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Abstract

Large external imbalances have become a policy concern. This study investigates the determinants of external balances for regions within a single country — Canadian provinces — as well as for a sample of 18 OECD countries. External balance adjustment may differ for provinces since there are few intra-national barriers to the mobility of capital, goods and labour within Canada. Also, because Canada is a monetary union, there is no currency risk associated with lending and borrowing across provinces, and this may promote inter-provincial financial flows. The estimates show that the short run response of the external balance to disturbances, such as a deterioration in the terms of trade, is typically larger for Canadian provinces than for OECD countries. There is also a much greater speed of adjustment of the external balance in the Canadian provinces. This faster adjustment speed, combined with the larger response of the external balance, means that provinces may see a quicker resolution of external imbalances, but larger deficits or surpluses may emerge before adjustment occurs.

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Keywords: Current account; External balance; Global imbalances; Currency union.

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Large current account deficits have become a policy concern. Leaders of the G20 group of major economies have emphasized the need to tackle global economic imbalances (G20, 2011), and the IMF has repeatedly argued for the need "to correct a worrying disequilibrium in the world economy" (Faruqee, 2008, p.33). The European Commission has gone so far as to propose that countries with current account imbalances pay a fine of 0.1 percent of GDP, as they may threaten the stability of the euro zone (Reiermann, 2010). Large external deficits may expose a country to the risk of a "sudden stop" in capital inflows,[1] and Blanchard (2010) and Blanchard and Milesi-Ferretti (2010) argue large current account deficits may matter for policy even if they reflect private saving and investment decisions when there are distortions in goods, labour or financial markets.[2]

This study contributes to our understanding of external balances through an analysis of the determinants of the external balance in a sample of 18 OECD countries compared to regions within a country—Canadian provinces. External balance adjustment may differ for provinces compared to countries since Canada has few intra-national barriers to the mobility of capital, goods and labour. Also, because Canada is a monetary union, there is no currency risk associated with lending and borrowing across provinces and this may promote interprovincial financial flows. Blanchard (2007) argues membership in a monetary union can influence the current account in regions with wage and price rigidities since a fixed exchange rate may hinder necessary adjustments in real wages and relative prices. He claims membership in the eurozone likely facilitated external imbalances in Portugal and Spain. Honohan (2009) and Connor, Flavin and O'Kelly (2010) believe admission to the euro area contributed to Ireland's large external imbalances, and the subsequent credit crisis, while Giavazzi and Spaventa (2010) state that membership in the euro area "fed the imbalances" in Ireland, Spain, Portugal and Greece in the run-up to the financial crisis in the eurozone.

One indication that external balance response may differ for regions within a country is suggested by the large external balances of Canadian provinces shown in Figure 1. Over the period

[1] Edwards (2004) defines a "sudden stop" as a decline in capital inflows by at least 5 percent of GDP in one year.
[2] Standard intertemporal analysis implies that a current account deficit should not, in principle be a concern as it is simply the accounting consequence of optimizing decisions by individuals and firms (Obstfeld and Rogoff, 1996).

1981-2006, the average absolute value of the external balance as a share of GDP for the Canadian provinces is 11.1 percent, or more than twice the 4.1 percent observed in a sample of 18 OECD countries. Further, the standard deviation of changes in the external balance is .032 for the provinces, almost twice the .017 observed for the OECD countries.[3]

Previous studies have examined the determinants of current account balances (Sheffrin and Woo, 1990; Otto, 1992; Glick and Rogoff, 1995; Otto and Voss, 1995; Debelle and Faruqee, 1996; Calderon, Chong and Loayza, 2002; Chinn and Prasad, 2003; Bergin, 2006; Chinn and Ito, 2007; Gruber and Kamin, 2007; Ca' Zorzi, Chudik and Dieppe, 2009; De Santis and Lührmann, 2009). For example, the influential study by Chinn and Prasad (2003) characterizes the medium term determinants of current account balances in a large sample of industrial and developing countries. They provide an indication of the levels considered "normal" given a country's macroeconomic attributes, such as stage of financial and economic development, demographic profile and government budget balance. However, existing studies tend to focus on industrial countries or industrial countries relative to less financially developed economies and, therefore, they do not shed light on the question of how greater financial and economic integration, as is observed within a country, may affect current account adjustment. Further, the possible role of membership in a monetary union has not been investigated. This may be partly due to limited data availability, as one of the few monetary unions between countries, the European Economic and Monetary Union (EMU) or euro area, was established only in 1999.

A small number of studies have used intra-national regional data to examine an issue closely related to the external balance — the comovement between saving and investment. Examples of this literature include the studies by Bayoumi and Rose (1993) for 11 UK regions; Iwamoto and van Wincoop (2000) for Japanese prefectures; Decressin and Disyatat (2008) for regions in Italy and Canada; and Thomas (1993) for regions of Canada, the UK and Germany. The general finding in this

[3] In Figure 1, the average absolute value of the external balance as a share of GDP is calculated with each province and country given equal weight. The maximum and minimum values of the external balance as a share of GDP are also larger for the Canadian provinces (.25 and -.33 for the provinces and .17 and -.15 for the OECD countries).

research is that savings-investment correlations tend to be weaker within a country than between countries, as would be expected since capital mobility is high within a country. However, these studies focus on the degree of capital mobility as indicated by savings-investment *correlations*, while the current study investigates external balance *determinants*.

Results presented below show that, compared to OECD countries, the external balances of Canadian provinces typically exhibit a larger response to economic shocks. For example, an improvement in the terms of trade raises saving and the current account, as expected, but the estimated short run effect is about twice as large for the provinces as for the OECD countries.

A second finding is that the speed of adjustment of the external balance of the Canadian provinces is much faster than for OECD countries. Approximately 41 percent of the deviation of net exports from the long run equilibrium is eliminated in a year for the Canadian provinces, compared to only 15 percent for the OECD countries. Adjustment dynamics have not been considered in most previous studies (which typically use five year averaged data).[4] In the current study, the speed of adjustment, as well as short and long run parameters are estimated using an autoregressive distributed lag model.[5] This methodology is particularly appropriate here since, while large deficits or surpluses may be feasible in the short term, in the long run a sustainable external balance must be consistent with the intertemporal budget constraint. In some sense, the observed faster adjustment speed in Canadian provinces compared to OECD countries might be surprising since, because Canadian provinces have fairly highly integrated financial markets and a common monetary policy, it would be easier to maintain an external imbalance for longer.[6] On the other hand, integrated financial, goods, and labour markets may facilitate speedier adjustment. Parsley and Wei (1996) find price convergence is faster within the US than in an international context, and Blanchard (2007) and Caballero and Lorenzoni

[4] The importance of adjustment dynamics is noted by Chinn and Prasad (2003, p.73) who argue that "a better understanding of the dynamic effects on the current account of shocks with different degrees of persistence could have important theoretical as well as policy implications."
[5] Calderón, Loayza and Servén (2000) is one of the few studies that employ a similar method (a pooled mean group estimator) in their investigation of a related variable: country net foreign asset positions.
[6] There are some differences in the regulation of financial markets across provinces, but the Canadian federal (central) government regulates the major banks, which operate across the country.

(2007) show that financial market constraints can slow adjustment if they prevent firms from making desired investments.

An additional contribution of this work is the presentation of estimates for saving and investment equations, along with estimates for the external balance equation. These estimates are of independent interest, but they also help to identify the channels through which economic disturbances influence the current account.[7] The savings and investment equation estimates reveal that, although investment is often viewed as the main driver of the current account (Sachs 1981; Baxter and Crucini 1993), changes in saving play a significant role in external balance movements.

Given the potential macroeconomic insights available from Canadian province-level analysis, it is surprising that intra-country data is relatively underutilized. As noted by Ostergaard, Sørensen and Yosha (2002), regional data at the sub-national level of the Canadian provinces or US states is sufficiently aggregated to be regarded as macroeconomic data, yet it exhibits considerable cross-sectional variation that can be exploited in empirical analysis. As well, endogeneity of income is not likely to be a problem for these smaller economic units. An advantage of using Canadian provincial data is that comparable and consistent export, import, and other data are available and collected by a single national data collection agency, Statistics Canada.[8] As well, Canadian provinces vary considerably in size, with some comparable in population to OECD countries.[9] Finally, the economies of the Canadian provinces exhibit a variety of economic structures — the economies of Alberta and British Columbia are more reliant on resources and primary products, while Ontario and Quebec have service and manufacturing-based economies. Therefore, the external shocks that affect the provinces, such as changes in the terms of trade, differ widely, which creates variation in the data.

[7] See Agénor and Aizenman (2004), Edwards (1996), and Masson, Bayoumi and Samiei (1998) for studies that investigate the determinants of saving in developing and developed countries. Chinn and Prasad (2003) present selected estimates for a saving equation, but do not report all coefficient estimates.

[8] Israël and Sánchez Muñoz (2007) discuss the many differences in the methods used to collect external balance data across countries. A related benefit of using data for a single country is that institutions are more similar than is likely to be the case for a cross-section of countries. Lemmen and Goodhart (1999) and Obstfeld (1992) note that use of data from a single country provides a more "clean" comparison which avoids country-specific factors.

[9] In 2006, the population of the province of British Columbia was greater than the populations of New Zealand and Ireland, the population of Quebec exceeded those of Switzerland, Denmark, Norway and Finland, and the population of Ontario surpassed those of Greece, Portugal and Austria.

The plan of the paper is as follows. The next section outlines the general analytical framework and Section 3 describes the choice of external balance determinants. Section 4 introduces the empirical methodology and the data and, in Section 5, the estimates are presented and compared for the provincial and OECD country samples. Section 6 discusses policy implications.

2. The Analytical Framework

The focus of this analysis is the external balance, but to better understand the connections between this variable and the rest of the economy, the impact on saving and investment of the factors predicted to affect the external balance is also investigated. The relationship between savings, investment, and the external balance is clear from the national income identity:

$$Y = C + I + G + NX, \tag{1}$$

which implies:

$$NX = S - I, \tag{2}$$

where Y is gross domestic product (GDP), C is personal consumption expenditure, G is government expenditure on goods and services, I is investment expenditure (gross capital formation), NX is the external balance or net exports of goods and services (exports minus imports), and S is saving, where S≡Y–C–G. If NX, S and I could be measured without error, Equation (2) would mean that only two of these three variables are independent.[10] However, due to the existence of a statistical discrepancy, the variables are effectively independent and equations for all three variables are estimated.[11]

Shifts in borrowing and lending opportunities across regions may cause net exports to vary widely in the short run, but in the long run the external balance must be consistent with the

[10] Given the data available, Equation (2) should be viewed as including an additional variable, the statistical discrepancy, due to error in the measurement of NX, S and I.

[11] The external balance definition employed here differs from the current account balance (which is defined as GNP–C–G–I) in that it excludes net investment income from nonresidents. This approach is necessary as only net exports data is available for the provinces and, to maintain comparability, the same definition is used for the OECD countries.

intertemporal budget constraint (Obstfeld and Rogoff, 1996). To allow for different short and long run effects, this study employs an autoregressive distributed lag (ARDL) framework which is used to estimate short run and long run coefficients. An advantage of the ARDL model is that OLS estimation yields consistent estimates of the parameters when the variables are all I(0) or all I(1), or when some are I(0) and some are I(1), and a long-run relationship exists (Pesaran and Shin, 1998). Further, Pesaran and Smith (1995) show that standard inference can be carried out on the short run and long run parameters even if it is not known *a priori* which variables are I(0) and which are I(1). As well, with the ARDL approach the data need not be pre-tested for unit roots (Pesaran, 1997) which is advantageous as unit root tests, even the panel specific alternatives, generally have low power in samples of the type and length used here.[12] Finally, Pesaran and Shin (1998) show that the ARDL methodology is directly comparable to the fully-modified OLS method of Phillips and Hansen (1990), but exhibits better performance in Monte Carlo studies.[13]

An ARDL model of the external balance, NX, can be written:

$$NX_{ct} = \lambda NX_{c,t-1} + \beta_1 \mathbf{X}_{ct} + \beta_2 \mathbf{X}_{c,t-1} + \varepsilon_{ct}, \quad (3)$$

where $\mathbf{X}_{ct}$ is a vector of regressors, ε_{ct} is an independently distributed and serially uncorrelated error term, and λ, β_1 and β_2 are parameters. For the purpose of estimation it is convenient and standard to re-parameterize this model as:

$$\Delta NX_{ct} = (\lambda - 1)NX_{c,t-1} + \beta_1 \Delta \mathbf{X}_{ct} + (\beta_1 + \beta_2)\mathbf{X}_{c,t-1} + \varepsilon_{ct}, \quad (4)$$

where $\Delta NX_{ct} = NX_{ct} - NX_{ct-1}$, and $\Delta \mathbf{X}_{ct} = \mathbf{X}_{ct} - \mathbf{X}_{ct-1}$. To make the interpretation of the parameters straightforward, equation (4) can be written in the error correction form:

[12] See Karlsson and Lothgren (2000) and Gutierrez (2003) on the power of panel unit root and cointegration tests, respectively. Previous studies find there may be uncertainty about the time series properties of saving and investment (Kollias, *et al.*, 2008; De Vita and Abbott, 2002).

[13] See Pesaran, Smith and Akiyama (1998) and Pesaran and Shin (1998) for general discussions of the ARDL methodology.

$$\Delta NX_{ct} = \beta_1 \Delta \mathbf{X}_{ct} + (\lambda - 1)\left[NX_{c,t-1} - \frac{\beta_1 + \beta_2}{1-\lambda} \mathbf{X}_{c,t-1} \right] + \varepsilon_{ct}. \qquad (5)$$

The term in square brackets reflects the long run relationship between NX and the explanatory variables. Thus, the long run marginal effect of **X** on NX is $\frac{\beta_1 + \beta_2}{1-\lambda}$, while the parameter $(\lambda - 1)$ determines the speed of adjustment to the long run and β_1 represents the short run marginal impact of a change in **X** on NX.

3. Current Account Determinants

To estimate the ARDL model of equation (5) it is first necessary to specify the vector of explanatory variables, **X**. The arguments of **X** are determined by theoretical considerations, while taking into account factors that have been relevant in previous work, such as in the country-level studies by Debelle and Faruqee (1996), Calderon, Chong and Loayza (2002), Chinn and Prasad (2003), Chinn and Ito (2007), Gruber and Kamin (2007), and Ca' Zorzi, Chudik and Dieppe (2009). It is also important to maintain a parsimonious specification as both short and long run coefficients are estimated. Finally, the explanatory variables are limited to those for which data is available for the Canadian provinces as well as the OECD countries. Gruber and Kamin (2007) have emphasized the importance, but also the difficulty, in finding quantifiable variables that are likely to cause shifts in the current account and that are also available for a large number of countries.

3.1 The Terms of Trade

The terms of trade, T, has historically been seen as a central determinant of the external balance. For example, policy discussions often express concern that oil price rises have large and potentially harmful effects on oil importers as they lead to borrowing from abroad. From a theoretical perspective, consumption smoothing motives predict a rise in national saving (a rise in the external

balance) following a transitory increase in the terms of trade, as argued by Harberger (1950) and Laursen and Metzler (1950), and described in the intertermporal models of Svensson and Razin (1983) and Obstfeld and Rogoff (1996).[14] Empirical studies support the importance of the terms of trade, as shown by Debelle and Faruqee (1996), Milesi-Ferretti and Razin (2000), Chinn and Prasad (2003),[15] Agénor and Aizenman (2004), Edwards (2006), Debelle and Galati (2007), Gruber and Kamin (2007) and Kilian, Rebucci and Spatafora (2009).[16]

While consumption/savings motives predict that a terms of trade improvement leads to a rise in saving, a higher export price could also prompt higher investment due to greater profitability in the export sector. Therefore, although empirical analyses have typically found that a rise in the terms of trade leads to an increase in the external balance, from a theoretical perspective, the effect is uncertain.

Following previous work, the terms of trade variable employed is defined is the ratio of the real price of exports to the real price of imports. The terms of trade includes only traded goods prices which are determined in world markets and can, for a small region, be viewed as exogenous to the domestic economy. This is an advantage of using the terms of trade rather than a related variable, the real exchange rate. The real exchange rate is calculated as the nominal exchange rate multiplied by the ratio of the foreign to the domestic price level (typically measured by the consumer price index) and includes domestically-determined nontraded goods prices. Further, Montiel and Servén (2008) argue that, while there is evidence that the terms of trade is an important determinant of saving, there is only weak support for the view that the real exchange rate affects saving. Although all regions face the same export and import prices, the terms of trade will vary across regions due to differences in the composition of exports and imports.

[14] A permanent shock to the terms of trade, however, is predicted to have no impact on saving, as consumption levels adjust immediately (Obstfeld and Rogoff, 1996).
[15] Chinn and Prasad (2003) note that both the terms of trade and its volatility could affect the trade balance.
[16] Gruber and Kamin (2007) and Kilian, Rebucci and Spatafora (2009) investigate the role of terms of trade shocks arising from oil price changes.

3.2 Real Housing Price

A number of recent studies have found that housing prices have a significant impact on the current account. Fratzscher, Juvenal and Sarno (2009) find housing price shocks have been a major determinant of the US current account, while Aizenman and Jinjarak (2008) find a positive correlation between rising real estate prices and current account deficits using data for 25 OECD and 18 non-OECD countries. Chinn and Ito (2007) note that housing market developments appear to have affected current account behavior in industrial countries, especially since the end of the 1990s. Investment in housing is likely to be affected by house prices, and residential housing investment represents a relatively large component of overall investment.[17]

As well as its impact on investment, housing prices can influence the current account through saving. Feldstein (2008) observes that, in the US, the savings rate has fallen as higher house prices have increased household wealth. Magnus (2008) argues that housing prices have affected savings rates in a similar fashion in European countries. In this study, the real average residential home sales price, H, is employed to capture housing price variation.

3.3 Real Relative Per Capita Income

Neoclassical economic theory predicts that capital will flow from high to low income regions, so regions with higher per capita income are expected to exhibit a higher external balance. This follows since poorer regions tend to be capital-poor and, therefore, are importers capital. These imports lead to higher investment and growth. Intertemporal consumption smoothing then leads to consumption ahead of income, and current account deficits are optimal (Barro, Mankiw and Sala-i-Martin, 1995; Obtsfeld and Rogoff, 1996). While the recent strong current account balances in emerging Asian economies appear to contradict this theory, the experience of OECD and emerging

[17] Construction of new housing comprised approximately one quarter of all gross private domestic investment in the US in 2000 (Carliner, 2001).

European countries is more supportive (Hermann and Winkler, 2008).[18] As *relative* income is central to appropriately capturing this effect, the variable employed, Y^{PC}, is defined as the ratio of real per capita income relative to the cross section sample mean.

3.4 Demographics/Working Age Population Share

Life cycle considerations suggest that demographics are likely to be a determinant of saving. That is, a higher saving rate is expected in an economy with a greater proportion of individuals of working age. Masson, Bayoumi and Samiei (1998) show that the ratio of young and elderly to persons of working age (the dependency ratio) is a key determinant of savings rates. An economy's demographic profile is relevant, however, only to the extent that it differs across regions. Therefore, the demographic variable, W, is defined as the working age population share relative to the cross section sample mean.

3.5 The Government Budget Balance

A number of theoretical models predict that the government budget balance, B (revenues minus expenditures as a share of GDP), should raise the external balance. In an overlapping generations model a government deficit can induce a current account deficit by redistributing income from future to present generations (Obstfeld and Rogoff, 1996). Further, if complete Ricardian equivalence[19] does not hold, a rise in the government deficit could lead to an increase in the external deficit. Under conditions of high capital mobility, the Mundell-Fleming model predicts that a fiscal expansion will be largely reflected in a current account deficit, as noted by Frankel (2005).

Government deficits could also affect the external balance through an impact on investment, although the direction of this effect is unclear. An increase in government borrowing could have no

[18] Lucas (1990) argues that, given the magnitude of differences in capital per worker in developing and developed countries, neoclassical theory predicts much greater capital flows from rich to poor countries than is observed. This is sometimes called the "Lucas paradox."
[19] Barro (1974).

impact on external borrowing if international capital mobility is low, so government borrowing simply crowds out private investment. However, if private and public investment are complements, and capital mobility is high, an increase in public investment would stimulate private investment which would cause the external balance to fall.

3.6 Fiscal Transfers

Chinn and Prasad (2003) find that transfers from abroad and foreign aid to developing countries have a significant and negative impact on current account balances. Obstfeld (1999) argues that the weight of the accumulated empirical evidence suggests that foreign resource inflows (such as foreign aid) are negatively related to national saving. These findings are not unexpected since inflows of aid should allow a country to finance larger current account deficits. For similar reasons, transfers to provincial governments from the Canadian central government would be expected to have a negative impact on provincial external balances. To measure this effect in a fashion that is comparable across provinces, the transfers variable, R, weights the dollar amount of transfers by provincial GDP.

The amount of aid and transfers received by OECD countries is sufficiently small that it will be ignored. Although some European Union member states receive transfers, the total amount of funds that can be made available is subject to a ceiling of just 1.24 percent of the Union's gross national income (European Commission, 2009).

4. Empirical Methodology and the Data

The ARDL model given by equation (5) is estimated with the vector of explanatory variables, **X**, replaced by the variables discussed in Section 3. Two separate data sets are employed: one for the ten Canadian provinces and one for a comparison group of 18 OECD countries. The data are annual and the sample period, 1981-2006, was determined by data availability. The 18 OECD countries are: Australia, Canada, Denmark, Germany, Finland, France, Ireland, Italy, Japan, Korea, Netherlands,

New Zealand, Norway, Spain, Sweden, Switzerland, United Kingdom, and the United States. Variable definitions and data sources are described in Appendix A.

The net exports equation to be estimated is:

$$\Delta NX_{ct} = (\lambda\text{-}1)NX_{c,t-1} + \gamma_1\Delta T_{ct} + \gamma_2\Delta H_{ct} + \gamma_3\Delta Y^{PC}_{ct} + \gamma_4\Delta W_{ct} + \gamma_5\Delta B_{ct} + \gamma_6\Delta R_{ct}$$
$$+ \gamma_7 T_{c,t-1} + \gamma_8 H_{c,t-1} + \gamma_9 Y^{PC}_{c,t-1} + \gamma_{10} W_{c,t-1} + \gamma_{11} B_{c,t-1} + \gamma_{12} R_{c,t-1} + \mu_c + \eta_t + \varepsilon_{ct}, \qquad (6)$$

where the subscripts c and t denote country or province and time, respectively; NX is net exports of goods and services as a share of GDP; T is the terms of trade; H is the real housing price indicator; Y^{PC} is real GDP per capita relative to the provincial or OECD country sample average; W is the working age population share relative to the provincial or OECD country sample average; B is the government fiscal balance (surplus) as a share of GDP; R denotes transfers to the province from the Canadian federal government as a share of GDP; and μ and η are vectors of country or province and time period fixed effects, respectively. Region-specific fixed effects are included in the estimating equation to represent factors that differ across provinces or countries, but are constant through time. These include the region's social, political, and institutional characteristics.[20] Time period fixed effects capture events that are common to all provinces or countries in a particular time period (a year since the data are annual), such as changes in the world price of oil or shifts in world demand. Only one lag is included in equation (6) for expositional simplicity, but an additional lag is considered during estimation. With a sample of the length employed here, consideration of more than two lags is generally not feasible (Pesaran, Smith and Akiyama, 1998; Pesaran, Shin and Smith, 1999).[21]

As well as the equation for the external balance shown by equation (6), equations are estimated for saving (S) and investment (I), each measured as a share of GDP. This helps to identify the channels through which different shocks affect the current account. To maintain comparability, the

[20] The inclusion of fixed effects in a dynamic model can lead to biased parameter estimates, but this bias falls as the length of the sample increases (Nickell, 1981). Monte Carlo evidence in Judson and Owen (1999) and Bun and Kiviet (2001) suggest that the magnitude of this bias is likely to be small in a sample of the size used here.

[21] The lag structure is chosen to minimize the Schwarz-Bayes information criteria when allowing for a maximum of two lags of each explanatory variable.

same explanatory variables are used in all three estimating equations.

5. Parameter Estimates for the Canadian Provinces and OECD Countries

Estimates of the parameters of the equations for net exports, saving, and investment for the 10 Canadian provinces and 18 OECD countries are reported in Table 1. Given that the dependent variables are first differences and the samples are pooled cross-sections, the estimates explain a reasonable proportion of the variation in the difference of net exports, saving and investment. Further, the adjustment coefficient, λ-1, is negative as expected and the bounds test of Pesaran, Shin and Smith (2001) does not reject the existence of a long run relationship in all cases.[22] Test statistics provided in Table 1 indicate that a RESET test does not reject the model in five of six cases, while the hypothesis of no serial correlation cannot be rejected in all but one case. Finally, the estimates are robust to several generalizations of the model in that none of the basic conclusions change if the estimating equation is altered to allow for the addition of a variable to represent country openness or country size or the replacement of the working age population variable with variables to represent the shares of the population that are young and elderly (see Appendix B for details).

Some of the variables employed as regressors may be affected by external balance developments. These include the terms of trade, T, housing prices, H, and relative real GDP per capita, Y^{PC}. Therefore, there is the potential for endogeneity bias since the errors, ε_{ct}, may be correlated with these variables. Pesaran (1997) and Pesaran and Shin (1998) show that the ARDL estimation method yields consistent estimates even if the explanatory variables are correlated with the error term as long as the estimating equation is augmented with a sufficient number of lagged changes of the explanatory variables. Further, a Durbin-Hausman-Wu test does not reject the hypothesis that the

[22] Pesaran, Shin and Smith (2001) note that the t-statistic associated with the lagged dependent variable—the adjustment coefficient (λ-1)—does not have a standard t-distribution. As an alternative to pre-testing for unit roots and cointegration, they provide a bounds test for the significance of the adjustment coefficient that is valid whether the variables are I(0) or I(1). Using the critical values for this test, as stated in Table 1, the adjustment parameter is conclusively significantly different from zero in all cases. Although this bounds test is used here to analyze a panel, it was developed in a non-panel framework.

errors are not correlated with the three contemporaneous explanatory variables in the external balance equation.[23] Nevertheless, to deal with possible endogeneity of the variables H, T and Y^{PC}, instrumental variables (IV) estimation is also employed. The instruments are the lagged values of these three potentially endogenous variables, and contemporaneous and lagged values of the other regressors. As shown in Table 2, the basic conclusions are unchanged, as the IV parameter estimates do not differ greatly in magnitude from the OLS estimates, although they tend to be significant less often.

5.1 A Comparison of the Estimates for the Canadian Provinces and OECD Countries

5.1.1 The Terms of Trade

Results presented in columns 1 and 4 of Table 1 show that the terms of trade has a significant impact on the external balance in both the short and long run for the Canadian provinces as well as for the OECD countries in the short run. Also notable is that the province estimates are larger in magnitude than those of the OECD sample. These results imply that a 4 percent rise in the terms of trade, which represents approximately one standard deviation for both the province and OECD samples,[24] leads to a short run rise in the ratio of net exports to GDP of almost 2 percent of GDP for the provinces (.0183=[.4419+.0153]×.04), but only about 7 tenths of one percent of GDP for the OECD countries (.0067=.1683×.04).

The external balance represents a region's saving net of investment, as indicated in Equation (2), so a change in the external balance must arise from a change in saving and/or investment. Estimates from the saving and investment equations reported in Table 1 (columns 2 and 3 for the Canadian provinces and columns 5 and 6 for the OECD countries) help identify the channels through which economic disturbances influence net exports. Consumption smoothing motives predict a temporary improvement in the terms of trade leads to higher saving and a rise in the external balance.

[23] The Durbin-Hausman-Wu test follows Davison and MacKinnon, 1993, 237-239. A 95 percent confidence level is used.
[24] For changes in the terms of trade, one standard deviation for the provincial sample is .042, while it is a bit smaller, at .037 for the OECD sample.

Consistent with this prediction, the estimates show that a rise in the terms of trade leads to a significant short run increase in net exports in both the provinces and OECD countries. This external balance response arises chiefly from an increase in saving, since the short run investment parameters are small. Further, the magnitude of the savings response is much greater for the provinces than for the OECD countries, and this accounts for the larger provincial coefficients in the net exports equation. The long run provincial estimates are similar to the short run estimates, but for the OECD countries the long run investment effect is larger and significant, which explains the negative and marginally significant impact on the current account.

In summary, a comparison of the estimates of the coefficient on the terms of trade variable for the Canadian provinces and OECD countries presents two interesting findings. First, a rise in the terms of trade generally affects the external balance of both the provinces and OECD countries through increased saving. This suggests that saving has an important role in external balance determination, even though investment is frequently identified as the main driver of the current account (Sachs 1981; Baxter and Crucini, 1993; Coughlin and Pollard, 2001). Second, the estimates show that the magnitude of the response of saving and net exports is greater for the provinces than for the OECD countries.

5.1.2 Real Housing Prices

An increase in the real price of housing is predicted to lead to both a rise in investment (due to the rise in the value of housing capital) and a fall in saving (as the expansion of housing wealth leads to increased consumption). Both these factors reduce the external balance. Estimates in Table 1 indicate that a rise in the real price of housing leads to a deterioration in the net exports balance for both the Canadian provinces and OECD countries. Also, the short run estimates for the provinces are larger in magnitude than those of the OECD countries. A measure of the difference in the estimated short run impact for the two samples can be seen by considering a rise in real house prices of 6 percent, which

represents an increase equal to approximately one standard deviation for both the provincial and OECD samples.[25] For the OECD countries, this leads to a short run fall in net exports of approximately 4 tenths of one percent of GDP (.0038=.0636×.06). For the Canadian provinces, the short run effect is close to double this magnitude at .72 percent (.0072=.1198×.06).[26]

The savings and investment equation estimates reveal that the external balance falls with a rise in house prices due to both higher investment demand and lower saving for both the provinces and OECD countries. A notable difference between the provincial and OECD results is that, while the savings effects are similar in magnitude, the short run impact on investment is more than twice as large in the Canadian provinces than in the OECD sample. This larger investment response accounts for the almost twice as great provincial external balance response.

5.1.3 Real Relative Per Capita Income

If capital is mobile between regions, neoclassical theory predicts that, as countries reach a more advanced stage of development, they will run current account surpluses to pay off accumulated external liabilities and to export capital to less advanced economies. As predicted, estimates in Table 1 indicate relatively higher income Canadian provinces have higher net exports in both the short run and the long run. Further, for the provinces, the impact on net exports is driven almost entirely by saving as the short and long run coefficient estimates in the saving equation are similar in magnitude to the estimates in the net exports equation, while real income per capita has no significant impact on investment in the short or long run.

In both the provinces and OECD countries, the long run response of investment is insignificant, but in the short run investment unexpectedly rises in the OECD sample, which explains the negative current account effect in this case. However, for both samples, saving increases with higher per capita

[25] For changes in real house prices, one standard deviation for the provincial sample is somewhat smaller, at .054, compared to .075 for the OECD sample.

[26] These estimates for the Canadian provinces and OECD countries are broadly similar in magnitude to estimates for the US by Fratzscher, Juvenal and Sarno (2009) who find a 1.0 percent rise in US house prices lowers the US trade balance by 0.16 percent of US GDP after 11 quarters.

income (although the long run saving coefficient for the OECD sample is insignificantly different from zero). Also, the magnitude of the estimates is larger for the provincial sample. Chinn and Prasad (2003) find only a marginally significant effect on current accounts of relative per capita income in industrial countries, and no impact in developing countries, which suggests stronger financial market development may promote the flow of saving from high to lower income regions.

5.1.4 Working Age Population Share

Life cycle motivations predict that a region with a higher share of its population of working age will have a higher savings rate. Previous studies find that significant demographic effects are not often observed in developed countries (Chinn and Ito, 2007; Chinn and Prasad, 2003), although the share of the population that is young and elderly influences the current account balance of developing countries (Gruber and Kamin, 2007). Table 1 shows that a rise in the working age population share raises the current account in the short run and saving in the long run for the OECD sample. For the province sample, there is an unexpected negative impact on net exports in the long run, and no significant short run effect, which may be due to limited variation in this variable across provinces.[27]

5.1.5 Government Budget Balance and Transfers to Governments

A variety of models predict a positive impact on saving from a rise in the government budget balance, but there is less theoretical basis for the government budget balance to affect investment, particularly if capital mobility is high (so investment is not "crowded out"). Columns 1 and 4 of Table 1 show net exports rise significantly only in the short run for the OECD countries, and only in the long

[27] The working age population share (which is measured relative to the sample average for Canada) ranges from .91 to 1.03, with a standard deviation of .030. For the OECD countries, the observations fall over a wider range—from .91 to 1.14, with a standard deviation of .051. High mobility of labor within Canada might lead to less variation across provinces than is observed across countries. The importance of sample variation has been noted by Masson, Bayoumi and Samiei (1998) who observe that studies using cross-country data have been more successful than time series studies for individual countries in finding significant demographic effects, probably because the variation over time of demographic variables is relatively small within countries.

run for the provinces.[28] For both the provinces and OECD countries a government surplus generally leads to a rise in saving, as predicted, and has little effect on investment, but the saving effect is not always sufficiently strong to lead to a significant rise in the external balance.

There is no evidence investment is crowded out by government spending, as none of the short and long run province or OECD country investment equation coefficients associated with the government budget variable is significantly different from zero. In contrast, the comparable coefficients for the savings equation are all significant, with the exception of the long run OECD estimate, and positive. The provincial savings equation estimates are similar in magnitude to the OECD estimates, but it should be noted that the provincial government budget balance measure incorporates only provincial surpluses or deficits, so it does not include the fiscal balance of the central government, which has been substantial at times.

Transfers from the central government should allow provinces to finance larger external deficits. Consistent with this prediction, estimates in Table 1 reveal a negative and significant impact of transfers on saving. As well, transfers reduce the external balance, although the effect is statistically significant only in the long run.

5.2 The Speed of Adjustment

A striking finding in Table 1 is the much quicker adjustment speed in the provinces compared to the OECD countries, as indicated by the larger provincial adjustment coefficients (measured in absolute value). For the net exports equation, the provincial estimate is -.41, compared to -.15 for the OECD country sample. The difference in adjustment speeds is even greater for the investment equation, where the province sample coefficient is -.52, compared to -.18 for the OECD countries.

[28] The OECD sample parameter estimate of .20 is smaller in magnitude compared to the IMF's calibrated model (Faruqee et al., 2007) which yields estimates close to 0.5, or those of Chinn and Ito (2007) for 19 industrial countries in the period 1971-2004. Chinn and Prasad (2003) obtain estimates for industrial countries that range from .076 to .340 using models that differ depending on the included explanatory variables, and whether the current account/GDP ratio is measured annually or over 5-year periods. A smaller effect is found by Kamin and Gruber (2007) using a panel regression model and data from 61 developed and developing countries.

A faster adjustment speed for the provinces is not necessarily expected since, within regions of high capital mobility, such as provinces within one country, it would presumably be easier to finance external borrowing for longer.[29] On the other hand, greater goods and asset market integration could lead to faster adjustment. For example, Parsley and Wei (1996) find that rates of price convergence within the US are substantially faster than convergence rates estimated in an international context. Further, Froot and Rogoff (1995) find, in a fixed exchange rate context, that goods prices adjust more quickly. On the financial side, lack of currency risk within a monetary union and fewer restrictions between provinces (compared to OECD countries) might speed adjustment if financial market constraints slow adjustment by preventing firms from making desired investments (see Blanchard, 2007; Caballero and Lorenzoni, 2007).

6. Conclusions and Policy Implications

Blanchard and Milesi-Ferretti (2010, 2) argue "Global imbalances are probably the most complex macroeconomic issue facing economists and policy makers." This paper aims to shed light on the behaviour of external balances by a comparison of external balance determinants for regions within one country, Canada, with determinants for a sample of 18 OECD countries. External balance adjustment could differ in the province sample since Canada is a monetary union and has few internal barriers to movements of capital, goods, and labour.

Relative to OECD countries, the external balance response to shocks, such as a deterioration in the terms of trade, tends to be greater for the Canadian provinces. The larger response may result from greater financial, goods and labour market integration within a country and because membership in a monetary union eliminates currency risk. These factors facilitate interregional financial flows and make it easier for firms and individuals to shift saving and investment between regions.

A second finding is that the estimated speed of adjustment of the external balance is faster in

[29] For example, Pelgrin and Schich (2008) find that savings and investment in 20 OECD countries from 1960-1999 have displayed a long run cointegration relationship but over time deviations from this long run equilibrium have become more persistent, which they interpret as evidence that capital mobility has increased.

the Canadian provinces than in the OECD countries. The quicker adjustment might be considered surprising since high capital mobility within a country should make it easier to finance an external imbalance for longer. The speedier adjustment in the provinces, combined with the larger response of net exports to disturbances, suggests that, while provinces may experience a quicker resolution of current account imbalances, they may also see larger deficits emerge before adjustment occurs.

Current account deficits expanded in a number of countries, including Spain, Portugal, Ireland, and Greece, after they entered the European monetary union. The seven euro area countries included in the OECD country sample in this study also exhibit larger current account deficits or surpluses compared to the remaining OECD countries.[30] If external balance adjustment in monetary unions like the euro area becomes similar, over time, to that of the provinces in Canada, larger deficits and surpluses would be expected. Giavazzi and Spaventa (2010) argue large current account deficits may require policy intervention if financial market regulation and supervision is inadequate. For example, individual eurozone country regulators might not consider spillover effects from bank credit growth in one region on perceived liquidity risk for the currency of the union as a whole. This may be less of an issue for monetary unions that are a single country, like Canada, where the largest financial institutions are regulated at the national level. By contrast, euro area member countries retain considerable banking regulatory powers (Vives 2001; Dermine 2006; Goddard, et al. 2007).

[30] The average absolute value of net exports as a share of GDP from 1999-2006 for the seven EMU member countries, is 5.5, compared to 4.7 for the sample of 18 OECD countries excluding EMU members. For the Canadian provinces, the comparable value is 9.4. Each country or province is given equal weight in the calculations.

Appendix A: Data Appendix—Variable Definitions and Data Sources

A. Province Data

Net exports. (NX) Defined as N/Y where Y is *Gross domestic product* and N is *Exports of goods and services* minus *Imports of goods and services*. All variables at current prices. Source: Statistics Canada, CANSIM Table 3840002. (Cansim series identifiers for *Exports of goods and services*: v687393, v687427, v687461, v687495, v687529, v687563, v687597, v687631, v687665, v687699. *Imports of goods and services*: v687400, v687434, v687468, v687502, v687536, v687570, v687604, v687638, v687672, v687706. *Gross domestic product*: v687375, v687409, v687443, v687477, v687511, v687545, v687579, v687613, v684647, v687681.)

Investment. (I) Defined as Inv/Y where Y is GDP and Inv is the sum of *Government gross fixed capital formation; Government investment in inventories; Business gross fixed capital formation; Business investment in inventories*. All variables at current prices. Source: Statistics Canada, CANSIM Table 3840002. (Cansim series identifiers for components of I: Newfoundland: v687382, v v687385, v687386, v687390; Prince Edward Island: v687416, v687419, v687420, v687424; Nova Scotia: v687450, v687453, v687454, v687458; New Brunswick: v687484, v687487, v687488, v687492; Quebec: v687518, v687521, v687522, v687526; Ontario: v687552, v687555, v687556, v687560; Manitoba: v687586, v687589, v687590, v687594; Saskatchewan: v687620, v687623, v687624, v687628; Alberta: v687654, v687657, v687658, v687662; British Columbia: v687688, v687691, v687692, v687696. See above for *GDP* identifiers.)

Saving. (S) Defined as Sav/Y where Y is *GDP* and Sav is *GDP* minus *Personal expenditure on consumer goods and services* minus *Net government current expenditure on goods and services*. All variables at current prices. Source: Statistics Canada, CANSIM Table 3840002. (Cansim series identifiers for components of Sav: v687376, v687381, v687410, v687415, v687444, v687449, v687478, v687483, v687512, v687517, v687546, v687551, v687580, v687585, v687614, v687619, v687648, v687653, v687682, v687687. See above for *GDP* identifiers.)

Terms of trade. (T) Log of real price of exports of goods and services divided by the real price of imports of goods and services. Source Statistics Canada CANSIM Table 3840002. (Cansim series identifiers for *Current prices; exports of goods and services*: v687393, v687427, v687461, v687495, v687529, v687563, v687597, v687631, v687665, v687699; *Chained (2002) dollars; Exports of goods ands services*: v15855472, v15855526, v15855580, v15855634, v15855688, v15855742, v15855796, v15855850, v15855904, v15855958. *Current prices; imports of goods and services*: v687400, v687434, v687468, v687502, v687536, v687570, v687604, v687638, v687672, v687706; *Chained (2002) dollars; Imports of goods ands services*: v15855475, v15855529, v15855583, v15855637, v15855691, v15855745, v15855799, v15855853, v15855907, v15855961.)

Real house price. (H) Defined as the log of Hous/Q, where Q (the GDP deflator) is defined as [*Current prices; Gross domestic product*]/[*Chained (2002) dollars: Gross Domestic Product*], and Hous is *Residential average home sales price, actual*. Source for Hous: Canadian Real Estate Association. British Columbia: MLS104011; Alberta: MLS104123; Saskatchewan: MLS104219; Manitoba: MLS104307; Ontario: MLS104355; Quebec: MLS104747; New Brunswick: MLS104851; Nova Scotia: MLS104891; Prince Edward Island: MLS104963; Newfoundland: MLS104963, Statistics Canada CANSIM Table 3840002. (Cansim series identifiers for *Chained (2002) dollars: GDP*: v15855454, v15855508, v15855562, v15855616, v15855670, v15855724, v15855778, v15855832, v15855886, v15855940. See above for *Current prices; GDP* identifiers).

Relative real income per capita. (Y^{PC}) Defined as the log of $(y_i/P_i)/(y_{Can}/P_{Can})$. (y_i/P_i) and (y_{Can}/P_{Can}) are defined as: [*Chained (2002) dollars: Gross Domestic Product (GDP)*]/[population] for province i and Canada, respectively. Sources: Statistics Canada, CANSIM Table 3840002 and Table 510001. (Cansim series identifiers for population: v466983, v467298, v467613, v467928, v468243, v468558, v468873, v469188, v469503, v469818, v466668. See above for *Chained (2002) dollars: GDP*.)

Working age population share. (W) Defined as $(W_i/P_i)/(W_{Can}/P_{Can})$, where W_i and W_{Can} are the working age population in province i and Canada, respectively, and P_i and P_{Can} are the total population in province i and Canada, respectively. Working age population is defined as the population *Both sexes; All ages (Persons)*

minus *Both sexes; 0 to 14 years (Persons)* minus *Both sexes; 65 years and over (Persons)*. Source: Statistics Canada, CANSIM Table 510001. (Cansim series identifiers for *Both sexes: 0 to 14 years (Persons)*, *Both sexes; 65 years and over (Persons)*: v467271, v467586, v467901, v468216, v468531, v468846, v469161, v469476, v469791, v470106, v466956; v467001, v467316, v467631, v467946, v468261, v468576, v468891, v469206, v469521, v469836, v466686. See above for *Both sexes; All ages (Persons)*.)

Government surplus. (B) Defined as BS/Y where Y is GDP, and BS is *Provincial government; Total revenue* minus *Provincial government; Total current expenditure*. All variables at current prices. Source: Statistics Canada, CANSIM Table 3840004. (Cansim series identifiers for *Provincial government; Total revenue* and *Provincial government; Total expenditure*: v689282, v689291, v689305, v689314, v689328, v689337, v689351, v689360, v689374, v689383, v689397, v689406, v689420, v689429, v689443, v689452, v689466, v689475, v689489, v689498.)

Transfers. (R) Defined as *Provincial government; Current transfers from federal government* divided by *Current Dollar GDP*. Source: Statistics Canada, CANSIM Table 3840004. (Cansim series identifiers: v689289, v689312, v689335, v689358, v689381, v689404, v689427, v689450, v689473, v689496).

B. OECD Country Data

The 18 countries in the sample are: Australia, Canada, Denmark, Germany, Finland, France, Ireland, Italy, Japan, Korea, Netherlands, New Zealand, Norway, Spain, Sweden, Switzerland, United Kingdom, United States. The sample period is 1981-2006 with the following exceptions, where the first observation is indicated: Germany 1993; Korea 1988; New Zealand 1988; Switzerland 1992.

Net exports. (NX) Defined as N/Y where Y is *Gross Domestic Product (expenditure approach*) and N is *External balance of goods and services*. Source: *SourceOECD*, Annual National Accounts – Main aggregates, Table 1.

Investment. (I) Defined as Inv/Y where Y is *Gross Domestic Product (expenditure approach*) and Inv is *Gross capital formation*. Source: *SourceOECD*, Annual National Accounts – Main aggregates, Table 1.

Saving. (S) Defined as Sav/Y where Y is *Gross Domestic Product (expenditure approach*) and Sav is Y minus *Final consumption expenditure* . Source: *SourceOECD*, Annual National Accounts – Main aggregates, Table 1.

Terms of trade. (T) Log of real price of exports of goods and services divided by the real price of imports of goods and services. Source: *SourceOECD* Annual National Accounts – Main aggregates. Defined as: [(C. Exports of goods and services)/(K. Exports of goods and services)]/[(C. Imports of goods and services)/(K. Imports of goods and services)].

Real house price. (H) Defined as the log of an index of real house prices (the ratio of actual house prices to the CPI) from the Economics Department of the OECD. Base year is 2000. Sources and methodology are described in Girouard, et al., (2006).

Relative real income per capita. (Y^{PC}) Defined as the log of $(Y_i/P_i)/(Y_{OECD}/P_{OECD})$ where Y_i is real GDP in country i in 2000 local currency units, converted to US dollars using the OECD's PPP exchange rate (PPPGDP.CD) in the base year, 2000. P_i is the population in country i. Y_{OECD}/P_{OECD} is the 18 country sample average value of Y_i/P_i.

Working age population share. (W) Defined as $(W_i/P_i)/(W_{OECD}/P_{OECD})$, where W_i/P_i and W_{OECD}/P_{OECD} are the ratio of *Working-age population* to *Total population* in country i and the average over the 18 OECD countries, respectively. Source: *SourceOECD*, Annual National Accounts – Population and Employment (in thousands of units), Economic Outlook No 83.

Government surplus. (B) *Government net lending, as a percentage of GDP*. Source: *SourceOECD*, Economic Outlook No 83.

Appendix B: Robustness Tests

To check the robustness of the estimates, three additional specifications described below were considered. They augment the specification in Table 1 by the inclusion of explanatory variables that have been suggested as possible determinates of the external balance. (The estimates associated with these alternatives are not reported to conserve space.)

1. A variable for region openness, measured as (exports+imports)/GDP, was significant in the short run for the OECD sample, but not with the provincial estimates. However, addition of this variable has almost no impact on the magnitude and significance of any of the other provincial coefficient estimates, with the exception that the long run coefficient on the working age population share becomes insignificant. With the OECD sample, addition of the openness variable causes the long run housing price variable to fall slightly (in absolute value) and become insignificant. Data sources: See sources for **Net exports** variable in Appendix A.

2. There is very little impact on the provincial results if the specification is changed to replace the share of the population that is working age with shares of young and elderly (measured as the share of the population that is 14 or younger and 65 or older, respectively). Due to data unavailability, it is not possible to examine this model variation using the OECD sample. The short run coefficients on the young and elderly variables are insignificant, and the long run estimate is significant (and positive) only for the share of the population that is young. The other coefficient estimates change only slightly. Data sources: See sources for the province data **Working age population share** variable in Appendix A.

3. Harberger (1980) and Murphy (1984) argue that size may affect a region's current account balance, since a given investment project undertaken in a smaller region will constitute a greater share of the region's income. Therefore, with given regional saving, the need to use external financing for investment projects is more likely to arise in a smaller region.[31] Aizenman and Sun (2008) note that a current account surplus run by one country requires that another country run a current account deficit, and a given surplus to GDP ratio run by a larger country will necessitate greater adjustment in the rest of the world.[32]

When region size (measured as the log of real GDP in the region) is included in the provincial net exports equation the short run coefficient estimate is negative and significant, but the long run coefficient is insignificant. However, inclusion of the size variable has little impact on the other estimates. Data sources: See sources in Appendix A for **Relative real GDP per capita**.

For the OECD net exports equation estimates, region size has an insignificant impact in the short run, but is significant in the long run. More importantly, the other coefficient estimates change little. Data sources for Region Size: Defined as the log of real GDP in country i measured in 2000 local currency units converted to US dollars using the OECD's nominal exchange rate (EXC.CD) in the base year, 2000. Source: *SourceOECD* Annual National Accounts – Main aggregates. *C. Gross domestic product (expenditure approach)*, deflated using *K. Gross domestic product (expenditure approach)*.

[31] This argument implies that a smaller region is more likely to have both larger surpluses and deficits, but restrictions on borrowing abroad could cause this effect to be asymmetric.

[32] Aizenman and Sun (2008) find that, if the US is excluded, the duration of spells of current account deficits depends negative on the relative size of a country. They focus on China and note that while a small country can sustain export led growth, for a large country, continuation of a fast growth rate while maintaining a large current account surplus is conditional on the sustainability of even larger current account deficit to GDP ratios for counties that grow at a slower rate, which is unlikely.

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Table 1: Parameter Estimates for Canadian Provinces and OECD Countries

	Canadian Provinces			OECD Countries		
	Net Exports	Saving	Investment	Net Exports	Saving	Investment
	1	2	3	4	5	6
Short run coefficients						
Terms of trade (ΔT)	.4419** (8.948)	.3361** (13.34)	-.0313 (.7423)	.1683** (8.926)	.1468** (11.57)	-.0198 (1.451)
Terms of trade lagged (ΔT_{-1})	.0153 (.3334)	.0564** (2.195)	.0731** (2.079)			
Real house price (ΔH)	-.1198** (3.339)	-.0331* (1.864)	.1141** (3.698)	-.0636** (5.319)	-.0286** (3.523)	.0358** (4.110)
Real relative per capita income (ΔY^{PC})	.5785** (7.554)	.5975** (15.35)	.0879 (1.346)	-.2765** (5.720)	.2640** (8.279)	.5313** (15.13)
Working age population share (ΔW)	-1.166 (1.258)	.2999 (.6229)	1.481* (1.893)	.4786** (2.077)	-.1785 (1.156)	-.6284** (3.794)
Government budget balance (ΔB)	.1077 (.6688)	.2875** (3.509)	.0124 (.0910)	.2022** (4.103)	.1707** (5.134)	-.0376 (1.056)
Transfers (ΔR)	-.2309 (.9792)	-.5133** (4.303)	-.1225 (.6120)			
Long run coefficients						
Terms of trade (T)	.3608** (5.581)	.2878** (5.783)	-.0508 (1.151)	-.1215* (1.788)	-.0389 (.8992)	.0954** (2.454)
Real house price (H)	-.0788* (1.648)	-.0394 (1.111)	.0448 (1.414)	-.0621** (2.188)	-.0136 (.7081)	.0513** (3.106)
Real per capita income (Y^{PC})	.4580** (3.882)	.4522** (4.967)	-.0309 (.3880)	.0033 (.0300)	.0537 (.7399)	.0409 (.6455)
Working age population share (W)	-.7390** (2.215)	-.4105 (1.616)	.1956 (.8798)	.6615 (1.464)	.5542* (1.879)	-.0738 (.2866)
Government budget balance (B)	.8284** (2.368)	.6306** (2.359)	-.1814 (.7838)	-.1272 (.6254)	.1357 (.9974)	.1845 (1.647)
Transfers (R)	-.9911* (1.780)	-1.186** (2.775)	-.1363 (.3659)			
Adjustment coefficient (λ-1)	-.4131[a] (7.206)	-.2719[a] (5.680)	-.5217[a] (8.731)	-.1458[a] (6.016)	-.1483[a] (6.602)	-.1819[a] (6.896)
$\overline{R}^2$	.620	.829	.406	.448	.586	.662

AR1 test	1.81[c]	1.69[c]	.294[c]	1.09[c]	2.74[e]	1.49[c]
RESET test	.268[f]	1.85[f]	.032[f]	1.14[f]	2.01[g]	3.72[h]

Notes:
The number in brackets under each coefficient estimate is the absolute value of the t-statistic. The test statistics for the long run coefficients are computed using the delta method, as recommended by Pesaran and Shin (1998).
Estimates of the province or country and year fixed effects are not reported.
The sample period is 1981-2006. There are 240 observations for the sample of ten Canadian provinces, and 431 observations for the OECD 18-country sample. See the Appendix B for variable definitions and data sources.

** The estimated short run or long run coefficient is different from zero using a 95 percent confidence interval.
* The estimated short run or long run coefficient is different from zero using a 90 percent confidence interval.

AR1 test: A t-test of the significance of the estimated lagged residuals in a regression of the residuals on the lagged residuals and the explanatory variables. See Davidson and MacKinnon (1993, p358)
RESET test: A t-test of the significance of the squared predicted value when it is included as an explanatory variable in the estimating equation.

Using the critical values for the bounds test from Table CII of Pesaran, Shin and Smith (2001):
[a] the estimated coefficient is conclusively non-zero at the 95 percent confidence level.
[b] cannot reject the hypothesis that the coefficient is zero at the 95 percent confidence level.

[c] Cannot reject the hypothesis of no serial correlation at the 95 percent confidence level.
[d] Cannot reject the hypothesis of no serial correlation at the 99 percent confidence level, but reject at 95 percent.
[e] Reject the hypothesis of no serial correlation at the 99 percent confidence level.

[f] The RESET test does not reject the specification at the 95 percent confidence level.
[g] The RESET test does not reject the specification at the 99 percent confidence level, but rejects at 95 percent.
[h] The RESET test rejects the specification at the 99 percent confidence level.

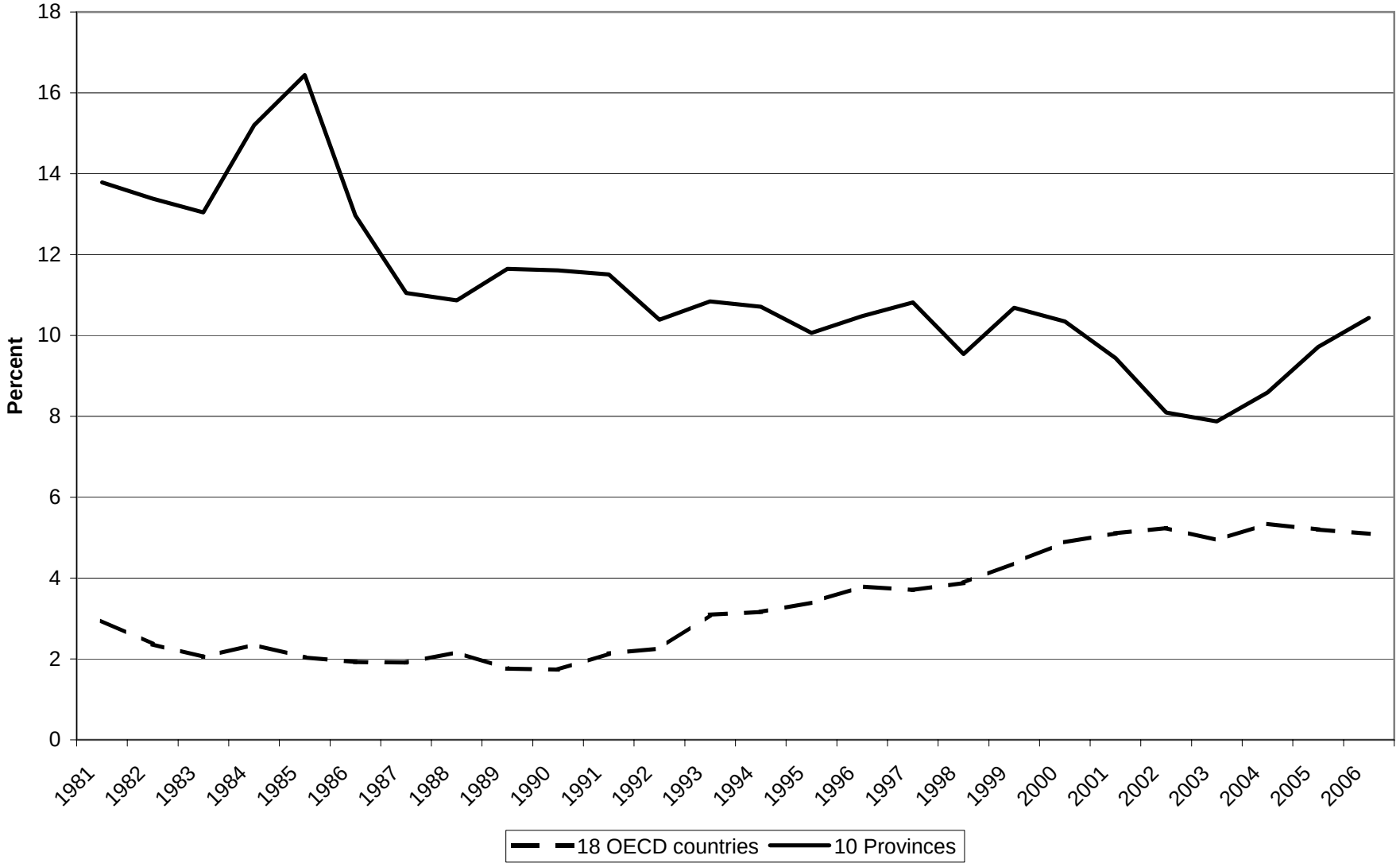
Table 2: Instrumental Variables Estimates for Canadian Provinces and OECD Countries

	Canadian Provinces			OECD Countries		
	Net Exports	Saving	Investment	Net Exports	Saving	Investment
	1	2	3	4	5	6
Short run coefficients						
Terms of trade (ΔT)	.3661** (2.124)	.1506 (1.269)	.1338 (.8334)	.0920* (1.780)	.0505 (1.402)	-.0682 (1.560)
Terms of trade lagged (ΔT_{-1})	.0143 (.2801)	.0197 (.5300)	.0596 (1.439)			
Real house price (ΔH)	-.1583* (1.833)	-.1287** (2.455)	.1685* (1.887)	-.0604* (1.831)	-.0322 (1.466)	.0924** (2.949)
Real relative per capita income (ΔY^{PC})	.6568** (2.449)	.8402** (4.838)	.2047 (.8204)	-.2614 (1.411)	.1936* (1.786)	.1285 (.7499)
Working age population share (ΔW)	-.9295 (.7999)	.7043 (.9851)	1.513 (1.489)	.5580* (1.771)	.0219 (.1010)	-.1699 (.6192)
Government budget balance (ΔB)	.1736 (.4824)	.4337* (1.845)	-.2899 (.9169)	.2483** (3.023)	.2704** (4.818)	.0731 (1.035)
Transfers (ΔR)	-.2344 (.4566)	-.4659 (1.432)	-.2434 (.5395)			
Long run coefficients						
Terms of trade (T)	.3444** (3.973)	.2059 (1.558)	-.0044 (.0738)	-.1605* (1.726)	-.1236* (1.843)	.0297 (.7453)
Real house price (H)	-.0651 (1.013)	-.0637 (.5967)	.0530 (1.296)	-.0405 (1.262)	.0114 (.4737)	.0672** (4.236)
Real per capita income (Y^{PC})	.5207** (3.217)	.8557** (2.634)	-.0305 (.2694)	-.0425 (.2538)	-.0859 (.7060)	-.1003 (1.390)
Working age population share (W)	-.7183** (2.084)	-.4522 (.9499)	.1204 (.5230)	.7186 (1.196)	.9559** (2.171)	.3749 (1.418)
Government budget balance (B)	.8598** (2.039)	.9039 (1.429)	-.3277 (1.163)	-.0501 (.2343)	.2792* (1.716)	.2192** (2.084)
Transfers (R)	-.8830 (1.397)	-.6003 (.6576)	-.0361 (.0833)			
Adjustment coefficient (λ-1)	-.4197[a] (6.694)	-.1902[b] (2.729)	-.5444[a] (6.898)	-.1519[a] (4.957)	-.1391[a] (5.446)	-.2505[a] (5.992)
R^2 †	.687	.787	.482	.497	.580	.597

AR1 test	2.169[d]	1.44[c]	.532[c]	.6617[c]	1.73[c]	.4705[c]
RESET test	2.05[g]	.492[f]	11.2[h]	4.43[h]	2.01[g]	11.8[h]

Notes: See notes to Table 1.
† R-squared between observed and predicted.

Figure 1: Average Absolute Value of External Balance as a Share of GDP



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