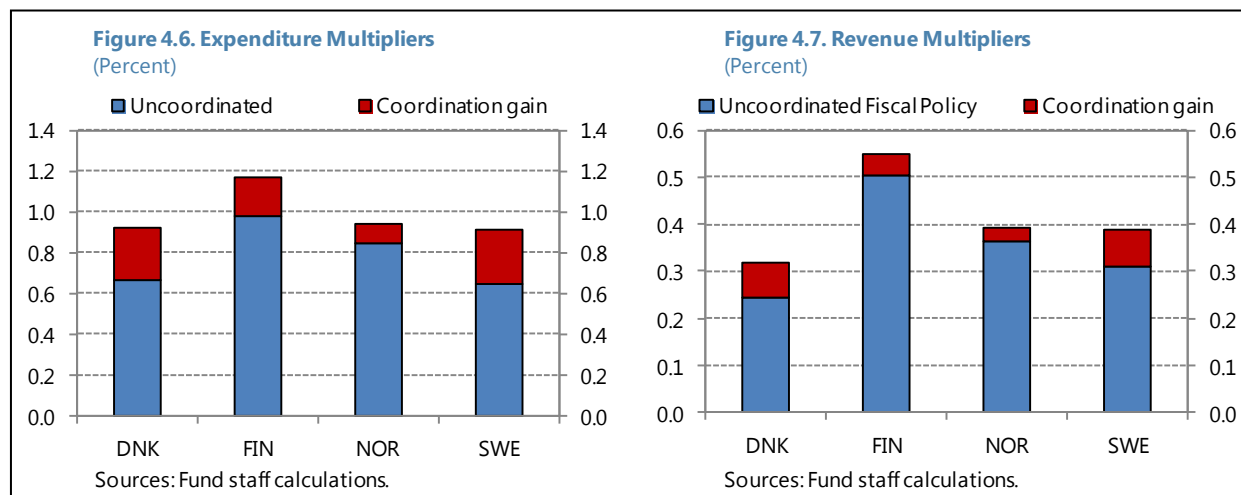
13. Greater fiscal policy coordination can generate short-run output gains. The strong fiscal frameworks in the Nordic countries have helped insulate their economies individually over time. However, given the interconnectedness of the economies through regional spillover effects, can we expect coordinated fiscal action in times of stress to generate positive spillovers and therefore deliver a collectively beneficial outcome?

14. We conduct an experiment to understand the potential gains from fiscal policy coordination. As we are interested in understanding the impact of a negative output shock on the region, we can look at the impact on *Nordic-4* output (as an average over the four countries) from any number of shocks, for example a macroeconomic deterioration in their major trading partners, a correction in house prices in one country with negative implications for confidence and consumption and therefore output or an intensification of the euro area (EA) sovereign debt crisis.⁵ In response to the shock, each country engages in a temporary uncoordinated versus coordinated fiscal stimuli. In the second experiment, we reduce fiscal balances (as a percent of GDP)



⁵ For this experiment, we can model an intensification of the EA crisis, in part, by a temporary but persistent 300 basis point increase in long-term government bond yields in the EA periphery.

of the four Nordics by 1 percent due to a combination of temporary and mildly persistent expenditure reductions and revenue increases.



15. Coordinated fiscal stimulus can mitigate the output effects of a negative external shock by up to one third more than uncoordinated action. The key transmission channel is changes in domestic demand on intra-regional trade flows. Following the negative output shock to the four countries, Denmark and Finland show larger output losses due to macroeconomic and financial spillovers than Norway and Sweden, as the latter can deploy conventional monetary policy loosening. However, a temporary but persistent expenditure-based fiscal stimulus (of one percent of GDP) is estimated to reduce initial output losses by 0.6 percentage points on average for the *Nordic-4* region if uncoordinated, and by 0.8 percentage points if coordinated. This implies a coordination gain of 35 percent in 2013. Eventually the four economies consolidate in the outer years with a similar impact on output between the coordinated and uncoordinated cases (see Figure 4.5).

16. These results reflect the fact that fiscal policy coordination leads to an increase in multipliers (see Figures 4.6 and 4.7). Assuming an expenditure-based fiscal stimulus, the coordinated policies lead to an increase in fiscal multipliers due to the spillovers from domestic demand operating via the regional trade links. Therefore, the multipliers on revenue and expenditure rise by 27 and 13 percent, respectively, after accounting for endogenous monetary policy changes in interest rates (in the case of Norway and Sweden). These coordination gains are highest for Denmark and Sweden, reflecting their regionally concentrated export exposures, and are lowest for Norway, given its high energy commodity export intensity. Finland’s gains are also more muted as the country has a lower share of overall trade within the region and therefore benefit the least from the coordinated expansion.

A Role for Policy Coordination

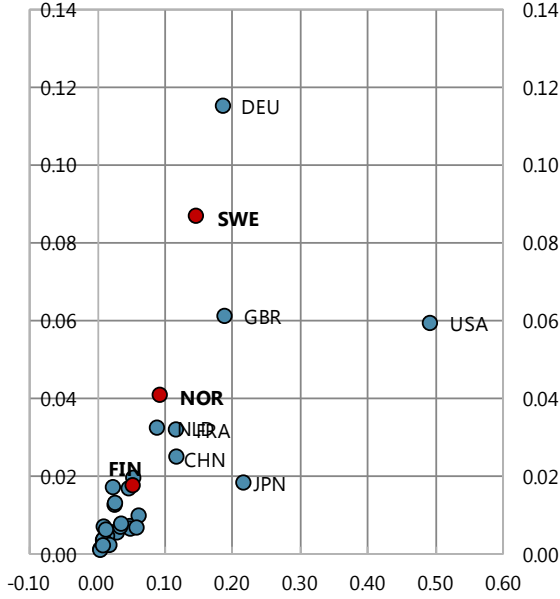
17. The preceding analysis suggests that a regional perspective for policymaking could lead to better outcomes for each country. Given the evidence that regional interlinkages can amplify spillovers to each of the *Nordic4*, there is a potentially useful role for policy coordination. For example:

- **Strong national policies have collective benefits.** The findings from the macroeconometric model suggest that negative episodes emanating from a single country in the region will be felt by all members given the extent of comovement within the *Nordic-4*. Therefore, strong domestic policies that could mitigate such shocks in the first instance are beneficial, for example, macro prudential policies that are geared towards managing private sector balance sheets and the housing market;
- **Building national and regional buffers.** Given that regional factors can help explain, in part, risk premia in financial markets, the risk from contagion from neighboring markets is evident. With potentially large contingent liabilities resulting from bank failures (see Chapter III of Selected Issues), fiscal buffers has advantages not only nationally but also to enhance regional stability;
- **The advantages from coordination.** The Nordic countries have different fiscal rules and, in some cases, different external policy constraints (e.g., EU Excessive Deficit Procedure rules). But the same linkages that can amplify shocks have the potential to create a virtuous circle of reinforcing fiscal impulses when the *Nordic-4* authorities take concerted actions. Furthermore, policy coordination would also ensure that strategic or competitive domestic policy responses by governments do not put the region on a sub-optimal output growth trajectory.

Panel 4.1. Estimated Inward Output Spillover Coefficients

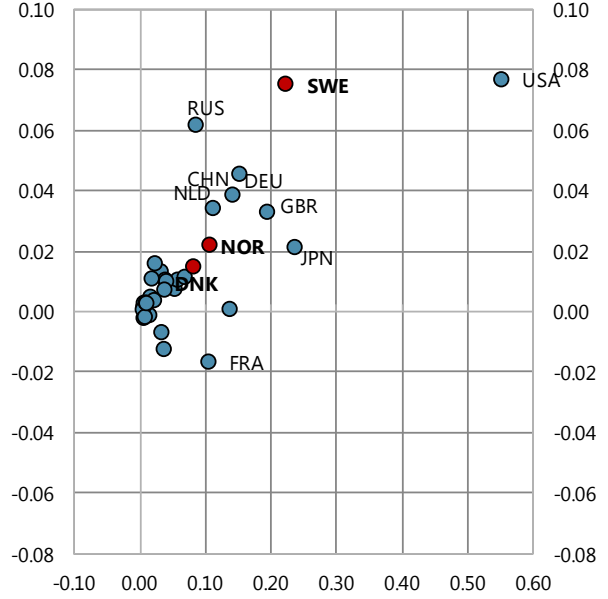
Denmark

(X: Financial Shock; Y: Macroeconomic Shock)



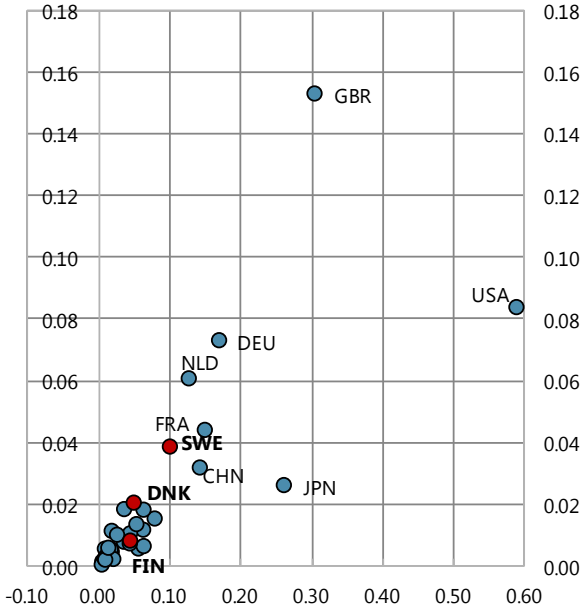
Finland

(X: Financial Shock; Y: Macroeconomic Shock)



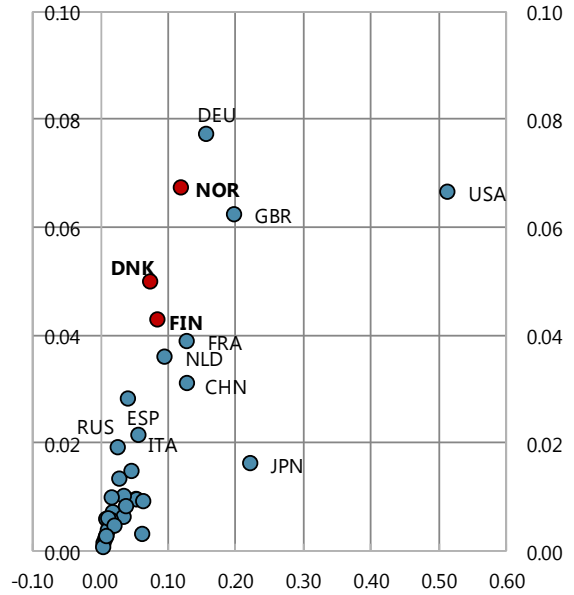
Norway

(X: Financial Shock; Y: Macroeconomic Shock)



Sweden

(X: Financial Shock; Y: Macroeconomic Shock)



Source: Fund staff calculations.