‘BI Norwegian Business School – Thesis’

Weathering the global financial crisis: results from Australia, Canada, and Norway

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Acknowledgement

This thesis represents the end of the program MSc in Business and Economics at BI Norwegian Business School. The writing process has been challenging but at the same time interesting as the topic is highly relevant. We have been able to apply the theoretical framework we have acquired through the program as well as gaining insight and understanding of the macroeconomic environment during the global financial crisis.

We would above all like to thank our supervisor Hilde C. Bjørnland for inspiration, guidance, and helpful comments throughout the thesis process. We would also like to thank friends and family for support and useful comments.

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Summary

This thesis examines how some countries have performed above average during the global financial crisis. In order to study this Australia, Canada, and Norway have been selected. We investigate whether the industry structure in the countries were an important factor to their resilience during the recent financial crisis, if the use of monetary- and fiscal policy has contributed to their resilience, and if there are any characteristics in the three countries financial systems where they stand out.

Comparable time series data and country characteristics have been used to compare the three countries. We relate our findings with OECD countries to evaluate their performance, and also to see if there are any differences as well as similarities. Further, a structural vector autoregressive (SVAR) model analysis has been conducted to find out if there is a positive relationship from an increase in the terms of trade on real gross domestic product (GDP) and the current account in the respective countries.

The results show that the resilience of Australia, Canada, and Norway partly can be explained by their favorable macroeconomic position compared to other OECD countries at the onset of the crisis. This position was a result of a combination of limited dependence on the hardest hit segments of global manufacturing together with a commodity-based industry. They have mainly benefited from the strong economic growth in commodity importing countries like China and other Asian countries and high prices for energy and mineral export. Furthermore, Australia, Canada, and Norway were able to stimulate the real economy through monetary- and fiscal policy measures. Moreover, while the financial sector was heavily affected internationally, the financial systems in Australia, Canada, and Norway showed relative resilience due to factors like healthy regulation and supervision, limited exposure of structured products and a more conservative attitude in financial institutions.

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1. INTRODUCTION

Through 2007-2009 the world experienced the deepest economic downturn since the Great Depression in the 1930s. The global financial crisis has affected economies around the world, some to a greater extent than others.

In this thesis we want to examine how some advanced countries have performed above average during the global financial crisis. In order to study this Australia, Canada, and Norway have been selected. They are located in three different regions of the world and they all managed to overcome the crisis without a severe recession. Australia was one of very few countries to escape the world financial crisis and experienced only a mild slowdown in economic activity without a recession. The impacts on the Canadian and Norwegian economies have also been limited compared with other countries.

In the aftermath of the crisis reports, academic articles, discussion and working papers concerning the financial crisis have been and still are frequently published. Brunnermeier (2009) was one of the first to give a detailed description of the course of events in the United States (US). Taylor (2009) provides an empirical analysis of what went wrong focusing on policy responses, though the results must be considered preliminary to some extent reflecting the time it was authored. Along with Brunnermeier (2009), much focus has been related to industrialized economies (see for instance Gorton 2009 and Lane and Milesi-Ferretti 2011). Additionally there are several papers discussing the impact of the recession on emerging nations, see for instance Blanchard, Faruqee, and Das (2010) that seek to understand the initial impact of the crisis across emerging market countries and Kshetri (2011) for the case of China and India. OECD and IMF have also contributed with detailed assessments of the unfolding of the crisis in different economies through their economic outlook and country reports. With this thesis we want to contribute to the field of research regarding the financial crisis by focusing on how some advanced economies weathered the crisis to a better degree than others. We will achieve this by exploring factors behind the resilience of Australia, Canada, and Norway. The focus of our thesis is central in order to acquire knowledge about which aspects that contributes to

the resilience in the three countries. Furthermore, the focus is of value in order to be able to take lessons from the aspects to reduce the severity and likelihood of possible future recessions. In addition, it is central to see if some of these factors can be transferred to other economies.

Even though there are many differences between the three countries, there are also a number of similarities. Australia, Canada, and Norway mainly produce and export commodities, which constitutes an important resemblance between them. These commodities have relatively volatile prices, and account for at least 47 percent of their total exports. The price volatility contributes to variability in real macroeconomic variables not only in commodity exporting countries, but also affect countries worldwide for instance through variability in import prices. We want to analyze whether increased commodity prices prior to the crisis, that further led to terms of trade improvements have put the three countries in a favorable position with respect to increasing current accounts. Furthermore we will investigate if an increase in terms of trade has provided the three countries with fiscal space to stimulate the economy going into the crisis. We will also examine how the active use of monetary- and fiscal policy in the countries has contributed to their resilience during the global financial crisis. Monetary policy is frequently used as a stabilizing tool and is essential in stimulating the economic activity in an economy during a financial crisis (Mishkin 2009). Nevertheless, during the recent recession fiscal policy was widely used as a stabilizing tool, partly due to the low interest rates around the world (Blanchard, Dell'Ariccia, and Mauro 2010). Moreover, while the financial sector was heavily affected internationally, the financial system in Australia, Canada, and Norway showed relative resilience. We will therefore outline aspects present in the respective countries' financial systems that made them withstand the 2007-09 turmoil. In order to conduct this we aim to answer the following questions in our thesis:

- Were countries with large export of commodities more resilient to the global financial crisis?

- Have Australia, Canada, and Norway been in a situation to use monetary policy effectively?
- Are there any characteristics in the three countries financial systems where they stand out?
- How has the active use of fiscal policy been an important factor behind their resilience?

To answer these questions we will illustrate the performance and measures undertaken by the governments in Australia, Canada, and Norway using comparable time series data and characteristics to compare the three countries. When applicable we will relate our findings with OECD countries to evaluate their performance, and also to see if there are any differences as well as similarities. Furthermore, our thesis will have a special emphasis on the role commodity production and export play for Australia, Canada, and Norway. Commodity price increases are usually followed by improvements in terms of trade. A structural vector autoregressive (SVAR) model analysis will thus be conducted to find out if there is a positive relationship from an increase in the terms of trade, on real gross domestic product (GDP) and the current account in the respective countries.

The thesis is organized as follows. Chapter two introduces the reasons behind the global financial crisis. Similarities between the three countries, as well as possible reasons for why they weathered the recession relatively well are discussed in chapter three. In chapter four an analysis of the impact of a shock to terms of trade on real GDP and the current account in Australia, Canada and Norway using a SVAR model is conducted. Then a review and discussion of our main findings are presented in chapter five. Chapter six concludes.

2. THE GLOBAL FINANCIAL CRISIS

The recent financial crisis has been the deepest downturn in 80 years. The time prior to financial crises are typically associated with excessively optimistic expectations for growth in income and wealth, which further leads to overheated prices for goods, services, and asset prices (IMF 2009d). Prior to the recent recession the world economy experienced a period of growth lasting about six years, before it reached a peak in December 2007 (according to the NBER's Business Cycles Dating Committee).

Box 1: Definition of business cycles and recession

In a classical definition from 1946 by Burns and Mitchell business cycles is defined as:

"Business cycles are a type of fluctuations found in the aggregate economic activity of nations that organize their work mainly in business enterprises: a cycle consists of expansions occurring at about the same time in many economic activities, followed by a similarly general recessions, contractions, and revivals which merge into the expansion phase of the next cycle; this sequence of changes is recurrent but not periodic; in duration business cycles vary from more than one year to ten or twelve years; they are not divisible into shorter cycles of similar character with amplitudes approximating their own (Burns and Mitchell 1946, 1)*."*

Further, the Business Cycle Dating Committee at NBER has defined a recession as:

"A recession is a significant decline in activity spread across the economy, lasting more than a few months, visible in industrial production, employment, real income, and wholesale-retail trade. A recession begins just after the economy reaches a peak of activity and ends as the economy reaches its trough (NBER 2008)*."*

Since the mid-1980s and up to the current recession, recessions in advanced economies became less frequent and milder, while expansions became longer lasting (see Box 1 for a definition of business cycle and recession). This is characterized as the Great moderation (IMF 2009d). However, this trend was disrupted once the financial crisis, which quickly evolved into a global crisis, hit. The global financial crisis evolved over a complex set of financial and economic factors. To begin with, global current account imbalances are regarded as one of

the key factors that contributed to the global financial crisis (Adams and Park 2009). In the years prior to the crisis a number of countries had high and rising current account deficits, including the United States. Simultaneously other parts of the world had rising surpluses, in particular emerging Asian economies and oil producing countries (Adams and Park 2009). Having a current account deficit is not necessarily negative. For instance, if an economy is either saving for an aging population, investing in attractive opportunities that will generate future profits, e.g. oil extraction, or have deeper and more liquid financial markets that attracts investors, it can be positive (Blanchard and Milesi-Ferretti 2009). However, the situation in the US, where US consumption was financed with the net savings of countries with surpluses, was not sustainable (Adams and Park 2009). At the same time the Federal Reserve performed expansionary monetary policy, and the domestic saving rate in the US declined. Further, the banks made it become increasingly easier for households to borrow larger sums of money to purchase properties. These sums seemed unlikely for the households to service but the banks chose to ignore this since housing prices were perceived to be ever increasing and hence there was "no risk" involved (Brunnermeier 2009). The increasingly riskier mortgage loans where in turn sold to investors at a high rate of return while the risks were ignored (Carmassi, Gros, and Micossi 2009). In the end this led to the collapse in the US housing market in 2007, which further spread to European banks as the shortage of liquidity increased (Bordo and Landon-Lane 2010). In 2008 the crisis worsened as the investment bank Lehman Brothers collapsed in September (Brunnermeier 2009). As a result of the Lehman Brothers collapse, together with the following near collapse of the insurance company AIG, banks around the world became unwilling to lend to each other. The banks started saving up cash even though the European Central Bank, the Bank of England, and the Federal Reserve injected huge amounts of liquidity into the financial system (Mishkin 2010). Further, the US stock market had fallen by over half of its value from the peak in the fall of 2007 to the end of 2008 (Mishkin 2010). Hence the subprime mortgage crisis evolved into a global financial crisis that not only affected the financial sectors but also the global economy as credit for firms, local and state government tightened (Brunnermeier 2009).

The 2007-2009 global financial crisis became the most severe and synchronized recession since the Great Depression as nearly all the advanced economies have experienced a downturn, together with several emerging and developing economies (IMF 2009d). Recessions associated with financial crises have according to IMF (2009d) usually been more severe and the recoveries from these recessions have been particularly slow as private demand and credit continues to be weak into the next period. Furthermore, highly synchronized recessions are longer lasting and deeper than those that are restricted to one region. According to NBER's Business Cycles Dating Committee the recent recession lasted for 18 months. Synchronized recessions also tend to experience weak recoveries (IMF 2009d). This reflects the severity of the recent recession.

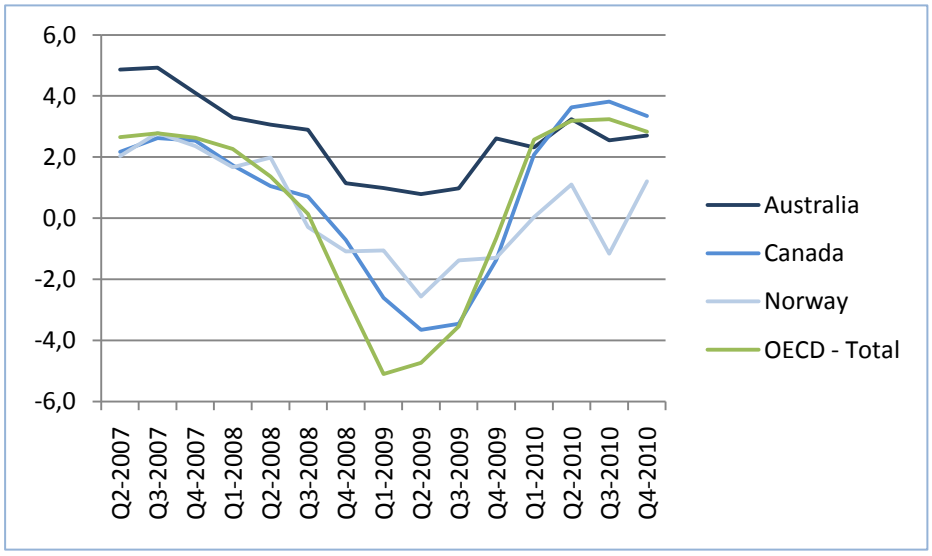
3. SIMILARITIES BETWEEN THE COUNTRIES

Australia, Canada, and Norway are all small open economies that are net exporters of commodities. A small open economy represents an economy that is too small to affect world prices, interest rates, or economic activity. Because an open economy is linked to other economies, policy actions in one country might affect other economies and spillovers can occur (Walsh 2010). Policy actions in one country will depend on the response of monetary and fiscal policy in other countries. Due to these spillovers, countries often attempt to coordinate their policy actions (Walsh 2010). Moreover, the three countries all have flexible exchange rates, which allow the domestic central bank to pursue its own monetary policy. They have all adopted a regime of inflation targeting, where policy makers specify a target for the rate of inflation that is considered to have an acceptable degree of price stability (Sørensen and Whitta-Jacobsen 2005). During the global financial crisis Australia, Canada, and Norway followed the same cyclical fluctuation.

The global financial crisis led to a sharp decline in economic activity in countries around the world. Figure 3.1 plots the quarterly growth rates of real gross domestic product (GDP) for Australia, Canada, Norway, and the average of OECD countries over the period 2007-2010. While real GDP growth slowed down in most OECD countries, the reduction in real GDP has been limited in Australia, Canada, and Norway in comparison to OECD average. Australia experienced a slowdown in GDP growth compared to earlier periods, nonetheless, the growth remained positive throughout the period. Canada and Norway experienced a decline in real GDP, however smaller than OECD average. The unemployment rate has also risen in the three countries (see Figure 3.2). However, the unemployment remains substantially lower in Norway than almost any comparable economy, with a little more than 3 percent unemployment in 2009. In Australia and Canada the increase in unemployment has been larger than in Norway and in line with the OECD average, with an unemployment rate of 5.6 and 8.3 percent in 2009 respectively. The slowdown in the activity was also illustrated through reduced private consumption. Figure 3.3 shows that the

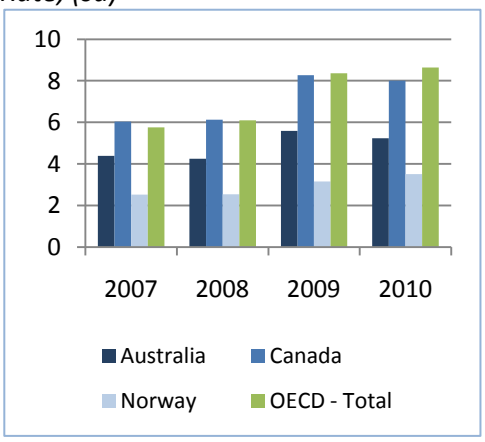
decline in private consumption was higher in OECD average compared to the three countries in question.

Figure 3.1: Quarterly growth rates of real GDP (compared to same quarter of previous year, sa)



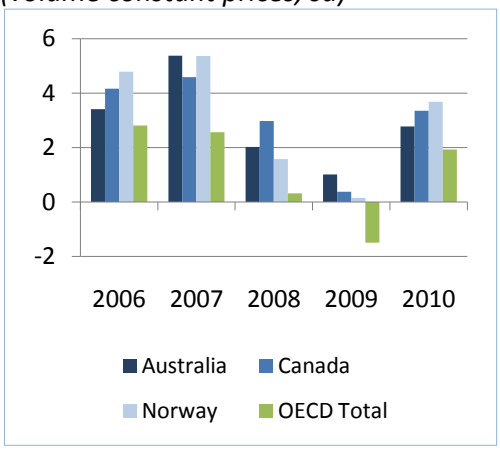
Source: OECD.Stat

Figure 3.2: Harmonized Unemployment Rate, (sa)



Source: OECD.Stat

Figure 3.3: Growth in private consumption (volume constant prices, sa)



Source: OECD.Stat

Furthermore, several factors have contributed to Australia, Canada, and Norway's resilience during the global financial crisis. The factors we have chosen to focus on are the industry structure in the respective countries, the substantial macroeconomic stimulus, and stability in the financial sector. Each of them will be described in detail in the following chapter, starting with the industry structure and the impact of commodity export. It is, however, important to emphasize that the factors we have chosen do not constitute an exhaustive list.

3.1 INDUSTRY STRUCTURE

On the basis of their industry structure Australia, Canada, and Norway were in a favorable macroeconomic situation going into the crisis (Finanstilsynet 2010). During the recession, the manufacturing sector weakened more than any other sector internationally (Finanstilsynet 2009). However, Australia, Canada, and Norway all have a limited dependence on the hardest hit segments of global manufacturing, as they have a smaller than average manufacturing sector (see Figure 3.4a-d). In 2007 the manufacturing sector accounted for 10, 13, and 10 percent of GDP respectively, while manufacturing accounted for 18 percent in the EU/OECD average. The figures illustrate that the three countries' industries have a different industry composition than the EU/OECD average and the manufacturing sectors are mainly based on raw materials. This signifies that their industry structure is not as vulnerable to changes in consumer demand, like for instance industries that depend on manufactured goods. Thus, the industry structure might be a key determinant behind the limited impact of the global crisis.

Figure 3.4a: Industry structure Australia (Percent of gross value added 2007)
Source: OECD.stat and own calculations.

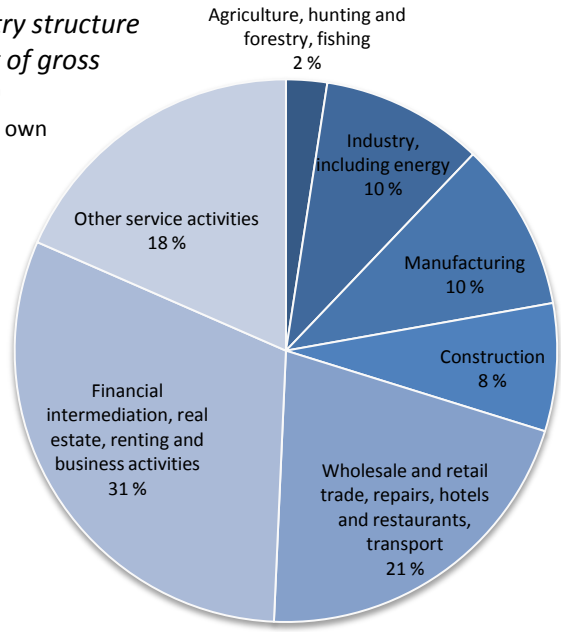


Figure 3.4b: Industry structure Canada (Percent of gross value added 2007)
Source: OECD.stat and own calculations.

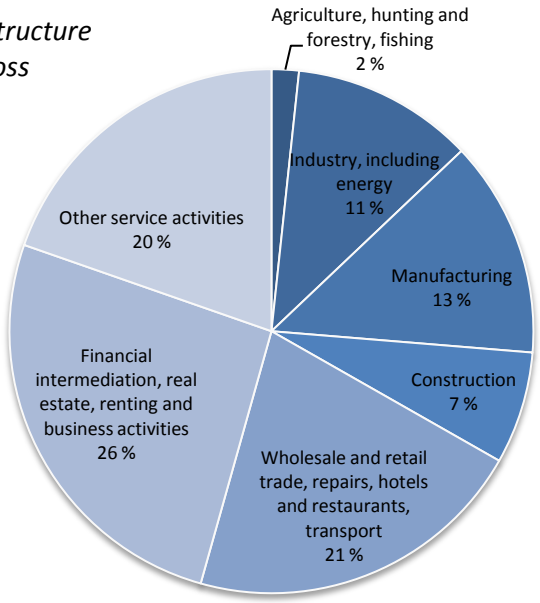


Figure 3.4c: Industry structure Norway (Percent of gross value added 2007)
Source: OECD.stat and own calculations.

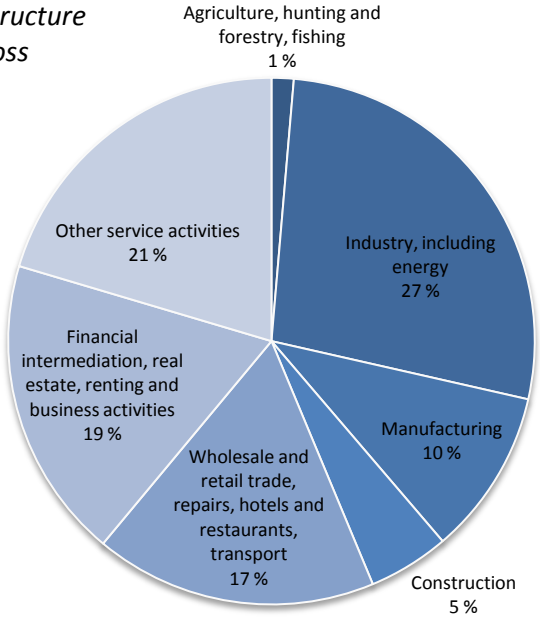
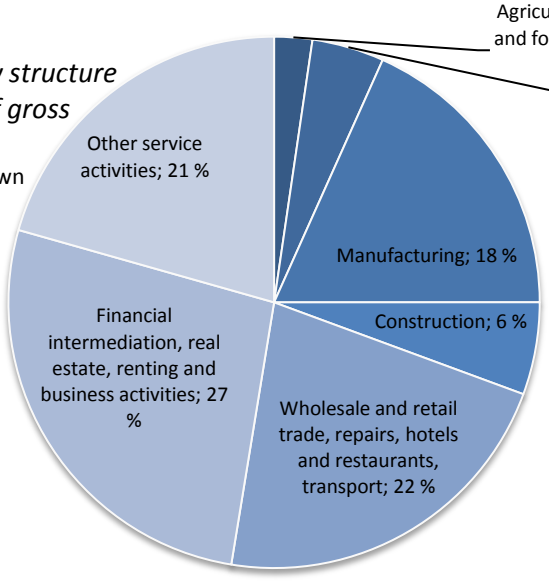


Figure 3.4d: Industry structure average (Percent of gross value added 2007)*
Source: OECD.stat and own



*Average of the European Union (27) and remaining OECD (data not available for New Zealand)

Since Australia, Canada, and Norway are small open economies they have strong real and financial linkages with the global economy. Further they are dependent on the global economic growth patterns. The economic growth of their trading partners is therefore of importance for domestic growth in Australia, Canada, and Norway. Arora and Vamvakidis (2005) found that countries benefit from trading with fast growing and relatively richer/more developed countries. The three countries have a relatively diverse composition of trading partners. However, a similarity is that the trading partners are located in the same region as the respective countries. This can partly be explained by the economic gains from the free trade agreements the countries take part in together with other countries in their region (Wild, Wild and Han 2010). Four of Australia's main trading partners are located in Asia, with China, Japan, India and the Republic of Korea (South Korea) counting for about 52 percent of total Australian export in 2008 (WTO 2009). Except from Japan, Australia's largest export markets mainly consist of economies that are experiencing some of the world's largest yearly GDP growth (OECD 2010a). According to data from the World Bank, China, India, and Republic of Korea experienced an average growth rate between 5.2 and 10.5 percent over the period 2000-2007. Canada on the other hand is highly dependent on the US, which accounts for about 78 percent of Canada's exports and around 25 percent of funding for Canadian businesses (WTO 2009; IMF 2009b). Because of these strong ties to the US, Canada was hit somewhat harder than other commodity exporters. Further, the European Union, Japan, and China are important for Canadian export (WTO 2009). The European Union is the most important trading partner for Norway, and accounted for as much as 83 percent of exports and 68 percent of imports in 2008 (WTO 2009). The US, Canada and China are other essential export markets for Norway (WTO 2009).

3.1.1 The impact of commodity export

As mentioned above Australia, Canada, and Norway are net exporters of commodities. Table 3.1 shows the amount of total export that consists of commodities in the respective countries. In 2008 about 74 percent of Australia's main merchandise export consisted of commodities, with coal, iron ore and concentrates as the largest individual export items. Also, a great fraction of the

Canadian merchandise exports are commodity based and accounts for about 47 percent of their total export. Norway is a major exporter of oil and gas and is heavily dependent on revenues from oil production. Here, commodities accounts for as much as 76 percent of total export.

Table 3.1: Export of commodities in percent of total export (2008)

	Australia	Canada	Norway
Fuels	32.0	27.6	65.9
Mining products	27.8	7.8	5.6
Agricultural	14.0	11.9	4.9
Total	73.8	47.2	76.3

Source: WTO Statistics Database and own calculations

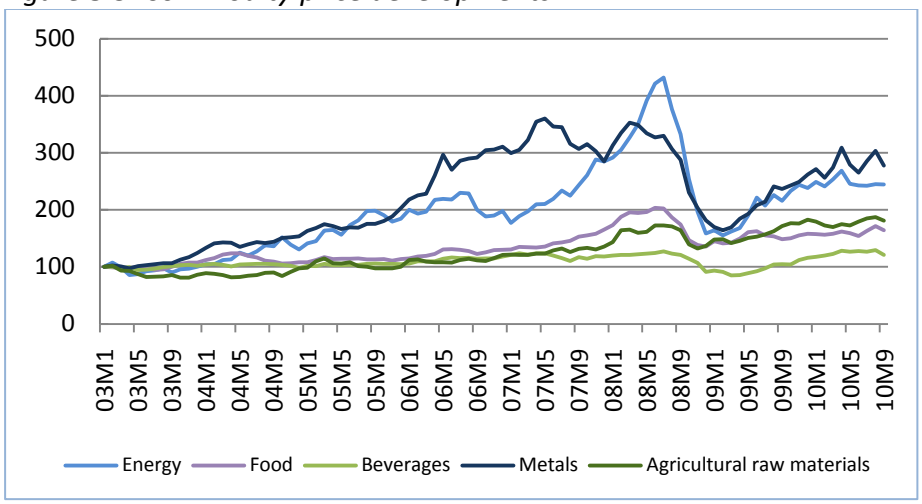
Table 3.2: Breakdown in economy's total imports (2008)

	Australia	Canada	Norway
Agricultural	5.4	7.7	9.4
Fuels and mining	17.2	16.0	13.8
Manufactures	71.5	75.5	76.8

Source: WTO Trade Profiles 2009

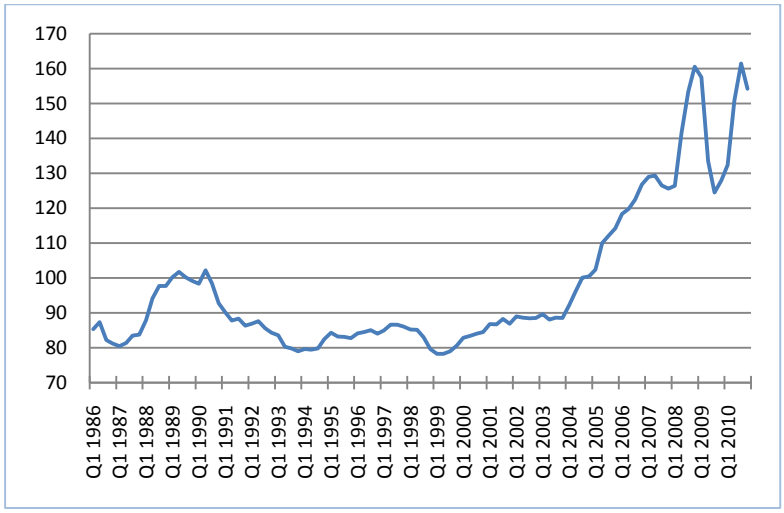
The three countries have mainly exported commodities that have relatively volatile prices, and imported manufactured goods that have more stable prices (see Table 3.1 and 3.2) (Reserve Bank of Australia 2005). In the years prior to the financial crisis the world experienced a commodity price boom (see Figure 3.5). These price increases were to a great extent caused by strong demand from emerging economies like China, and have provided a significant economic boost to major commodity-exporting countries (Francis 2007; 2008). Australia, Canada, and Norway have, through their commodity export, been well positioned to take advantage of these price increases. They have mainly benefited from the strong economic growth in commodity importing countries like China and other Asian countries and high prices for energy and mineral export. This commodity demand led to favorable business cycle developments and high productivity growth in the years before the crisis (Finanstilsynet 2010).

Figure 3.5: Commodity price developments



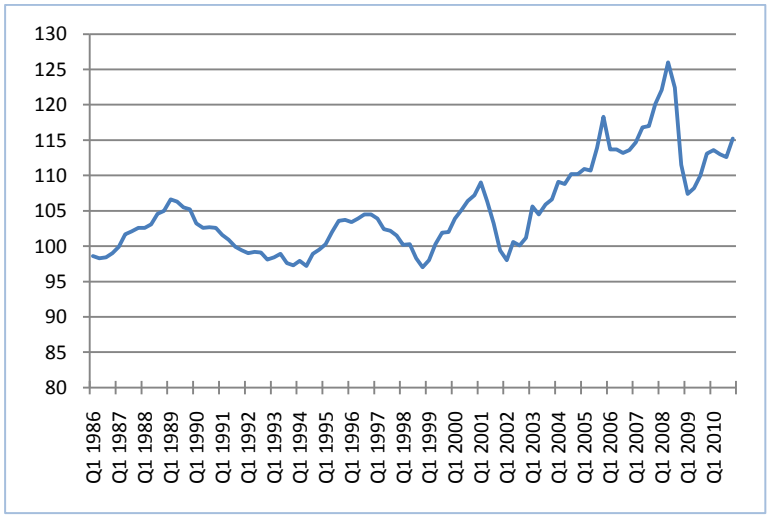
Source: IMF World Economic Outlook 2010

Figure 3.6a: Terms of trade development in Australia (1989-1990=100)



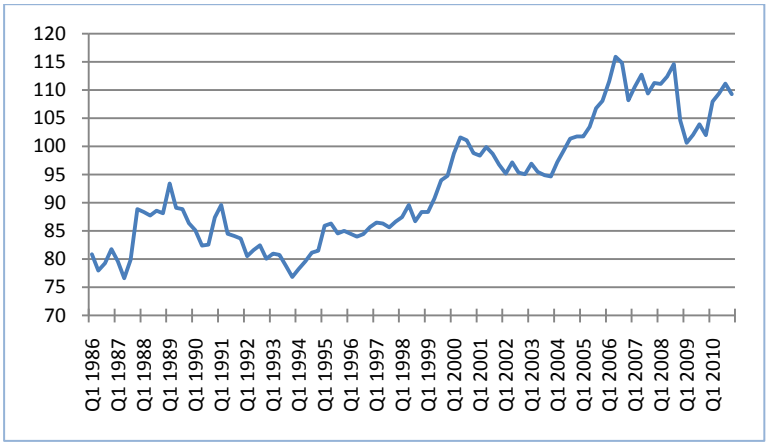
Source: Datastream; Australian Bureau of Statistics

Figure 3.6b: Terms of trade development in Canada (2002=100)



Source: Datastream; Thomson Reuters and national source

Figure 3.6c: Terms of trade development in Norway (2000=100)



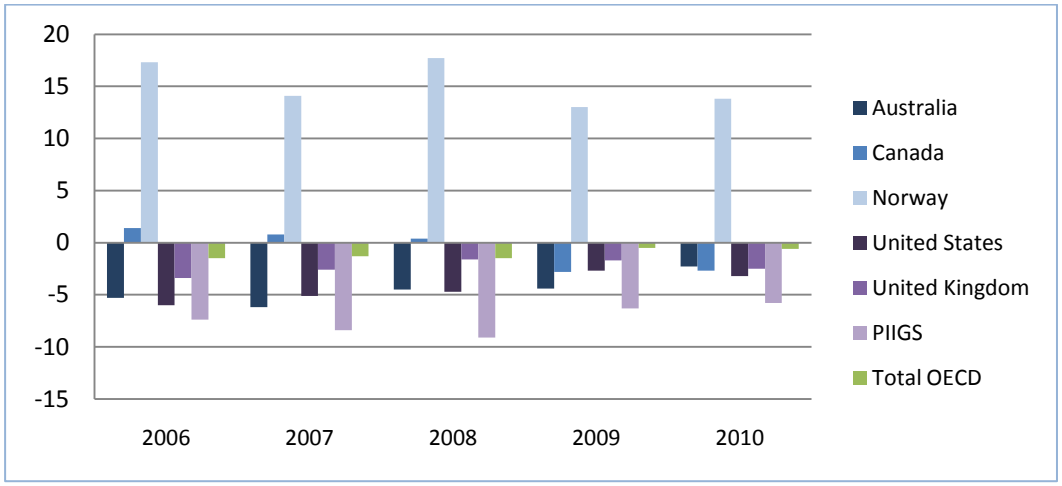
Source: Datastream; Statistics Norway

The rising commodity prices have led to improvements in terms of trade, which is the ratio of export prices to import prices (see Figure 3.6a-c). The increase in terms of trade had a direct positive effect on the respective countries' current account position (see chapter 4 for an empirical analysis). A country's current account balance describes whether a country is a net lender (positive) or a net borrower (negative), and can be defined as $CA_t = Y_t + rB_t - C_t - G_t - I_t$, where Y_t is GDP, rB_t is interest earned on foreign assets acquired previously, and $Y_t + rB_t$ is the gross national product, C_t is private consumption, G_t is government consumption, and I_t is investment (Obstfeld and Rogoff 1996). The current account can further be written as $CA_t = S_t - I_t$, where S_t is national saving.

In Figure 3.7 the current account positions for a number of countries are illustrated. Canada and in particular Norway had a current account surplus in the years before the crisis, while Australia has had a small deficit since the 1980s. On the other hand, countries like the United States, the United Kingdom, and the PIIGS countries (Portugal, Italy, Ireland, Greece, and Spain) ran large current account deficits. Although Australia has a current account deficit it differs in important respects to other countries with deficits. First, the deficit in Australia has been due to a high level of investment rather than low savings. Second, higher investment has been used to expand productive capacity, particularly in the export sector. Third, Australia has maintained a sound underlying fiscal position (Garton, Sedgwick, and Shirodkar 2010). It has been stated that countries with larger initial current account deficits when going into the crisis have experienced larger output declines during the downturn (Blanchard and

Milesi-Ferretti 2009). Furthermore, IMF (2010b) finds that economies with a favorable current account position when going into a crisis experience less of an adjustment in relative prices, and imports will thus not be affected as hard as in economies with a deteriorated current account balance. Hence, Australia, Canada, and Norway did not experience the same output declines as in the countries with large current account deficits.

Figure 3.7: Current account balances as percentage of GDP



Source: OECD Economic Outlook 89 database.

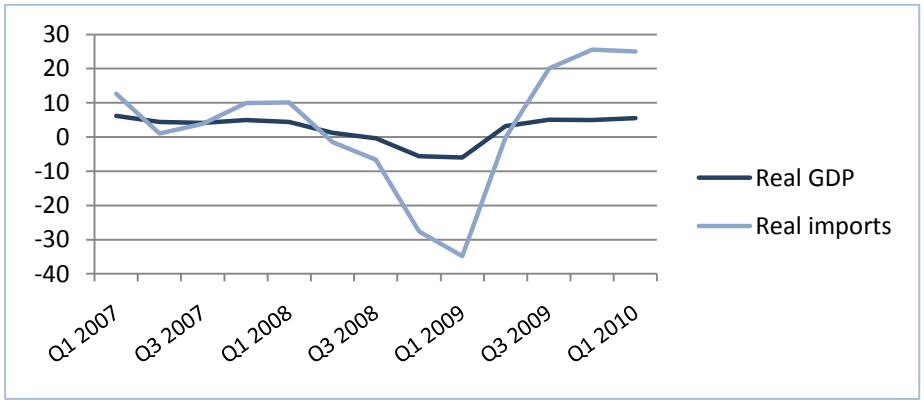
In addition to an improvement in the current account, an increase in terms of trade will lead to an increase in the real purchasing power of domestic production, since an increase in export prices relative to import prices means that a larger volume of imports can be purchased with a given volume of export (Reserve Bank of Australia 2005). Moreover, an increase in the real purchasing power of domestic production causes an increase in real domestic income (RDI). A substantial fraction of this income gain will accrue to the government via taxes, such as corporate and income taxes, and royalties (Reserve Bank of Australia 2005). As commodity prices have increased, mineral, oil and gas resources have become an important source of government revenue (Francis 2008). According to the homepage of the Norwegian Tax Administration, a marginal tax rate between 50 and 78 percent of the revenues from oil extraction is channeled back to the Norwegian government. Higher government revenues have resulted in a government surplus when going into the crisis, placing Australia, Canada, and Norway in a good position to stimulate the economy via spending measures and tax reductions (see section 3.4.2). In this way the terms of trade shock directly

affects the use of fiscal policy, transferring the shock through rest of the economy (Francis 2008). In addition, higher resource prices have led to additional investment in the mining industry in Australia (Garton, Sedgwick and Shirodkar 2010). The same has been true for Canada, which has also invested in the oil and gas sector (Dupuis and Marcil 2008). Furthermore, Canadian authorities have since 2006 aimed to reduce the government debt by an annual rate of 0.2 percent of GDP (IMF 2009b). From 2000 to 2008 the debt has according to data from OECD been reduced from 41 to 29 percent.

3.1.2 The impact of the collapse in global trade

As the global financial crisis hit, the world experienced a collapse in global trade. The decline in world trade was much greater than the decline in world GDP, and has been named "The Great Trade collapse" (see Figure 3.8). Between the last quarter of 2008 and the first quarter of 2009, the annualized quarter-over-quarter drop in global real GDP was just below 6 percent, while the drop in global real import decreased by over 30 percent. The drop in trade was largely driven by a drop in demand (Baldwin 2009). An emerging consensus is that the large drop in trade can be explained by the "composition effect". This argument is founded on the fact that "postponeable" items, like capital goods and consumer durables, make up only a small fraction of world GDP, however a large fraction of world trade (Baldwin 2009). The freeze of credit markets during the financial crisis led to a sharp fall in the demand for the "postponeable" items (IMF 2010b). Thus, since these items account for a much larger share of trade than of GDP, the fall in trade was much larger.

Figure 3.8: Growth rates of Real GDP and Real imports
(PPP-weighted, percent, quarter-over-quarter seasonally adjusted annual rate)

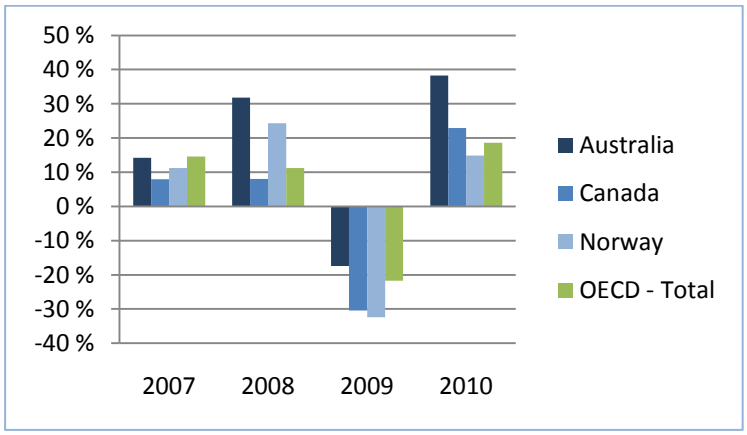


Source: IMF World Economic Outlook 2010

What is more, the trade in fuel and minerals fell faster than total trade (Baldwin 2009). Among the main primary commodity markets, oil markets were the most affected by the decline in global activity. The reduction in global oil demand was attributed to slowing demand from advanced economies (IMF 2009d). Commodity exporters both experienced a shock to external demand along with a sharp fall in commodity prices. Between July and December 2008 oil prices plunged by approximately 70 percent while prices on metals fell with 45 percent. Nonetheless the prices started rising during the spring of 2009, and has recovered since (see Figure 3.5).

The declining commodity prices made Australia experience a negative change in terms of trade of approximately 22 percent from the last quarter of 2008 to the third quarter of 2009, after which it quickly started increasing again (see Figure 3.6a). Furthermore, the value of export fell with nearly 18 percent from 2008 to 2009 (see Figure 3.9). Canada experienced a sharp fall in export from 2008 to 2009, with a decrease of 30 percent (see Figure 3.9). The fall in export was largely reflected by the deterioration in US economy (IMF 2009b). Moreover, the terms of trade for Canada worsened with almost 15 percent from the second quarter of 2008 to the first quarter of 2009 (see Figure 3.6b). Lower oil and gas prices were the main factors behind the falling trade surplus for Norway in 2009 (OECD 2010c). In Norway terms of trade decreased with approximately 12 percent from the second quarter of 2008 to the first quarter of 2009, while the value of exports fell with approximately 32 percent from 2008 to 2009 (see Figure 3.6c and 3.9).

Figure 3.9: Yearly percentage change in total exports



Source: OECD.Stat and own calculations

On the other hand, the terms of trade losses, together with interest rate cuts by the central banks (see section 3.2), have made the exchange rate in Australia, Canada, and Norway to depreciate substantially in nominal terms. As a result, the commodity revenues in domestic currency have not declined nearly as much as the decline in world prices (IMF 2009d). Kaminsky and Reinhart (1999) provide an explanation and find that currency depreciations during banking crises create a swing in relative prices that hurt imports but boost exports.

The strong demand from Asia, in particular China has contributed to Australia's resilience during the crisis. Demand for fuels and minerals from the Asian countries was one of the factors that contributed to an increase in exports and hence terms of trade with 38 and 30 percent in 2010 respectively (cf. Figure 3.6a and 3.9). The growth in China thus offset the impact of declining global trade on the Australian economy as the commodity prices were pushed back up again (cf. Figure 3.5). Canada and Norway also took advantage from growing demand in emerging economies through increased commodity prices. In addition, the Canadian export sector benefited from a sharp recovery of US GDP in the second half of 2009 and improved with 23 percent (cf. Figure 3.9). Moreover, terms of trade also increased with 7 percent between the first quarter of 2009 and the last quarter in 2010 (cf. Figure 3.6b). The improvement in exports, due to temporary factors such as US investment in inventories and fiscal stimulus program, led to improvement in the Canadian economy (OECD 2010b). The recovery of Norwegian export was not as significant as for the two other countries, and export experienced an increase of 15 percent (cf. Figure 3.9). Terms of trade, however, rose by 10 percent between the first quarter of 2009 and the third quarter of 2010.

As can be seen from Figure 3.9 Australia both experienced a smaller deterioration together with a stronger improvement in total export compared with OECD average. The fall in total export was sharper in Canada and Norway relative to OECD, however, the recovery was stronger in Canada.

3.2 MONETARY POLICY

Monetary policy has been rather expansionary during the financial crisis, where central banks across the globe have cut policy rates to historically low levels. In the years prior to the global financial crisis Australia, Canada, and Norway faced increasing interest rates due to the high level of economic activity. The scope of action was thus large to stimulate the economy by lowering the short-term interest rates once the crisis hit. Moreover, specific measures to improve banks' equity and access to funding have been carried out.

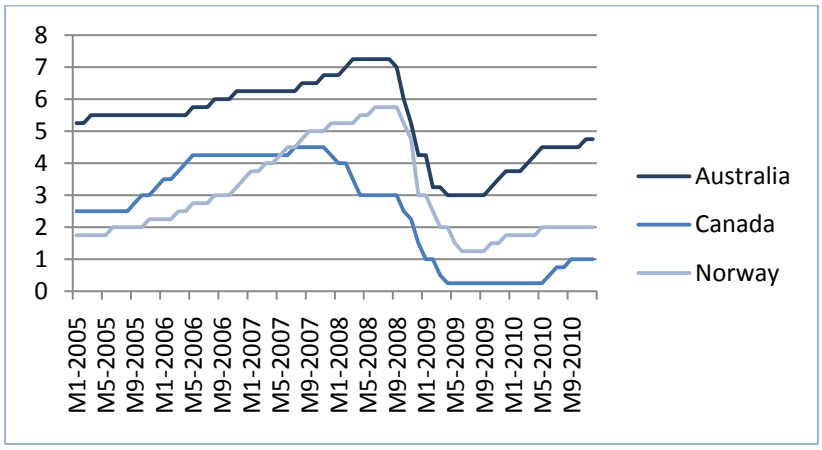
Box 2: Definition of monetary policy

Open economies with floating exchange rates typically apply a monetary policy regime of inflation targeting, which is characterized by official target ranges for the inflation rate at one or more horizons. Further, the principal goal is to maintain the inflation rate low and stable through the monetary policy instrument (Bernanke and Mishkin 1997). Australia, Canada, and Norway have all specified an inflation target of 2-2.5 percent for monetary policy and the central banks set the key policy rate to stabilize inflation close to the target.

When the financial crisis hit all the three countries responded by lowering the short-term interest rate. The Reserve Bank of Australia (RBA) reacted to the crisis before economic data was presented and lowered the interest rate in Australia at an early stage (OECD 2010a). The cash rate was dropped with 425 basis points over the period from a peak of 7.25 percent in March 2008 to 3 percent by April 2009, which was the bottom level (see Figure 3.10). Interest rates in Australia were not reduced below a nominal 3 percent rate, thereby not inducing negative real interest rates. This is in contrast to many other developed economies where nominal interest rates were lowered to, or set very close to zero. The Bank of Canada also reduced the target rate for overnight funds by 425 basis points to 0.25 percent in April 2009, from a target rate of 4.5 percent in July 2007 (see Figure 3.10). The Norwegian sight deposit rate was rising until September 2008 and peaked at 5.75 percent. Norges Bank then gradually decreased the key interest rate by 450 basis points to 1.25 percent in June 2009 (see Figure 3.10).

The central banks in Australia and Norway were among the first to raise the key policy rates after the crisis began (OECD 2010a; 2010c). As early as October 2009, both RBA and Norges Bank decided to start tighten the monetary policy, and increased the key policy rate by 25 basis points (see Figure 3.10). These early interest rate increases were a sign of fast recovery, and were conducted in light of a relatively high inflation level, rising house prices, and recovery in activity (OECD 2010a; 2010c). Bank of Canada, on the other hand, committed to keep the short-term interest rate at 0.25 percent until the second quarter of 2010, conditional on the rate of inflation (OECD 2010b).

Figure 3.10: Key Policy Rates



Source: Reserve Bank of Australia, Bank of Canada, and Norges Bank

3.3 FINANCIAL STABILITY

What started in 2007 as a crisis in one small part of the financial system led to a worldwide financial crisis by late 2008 and early 2009 partly due to the strong interconnection of the global financial system (Mishkin 2010). The financial crisis showed that the existing financial regulatory framework had substantial flaws and has demonstrated the importance of having a sound financial market regulation and supervision. Further, the capital requirements that investment banks were subject to were exceptionally low, and there was little focus on solvency supervision (Finanstilsynet 2010). However, the financial system in Australia, Canada, and Norway showed relative resilience during the financial crisis.

In the US a considerable part of the financial sector was either without supervision or had limited capital requirements, with financial regulation divided

among a host of federal agencies (Finanstilsynet 2010). The financial supervisory authorities are organized somewhat differently in Australia, Canada, and Norway (see Box 3 for a more detailed description regarding the characteristics about the financial sector in the respective countries). In comparison to the US, all financial activity is in general subject to strict supervision in the three countries in question (Finanstilsynet 2010). Prudential supervision and a well working regulatory regime were factors contributing to the stability of banks in Australia, Canada, and Norway during the crisis.

Box 3: Characteristics about the financial sector regulation and supervision

Australia and Canada have adopted a "twin peak" model for the organization of financial regulation and supervision. In Norway there is one institution that is responsible for regulation, capital requirements, and supervision of the entire financial sector (Finanstilsynet 2010). In Australia, the Australian Prudential Regulation Authority (APRA) is responsible for the supervision of the bank- and insurance sector along with pension schemes, while the Australian Securities and Investment Commission (ASIC) is responsible for regulation of market integrity and consumer confidence (Cooper 2006). In Canada, the Office of the Superintendent of Financial Institutions (OSFI) is the regulator in charge of supervising the financial health and stability of all federally chartered depository institutions and insurance companies (Pan 2011). Further the Financial Consumer Agency of Canada (FCAC) provides Canadian consumers with information about financial products and services and monitors the compliance of federally incorporated financial institutions with consumer protection laws, along with being the primary regulator of bank conduct (Pan 2011). Furthermore, OSFI and FCAC divide their regulatory responsibilities between prudential regulation (i.e., OSFI) and business conduct regulation (i.e., FCAC) (Pan 2011). Regulatory responsibility is also split between the provinces and the national government, with securities regulation entirely in the hands of the provinces (Pan 2011). The supervision of financial stability in Norway is a shared responsibility between the three authorities the Ministry of Finance, Norges Bank, and the Financial Supervisory Authority (FSA). According to the homepage of the Ministry of Finance, the authority is responsible for the regulation of financial markets and the financial institutions. Norges Bank has the

authority of monetary policy, while according to the homepage of FSA it is responsible for the supervision of the financial sector.

Australia, Canada, and Norway all experienced banking difficulties in the early 1990s. In Australia the difficulties reinforced financial supervision and caution in bank lending, leading to reduced vulnerabilities in the banking sector (OECD 2010a). In Canada the experience led the authorities to emphasize the role of early intervention principles and conservative supervision (Daniel 2003). In Norway, the lessons from the banking crisis have likely resulted in a relatively conservative credit practice and limited risk taking by Norwegian banks (Finanstilsynet 2009).

The portfolios of Australian and Norwegian banks' were focused on domestic, mainly low-risk loans to households and firms (IMF 2009a; Finanstilsynet 2009). The losses on such loans have been limited and significantly smaller than in most Western countries (Finanstilsynet 2009). Canada has a conservative banking culture where traditional banking is the main activity and the focus is on liquidity- and market risk management (OECD 2010b; Finanstilsynet 2010).

In spite of sound supervision and regulation, the three countries experienced some liquidity problems at the onset of the crisis (Finanstilsynet 2010). However, during the downturn Australia was able to hold its credit channels open due to the soundness of the financial sector (OECD 2010a). The authorities in Canada expanded liquidity facilities, provided liability guarantees, and purchased mortgage-backed securities to cope with the liquidity problems (IMF 2009b). In order to ease liquidity conditions, the Norwegian authorities introduced several alternatives for short- and long-term funding (OECD 2010c). Among other, a scheme was set up by which banks were entitled to temporarily exchange covered bonds against treasury bills, which improved the banks' access to longer term funding (OECD 2010c). The short-term and medium-term credit markets progressively returned to normal, showing that these liquidity measures were generally effective (OECD 2010c).

Nonetheless, there were no severe solvency problems in the financial systems in any of the three countries, and no banks went bankrupt. This has to be seen in

light of the low exposure of "toxic" structured products in the three countries financial systems (Finanstilsynet 2010). Both Canada and Norway face strict regulations for securitization (OECD 2010b; 2010c). Furthermore, the banking sectors in the respective countries were also less-leveraged than banks in comparable countries prior to the crisis (OECD 2010a; 2010b; IMF 2010a).

In Australia Basel II was implemented in January 2008 and stress tests are regularly carried out by APRA (see a more thoroughly description of Basel II in box 4). According to the RBA, the largest Australian banks had a Tier 1 capital ratio above 8 percent and a total capital ratio above 11 percent in 2009. Canadian banks also held a stronger degree of capital at the entrance of the crisis than what was required by Basel II (OECD 2010b). The minimum capital requirement in Canada is 10 percent and the Tier 1 capital has to be at least 7 percent. In February 2009 the six largest banks in Canada had a level above 9 percent of Tier 1 capital and a total capital ratio above 11 percent (IMF 2009b). Norway follow Basel II in accordance with the regulations set out by the EU legislation, as they are a member of the European Economic Area (EEA). However, the Norwegian authorities have decided upon stricter definition on core capital than the Basel II requirements (OECD 2010c). In 2009 the five largest banks held a Tier 1 capital ratio of 8.3 percent and a total capital ratio of 11.3 percent (IMF 2010a).

Box 4: Basel II

The Basel Committee was established in the end of 1974 by the central bank Governors of the Group of Ten countries, among them Australia and Canada. The committee meets four times a year and their mission is to formulate broad supervisory standards and guidelines that individual authorities will arrange to implement in their own national systems. In 1988, the Committee decided to introduce a capital measurement system commonly referred to as the Basel Capital Accord. It is not only the member countries that follow the guidelines, but nearly all economies with internationally active banks. The Basel II framework is the second Basel Accord and consists of three pillars: (1) minimum capital requirements, (2) supervisory review process, and (3) market discipline. The minimum capital requirement for risk-weighted assets is set at 8 percent. Tier 1

capital (core capital) should make up at least half of this amount and Tier 2 capital (supplementary capital) not more than 100 percent of Tier 1 capital.

Source: Bank for International Settlements (BIS)

3.3.1 The importance of funding structure during the financial crisis

Ratnovski and Huang (2009) found that a high share of depository funding and capital ratio above the critical minimum were the most significant and robust determinants of bank resilience during the turmoil. Banks with these characteristics experienced smaller equity price declines and a lower probability of government assistance due to financial distress. Retail deposits are usually insured by the government and hence "sticky", and provide a stable source of long-term funds for banks (Feldman and Schmidt 2001). In contrast, wholesale funds can withdraw rapidly based upon minor negative signals, and were a major source of vulnerability during the turmoil (Huang and Ratnovski 2009). Ratnovski and Huang (2009) found that the pre-crisis capital and liquidity ratios of Canadian banks were not exceptionally strong relative to their peers in other OECD countries. However, Canadian banks clearly stood out in terms of funding structure because they relied more on depository funding and less on wholesale funding (Ratnovski and Huang 2009). The funding structure might thus be a key determinant of the resilience of Canadian banks during the recent recession.

In comparison about half of Australian banks' total funding consisted of wholesale funding. In October 2008 the government announced guarantees on deposit and wholesale funding to cope with the crisis. This allowed banks to continue to get access to international capital markets and helped ensure liquidity (IMF 2009a). Norwegian banks also rely extensively on foreign short-term funding (IMF 2010a). Thus, the Norwegian banking sector was heavily affected by the non-functioning money markets abroad, and the bankruptcy of Lehman Brothers caused the Norwegian interbank market to freeze (OECD 2010c). However, the measures taken by the authorities introduced above helped ensure liquidity.

3.4 FISCAL POLICY

3.4.1 Use of discretionary fiscal policy during recessions

In the past two decades fiscal policy (see Box 5 for a definition of fiscal policy) has taken a backseat to monetary policy (Blanchard, Dell'Ariccia, and Mauro 2010). Blanchard, Dell'Ariccia, and Mauro (2010) present several reasons for this. First there was wide skepticism about the effects of fiscal policy. This was largely based on Ricardian equivalence arguments. Second, if monetary policy could effectively stabilize the output gap there was little reason to use another instrument. Third, priority was given to stabilize and hopefully decrease high debt levels in advanced economies. Fourth, fiscal measures were likely to come too late due to lags in design and implementation, together with usually short duration of recessions (Blanchard, Dell'Ariccia, and Mauro 2010). There is a risk that fiscal stimulus will arrive just as the economy recovers from the downturn or not quickly enough to preserve fiscal sustainability (IMF 2008). Fifth, in comparison to monetary policy, fiscal policy was likely to be distorted by political constraints (Blanchard, Dell'Ariccia, and Mauro 2010). This might also imply that fiscal stimulus easily is directed towards projects that are not optimal for economic growth (IMF 2008). Thus, a critical aspect of using fiscal policy during a recession is the timing of the implementation. In spite of these critics, empirical support exists for a moderately positive effect on output growth in advanced economies with discretionary fiscal stimulus (IMF 2008). IMF (2009d) finds that during recessions associated with financial crises, fiscal stimulus appears to be particularly helpful and is associated with stronger recoveries and shortening of the recession. The use of expansionary monetary policy is also associated with stronger recoveries. However, the effect on the duration of the recession is not statistically significant (IMF 2009d).

Box 5: Definition of fiscal policy

Fiscal policy is defined as the *set of decisions a government makes with respect to taxation, spending, and borrowing*. Fiscal policy can work in two general ways to stabilize the business cycle. One way is through automatic stabilizers and the other through discretionary fiscal policy. Automatic stabilizers arise from parts of the financial system that naturally vary with changes in economic activity, while

discretionary fiscal policy involves active use of government expenditure, taxes, and transfers (IMF 2008).

The financial crisis has returned fiscal policy as a stabilizing tool for two main reasons. First, during the recent recession many economies lowered nominal interest rates to, or very close to, zero. At this level monetary policy can no longer stimulate output, hence calling for the help of fiscal policy (Blanchard, Dell'Ariccia, and Mauro 2010). The reason for this is that as prices start to decrease agents will expect future deflation. This leads to an increase in the real interest rate causing desired saving to rise. This creates a deflationary spiral, which strengthens the initial fall in output. However, if government spending increases, this will result in a rise in output, marginal cost and expected inflation. Since the nominal interest rate is zero, the expected inflation will increase, hence driving down the real interest rate, which drives up private spending. This rise in spending leads to a further rise in output, marginal cost, expected inflation, and a further decline in the real interest rate. The net result is a large increase in output and a large fall in the rate of deflation. The effect becomes an increase in the government spending that offsets the deflationary spiral associated with the zero-bound state (Christiano, Eichenbaum, and Rebelo 2011). Second, according to NBER the recession lasted for 18 months. Fiscal stimulus therefore had sufficient time to yield a beneficial impact despite implementation lags (see Blanchard, Dell'Ariccia, and Mauro 2010; Spilimbergo et al 2008).

3.4.2 Policy actions

Fiscal policy actions were implemented around the world during the financial crisis to limit the impact of the downturn on the real economy. The design and implementation of these fiscal packages are important in maximizing their effectiveness and provide a boost to demand (see Box 6).

Box 6: Optimal fiscal packages

Spilimbergo et al. (2008) argues that the optimal fiscal package should be timely, large, lasting, diversified, contingent, collective, and sustainable. It should be timely because there was an urgent need for action. It should be large since the drop in demand was large. As the recession was expected to last for some time the

package should be lasting. It is therefore desirable to target the fiscal measures that bring long-term benefits, such as spending on infrastructure investments. Furthermore, it should be diversified as there is uncertainty regarding which measure would be most effective. That is, not relying on revenue or expenditure measures alone, but a combination of the two. It should be collective since each country that had the fiscal space should contribute, and sustainable to avoid debt explosion in the long run and adverse effects in the short run.

Moreover, there is not necessarily one optimal size of the fiscal measures. The optimal response depends for instance on initial conditions in a country as well as specific country characteristics (Bénétrix and Lane 2010).

There has been considerable variation in the size of packages across countries, partly reflecting the severity of the crisis, the fiscal position before the onset of the crisis and the size of automatic stabilizers (OECD 2009a). Automatic stabilizers consist of marginal rate of taxes, unemployment benefits and social assistance benefits (Sørensen and Whitta-Jacobsen 2005). They work to dampen the fluctuations in real GDP without any specific policy actions by the government (OECD 2009b). The government size can work as a proxy to decide the impact of automatic stabilizers. The government size in Australia and Canada is relatively small and they both have modest automatic stabilizers (IMF 2009c; OECD 2010a). In Norway, on the other hand, the size of the automatic stabilizers is probably larger than in many other countries due to the size of the public sector and well-developed income protection schemes (Finansdepartementet 2008).

Further, as discussed in section 3.1, Australia, Canada, and Norway had the fiscal space to carry out discretionary fiscal measures to stimulate the economy. Australia implemented a fiscal stimulus package that amounted to 5.41 percent of GDP over the period 2008-2010. The package mostly focused on expenditure measures, which accounted for 4.09 percent, and 1.32 percent was targeted to tax relieves (revenue measures) for individuals and businesses (see Table 3.3.). The Australian government announced through the Nation Building and Jobs Plan that the main priority for the fiscal policy measures was to support

economic growth and jobs (Australian Government 2010). The programs were announced between October 2008 and May 2009, and were planned to last out the fiscal year of 2011/12. The fiscal stimulus can be divided into three phases. The first phase was directed towards private consumption. The second phase, from the second half of 2009 to early 2011, focused primarily on infrastructure investments. The third phase also included infrastructure projects, however at a more long-term basis. The fiscal stimulus package showed highly successful, among others due to a rapid implementation (OECD 2010a).

Table 3.3: Composition of fiscal packages 2008-2010 (percent of GDP in 2008)

		Australia	Canada	Norway	OECD Average*
	Net effect	-5.41	-4.11	-1.17	-1.62
Tax measures	Total**	-1.32	-2.37	-0.27	-0.76
	Individuals	-1.07	-0.83	0.00	NA
	Businesses	-0.24	-0.33	-0.27	NA
	Consumption	0.00	-1.08	0.00	NA
	Social contributions	0.00	-0.13	0.00	NA
Expenditure measures	Total**	4.09	1.74	0.91	0.86
	Consumption	0.00	0.12	0.02	NA
	Investment	2.99	1.28	0.36	NA
	Transfers to households	1.09	0.27	0.05	NA
	Transfers to businesses	0.00	0.07	0.05	NA
	Transfers to sub-national government	0.00	NA	0.35	NA

* Not including Chile, Estonia, Israel, and Slovenia
** Data not available for Portugal
Source: OECD.Stat and own calculations

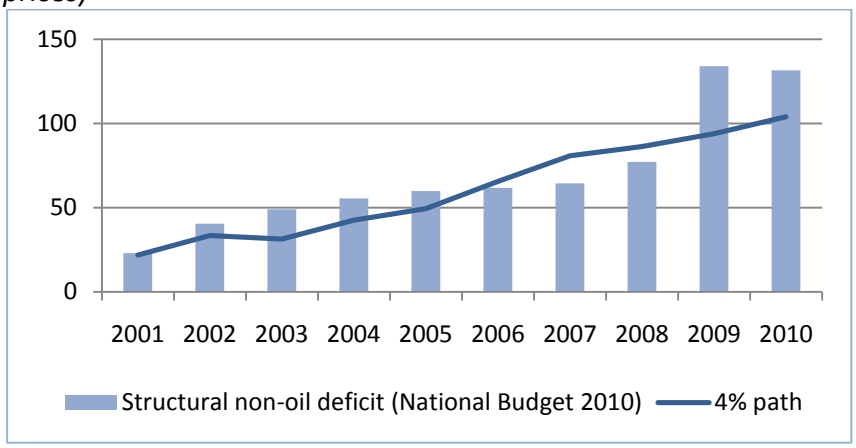
Canada's fiscal stimulus package, the Economic Action Plan, consisted in large part of special federal funds for infrastructure investments in collaboration with the provinces to create jobs (OECD 2010b). Moreover, according to the home page of Canada's Economic Action Plan, the plan included measures like personal income tax relief, training to facilitate job reallocation, stimulation for housing construction, and improving access to financing and strengthen Canada's financial system. Already in the budget for 2007 Canada announced that it would introduce tax reductions at a total value of CAD 60 billion over the current and the next five years (Department of Finance Canada 2007). The fiscal package was estimated to a total of 4.11 percent of GDP over the period 2008-2010, of which 2.37 percent was targeted to several tax relief measures and 1.74 percent was an increase in government expenditure (see Table 3.3.). IMF (2009b) noted that the

fiscal package was effective since it was appropriately large, timely, well diversified and structured.

In Norway the fiscal policy has been centered on discretionary increases in spending. The key anchor of fiscal policy since 2001 has been the 4 percent rule. According to the Ministry of Finance this guideline specifies that over time, the non-oil structural government budget deficit shall correspond to the expected return on the Government Pension Fund Global (GPFG), which is estimated to 4 percent. According to the homepage of Norges Bank Investment Management (NBIM) GPFG is a fiscal policy tool to support long-term management of Norway's petroleum revenues. Moreover, the guidelines allow for fiscal policy to be used actively to counter fluctuations in economic activity. When the global financial crisis set in, policy rapidly shifted from a neutral fiscal stance in 2008 to a quite expansionary one in 2009. The government's main priority was to stimulate production and employment and several expenditure measures were implemented. The Norwegian government allocated grants to central and local government authorities for maintenance and investments, transfers to the business sector, along with employment and requalification measures in order to support the economic activity in Norway (Gjedrem 2010). The fiscal package was estimated to 1.17 percent of (mainland) GDP, of which 0.91 percent was an increase in government expenditure and 0.27 percent was targeted to tax relief for the business sector (see Table 3.3). This fiscal measure was a large deviation from the 4 percent rule and the structural non-oil budget deficit has risen more sharply than in most previous recessions (OECD 2010c) (see figure 3.11).

The fiscal stimulus package was the most ambitious fiscal stimulus presented in Norway in more than 30 years (Finansdepartementet 2008). The object of the Norwegian fiscal package was not only to stimulate the economy in the short run, but also in the longer run (OECD 2010c). The fiscal package included measures like infrastructure investments that can support potential growth in the medium run.

Figure 3.11: Deviation from the 4 % path in 2009 and 2010 (NOK Billion, 2010 prices)



Source: Ministry of Finance Norway

The average fiscal package implemented in the OECD countries was estimated to 1.62 percent of GDP (see Table 3.3). Compared to OECD average the fiscal stimulus packages in Australia and Canada were relatively large, while the fiscal package in Norway was in line with the OECD average. Australia, Canada, and Norway all implemented a combination of revenue and expenditure measures. The same was true for the average of OECD countries. IMF (2008) found that economies that implemented this combination experienced less severe downturns compared with countries that relied solely on expenditure or revenue measures.

3.4.3 Ricardian Equivalence theorem

A matter to be investigated is whether the use of fiscal spending and taxation affects the overall economy. Many neoclassical theorists emphasize that the role of expectations about future income and taxes prevents fiscal policy from having impact on aggregate demand (IMF 2008). One example is the Ricardian Equivalence Theorem, which claims that taxes and debt are equivalent methods of public finance. The theorem claims that a switch from tax financing to debt financing of current public spending will have no effect on private consumption because consumers have rational expectations. They realize that a tax cut today will be offset by a tax increase in the future. The consumers would then rather save than spend temporary tax cuts (Sørensen and Whitta-Jacobsen 2005). For a further explanation of the Ricardian Equivalence Theorem see Box 7.

Box 7: The history of Ricardian Equivalence Theorem

In 1974 Barro questioned whether government bonds are net wealth. He argued that there is no effect on aggregate demand, interest rates, and capital formation when there are changes in the relative amounts of tax and debt finance in order to finance government spending. In 1976 Buchanan pointed towards the similarities between Barro's article and the work by David Ricardo from 1820 and proposed naming the theory Ricardian equivalence theorem. Barro (1974) explains that as long as intergenerational transfers exist, in the sense of bequests, or gifts across generations, there will be no net effect on wealth, and thus, no effect on aggregate demand or on interest rates when there are marginal changes in government debt. He argues that households will act as though they were having infinite lives, and because they only will shift the excess liquidity today over towards later generations the net effect in wealth will become zero. Hence, there is no reason to perceive government debt as a net component of household wealth.

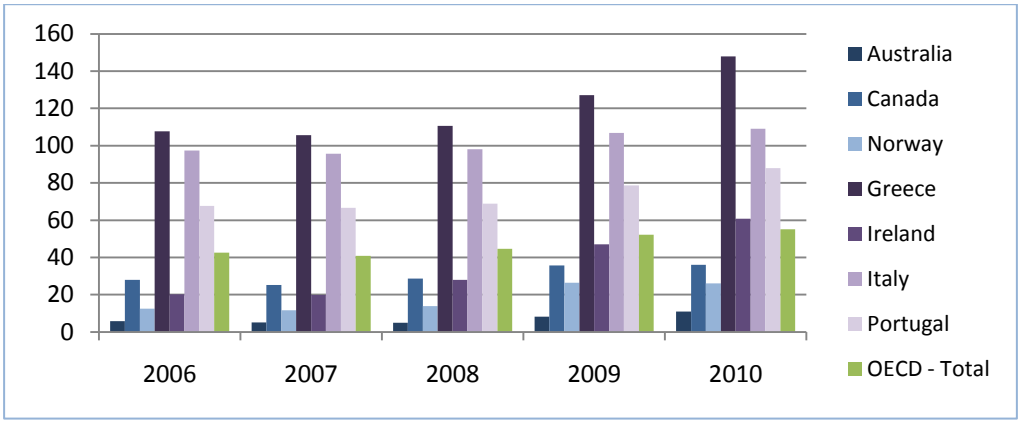
Ricardian equivalence assumes lump sum taxes, however Abel (1986) argues that with distortionary taxes, which most economies pursue, the theorem will not hold. If consumers face different tax levels a lump-sum reduction in the tax rate redistributes differently to individuals, and some will increase their consumption while others might have no changes. Another argument against Ricardian equivalence is when liquidity constrained consumers exist. Blinder (2004) argues that a liquidity constraint consumer will perceive current income to matter more than future income when the constraint is binding, since the increased income today from e.g. a tax cut will make the consumer able to conduct the purchase it was constrained from. Thus, a debt-financed tax cut will increase spending, and Ricardian equivalence will not hold (Blinder 2004). Moreover, Tagkalakis (2008) claims that different degrees of liquidity constraints among the population can explain asymmetric effects of fiscal policy on consumption over the business cycle. During recessions liquidity constraints might bind for a larger degree of households and firms because fewer people have access to credit (Tagkalakis 2008). Thus, fiscal policy seems to have a stronger effect during recessions than during expansions.

Researchers have not been able to reach consensus regarding whether Ricardian equivalence holds or not. Some researchers claim that the theorem holds, while others claim the opposite.

A government with solid fiscal space during a recession has the opportunity to increase its government spending or reduce taxes. According to Ricardian equivalence theorem the fiscal stimulus is however not certain to yield effect on the real economy. In spite of this, a rise in fiscal spending might not lead to an equivalent reduction in later periods if a country has a solid fiscal space. They can then finance higher short-term and future expenditure with current and future revenues, without increasing debt. Hence, consumers may simply spend their disposable income in each period, and this can strengthen the impact of policy actions that alter their disposable income.

Nickel and Vansteenkiste (2008) test the empirical relationship between fiscal policy and the current account and investigate whether Ricardian equivalence changes this relationship. They find that for low debt countries (up to a level of 44 percent of GDP), like Australia, Canada, and Norway (see Figure 3.12 for government debt), an increase in the fiscal deficit will lead to a higher current account deficit. This means the consumers are likely to increase their consumption when the fiscal deficit increases. The increased consumption reduces national saving which reduces the current account (see chapter 3.1. for a definition of the current account). However, when the country is highly indebted (more than 90 percent of GDP), like Greece and Italy, the results suggest that a rise in the fiscal policy will not give a rise in the current account and the consumers starts acting in a Ricardian way. The result is supported by Berben and Brosens (2007) who find that Ricardian equivalence is more likely to hold where governments are highly indebted, and Perotti (1999) who finds that fiscal policy is less effective if the degree of public indebtedness is high when entering a downturn. In this case fiscal policy stimulation can work in the opposite direction. The results suggest that the fiscal policy measures implemented by the government in Australia, Canada, and Norway can be effective in stimulating the economy.

Figure 3.12: Total central government debt, % of GDP



Source: OECD.Stat

3.4.4 The effect of the fiscal policy measures on GDP

To measure the impact of fiscal policy on output fiscal multipliers are frequently used (see Box 8). In order to illustrate the effect of the fiscal packages in Australia, Canada, and Norway several sources have provided estimates of the effect on GDP. However, the impact of a fiscal stimulus in a crisis period is uncertain and therefore difficult to estimate and evaluate.

Box 8: Fiscal multipliers

OECD (2009a) provides a review of numerous empirical studies on the effectiveness of fiscal policy in stimulating aggregate activity, measured by fiscal multipliers. These studies show that the effectiveness of fiscal policy is dependent on the nature of the underlying economic circumstances and vary across fiscal policy instrument – which can be through expenditure, taxation, or a combination (Australian Government 2009; OECD 2009a). The studies further suggest that expenditure measures like direct spending on goods and services, or infrastructure investment is generally the most effective, with multipliers slightly above 1, while multipliers from revenue measures are smaller with a value between 0.2 and 0.8 (OECD 2009a). Fiscal multipliers also depend on the characteristics of an economy. Multipliers seem to be lower in smaller and more open economies, since part of the impact of an individual country's fiscal stimulus will leak out across borders (IMF 2008; OECD 2009a). On the other hand these leakages bring benefits to the global economy. Furthermore, multipliers appear to be larger if there is a higher share of liquidity-constrained consumers (IMF 2008).

The Australian Nation Building and Jobs Plan (the fiscal policy package) was expected to increase GDP by around 0.5 percent in 2008-09 and 0.75 in 2009-10, along with sustaining up to 90,000 jobs over the next two years (Australian Government 2009). In the 2009-10 Budget the numbers were revised, and the fiscal stimulus was estimated to have added around 1 percent to GDP in 2008-09 and give an expected GDP growth of around 1.5 percent in 2009-10 (Australian Government 2010). The Economic Action Plan in Canada together with the tax reductions from the 2007 Economic Statement was in total budgeted to boost real GDP with 1.8 percent in 2009 and 0.3 percent in 2010, and further provide 265 000 additional jobs over the same period (Department of Finance Canada 2009). However, according to the 2011 Budget, the Economic Action Plan in Canada has contributed to the creation of about 540 000 jobs since July 2009 (Department of Finance Canada 2011). OECD methodology suggests that the fiscal stimulus in Norway will have boosted GDP by a little over 1 percent of GDP in 2009 and by 0.6 percent in 2010 (OECD 2010c). In addition, the measures taken by the Norwegian government were estimated to increase employment of about 15 000 people compared to the situation of no stimulus (Finansdepartementet 2008). The additional jobs, which were mainly created in the public sector, were an offsetting factor to an otherwise increasing unemployment rate (Finanstilsynet 2009).

Because of different estimation methods it is difficult to evaluate and compare the three countries' fiscal packages and the effect they have on GDP. However, the estimated multipliers from fiscal expansions for Australia, Canada, and Norway on GDP appear to be in line with the multiplier effect on aggregate activity presented in Box 8.

3.5 SUMMARY

This chapter has looked into several factors that can explain the limited impact on Australia, Canada, and Norway during the global financial and economic crisis. A factor shared by the three countries, as opposed to the average of the EU/OECD, was their limited dependence on the hardest hit segments of global manufacturing together with a commodity-based industry. In the years prior to

the recession the world experienced a commodity price boom providing a significant economic boost to major commodity-exporting countries. Australia, Canada, and Norway were well positioned to take advantage of these price increases, which led to terms of trade improvements. The rising terms of trade resulted in an increase in government revenues. They thus had the fiscal space to stimulate the economy via fiscal policy measures when the crisis hit. Furthermore, the terms of trade improvements has likely led to favorable current account positions for the respective countries. Canada and especially Norway had a considerable current account surplus prior to the crisis, while Australia had a small deficit. Hence, Australia, Canada, and Norway did not experience the same output declines as in the PIIGS countries with large current account deficits (see Figure 3.7).

When the financial crisis hit, all the three countries responded by lowering the short-term interest rate. Monetary policy was likely effective in stimulating the economies, particularly in Australia and Norway due to the relatively high interest rates when entering the crisis. Furthermore, the financial sector in all three countries weathered the turmoil well and there were no banking failures in comparison to for instance the US. This can most likely be explained by factors as good supervision and regulation, a banking crisis in the early 1990s that caused a relatively conservative banking culture – particularly in Canada, low exposure to toxic structured products, solid capital ratios, and measures implemented to support liquidity.

Over the past two decades fiscal policy took a backseat to monetary policy. However, the financial crisis returned fiscal policy as a stabilizing tool. Fiscal packages of varying sizes were introduced around the world to limit the impact of the downturn on the real economy. The fiscal measures implemented in Australia and Canada was larger than the OECD average, while in line with OECD average for Norway. The fiscal packages were further timely and well designed, and succeeded in boosting real macroeconomic variables like GDP and employment.

The global current account imbalances are regarded as a key determinant behind the global financial crisis (see for instance Adams and Park 2009). Further, it has been demonstrated that countries with larger initial current account deficits have experienced larger output declines (Blanchard and Milesi-Ferretti 2009). This can be the same as saying that better-performing economies featured a current account surplus. Moreover, the commodity price increases prior to the recent crisis led to terms of trade improvements in Australia, Canada, and Norway. It is therefore interesting to explore if these terms of trade expansions led to improvements in the respective countries real GDP and current account. The following chapter addresses the impact of a terms of trade shock to these variables.

4. THE EFFECT OF A TERMS OF TRADE SHOCK

This chapter will analyze the impact of a shock to terms of trade on real GDP and the current account in Australia, Canada and Norway. We want to find out if there is a positive relationship between terms of trade and the current account for these small open economies. We address this issue using a structural vector autoregressive (SVAR) model. The VAR methodology was introduced by Sims (1980) after academic concerns about the validity of some of the assumptions used in traditional macro-econometric models. More precisely, the concern was directed towards the 'inappropriateness' of the restrictions used to identify the parameters in traditional macroeconomic models as they often excluded variables or assumed that the variables were exogenous. Sims felt the theory was not strong enough for such assumptions and that the models instead of being over-identified, rather was under-identified. Our VAR model will be identified using only short run (zero) restrictions. A recursive Cholesky ordering will be applied to identify a terms of trade shock.

4.1 A VAR-system

A VAR model of order p can be expressed as (ignoring any constant term):

$$X_t = A_1 X_{t-1} + \cdots + A_p X_{t-p} + e_t \quad (1)$$

where X_t is a vector of endogenous variables at time *t*, *A* is a coefficient matrix, *p* is the number of lags included in the system, and e_t is a vector of residuals (white noise) with covariance matrix Σ_e; $E\left(e_t e_t^{'}\right) = \Sigma_e$. The residuals are assumed to be uncorrelated with its own lagged values and have a zero mean; $E(e_t) = 0$.

The VAR(p) in (1) can be written in the following form:

$A(L)X_t = e_t$, where $A(L)$ is a lag polynomial; $A(L) = I - A_1 L - \cdots - A_p L^p$ (2)

Given that *A(L)* is invertible, the VAR model can also be written as a moving average (MA) representation.

$$X_t = A(L)^{-1} e_t = B(L) e_t \quad (3)$$

$\mathrm{B(L)} = \sum_{\mathrm{j=0}}^{\infty} \mathrm{B_j L^j}$ is defined as the inverse $\mathrm{A(L)^{-1}}$, that is $\mathrm{B(L)} = \mathrm{A(L)^{-1}}$, and $B_0 = I$.

Since the endogenous variables in the model can be explained by the lagged values of the other endogenous variables, there is a possibility that the residuals are correlated with each other. Correlation in the residuals may indicate that a shock in one variable is likely to be accompanied by a shock in another variable (Lütkepohl 1993). If there is a change in one of the error terms of a variable, it will be impossible to discover if this is due to a shock in its own variable or because of exogenous shocks in one of the other variables. In order to find the response of one variable to a shock in another variable in the system we need the residuals to be orthogonal.

Orthogonal residuals can be obtained by imposing restrictions on the VAR to transform it into a structural VAR representation. We let the error term e_t be linearly related to vector ε_t of orthogonal structural shocks normalized to have unit variance ($E\left(\varepsilon_t \varepsilon_t^{'}\right) = I$), $e_t = C\varepsilon_t$. Inserting for this expression into (3) gives the MA representation in terms of the structural shocks.

$$X_t = B(L)e_t \ = B(L)C\varepsilon_t \equiv \Theta(L)\varepsilon_t \qquad (4)$$

Writing this out the structural MA is simply:

$$X_t = \theta_0\varepsilon_t + \theta_1\varepsilon_{t-1} + \theta_2\varepsilon_{t-2} + \cdots \qquad (5)$$

where $\varepsilon_t \sim \mathrm{N}(0, \mathrm{diag}(\mathrm{I}_6))$, $\mathrm{B}_0 = \mathrm{I}$, $\theta_0 = \mathrm{C}$, and $\theta_\mathrm{j} = \mathrm{B_j C}$, for $\mathrm{j} = 1,2, \ldots$

In order to identify the structural shocks it is necessary to impose restrictions on the elements in *C*. The matrix *C* is chosen such that $CC^{'} = \Sigma_e$, where *C* is a lower triangular matrix with positive diagonal elements (Hamilton, 1994). This decomposition is called the Cholesky decomposition. Given that *C* is a lower triangular matrix, the components of ε_t will be uncorrelated.

Sims (1980) suggests that there should be placed $n(n-1)/2$ restrictions by setting the elements above the diagonal of Θ_0 to zero. Moreover, since *C* is a lower triangular, then Θ_0 will also be a lower triangular.

However, the SVAR methodology is subject to several critiques. For instance Cooley and LeRoy (1985) criticize the "atheoretical" orthogonality assumption since the use of a different variable ordering is likely to yield different parameters in the structural model. Moreover, Blanchard and Quah (1989) found that the SVAR system may not identify all the shocks that hit the economy, which makes the results less reliable.

4.2 Specification of the model

The variables included in the model consists of $X_t = (\Delta tot, \Delta y, ca)'$, where Δtot is the log of the terms of trade, Δy is the log of real gross domestic product (GDP), ca is defined as the current account as a percentage of GDP (see section a in the Appendix).

The VAR will be identified using a standard recursive structure as in Sims (1980) and Christiano, Eichenbaum and Evans (1999). When the variables are ordered recursively, the structural shocks can be recovered from the residuals using the Cholesky decomposition. This implies that the variable ordered on top will only react to its "own shock", while the variable ordered at the bottom will react to all shocks. The variables will be ordered recursively $(\Delta TOT, \Delta y, ca)$. This means that output and the current account will react immediately to fluctuations in terms of trade.

We assume a recursive structural relationship defined above in equation (5):

$$\begin{bmatrix} \Delta tot_t \\ \Delta y_t \\ ca_t \end{bmatrix} = \begin{bmatrix} \theta_{11,0} & 0 & 0 \\ \theta_{21,0} & \theta_{22,0} & 0 \\ \theta_{31,0} & \theta_{32,0} & \theta_{33,0} \end{bmatrix} \begin{bmatrix} \varepsilon_{tot,t} \\ \varepsilon_{y,t} \\ \varepsilon_{ca,t} \end{bmatrix} + \Theta_1 \varepsilon_{t-1} + \cdots$$

where ε_{tot} is a terms of trade shock, ε_y is a shock to aggregate demand, and $\varepsilon_{ca,t}$, is a shock to the current account. Given the focus of the chapter, we restrict our attention to identifying the terms of trade shock (ε_{tot}).

The purpose of the model is to see if the commodity price boom prior to the financial crisis that led to improvements in terms of trade for the respective countries had a positive effect on the countries' GDP and current account (cf. Figure 3.5 and 3.6a-c). Harberger (1950) and Laursen and Metzler (1950) showed

that an exogenous fall (rise) in the terms of trade faced by a small open economy would lead to a deterioration (improvement) in the country's trade balance. This effect has later been known as the Harberger-Laursen-Metzler (HLM) effect. More precisely, deterioration in terms of trade will decrease the level of a country's real income when measured in exportable goods. A decrease in the real income will most likely reduce saving, and holding investment constant, the change in saving will equal the change in a country's current account surplus. Thus, holding income constant, the HLM-effect implies that the current account will deteriorate when terms of trade deteriorates (Svensson and Razin 1983).

There exists a relatively large theoretical literature on the HLM effect. Sachs, Cooper, and Fischer (1981) extended the effect into a forward-looking framework, and Obstfeld (1982) and Svensson and Razin (1983) introduced importables and exportables to the model, where Svensson and Razin (1983) generalize the results of Sachs and Obstfeld by distinguishing between current and future changes in the terms of trade. Later contributions to the HLM literature include Persson and Svensson (1985) that use an overlapping generations model, along with Ostry (1988), Backus (1993), Backus, Kehoe, and Kydland (1992, 1994) and Mendoza (1992, 1995) among others.

4.3 Properties of the data

Prior to analyzing the economic relationship between the variables one need to test if a series is integrated of order one, I(1), i.e. non-stationary against the alternative that it is integrated of order zero, I(0) i.e. stationary. The Augmented Dickey-Fuller (ADF) test for unit root and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test are used to test whether the time series are random walks against the alternative that they are (trend-)stationary. The ADF test allows for serial correlation in the residuals, however, it has low power to distinguish between unit root and 'trend with structural break'. The results are summarized in table 4.1 and 4.2.

Table 4.1: ADF test for unit root (H_0 non-stationary)

Australia:	**t_{ADF}**	**p-value**	**Properties**
Terms of trade	0.598420	0.9891	I(1)
Real GDP	-1.938420	0.6277	I(1)
Current account	-3.449397	0.0113	I(0)

Diff Terms of trade	-4.334298	0.0006	I(0)
Diff Real GDP	-5.219329	0.0002	I(0)
Diff Current account	NA	NA	
Canada:			
Terms of trade	-1.224878	0.6611	I(1)
Real GDP	-2.165386	0.5029	I(1)
Current account	-1.507360	0.5257	I(1)
Diff Terms of trade	-4.773261	0.0001	I(0)
Diff Real GDP	-3.235898	0.0838	I(1)*
Diff Current account	-4.701242	0.0002	I(0)
Norway:			
Terms of trade	-1.256308	0.6478	I(1)
Real GDP	-3.535541	0.0405	I(0)
Current account	-1.729140	0.4139	I(1)
Diff Terms of trade	-4.983046	0.0001	I(0)
Diff Real GDP	NA	NA	
Diff Current account	-5.427721	0.0000	I(0)

*10% I(0)

Table 4.2: Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test (H_0 stationary)

Australia:	**KPSS test statistic**	$t_{\alpha = 5\%}$	**Properties**
Terms of trade	1.026285	0.463000	I(1)
Real GDP	0.121953	0.146000	I(0)
Current account	0.148664	0.463000	I(0)
Diff Terms of trade	0.451900	0.463000	I(0)
Diff Real GDP	0.064027	0.146000	I(0)
Diff Current account	0.042794	0.463000	I(0)
Canada:			
Terms of trade	1.314021	0.463000	I(1)
Real GDP	0.208898	0.146000	I(1)
Current account	1.066057	0.463000	I(1)
Diff Terms of trade	0.047546	0.463000	I(0)
Diff Real GDP	0.123734	0.146000	I(0)
Diff Current account	0.159637	0.463000	I(0)
Norway:			
Terms of trade	1.983803	0.463000	I(1)
Real GDP	0.170031	0.146000	I(1)
Current account	1.826811	0.463000	I(1)
Diff Terms of trade	0.053185	0.463000	I(0)
Diff Real GDP	0.141145	0.146000	I(0)
Diff Current account	0.040510	0.463000	I(0)

Results from the Augmented Dickey-Fuller unit root test suggest that for all three countries terms of trade is I(1) in levels, real GDP is I(1) in levels for Australia and Canada, while I(0) for Norway. However, using KPSS unit root test real GDP is I(0) for Australia and I(1) for Norway in levels. The tests of whether real GDP are non-stationary or stationary thus give an ambiguous result for Australia and Norway.

The current account is I(1) in levels for Canada and Norway both when testing with ADF and with KPSS, while I(0) for Australia in both tests.

Since most of the series are non-stationary we need to test for co-integration before deciding to use data in levels or first differences. This is because differentiating removes any long-run relationship between the variables. Co-integration means that despite being individually non-stationary, a linear combination of two or more time-series can be stationary (Gujarati 2003). To test for co-integration in the system, Johansen Co-integration test is used. The trace test and max-eigenvalue test indicate that there may be co-integration in the system for Australia, while no co-integration for Canada and Norway (see Appendix section b).

If there is co-integration in a model one should not differentiate the data. Using levels will then imply that one allow for implicit co-integration. We find little evidence of co-integration for Canada and Norway, hence estimating the model in first differences would not remove any information about the long run relationship between the variables. However, we find that estimating the VARs in levels gives a higher explanatory power. The VAR stability condition check (see Appendix section c) confirms that the VAR is stable, so using levels is suitable.

Prior to estimating the structural VAR, one also needs to determine the number of optimal lags in the VAR. The lag order of the VAR model is determined using Schwarzs (SC), Hannan-Quinns (HQ), and Akaike's Information Criterion (AIC). Even though different, they all try to minimize the squared sums of the residuals (Lütkepohl 1993). The results are summarized in table c.1-3 in section c in the Appendix. Since we have quarterly data, the models for Canada and Norway are specified with 4 lags, while Australia is specified with 5 lags.

Furthermore, the LM test for serial correlation is used to examine whether there is autocorrelation in the residuals. The results indicate that there is no autocorrelation in any of the models (see section d in the Appendix). We find that heteroskedasticity might be present for all three countries (see section e in Appendix). Moreover, to test for non-normality the VAR Residual Normality Test is used. The results are described in the Appendix section f.

4.4 Empirical results

The model is estimated using quarterly data from 1982Q1 to 2010Q4 for Australia and Norway and 1986Q1 to 2010Q4 for Canada. An analysis of the impulse response functions will be conducted. An impulse response function traces the effects of a shock to one endogenous variable on the other variables in the VAR (Lütkepohl 1993).

4.4.1 Dynamic effects of a terms of trade shock

Figure 4.1a-c graphs the estimated impulse response functions using the structural model for Australia, Canada and Norway. The figures illustrate the impulse response functions in the three variables following a terms of trade shock. We see an immediate positive response following a terms of trade shock on real GDP and the current account in all three countries. The effect is however larger for the Norwegian data.

The shock increases terms of trade temporarily, and then gradually returns back to steady state for all countries. The effect on real GDP gives somewhat different results. However, we see an initial positive response in GDP for all three countries. GDP in Australia and Canada show a marginal positive response. In Norway the increase in real GDP appear more persistent, nevertheless the effect of Norwegian GDP is also small. This effect is to be expected because although nominal GDP increases with the terms of trade, the GDP deflator also raises, leaving a modest change in real GDP (Kohli 2006).

The positive effect on the respective countries' current account can be said to be in line with the Harberger-Laursen-Metzler (HLM) effect. Thus, an exogenous raise in the terms of trade leads to improvements in the country's current account. The shock to terms of trade on the current account on Australian and Canadian data has a rather similar effect. There is an initial increase in the current account, subsequently the effect gradually declines and falls below the steady-state, before the effect dies out. For Norway the current account rapidly increases before the effect gradually returns back to steady state.

In conclusion, we find that terms of trade shocks seem to cause changes in the current account position for all three countries. Terms of trade shocks appear to

have a marginal, but persistent effect on real GDP in Norway. However, the shocks have smaller effects on real GDP in Australia and Canada.

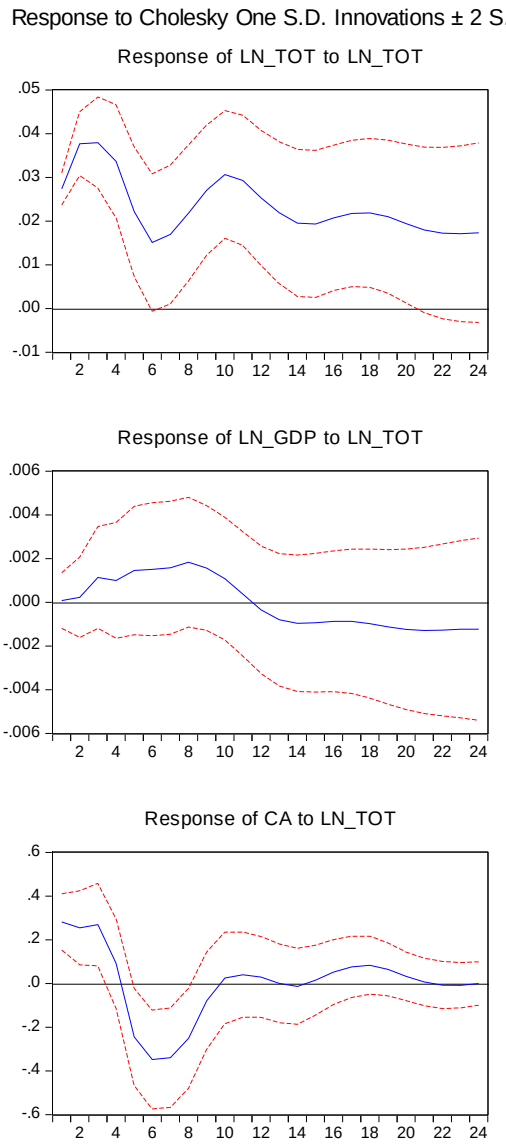


Fig. 4.1a. Response to a terms of trade shock on Australian data, using the structural VAR, quarterly data.
Note: The dotted lines are probability bands.

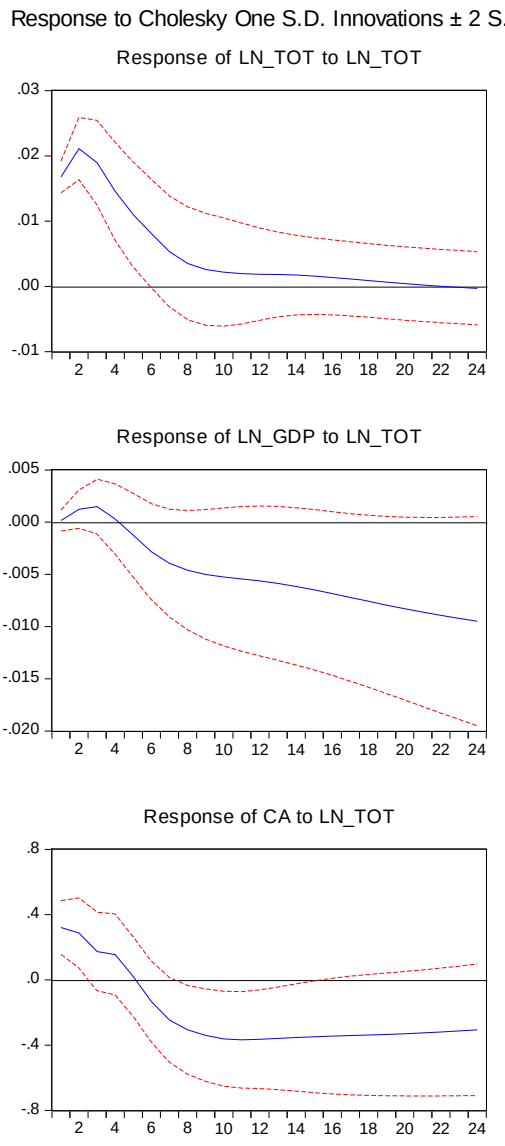


Fig. 4.1b. Response to a terms of trade shock on Canadian data, using the structural VAR, quarterly data.
Note: The dotted lines are probability bands.

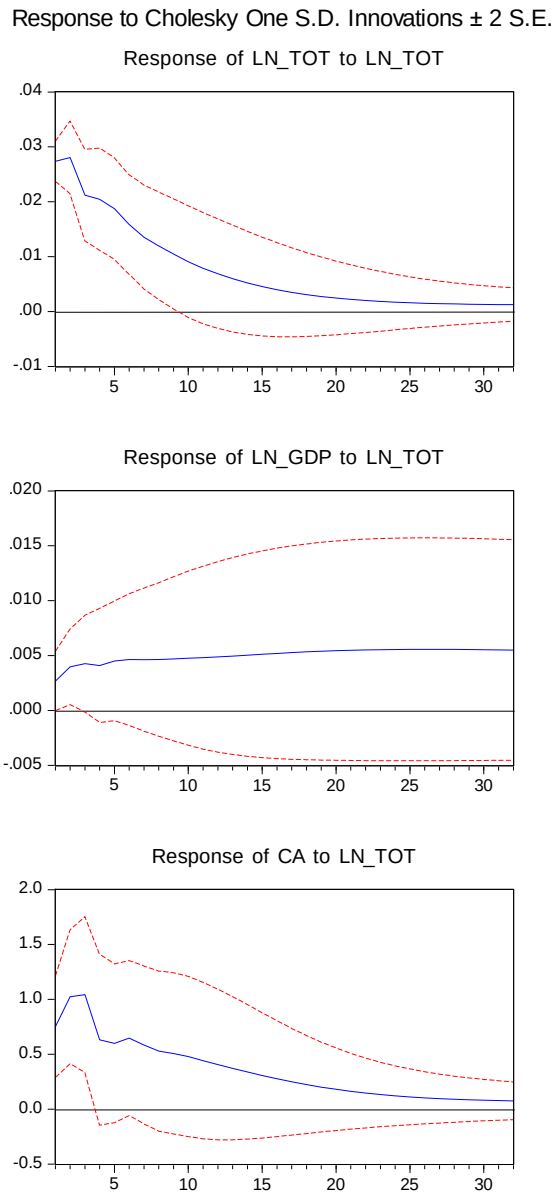


Fig. 4.1c. Response to a terms of trade shock on Norwegian data, using the structural VAR, quarterly data.
Note: The dotted lines are probability bands.

To see these results in the context of the situation prior to the recent recession, it is appropriate to draw the inference that the widening current account surpluses in Canada and Norway, and the shrinking deficit in Australia were partly caused as a response to terms of trade improvements (cf. Figure 3.6a-c). It is also likely that the terms of trade improvement contributed positively to real GDP growth in the respective countries. This can imply that when the terms of trade started to fall during the global financial and economic crisis, the activity in the respective countries also fell. However, the decline in terms of trade was only temporarily and then quickly started increasing, thus moderating the negative impact of the global financial and economic crisis on domestic activity.

5. THE RESILIENCE OF THE THREE ECONOMIES

So far we have looked into different possible reasons behind the limited impact on Australia, Canada, and Norway during the global financial crisis. In this chapter we will review and discuss our main findings, as well as answer the questions that were raised in the introduction.

As discussed in chapter 3, Australia, Canada, and Norway were in a favorable macroeconomic situation going into the crisis largely due to their extensive commodity-based industry sector. Furthermore, the three countries had limited dependence on the hardest hit segments of global manufacturing, where they all have a manufacturing sector that is smaller than the EU/OECD average. Prior to the global financial crisis the world experienced a commodity price boom that was to a great extent caused by strong demand from emerging economies like China. The increase in commodity prices led to improvements in the terms of trade in Australia, Canada, and Norway. A terms of trade increase will likely raise a country's current account as well as real GDP. It has been demonstrated that countries with larger initial current account deficits have experienced larger declines in output during the global financial crisis and hence more resilient economies featured a current account surplus (Blanchard and Milesi-Ferretti 2009). A SVAR analysis has been conducted to find out if the commodity based industry structure was a key determinant behind the limited impact of Australia, Canada, and Norway during the global crisis. In the analysis we explore if an increase in terms of trade expansions have a direct positive effect on the respective countries' current account position and real GDP. The results showed an immediate positive response following a terms of trade shock on real GDP and the current account in all three countries. Thus, the results indicate that the widening current account surpluses in Canada and Norway and the shrinking deficit in Australia were caused as a response to terms of trade improvements. Terms of trade fell during the recession, however, the decline was only temporarily and terms of trade quickly started to increase. This rapid recovery moderated the negative impact of the global financial crisis on domestic activity. We therefore find that Australia, Canada, and Norway's focus on commodity

production and export did contribute to their resilience during the global financial crisis.

Moreover, the improvement in terms of trade led to an increase in real domestic income (RDI). Some of this income gain has accrued to the government in the three countries through increased taxes and royalties. These revenues are particularly important for Norway due to their high tax levels on oil revenues. The increased revenues have further contributed to an improved fiscal space for Australia, Canada and Norway. Due to this fiscal space the three countries were in a good position to stimulate the economy via spending measures and tax reductions when the global financial crisis hit. The fiscal packages implemented in Australia and Canada was extensive in comparison to the packages introduced in Norway and the average of all OECD countries (cf. Table 3.3). It is, however, challenging to compare the size of the fiscal stimulus plans for various reasons. For instance, the size of the fiscal packages does not take into account automatic stabilizers. OECD (2009b) has found that an inverse correlation exist between the size of discretionary fiscal packages announced/implemented among OECD countries and the strength of automatic stabilizers. Norway implemented a smaller fiscal package than Australia and Canada when measured in GDP. On the other hand, the automatic stabilizers are correspondingly larger in Norway compared with the two other countries. The need for a larger discretionary package has then likely been more important for Australia and Canada than Norway.

Australia, Canada, and Norway have all managed the commodity revenues in a suitable manner, and have predicted the possibility of downturns. Norway has invested the oil revenues in Government Pension Fund Global (GPFG). Further, contrary to Australia and Canada, Norway follows a fiscal rule for the use of the petroleum revenues, the 4 percent rule. According to the homepage of the Norwegian Ministry of Finance the rule is designed to be sustainable over the long term, meaning that the government should spend less than 4 percent during expansions in order to spend more than 4 percent during a recession (cf. Figure 3.11). Australia has invested in the mining industry (Garton, Sedgwick and Shirodkar 2010). The same has been true for Canada, which in addition has

invested in the oil and gas sector (Dupuis and Marcil 2008). Moreover, Canadian authorities have since 2006 aimed to reduce the government debt annually by 0.2 percent of GDP (IMF 2009b).

A question that remains is whether the fiscal measures that were implemented have succeeded in stimulating the overall economy. The effect of the fiscal policy measures is difficult to estimate. The skepticism about the effects of fiscal policy is also wide and is largely based on Ricardian equivalence arguments. On the basis of this, Berben and Brosens (2007) and Nickel and Vansteenkiste (2008) both come to the conclusion that Ricardian equivalence is more likely to hold where governments are highly indebted meaning that fiscal policy is less effective in these economies. In addition, Perotti (1999) finds that fiscal policy is less effective if the degree of public indebtedness is high when entering a downturn. The level of government debt was low in Australia, Canada, and Norway compared to countries like Greece and Italy when going in to the crisis (cf. Figure 3.12). The fiscal policy measures implemented by the government in Australia, Canada, and Norway should therefore be more effective in stimulating the economy than in for example Greece and Italy. Another critique was that fiscal measures were likely to come too late. However, as the current recession was long-lasting (18 months according to NBER) there was enough time for the implementation to be effective despite lags (see Blanchard, Dell'Ariccia, and Mauro 2010; Spilimbergo et al 2008).

It is hard to give an exact answer concerning the effect of the fiscal measures on GDP and unemployment in Australia, Canada, and Norway. On the other hand, we can infer from the analysis that fiscal policy had impact and can be considered to be an important factor behind their resilience.

Monetary policy measures were also applied to stimulate the economy. When the financial crisis hit, the central banks in Australia, Canada, and Norway responded by lowering the key policy rate. They could do so due to the relatively high interest rates going into the crisis. The three countries were thus in a situation to use monetary policy effectively during the crisis. IMF (2009d) finds that during recessions associated with financial crises the use of expansionary

monetary policy is associated with stronger recoveries. On the basis of this, the large reductions in the key policy rates were likely effective in stimulating the real economy.

Furthermore, we have found characteristics of the three countries financial sector where they stand out. The financial crisis demonstrated the importance of having a sound financial market regulation and supervision. One of the strengths of the financial sector in Australia, Canada, and Norway is that they all had a healthy regulation and supervision and there was limited exposure of structured products. Combined with a more conservative attitude in financial institutions this prevented any solvency problems in the financial sector. Canadian banks also stood out in their funding structure, as they relied much more on depository funding than elsewhere. Further, the soundness of the financial sector in Canada during the crisis, despite of the strong financial links to the US economy, emphasized the strength of Canadian banks.

The favorable situation Australia, Canada, and Norway were in at the onset of the global financial and economic crisis was probably more due to luck rather than deliberate planning. They feature a commodity-based industry and benefitted from the strong demand from emerging Asian countries. The commodity-based industry sector depends on factors that for the countries are external and hence difficult to transfer to other economies. The way Australia, Canada, and Norway have managed the commodity revenues is however transferrable to other economies. In addition, characteristics exist in the three countries financial sectors that are transferrable, such as their sound financial market regulation and prudent supervision.

6. CONCLUSION

The resilience of Norway, Canada, and Australia can be attributed to a number of reasons. The three countries were in a favorable macroeconomic position compared to many other countries when the financial crisis hit. This position was a result of a combination of industry structure in the three countries and changes in the international trade- and growth pattern in the years before the crisis. Furthermore, Australia, Canada, and Norway were able to stimulate the real economy through monetary- and fiscal policy measures. Moreover, while the financial sector was heavily affected internationally, the financial system in Australia, Canada, and Norway showed relative resilience due to factors like healthy regulation and supervision, limited exposure of structured products and a more conservative attitude in financial institutions.

Appendix: SVAR analysis

a. Data sources

All data used in the SVAR model are quarterly.

- *TOT*: Terms of trade is downloaded from Datastream. For Australia the source is Australian Bureau of Statistics (AUTOTPRCF) and for Norway the source is Statistics Norway (NWTOTPRCF). The Canadian terms of trade data are found from Thomson Reuters and national source (CNTOTPRCE) and are seasonally adjusted by the source.
- *GDP*: Real GDP is downloaded from Datastream. For Australia and Canada the source is OECD Economic Outlook Database and the data are seasonally adjusted by the source (Australia: AUOCFGDPD, Canada: CNOCFGDPD). For Norway we have used real GDP for mainland Norway. The data source is Statistics Norway and the data are measured in adjusted current prices (NOK) and are seasonally adjusted (NWGDPNORB).
- *CA*: The data for the respective countries current accounts are measured as a percentage of GDP. They are all found at OECD.Stat.

b. Test for co-integration

The Johansen co-integration test is used to test for co-integration in the system. The results of the test are presented in Table b.1-3 below.

Table b.1: Australia

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.238124	45.00028	42.91525	0.0305
At most 1	0.102599	15.08341	25.87211	0.5676

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.238124	29.91686	25.82321	0.0136
At most 1	0.102599	11.90774	19.38704	0.4238

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table b.2: Canada

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.165608	30.37406	42.91525	0.4802

Trace test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.165608	17.19994	25.82321	0.4411

Max-eigenvalue test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table b.3:Norway

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.150493	29.07416	29.79707	0.0604

Trace test indicates *no cointegration* at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.150493	18.10395	21.13162	0.1260

Max-eigenvalue test indicates *no cointegration* at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Source: Own calculations in EViews

The trace test and the max-eigenvalue test indicate that there may be one co-integrating equation in the case of Australia, while no co-integration in the case of Canada and Norway. Note that the test may not be valid for Canada and Norway due to the possible existence of variables that are stationary.

c. Lag length criteria and stability

Choosing the correct number of lags is critical in order to obtain a good model for analysis. The tables below show the results of VAR lag order selection criteria obtained from EViews.

Table c.1: Australia

Lag	AIC	SC	HQ
0	2.630951	2.705454	2.661159
1	-8.890422	-8.592407*	-8.769588
2	-9.082482	-8.560957	-8.871022*
3	-9.115019	-8.369983	-8.812934
4	-9.161918	-8.193370	-8.769207
5	-9.229833*	-8.037774	-8.746496
6	-9.192197	-7.776628	-8.618235
7	-9.078251	-7.439171	-8.413663
8	-9.003766	-7.141175	-8.248553

* indicates lag order selected by the criterion
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Table c.2: Canada

Lag	AIC	SC	HQ
0	0.003633	0.085865	0.036823
1	-10.14602	-9.817096	-10.01327
2	-10.83868*	-10.26305*	-10.60635*
3	-10.76961	-9.947289	-10.43772
4	-10.67159	-9.602567	-10.24012
5	-10.59025	-9.274532	-10.05921
6	-10.54010	-8.977691	-9.909501
7	-10.52478	-8.715669	-9.794607
8	-10.54973	-8.493920	-9.719985

* indicates lag order selected by the criterion
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Table c.3: Norway

Lag	AIC	SC	HQ
0	3.907994	3.982498	3.938203
1	-5.360279	-5.062265*	-5.239445*
2	-5.379350*	-4.857825	-5.167891
3	-5.291417	-4.546381	-4.989332
4	-5.225931	-4.257384	-4.833220
5	-5.253532	-4.061474	-4.770196
6	-5.182740	-3.767171	-4.608778
7	-5.129334	-3.490254	-4.464747
8	-5.037606	-3.175015	-4.282393

* indicates lag order selected by the criterion
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Source: Own calculations in EViews

The lag order criterions choose the minimum number of lags needed. For Australia the AIC display 5 lags as the minimum criteria, and for Canada and Norway the minimum number is 2. When quarterly data are used 4 lags are usually applied. We choose 5 lags for Australia and 4 for Canada and Norway. With this number of lags we obtain stability in the SVAR model for all three countries (see Table c.4-6). The VAR stability condition check below show that all the eigenvalues have modulus less than 1 in all cases, hence the VARs' are stable.

Table c.4: Australia

Roots of Characteristic Polynomial
Lag specification: 1 5

Root	Modulus
0.988853 - 0.007142i	0.988879
0.988853 + 0.007142i	0.988879
0.604345 - 0.623966i	0.868658
0.604345 + 0.623966i	0.868658
0.812882 - 0.277000i	0.858782
0.812882 + 0.277000i	0.858782
-0.410194 - 0.677690i	0.792163
-0.410194 + 0.677690i	0.792163
0.440099 - 0.592443i	0.738022
0.440099 + 0.592443i	0.738022
-0.581482 - 0.385608i	0.697721
-0.581482 + 0.385608i	0.697721
-0.439319 - 0.225712i	0.493910
-0.439319 + 0.225712i	0.493910
0.431339	0.431339

No root lies outside the unit circle.
VAR satisfies the stability condition.

Table c.5: Canada

Roots of Characteristic Polynomial
Lag specification: 1 4

Root	Modulus
0.983569 - 0.022350i	0.983822
0.983569 + 0.022350i	0.983822
0.805371	0.805371
0.660978 - 0.311777i	0.730819
0.660978 + 0.311777i	0.730819
0.019150 - 0.610942i	0.611242
0.019150 + 0.610942i	0.611242
-0.444394 - 0.281926i	0.526278
-0.444394 + 0.281926i	0.526278
0.276020 - 0.385189i	0.473875
0.276020 + 0.385189i	0.473875
-0.358879	0.358879

No root lies outside the unit circle.
VAR satisfies the stability condition.

Table c.6: Norway

Roots of Characteristic Polynomial
Lag specification: 1 4

Root	Modulus
0.994414	0.994414
0.811667 - 0.079830i	0.815583
0.811667 + 0.079830i	0.815583
0.745234	0.745234
-0.055113 - 0.561090i	0.563790
-0.055113 + 0.561090i	0.563790
-0.403758 - 0.339256i	0.527366
-0.403758 + 0.339256i	0.527366
-0.324803 - 0.216583i	0.390391
-0.324803 + 0.216583i	0.390391
0.303622 - 0.158324i	0.342422
0.303622 + 0.158324i	0.342422

No root lies outside the unit circle.
VAR satisfies the stability condition.

Source: own calculations in EViews

d. Autocorrelation

To test for autocorrelation (serial correlation) in the residuals VAR Residual Serial Correlation LM Test is used (see Table d.1-3 below).

Table d.1: Australia

VAR Residual Serial Correlation LM Tests
Null Hypothesis: no serial correlation at lag order h

Lags	LM-Stat	Prob
1	8.771656	0.4586
2	13.43000	0.1441
3	5.605888	0.7786
4	7.414095	0.5941
5	7.132171	0.6234

Probs from chi-square with 9 df.

Table d.2: Canada

VAR Residual Serial Correlation LM Tests
Null Hypothesis: no serial correlation at lag order h

Lags	LM-Stat	Prob
1	22.32171	0.0079
2	13.73486	0.1321
3	16.10778	0.0647
4	6.941062	0.6433
5	4.565664	0.8704

Probs from chi-square with 9 df.

Table d.3: Norway

VAR Residual Serial Correlation LM Tests
Null Hypothesis: no serial correlation at lag order h

Lags	LM-Stat	Prob
1	15.98341	0.0672
2	24.68377	0.0033
3	10.45368	0.3150
4	15.04062	0.0898
5	6.925292	0.6449

Probs from chi-square with 9 df.

Source: own calculations in EViews

The null hypothesis states no serial correlation at lag order h. Since neither of the probability values for Australia with 5 lags, or Canada and Norway with 4 lags is significant at the 5 % level, the null hypothesis cannot be rejected. Hence, we find little evidence of autocorrelation the residuals.

e. Heteroskedasticity

VAR Residual Heteroskedasticity Tests: No Cross Terms (only levels and squares)

	Chi-sq	df	Prob.
Australia	218.7448	180	**0.0258**
Canada	185.3290	144	**0.0115**
Norway	216.5523	144	**0.0001**

Source: Own calculations in EViews

The test for heteroskedasticity is conducted in EViews with no cross terms is based on White (1980). The results from the test indicate that there exist heteroskedasticity in the residuals for all three countries. This indicates that we cannot conclude equal variance in the residuals. Presence of heteroskedasticity can among others cause underestimated standard errors and overestimated t-values in the model (Vogelvang 2005).

f. Non-normality and dummy variables

By plotting the variables in first differences one can see if there are any extreme outliers in the time series (see Figure f.1-3). We see that there is quite a lot of volatility in most of the variables during the financial crisis.

Figure f.1: Australia

Figure f.2: Canada

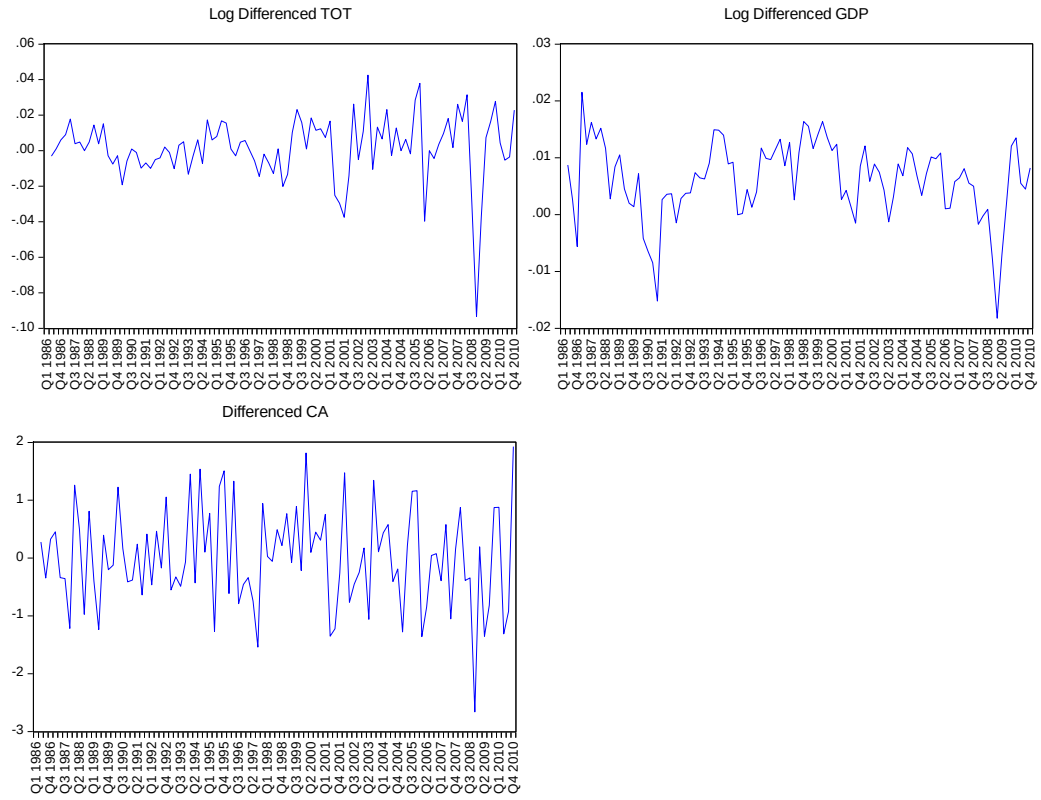


Figure f.3: Norway

By looking the Jarque-Bera test statistics shown in Table f.1, we see that there is likely presence of non-normality in some of the time series.

Table f.1: Test for normality in the data

Australia:	**Terms of trade**	**Real GDP**	**Current account**
Kurtosis	3.878741	1.757075	2.132075
Skewness	1.317369	-0.018933	0.081905
Jarque-Bera	37.28446	7.473769	3.770617
Probability	0.000000	0.023828	0.151782
Canada:			
Kurtosis	3.140511	1.496854	1.631918
Skewness	0.891732	0.023747	0.164145
Jarque-Bera	13.33537	9.423760	8.247597
Probability	0.001271	0.008988	0.016183
Norway:			
Kurtosis	2.043157	2.018077	2.142359
Skewness	0.467135	-0.124649	-0.064832
Jarque-Bera	8.643985	4.960560	3.636411
Probability	0.013273	0.083720	0.162317

Source: Own calculations in EViews

A plot of the residuals can be used in order to detect any non-normality in the VAR (see Figure f.4-6).

Figure f.4: Plot of residuals for Australian data

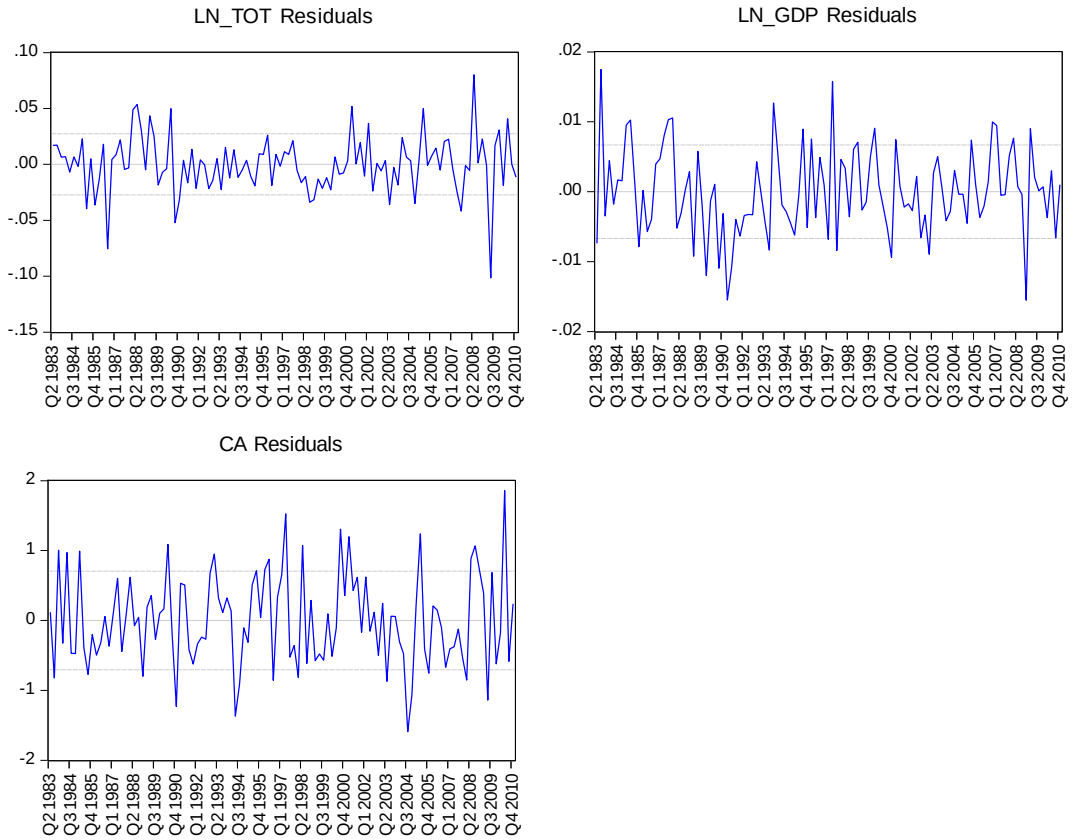


Figure f.5: Plot of residuals for Canadian data

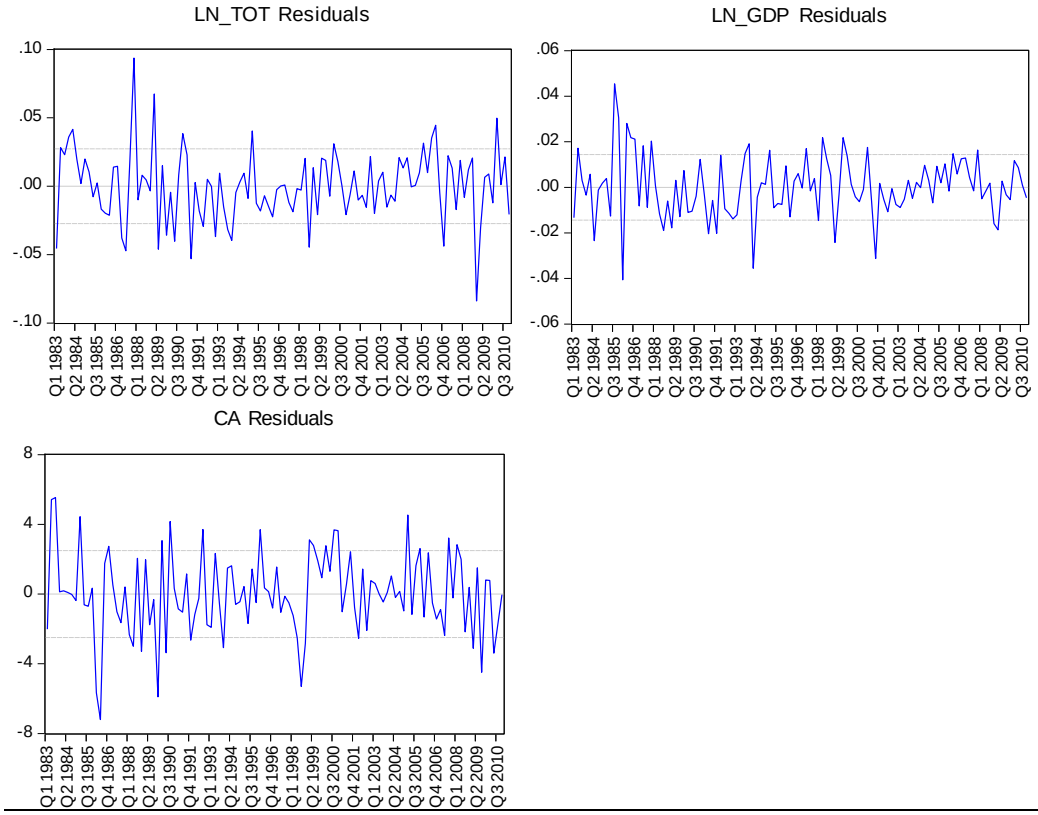
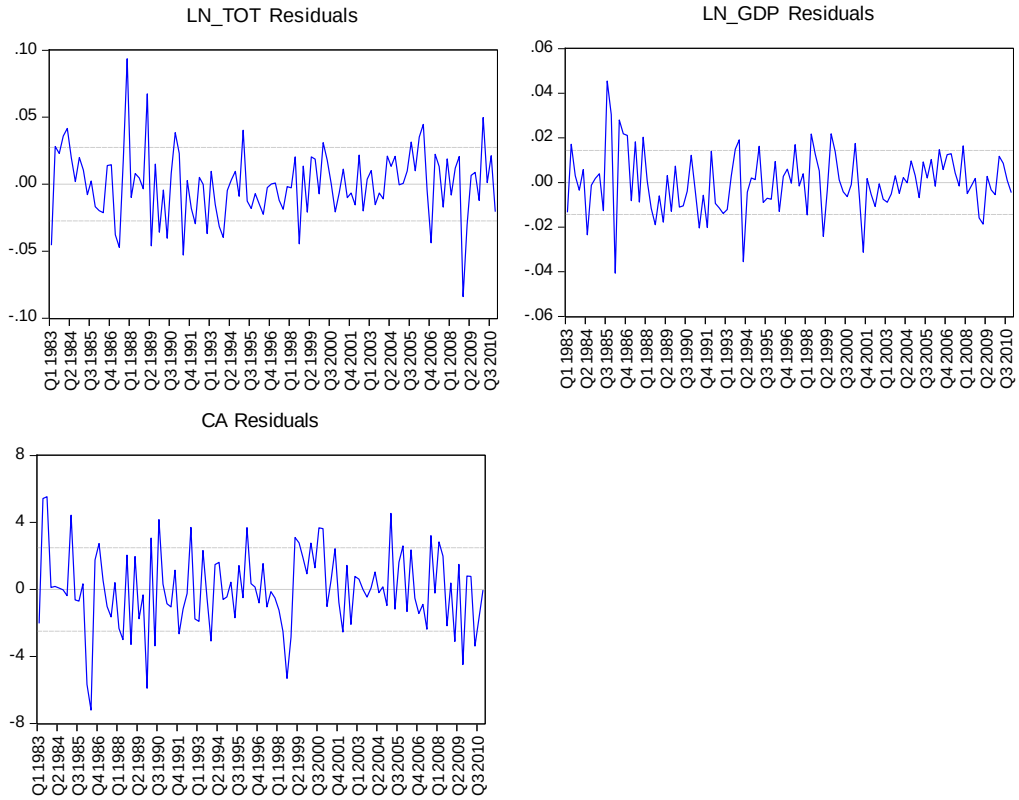


Figure f.6: Plot of residuals for Norwegian data



To test for skewness and kurtosis in the residuals of the VAR, the VAR Residual Normality Tests in EViews is used. The results are summarized in Table f.2-4.

Table f.2: Australia

VAR Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal

Component	Skewness	Chi-sq	df	Prob.
1	-0.306714	1.740358	1	0.1871
2	0.169938	0.534261	1	0.4648
3	0.195250	0.705267	1	0.4010
Joint		2.979886	3	**0.3947**

Component	Kurtosis	Chi-sq	df	Prob.
1	5.504947	29.02076	1	0.0000
2	3.093588	0.040509	1	0.8405
3	2.836404	0.123781	1	0.7250
Joint		29.18506	3	**0.0000**

Table f.3: Canada

VAR Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal

Component	**Skewness**	Chi-sq	df	Prob.
1	-0.921242	13.57898	1	0.0002
2	0.180928	0.523758	1	0.4692
3	0.069199	0.076617	1	0.7819
Joint		14.17936	3	**0.0027**

Component	**Kurtosis**	Chi-sq	df	Prob.
1	5.355367	22.19101	1	0.0000
2	5.379682	22.65155	1	0.0000
3	2.886011	0.051974	1	0.8197
Joint		44.89453	3	**0.0000**

Table f.4: Norway

VAR Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal

Component	**Skewness**	Chi-sq	df	Prob.
1	0.098615	0.181531	1	0.6701
2	0.166160	0.515369	1	0.4728
3	-0.050706	0.047994	1	0.8266
Joint		0.744894	3	**0.8626**

Component	**Kurtosis**	Chi-sq	df	Prob.
1	4.463224	9.991451	1	0.0016
2	4.097351	5.619501	1	0.0178
3	3.092368	0.039815	1	0.8418
Joint		15.65077	3	**0.0013**

The null hypothesis of the test states that the residuals are multivariate normal. The null hypothesis of no kurtosis in the residuals can be rejected in all cases. Hence, this indicates that there is kurtosis in the data. The null hypothesis of no skewness in the residuals can only be rejected for the Canadian data. This non-normality is likely caused by the large volatility in the variables caused by big events like the 1980s oil glut (1986), the Gulf war (1990-1991) the financial crisis (2007-2010).

In order to account for skewness in the VAR for Canada, one impulse dummy (that takes the value 1 in one quarter and 0 otherwise) can be included for the period Q2-Q4 2008. The dummy represents the financial crisis. We now see that the null hypothesis of multivariate normal residuals cannot be rejected (see Table f.5). However, since the focus of this thesis is to analyze the effect on the three countries during the financial crisis, this dummy will not be imposed in the model that is presented in the main text.

Table f.5:

VAR Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal

Component	Skewness	Chi-sq	df	Prob.
1	-0.357600	2.046047	1	0.1526
2	0.179747	0.516943	1	0.4721
3	0.068797	0.075728	1	0.7832
Joint		2.638718	3	0.4507

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