May 2005
IMF Country Report No. 05/153

New Zealand: Selected Issues

This Selected Issues paper for New Zealand was prepared by a staff team of the International Monetary Fund as background documentation for the periodic consultation with the member country. It is based on the information available at the time it was completed on April 11, 2005. The views expressed in this document are those of the staff team and do not necessarily reflect the views of the government of New Zealand or the Executive Board of the IMF.

The policy of publication of staff reports and other documents by the IMF allows for the deletion of market-sensitive information.

To assist the IMF in evaluating the publication policy, reader comments are invited and may be sent by e-mail to publicationpolicy@imf.org.

Copies of this report are available to the public from

International Monetary Fund ● Publication Services
700 19th Street, N.W. ● Washington, D.C. 20431
Telephone: (202) 623 7430 ● Telefax: (202) 623 7201
E-mail: publications@imf.org ● Internet: http://www.imf.org

Price: $15.00 a copy

International Monetary Fund
Washington, D.C.

INTERNATIONAL MONETARY FUND

NEW ZEALAND

Selected Issues

Prepared by C. Beaumont, L. Cui, B. Mercereau (all APD), and J. di Giovanni (RES)

Approved by the Asia and Pacific Department

April 11, 2005

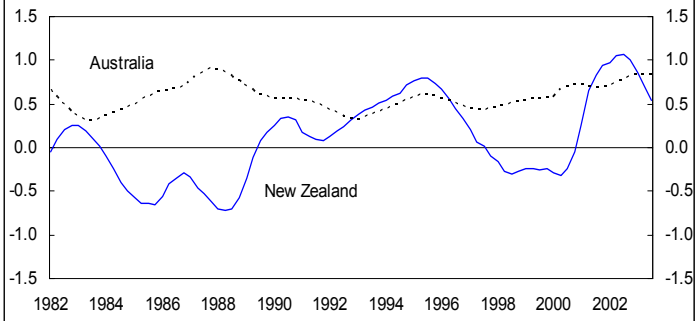
Contents Page

I. How does International Migration Affect Unemployment in New Zealand?[1]

A. Introduction

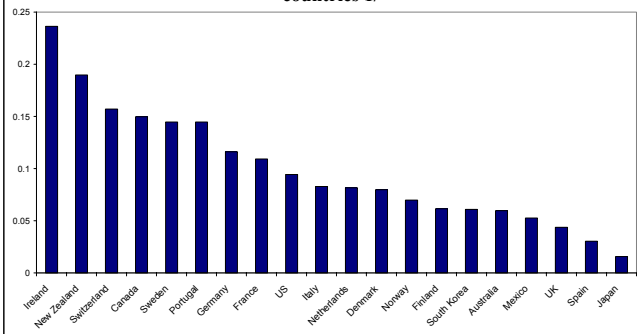
1. **International migration flows to and from New Zealand are large and volatile.** During the past twenty years, permanent and long-term migrants arriving and leaving New Zealand averaged about 1¾ percent of the total population or 3½ percent of the labor force in both directions.[2] Net migration flows to New Zealand are also volatile compared with other traditional immigration countries. For instance, while Australia has been steadily receiving migrants in the past twenty years, net migration flows to New Zealand have oscillated from being significantly positive to being significantly negative (Figure I.1). As a result of the high variability of the net migration flows, the population growth in New Zealand has also been more volatile than most other OECD countries (Figure I.2).

Figure I.1. Net long-term migration of Australia and New Zealand
(in percent of total population)



Source: CEIC data and Fund staff calculations.

Figure I.2. Volatility of population growth in selected OECD countries 1/



1/ Measured as the standard deviation of annual percentage changes in the population during 1989-2003.
Source: US Census Bureau: International Data Base.

2. **Migration has had an important influence on New Zealand's economy.** Migration affects both demand and supply. On the demand side, the swings in migration flows contributed to business cycle developments in the economy during the 1990s.[3] Figure I.3 illustrates how real exchange rate changes (measured as the differences between non-tradable goods inflation and tradable goods inflation) tend to follow the movements of net immigration flows. The positive relationship of the two series suggests that immigrants are associated with an increase in domestic demand. The housing sector is one prominent

---

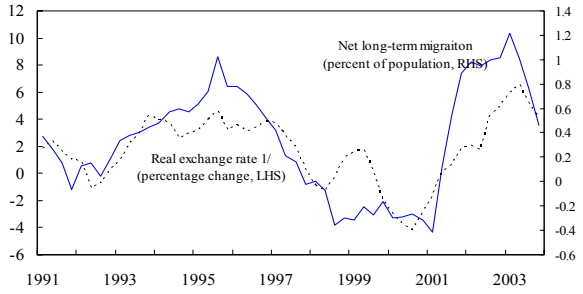
[1] Prepared by Li Cui.

[2] As a result, New Zealand has a higher share of foreign-born population than most other countries, as well as one of the largest shares of people living overseas. See OECD (2002) and Bryant and Law (2004).

[3] Reserve Bank of New Zealand (2000).

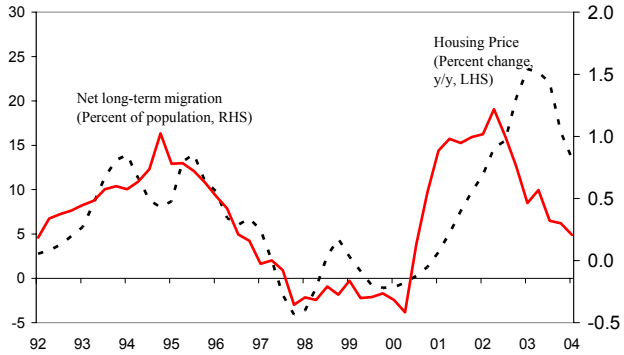
demand component affected by immigration, with immigrants helping to fuel the housing boom since the mid-1990s (Figure I.4). Opinions about the impacts of migration on the supply side are more complex. While some suggest that immigrants may "invade" local jobs, others view immigrants more positively as a welcome offset to the "brain drain" resulting from New Zealanders' emigration and a driver of the country's long-term growth and job prospects (New Zealand Department of Labor, 2004).

Figure I.3. Migration and Real Exchange Rate



1/ Advanced three quarters and measured as the difference of the inflation between non-tradable and tradable.
Source: CEIC data and staff calculations.

Figure I.4. House price and migration



Source: Reserve Bank of New Zealand.

3. **The empirical results in this chapter suggest that net migration inflows give rise to a fall in the unemployment rate.** Net migration from Australia is also found to induce a stronger reduction in the unemployment rate than that from other countries, suggesting that migrants to and from Australia may have a better match in their skill set with local workers than those from other countries. A higher share of skilled migrants in the net inflows—measured by their declared occupations—does not seem to have an additional impact on the unemployment rate, suggesting skilled migrants have not in general been more successful in their job search than unskilled migrants.

4. **A slowdown in net migration inflows is expected to contribute to a rise in the unemployment rate in the next few years.** Model simulation indicates that the projected reduction in the net migration inflows would lead to a rise in the unemployment rate by close to half a percentage point over the next two years.

B. Migration and Unemployment—Economic Links and Empirical Model

5. **The interest in the impact of migration on the unemployment rate is two fold.** First, an estimate of the impact of migration on the labor market of New Zealand can be used to assess whether and to what extent an anticipated decrease in the net inflow of migrants will lead to an increase or decrease in the unemployment rate. Second, it may aid the

understanding of the extent to which migration could affect the gap between unemployment and its natural rate, and thus result in inflationary pressures (along the "Phillips Curve").[4]

6. **The effect of migration on unemployment is ambiguous from a theoretical perspective.** On the one hand, immigrants may reduce unemployment through complementing existing jobs and stimulating job creation, or if the demand of the immigrants for goods and services generate more jobs than they themselves occupy. Moreover, to the extent that some immigrants come as investors, they also generate investment demand. On the other hand, immigrants may increase unemployment if they compete and substitute for existing workers, or find it hard to get suitable jobs

7. **The empirical literature considering the impact of migration on the job market has produced mixed results.** Most work has used a cross-sectional approach to measure the impact of immigration across different regions in a country, with particular attention paid to the effect of the immigrants on the labor market outcomes of native-born workers. The results have typically pointed to a small effect on the wage and employment of native-born workers.[5] Work on New Zealand has largely focused on the labor market performance of immigrants. In particular, Winkelmann and Winkelmann (1998) concluded that the labor market performance of immigrants is related to their educational qualifications, years in New Zealand, and regions of origin. Among the work using time-series data is a study on Australia by Pope and Withers (1993), who examined the impact of migrants over a long sample and found that more immigrants did not lead to higher unemployment. In the case of France, Gross (1999) found that immigrants tended to increase unemployment slightly in the short-run, although there was a reduction in the unemployment rate in the long run.

8. **This chapter estimates a system of equations including the unemployment rate, real wage, net migration rate, and labor force participation rate, taking into account the inter-dependence of the variables.** The model is similar to that of Pope and Wither (1993) and Gross (1999). The net migration rate is defined as the ratio of net permanent and long-term migration inflows to the total labor force. The impact of migration on unemployment is a combination of demand side factors (increased aggregate demand from the consumption and investment of the migrants, and consequently demand for labor) and supply side factors (impact on the labor supply and the real wage). Migrants themselves may be driven by domestic economic conditions, such as the unemployment rate and the real wage (pull factors), and affected by exogenous events such as the labor market conditions or perceived security situation in other countries (push factors). Annex I lays out the empirical

[4] A recent OECD country survey (2004) postulated that migration flows themselves might generate some cyclical "amplification" effect as migrants create more demand than supply in the short-term. The survey, however, did not find such a link in simple correlations between broad cyclical indicators and migration flows.

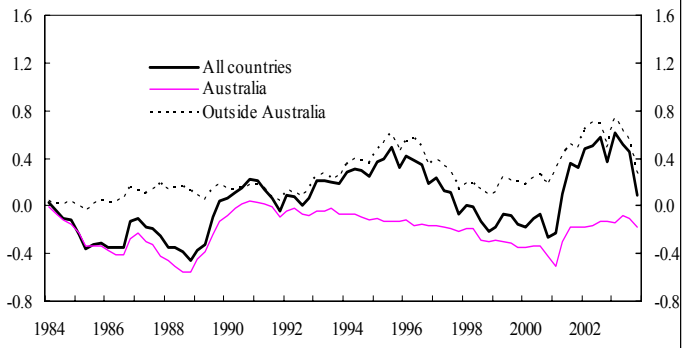
[5] See a survey by Friedberg and Hunt (1995).

model that enables an exploration of the interaction and joint behavior of migration and labor-market indicators. Annex II discusses definitions of the variables and sources of the data

9. **The potential impact of the composition of the migrants are further considered, with particular attention on their country origins/destinations and their skill levels.**

- Differences in the impacts of the net migration inflows from Australia and those from non-Australian countries are examined. New Zealand has a common labor market and very close economic ties with Australia. Not surprisingly, Australia is the single most important migration partner with New Zealand. As migration to and from Australia does not face immigration restrictions, as is the case with migration to and from other countries, it is plausible that trans-Tasman migrants have different characteristics compared to those who migrate to and from other countries. As seen in Figure I.5, the past two decades were associated with net outflows of migrants to Australia and net inflows of migrants from other countries. While migration to and from other countries may be influenced by immigration policies, migration to and from Australia is mainly driven by New Zealanders' choice about where to live.

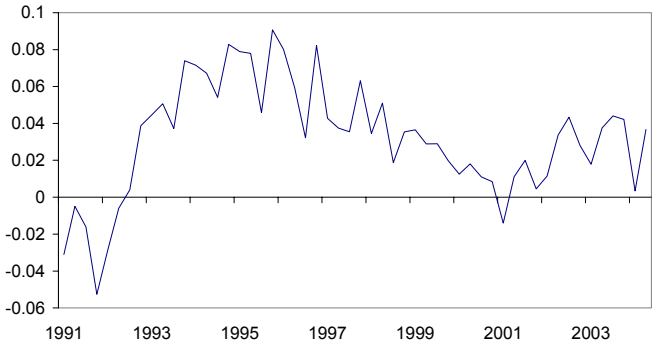
Figure I.5. Net migration from Australia and other countries (in percent of labor force)



Source: CEIC data and Fund staff calculation.

- On skill composition, the assessment focuses on whether a greater share of skilled migrants in the net inflows has any additional impact on the unemployment rate. Are skilled migrants more beneficial to the job market than unskilled migrants? This might be expected if one or more of the following about skilled immigrants holds true: i) they are more successful finding jobs than unskilled immigrants; ii) they help alleviate skill shortages in the country, thereby enhancing the scope of business expansion and possibly increasing employment; or iii) they generate a higher demand impact than unskilled immigrants, having accumulated greater savings out of higher earnings in the past. A skill composition index of the migrants is constructed based on their declared occupations. A rise in the index corresponds to a larger increase of skilled migrants relative to unskilled migrants in the net inflows (Figure I.6). Annex III discusses the skill index and the empirical analysis.

Figure I.6. Skill index of migrants 1/



1/ Defined as the difference between skilled and unskilled workers in the net inflows of migrants (in percent of labor force).
Source: CEIC data and Fund staff calculation.

C. Empirical Results

10. **The econometric results show that a positive shock to the net immigration rate reduces the unemployment rate and raises labor force participation in New Zealand.** Annex I provides the details of the results. The increase in the labor force participation rate suggests that the demand impact of the immigrants helps to raise the labor force participation rate by enhancing job prospects. The reduction in the unemployment rate indicates that immigrants, by generating greater demand and limiting wage growth, create more jobs than they themselves occupy.

11. **Moreover, while the impacts of migrants to and from Australia and migrants to and from other countries are similar in signs, the impact of the former is much stronger.** Assuming that migrants from different geographic location have a similar demand impact, the stronger response of the labor market variables to migration with Australia suggests that immigrants from non-Australian countries are less successful in finding jobs than those who migrate to and from Australia.[6]

12. **A higher share of skilled workers in net migration inflows is not found to have an additional impact on the unemployment rate.** Despite the shortages of skilled labor often cited by employers, skilled migrants do not appear to have greater success finding jobs than their unskilled counterparts. This might be explained by the observation that many skilled immigrants may have been inhibited in their job search by factors such as their

[6] Those going to Australia are probably representative of the remaining population, as suggested by Glass and Choy (2001). They argued that the common labor market with Australia has allowed the migration of a broad mix of New Zealanders who might otherwise has been screened out by selective immigration policies.

language skills, or by direct or indirect discriminations by employers.[7] However, an important caveat applies to the occupation based skill index, as a significant proportion of migrants do not register their occupations (Annex III).

D. Conclusion

13. **Econometric results suggest that the fluctuating migration flows to New Zealand indeed "amplify" the cyclical position of the economy, highlighting the need for careful demand management by policy makers to take into account the projected trend of international migration.** In this regard, the recent change in the immigration policy is helpful as it may facilitate smoother inflows and "dampen" the fluctuations.[8] The results also show that migration inflows have a positive impact on the job market overall, as it helps to raise the labor force participation rate and reduce unemployment. However, despite the high share of skilled workers in the net inflows, foreigners (other than those from Australia) tend to have more difficulties finding jobs than New Zealanders, underlining the importance of the efforts currently underway to enhance the job market integration of immigrants.[9]

14. **The slowdown in the net migration inflows projected for the coming years is expected to contribute to a rise in the unemployment rate and subsiding inflationary pressure.** The Reserve Bank of New Zealand projects that annual net migration inflows will slow by about 50 percent during the year to the September quarter 2005 (Reserve Bank of New Zealand (2004)). The model estimated here suggests that a 50 percent reduction in net migration could lead to an ⅛ percentage point rise in the unemployment rate in the first year and nearly a ½ percentage point rise over two years.

---

[7] A survey by the Department of Labor of New Zealand (1998) concluded that many highly qualified and experienced migrants from Asian countries and the countries in the Former Soviet Union (FSU) were either unemployed or underemployed.

[8] People seeking to migrate to New Zealand now make an expression of interest (EOI) rather than a direct application. The government then invites the potential immigrants to apply, giving more capacity to smooth inflows over time. However, these policies do not affect outflows of migrants, which account for a large part of the fluctuations in net migration. See OECD (2004) and New Zealand Department of Labor (2005).

[9] OECD (2004).

REFERENCES

Bryant, John, and David Law, 2004, "New Zealand's Diaspora and Overseas-born Population," New Zealand Treasury Working Paper.

Friedberg, Rachel and Jennifer Hunt, 1995, "The Impact of Immigrants on Host Country Wages, Employment, and Growth," *Journal of Economic Perspective*, Vol. 9, No. 2.

Glass, Hayden, and Wai Kin Choy, 2001, "Brain Drain or Brain Exchange," New Zealand Treasury Working Paper.

Gross, Dominique, 1999, "Three Million Foreigners, Three Million Unemployed? Immigration and the French Labor Market," IMF Working Paper 99/124 (Washington: International Monetary Fund).

New Zealand Department of Labor, 1998, "The integration of Highly Skilled Migrants into the Labor Market: Implications for New Zealand Business."

_____, 2004, "Globalisation of Labor Flows and Its Impacts on New Zealand."

_____, 2005, "Immigration Policy and Trends - July 2003 to December 2004," unpublished manuscript.

OECD, 2002, Trends in International Migration (Paris: OECD).

_____, 2004, Economic Survey: New Zealand (Paris: OECD).

Pope, David, and Glenn Withers, 1993, "Do Migrants Rob Jobs? Lessons of Australian History, 1861-1991," *Journal of Economic History*, Vol. 53, No. 4.

Reserve Bank of New Zealand, 2000, "Monetary Policy Review: Business Cycle Developments and the Role of Monetary Policy over the 1990s."

_____, 2004, "Monetary Policy Statement, December 2004."

Winkelmann, Liliana and Winkelmann, Rainer, 1998, "Immigrants in the New Zealand Labour Market: a Cohort Analysis using 1981, 1986 and 1996 Census Data," *New Zealand Labor Market Bulletin*: 1 & 2.

Employment and Migration—Empirical Model and Results

1. Following Gross (1999), a model is constructed to examine the interactions of the unemployment rate (UR), real wage in logarithm (LRW), labor force participation rate (LFP), and net migration rate (MIG). The net migration rate is defined as the net inflows of permanent and long-term migrants divided by the labor force. The sample period is from the first quarter of 1988 to the third quarter of 2004.

2. The dynamics of the variables are explored with the following vector auto-regression (VAR):

$$\Delta UR_t = \alpha^u + \sum_{i=1}^{I} \beta_i^u \Delta UR_{t-i} + \sum_{i=1}^{I} \gamma_i^u \Delta LRW_{t-i} + \sum_{i=1}^{I} \eta_i^u \Delta LFP_{t-i} + \sum_{i=1}^{I} \lambda_i^u MIG_{t-i} + \sum_{j=0}^{J} \delta_j^u \Delta Z_{t-j} + \varepsilon_t^u \quad (1)$$

$$\Delta LRW_t = \alpha^w + \sum_{i=1}^{I} \beta_i^w \Delta UR_{t-i} + \sum_{i=1}^{I} \gamma_i^w \Delta LRW_{t-I} + \sum_{i=1}^{I} \eta_i^w \Delta LFP_{t-i} + \sum_{i=1}^{I} \lambda_i^w MIG_{t-i} + \sum_{j=0}^{J} \delta_j^w \Delta Z_{t-j} + \varepsilon_t^w \quad (2)$$

$$\Delta LFP_t = \alpha^l + \sum_{i=1}^{I} \beta_i^l \Delta UR_{t-i} + \sum_{i=1}^{I} \gamma_i^l \Delta LRW_{t-I} + \sum_{i=1}^{I} \eta_i^l \Delta LFP_{t-i} + \sum_{i=1}^{I} \lambda_i^l MIG_{t-i} + \sum_{j=0}^{J} \delta_j^l \Delta Z_{t-j} + \varepsilon_t^l \quad (3)$$

$$MIG_t = \alpha^m + \sum_{i=1}^{I} \beta_i^m \Delta UR_{t-I} + \sum_{i=1}^{I} \gamma_i^m \Delta LRW_{t-I} + \sum_{i=1}^{I} \eta_i^m \Delta LFP_{t-i} + \sum_{i=1}^{I} \lambda_i^m MIG_{t-i} + \sum_{j=0}^{J} \delta_j^m \Delta Z_{t-j} + \varepsilon_t^m \quad (4)$$

3. Since UR, LRW, and LFP contain unit roots, they enter the VAR as the first differences. Vector Z include all exogenous variables, including the first difference in the log of import prices (seasonally adjusted) to represent supply shocks, and the first difference of the Australian unemployment rate. Also included are seasonal dummies, and a dummy variable that takes the value of one between the third quarter of 2001 and the third quarter of 2003 and zero during other periods, to capture the migration flows related to 9-11 security concern.[10]

4. The VAR model is specified with four lags based on likelihood ratio test. The numbers of lags of the exogenous variables are selected based on Schwartz and Akaike information criteria. The diagnostic tests indicate that the residuals are reasonably well behaved, with only normality being rejected. Alternative lag specifications yield similar results, although residuals from VARs with smaller lags are less well behaved.

5. Figure I.7 shows the accumulated impulse response of ΔUR, ΔLRW, and ΔLFP to a one-percentage point increase in the net migration rate (with two times the standard errors on both sides). A positive innovation in the net migration rate results in a fall in the unemployment rate and the real wage, and a rise in the labor force participation rate.

[10] Other exogenous variables considered include the real growth of Australia, trade weighted real growth of all foreign countries, and terms of trade. None of these variables was found to be significant.

6. To examine the possibly different impacts of migrants to and from Australia and migrants to and from non-Australian countries, the above VAR is re-estimated with a breakdown between the net migration rate from Australia and the net migration rate from other countries. The accumulated impulse response of ΔUR, ΔLRW, and ΔLFP to a one-percentage point increase in the net migration rate from all countries, that from Australia, and that from non-Australia countries are summarized in Figure I.8. The responses of the labor market indicators to the migration rate from Australia are much stronger than the responses to the migration rate from other countries, suggesting that immigrants from non-Australian countries are less well-matched in their skill set with the local labor force, and thus are less successful in finding jobs, than those who migrate to and from Australia.

7. The estimated model is simulated with the migration flows projected by the Reserve Bank of New Zealand (Reserve Bank of New Zealand, 2004), where the annual net migration inflows are expected to slow from 18600 in the year through September 2004 to 9500 in the year through September 2005. Assuming a one-time shock of about 50 percent reduction in the net migration ratio from its current level–roughly the percentage reduction in the RBNZ projection, model simulation suggests that unemployment rate will rise 0.13 percent in one year and about 0.4 percent over two years.

Figure I.7. Accumulated Impulse Response to 1 Percentage Point Increase in Net Migration (+/- 2 S.E.)

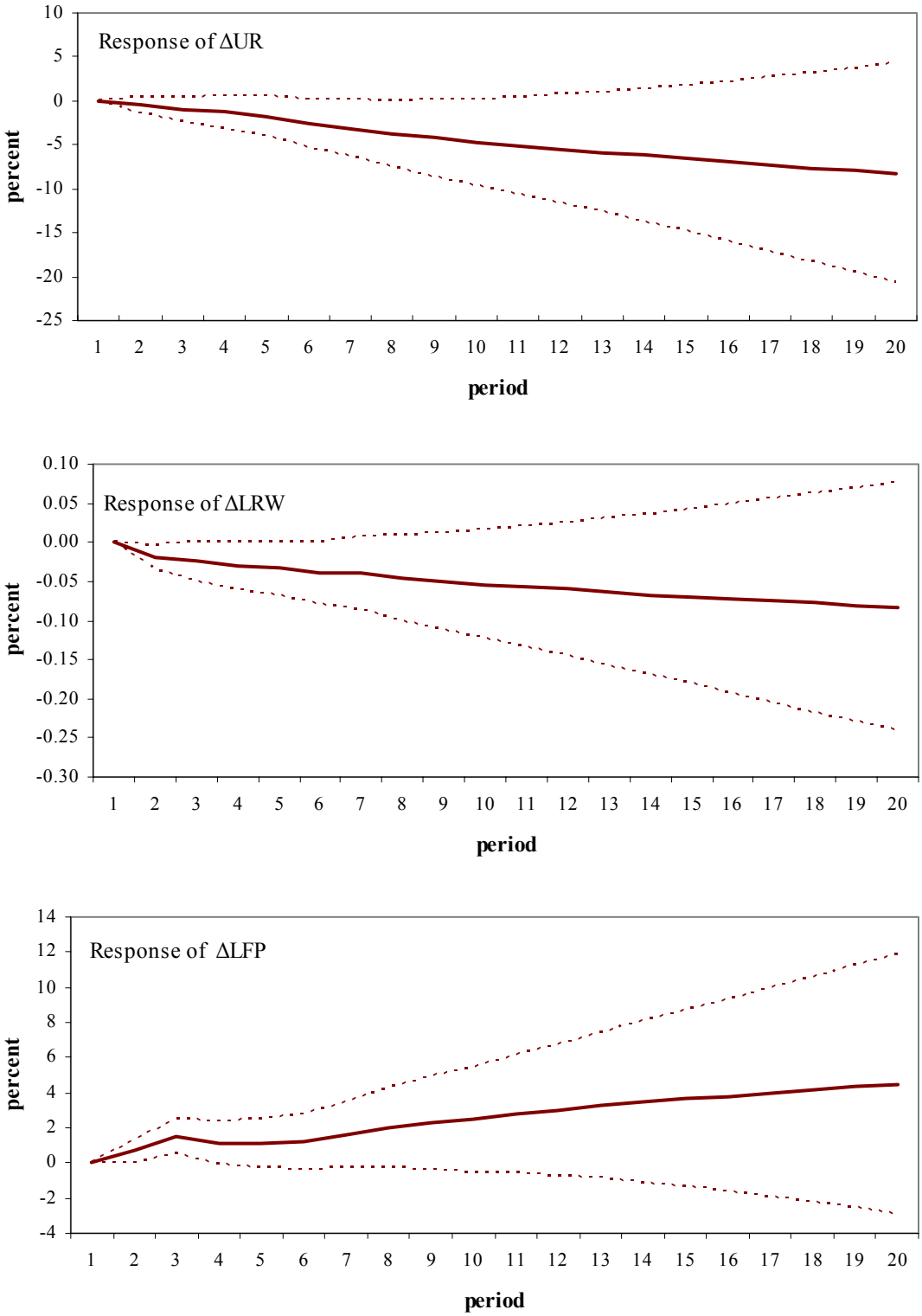
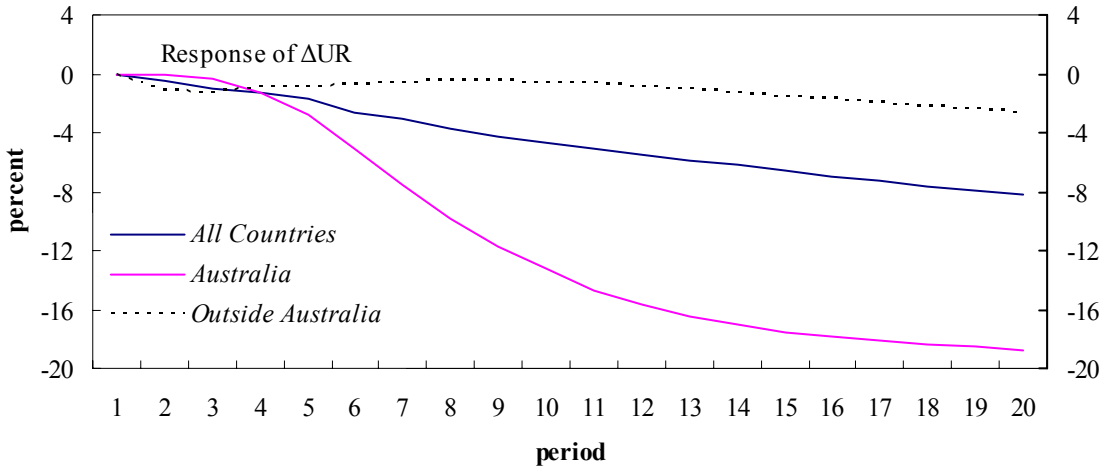
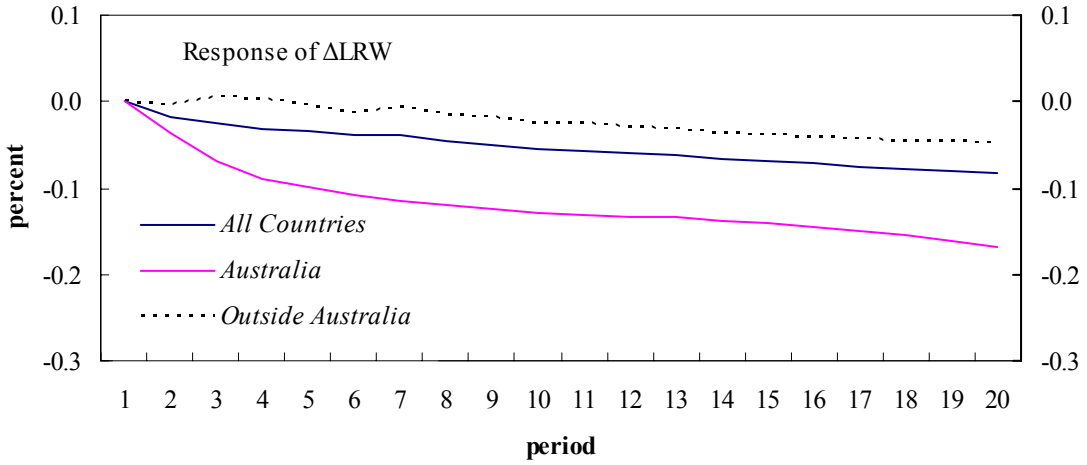
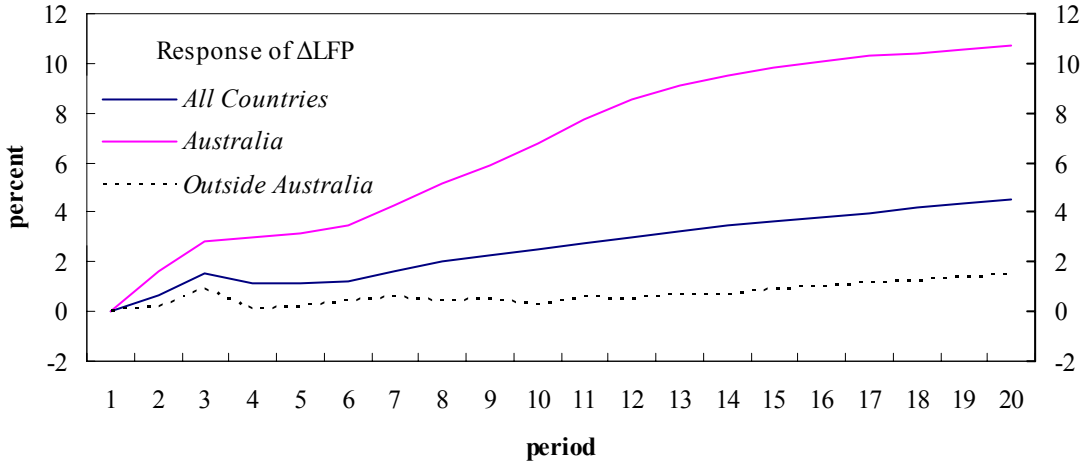


Figure I.8. Accumulated Impulse Response to 1 Percentage Point Increase In Net Migration Rate From All Countries, Australia, and Other Countries







Data definitions and sources

Unemployment rate (UR). Source: OECD

Log of real wage (LRW). Wage is the labor cost index, with data before December 1992 calculated based on the prevailing weekly wage index, deflated by the Consumer Price Index. Source: OECD.

Labor force participation rate (LBF). Source: OECD.

Net migration rate (MIG_NET). Net permanent and long-term migration inflows divided by the total labor force. Source: CEIC and OECD.

Unemployment rate in Australia (AUS_UR). Source: OECD.

Change in log of import price index (DLPIMT). Source: IFS.

Do Skilled Immigrants Induce Greater Reduction in the Unemployment Rate?

1. The data on the skill level of the migrants is based on the occupational information collected on all arrival and departure cards.[11] Based on the claims of occupations, migrants are classified into skilled and unskilled workers.[12] The skill indicator is defined as the difference between the number of skilled and unskilled migrants in the net inflows, divided by the labor force. As seen in Figure I.6, the relative share of the skilled immigrants have fluctuated but steadily declined between 1993 and 2001, before rising again.

2. Does the relative share of skilled migrants have any significant impact on economy-wide unemployment rate, besides those brought about by migration itself? To answer this question, lagged skill indices are added to the VAR. Wald tests suggest that the coefficients of the lagged skill indices are not statistically significant.

[11] One caveat about the data is the large number of "not actively engaged" or "not specified" responses. More details are in Glass and Choy (2001). Nevertheless, these are the only continuous series that could shed light on the skill composition of the migrants.

[12] Skilled workers include legislators, administrators and managers, professionals, technicians and associate professionals; unskilled workers include other professions such as clerks, service and sale workers, agriculture and fishery workers, plant and machine operators and assemblers, trader workers, and laborers and related elementary services. Similar classification was used by Glass and Choy (2001), which further split the unskilled category into semi-skilled and low-skilled.

II. Exchange Rate Volatility and Foreign Exchange Hedging of Exports[13]

A. Introduction

1. **New Zealand is a small open economy that relies heavily on trade.** New Zealand is quite open as measured by its trade-to-GDP ratio, which has averaged almost 60 percent over the past three decades (Table II.1). Furthermore, exports have averaged more than 29 percent of GDP over this same period, underscoring the importance of foreign sales for national income. Therefore, the health of New Zealand's economy strongly depends on its ties to the rest of the world, which in turn leaves the domestic economy subject to external shocks.

Table II.1. Trade to GDP Ratios (in percent), 1975–2003

Year	Trade/ GDP	Exports/ GDP	Imports/ GDP
Mean	59.0	29.4	29.6
Std. Dev.	5.4	2.8	3.1

Source: International Financial Statistics. Includes Goods and Services.

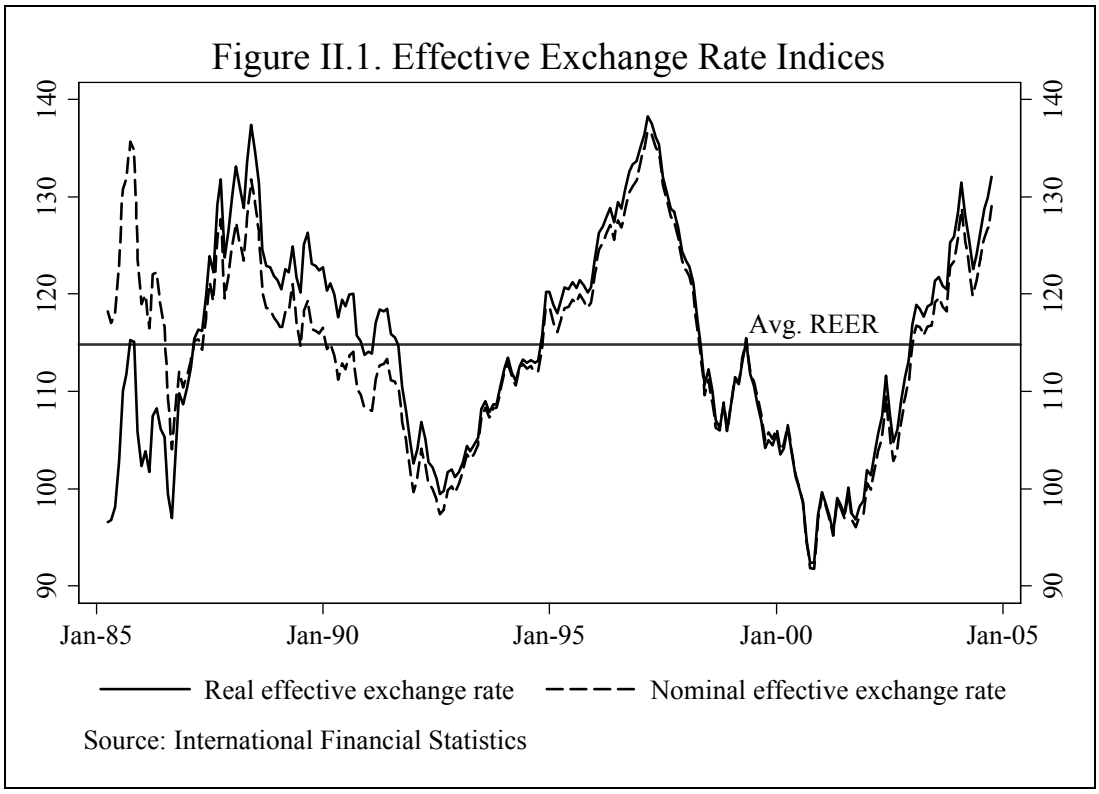
2. **Firms in the tradable sector must manage exchange rate fluctuations that are both significant in magnitude and duration.** Figure II.1 illustrates the behavior of the nominal and real effective exchange rates since the New Zealand dollar was floated in March 1985.[14] Both the nominal and real exchange rates have fluctuated cyclically around their "long-run" averages over the past twenty years. Moreover, the peaks and troughs of the cycles have been large relative to the average—the absolute peak was 18.6 percent above the average (March 1997), and the absolute trough was 21.8 percent below the average (November 2000).

3. **This chapter examines the impact of exchange rate volatility on export firms' decisions to hedge foreign exchange exposure.** The analysis is based on a small analytical model of a firm's optimal hedging strategy, which is calibrated to the New Zealand exchange rate process in order to undertake some comparative static exercises. Before presenting the model, Section B compares the volatility of the New Zealand dollar exchange rate with other currencies. Section C discusses the literature on the impact of the exchange rate on New

[13] Prepared by Julian di Giovanni.

[14] These exchange rates are constructed based on New Zealand's bilateral trade weights (Zanello and Desruelle, 1997).

Zealand's trade and exporters hedging behavior. Section D describes the hedging model and discusses its implications.



B. Is the New Zealand Dollar Relatively Volatile?

4. **There are several ways to measure real exchange rate volatility.** Given that export firms tend to hedge only for fairly short periods on average (Briggs, 2004), real exchange rate volatilities and persistence measures are calculated for monthly, quarterly, and annual horizons. Two main methods are used. The first calculates the persistence of the exchange rate based on autoregressive regressions, while the volatility measure is the standard deviation of one-period changes.

5. **Table II.2 compares New Zealand's real exchange rate volatility against several other countries over the period since the New Zealand dollar began to float.** The countries included for comparison are Australia, the United States, Canada, Chile and Denmark. Australia is a natural comparator given its proximity and close economic links with New Zealand, while the United States is a large trading partner. Canada and Chile are chosen because these two countries like New Zealand depend heavily on commodity trade. Denmark is examined because it is another small open economy.

Table II.2. Real Exchange Rate Persistence and Volatility Statistics (1985–2004)

	Persistence: Autoregressive Regression			Volatility: St. Dev. of Log Differences		
Country	**Monthly**	**Quarterly**	**Annual**	**Monthly**	**Quarterly**	**Annual**
New Zealand	0.96	0.83	0.60	2.18	3.65	8.10
Australia	0.94	0.82	0.57	2.37	4.17	7.35
United States	0.97	0.83	0.68	1.54	2.82	6.67
Canada	0.97	0.86	0.84	1.34	2.36	5.34
Chile	0.98	0.93	0.77	2.41	3.91	6.56
Denmark	0.90	0.76	0.44	0.78	1.41	2.94

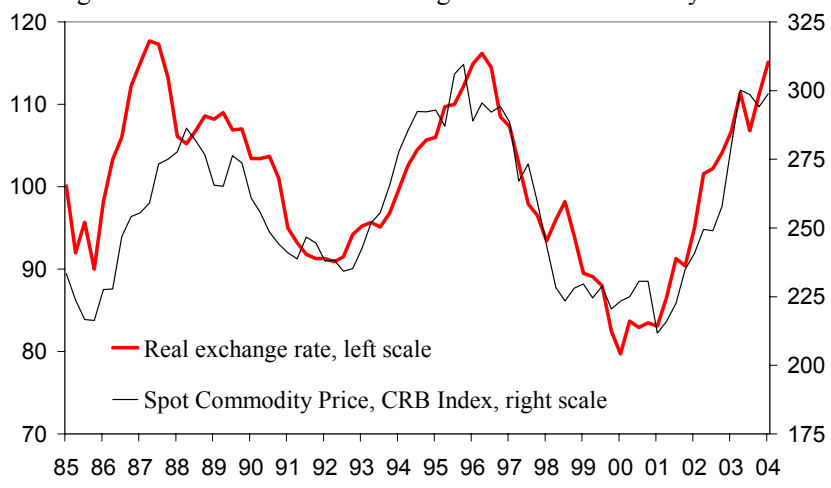
Notes: Based on staff calculations using data from International Financial Statistics. Optimal lags used in autoregressive regressions are: 12 (monthly), 9 (quarterly), 1 (annual). The optimal lag is chosen using methodology based on Elliott et al. (1996). Volatility measures are standard deviations calculated over the sample period. These measures are unit free, since log differences are taken, and are then multiplied by one hundred to convert to percentage points.

6. **The New Zealand dollar appears to be one of the more volatile currencies overall.** Table II.2 shows that its volatility is most similar to the currencies of Australia and Chile at each horizon.[15] All of the exchange rates have similar levels of persistence (particularly at the monthly rate). Denmark stands out as having the least persistent and volatile rate, which can partly be explained by its participation in the European Monetary System's exchange rate band over part of the sample period. Canada, which also depends on commodity trade has considerably lower exchange rate volatility than New Zealand; but this may be explained by commodities accounting for a smaller share in Canada's economy. The substantial weight of commodities in New Zealand exports explains much of the currencies volatility. Chen and Rogoff (2003), among others, show that world commodity price movements are strongly correlated with movements of the New Zealand dollar (Figure II.2).[16]

[15] This fact is interesting because these three countries are also the most geographically remote of the sample. Recent work by Bravo-Ortega and di Giovanni (2005) point to the importance of trade costs in explaining real exchange rate volatility, where remoteness increases trade costs and thus volatility.

[16] See Munro (2004) for a comprehensive study on different factors that drive the New Zealand dollar.

Figure II.2. Real Effective Exchange Rate and Commodity Prices



Sources: Reserve Bank of New Zealand and Commodity Research Bureau (CRB).

C. How Do Firms Manage Exchange Rate Volatility?

7. **In practice, the volatility of the exchange rate is not found to impact heavily on export volumes.** Smith (2004) presents the most recent evidence on the impact of the exchange rate on New Zealand exports volumes. He finds that the exchange rate affects export volumes, but that this effect is not very large. Specifically, a medium-term exchange rate elasticity of 0.14 is estimated for all sectors, with the peak effect occurring with a lag of eighteen months. Thus a 10 percent real appreciation would reduce export volumes by only 1½ percent in the medium-term. In practice, exchange rate fluctuations have been considerable, nonetheless, it is notable that the real exchange rate accounts for less than 20 percent of the total cyclical variation in total export volumes. Moreover, the exchange rate impact varies by sector, where the effects are largest on the service sector, which may be less able to hedge or may face higher hedging costs. Together with time lags in the impact of the exchange rate, this finding points to potential behavior at the firm-level to offset exchange rate effects.[17]

8. **Exchange rate hedging—through the use of forward contracts, futures, and options—has become common practice in New Zealand.** Briggs (2004) finds that New Zealand exporters hedge against exchange rate changes quite extensively in the short-term—

[17] This argument is potentially most relevant for non-commodity exports given the relationship between commodity prices and the exchange rate depicted in Figure II.2. Specifically, the exchange rate tends to buffer commodity price movements, and commodity exports are generally supply driven.

the majority of firms hedge between one and five quarters.[18] The availability of hedging enables firms to continue trading in markets for some period even when at spot exchange rates this activity may not be profitable, thus reducing the sensitivity of export volumes to exchange rate shocks.

9. **The impact of exchange rate hedging on trade has not received much attention in the economics literature.** There is an old literature that examines hedging behavior theoretically for developing countries that depend heavily on commodity trade (e.g., Rolfo, 1980). More recently, Wei (1999) provides cross-country empirical evidence in support of the hypothesis that the existence of currency hedging opportunities increases bilateral trade.[19]

10. **A natural question to ask is how much a change in exchange rate volatility will affect a firm's hedging behavior.** This question is relevant because hedging is costly at the firm-level and may not always be possible.[20] To answer this question, some form of formal model is needed. There is an extensive theoretical literature that examines the impact of large exchange rate movements on trade in a dynamic setting; for example, the literature that examines "trade hysteresis" (e.g., Baldwin and Krugman, 1991). However, none of this literature considers a firm's ability to hedge exchange rate volatility. The following section presents a small model that attempts to present some simple insights about the likely determinants of hedging decisions.

D. The Foreign Exchange Hedging Model

11. **The hedging model is very stylized, but is able to capture a few interesting properties that potentially match the behavior of New Zealand exporters in a realistic manner.** For example, the model comes close to matching the 60 percent coverage ratio found by Briggs (2004) at a volatility close to what has been estimated for New Zealand using quarterly data based on some reasonable parameter choices.

12. **The basic structure of the model is the following:**[21]

- A risk-averse firm is able to hedge each period. In doing so, it enters into a forward contract where it can sell up to one hundred percent of its output at a forward price,

---

[18] Briggs also finds evidence that suggests that importers do not hedge as much as exporters, but this fact will not be examined in this chapter.

[19] There also is still a lack of robust evidence on the impact of real exchange rate volatility on trade, however. See Clark et al. (2004) for a recent extensive survey.

[20] Brooks et al. (2000) confirm that hedging can insulate New Zealand firms against exchange rate risk, but the costs increase the duration of the hedge.

[21] The Appendix gives a technical description of the model and how it is solved.

and no short selling is allowed (i.e., it cannot enter into a contract that would effectively allow it to buy its own output).

- The firm maximizes expected utility in the following period, where utility is a function of profits, by choosing an optimal hedge contract a period before the price is realized.

- The firm must pay a fee (the forward premium) to hedge.

- The price of the good is assumed to be constant as is the world price level, therefore the asset underlying the forward contract is equivalent to the real exchange rate.

- The firm's output is also assumed to be constant (e.g., exogenous world demand).

- The firm's technology is constant returns to scale, and thus it faces a linear cost function.

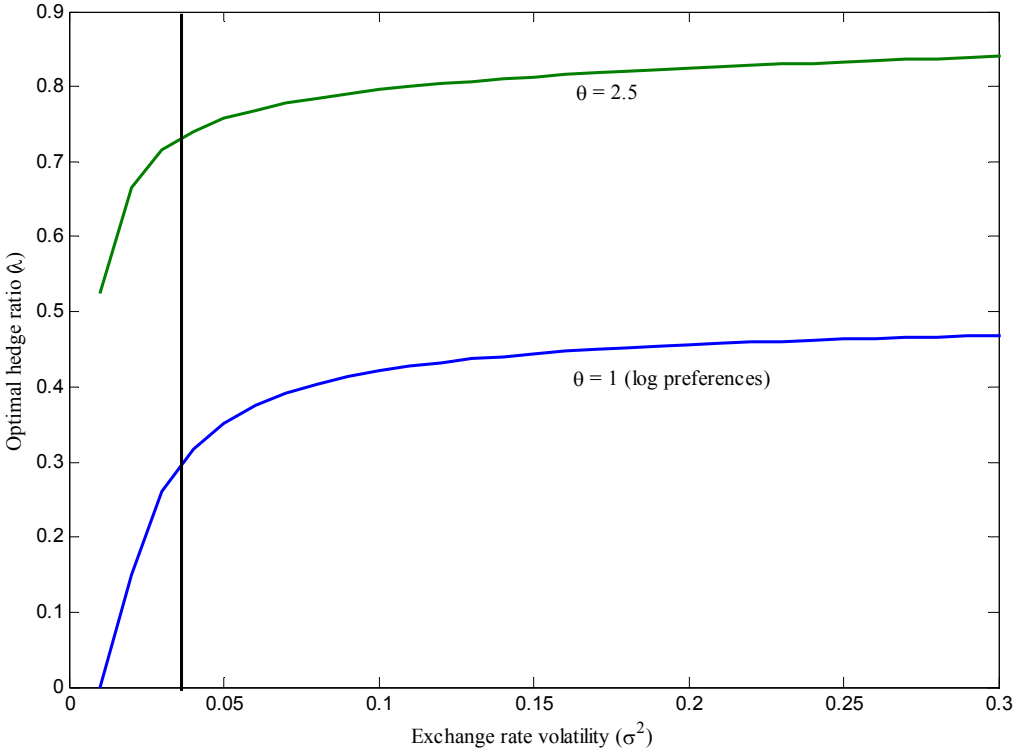
- The firm's exchange rate expectations are assumed to be such that they match the pattern of the real exchange rate in Figure II.1, and each period the real exchange rate is subject to a possible random shock.

Thus, the only form of uncertainty in the model is the path of the real exchange rate. Furthermore, the level of risk aversion captures how sensitive a firm is to volatility.

13. **The comparative static analysis concentrates on three elements of the model:** (i) the firm's risk aversion, (ii) the exchange rate volatility, and (iii) the cost of hedging. Figures II.3 and II.4 depict some solutions to the model. The first point that is evident from Figures II.3 and II.4 is that the more risk averse a firm is (i.e., the larger is θ), the higher its average hedge ratio is, regardless of the value of exchange rate volatility or hedging cost. This makes intuitive sense, and one way of interpreting this result is that firms that are more risk averse are those whose survival is more sensitive to large swings in the exchange rate (e.g., because they have less capital to absorb shocks).

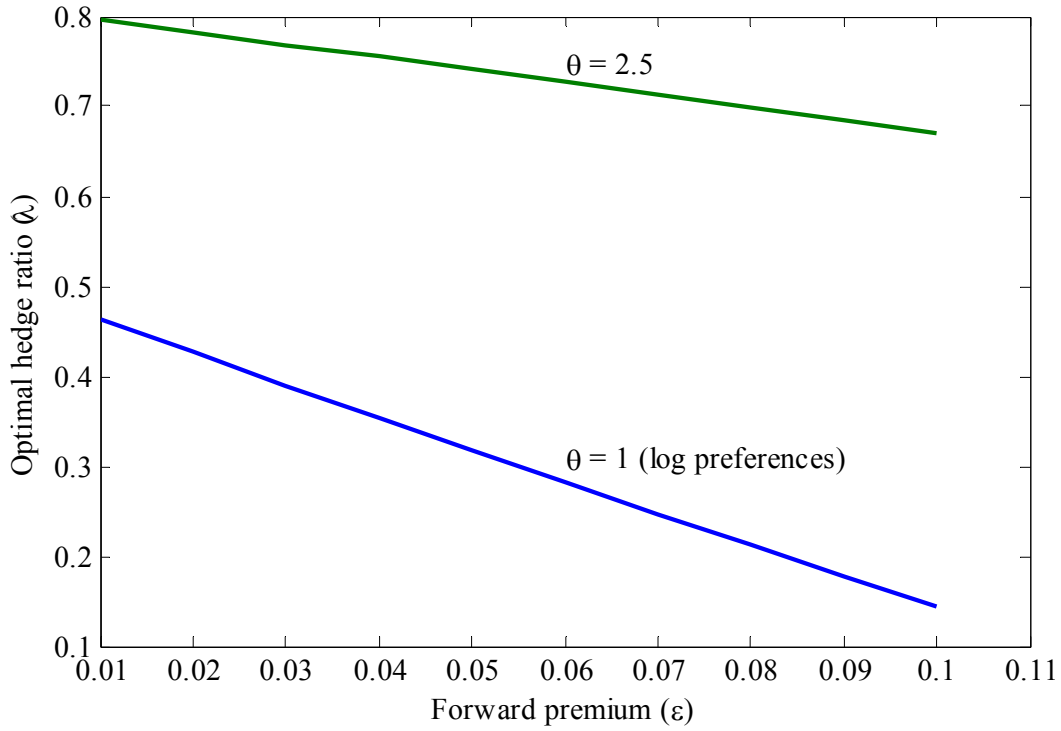
14. **Second, increases in exchange rate volatility have the largest effects on hedging coverage at the margin for relatively low values of volatility (Figure II.3).** In particular, regardless of the risk aversion or forward premium, most of the action goes on at volatilities between zero and ten percent. This result is quite relevant given the calculated volatilities for New Zealand in Table II.2. The model's result is driven by the fact that volatility/risk is a second-order effect in the model (since the firm is maximizing expected utility). Therefore, on the margin, volatility matters less the larger its absolute value. Finally, at an exchange rate volatility close to what is found in the data, the vertical line in Figure II.3 points to hedge ratios close to the 60 percent estimate of Briggs (2004) at risk aversion coefficients between 1 and 2½.

Figure II.3. Impact of Exchange Rate Volatility on Hedging Behavior
Forward premium (ε) = 0.05
$p_t = 0.46 + 1.13p_{t-1} - 0.23p_{t-2} + \nu_t$; $\nu_t \sim N(0,\sigma^2)$



15. **Third, the hedge ratio decreases linearly with the forward premium, though this effect is not very strong (Figure II.4).** Moreover this effect is weaker at higher risk aversions on margin (i.e., the slope of the plotted line becomes less steep). This result makes sense, since the more risk averse a firm is the more willing it will be to hedge, regardless of the cost.

Figure II.4. Impact of Forward Premium on Hedging Behavior



16. **Overall, the hedging model suggests that New Zealand's relatively high exchange rate volatility is a key factor explaining why hedging is so prevalent.** The results from the calibrated model point to firms hedging a significant share of future receipts (between thirty and seventy percent) when they face levels of exchange rate volatility seen in the New Zealand data. If exchange rate volatility were to decline, the model suggests that this would be associated with a significant reduction in hedging and thus in hedging costs.

REFERENCES

Baldwin, Richard, and Paul Krugman, 1989, "Persistent Trade Effects of Large Exchange Rate Shocks," *Quarterly Journal of Economics*, Vol. 104 (November), pp. 635–654.

Bravo-Ortega, Claudio and Julian di Giovanni, 2005, "Remoteness and Real Exchange Rate Volatility," IMF Working Paper 05/01 (Washington: International Monetary Fund).

Briggs, Phil, 2004, "Currency Hedging by Exporters and Importers," *Reserve Bank of New Zealand Bulletin*, Vol. 67 (December), pp. 17–27.

Brooks, Andy, David Hargreaves, Carrick Lucas, and Bruce White, 2000, "Can Hedging Insulate Firms From Exchange Rate Risk?" *Reserve Bank of New Zealand Bulletin*, Vol. 63 (March), pp. 21–34.

Clark, Peter B., Natalia Tamirisa, Shang-Jin Wei, Azim Sadikov, and Li Zeng, 2004, *A New Look at Exchange Rate Volatility and Trade Flows*, IMF Occasional Paper No. 235 (Washington: International Monetary Fund).

Chen, Yu-chin, and Kenneth Rogoff, 2003, "Commodity Currencies," *Journal of International Economics*, Vol. 60 (May), pp. 133–60.

Elliott, Graham, Thomas J. Rothenberg, and James H. Stock, 1996, "Efficient Tests for an Autoregressive Unit Root," *Econometrica*, Vol. 64, No. 4. (July), pp. 813–36.

Munro, Anella, 2004, "What Drives the New Zealand Dollar," *Reserve Bank of New Zealand Bulletin*, Vol. 62 (June), pp. 21–34.

Rolfo, Jacques, 1980, "Optimal Hedging Under Price and Quantity Uncertainty: The Case of a Cocoa Producer," *Journal of Political Economy*, Vol. 88 (February), pp. 100–16.

Smith, Mark, 2004, "Impact of the Exchange Rate on Export Volumes," *Reserve Bank of New Zealand Bulletin*, Vol. 67 (March), pp. 5–13.

Wei, Shang-Jin, 1999, "Currency Hedging and Goods Trade," *European Economic Review*, Vol. 43 (June), pp. 1371–94.

Zanello, Alessandro, and Dominique Desruelle, 1997, "A Primer on the IMF's Information Notice System," IMF Working Paper 97/71 (Washington: International Monetary Fund).

Volatility and Persistence Measures

The real exchange rate persistence measure is calculated as:

$$\Theta = \sum_{k=1}^{K} \rho_k$$

where the ρ's are obtained from running the following autoregressive regression:

$$y_t = \alpha + \sum_{k=1}^{K} \rho_k y_{t-k} + \eta_t$$

where y_t is the log real effect exchange rate, and K is the optimal lag length.

These regressions are run over ten-year windows for the monthly and quarterly data, where the window is moved by one period for each regression. The persistence measure, Θ, is then an average of all the values of each window.

The real exchange rate volatility measure is calculated as the standard deviation of the one period log-difference of the real exchange rate over the sample period:

$$\sigma = \text{StDev}\left(\ln y_t - \ln y_{t-1}\right)$$

Hedging Model

The firm's problem at any period t is to choose a hedge ratio to maximize expected utility, which is a function of profits, for the next period given the exchange rate process. Given that the firm is risk averse, and has linear costs, this is equivalent to the following problem:

$$\max_{\lambda_t} \; \text{E}_t \left\{ \text{U}\left[\Pi_{t+1}\left(\lambda_t\right)\right]\right\}$$

s.t.

$$p_t = \alpha + \rho_1 y_{t-1} + \rho_2 y_{t-1} + \upsilon_t, \qquad \upsilon_t \sim \text{N}\left(0, \sigma^2\right)$$

$$0 \le \lambda_t \le 1$$

where λ_t is the hedge ratio a firm chooses at time t (with $\lambda_t = 1$ implying complete hedging), and the (log) real exchange rate, p_t, follows an AR(2) process, and is subject to shocks

distributed i.i.d. normal, with mean zero and variance σ^2. Utility and profits are defined as follows:

$$\mathrm{U}\left[\Pi_{t+1}\right] = \frac{\Pi_{t+1}^{1-\theta}}{1-\theta},\ \theta > 1 \qquad (\theta = 1 \Leftrightarrow \text{log preferences})$$

$$\Pi_{t+1} = \left[\lambda_t P_{t+1}^f + \left(1-\lambda_t\right)P_{t+1}\right]Y - cY,\ c > 0$$

$$p_{t+1} = \ln\left(P_{t+1}\right)$$

$$p_{t+1}^f = \mathrm{E}_t\left\{p_{t+1}\right\} - \varepsilon,\ \varepsilon > 0$$

The parameter, θ, measures the firm's risk aversion. The greater this parameter value, the more averse a firm is to risk in profits. Given the simple technology used in this model, one could also associate a higher θ with a firm's greater sensitivity to entering/exiting given exchange rate movements. A firm's profit, Π, is simply the effective price times output minus total cost, which is linear in output (i.e., cY). The effective price depends on how much of the price the firm chooses to hedge forward. The (log) forward price, p_{t+1}^f, is equal to the expected price level less a forward premium, ε, that the firm must pay.

The firm solves its maximization problem each period, and the first-order condition at time *t* is:

$$\mathrm{E}_t\left\{\Pi_{t+1}^{-\theta}\left[P_{t+1}^f - P_{t+1}\right]\right\} \leq 0.$$

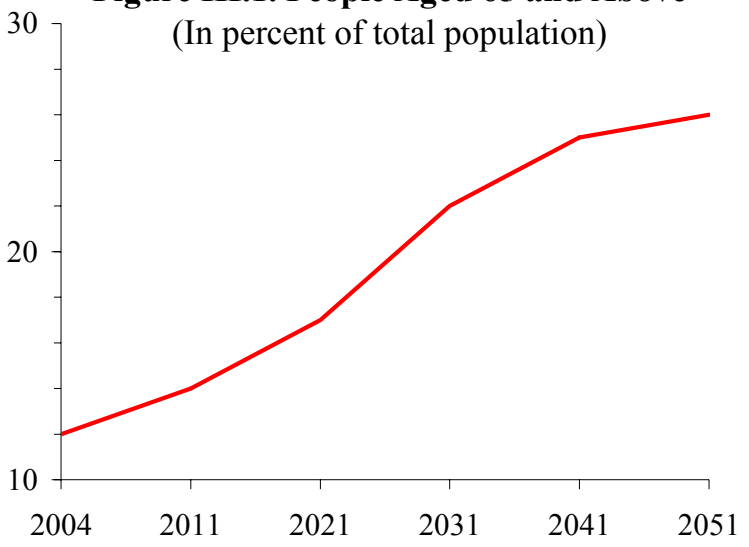
This stochastic non-linear equation can be solved numerically given the exchange rate process if the constraint is binding. But, it is possible that a corner solution is reached (i.e., the hedge ratio is equal to 0 or 1) such that the first-order condition is non-binding. For the purposes of this chapter and given the smoothness of the profit function and properties of the normal distribution, it was possible to simulate the model in Matlab by creating a series for the log exchange rate by drawing 1000 observations of the error term, υ_t, randomly from a normal distribution with a given variance and zero mean, and then solving for the exchange rate given coefficients estimated from an AR(2) regression of the New Zealand real exchange rate using quarterly data in the floating era. The estimated coefficients are $\alpha = 0.45$, $\rho_1 = 1.13$, and $\rho_2 = -0.23$. The model is solved for a range of risk aversions and exchange rate volatilities, and the linear cost, *c*, is assumed to be 0.5 (a value of *Y* is not needed to solve the model).

III. How to Keep Living Standards in New Zealand Rising as the Population Ages?[22]

A. Introduction

1. **Population aging poses a number of challenges to New Zealand's economy.** As the population ages, there will be relatively fewer people available for the production of goods and services, potentially reducing the rate of growth of GDP per person (Figure III.1). An aging population will also increase government expenditure on pensions and healthcare (see, e.g., Creedy and Scobie, 2005), and the demographic shift might also affect savings and investment. While New Zealand's demographic profile may be more favorable than most developed economies (Figures III.2 and III.3), the country faces the twin challenge of dealing with an aging population and of closing the GDP per capita gap with the rest of the OECD.

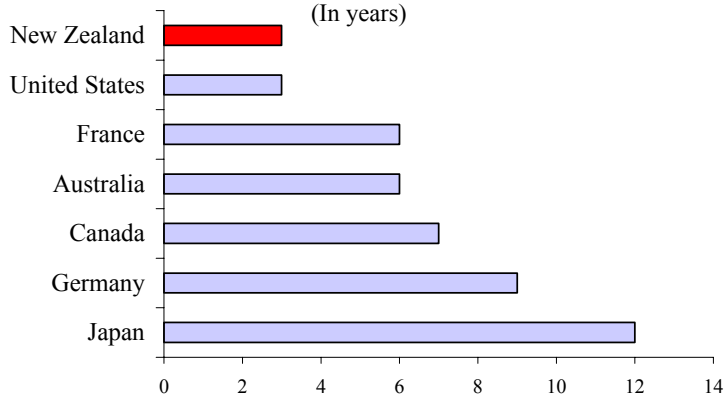
Figure III.1. People Aged 65 and Above
(In percent of total population)



Source: Statistics New Zealand.

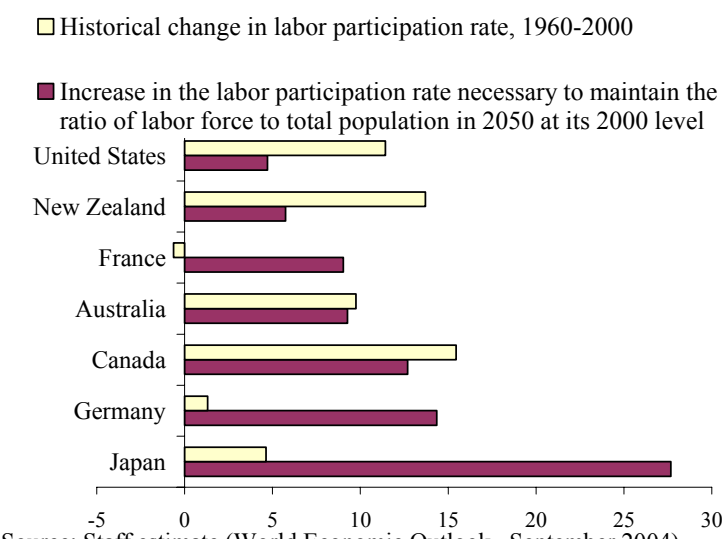
[22] Prepared by Benoit Mercereau.

Figure III.2. Increase in the Retirement Age Necessary to Maintain the Ratio of Workforce to Population in 2050 at its 2000 Level
(In years)



Source: Staff estimate (World Economic Outlook, September 2004).

Figure III.3. Necessary Increase in the Labor Participation Rate
(percentage point change)



Source: Staff estimate (World Economic Outlook, September 2004).

2. Using a Cobb-Douglas production function, the GDP per capita of a country is given by:

GDP per capita= Labor Productivity * Labor Utilization,

where: Labor Productivity= Total Factor Productivity*(Stock of Capital per Hour Worked)$^{\alpha}$,

and Labor Utilization = Share of Population of Working Age* Participation Rate* (1-Unemployment rate)*Average Hours Worked per Employed Worker.

The above equation summarizes the determinants of GDP per capita, and various versions of this equation have been used to simulate the impact of population aging on GDP per capita (e.g., Cheng, 2003).

3. **This chapter argues that strong GDP growth would help manage the challenge posed by population aging.** Productivity and the various components of labor input (working age population, labor participation, unemployment, and the average hours worked per person in employment) determine a country's living standards. This chapter studies these determinants as population ages, and reaches the following conclusions:

- Population aging might affect productivity, but the direction is unclear. In any event, New Zealand's productivity is low by OECD standards and boosting productivity should therefore play a key role in raising GDP per person as the country's population ages. Increasing investment (for example by improving infrastructure), investing in education and promoting research and development might contribute to enhancing productivity.

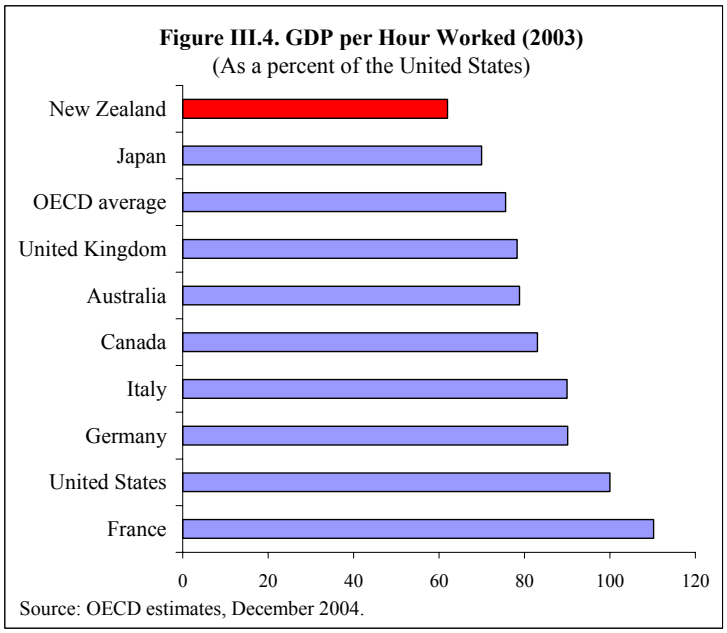
- Labor input is high in New Zealand compared to other developed nations. But people might desire to increase leisure and work less as the country grows richer. To keep labor input high, the focus should therefore be on identifying impediments that prevent people from working. For example, providing better childcare might give some women who would like to combine family life and work the opportunity to do so. Better education would help young people entering the workforce and also aid workers seeking to upgrade skills during their career. Better healthcare for older workers might allow them to remain in the workforce longer, and giving these workers more flexibility over their retirement age might also induce some to retire later, especially as life expectancy increases. Immigration, however, is unlikely to make a large difference in solving the impact of aging on the labor force.

4. **The rest of the chapter studies each determinant of a country's living standards,** and discusses ways to improve it as population ages. The next section discusses productivity.

B. Productivity

5. **Productivity is a key determinant of a country's GDP per capita.** Boosting productivity could therefore play a central role in handling the aging challenge.

6. **New Zealand's productivity is relatively low.** As Figure III.4 shows, New Zealand's output per hour worked is significantly lower than OECD average. Moreover, productivity growth has been lower than the OECD median in recent years (Ministry of Economic Development, 2005). To improve its productivity, New Zealand will need to increase its capital stock (capital deepening), as well as enhance its total factor productivity.



7. **Aging might affect productivity through its impact on capital deepening and total factor productivity,** but the net impact is unclear.

- **Aging might affect capital deepening,** but the direction is uncertain. The life cycle model predicts that older people tend to save less than younger ones, reducing national savings, which might lower investment if foreign savings do not fully compensate for the fall in domestic savings. Also, saving and investment might suffer if taxes were raised to fund growing pension and healthcare spending. On the other hand, a decline in working age population initially increases the stock of capital available per worker. Scarcer labor also provides an incentive to substitute capital for labor. This is essentially the opposite of the situation through the 1990's and early 2000's in New Zealand, when low wages relative to the cost of capital contributed to the substitution of labor for capital and New Zealand's relatively low unemployment rate.

- **Aging could also affect total factor productivity.** Romer (1990) argues that aging might boost innovation because it puts a larger premium on innovation as labor becomes scarce. An older workforce should also be more experienced, which might increase average productivity. But aging might be detrimental to productivity if older people turn out to be less dynamic and less innovative than younger ones. Higher taxes might lower the incentive to innovate as well.

- **Overall, there is no clear evidence yet on the net impact of aging on productivity** (see Bryant 2003 for a survey of the academic literature). Romer (1990), and Little and Triest (2002) find that decreases in the growth rate of the working age population in the United States seem to induce an increase in productivity. But other studies conducted on a panel of countries do not find evidence that demographic changes

affect productivity (Brander and Dowrick 1994, Bloom and Williamson 1998). Moreover, the aging issue now faced by developed nations is unprecedented, and it is therefore difficult to know how it will affect productivity.

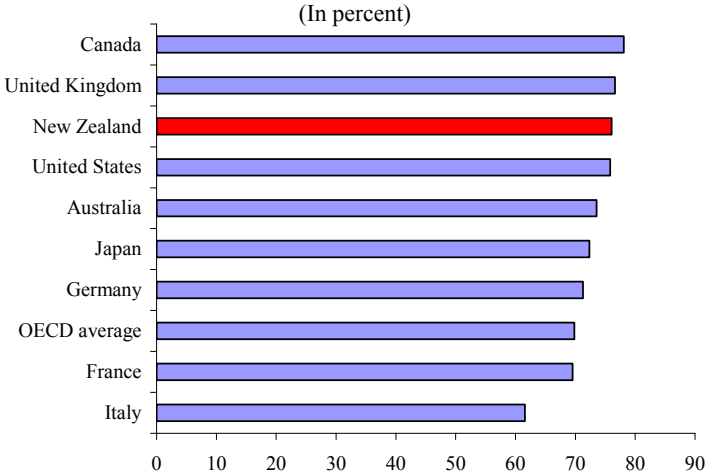
C. Labor Input

8. **Increasing labor input increases a country's GDP.** Labor input is a function of four components: labor participation (the share of the working age population that are in the labor force); unemployment; the average hours worked per person in employment; and the working age population. Improvement in any of these components would raise GDP. People might decide to work less as the country grows richer, however. To keep labor input high, the focus would have to be on identifying impediments that prevent people from working more when they wish to do so.

9. **New Zealand's overall participation rate is high,** but there may be impediments to participating for some categories of workers.

- Average labor participation rate in New Zealand has grown in recent decades (Figure III.3) and is among the highest in the OECD (Figure III.5).

Figure III.5. Average Labor Participation Rate for Men and Women Aged 15-64 (2003)
(In percent)

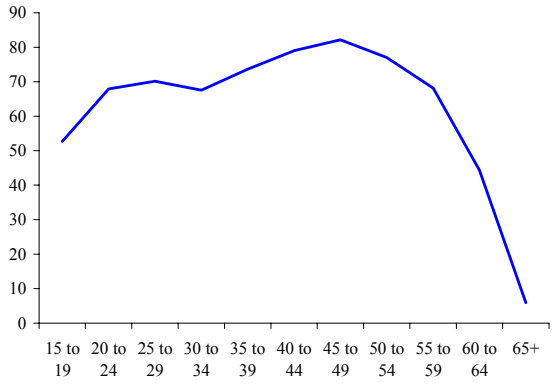


Source: OECD Labor Market Data.

- But participation of women is relatively low compared with countries with the highest rates of female participation such as Canada or Scandinavian nations**,** particularly in the 25 to 45 age group (Figures III.6 and III.8). Participation is of course significantly lower among older people (both male and female) than in the rest of population (Figures III.6 to III.9), although there has been a substantial increase in the participation of 60–64 year olds in the last decade, as people have responded to an increase in the age of eligibility for New Zealand superannuation.

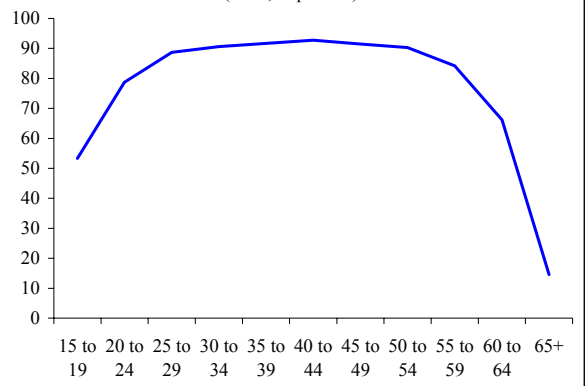
- Reducing obstacles to work might increase participation. While lower participation may reflect the choice of some people not to work, obstacles to joining the workforce might also play a role. For example, limited provision of public childcare may contribute to lower participation of women aged 25 to 45, as argued by Bryant et al. (2004). Also, better health care might give older workers the opportunity to remain in the workforce if they so desire. In many countries, poor health often leads to early retirement or repeated sick leaves. For example, a recent Australian report (Treasury, 2004) stresses that 30 percent of 50 to 65 year olds who retire in Australia do so because of illness or disability. There is evidence that participation also increases significantly with the level of education. Raising the level of education might give some people who would like to work, the opportunity to do so. Finally, fiscal policy has implications for participation. Higher taxes on labor income can discourage paid work (Prescott, 2003, Nickell 2003). Moreover, workers whose skills are in high demand internationally might choose to relocate to countries with more favorable tax rates.

Figure III.6. Labor Participation Rate in New Zealand: Females
(2003, in percent)



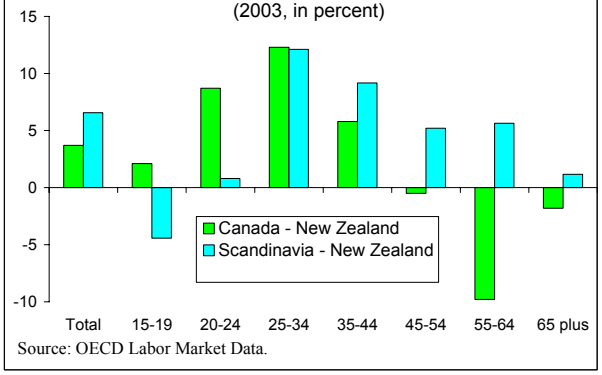
Source: OECD Labor Market Data.

Figure III.7. Labor Participation Rate in New Zealand: Males
(2003, in percent)



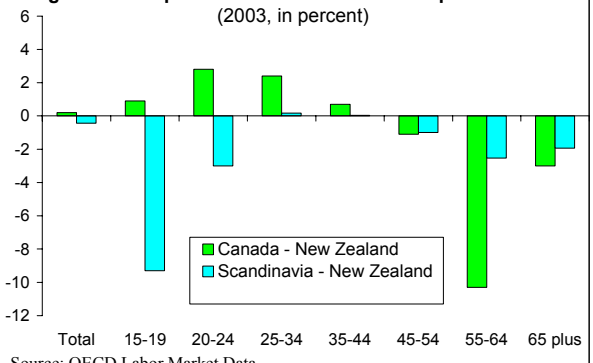
Source: OECD Labor Market Data.

Figure III.8. Gaps in Female Labor Force Participation Rates
(2003, in percent)



Source: OECD Labor Market Data.

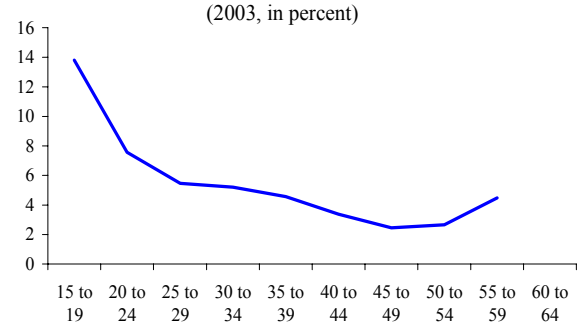
Figure III.9. Gaps in Male Labor Force Participation Rates
(2003, in percent)



Source: OECD Labor Market Data.

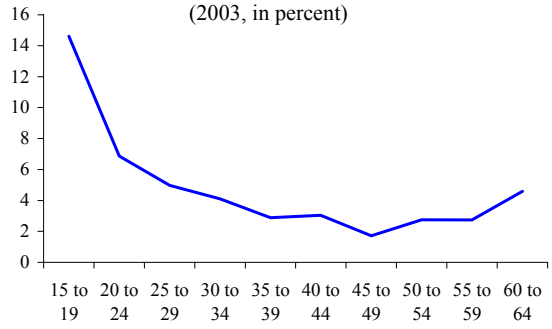
10. **Unemployment in New Zealand is low, but could be even lower among young people.** The unemployment rate in New Zealand, at under 4 percent, is the lowest in the OECD. However, unemployment for both males and females below 30 is significantly higher than the national average (Figures III.10 and III.11). Here again, education (including vocational training) could play a role in supplying young people with the skills they need to enter the workforce.

Figure III.10. Unemployment by Age Groups in New Zealand—Females
(2003, in percent)



Source: OECD Labor Market Data.

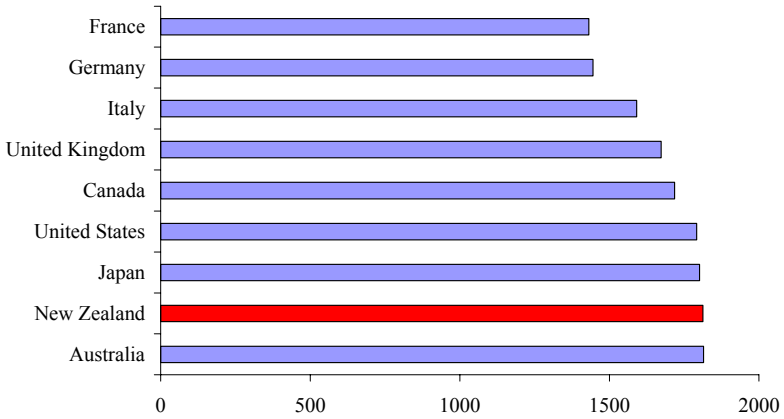
Figure III.11. Unemployment by Age Groups in New Zealand—Males
(2003, in percent)



Source: OECD Labor Market Data.

11. **Average annual hours worked per person in employment are high in New Zealand** (Figure III.12), but might decline in the future to the extent that leisure is a normal good. Such pressure already materialized recently, when the country decided to shift from 3 to 4 weeks of paid leave under the Holidays Act 2004. As New Zealand catches up with the richest countries, some people might choose to work even fewer hours. This will make giving people who want to work longer hours the opportunity to do so even more important if the country is to maintain high growth rates.

Figure III.12. Average Annual Hours Worked per Person in Employment (2003)



Source: OECD Labor Market Data.

12. **The effective retirement age could increase as gains in life expectancy continue.** Life expectancy has risen significantly in recent years (in 2001, life expectancy at age 65 was about 18 years for men and 22 for women, against about 13 and 17 respectively in the early 1960s). Life expectancy is expected to further increase by several years in the decades to come (Bryant, 2003). As workers become healthier at a given age, some might consider retiring later. New Zealand's current pension system does not deter later retirement, as the net pension payment does not decline if a person has other income.

13. **Immigration is unlikely to increase the share of working age population much.** While migrants tend to be younger than existing population, higher immigration will probably not have a large impact on the country's age structure. First, many migrants also belong to older age groups. And second, those who do not, will eventually age. Immigration therefore changes the size of a country's population rather than its structure (Bryant 2003, United Nations 2000). As a consequence, immigration does not seem very helpful in solving the aging problem.

REFERENCES

Australia Treasury, 2003, *Sustaining Growth in Australia's Living Standards,* (Commonwealth Treasury), 2003–04 Budget Papers, Statement 4.

_____, 2004, *Australia's Demographic Challenges* (Canberra).

Bloom, D., and G. Williamson, 1998, "Demographic Transitions and Economic Miracles in Emerging Asia," *World Bank Economic Review*, Vol. 12 (3), pp. 419–56.

Brander, J., and S. Dowrick, 1994, "The Role of Fertility and Population in Economic Growth: Empirical Results from Aggregate Cross-national Data," *Journal of Population Economics*, Vol. 7, pp. 1–25.

Bryant, J., 2003, "The Ageing of the New Zealand Population, 1881-2051," New Zealand Treasury Working Paper Number 03/27.

_____, V. Jacobsen, M. Bell, and D. Garrett, 2004, "The Labour Force Participation and GDP in New Zealand" New Zealand Treasury Working Paper Number 04/07.

Cheng, K., 2003, "Economic Implications of China's Demographics in the 21st Century," IMF Working Paper 03/29 (Washington: International Monetary Fund).

Creedy, J., and G. Scobie, 2005, "Population Ageing and Social Expenditure in New Zealand," *The Australian Economic Review*, Vol. 38 (1), pp. 19-39.

Little, J., and R. Triest, 2002, "The Impact of Demographic Change on U.S. Labor Markets," in Seismic Shifts: The Economic Impact of Demographic Change (Boston: Federal Reserve Bank of Boston).

Prescott, E., 2003, "Why do Americans Work So Much More Than Europeans?," Federal Reserve Bank of Minneapolis Research Department Staff Report 321, November 2003 (Minneapolis: Federal Reserve Bank of Minneapolis).

Romer, P., 1990, "Capital, Labor, and Productivity," *Brookings Papers on Economic Activity,* Brookings Institution.

International Monetary Fund, 2004, *World Economic Outlook, September 2004: How will the Demographic Change Affect the Global Economy,* World Economic and Financial Surveys (Washington).

New Zealand Ministry of Economic Development, 2003 and 2005, *Growth and Innovation Framework, Benchmark Indicators Report,* (Wellington).

Nickell, S., 2003, "Employment and Taxes," paper prepared for the CESifo conference on "Tax Policy and Employment", July 2003.

United Nations, Mimeo, Population Division, Department of Economic and Social Affairs, United Nations Secretariat, 2000, *Replacement Migration: Is It a Solution to Declining and Ageing Populations?* (New York).

IV. Household Indebtedness and Monetary Policy[23]

"…the fact that the household sector is carrying so much more debt means that monetary policy is, in some sense, a more powerful weapon and has to be used sparingly and delicately."[24]

A. Introduction

1. **Household debt has increased substantially in New Zealand, which may affect macroeconomic behavior, including the transmission of monetary policy.** The indebtedness of households has doubled in the last 12 years, to reach an estimated 137 percent of disposable income at the end of 2004. Research by the Reserve Bank of New Zealand (RBNZ) concludes that household cash flows will be more interest sensitive, and hence, consumption will likely be more responsive to interest rates (Hull, 2003). A recent BIS survey similarly concluded that rising household debt makes the household sector more sensitive to shocks to interest rates, income, and asset prices (Debelle, 2004). This suggests that one implication of the rise in household leverage is that central banks may be able to achieve their macroeconomic policy goals with smaller or more gradual adjustments in interest rates.

2. **This chapter finds some empirical evidence that consumer spending has become more interest sensitive as household indebtedness has increased.** In contrast with most previous models of consumption in New Zealand, this paper finds a significant effect from real interest rates on consumption. Consistent with the hypotheses of Hull and Debelle, the strength of this effect appears to have increased as household debt has risen—a model allowing for the interaction of household indebtedness with real interest rates provides greater explanatory power for consumption than a model without this interaction.

3. **Nonetheless, the recent rise in households' equity in housing could moderate the interest rate sensitivity of consumption looking forward.** As discussed below, recent U.S. research confirms that households can better smooth the impact of income shocks on their consumption when collateral for borrowing is more abundant. Housing equity has risen by some 100 percentage points of income in recent years in New Zealand, so the scope for households to smooth the effects of shocks to their disposable income due to changes in interest rates may have risen significantly. While housing equity was not found to affect interest rate responses in the econometric analysis, this may be due to the fact that the large increase in housing equity occurred only at the end of the sample period.

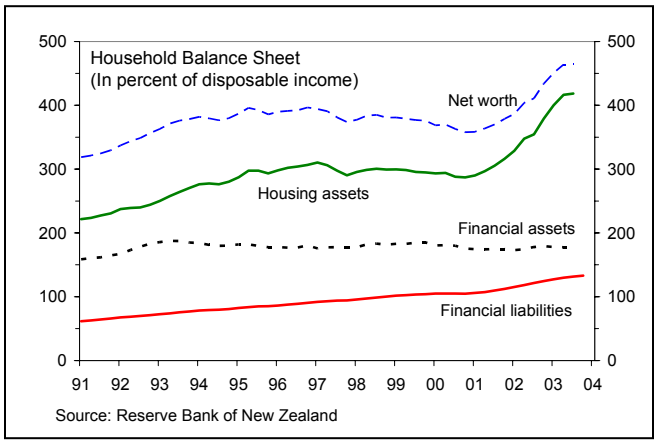
---

[23] Prepared by Craig Beaumont.

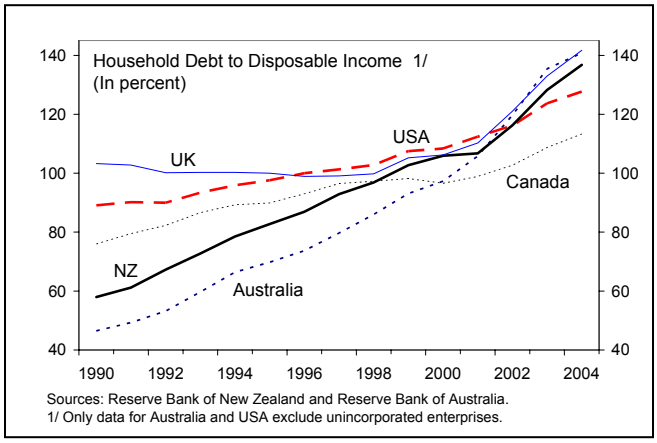
[24] Reserve Bank of Australia Governor Ian Macfarlane, in testimony to House of Representatives, Commonwealth of Australia, February 18, 2005.

B. What Has Happened to Household's Balance Sheets?

4. **Boosted by rising housing prices, household net worth has improved even as debt burdens have risen.**[25] Household debt was about 50 percent of income in the first half of the 1980s. Following the financial deregulation in the mid-1980s, including the removal of quantitative credit controls, the household debt ratio rose steadily to reach 100 percent by the end of the 1990s. The pace of increase picked up in 2002–04, lifting debt to an estimated 137 percent of disposable income at the end of 2004. In contrast, household financial assets, including listed equities, have been quite stable at about 180 percent of disposable income since 1993. Housing loans account for almost 90 percent of household debt, and the recent strong growth in debt has been linked to the rise in housing prices. But as only one-fifth of the rise in housing values was offset by an increase in household debt, household net worth also rose substantially.



5. **The trends in New Zealand's household indebtedness are similar to those in a number of other countries.** Differences in data compilation suggest that cross-country comparisons should focus on large differences in levels, and differences in trends over time.[26] Nonetheless, it can be said that compared with Canada, the U.K., and the U.S., household debt levels in Australia and New Zealand were relatively low in

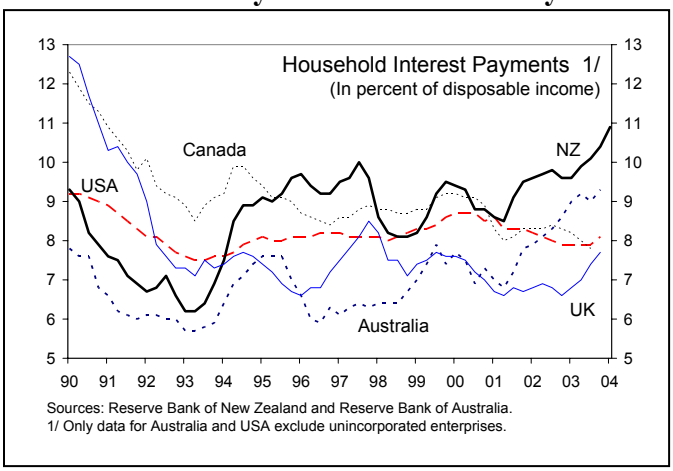


[25] Household balance sheet data are prepared by the RBNZ (Thorp and Ung, 2000). Household debt includes financing for small business secured on housing. Nonfinancial assets do not include the value of equity in unlisted companies, or the value of nonresidential land, e.g., farms.

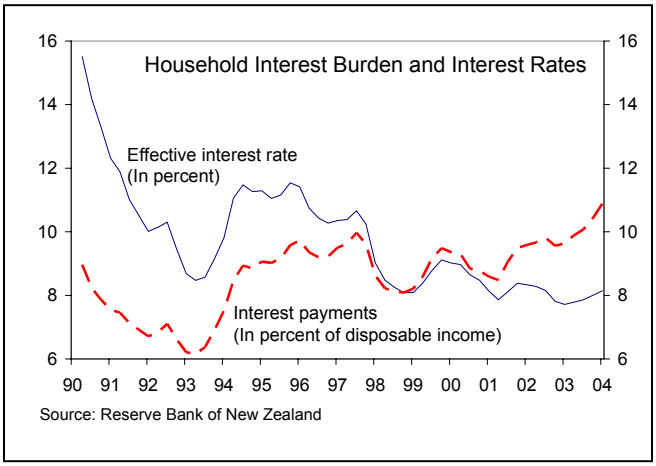
[26] These cross-country data are collected from national sources by the Reserve Bank of Australia. The key differences in the data coverage are that data for Australia and the U.S. exclude small business loans secured on real estate, while data for New Zealand and the other countries do not make this exclusion.

the early 1990s. Debt burdens have risen in all these countries, but rose most quickly in Australia and New Zealand, so household debt levels in 2004 are more similar.[27]

6. **In contrast, debt service burdens have been relatively stable since the early 1990s, as in other countries.** Debt service burdens peaked in the late 1980s and early 1990s in countries other then the United States. But since the early 1990s there has been little change in the trend level of interest burdens. In New Zealand, even though the household debt ratio almost doubled from 1990 to 2001, household's interest payments remained just under 9 percent of disposable income. Nonetheless, interest payment ratios of both Australian and New Zealand households have risen recently, to levels somewhat above earlier highs.



7. **The decline in nominal interest rates made possible by lower inflation accounts for these divergent trends in debt and debt service ratios.** From an average of almost 18 percent in the second half of the 1980s, nominal mortgage lending rates fell to 11 percent in the first half of the 1990s, and have averaged 7¾ percent in the first half of this decade. This 10 percentage point reduction in nominal interest rates is the primary factor accounting for the broad stability in the interest burden despite the rise in debt levels.[28] Indeed, without this decline in interest rates, the large scale rise in debt levels would probably not have been feasible, as the higher resulting debt service burden

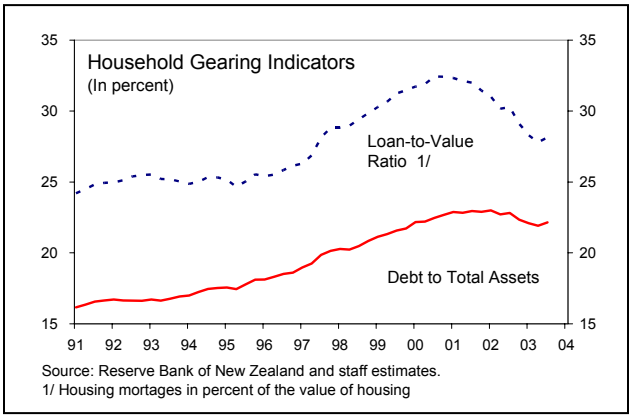


[27] From a broader cross-country perspective, developments in Australia and New Zealand have similarities with those in Spain. In contrast, household debt burdens were relatively stable in the 1990s in France and Japan, increased modestly in Germany and Sweden, and rose to substantially higher levels in Denmark and the Netherlands.

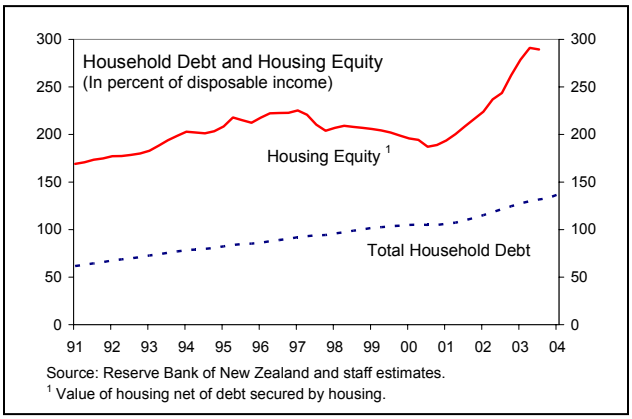
[28] Basdevant, *et al*, 2004, find that a decline in the neutral or equilibrium real interest rate also contributed to the decline in the trend level of interest rates in New Zealand.

might have increased default rates significantly.[29]

8. **Financial liberalization also contributed to the rise in debt levels.** Innovations in mortgage financing followed the financial deregulation and elimination of capital controls in the mid-1980s. These innovations include lower down payments—up to 95 percent of a property's value can be borrowed—and lower transactions costs, e.g., line-of-credit home equity mortgages.[30] However, increases in household gearing ratios have accounted for a relatively modest part of the increase in debt, e.g., the average loan-to-value ratio of housing mortgages of about 28 percent in mid-2004 is only a little above its level in the early 1990s. Rather, by relaxing financing constraints on those purchasing housing, and by making equity in housing more accessible for financing other needs, financial innovations have likely raised the demand for housing, raising housing prices and thereby providing additional collateral for household borrowing.



Source: Reserve Bank of New Zealand and staff estimates.
1/ Housing mortages in percent of the value of housing



Source: Reserve Bank of New Zealand and staff estimates.
[1] Value of housing net of debt secured by housing.

C. How Might Higher Household Debt Affect Monetary Policy Transmission?

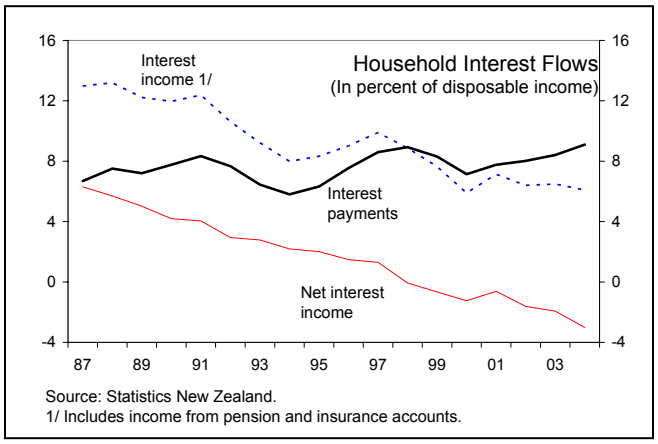
9. **Household debt levels could affect the strength of a number of the channels through which monetary policy influences consumer spending:**

- **Inter-temporal substitution effects may weaken with higher debt levels.** Interest rates affect the tradeoff between consuming now or in the future, where spending on consumer durables may be especially interest sensitive. In practice, the strength of the substitution effects is likely to depend on household's ease of access to credit. A higher debt level could reduce access to new credit, reducing the strength of the response of consumption to interest rate cuts. But such a moderation in interest sensitivity will be smaller if lenders focus more on debt service than debt levels, as an interest rate cut would increase the exposure lenders are willing to accept.

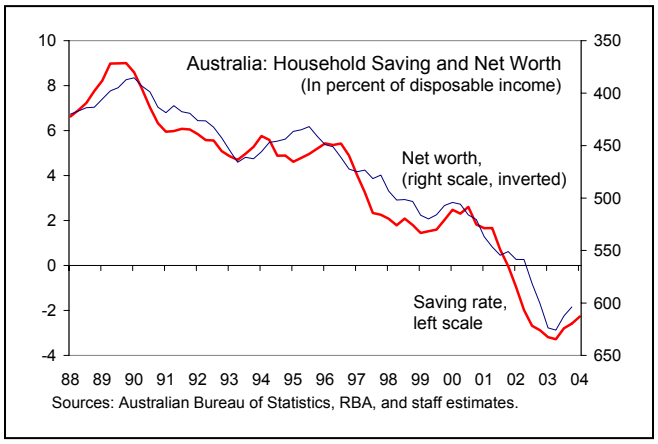
[29] Whitley, *et al*, 2004, find the debt service burden is found to be a key factor driving arrears on mortgages in the UK.

[30] Leslie, 2003, provides further discussion of financial liberalization in New Zealand.

- **Income effects on consumption will become more negative at higher debt levels.** A rise in household indebtedness means that an increase in interest rates will result in a larger increase in household interest payments than before. Hence, the negative income effect on the consumption of debtor households will be larger, while the size of the positive impact on the consumption of creditor households is unchanged. The extent to which this income effect becomes more negative will be greater if debtors have a higher marginal propensity to consume than creditors, which seems likely as the spending of some debtors may be constrained by limits on their access to credit



- **Wealth or financing effects may be affected asymmetrically by higher debt.** In both New Zealand and Australia, the link between consumption and household net worth has been evident in recent years.[31] Hence the effects of interest rates on house prices may be an important monetary transmission mechanism. Financial liberalization may make asset prices more sensitive to interest rates (Iacoviello and Minetti, 2004.) But higher debt levels could have an asymmetric effect on asset price sensitivity to interest rates. High debt may tend to moderate the increase in housing prices in response to interest rate cuts, by limiting the resulting expansion in credit and hence in demand for housing. But high debt could possibly exacerbate the negative impact on housing prices of interest rate hikes, especially if it is associated with a larger share of households who treat housing as an investment.[32]



[31] A chart is presented for Australia, as Statistics New Zealand is reviewing the Household Income and Outlay Account data for New Zealand, but the broad pattern is similar.

[32] It is notable that the 50 basis point tightening by the Reserve Bank of Australia at the end of 2003 was followed by a marked cooling in the housing market in 2004. Anecdotal reports indicate that household consumption responded more strongly due to higher debt levels.

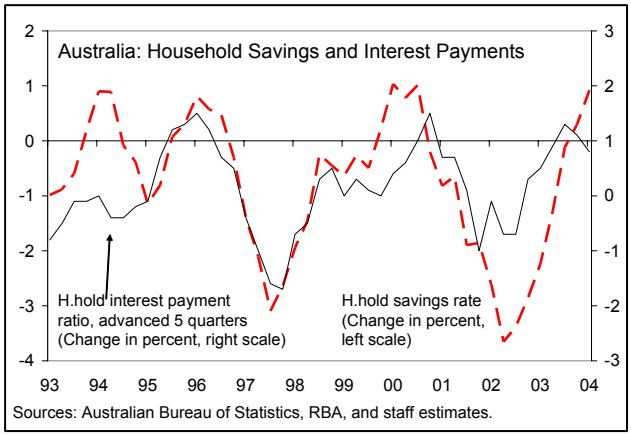
10. **The short-term structure of household debt in New Zealand increases the potential importance of income effects.** While only 26 percent of mortgage lending was on a floating rate basis in November 2004, the bulk of mortgage loans have rates which are fixed for relatively short periods, with 60 percent of all mortgages on rates fixed for 2 years or less. Thus interest payments by New Zealand households are relatively sensitive to changes in official interest rates. Nonetheless, it is observed that some households make larger principal payments when interest rates are low, giving them a buffer when interest rates rise (Debelle, 2004). Hence, the impact of rate hikes may depend on the extent to which they are within the range of cyclical variation allowed for by such buffers.

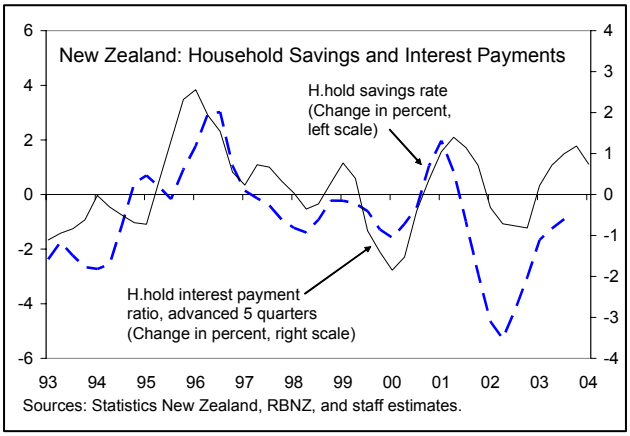
11. **The capacity of households to smooth their consumption in the face of higher interest payments also depends on the level of housing equity.** Lustig and Nieuwerburgh (2004) find that households in the U.S. are better able to smooth their consumption in the face of shocks to regional income if housing wealth is higher, increasing households' collateral for borrowing. In addition, Hurst and Stafford (2004), find that U.S. households are more likely to refinance their mortgage to access home equity if they receive a negative income shock and they have few liquid assets. It therefore seems likely that households with greater equity in housing will be better able to borrow to smooth the impact of higher interest payments on their consumption, so higher housing equity could partly offset the impact of rising indebtedness on the interest sensitivity of consumption.

D. Has Consumption Become More Interest Sensitive in New Zealand?

12. **There is currently little international evidence on the impact of changes in household debt on the interest sensitivity of household spending.** There is a literature analyzing the impact of financial liberalization on household consumption. For example, Barrell and Davis (2004) find a shift in consumption behavior in G-7 countries due to financial liberalization, with a decline in short-run income elasticities, and a rise in short-run wealth and interest rate elasticities. Before discussing the econometric analysis of consumption in New Zealand, the following presents some graphical analysis for Australia and New Zealand, as results for Australia are also likely to be relevant for New Zealand.

13. **Household interest payments appear to have significant effects on savings in both Australia and New Zealand.** In both countries, changes in the interest payment burden are found to be positively correlated with changes in the household savings rate with a lag of about 5 quarters. This indicates the lags in the effect of interest rates on consumption are relatively long, as interest payments themselves respond with a lag to changes in official interest rates. Changes in savings rates in New Zealand have a correlation of 0.61 with changes in the interest payment burden, which is modestly higher than the 0.56 correlation with changes in the interest rate. Since changes in the interest burden depend on the level of indebtedness, this is suggestive that the impact of interest rates on consumption spending has risen with the level of household indebtedness.



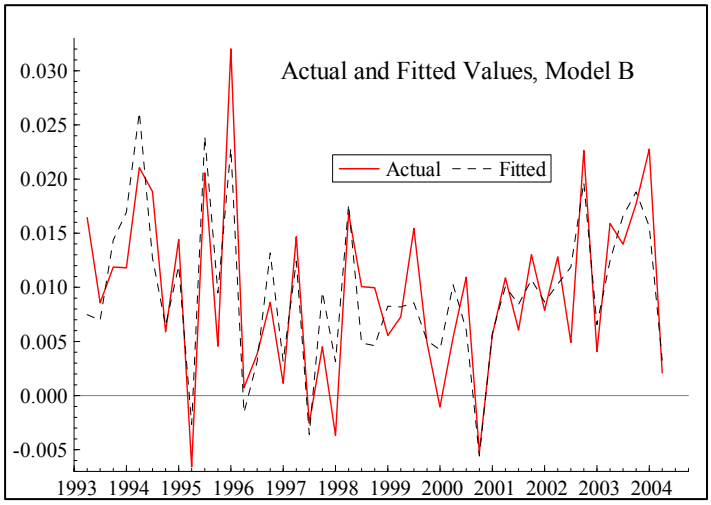


14. **That said, previous econometric analysis has typically not found consumption to be very interest sensitive in New Zealand.** Goh and Downing (2002) report that earlier analysis of consumption in New Zealand did not find a statistically significant effect from interest rates. Their analysis, which took advantage of newly available RBNZ data on household balance sheets, found no evidence of interest rate effects in the short-run, but did find some evidence of effects after 12–18 months. This finding is consistent with above graphical evidence, and indicates that the econometric analysis of consumption behavior will need to allow for relatively long lags.

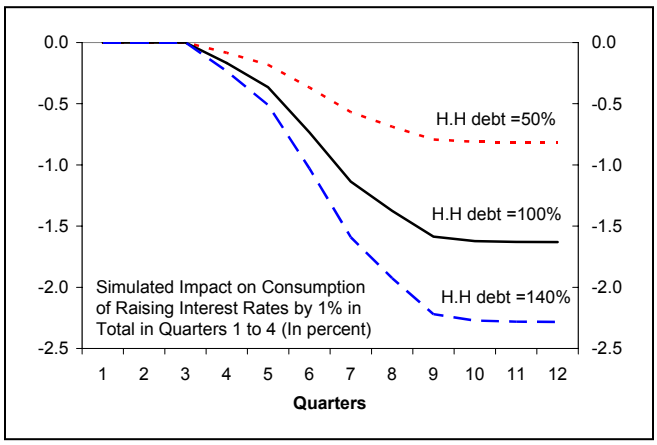
15. **An error correction equation for consumption is estimated based on a standard theoretical model.** Consumption (c) is determined by net wealth (nw), labor income (le), and real interest rates (r) in the long run. The effect of interest rates may depend on the level of indebtedness (d):

$$c = f(le, nw, g(r,d)) \quad (+, +, -)$$

16. **To test whether the level of household indebtedness affects the sensitivity of consumption to interest rates, two versions of the model are estimated** (see Annex IV.1 for details). Model A includes the real interest rate as in a standard consumption equation, while model B allows for the interaction between the real interest rate and household debt relative to disposable income. Real interest rates are found to affect consumption with lags of 3 to 5 quarters in both models. There is little sign of instability in the estimated interest rate coefficient based on recursive estimates of model A. However, model B (R^2=0.734) fits modestly better than model A (R^2=0.707). When both the real interest rate (r) and the interaction between interest rates and debt (r*d) are included in the same equation, the coefficient on r has an incorrectly positive coefficient, and is statistically insignificant, so model B is statistically preferred.[33]



17. **The sensitivity of consumption to interest rates has increased substantially according to these estimates.** The figure presents the simulated effect on consumption in Model B of a 1 percentage point increase in real interest rates made in 25 basis point steps per quarter. With debt approaching 140 percent of disposable income, a 1 percentage point rise in real interest rates is estimated to reduce consumption by 2.3 percent after 8 quarters from the initial rate increase. The final impact is up from an estimated reduction of 0.8 percent when the household debt ratio was 50 percent in the late 1980s. If these estimates are broadly correct, the earlier failure to find significant interest rate effects on consumption may be because these effects were relatively small in earlier samples.



[33] Equations allowing for an interaction between housing equity and real interest rates, to allow for greater ability of households to smooth the income effects of changes in interest rates if housing equity is high, did not produce a statistically significant effect.

REFERENCES

Basdevant, Olivier, Nils Björksten, and Özer Karagedikli, 2004, "Estimating a time varying neutral real interest rate for New Zealand," *Reserve Bank of New Zealand Discussion Paper* 2004/01.

Barrell, R. and E.P. Davis, 2004, "Financial Liberalization, Consumption, and Wealth Effects in 7 OECD Countries", *NIESR Discussion Paper* No. 247.

Debelle, Guy, 2004, "Macroeconomic implications of rising household debt," *BIS Working Paper* No. 153.

Goh, Khoon and Richard Downing, 2002, "Modeling NZ Consumption Expenditure Over the 1990s," *New Zealand Treasury Working Paper* 02/19.

Hull, Leslie, 2003, "Financial deregulation and household indebtedness," *Reserve Bank of New Zealand Discussion Paper 2*003/01.

Hurst, Eric and Frank Stafford, 2004, "Home is Where the Equity Is: Mortgage Refinancing and Household Consumption," *Journal of Money Credit and Banking* Vol. 6, No. 6 (December).

Iacoviello, M. and R. Minetti, 2004, "Financial Liberalization and the Sensitivity of House Prices to Monetary Policy: Theory and Evidence," Mimeo, Boston College.

Lustig, Hanno and Stijn Van Nieuwerburgh, 2004, "Housing Collateral and Consumption Insurance Across US Regions," *National Bureau of Economic Research Working Paper* 10505.

Thorp, Clive and Bun Ung, 2000, "Trends in household assets and liabilities since 1978," *RBNZ Bulletin*, June.

Whitley, John, Richard Windram, and Prudence Cox, 2004, "An empirical model of household arrears," *Bank of England Working Paper* No. 214.

An Error-Correction Model of Household Consumption

Data sources:

c Household consumption, constant 1995/96 prices, seasonally adjusted, Statistics NZ code: SNCQ.S2RP30ZES

le Total gross wage and salary earnings, seasonally adjusted, Statistics NZ code: EESQ.SHAZS,

nw Household net worth, RBNZ. Quarterly data available for March 1991 to June 2004. Covers housing assets in addition to financial assets and liabilities.

h Housing asset value, RBNZ. Quarterly data available for March 1991 to June 2004.

r Real mortgage interest rate ($i - \pi^e$)
i = Effective mortgage interest rate, RBNZ
π^e = 1 year ahead, mean household inflation expectation, Marketscope survey

d Ratio of household debt to disposable income, RBNZ

To convert le, nw, and h into real values, they are deflated by the implicit price of household consumption (SNCQ.S2NP30ZES / SNCQ.S2RP30ZES)

Econometric results (OLS estimates):

Dependent: $\Delta\log(c)$ Sample: 1993Q2 to 2004Q2 Observations: 45

	Model A: Fixed Interest Effect		**Model B: Variable Interest Effect**	
Variable	*Coefficient*	*Std. Error*	*Coefficient*	*Std. Error*
$\log(c)_{-1}$	-0.8214	0.1222**	-0.8229	0.1135**
$\log(le)_{-1}$	0.3814	0.0801**	0.3713	0.0755**
$\log(nw)_{-1}$	0.3143	0.0512**	0.3947	0.0582**
$(r_{-3}+r_{-5})/2$	-0.8854	0.1664**	--	--
$((r*d)_{-3}+(r*d)_{-5})/2$	--	--	-1.3417	0.2261**
$\Delta\log(le)$	0.4180	0.0882**	0.4166	0.0839**
$\Delta\log(h)$	0.2191	0.0518**	0.2246	0.0493**
$\Delta_8\log(nw)_{-1}$	-0.1690	0.0271**	-0.2145	0.0307**
Intercept	2.1481	0.3168**	1.6506	0.2184**
S.E.	0.48%		0.46%	
R^2	0.707		0.734	
DW	1.96		1.97	

Specification tests of Model B:

			P-value
Autocorrelation:	F(1,36) =	0.1615	0.6902
	F(4,33) =	3.3002	0.0222*
ARCH:	F(4,29) =	0.3245	0.8592
Normality test:	$Chi^2(2)$ =	2.5247	0.2830
Heteroscedasticity	F(14,22) =	1.0016	0.4843
Functional form:	F(1,36) =	0.1565	0.6947
Out-of-sample Chow-tests for stability:	F(4,33) =	0.8620	0.4969
	F(8,29) =	1.0165	0.4458

There is negative residual autocorrelation at the 2nd and 3rd lags. This may reflect the measurement error in the levels of consumption, which is evident in the high negative autocorrelation in the differences of consumption. The consequence is that reported standard errors bias are biased up rather than down.

Long-run Solution:

$$\log(c) = 0.45 \log(le) + 0.48 \log(nw) - 1.63 (r*d)$$

18. The estimated long-run coefficients on income and wealth add to 0.93, but the homogeneity restriction that the elasticities on income and wealth sum to unity is not accepted statistically. The lack of homogeneity may reflect problems with gross labor earnings as a proxy for income, and possibly also the omission of significant assets in the measurement of net household wealth, e.g., unlisted business equity and nonresidential land, especially farms. The long-run elasticity on income appears relatively low, although income which is not consumed will also add to wealth, leading to a larger total impact from higher income in the long-run.

Short-run Dynamics

19. The high error correction coefficient indicates deviations from equilibrium consumption levels are not long lasting. The long lag (8 quarters) on the change in wealth has the effect of delaying the full effect of a rise in wealth on consumption by 2 years, where the initial effect is about half of the long-run effect. Hence the strong rises in net wealth due to housing price increases in 2002–03 may continue to support consumption during 2005 even if housing prices are flat. The significance of the contemporaneous change in the value of housing ($\Delta\log(h)$) may reflect a consumer confidence effect, as higher price increases are also associated with greater turnover in housing.