

# ***PETROLEUM PROSPERITY AND HOUSING PRICES IN NORWAY***

Anne-Britt Halonen, University of Stavanger Business School, phone: + 47 - 906 36 963, anne-britt.halonen@uis.no  
Klaus Mohn, University of Stavanger Business School, phone: + 47 - 915 34 814, klaus.mohn@uis.no

## **Overview**

Windfall revenues in resource-rich economies raise the risk of repressed economic growth via Dutch disease and resource curse mechanisms. The standard piece of policy advice is that social planners should exploit financial markets to separate the accrual of resource revenues from the dispersal of the same revenues. Such a prescription requires that saving and spending decisions among households are independent of shocks to net government wealth, which again is at stake with the Ricardian Equivalence Hypothesis (REH). Based on time series data for Norway, we present an econometric assessment of the relationship between government financial wealth, household credit, and housing prices. Our results suggest that oil price shocks to government wealth tend to stimulate both household borrowing and housing price inflation. With wealth effects on private consumption, the implication is that oil fund mechanisms and rule-based fiscal policies are not necessarily sufficient to shelter the non-resource economy from resource-related shocks.

## **Methods**

This study builds on three strains of the academic research literature. The point of departure relates to macroeconomic effects of energy resource revenues, including pressures on domestic demand and prices, real appreciation, loss of competitiveness and de-industrialisation – as described in the Dutch Disease literature (e.g., Bruno and Sachs, 1982; Corden and Neary, 1982; van der Ploeg, 2011). Key results from theory of optimal management of resource wealth suggests that a key purpose of extraction should be to transform resource wealth to financial wealth, and that spending should not exceed the real return on the combined total (Hartwick, 1977). This has given rise to the establishment of sovereign wealth funds in several resource-rich countries. In Norway the establishment of the Government Pension Fund was followed by a fiscal spending rule, limiting average fiscal spending of oil and gas revenues to the estimated real return on the Fund (i.e. 4%).

This takes us to the second strain of related literature, with the key Ricardian Equivalence Hypothesis (Barro, 1974; Ricciuti, 2003) hypothesizes that forward-looking consumers will consolidate government and private wealth in their decisions on spending and saving. In the presence of Ricardian equivalence, saving by government will be offset by dis-saving by households, undermining one of the key intentions of sovereign wealth funds and fiscal discipline in resource-rich countries. This erosion of fiscal policies due to forward-looking consumers is coined with “The Ricardian Curse” by van der Ploeg and Venables (2011) in a theory-based review of optimal policies for resource-rich countries.

We link the above set of ideas to a third strain of related literature, which is concerned with credit formation and real estate pricing. Specifically, this study extends the modern empirical literature on housing price formation, building on financial accelerator mechanisms (e.g., Anundsen and Jansen, 2013). This study contributes to the above three bodies of literature by allowing for potential spill-overs from government saving (SWF accumulation) to household borrowing. This approach opens for a new channel of transmission for resource-related shocks to the non-resource economy.

We formulate a model of three equations to explain housing prices ( $P$ ), household debt ( $D$ ), and government financial wealth ( $G$ ). Explanatory variables include the housing stock, household real disposable income, cost of housing capital, and the oil price. This setup allows us to test for the presence of a transmission mechanism of oil-related impulses to the non-oil economy via government saving, household borrowing, and domestic housing prices – and consequent wealth effects on private consumption and investment. Co-integration techniques are combined with quarterly time-series data (1985-2014) to estimate the above model. Tests of stationarity and co-integration are performed according to standard procedures. We then go on to estimate three long-term equilibrium relations – for housing prices, household borrowing, and government financial wealth. Finally, we establish error-correction models to account for dynamics, short-term responses, and adjustment towards the long-term equilibrium relations.

## Results

The three estimated long-term equilibrium relations take significant coefficients, their signs are according to expectations/theory, and model diagnostics are generally in support of our key hypothesis. With an elasticity close to unity, housing prices ( $P$ ) are positively influenced by real disposable income. Household debt takes an elasticity of nearly 2 in the housing price relation, whereas a 1 per cent change in the real after-tax interest rate will reduce housing prices by nearly 4 per cent in the long run. Estimation results suggest a feedback from housing prices to household credit, with an estimated elasticity of 0.15. The long-term equation for household debt ( $D$ ) is also supportive of a spill-over effect from government financial wealth, but preliminary results suggest that the elasticity is modest ( $< 0.1$ ). Our third equilibrium relationship suggests that government wealth ( $G$ ) is positively influenced by the oil price. An estimated oil price elasticity of 0.4 captures the impact of oil price shocks on net cash-flows and wealth accumulation at the government level. Moreover, the estimated long-term relationship for government wealth indicates that a drop in the real after-tax interest rate of one percentage point will increase government financial wealth by more than 3 per cent. With an equity share of 60 per cent in the Norwegian Government Pension Fund, the negative effect of interest rates most probably is a proxy for the influence on government wealth from general stock market developments.

With 8 initial lags, changes in the three dependent variables are then regressed on changes in dependent and independent variables, including estimated lagged deviations from the long-term equilibria. These error-correction models capture short-term dynamics, impulse response, and also offer empirical representations of the adjustment patterns toward the long-term equilibria. Preferred, parsimonious models are achieved through a general-to-specific approach. The preferred models show satisfactory performance, and involves a series of short-term coefficients, in particular for housing prices and household debt. The estimated error-correction coefficients suggest relatively sluggish adjustments process, with 4-6 per cent of any deviation from the long-term equilibria being adjusted in each quarter.

An exercise with dynamic multipliers is applied to assess the key hypothesis of the study, demonstrating the implied transmission mechanism for an oil price shock through the three equations of our model. As suggested above, an oil price shock have a significant effect on government financial wealth. However, the estimated spill-over from government wealth to household debt is moderate, thereby dampening the indirect impact on housing prices, in spite of a significant credit multiplier in housing price formation. The study thereby succeeds in the identification and estimation of a novel transmission mechanism for oil price shocks, although the actual estimates suggest that the impact and relevance for policy design is moderate.

## Conclusions

Sound management of energy resource wealth requires a profound understanding of the links between the extraction sector and the rest of the economy. The academic literature has provided theoretical insights and model tools to understand important mechanisms of shock transmission, including advice and recommendations on policy response. However, literature is still short on empirical studies whereby theory is confronted with macroeconomic data. The contribution of this study is an econometric modelling approach to explore a transmission mechanism for oil price shocks via government saving and wealth, household debt, to housing price formation. With Ricardian consumers, this mechanism would imply that government saving of resource revenues is offset by household borrowing, housing investment, and housing price inflation (“Ricardian curse”; van der Ploeg and Venables, 2011) – potentially in a spiralling process fuelled by financial accelerator mechanisms. Our empirical results are supportive of such a mechanism, but with modest estimated coefficients, the economic significance is limited.

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