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NORWAY

SELECTED ISSUES

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SELECTED ISSUES

July 24, 2018

Approved by
European Department

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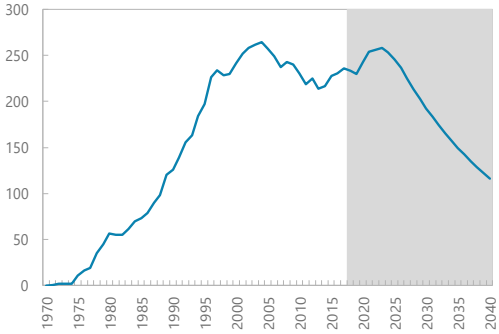
CONTENTS

WAGES AND COMPETITIVENESS IN NORWAY[1]

Wage growth was high during the 15 years before the 2014–16 oil downturn, substantially outpacing productivity growth and wages in trade partners. But Norway was able to avoid a large deterioration in aggregate competitiveness, thanks to sizable terms of trade gains—not only in oil[2] and oil-related industries, but also metals and fisheries. Still, other tradable sectors have experienced declining exports—and these sectors will be important in the future to absorb labor as oil production eventually declines. This paper presents evidence that despite Norway's stellar institutions to manage oil revenues parts of its non-oil economy nevertheless suffered due to the oil boom. To address competitiveness challenges in these sectors, and to prepare the transition out of oil, it would be helpful to: (i) continue the wage moderation started during the oil downturn, and (ii) use the current economic upturn to start gradually tightening fiscal policy.

A. Background: One Country, Two (Interlinked) Economies

1. Oil production is projected to decline starting in the mid-2020s. After discoveries in the late 1960s, production started in the mid-1970s. It reached a first peak by the mid-2000s, which it is expected to reach once more as a large field comes onstream by the early 2020s. While the difficulties in forecasting oil production ought to be acknowledged, forecast errors in the past have not been enough to throw into doubt the view that oil is close to its peak.



Sources: Norwegian Petroleum; and IMF staff estimates.

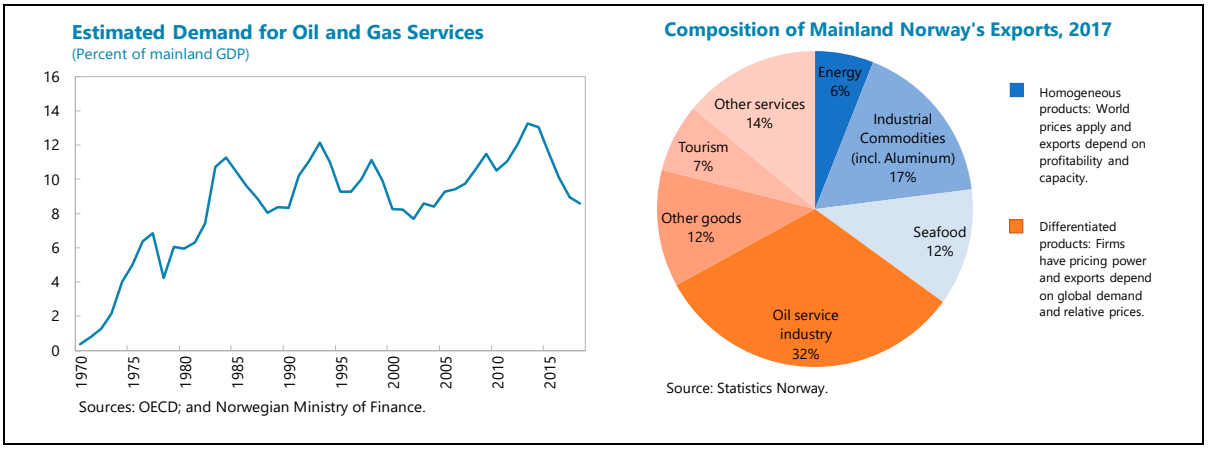
2. The oil sector has strong spillovers on Norway's mainland economy, chiefly through large oil-related industries. Norway's petroleum production represented ⅛ of output and ¼ of exports in 2017. Direct employment in the oil sector is 2 percent of total employment. But the oil sector also has important spillovers on the mainland economy: a further 8 percent of employment is estimated to indirectly depend on it.[3] In particular, Norway features sizable oil-related industries. It is commonly referred to as the oil services industry, although this is somewhat of a misnomer as the industry provides both specialized manufactures and vessels as well as engineering and other services to oil companies. It is also a strong export sector: it accounts for 1/3 of mainland, i.e. non-oil, exports.

3. Oil and oil-related industries lifted Norway's GDP above regional peers, but also contributed to developing a two-speed economy. The oil and the oil services industries have

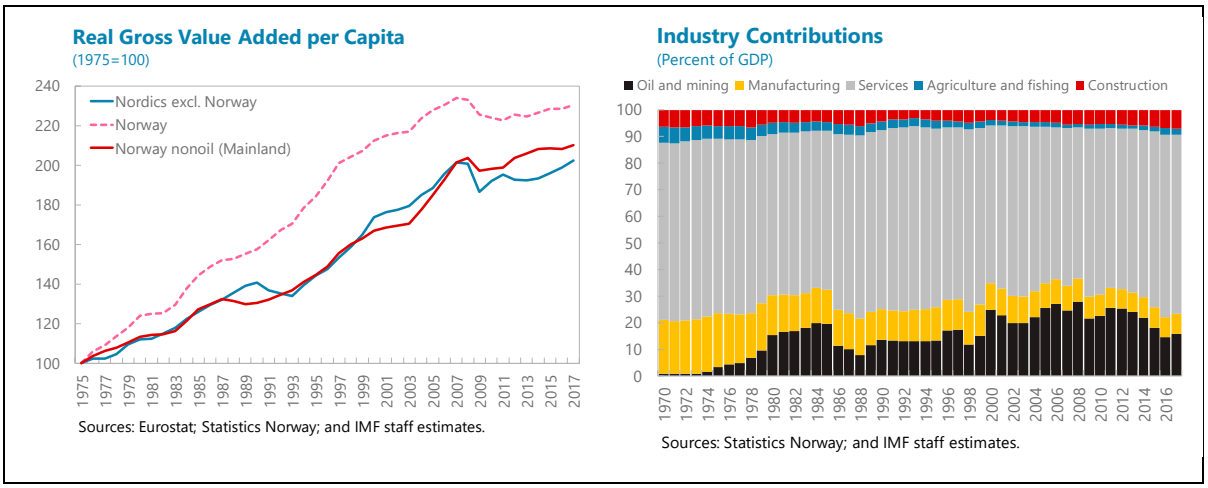
[1] Prepared by Ezequiel Cabezon and Christian Henn.

[2] In this SIP, the term "oil" is used to define both oil and gas.

[3] Hungnes and others (2016).



grown rapidly and the 2004–13 oil boom led to a further expansion of the sector. Oil services firms extracted terms of trade gains during this period as—being quite specialized—they could use pricing power to their advantage during this time of high global oil investment. Despite the rapid growth of the oil services industry,[4] which forms part of the mainland economy, mainland real GDP only increased in line with peers. As resources were in fact reallocated toward these oil-related industries, this implies that the non-oil economy actually grew less than peers.



4. This paper evaluates the channels through which competitiveness of certain non-oil tradables may have declined during the past 15 years. This is important because non-oil tradables will need to become a larger contributor to growth if Norway is to sustain its strong performance as oil production declines over the long term. The paper departs from the literature studying the incidence of Dutch Disease in Norway. This literature concludes that Norway in many ways has managed to contain Dutch Disease symptoms well, but that it was not able to shelter the economy completely (Section B). This literature, however, focusses relatively little on wage

[4] Note that the oil services industry is hard to statistically pin down and separate from the remaining mainland economy. However, it is illustrative of its rapid growth that went from being nonexistent in the 1960s to constituting 1/3 of exports in 2017.

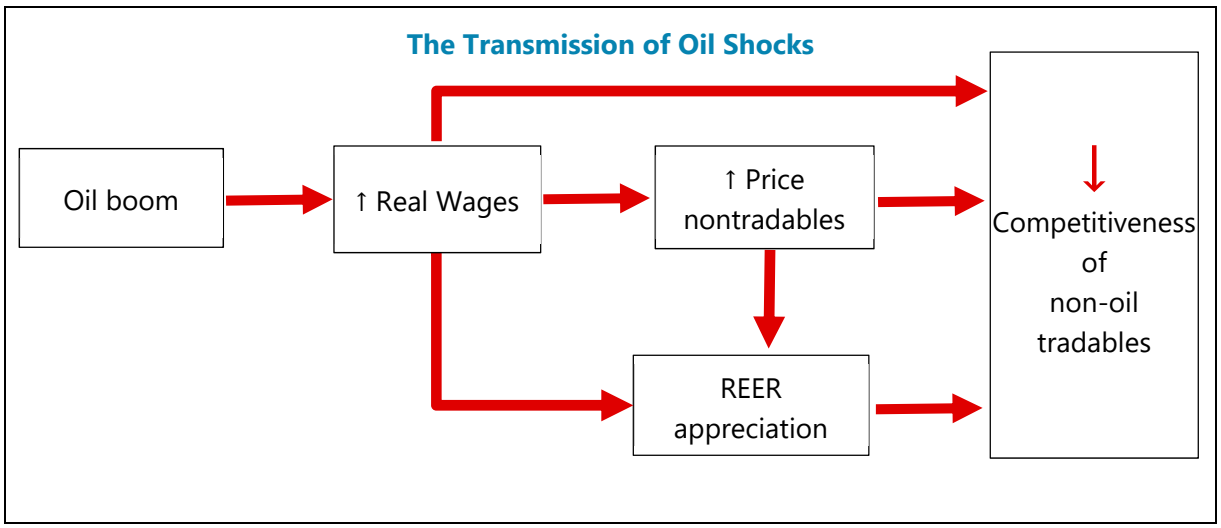
developments since the 2000, which we complement in Section C. This section notes that Norway's collective bargaining system, on the one hand, enabled a broad sharing of these terms of trade gains through relatively homogenous wage increases across sectors. On the other hand, this has strained sectors not benefitting as much from terms of trade gains, whose competitiveness decreased by more than that of the economy on aggregate. Section D shows that the expansion of non-oil fiscal deficits during the last decade may have indirectly exacerbated competitiveness pressures; therefore, a tightening of fiscal policy would now be appropriate, given the current economic up-cycle.

B. The Literature on Dutch Disease in Norway

5. Dutch Disease is a phenomenon by which a boom in the natural resource sector can result in a real appreciation of the exchange rate through two channels (Corden and Neary, 1982):

- **A spending effect:** The boom in the resource sector generates additional income. If it is spent, demand for tradables and non-tradables expands. While prices of tradable goods have to remain aligned with international prices, prices of nontradable goods climb. As a consequence of higher wages and higher prices of nontradable goods, the tradable sector's costs increase and therefore its competitiveness declines.

- **A resource allocation effect:** During the resource boom, labor (and capital) is reallocated towards the resource sector. Higher remuneration in the resource sector and related activities will attract labor. This increases the cost of labor for the whole economy. In the non-tradable sector, prices will rise as the sector needs to pay higher wages to attract labor.



6. Norway in many ways has done an excellent job in limiting Dutch Disease and safeguarding competitiveness. Some econometric studies find limited evidence of Dutch Disease (Hutchison, 1994, Bjørnland 1998, and Bjørnland and Thorsrud, 2016). The literature in particular highlights the role of strong institutions and policies, development of other (related) industries, and migration.

- **Strong institutions and policies.**[5] The fiscal framework (see Staff Report, Annex III) ensures that oil revenues are saved abroad in a sovereign wealth fund. Only the expected real returns of those savings, revised down in 2017 from 4 percent to 3 percent, are gradually injected into the Norwegian economy. This delinks spending from contemporaneous oil revenues and contains the spending channel of Dutch Disease (Davis et al, 2003; Medina and Soto, 2016). Norway's institutions also prevented rent-seeking behaviors and sound fiscal policy contained government spending.

- **Development of other (related) industries.** Bjørnland and coauthors[6] argue that complementarity between oil and the rest of the economy play a critical role inhibiting a real GDP growth deterioration. Development of the oil services sector alongside the development of oil production itself created a new export sector—and although it is related to oil and subject to much of the same fluctuations, it offsets in the aggregate the lower growth of other tradables. Anecdotal evidence furthermore suggests that there are favorable knowledge spillovers from oil-related engineering, which have fostered innovation in other areas.

- **Migration.** Inward migration in boom phases helps buffer the resource reallocation effect, thereby softening wage pressures from Dutch Disease (Cappelen and Eika, 2017). Traditionally, Norway's labor market has been well integrated with the other Nordic countries, facilitating migration. In addition, Norway has received significant immigration from various EU countries, which contained wage pressures during the oil boom.

7. But Norway may not have been able to counteract the resource allocation channel as much. Several studies observe a resource movement effect in Norway, as epitomized by the stagnation of non-oil exports and manufacturing growth. Gylfason (2001) also emphasizes the lack of a high-tech manufacturing sector, in contrast to Sweden and Finland. Larsen (2006) identifies weaker growth than Denmark and Sweden in the second half of the 1990s and a contraction of manufacturing as concerns. Holmøy and Massey (2005) conclude that Norway's competitiveness was indeed affected by its high wage growth and real exchange appreciation since the mid-1990s.

8. Loose fiscal policy can exacerbate the spending channel. Holmøy and Massey (2005) also emphasize that a favorable financial situation for the government and the economy can confuse the public with respect to long run consumption possibilities. Similarly, Gylfson (2001) warns that the

[5] See Gylfason (2001) and Larsen (2006).

[6] See Bjørnland and Thorsrud (2016) and Bjørnland, Thorsrud, and Torvik (2018).

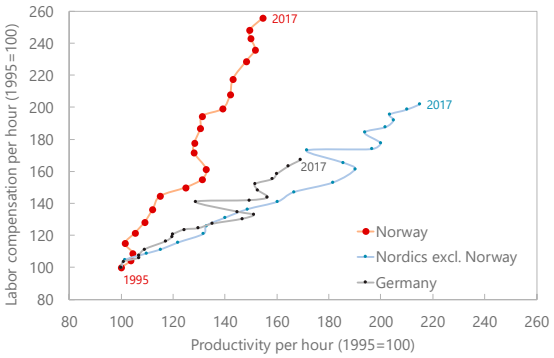
assets in the sovereign wealth fund can generate a false sense of security; difficult decisions could thereby be delayed, jeopardizing long term growth. Since these authors studied the issue, the sovereign wealth fund has grown much larger, and now stands above 300 percent of mainland GDP. The Norwegian authorities have recognized this and tightened their fiscal rule in 2017. But even adhering to the tightened fiscal rule's long-run benchmark of spending 3 percent of the sovereign wealth fund is still expected to mean non-oil deficits of some 8 percent of mainland GDP.

C. Wage and Competitiveness Developments of the Last Twenty Years

9. The Dutch Disease literature on Norway has paid relatively little attention to wage developments during the last decade. This is because many studies were published before the mid-2000s and more recent studies do not explicitly focus on wages.

10. This matters, because over the last two decades, wage growth in Norway has notably outpaced that in trade partners. Since 1995, nominal manufacturing wages in Norway have risen by 160 percent, compared to less than 100 percent in other Nordics and less than 80 percent in Germany. Similar trends are observable for services, though the magnitudes of differences are slightly less stark.

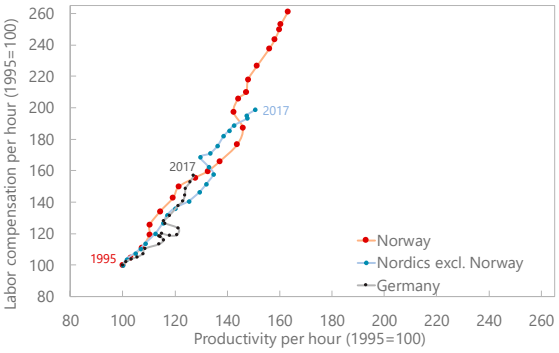
Manufacturing: Labor Compensation and Productivity



Sources: OECD; and IMF Staff estimates.

11. At the same time, productivity growth has been slower than in trading partners. Since 1995, productivity in manufacturing has only grown by 50 percent, while that of other Nordic peers more than doubled. In contrast, productivity in services increased somewhat more than in trading partners, but not enough to offset the higher wage increases in the sector compared to peers.

Services[1]: Labor Compensation and Productivity

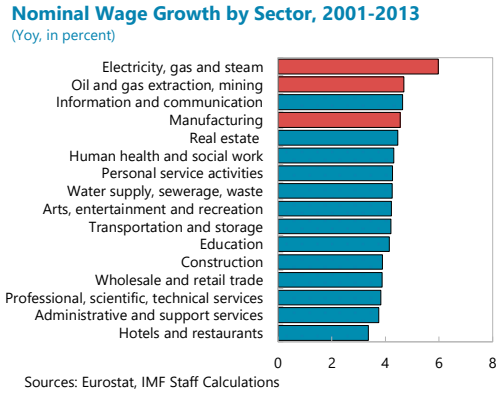


1/ Excluding real estate activities.
Sources: OECD; and IMF Staff estimates.

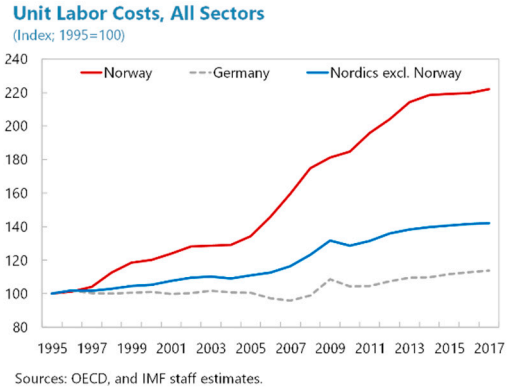
12. In Norway's collective bargaining model, the manufacturing sector, a considerable part of which supplies oil firms, leads wage negotiations. Norway's sector-level bargaining negotiations follow the so-called "pattern bargaining" process: the manufacturing sector, which is deemed the most exposed to international competition, agrees on a wage target. This target is then applicable to the other sectors as well. The blue-collar workers in the manufacturing sector traditionally (i.e. up to 2014) negotiated their wages first, setting a starting point for the wage agreement for all workers in the sector. The wage norm agreed in manufacturing, in turn, served as a target for the *average* wage rises in the rest of the economy, including the public sector. Within manufacturing, oil-related

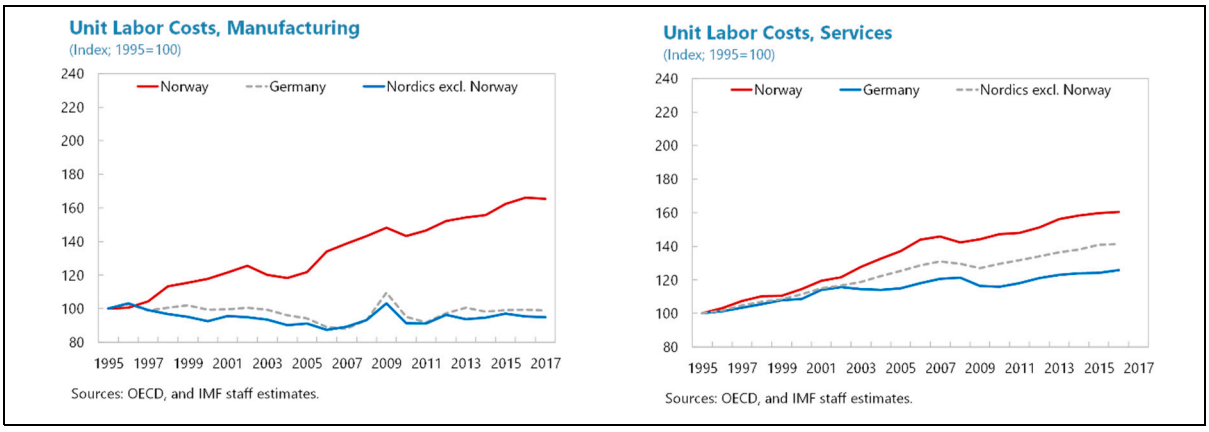
manufacturing played an important role and could afford high wage increases as the rising price of oil in much of the last 15 years increased demand for the sector's products.

13. High wage increases were then passed onto sectors that had not experienced terms of trade gains. While there are no laws preventing different sectors from deviating from the norm established by the manufacturing sector, social partners have historically complied with the central agreements. Given this close adherence of follower sectors, the manufacturing sector's high wage increases—of above 4 percent during 2001–13—permeated throughout the economy. Arguably, social partners' traditional objective to contain wage dispersion in the economy also played a role.



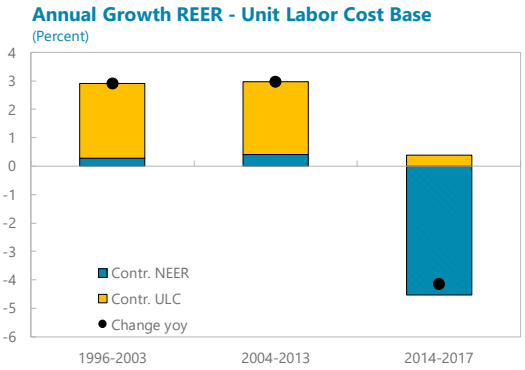
14. Wage increases in excess of productivity growth increased aggregate unit labor costs (ULC). Non-agricultural ULC have increased by more than 120 percent since 1995, compared to less than 40 percent in Nordic peers. In manufacturing, ULCs increased by 70 percent, running far ahead of peers. In services, Norway's ULC also outpaced peers but to a lesser extent. Deteriorations in unit labor costs were particularly pronounced during 2005–13, when global commodity prices spiked.



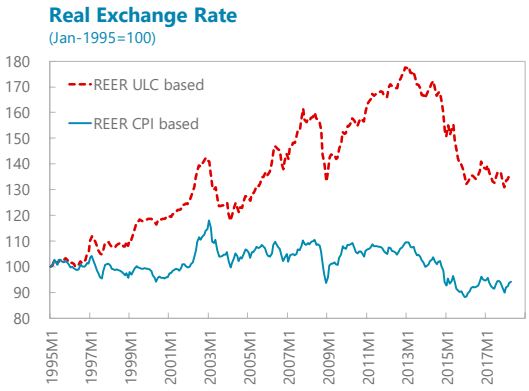


15. Not surprisingly, the ULC-based REER has appreciated significantly. The deviation of the ULC-based REER from the CPI-based REER has been startling in Norway, especially over the last decade. The latter has hardly moved and now stands slightly below its 1995 level. In contrast, the ULC-based REER in 2013 was some 70 percent more appreciated than in 1995, with rising labor costs being virtually the sole driver as the nominal effective exchange rate was quite stable.

Only half of this trend appreciation has been reversed during the recent oil downturn, as a result of krone depreciation.

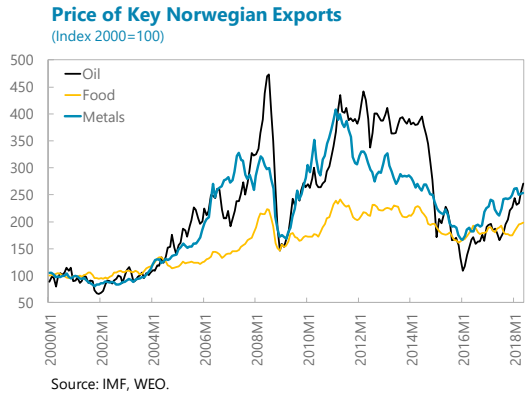


Sources: IMF staff estimates.

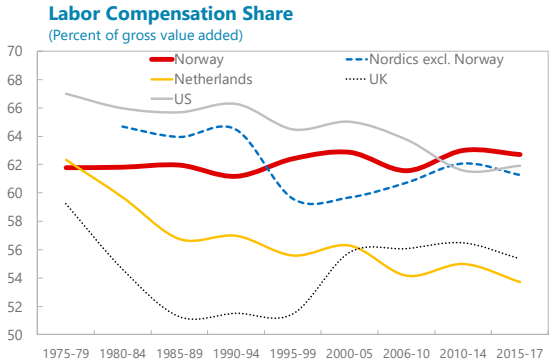


Source: IMF staff estimates.

16. Despite these negative developments, large terms of trade gains cushioned the decline in aggregate competitiveness. Large improvements in key prices of export products such as oil, metals, and food products mitigated the competitiveness deterioration for the overall economy. One way to see that wage gains may not have been unsustainable *in the aggregate* is to note that wages have not increased as a share of GDP. At a time when several other advanced countries experienced falling labor shares, Norway's remained constant. It likely played a role that maintaining a stable share of labor compensation in domestic income is an important objective of collective wage bargaining in Norway.



Source: IMF, WEO.



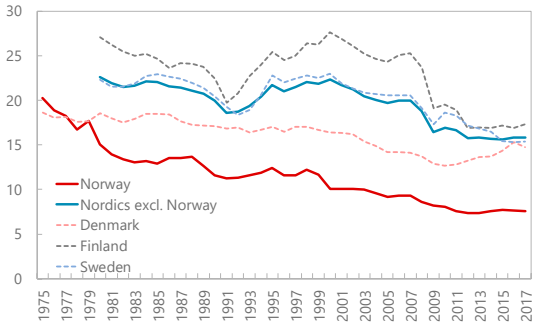
Sources: Eurotat; country authorities; and IMF staff estimates.

17. Nevertheless, competitiveness is now a challenge in non-oil manufacturing sectors (Figure 1). Non-oil manufacturing's value added has approximately halved in terms of mainland GDP since the late 1990s. True, this trend can be interpreted benignly, as an optimal reallocation of resources to the sectors benefiting from terms of trade gains. However, this reallocation will likely make diversification away from oil, which is ultimately needed over the longer term, more difficult. Also, their response to the 20 percent real exchange rate depreciation of the recent oil downturn has been muted so far. In contrast, oil-related manufacturing showed a robust performance. It was able to retain its share of value added in the economy through 2014. After that they were impacted by declines in global oil investment, but the latter is already recovering.

Figure 1. Non-oil Competitiveness

Share of Manufacture on Gross Value Added

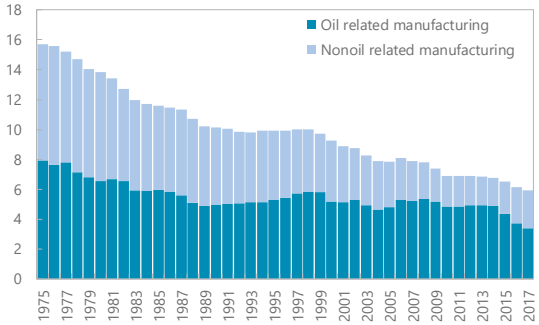
(Percent)



Sources: Country authorities; Eurostat; and IMF staff estimates.

Norway: Manufacturing Gross Value Added

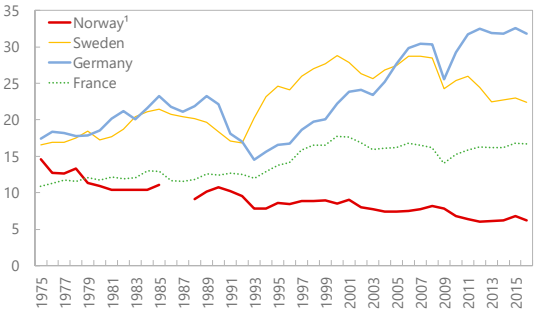
(Percent of mainland gross value added)



Sources: Statistics Norway; and IMF staff estimates.

Manufacturing Exports

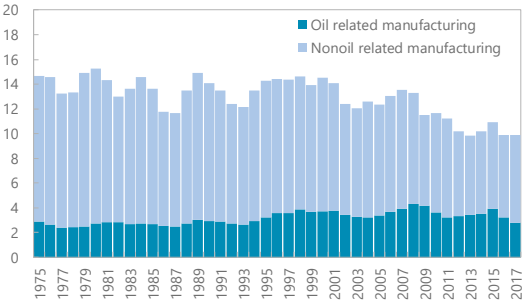
(Percent of GDP)



1/ Percent of mainland GDP.
Sources: World Bank, WDI; and IMF staff estimates.

Manufacturing Exports

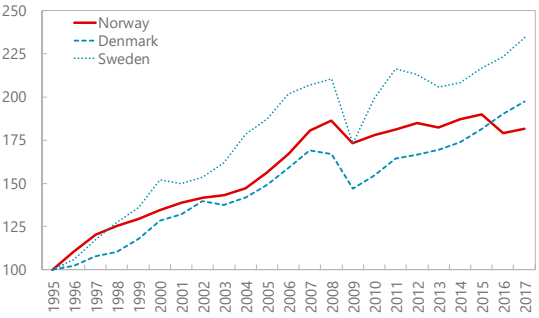
(Percent of mainland GDP)



Sources: Statistics Norway; and IMF staff estimates.

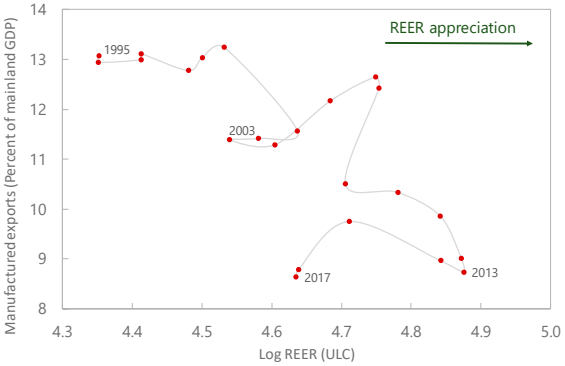
Nonoil Exports of Goods: Quantity

(1995=100)



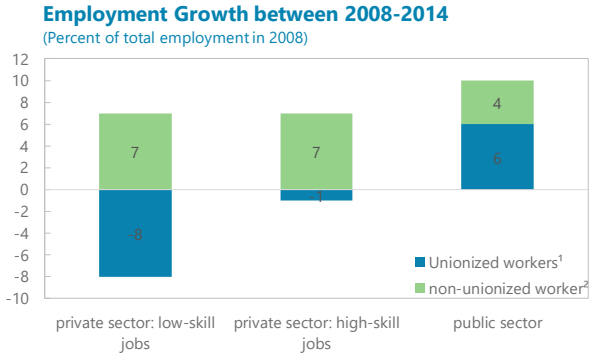
Sources: Country authorities; and IMF staff estimates.

REER and Manufactured Exports



Sources: Haver Analytics, and IMF staff estimates.

18. Moreover, in some non-tradable sectors a segmented labor market is arising as a result of high wage costs. Traditionally the non-tradable sectors—such as retail trade, restaurants, and construction—do not directly face international competition. However, as wage growth could not be completely neutralized by productivity gains in these sectors, they have been experiencing considerable inward labor migration. Migrants often accept lower wages and tend not to be covered by collective agreements, unlike most native workers. Therefore, union coverage in certain sectors has been decreasing quite rapidly. The consequences of the rise of non-unionized employment on Norway's tight social compact remain to be seen.

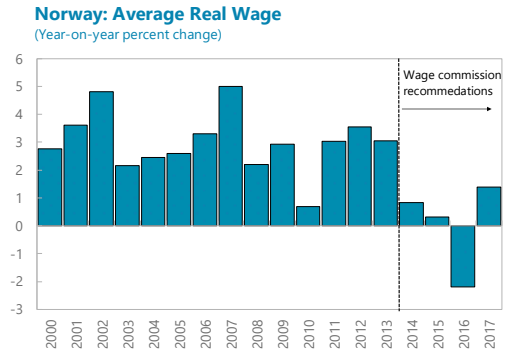


1/ Proxied with local workers.
2/ Proxied with immigrant workers.
Sources: The Norwegian Confederation of Trade Unions; and IMF staff estimates.

19. Wage growth has moderated substantially in the last few years. Social partners have been able to deliver wage moderation since the onset of the oil downturn. Wage growth in the manufacturing sector was less than 2 percent on average during 2014–17, with other sectors reducing their average wage growth from above 4 to 2.3 percent during the same period. This helped prevent further deterioration of cost competitiveness, although losses from the past decade have not been reversed. Reforms to the collective bargaining system, effective 2014, likely also had a positive impact on the outcomes (Box 1).

Box 1. The 2013 Amendments to the Wage Setting Agreement

In 2013, Norway appointed a commission to examine wage formation experiences since the introduction of the fiscal rule and the monetary policy inflation target. The committee recommendations highlighted that wage moderation would be needed in the long run. Key changes implemented starting in 2014 included:



Sources: Statistics Norway; and IMF staff estimates.

1) Setting a wage increase for all workers. Before 2014 the agreement only set blue-collar workers' wages. This resulted in white-collar workers' wages growing above blue-collar workers'.
2) Giving the NHO (main employers' confederation) and LO (confederation of Trade Unions) the task to set a benchmark for wage growth. This reduced uncertainty and disputes at firm and sector level. Before 2014, the wage leading agreement was set by the Federation of Norwegian industries (Norsk Industri) and the metal workers. As many blue-collar workers received additional wage increases at the firm level, the scheme was fostering higher wage increases.
3) More focus on benchmarking competitiveness and wage growth against trading partners.

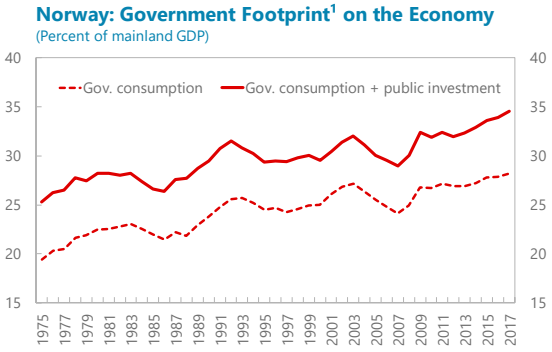
The timing of the recommendations and their implementation was optimal, as in 2014 the sharp decline in oil prices provided an opportunity to test the framework. The framework has delivered wage moderation during the last few years.

Sources: Norwegian Government (2013).

D. Fiscal Policy and Competitiveness

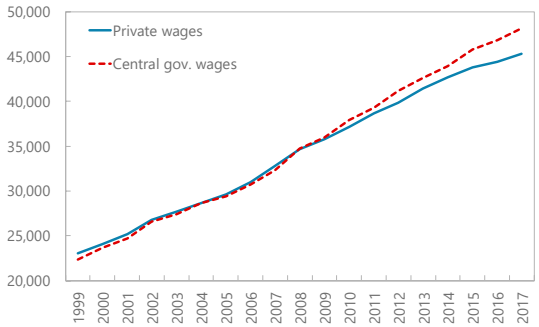
20. Norway's fiscal institutions have contained the spending of oil revenues to a greater extent than in other resource-rich countries. The fiscal rule (see Staff Report, Annex III) has significantly contained the procyclicality of fiscal policy and helped contain government spending during the oil boom particularly in relation to other oil-rich countries. Nevertheless, the sovereign wealth fund has now expanded to some 300 percent of GDP, and the non-oil deficit allowed by the fiscal rule has increased commensurately. Specifically, the non-oil deficit has gone from 1–2 percent of mainland GDP in the early 2000s to some 8 percent now. The authorities have commendably tightened the fiscal rule in 2017 (by assuming a lower real return of the sovereign wealth fund) but even under the tighter parameters non-oil deficits could remain at 7– 8 percent of mainland GDP in the foreseeable future.

21. The continuous fiscal expansion is likely to have worsened cost competitiveness. Government consumption has increased significantly in Norway, bucking a trend seen in other Nordic countries. Such a rise is likely to have appreciated the real exchange rate above and beyond what could be expected from terms of trade gains. Another way to see this is that the loose budget constraint allowed the public sector to fully accommodate and reinforce large wage increases led by oil sectors, instead of providing an anchor.[7]



Norway: Government Footprint[1] on the Economy
(Percent of mainland GDP)

1/ Gov. Footprint includes government consumption + public investment.
Sources: Statistics Norway; and IMF staff estimates.



Norway: Average Wages
(NOK per month)

Sources: Statistics Norway; and IMF staff estimates.

[7] Public wages in Norway follow the guidelines set by the social partners' economy-wide benchmark agreement and thereby the government has only a limited role in wage negotiations.

E. Conclusions and the Challenges Ahead

22. Going forward, Norway may have to downwardly revise its expectations for wage growth if it is to avoid a significant loss of competitiveness and manage the transition to a less oil-dependent economy. Norway was able to afford very high wage growth in the past (notwithstanding the noted challenges in several sectors) thanks to good fortune in its terms of trade. Going forward, it would be prudent not to count on being fortunate twice: wage moderation would help build resilience in case of less favorable trends in international prices. It would also help facilitate the needed transition out of oil by supporting sectors that did not benefit from past terms of trade gains. Communication from the government can continue to help in managing public expectations.

23. There are reasons to be optimistic for the future. Norway was exposed to sizable terms of trade declines during 2014–16. Its effects were cushioned by krone depreciation and, importantly, by social partners' ability to deliver wage moderation.

24. Fiscal policy plays a key role in promoting competitiveness and containing the spending effect of Dutch Disease. After a prolonged expansion of fiscal policy—partly enabled by large valuation gains of the sovereign wealth fund—it is now appropriate to gradually start tightening fiscal policy. The ongoing up-cycle provides an ideal setting to get started on structural consolidation, which will ultimately be needed to face to address aging pressures. Relatively timely adjustments to negative shocks and a conservative approach to internalizing positive shocks into fiscal policy would help competitiveness. This is particularly important for Norway, because its public sector net worth is subject to higher fluctuations as a result of asset and petroleum prices than that of other countries (Cabezon and Henn, 2018). Finally, further reorienting spending to make it more productivity-enhancing would also help support competitiveness.

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NORWAY'S PUBLIC SECTOR BALANCE SHEET AND FISCAL IMPLICATIONS[1]

1. An intertemporal public sector balance sheet is the most comprehensive way to evaluate long-term fiscal sustainability. In contrast to a debt sustainability analysis, the intertemporal balance sheet also takes into account financial assets, which are large in Norway's case given oil savings in the sovereign fund (of some 300 percent of mainland GDP as of end 2017). Moreover, nonfinancial assets are also added, which are also very large for Norway given substantial remaining oil and gas deposits. Finally, the public corporations sector is added and, crucially, long-term aging costs are accounted for—these will accrue overwhelmingly to the public sector in Norway, as it funds virtually all pensions and health and long-term care. Cabezon and Henn (2018) developed such a public sector balance sheet for Norway for this Article IV consultation.

2. The approach provides a single measure to assess fiscal sustainability. This single measure—intertemporal financial net worth (IFNW)—brings together the present values of all public assets and liabilities and the future fiscal path. Representing an intertemporal budget constraint, it provides a bottom-line assessment for fiscal sustainability that is easy to interpret. This is especially convenient when large public assets are juxtaposed against high fiscal (non-oil) deficits, as in Norway. If IFNW is negative, fiscal adjustment will be required at some point in the future.

3. The intertemporal public sector balance sheet is made up of two broad components. The static balance sheet comprises all present-day assets and liabilities; it involves few assumptions. The intertemporal component adds net present values of all future fiscal balances. This necessarily involves many assumptions on the future fiscal path and macroeconomic variables. We assume that non-oil revenues will stay constant relative to mainland GDP and that expenditure would increase over time solely in response to rising aging costs. Aging cost projections mirror those made by the Norwegian authorities. While it may seem unrealistic that the Norwegian authorities would not act to address aging pressures in the future, such a no policy action scenario is useful as a baseline.

4. Not surprisingly, the analysis shows that Norway's static fiscal position is highly positive (Figure 1). Static public sector net worth for Norway stood at around 340 percent of mainland GDP as of 2017. Driven mainly by higher valuations for assets in the sovereign wealth fund and the present value of remaining oil and gas deposits, it is about 500 percentage points higher than that of Finland (which is analyzed in Brede and Henn, 2018). The IMF's October 2018 Fiscal Monitor will help put Norway into an even broader international perspective by providing static public sector balance sheets for a larger series of countries.

5. But, more surprisingly, Norway's intertemporal financial net worth (IFNW) is negative, at *minus* 240 percent of GDP. How can this be? Non-oil fiscal deficits have been rising steadily over the past 15 years. While they were less than 2 percent of mainland GDP in the early 2000s, they now stand at close to 8 percent of mainland GDP. The rise occurred during a period of positive

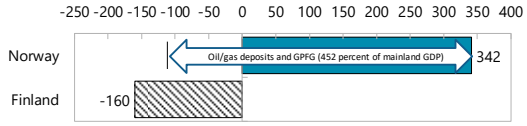
[1] Prepared by Ezequiel Cabezon and Christian Henn.

aging trends—but aging costs will now start to mount. Thus, the IFNW signals that, if non-oil deficits were allowed to rise further in line with aging in the future, Norway's savings would be gradually eroded and eventually more than depleted. The situation of Finland is the reverse. Its negative static net worth is more than compensated for by the strength of its future fiscal balances. Finland's IFNW is slightly positive because Finland's fiscal deficits are below 2 percent of GDP and declining; moreover, aging pressures have already been absorbed therein to a larger extent.

Figure 1. Comparison of Norway and Finland's Public Sector Balance Sheets

Norway's static net worth is positive, while Finland's is negative.

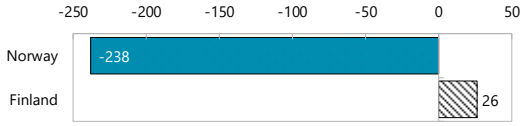
Static Net Worth, 2017
(Percent of mainland GDP for Norway; Percent of GDP for Finland)



Sources: Norwegian Authorities, IMF Staff calculations and estimations, Brede and Henn (2018).

Nonetheless, Norway's much higher non-oil fiscal deficits imply a negative IFNW, while Finland's low deficits turn its IFNW positive.

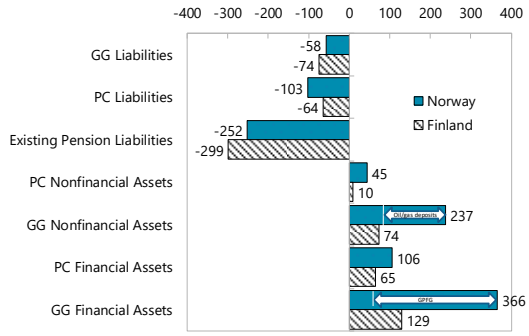
Intertemporal Financial Net Worth, 2017
(Percent of mainland GDP for Norway; Percent of GDP for Finland)



Sources: Norwegian Authorities, IMF Staff calculations and estimations, Brede and Henn (2018).

The GPFG and present value of oil and gas in the ground explain the difference in static net worth.

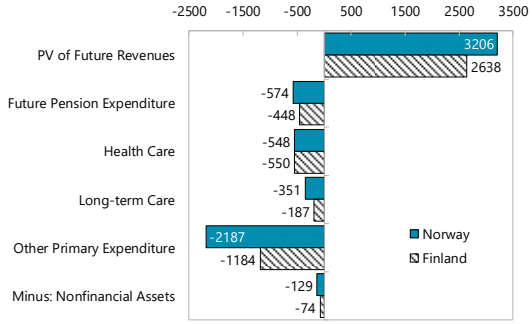
Breakdown of Static Net Worth, 2017
(Percent of mainland GDP for Norway; Percent of GDP for Finland)



Sources: Norwegian Authorities, IMF Staff calculations and estimations, Brede and Henn (2018).

Higher non-age-related expenditures drive Norway's IFNW lower, while future age-related expenses are comparable.

Breakdown of the Intertemporal Component, 2017
(Percent of mainland GDP for Norway; Percent of GDP for Finland)



Sources: Norwegian Authorities, IMF Staff calculations and estimations, Brede and Henn (2018).

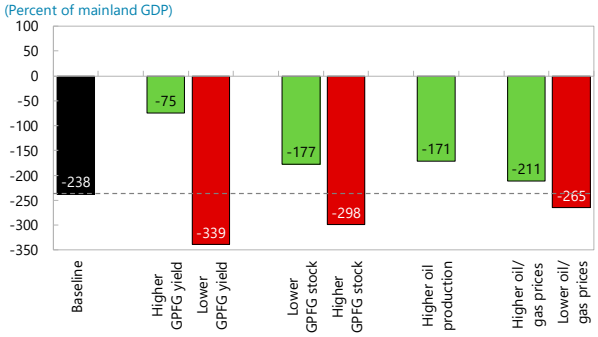
6. Scenario analysis highlights that good fortune alone would be unlikely to bring Norway's IFNW up sufficiently (Figure 2). Stress tests suggest that a buffer of 25–95 percent of mainland GDP would be required to enable Norway to withstand a large shock while retaining positive IFNW. We take this to be a desirable benchmark range for IFNW. Scenario analysis can then be used to evaluate which changes in assumptions would be needed to increase IFNW to this prudent range in the absence of actual fiscal adjustment. It shows that simultaneous positive surprises in several variables (such as asset prices, oil prices, oil production, etc.) would be needed; conversely, negative shocks to these variables would make IFNW more negative than it already is.

Such positive surprises are a possibility: All key variables to which Norway's net worth is sensitive have surprised to the upside during the last two decades. However, Norway should not rely on a repeat of such a positive confluence of factors. Identifying potential savings ahead of time would thus be prudent to forestall possible need for larger adjustments later.

Figure 2. Scenario Analysis

Good fortune alone with respect to the external economic environment would be unlikely to lift IFNW to the prudent buffer range.

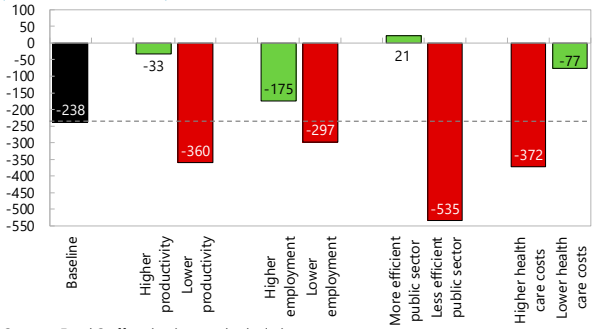
IFNW under Alternative Assumptions on Oil and the GPFG
(Percent of mainland GDP)



Sources: Fund Staff projections and calculations.

However, achieving efficiency improvements in public services provision would have a strong impact on IFNW, if savings are used to improve future fiscal balances.

IFNW under Alternative Macroeconomic Assumptions
(Percent of mainland GDP)



Sources: Fund Staff projections and calculations.

Note: See Cabezon and Henn (2018) for definitions of the shocks underlying these scenarios.

7. Continued adherence to the fiscal rule would ensure long-run fiscal sustainability, because sticking to the rule will eventually require significant fiscal adjustment. The rule envisages that the expected real return of 3 percent of the GPFG would be spent annually over the cycle (see Staff Report, Annex III). Our analysis shows that adhering to the rule ad infinitum would put IFNW into the middle of the prudent buffer range (Figure 3). This is because sticking to the rule might not require adjustment now but will require significant adjustment down the road, a point that the authorities openly acknowledge.[2] The rule implies that fiscal adjustment would have to start by the late 2020s, and the adjustment would exceed increases in aging costs from the 2040s onwards.

8. Realizing some fiscal savings earlier, such as during the present upcycle, would thus be favorable. While Norway's large static net worth gives it considerable time to adjust to aging, using the ongoing economic upturn to reduce the non-oil deficit would be advisable. Doing so would not only constitute sound countercyclical policy, but would also: (i) help underpin competitiveness by limiting pressures on the real exchange rate (see Staff Report, Annex I); (ii) make Norway more resilient to adverse shocks, including to asset price exposures of the sovereign wealth fund; and (iii) reduce long-term adjustment challenges. To completely meet the long-term adjustment

[2] The authorities should thus be commended for switching in 2017 from a 4 percent to a 3 percent rule, as the former would have ramped up spending dramatically over the coming decade, and required a significantly larger adjustment later. See Norwegian Government (2015, 2017).

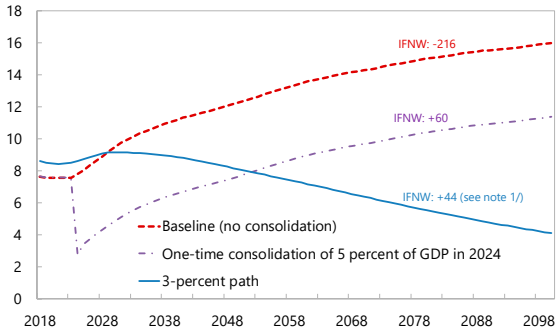
challenges, public sector efficiency improvements—onto which the authorities are turning their focus—would be required to deliver savings while maintaining public services provision as comprehensive as is currently the case under Norway's social model. Identifying areas of potential fiscal savings requires careful analysis, which the authorities are envisaging to conduct by through a system of regular spending reviews. However, simple benchmarking suggests that Norway's spending exceeds that of peers in the areas of transport, disability allowances, and health care (see Staff Report, Figure 6).

Figure 3. Fiscal Paths, Implied IFNWs, and Aging Costs

Adhering to the 3-percent path ad infinitum would ensure intertemporal fiscal sustainability. An illustrative 5 percent of mainland GDP one-time consolidation by 2024 would also jolt Norway's IFNW to the prudent buffer range.

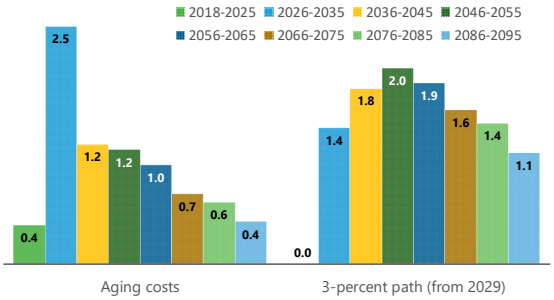
The 3-percent path implies no consolidation until 2029, but thereafter the rule would require consolidation to proceed faster than age-related cost increases.

Alternative Non-oil Fiscal Deficit Paths and implied IFNW
(Percent of mainland GDP)



Sources: IMF Staff projections.
1/ Baseline until 2028; then adhere to 3 percent rule after it binds from 2029 onwards.

Aging Cost and Consolidation under 3-percent Path
(Percent of mainland GDP)



Source: Norwegian Authorities and Fund Staff projections.

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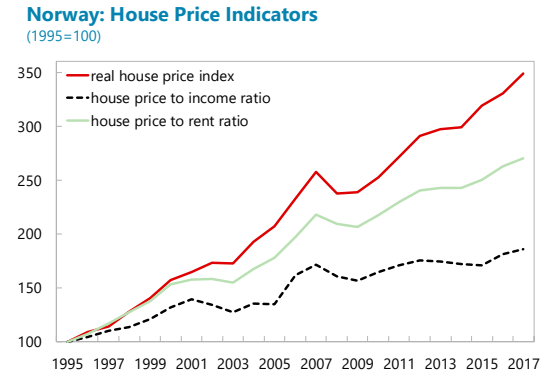
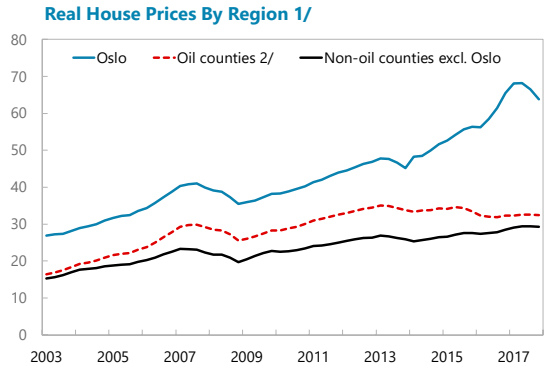
HOUSE PRICES AND LABOR MOBILITY IN NORWAY: A REGIONAL PERSPECTIVE[1]

A. Introduction

1. House prices in Norway have been growing rapidly in recent years. As of May 2018, nationwide house prices were 55 percent higher than in 2010. The national house price to income ratio remains historically and internationally high. Although house prices fell in 2017[2]—particularly in Oslo, which saw nominal house price declines of 10.5 percent—the correction was short lived. House prices rose again by 7.5 percent during January to May of 2018 on a seasonally-adjusted basis.



Sources: OECD. Haver Analytics.



Source: Haver Analytics.
Notes: 1/ per square meter in thousand NOK deflated by CPI; 2/ Rogaland and Hordaland

2. There has been a significant regional divergence of house price trends since 2013. Real house prices in Oslo now stand 60 above their 2010 level—compared to 35 percent for the whole of Norway. House prices in Oslo have been increasing particularly quickly compared to other regions since 2013. This represents a contrast to the last period of rapid house price appreciation—before the global financial crisis—when house prices grew evenly across Norway.

3. Large differences in house prices across regions can have macroeconomic implications. There is growing evidence that large house price differentials can limit regional labor mobility, thus slowing income and productivity convergence (Ganong and Shoag, 2015; Hsieh and Moretti, 2017). House price differentials—to the extent they translate into higher household debt and debt

[1] Prepared by Lucyna Górnicka and Yuanyan Sophia Zhang. We would like to thank the Real Estate Norway for providing us with data on regional house prices, and Nan Geng for sharing cross-country data and results of her analysis. We thank staff at the Norges Bank, as well as Francesca Caselli, Jacques Miniane, and Mico Mrkaic (all IMF) for useful comments.

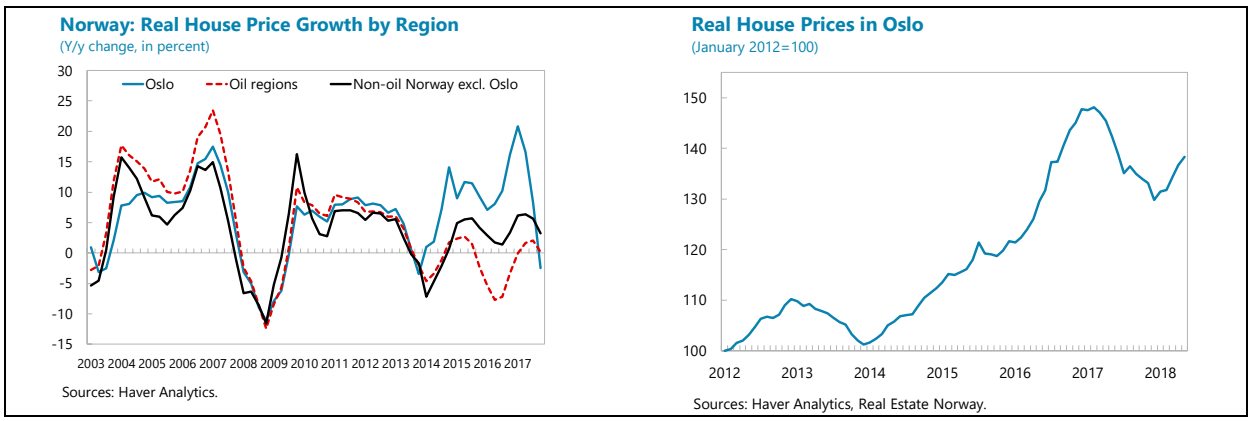
[2] Note that the annual average of real house prices in 2017 was nonetheless 10 percent higher than the average observed during 2016 for two reasons: (i) house price increases cumulated during 2016, reducing that year's average figure and (ii) the correction in 2017 mostly occurred in the second half of the year, thereby not pulling down the 2017 annual average by that much.

servicing costs—can make some local economies more sensitive to abrupt house price corrections than the others, thus providing arguments in favor of region-specific rather than nation-wide policies to mitigate financial vulnerabilities.

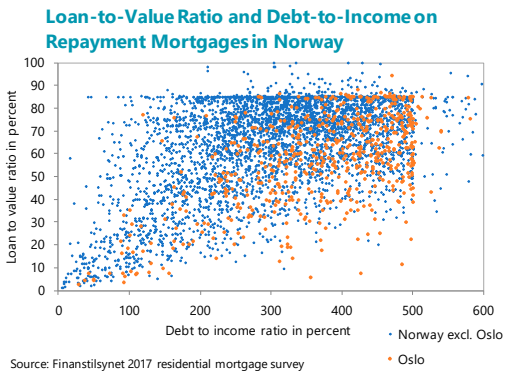
4. In this analysis we estimate the extent to which the recent regional house price divergence in Norway can be explained by fundamental factors. Section B looks at the recent trends in regional house prices, demand and supply factors more in detail. Section C describes our econometric approach to estimating regional equilibrium house prices, and provides main findings on the extent of house price over- or under-valuation across Norwegian regions. Section D studies the impact of house price differentials on labor mobility in Norway. Section E concludes.

B. Regional House Price Developments in Recent Years

5. In recent years, house prices have been increasing rapidly in Oslo, and growing at a moderate pace in other regions. House prices in Oslo have been growing at a fast rate since 2013, with a real appreciation of over 20 percent in 2016 alone. While real prices in the capital declined by 11 percent between March and December 2017, they picked up strongly again in the first half of 2018, and as of May 2018 they were again above their average 2016 level. In comparison, in the oil regions house prices are still below the levels observed before the 2014 oil price bust, and in the rest of the country the average real annual house price growth between 2013 and 2017 has been only 2.5 percent.



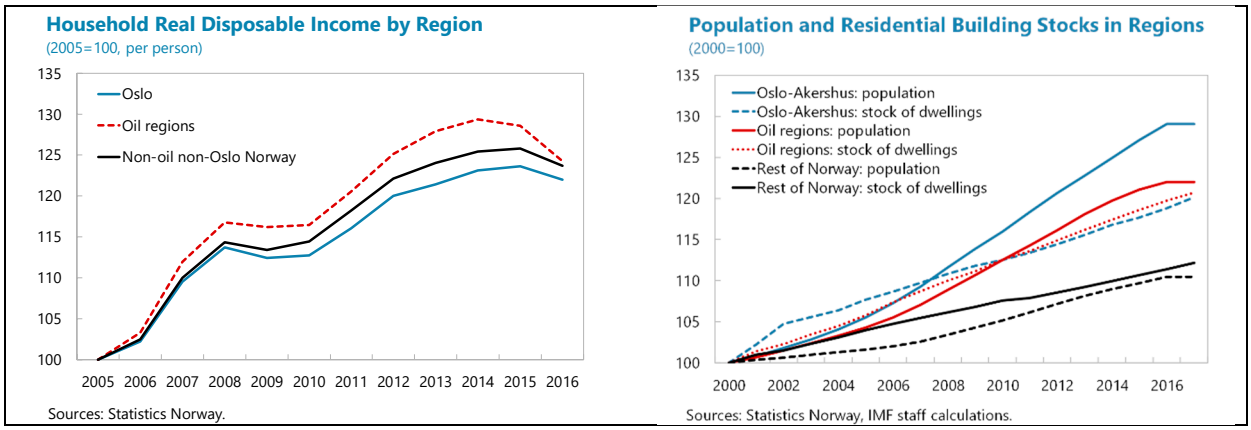
6. The Oslo correction happened not long after new mortgage regulations entered into force in January 2017. The new measures included: (i) a debt-to-income (DTI) limit of five; (ii) tightened conditions for applying an amortization requirement; and (iii) a lower limit for the maximum percentage of new mortgage lending in Oslo to deviate from one or more of regulatory requirements. There is evidence that the regulations, especially the DTI limit, have been



more binding in Oslo than in the rest of the country. More generally, staff's analysis suggests that macroprudential tools targeted at the housing market in Norway have contributed to improving the composition of household credit, and have had a dampening impact on growth in household credit and house prices.[3]

7. Several factors have likely contributed to strong house price growth in recent years, but not all can potentially account for the regional divergence in price developments:

- *Population growth outpacing residential construction*. Over the last decade Oslo has experienced much stronger population growth than the rest of the country. At the same time, the response of housing supply has been very sluggish, and only very recently has there been a considerable increase in the number of new house starts in Oslo. In comparison, in the rest of the country housing supply growth has been more aligned with population changes. Nevertheless, housing supply in the capital region has not been able to keep up with population growth since the mid-2000s. This raises the question why slow supply would lead to price increases only in the last three to four years.
- *Oil shock*. The rapid decline in oil prices in 2014 has had an impact on the whole Norwegian economy, but the regions with a larger dependence on oil, such as Rogaland and Hordaland, have been hit much more—translating into slowdowns or declines in house prices in these areas, relative to the rest of the country.
- *Low interest rates*. A gradual reduction of the Norges Bank's policy rate since late 2014, and low global interest rates have led to a considerable decline in mortgage rates in Norway in recent years. However, unless borrowing costs have not declined evenly across regions, lower mortgage rates cannot explain the faster house price growth in Oslo than in other regions.
- *Preferential property taxes.* Property tax rates differ across municipalities in Norway, and several municipalities do not impose property taxes at all. In Oslo, the property tax was introduced only in 2016, and it is levied on a relatively small share of the properties (the most expensive ones). Despite local differentiation, property taxes are overall relatively low (the maximum rate is 0.7 percent of a property's value) and the national tax system is very generous to mortgage-takers.



[3] IMF (2018), "Macroprudential Policies and Housing Prices," EUR Departmental Paper, forthcoming.

8. Differences in supply and demand factors across regions may not be large enough to fully explain recent house price dynamics. In particular, a rapid *pace* of house price growth in some areas raises questions whether fundamental factors alone can explain the growing differences across regions. To quantify the impact of fundamental factors on house prices and the extent of potential regional overvaluations, in Section C we construct an econometric model and use it to estimate equilibrium house prices at the *regional* level.

C. Estimation of Regional House Price Overvaluation

9. To estimate potential overvaluation of regional house prices in Norway, we use a two-stage approach. The existing literature has primarily focused on detecting *national* house price overvaluations, as sufficiently long time series of data are necessary to model the long term relationship between house prices and fundamental factors[4] (see Box 1 for an overview of tests of asset price overvaluations). In comparison, house prices and key explanatory variables are often not available at the regional level, or regional data have only few observations. This is also the case in Norway, where time series of many regional variables start from early or mid-2000s, and are available only on annual basis. To overcome the short sample issue, we thus apply a two-stage approach, where we first estimate national equilibrium house prices in Norway. The national equilibrium prices then inform the regional (second stage) regression, which is specified in terms of deviations of variables from their national-level averages.

Box 1. Tests for House Price Overvaluations: Literature Overview

Methods used to identify deviations of house prices from their equilibrium levels (or "bubbles") can be divided into three groups:

- **Cointegrating equations and error correction models.** House prices (or house price to income/rent ratios) and the fundamental factors, such as housing stock and borrowing costs, are assumed to co-move closely over the long term. Bubbles are then identified as short-term deviations from the estimated long-term relationship (Meen 2001; Ambrose et al. 2013; Geng 2018).
- **Econometric tests of time series of asset prices**. The time series of house prices are tested for the presence of bounded variance, and for stationarity. The overvaluations are identified as periods during which house prices present explosive or non-stationary behavior. Similarly, the existence of the cointegrating (error-correcting) relationship between house prices and fundamental factors can be tested within separate periods. See Gurkaynak (2005) for an overview of the time series tests.

Focusing on Norway, Anundsen (2016) considers a mix of cointegrating-equations methods, and econometric time series tests to analyze the behavior of house prices. He finds no evidence of house price overvaluation in Norway *at the national level* as of 2016, consistent with our analysis (see below).

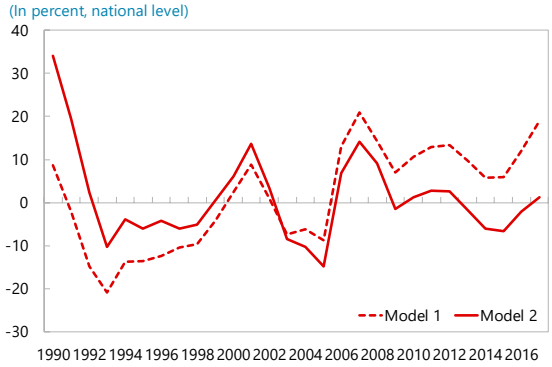
10. In the first step, we estimate the national equilibrium house prices for Norway using approach in Geng (2018). In her model, real house prices are a function of a range of fundamental and policy-related factors (Box 2). The regression is estimated using data for 20 advanced

[4] For another example of a regional analysis of house prices see e.g. Ho, G. (2016), "The Great Divergence: Regional House Prices in Denmark," Selected Issues Paper.

economies between 1990:Q3–2016:Q4—which should be sufficiently long to properly identify a long term cointegrating relationship. We estimate national equilibrium house prices in Norway[5] as the fitted values from two specifications in Geng (2018): one that includes only the fundamental factors commonly used in the literature, i.e. household real income and wealth, building stock, and interest rate (model 1); and one that has a larger number of significant explanatory variables, and that includes policy measures (model 2). Residuals from the two models are then identified as deviations of actual house prices from the equilibrium values, i.e. over- or under-valuations.

11. The cross-country panel regressions suggest that *at the national level* house prices were moderately overvalued in 2017. Both models imply a real overvaluation of house prices (of 10–20 percent) in the periods prior to the Nordic banking crisis in the early 1990s and before the global financial crisis. The models also show that real house prices were around 10 percent above their equilibrium levels in the early 2000s. For 2017, model 1 suggests a real overvaluation of national house prices of 19 percent, while model 2 suggests that prices were broadly in line with fundamentals in 2017 on average.

Model-Implied Real House Price Overvaluation in Norway
(In percent, national level)



Sources: Geng (2018), staff calculations.

Box 2. Estimating National Equilibrium House Prices in Norway

In Geng (2018), equilibrium real house prices are a function of fundamental and policy factors. The model is estimated on a panel of 20 advanced economies, over the period 1990:Q1–2016:Q4, with country fixed effects.

Variables	(1)	(2)
real income pc, log	1.63***	1.53***
real net financial wealth pc, log	0.08***	0.06**
stock of buildings per capita (in %)	-1.08***	-1.32***
mortgage rate	-2.76***	-1.78***
(mortgage rate)^2	0.08**	0.06*
tax relief index * real income pc		0.49***
rent control index * stock of buildings pc		0.44***
real income pc * s		-0.01
mortgage rate * s		1.13***
real net financial wealth pc * s		-0.06*
Observations	2,080	2,080
R-squared	0.781	0.781
Number of countries	20	20
Country fixed-effects	YES	YES
Robust standard errors	YES	YES

*** p<0.01, ** p<0.05, * p<0.1

Coefficient estimates from the two model specifications applied to our analysis are presented in Table 1. In model 1 only core fundamental factors commonly used in other studies— real household income and wealth per capita, building stock, and mortgage rate— are included as explanatory variables. In model 2, the per capita income, net financial wealth, and the mortgage rate are also interacted with country-specific elasticity of housing supply with respect to house prices (*s* in Table 1). This allows for capturing the variation in responses of house prices to changes in the three variables across the countries—proportional to the responsiveness of national housing supply. Additionally, two policy variables: a measure of severity of rent controls and of generosity of the tax system towards mortgage debt are interacted with demand and supply variables to allow for more variation in coefficients across countries.

[5] We make an out-of-sample prediction for 2017.

Box 2. Estimating National Equilibrium House Prices in Norway (concluded)

A potential drawback of the panel regressions is that the coefficient on the mortgage rate is relatively small for Norway. In comparison, other Norway-specific studies find an elasticity of house prices with respect to the borrowing rate of around (or above) 10 percent (e.g. Anundsen, 2016). The rationale is that the share of flexible-rate mortgages in Norway (over 90 percent) is very high compared to other countries, making house prices particularly sensitive to changes in the interest rates. Our estimate is much closer to the ones found in other cross-country regressions (see Turk, 2015 for a literature overview).

12. Model 2 is our preferred specification, but to capture model uncertainty, we report results from both specifications. In both models, coefficients are estimated with high precision. Model 1 captures variables for which the relationship with house prices can be derived from a theoretical life-cycle model (Meen, 2001), but model 2 is our preferred specification as the overvaluation time series for model 1 (model residuals) are non-stationary over the sample period. However, to account for model uncertainty, we use results from both specifications to derive regional equilibrium house prices.

13. In the second stage, we specify the regional house price regression in terms of deviations from the national equilibrium prices. To estimate the *regional* equilibrium house prices, we regress deviations of regional house prices from the *national* equilibrium price—derived in stage one—on deviations of regional fundamental factors from their national averages. In other words, in the regional regression we estimate the extent to which regional deviations of house prices from the national equilibrium can be explained by the differences in fundamental factors across regions. Formally:

$$p_{jt}^{dev} = \alpha_j + \beta * X_{jt}^{dev} + \varepsilon_{jt},$$

where p_{jt}^{dev} is a percentage deviation of the house price in region j from the national equilibrium price p_t^*, and X_{jt}^{dev} is a vector of explanatory variables specified in terms of percentage deviations from the national averages in period t. The fitted values from the regional regression are then added to the national equilibrium prices from stage one. This provide us with the estimates of *regional* equilibrium house prices over time:

$$p_{jt}^* = p_t^* * (1 + \widehat{p_{jt}^{dev}})$$

We use annual data for 19 Norwegian counties between 2005–2016 and estimate a panel regression with county fixed effects. We take regional house price data from Real Estate Norway. As explanatory variables, we use regional registered unemployment, population aged 20–50 years, residential building stock, real income, public housing, and property taxes from Statistics Norway. To correct for the impact of serial correlation and cross-section dependence of error terms, we use Discoll-Kraay standard errors (Table 1).

14. For 2017, the results suggest a real house price overvaluation of 10–20 percent in Oslo, no overvaluation in the oil regions, and a mild overvaluation of 5–10 percent the rest of Norway. House prices in Oslo are estimated to be overvalued by 11 percent in 2017 when applying national equilibrium prices from model 2, while those in oil-dependent regions are

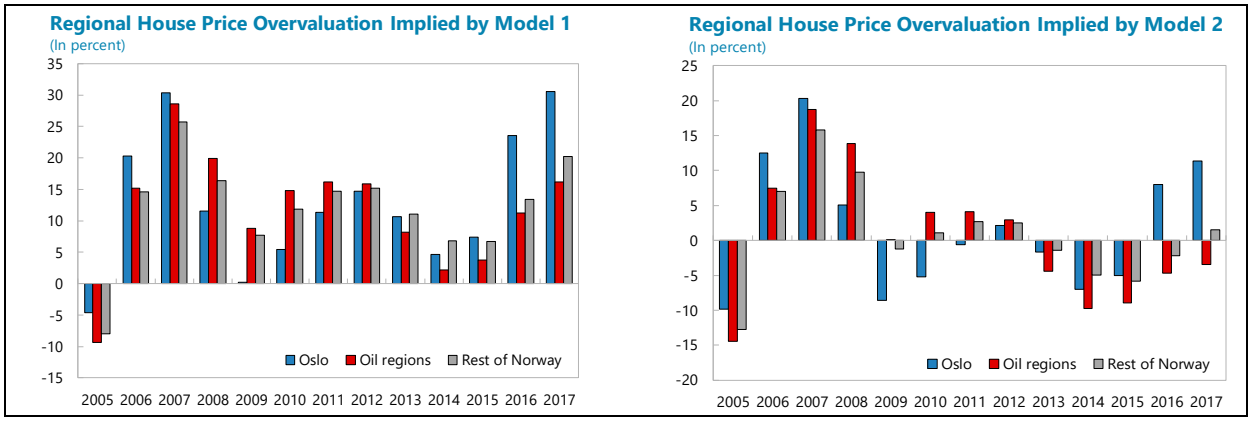
estimated to be somewhat undervalued. House prices in other regions seem well explained by fundamentals. Using estimates from model 1 as national equilibrium prices yields much higher overvaluations across all regions in 2017:[6] from around 30 percent in Oslo, to 15–20 percent in the rest of the country. Given the higher weight we put on the results from model 2, and considering the size of confidence bands around the estimates,[7] we estimate the house price overvaluation in Oslo at around 10–20 percent in 2017. For the rest of the country, the results suggest that house prices are well aligned with fundamentals in the oil regions, and we estimate the house price overvaluation to be around 5–10 percent in the non-oil, non-Oslo Norway.

Table 1. Norway: Estimation of Regional Equilibrium House Prices in Norway: Results

Variable	(1)	(1)	(1)	(2)	(2)	(2)
population 20-50 years old	0.4694***	0.4060***	0.4263***	0.3911***	0.3384***	0.3562***
registered unemployment rate	-0.0673	-0.0814**	-0.0744*	-0.0633	-0.0759**	-0.0696*
median household real income per person	3.3254***	3.0113***	3.4119***	2.8259***	2.5543***	2.9057***
local property tax rate	-0.0033			-0.0095		
public housing per 1000 inhabitants	0.0701			0.0681		
stock of dwellings per person	-0.0039	-0.0214***		-0.0032	-0.0187***	
(stock of dwellings per person)^2		0.0001***			0.0001***	
Observations	228	228	228	228	228	228
Number of counties	19	19	19	19	19	19
Discoll-Kraay standard errors	YES	YES	YES	YES	YES	YES
County fixed effects	YES	YES	YES	YES	YES	YES

*** p<0.01, ** p<0.05, * p<0.1

Notes: All explanatory variables are in percentage deviations from the national averages. Specifications (1) and (2) use the percentage deviation of regional prices from the national equilibrium price derived in model 1 and in model 2, respectively. The reported versions of the two specifications differ with respect to the number of explanatory variables. The inclusion of the squared stock of dwellings per capita in the specifications in columns 2 and 5 captures a non-linear effect of new dwellings on house prices; without it the housing supply is not significant. The model-implied regional house price overvaluations presented in the main text are derived using specifications without the level and the square of stock of dwellings per capita, but the results are very similar when using model specifications in columns 2 and 5, i.e. with the stock of dwellings. Results are robust to using levels of explanatory variables instead of percentage deviations, while including both time- and county- fixed effects.



[6] This is consistent with an average overvaluation of 19 percent at the national level implied by the model 1.

[7] For Oslo, the 95 percent confidence band around the estimate of overvaluation is 6–18 percent for 2017 when using model 2, and 29–39 percent when using model 1.

15. The two-stage approach is based on some important assumptions, and thus the results should be interpreted with caution. First, an important implicit assumption is that variables used in national-level regression and not available at the regional level (such as mortgage rate or financial wealth) do not vary significantly across regions. Otherwise, the regional regression will suffer from omitted variables bias. Second, in the absence of regional consumer price indices (CPI), we use national price indicators to obtain real values—while it is possible that prices of the same goods differ across regions.

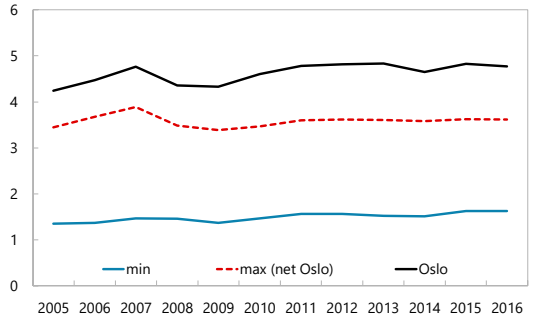
Model 2: Overvaluation in Oslo with 95 Percent Confidence Band
(In percent)

D. Regional House Price Differentials and Labor Mobility

16. Evidence from other countries suggests that large house price differentials can have a significant impact on internal migrations. Barriers to labor mobility may reduce its effectiveness as an adjustment mechanism, through which employment, income, and productivity converge across regions. Papers studying labor mobility in the UK and the US find that: (i) housing regulations tend to be more strict in high-income areas (Hilber and Robert-Nicoud, 2013); (ii) housing regulations tend to lead to higher house prices (Hilber and Vermeulen, 2015); and (iii) strict housing restrictions and rising house prices work as a barrier to interregional migration of low-skilled workers and regional income convergence (Ganong and Shoag, 2015; Arregui and Górnicka, 2018), negatively affecting national GDP (Hsieh and Moretti, 2017).

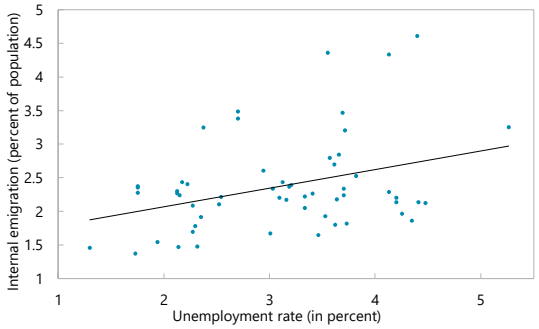
17. Internal mobility in Norway is relatively high by international standards. Annual regional migration flows have oscillated around 2.5 percent of the total population in recent years, which is high compared to other European countries (close to 1 percent of national populations in EU-15 countries on average), and comparable to the levels observed in the US.[8] During the recent global financial crisis internal migrations were highly correlated with the differences in unemployment rates across regions, helping to mitigate the impact of the recession.

Norway: Internal Emigration by Region
(In percent of local population)



Source: Statistics Norway.

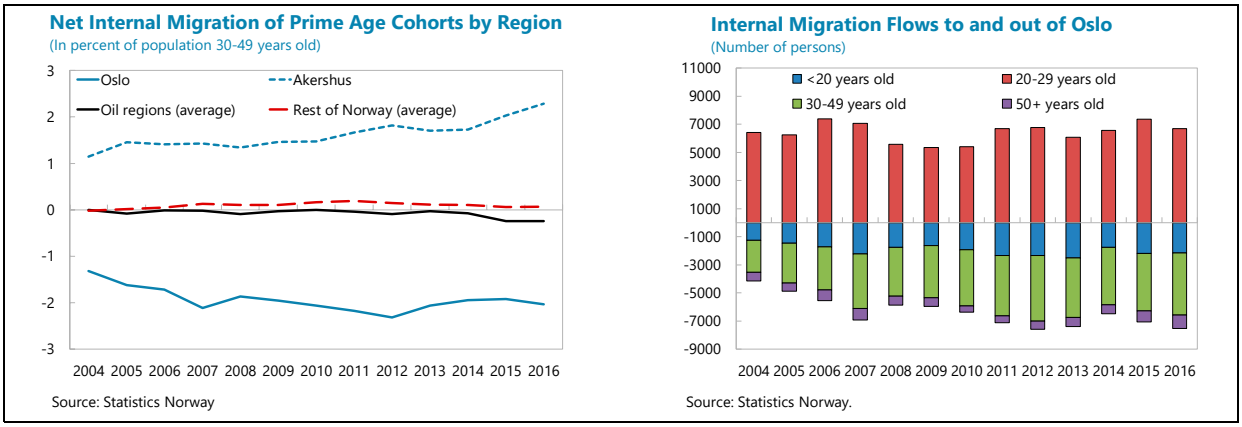
Norway: Internal Emigration and Unemployment Rates in Counties in 2008-2010



Source: Statistics Norway.

[8] The Economist: America settles down, July 5th, 2012.

18. However, there is evidence of increasing outflows of prime-age cohorts from Oslo. Outflows of 30–49-year-olds from agglomeration centers are common, as prime age cohorts start families and move further from the city centers in search for bigger and more affordable dwellings. However, the net outflow of prime age cohorts from the capital—mostly to the surrounding regions—has been increasing over the last decade, raising questions about the connection with the increasing house price differentials between Oslo and the rest of the country.



19. We estimate the impact of house price differentials on internal migrations between 19 Norwegian counties. We use annual data between 2005–2016 and focus on the migrations of 30–49-year-olds, for whom house prices are an important factor when deciding on the place to live. For younger cohorts, education choices and locations of universities are often the most important reasons for moving. In the absence of data on bilateral migration flows between counties by age, we use the total net internal migration of persons aged 30–49 years (in percent of a county's population of the same age cohort) as the dependent variable:

$$net\ migration_{jt} = \alpha_j + \beta_1 u_{jt-1}^{dev} + \beta_2 w_{jt-1}^{dev} + \beta_3 hp_{jt-1}^{dev} + \beta_4 pop_{jt-1}^{dev} + \varepsilon_{jt},$$

where u_{jt-1}^{dev}, w_{jt-1}^{dev}, hp_{jt-1}^{dev}, pop_{jt-1}^{dev} stand for the unemployment rate, real labor compensation per person, real house price, and total population in county *j* in period *t*, defined in terms of deviations from their cross-county averages. Unemployment and wages capture the economic dimension of internal migrations, population—the structural trend of increasing urbanization (migrations to the cities). All dependent variables are lagged to address potential endogeneity issues. If house prices are a barrier to regional mobility, one would expect the coefficient on the house prices to be negative: a higher real house price relative to the national average should reduce the net migration to county *j*.

20. Results show a statistically significant, although moderate in magnitude, impact of house prices on internal migrations in Norway. The coefficient on house prices is negative and significant across specifications, and is robust to excluding Oslo and Akershus from the sample (Table 2). It implies that—in the case of Oslo—a 25 percent increase of house prices above national

average increases the net outflow of the prime age cohort by almost 10 percent. This magnitude is comparable to estimates obtained by other studies for the case of the U.K.[9]

Table 2. Norway: Estimation of Internal Migrations of Prime Age Cohorts in Norway: Results

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
net migration, t-1							0.25**
real house price per sq. meter, t-1	**-0.03*** **	**-0.03*** **	**-0.007** **	**-0.006***	**-0.006** **	**-0.007***	**-0.006***
unemployment, t-1	-0.002	0.001	-0.0006*	-0.0009**	-0.0006*	-0.0006**	-0.0004
compensation, t-1	0.004*		0.0005			0.0005	0.0002
real income per capita, t-1		0.15***		-0.04			
population, t-1			0.00	0.00		-0.00	0.00
Oslo dummy	0.52	-0.8					
employment in non-services (average across years)	-0.05	-0.1**					
distance from Oppland	-0.001***	-0.001***					
constant	1.63	3.3***	-0.33	-0.1	0.06***	0.52*	-0.23
Observations	209	209	209	209	209	187	209
R-squared	0.494	0.675					
Number of counties	19	19	19	19	19	17 (excl. Oslo and Akershus)	19
County fixed effects	NO	NO	YES	YES	YES	YES	YES
Robust standard errors	YES	YES	YES	YES	YES	YES	YES

*** p<0.01, ** p<0.05, * p<0.1

Notes: All explanatory variables are in percentage deviations from the national averages. The dependent variable is the total net internal migration of persons aged 30–49 years by county in percent of the local population of the same age cohort. We use prices of detached houses from Statistics Norway to measure house price differentials. Specifications (1) and (2) include time-invariant variables: the Oslo dummy, average employment in non-services sector and distance from Oppland—the most central county (to capture remoteness of a county—which should affect net migration negatively). Specifications (3)–(7) include county fixed effects. In models (2) and (4) real income is included as an alternative measure of compensation. Neither compensation nor income are significant – likely reflecting very small variability of each along time and across regions in Norway. Model (6) is estimated excluding Oslo and the neighboring county—Akershus. Specification (7) includes lagged dependent variable to correct for autocorrelation of residuals. Results are robust to using price of flats, house price to income ratio, and to using net migration of 30–59 years old cohort as the dependent variable. The coefficient on house prices is not significant when using an aggregate house price index (which captures different types of dwellings)—suggesting a segmentation of the housing market within the prime age cohort.

E. Conclusions

21. There is evidence that differences in house prices across regions in Norway exceed the levels implied by the variation in fundamental factors. In general, large deviations of house prices above the equilibrium make them more vulnerable to significant corrections. In this context, we find that in 2017 real house prices in Oslo exceeded the equilibrium levels implied by empirical models by around 10–20 percent. While there was a considerable correction in the Oslo market in the second half of 2017, prices picked up strongly again in the first half of 2018, and as of May 2018 they are again above their average 2016 level. In the rest of the country, house prices seem well

[9] For example, Murphy et al. (2006) finds that a 25 percent increase in house prices in Greater London would result in an increase of the population outflow by around 20 percent.

aligned with fundamentals in the oil regions, and we estimate the house price overvaluation to be around 5–10 percent in the non-oil, non-Oslo Norway in 2017.

22. We find evidence of a statistically significant, although quantitatively moderate effect of regional house price differentials on internal migrations in Norway. Consistent with evidence from other countries, large house price differences are found to be a factor preventing migrations across Norwegian counties. While internal migration in Norway is high by international standards, continued house price divergence across regions can potentially contribute to weakening income and productivity convergence across regions going forward.

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