Real Exchange Rates and International Competitiveness – Concepts, Measures and Trends in New Zealand

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DISCLAIMER

ABSTRACT

The paper examines links between real exchange rates (RER) and competitiveness, the channels relevant for New Zealand, merits/demerits of alternative RER measures and New Zealand's trends in terms of those measures. Conventionally, RER appreciation reduces price competitiveness of tradables and lowers output, but for New Zealand positive links have been more prominent. Strong primary exports' demand increased New Zealand's terms of trade, RER and incomes in recent years. However, RER appreciations above the equilibrium level justified by the terms of trade may unduly hurt the manufacturing sector's competitiveness. The paper covers measurement issues, and argues that RER measures need to be tailored to the appropriate price index and trading partners depending upon the competitiveness aspect and the country group being studied.

JEL CLASSIFICATION F4 MACROECONOMIC ASPECTS OF INTERNATIONAL TRADE AND FINANCE

KEYWORDS Real Exchange Rate; International Competitiveness

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"The appropriate definition and calculation of the (real) exchange rate depends upon a complicated interplay of the theoretical model of interest and data availability and reliability."

Menzie D. Chinn (2006)

1. Introduction

The persistence of a high level of real exchange rate since 2000 has been a focal point of policy discussions. The exchange rate workshop hosted by the Treasury and the Reserve Bank in March 2013 discussed a wide range of issues including exchange rate regimes, drivers of the exchange rate and their impact on the real economy, effects of high interest rates on exchange rates and exchange rate cycles. However, recent work has relied on available headline measures of real exchange rate based on consumer prices. Further, the analysis has focused on the inter-relationship between exchange rates and the real economy without detailing the intermediate links between exchange rate and competitiveness, and competitiveness and the real economy.

The paper focuses on the link between the real exchange rate and price competitiveness in terms of conceptual underpinnings, and alternative measures of RER and their trends in New Zealand. The real exchange rate and its effects on the real economy are also conceptually addressed. Section I examines the concepts surrounding the definition of real exchange rate, various channels of its impact on trade and the resultant outcome on the real economy. This section also looks into theoretical and empirical underpinnings of determinants of equilibrium RER. Being unobserved and ambiguous in nature, the equilibrium RER could be difficult to pin down. Thus, this section also identifies relevant average norms used in some studies as practical proxies for equilibrium RER. Section II surveys alternative RER measures based on chosen foreign currency baskets and price indices. In particular, this section discusses merits and demerits of alternative price/cost measures of RER to evaluate their appropriateness relative to various aspects of international competitiveness. The section also presents New Zealand's comparative price competitiveness position within the OECD group of economies in terms available consumer price and unit labour cost real effective exchange rate measures (REER). Section III discusses some stylised trends in New Zealand's REERs as published by the international agencies and the Reserve Bank of New Zealand (RBNZ) corresponding to broad groups of trade partners. This section also presents a wider menu of real effective and bilateral exchange rate measures for New Zealand based on alternative overall and manufacturing price and cost indices compiled relative to five advanced economies. Section IV concludes.

2. Real exchange rate, competitiveness and the real economy: Conceptual links

2.1 Real exchange rates, price competitiveness and output

Real exchange rate depreciation increases international price competitiveness but the impact on output may be uncertain

A real exchange rate (RER) measures domestic prices relative to foreign prices as converted in domestic currency. Symbolically, the RER for New Zealand can be written as:

$$RER = \text{Nominal exchange rate} \times \frac{Prices\ New\ Zealand}{Prices\ Foreign\ country} \quad \text{-------} \ (1)$$

It follows that New Zealand's international price competitiveness increases when its price level decreases or its nominal exchange rate (expressed as foreign currency units per NZ dollar) depreciates relative to the foreign economy, or foreign price level increases. Nominal exchange rate depreciation pushes up demand for domestic goods (exports and import substitutes) relative to foreign goods, but the impact on aggregate demand depends on the offset from the higher margins on intermediate imports paid abroad for producing final goods (Krugman and Taylor, 1978)[1]. The expansionary effect of exchange rate depreciation becomes more prominent for economies with a trade surplus, less import intensity of domestic production and higher share of manufacturing in exports. The East Asian economies (like China) jump-started growth through depreciating their currencies to increase the price competitiveness of their manufacturing exports. However, growth experiences from a majority of economies do not suggest that the undervaluation of exchange rate was explicitly pushing up economic growth (Magud and Sosa, 2010).

RER appreciation indicates the tradables sector's loss in internal competiveness or its loss in external competitiveness or both; for New Zealand the fall in competitiveness of the tradables relative to the housing sector and the rise in labour costs relative to elsewhere have contributed to RER appreciation

Unlike the small East Asian economies, New Zealand's non-tradable sector is sizeable, and non-tradable inflation has been an important driver of RER appreciation since 2000. The tradable sector produces output most likely to be traded internationally and includes both actual and potential exports, and import substitutes. The non-tradable sector constitutes the rest of the economy. An economy loses its competitiveness when the tradable sector loses its competiveness either internally relative to non-tradables or

[1] The nominal exchange rate depreciation increases the economy's output through three channels:

- a rise in demand for the exports denominated in domestic currency as their foreign currency price falls
- a rise in exports denominated in foreign currency as their domestic currency price increases and incentivises their production
- a rise in demand for import substitutes as the prices of imports in domestic currency terms increases.

The contractionary impact comes when higher value of payments on imported inputs reduces domestic income and demand through fall in propensity to consume or invest. Krugman and Taylor (1978) show that in the case of a trade surplus the expansionary channel dominates, and in the case of a trade deficit, the contractionary effect becomes more prominent in driving economy's equilibrium output down.

externally relative to foreign tradables or in terms of both the measures. The tradables sector loses its internal competitiveness when tradable prices fall relative to non-tradable prices, and their external competitiveness when their prices rise relative to the prices of foreign tradables, and these result into an increase in RER (See equation 2 below).

$$RER = NER \times \left[\frac{tradable\ prices\ NZ}{foreign\ tradable\ prices}\right] \times \left[\frac{Non-tradable\ prices\ NZ}{Tradable\ prices\ NZ}\right]^{\alpha} \times \left[\frac{Non-tradable\ prices\ NZ}{Tradable\ prices\ NZ}\right]^{\alpha *} \text{-- (2)}$$

where NER is nominal exchange rate, and α and α are the shares of non-tradable prices in New Zealand price and foreign prices respectively.*

Depending upon the key driver, the RER can be effectively represented in terms of the price ratio of non-tradables to tradables (for small economies facing given international prices of tradables) or the price ratio of tradables to foreign tradables (when non-tradable prices are relatively rigid) or the price ratio of domestic unit labour cost to the foreign unit labour cost (for homogenous goods whose world prices equalise) (See also Box I).

Box 1: Alternative Representations of Real Exchange Rate: Derivation

Following Chinn (2006), the standard representation of the real exchange rate can be decomposed into (i) the relative price of tradables in terms of foreign tradables (external competitiveness), (ii) the relative price of non-tradables in terms of tradables in the home country (internal competitiveness), and (iii) the corresponding relative price in the foreign country, as follows.

$e = E \times P/P^*$..... *(1),* where *e* denotes the real exchange rate, *E*: nominal exchange rate (units of foreign currency per unit of home currency), *P*: home country price index and *P**: foreign price index.

Decomposing the two price indices into their non-tradable (P_n) and tradable components (P_t), and assuming shares of *α* and *α** of non-tradables in the home price and foreign prices, respectively, we get,

$P = (P_n)^{\alpha}(P_t)^{(1-\alpha)}$, $P^* = (P^*_n)^{\alpha^*}(P^*_t)^{(1-\alpha^*)}$ ..... *(2)*

Substituting (2) in (1), we get,

$e = E \times [(P_n)^{\alpha}(P_t)^{(1-\alpha)}]/[(P^*_n)^{\alpha^*}(P^*_t)^{(1-\alpha^*)}]$ ..... *(2) or*

$e = E \times [(P_n)^{\alpha}P_t(P_t)^{(-\alpha)}]/[(P^*_n)^{\alpha^*}(P^*_t)(P^*_t)^{(-\alpha^*)}]$*, which after rearranging,*

$e = E \times (P_t/P_t^*) \times (P_n/P_t)^{\alpha} \times (P^*_n/P^*_t)^{(-\alpha^*)}$..... *(3), and in log form becomes,*

$\log e = \log E + (\log P_t - \log P_t^*) + \alpha(\log P_n - \log P_t) - \alpha^*(\log P^*_n - \log P^*_t)$ .. (4)

Equation (4) shows that the real exchange rate of an economy can increase due to (i) rise in the nominal exchange rate, (ii) rise in the relative price of tradeables in terms of foreign tradables (loss in external competiveness of tradeables), (iii) rise in the relative price of non-tradeables in terms of tradeables in the home country (loss of internal competitiveness in tradeables) and (iv) fall in relative price of non-tradeables in terms of tradables in the foreign economy. However, all may not draw equal importance. The key driver of the real exchange rate varies depending upon the context.

Accordingly, alternative representations of real exchange rate are possible based on the key driver, as follows.

- For a small open dependent economy, the relative price of non-tradables in terms of tradables in the home country adequately proxies the real exchange rate. This is because a small economy

with no control over the world supply of tradables faces given tradable prices (Salter, 1959 and Swan, 1960). If the law of one price (LOOP) holds for tradables, and the home and foreign tradable baskets are similar consisting of homogenous goods, the tradable price ratio between home and foreign becomes constant subject to transportation costs/trade barriers. Further, the foreign non-traded to traded price ratio is also outside domestic policy control. So, excess supply/demand spills on to non-traded prices, impacting the non-traded to traded price ratio and the real exchange rate. An increase in the non-traded to traded price ratio raises the real exchange rate and reduces internal competitiveness of tradables reallocating resources towards non-tradables. The real exchange rate is effectively represented by:

$$\log e^1 \simeq \log E + \alpha(\log P_n - \log P_t) \text{ ..... (5)}$$

- Alternatively, the tradable price ratio between the home and the foreign country adequately represents the real exchange rate when tradable prices do not equalise and non-tradable prices are more rigid. Engel, 1999 argued that tradable prices may vary while non-tradable prices may not, at least in the short-term. Under such a set up, the relative price of tradables in terms of foreign tradables adequately represents the real exchange rate. Increases in *external* competitiveness of tradables through their fall in price relative to that of the foreign country lowers the overall real exchange rate. The real exchange rate is effectively represented by:

$$\log e^2 \simeq \log E + (\log P_t - \log P_t^*) \text{ ..... (6)}$$

- Real exchange rate is also conceptualised as a cost competitiveness measure for an economy's tradables relative to the foreign tradables (Marsh and Tokarick, 1996). The increase in wages over and above labour productivity increases raises the real exchange rate and reduces an economy's cost competitiveness. Assuming a mark-up (μ) factor over nominal wages (W), the tradable price can be determined by:

  $P_t = (W/A)(1 + \mu)$ ..... (7), where *A* denotes the labour productivity, or

  $\log P_t = \log W - \log A$ .....(8), assuming constant mark-ups.

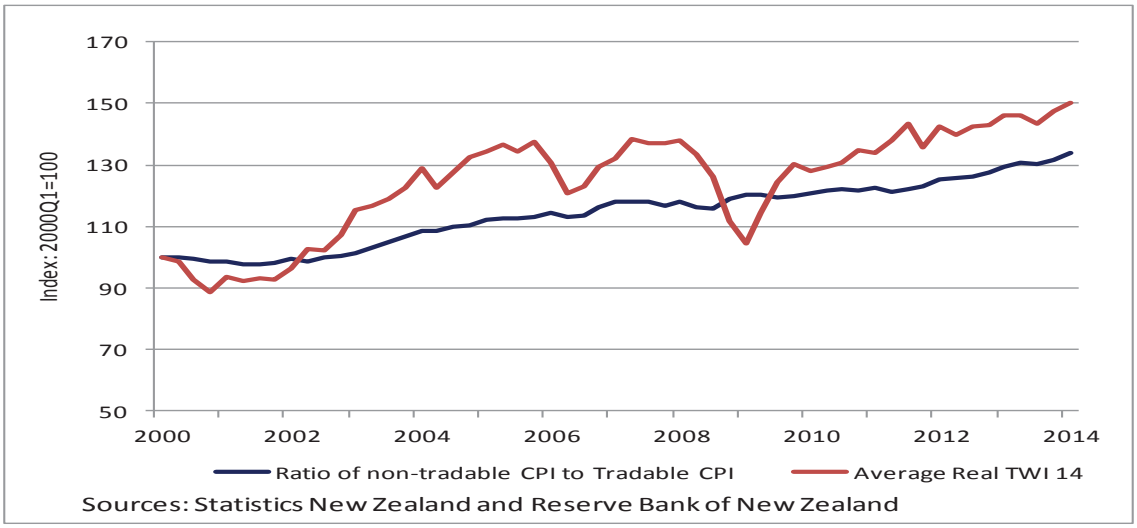
  Substituting (8) in (6), the real exchange rate is adequately represented as a cost competitiveness measure by:

  $\log e^3 \simeq \log E + (\log W - \log A) - (\log W^* - \log A^*)$ --------- **(9),** where * denotes variables in the foreign country**.**

Source: Chinn (2006)

In reality, both internal and external competitiveness measures matter for incentivising resource shifts to tradeables goods production and increasing the trade balance. New Zealand's tradables have been losing internal competitiveness relative to the non-tradables, and external competitiveness through higher unit labour costs compared to other major OECD economies (Figures 1 and 12). Losses in internal competiveness and external competitiveness of tradables have contributed to New Zealand's real exchange rate appreciation. The impact of RER appreciation on economic growth depends on whether the higher growth in non-tradables can offset the lower growth in tradables. Since non-tradables are characterised by lower productivity given the limits to the size of domestic market in New Zealand, RER appreciation can drive down overall productivity and growth.

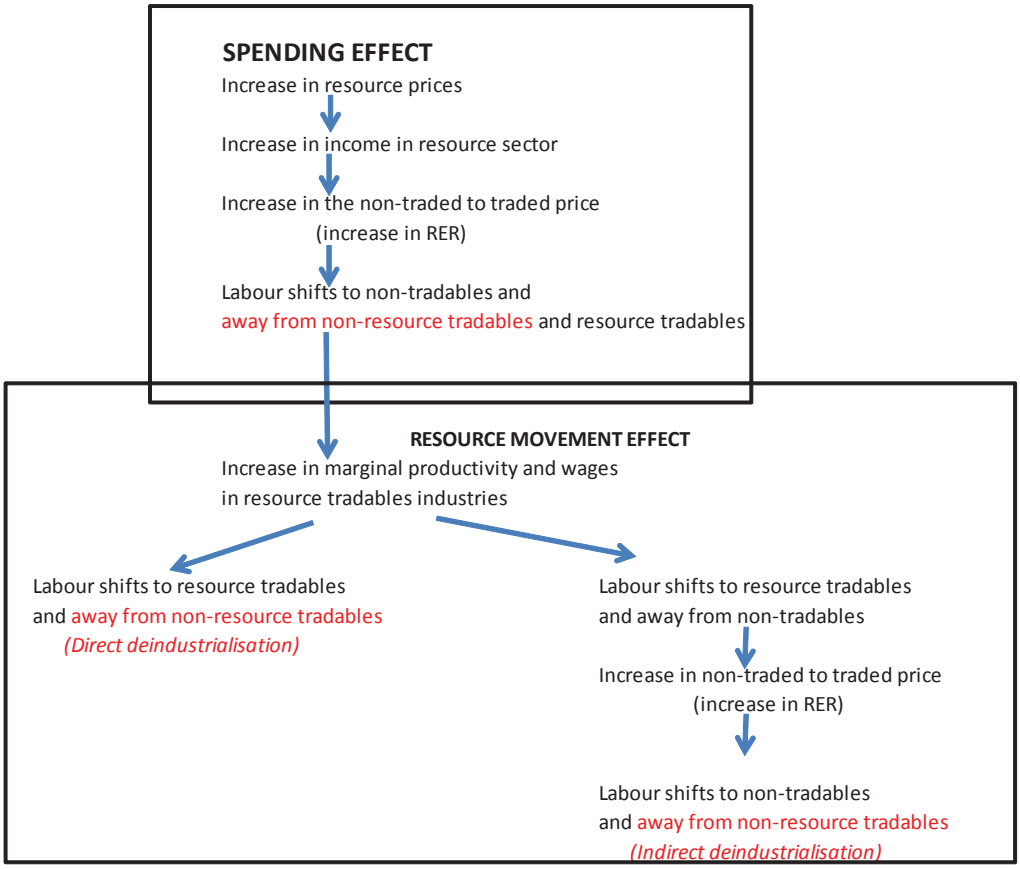
Figure 1: Relative price of Non-tradables to Tradables and RER



Resource price shocks also drive RER appreciation; for New Zealand the increase in food product prices have driven RER appreciation and the persistent demand for primary exports has supported overall growth

Conventionally, RER appreciation deteriorates the trade balance, and this drives down economic growth. International evidence also points that an overvalued RER and its high volatility pull down growth (Magud and Sosa, *op. cit*). However, for natural resource rich economies, the RER appreciations often result from rising prices of oil or food exports. An overvalued currency then drags down growth of non-resource tradables like manufacturing but overall growth could still be supported by expanding primary tradable industries and the non-tradable sector. Corden and Neary's (1982) model disaggregates the tradables sector into 'booming' resource and lagging tradable industries to study the impact of resource price shocks (Enzo and Oxley, 2013). A rise in world resource prices raises incomes from commodity exports. Rising incomes cause real exchange rate appreciation, trade deficits and shift in resources away from manufacturing and other lagging tradable industries through two effects, viz., (a) spending effect (increase in non-traded-to-traded price) and (b) resource movement effect (shift in labour from lagging tradables to booming resource tradables and non-tradables) as shown in diagram I.

DIAGRAM I: RER APPRECIATION AND RESOURCE SHIFTS AWAY FROM NON-RESOURCE TRADABLES SECTOR (INCLUDING MANUFACTURING)



Source: Based on Enzo and Oxley (2013)

RER appreciations driven by commodity price increases of a more permanent nature ('Dutch Disease') do shift resources away from other sectors like manufacturing. However, if the booming primary commodity sectors generate positive externalities benefitting the overall economy, then the RER appreciations help in reallocating resources without hurting growth. Commodity exporters like New Zealand, Canada and Australia have benefited from the resource-sector led growth despite the high RERs dragging down competitiveness of growth of manufacturing and services (Rogoff, 2005). The rise in New Zealand's commodity prices since 2006 has lifted the terms of trade, and this has reflected strong demand for primary exports like dairy and meat products (Figures 2 and 3). Accordingly, primary exports have risen compensating for stagnation in exports from manufacturing, travel and transportation (Figure 4). The growth of the primary tradables has also supported the overall growth of the economy (Figure 5).

Figure 2. ANZ Commodity Price Index

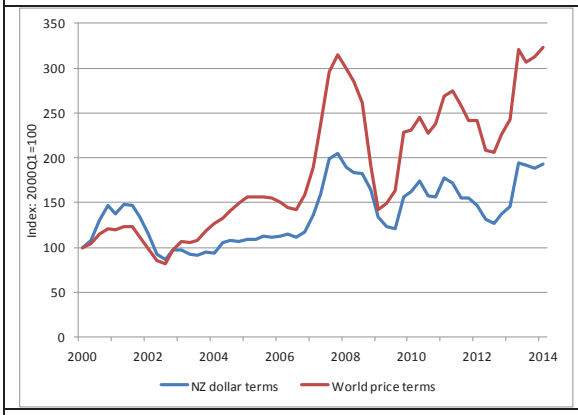


Figure 3: New Zealand's Merchandise Terms of Trade

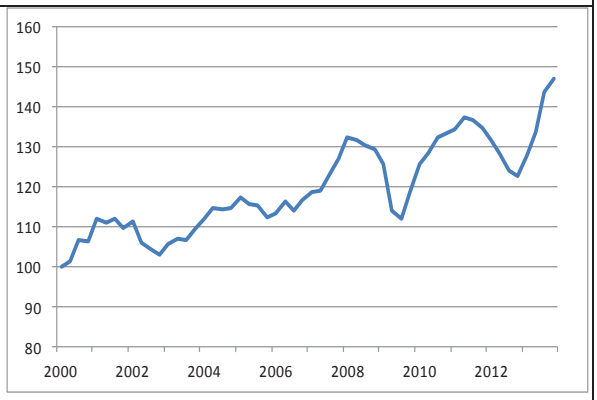


Figure 4: New Zealand's merchandise exports

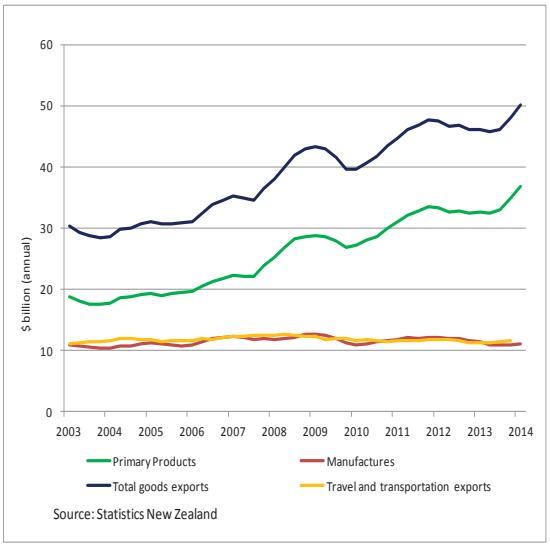
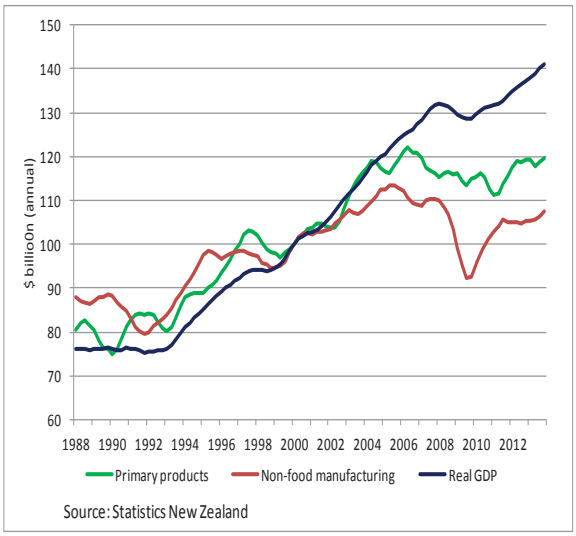


Figure 5: New Zealand's booming primary sector



Critically, however, lack of unambiguous criteria for tradable and non-tradable bifurcation increases susceptibility of internal/external competiveness measures to the classification adopted. Often, exports/sales and imports/sales ratios are used for distinguishing tradable and non-tradable sectors (Schoefisch, 1992). For New Zealand, this has been a contention for transport and distribution sectors, prompting their equal bifurcation between tradable and non-tradable categories. More recently, the Treasury's standard measure for tradable output for New Zealand included primary (agriculture, forestry and logging, fishing and mining), manufacturing and services based on most likelihood of production of tradable output. The remaining output is non-tradable (Treasury, 2012).

Alternative criteria for judging the tradable segment could produce alternative measures of tradable output. Statistics New Zealand now publishes measures of tradable and non-tradable output using direct and indirect methods. By the direct method, tradable industries include those that face international competition, either in export markets or by competing with imports. The indirect method also includes those which face international competition indirectly as their output is included as part of the

value of exports or import competing products. The tradable sector accounted for around 21% of GDP by the direct method and around 49% by the indirect method for New Zealand during 2010-13. Statistics New Zealand also releases official measures of consumer prices showing tradable and non-tradable components. However, the extent of correspondence between the output measure and the price measure of tradeables in terms of sectors need to be examined for drawing implications of high non-traded to traded prices on tradable output. Statistics New Zealand does not disaggregate the profiles of tradable and non-tradable consumer prices across various segments.

2.2 Real exchange rate equilibrium

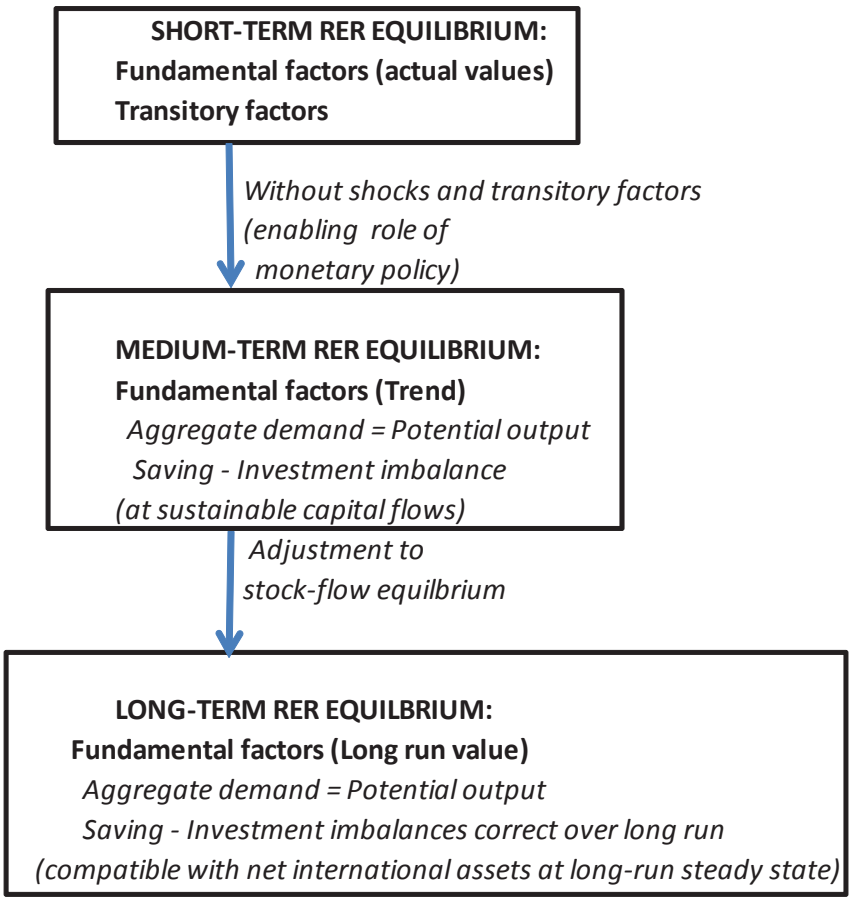
Changes in RER relative to equilibrium represent changes in competitiveness but equilibrium may vary over time.

The RER is a relative price variable, and its equilibrium corresponds to the level that equilibrates internal balance (aggregate demand with aggregate supply) and external balance (saving-investment gap with net capital flows). Changes in the RER relative to its equilibrium matter for competitiveness because a persistently overvalued RER reflects unwarranted deterioration in an economy's competitiveness, while an undervalued RER indicates its non-sustainability at competitive levels. However, estimating the extent of RER misalignment is challenging because the equilibrium could be not only difficult to determine but may also evolve over time alongside an economy's fundamentals[2].

Driver and Westaway (2004) provides a taxonomy of determinants of equilibrium RER over the short-term, medium-term and long-term (Diagram 2). Based on this taxonomy, the RER could misalign in the short-term from the level justified by the economy's fundamentals and transitory factors due to random and unexpected supply/demand shocks and asset market bubbles. A misalignment over the medium run would be relative to the equilibrium RER consistent with the economy running at its potential capacity (NAIRU consistent) and 'sustainable' level of external balances (*i.e*. consistent with eventual convergence to a sustainable stock of external liabilities). Thus, output gap (deviation from actual from potential output) and unsustainable saving-investment gap (over and above the gap that can be financed through capital flows) along with short-run misalignment factors could account for deviation of the actual RER from the equilibrium over the medium-term. The long run equilibrium level of RER corresponds to an economy's fundamentals being at long run steady state values without any endogenous tendency to change. In other words, whereas medium-run exchange rate equilibrium concepts relate to the situation in which fundamental *flow* variables are at their trend values (i.e. current account balances), long-run equilibrium concepts involve the corresponding *stock* variables (i.e. the net international investment position) settling at their steady state levels. Thus, misalignment of the current RER over its long term equilibrium reflects the effect of saving-investment imbalance and asset stock-flow adjustments together with any short and medium term misalignment factors.

[2] The fundamentals for an economy could include consumer preferences, differentiated products, imperfect markets, non-tradables, demographics, fiscal policy, and inter-sector and international productivity differentials.

DIAGRAM 2: RER equilibrium - Determinants over time



Source: Based on Driver and Westaway (2004)

Different equilibrium levels of the RER could be relevant for assessing New Zealand's macroeconomic outlook. The short-term equilibrium RER could be relevant for drawing economic forecasts up to five years, while the medium-term for a 10-year projection span and the long-term for the time span beyond 10 years. Driver and Westaway (*op. cit*) provide a menu of empirical models for estimating RER misalignments relevant for different time spans. In the context of New Zealand, the fundamental determinants of the exchange rate primarily include the terms of trade, real house prices and interest rate differentials with the rest of the world. The choice of fundamentals would depend upon macroeconomic theory, while equilibrium estimates of RER would vary as per empirical model used corresponding to short, medium or long run.

The adjustments of the RER back to equilibrium levels in the empirical models use alternate arbitrage conditions (Table 1). In the shorter-term models, the uncovered interest parity (UIP) condition is used assuming that the exchange rate adjusts to equalise expected returns (adjusted for risks) on domestic and foreign assets. In the longer-term models, the purchasing power parity (PPP) condition is used, assuming that the nominal exchange rate adjusts to equalise price levels for similar tradable

baskets in common currency [law of one price (LOOP)] subject to trade and transport barriers, country policies including destination-specific mark-up (Krugman, 1987). Empirical models usually test for mean-reverting hypothesis for the RER to its equilibrium value, as defined by purchasing power parity (PPP). In reality, however, nominal exchange rate movements may not restore PPP, resulting in deviations of the RER from its equilibrium, at least in the short run, or sometimes for considerable periods of time.

Table 1: Common Approaches to Measure Equilibrium Exchange Rates (Real or Nominal)

Name	Acronym	Relevant Time Horizon	Dependant Variable	Change or Level
Uncovered interest parity	UIP	Short-run	Real or Nominal	Change
Purchasing power parity	PPP	Long-run	Real or Nominal	Level
Macroeconomic balance	MB	Medium-run	Real Effective (usually)	Level
Fundamental equilibrium exchange rate	FEER	Either medium or long run	Real Effective (usually)	Level
Equilibrium real exchange rate	ERER	Depends but usually long run	Real or Nominal	Level
Structural vector auto regression	SVARs	Short-run and long-run	Real	Change

Source: Driver and Westaway (2004)

Importantly, assessing competitiveness changes involves filtering out variations in the estimated equilibrium RER from the actual RER changes over the relevant time span. If the RER movements are driven by changes in an economy's fundamentals that affect the equilibrium RER, then the changes in the RER itself may not reflect changes in competitiveness (Di Bella et. al, 2007). The equilibrium RER could increase over time as an economy develops, as per the Balassa-Samuelson (1964) effect, through productivity-driven wage increases in tradables spilling over into wages of non-tradables sector. This could drive up the non-traded-to-traded price ratio for an economy as its per capita income increases relative to others. The RER increases due to productivity improvements do not denote fall in an economy's competitiveness. Similarly, the RER appreciations or price increases on account of a permanent and positive natural resource shock or higher terms of trade also indicate a change in equilibrium levels.

For New Zealand, Brook and Hargreaves (2001) found that the bilateral nominal USD/NZD exchange rate co-moved with the US-NZ relative consumer price ratio (excluding GST and interest) over 1964-2001, thereby confirming that the RER converged over its long-run PPP equilibrium value during this period. The study found that terms of trade changes were a statistically significant determinant of variations in bilateral USD/NZD exchange rates, while interest rate differentials and productivity turned out to be relatively insignificant factors. Based on a cross-country comparison of prices for individual goods, augmented with a Balassa-Samuelson variable, the study suggested that the New Zealand dollar was close to its faire value in 1999, but became undervalued in 2000.

More recently, the IMF Staff report[3] (2012) found the real effective exchange rate (REER) of New Zealand to be overvalued in the range of 10-20 percent. Assessing New Zealand dollar's appreciation subsequently, the IMF's Article IV in 2014 found that even with the strong terms of trade, the New Zealand dollar was currently stronger than would be consistent with stabilizing net foreign liabilities over the long run, and on this basis appears to be overvalued. The other contributory factors were the gap between domestic and foreign interest rates, New Zealand's favourable growth outlook, and an appetite for relatively safe New Zealand assets. Admittedly, the short-term exchange rate models may not predict the behaviour of the RER as accurately as the models for longer-term (Driver and Westaway, *op. cit*). This may be due to short-term volatility associated with trading activity. Also, the longer-term empirical models provide better understanding of underlying macro drivers of the RER that help in predicting its behaviour over time.

Difficulties in identifying equilibrium RER often orient competiveness analysis to actual changes in RER

The equilibrium RER varies not only over time but its identification also remains sensitive to the macro model chosen to identify the fundamental determinants. Standard trade theories (Heckscher-Ohlin-Ricardian) highlight the prominence of international trade patterns to drive the balance adjustments at a macro level, while macroeconomic theories (Keynesian) emphasise the influence of expenditure changing policies (fiscal and international transfers).

The deviation of the actual RER from its long-term average is often a first port of call for measuring changes in competitiveness for a country. Rogoff (2005) found this 'distance from average norm' measure quite instructive in terms of competitiveness as the long-term average REER is a 'fair measure' of equilibrium as financial/other shocks get averaged out. The average measure could be a reasonable proxy for RER equilibrium provided that the country's current account performance stabilises over an extended period. Rogoff also indicated that persistent current account imbalances need not indicate lack of stability, particularly if they mirror borrowings for financing productive investment in export or infrastructure sectors. Equally, scaling back of over-investments in previous years may lead to current account surpluses, which does not indicate increased competitiveness. On the other hand, trade/macroeconomic policy-driven current account imbalances could be indicative of exchange rate misalignment impacting on international competitiveness that may not be sustainable. The 'distance from average norm' measure of RER misalignment could fairly indicate competitiveness for countries showing extreme under/over-valuation with respect to the norm but may not be appropriate for those with moderate deviations.

RER misalignments are more directly observable under fixed exchange rate regimes than under floating exchange rate regime

Under a floating exchange rate regime, interpreting RER misalignments from nominal exchange rate movements may be difficult to the extent that they include responses for

[3] IMF Staff Report for 2012 Article IV Consultation, May 2012

neutralising the impact of changes in relative prices or fundamental drivers to equilibrium. On the other hand, for economies that do not have floating exchange regimes, the potential for real exchange rate disequilibrium to occur is more obvious because of the stickiness of domestic wages and prices. When nominal exchange rate movements are not aligned with the fundamentals of a fixed-exchange rate economy, the only way for the RER to be bought back into equilibrium is through adjustment in domestic prices. The corollary is that competitiveness can be improved by policies directed at lowering domestic prices. As a consequence, much of the work on assessing competitiveness using RER measures is focussed on fixed-exchange rate economies and policy responses to adjust domestic prices.

2.3 Real exchange rates, growth and macroeconomic policy

The RER is an important conditioning variable for facilitating growth in open economies

The RER does not appear as an explicit factor in traditional growth literature, which focussed on contributions of factors of production, technical change (exogenous/endogenous) and domestic institutions. However, the RER can be an important conducive factor to growth although as a relative price variable it is amenable to myriad influences, which may not be at policy discretion in countries with open current and capital accounts (Eichengreen, 2007). Keeping the RER at a competitive level (relative to corresponding low growth levels), avoiding its excessive volatility and removing policy distortions could be a 'facilitating' condition' for capitalising growth fundamentals.

The East Asian economies could sustain competitive RERs through appropriate monetary and fiscal policies. Some of them had high saving rates that helped their export-led growth strategies without causing undue inflationary pressures. Undervalued RERs increased price competitiveness of manufacturing exports, and helped these economies to expand the market for these industries (Box 2). The key policy decision for these economies, however, was to design and time the exit from the RER undervaluing strategy before undue inflationary pressures were build up or when the current account surplus became unsustainable.

Box 2. Links between RER, Net Exports and Output

The RER is a relative price variable that determines the trade balance by impacting competitiveness of an economy. The trade balance, in turn, affects overall demand and output of the economy. Following La Marca (2004), standard RER-output relationships can be shown in structuralist model (Keynes-Kalecki) in terms of RER-current account balance and current account balance-output links, as below:

$$X = A(A;\emptyset) + CA \quad \text{(i)}$$

$$CA = CA(X, X^*, e) \quad \text{(ii)}$$

$$X = X(L) \quad \text{(iii)}$$

$$PX = (1+\tau)[wL + eP^*\gamma X] \quad \text{(iv) or, equivalently,}$$

$$(1-\pi) = (w\beta + e\gamma) \quad \text{(iv)}'$$

where, X:output, e: RER denotes price of exports relative to imports, A: domestic demand;

CA: exports – imports, τ : mark up factor; $\pi = \frac{\tau}{(1+\tau)}$: profit share;

β: labour coefficient and γ: imported input coefficient in output; L:labour input, w:wage; and Ø: redistribution, fiscal policy effects on effective demand and foreign variables are with * superscripts.

Assuming that the economy produces a composite good, which is also exported, trade balance refers to current account balance and production of each unit of output requires labour and imports, then the RER changes impact overall demand through two channels, viz., external demand and import margins.

Illustratively, RER depreciation would

- increase exports by making them cheaper and reduce competitive imports by making them expensive
- increase the value of exports net of competitive imports or trade balance used for final use (assuming that price elasticity of demand for exports is higher than that for imports, i.e., Marshall-Lerner condition, holds; although with quantity rigidities in the short term, value of imports would increase and value of exports would fall initially), which would have a positive effect on overall effective demand
- increase demand for imported intermediate inputs (non-competitive imports) to meet higher output supply, which would dampen increase in net exports and have a negative impact on overall effective demand;
- reduce domestic factor incomes due to higher import margins transferred abroad, which would reduce consumption and overall effective demand; and
- reduce consumption demand through lower value of multiplier if higher import margins leads to squeeze in wages to retain profit margins, which would reduce overall effective demand.

References:

La Marca, M. (2004) and Krugman, P. and Taylor, L. (1978)

A competitive RER increases the share of manufacturing exports but this may not be sufficient to raise overall growth. In the East Asian economies, other factors also mattered for lifting overall growth. There were horizontal spillover benefits from exporting firms to other firms, but more importantly the firms in these economies had organisational flexibility to assimilate new/foreign technology and improved supply of inputs that contributed in lifting the overall growth.

Equally, commodity price-driven RER appreciation may not make the whole economy uncompetitive but could signal investment switches towards commodities industries. In the case of resource-based economies like Australia, the RER appreciations due to fundamental factors like resource price shocks may not warrant policy action unless there is evidence that this is unduly hurting the growth of the manufacturing sector, and more importantly that the lagging manufacturing sector is pulling down overall growth. However, policy could still have some role in addressing the impact of shocks that lead to undue exchange rate appreciation (Casino and Oxley, *op cit*). This is because such shocks could bring down the productivity growth of manufacturing that could hurt an economy's growth in the long run [4]. However, Casino and Oxley's survey showed that in the case of New Zealand, exchange rate misalignment had an insignificant impact on export volumes. The impact was found to affect manufacturing and construction sectors rather than the whole economy.

[4] Magud and Sosa's (2010)'s extensive literature survey found evidence of Dutch Disease phenomenon reducing manufacturing sector's international competitiveness and growth through RER appreciation. Typically, rise in TOT increases domestic income/wealth, which raises domestic demand pressures impacting the non-tradeable sector for a small economy facing exogenous prices of tradeables. Higher profitability/prices of non-tradeables would raise RER, reduce manufacturing sector's international competiveness and drive away resources from that sector. More importantly, the study found some empirical evidence of an overvalued RER above its fundamental equilibrium dragging overall economic growth down although empirical link of an undervalued RER to higher growth could not be established notwithstanding the East Asian experience.

3. Calculation and various measures of real exchange rate

3.1 Real exchange rate calculation: Level measures

Most studies analyse RER measures of competitiveness in terms of *changes* in the RER rather than in *level* terms primarily on account of three reasons. First, the RER, in level terms, as a ratio of price indices of two countries, represents an uneven comparison of two different country-weighting designs. Also, reliability and timeliness in absolute price indices could differ across countries – especially at a disaggregated level. Tracking the changes in RER is more meaningful as it controls for the different nature of the price indices in the two countries, and shows whether a country has gained or lost in price competitiveness relative to the other country over time.

Secondly, equalisation of price levels (as assumed under PPP[5]), even for tradable goods, at least in the short run, may not hold across countries. This may be due to trade and transport barriers (Driver & Westaway, 2004), transaction costs, arbitrage time lags, structural/government regulation (La. Marca, 2004) or lower price levels in lower-income countries (i.e. they appear to be more competitive) and higher prices in higher-income countries (Turner and Van't dack, 1993).

Thirdly, if tradables' prices are equalised, Balassa-Samuelson effect discussed previously predicts that rich countries could face higher non-traded to traded price ratios and a higher overall price level in comparison with low income countries. Consequently, there is a positive relationship between (relative) productivity performance and the equilibrium RERs.

[5] Opportunity for arbitrage means that in equilibrium (i.e. the long-run) comparative price levels, especially for tradable goods, should be equivalent across countries when measured in a common currency. This result is known as purchasing power parity and it is linked with the theory of the "Law of One Price". To illustrate the law of one price, suppose New Zealand has lower labour costs and, as a result, lower final output prices than other countries for a particular good (say t-shirts). Demand for t-shirts made in New Zealand would increase and global capital would be attracted to manufacturing t-shirts in New Zealand. An increase in labour demand would result, which would drive up wages and prices in New Zealand until they were equalised with those in other countries, and there would be one global price. This dynamic is one of the drivers of long-run income convergence across countries.

3.2 RER Calculation: Which currency basket?

Real Effective Exchange Rates

Real effective exchange rates (REERs) provide a weighted average measure of the bilateral RERs that are relevant for a country's competitiveness. A simple weighting approach involves using bilateral exchange rates with respective country aggregate import and export shares with the country in focus. A multilateral weighting methodology is used to capture competition of trade partner countries in third markets (eg. competition between Australian and New Zealand firms in China). Incorporating the effects of Australian competition in third markets therefore requires currency-weights that account for the share of Australia's supply in third markets that are also exporting destinations for New Zealand, i.e. a multilateral weighting methodology.

Multilateral weighting methodologies tend to weight trade flows in differentiated products (e.g. manufactured goods and services) and homogenous products (e.g. commodities) differently because of the differences in the way international prices are generally set for these product groups:

- For homogeneous products, the presence of a competing country in any specific market will be less relevant for determining the competitiveness of New Zealand exporters than that competing country's overall importance (as an importer or exporter) in the global market, because prices for homogenous goods are determined on the 'world' market (Hargreaves & White, 1999).[6] Country weightings for homogenous products therefore incorporate global market shares.
- For more differentiated products, especially those which are tailored to a specific market, producers of similar products that are not already competing with New Zealand in a *particular* market are less relevant, at least in the short term, to the competitiveness of New Zealand exporters than those with whom they are directly competing. Country weights for differentiated products therefore incorporate bilateral competition as well as the extent to which competition occurs in specific third markets.

Constructing multilateral weights along the above lines is data intensive. The IMF, for example, produces separate formulae for the construction of weights in the commodity, manufacturing and tourism sectors (Kite, 2007). The currency weights that result for these different sectors, as well for as the industries within them, vary widely due to both the variation in New Zealand's export markets by product and the international composition of trade.

The Reserve Bank of New Zealand (RBNZ) originally compiled New Zealand's effective exchange rate measure [trade weighted index (TWI)] relative to five currencies (US dollar, UK pound, Euro, Japanese Yen and the Australian dollar) with bilateral trade shares as weights). In 1997, the RBNZ started weighting the currencies partly (50 per cent) on the basis of the size of the trading partner's economy or GDP, and partly (50 per cent) on their share of New Zealand's bilateral trade. The GDP weighting was

[6] Ideally both internationally traded as well as domestically produced and consumed production would be included in the 'global market'. In practice, multilateral weights for commodities, such as those produced by the IMF, only include internationally traded production. This means that countries which are large producers but which engage in relatively little net trade are effectively underweighted (e.g. the US is a major dairy producer, but a relatively small player on the world market).

intended to proxy for third party competition, given large countries are more likely to have a large trading presence in global markets (Kite, *op.cit*). The new weighting pattern made New Zealand's TWI more sensitive to NZ dollar movements *vis-a-vis* the US dollar than *vis-a-vis* the Australian dollar given the larger size of the US economy. After a review in 2007, the RBNZ introduced an extended TWI, based on 14 currencies[7], to capture its external sector's competitiveness relative to the Asian economies as well. The TWI-14 measure was more sensitive to the New Zealand-US dollar movements than the TWI-5 measure because many Asian currencies were pegged relative to the US dollar. As Asian currencies remove US dollar pegs, the influence of the US dollar on the extended TWI is expected to decrease in future.

Value-added Real Effective Exchange Rates

Value-added exchange rates are more suitable than the conventional REER for measuring competitiveness of countries that specialise in supplying value added to only a part of the global production chain. With progressive vertical specialisation of trade, countries are competing more in supplying product inputs rather finished products produced entirely from domestic inputs. Value-added REERs use value added indices like the GDP deflator instead of output price indices, and the trading partner weights based on value-added measures of trade instead of gross flows. Of the two, using GDP deflator as a price relative proxy was found to account more for differences between value-added REER and REER rather than the trade weights based on value added in a cross-country study over 1970-2012 (Bems and Johnson, 2012). However, for New Zealand, the paper did not find any significant differences between value-added REERs and CPI REERs. This could be on account of the fact that New Zealand's exports (particularly dairy) have less contributions from imported inputs.

3.3 RER Calculation: Which price or cost measure?

No single RER measure captures all the aspects of international price/cost competitiveness. The price index in the RER needs to be selected based on the aspect of competitiveness that is to be measured and the availability, international comparability and robustness of the price index. Output price indices are appropriate for measuring competitiveness in production of differentiated products because they capture productivity differences. Profitability/cost based indices measure more aptly the international competitiveness in homogenous goods because their international prices tend to equalise under pressures of competition. Also, the price index chosen in the RER measure can have a narrow coverage including only traded goods or have an economy-wide coverage including both tradable and non-tradable products. Besides conceptual appropriateness, the selection of prices/cost measures needs to be based on indices that are internationally comparable and are available on a reasonable frequency over a sustained period of time. Further, there could be non-trivial measurement errors associated with the measures. There are six popular prices used in calculating RERs (including those based on value-added deflators already discussed earlier) that can be broadly divided into those reflecting (i) output prices and (ii) those

[7] The extended TWI included currencies of Korea, China, Malaysia, Hong Kong, Indonesia, Thailand, Singapore, Canada and Taiwan besides the earlier currencies of the US, Australia, UK, Japan and the Euro area.

that reflect underlying profitability or costs, although the bifurcation can be blurred (Turner and Van't dack, 1993).

Often the price index chosen is based on ready availability rather than its suitability to competitiveness. Classical price/cost RERs (consumer price, unit labour cost and export unit values) along with profitability ratios of price to cost measures provide useful indicators of narrow and broad measures of international competitiveness. Some key merits/demerits of the various RER measures are discussed in detail in Box 3 and summarised in Table 2.

Box 3. Alternate Price Measures of Real Exchange Rate

The set of RER measures based on coverage of the price indices can be classified into external price competitiveness, profitability measures and value-added deflators.

External Price Competitive Measures

The consumer price RER is appropriate for measuring cost of living conditions but leave out tradable products

The consumer price RER is calculated based on consumer price indices (CPI). As most economies monitor inflation through CPI, consumer price RERs are the most commonly produced RER measure due to their reliability, ready availability and international comparability. Consumer price RERs are appropriate for measuring international competitiveness in retail purchasing power. However, CPI are heavily weighted to the nontradable sector (e.g. housing and housing-related items) and do not include (directly) some important traded goods (such as capital and other intermediate goods) at all. Further, CPIs tend to be directly affected by government policies such as indirect taxes and subsidies, which can distort the performance of the consumer price RER. Arguably, however, the CPI may still accurately reflect the *costs* of production, given many factor inputs, such as labour, tend to be priced in line with consumer prices.

The producer price RER captures tradable sector but methodologies of compilation differ across countries

The wholesale or producer price index (PPI) is sometimes used in an attempt to more closely approximate tradable sector prices. PPI-input (PPI-I) measures are effective in comparing competitiveness in input usage and do not include demand effects. Although these measures are theoretically attractive, in practice they are seldom used simply because of the lack of cross-country consistency in construction methods.

Export price RER may be apt for comparing countries with similar composition of exports but leave out the non-exporting part of tradable sector

Export price-based RERs more directly measure competitiveness as they use prices of goods and services that are actually traded internationally. A major measurement drawback is that export prices are usually calculated on a unit value basis (i.e. the total value of exports divided by a quantity measure) given the impracticality of directly measuring the prices of individual export items. Export price RERs change with the changes in composition of trade (e.g. a movement away from lower-priced commodity goods to higher-priced manufactured goods) over time, which may not imply changes in price-competitiveness. Further, comparing export prices between a country exporting commodities and another country exporting manufactured goods would also be inapt. Further, by excluding the non-exporting parts of the tradable sector, which are not competitive globally, export price RERs may potentially overstate the tradable sector's competitiveness. Finally, an export-price RER loses its relevance for similar goods whose price differentials narrow down under forces of international competition and arbitrage.

Profitability Measures

Profitability-related RERs tend to become relevant under the situations where tradable prices are fixed and composition of output is changing as they reflect the *underlying* cost structures (such as labour costs) of an economy.

Internal terms of trade (the price of nontradables relative to tradables) is suitable for measuring of internal competitiveness provided tradable-nontradable bifurcation can be demarcated accurately

The internal terms of trade (ratio of nontradable prices to tradable prices)[8] is a profitability measure, and in theory, it should move proportionally to the RER if two conditions are met, *viz*., (i) prices of tradables

[8] This measure has its theoretical foundations in the "Salter-Swan" model.

converge across countries [law of one price (LOOP)]; and (ii) internal terms of trade are unchanged in foreign economies (Dywer & Lowe, 1993). *Ceteris paribus*, an increase in the relative price of nontradables pushes up the RER. A nominal appreciation of the currency would reduce domestic currency price of tradables and increase internal terms of trade, which could push up RER. Alternatively, domestic demand pressures could spill over into higher nontradable prices and internal terms of trade leading to appreciation in RER. Assuming changes in profitability lead to resource shifts across the economy, an alternative way to measure changes in the internal terms of trade is simply to monitor the relative output shares of the tradable and nontradable sectors. A key measurement drawback relates to the difficulties in accurately defining and measuring the nontradable and tradable sectors.

Unit labour cost RER is a strong indicator of competitiveness as it covers labour costs but excludes other input costs

RERs are also constructed from unit labour costs (ULC). ULC is the cost of labour adjusted for labour productivity. ULCs increase whenever wages rise (fall) by more (less) than growth in labour productivity. Both nominal and real ULCs are commonly calculated using nominal and real labour costs respectively. Because RERs are a measure of relative prices, the nominal form is used for RER calculations. An appreciation of a ULC based RER would reflect higher ULC and deterioration international competitiveness in terms of profitability.

Nominal ULCs can be expressed in various ways:

ULC = [(Total nominal labour cost/Total hours worked) / (Real GDP/Total hours worked)]

= Average nominal wage / Labour productivity

Thus, nominal ULCs, expressed either as the ratio of total nominal labour costs to real output, or in terms of labour's share of national income adjusted by the GDP (i.e. economy-wide) deflator, become inversely related to the profitability of production. Countries with higher ULCs (or greater labour shares of national income and/or higher general price levels) will be less competitive with respect to labour costs than countries with lower ULCs. A key strength of ULC RER as a competitiveness indicator is that labour costs cover a large share of input costs and are relatively non-tradable. Therefore differences in ULCs are likely to account for much of the difference in profitability between countries. Reflecting these strengths, the OECD views the ULC RER as "by far the best established indicator of international competitiveness".[9] However, the ULC-RERs have some weaknesses. Movements in ULC-RER can often be misinterpreted. For instance, a ULC-RER may decline not due to improved competitiveness of existing firms but due to the rise in measured average labour productivity in the economy when less competitive and low productive firms close down. On such instances, the ULC-RER falls although the economy's international competitiveness has actually deteriorated. Second, while labour costs comprise a large share of production costs, costs of other inputs may be material for differences in competitiveness. This weakness would be mitigated to the extent that international mobility of raw materials, capital and capital goods creates the tendency for their prices to converge. However, while price convergence may be broadly true for raw materials (such as oil), the New Zealand case provides evidence that the real cost of capital, as an example, can vary considerably across developed countries (Labushagne & Vowles, 2010). In a similar vein, improvements in labour productivity due to greater capital intensity are often associated with rising unit capital costs, meaning the resulting measured labour productivity improvements may overstate the true gain in overall competitiveness.

[9] OECD *Main Economic Indicators*: Sources and Definitions – available t: http://stats.oecd.org/mei/default.asp?lang=e&subject=16.

Table 2: REER measures of International Competitiveness				
REER Measure	**Competitiveness aspect covered**	**Strengths**	**Weaknesses**	**Official key sources**
Export prices	Prices of actual exports	• Directly measures prices of goods being traded internationally.	• Excludes tradables that are not exports; • Varies with changing composition of export baskets; • Uses unit value indices instead of price indices.	The OECD discontinued its earlier practice of publishing export price measures; The IMF constructed such measure for the Euro area earlier.
Consumer price index (CPI)	Retail purchasing power	• Remains most readily available measure on high frequency; • Covers internationally comparable basket of goods; • Remains a good proxy of labour cost conditions.	• Includes non-tradables; • Excludes capital goods; • Remains prone to government policy distortions.	The effective measures of exchange rates are widely released by both international agencies (IMF, BIS and OECD) and central banks (like the RBNZ).
Producer price index (PPI)	Prices charged in international trade excluding retail distortions	• Remains less Influenced by non-tradable goods prices; • Excludes distortions at the retail level.	• Lacks consistency in construction methods across countries.	No official agencies release effective exchange rate measures.
Internal Terms of Trade	Relative profitability of tradable versus non-tradable sectors within an economy	• Remains consistent with the standard RER measures for small and open economies; • Does not require data from other countries	• Remains prone to errors made in measuring the tradable sector of the economy.	Domestic sources
Unit Labour Cost	Labour productivity	• Measures labour cost competitiveness.	• Falls when competition leads to closure of low-productive firms • Excludes non-labour input costs	OECD
Value-added deflators	Total factor productivity	• Are broadest measure of prices	• Cover non-tradable sector; • Sensitive to the composition of output; • Are released with low frequency (quarterly/annual frequency)	The OECD releases PPP comparative price levels, based on consumption deflator

A key message is to choose the measure for the RER that is most relevant for the aspect of competitiveness being covered based on its strengths and subject to data

availability of the price indices. The aspect of competitiveness being covered depends upon the price measure for construction of the RER.

- For measuring competitiveness in retail purchasing power, consumer price index (CPI) based RER could be appropriate. Being reflective of domestic cost of living of the consumer including non-tradable goods, consumer price RER could be used as competitiveness measure for attracting immigrants. Further, consumer price RER changes could reflect the impact of changes in taxes/subsidies on an economy's international competitiveness.
- Producer price RER measures competitiveness in prices charged in international trade reflective of production costs (without retail distortions) including the prices of intermediate goods/capital goods.
- For small and open economies like New Zealand, which are price takers, profitability-based RERs using unit labour costs (ULCs) and gross value added deflators become better indicators of international competitiveness. If tradable prices equalise internationally, the internal terms of trade (TOT) measures reflect better the incentives for resource allocation between the non-tradable and tradable sectors. Amidst rigid tradable prices, domestic demand pressures drive up internal TOT as measured through the relative price of non-tradables to tradables. Pressures on internal TOT could impact overall RER measures of international competitiveness even in the long term.
- Often some measures are used as a combination to capture international competitiveness more appropriately and mitigate drawbacks of the individual measures. For instance, the ratio of CPI to the output version of PPI (PPI-O) is often used to proxy the non-tradable-to-tradable price ratio (internal real exchange rate) (Chinn, 2006).

Table 3 summarises the various REER measures produced by a range of agencies. The central banks of individual economies release mostly CPI-REERs relative to their chosen basket of trading partners. The international agencies release CPI-REERs of economies relative to broader baskets of trading partners since CPI is the almost universally used measure to track inflation. Some of these agencies also release ULC-REERs, but most of them do not regularly publish REERs based on the other price indices because methodological limitations and cross-country differences in the compilation of these indices are sharper than with respect to CPI and ULC.

Table 3: Real Effective Exchange Rates – Source Agencies and Coverage		
REER measure	**Source agency and price/cost data**	**Basket and weighting**
Consumer price index (CPI)	**OECD** *(relative consumer prices*); **IMF** (*real effective exchange rate*) **BIS** (*real effective exchange rate)* **RBNZ**.(*real trade-weighted index*)	**OECD** • Economic Outlook 92 data • 48 economies • weights in export and import markets • methodology in *EO Sources and methods* **IMF** • IFS data • 183 economies • weights - *commodity trade* (integrated global market), *manufacturing products* and *tourism* (imports, bilateral exports and third country exports in the destination country) • methodology in Bayoumi, Lee and Jayanthi, (2006). **BIS** • broad indices for 60 economies • narrow indices for 26 economies • bilateral and third country manufacturing trade weights • methodology in Klaus and Fung, 2006 **RBNZ** • real trade weighted index for 5 economies • real trade weighted index for 14 economies • weights – 50:50 (merchandise trade: GDP) • methodology in Kite, 2007
Unit Labour Cost (ULC)	**OECD** (*relative ULCs* are the ULC competitiveness indicator) **IMF** (*real effective exchange rate for advanced economies)*	**OECD:** same as in above **IMF** • IFS data • 26 advanced economies • based on the OECD data**

* See user guide in << http://www.esds.ac.uk/international/support/user_guides/imf/Introduction.pdf>>

Some CPI-based and ULC-based REERs measures are used here to benchmark New Zealand's international price competitiveness. In terms of the IMF's CPI-REER, New Zealand's average real exchange rate during 2010-2013 was significantly higher than the average level over 1990-1999. More importantly, this contrasted with the real exchange rate depreciation recorded by some of its major trading partners. With marginal flexibility in its exchange rate regime, China's average exchange rate also appreciated (Figure 6). Cross-country trends in ULC-based REERs of the OECD show that the relative increase for New Zealand has been the sharpest since 2002 among the major developed economies (Figure 7).

Figure 6: IMF's CPI-REER

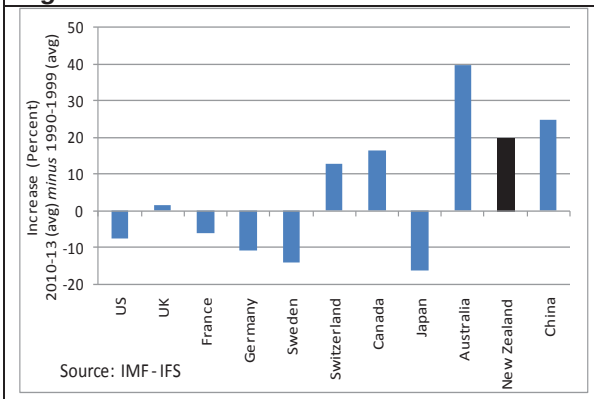
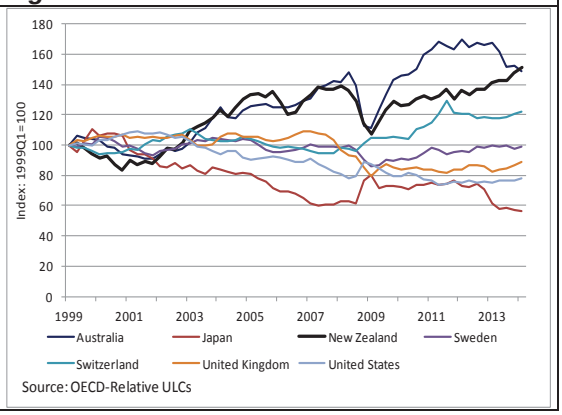


Figure 7: OECD's ULC-REER



4. Patterns in New Zealand's various Real Exchange Rate measures

This section summarises historical patterns in the alternative REER measures of New Zealand with a focus on the 1999-2013 period. It discusses inter-temporal patterns in CPI and ULC-based multilateral REER measures that are readily available from the IMF, BIS and OECD. For the recent period, additional price/cost/profitability based effective RER measures are compiled based on the RBNZ's trade *cum* GDP weighting design of relative importance of the US, the UK, Australia, the Euro area and Japan. Trends in New Zealand's bilateral RERs relative to each of these five major trading patterns are also analysed.

4.1. Trends in New Zealand's multilateral Real Effective Exchange Rates

Panel A figures depict the patterns of New Zealand's consumer price/ULC REERs in terms of narrow, broad and more universal coverage of trading partner economies over the long-term. All the indices are rebased to 100 for 1999-Q1. Key features are noted below.

Wedge of real effective exchange rate measures over nominal effective exchange rate widened from 2009 particularly relative to the advanced economies

New Zealand's real effective exchange rate measures tracked nominal effective exchange rates well, and the cycles followed a regular pattern during the 1990s (Figures 8-13). After 2001, the upswings in the real and nominal effective exchange rates persisted longer than the upturns during the 1990s. Notably, the REERs appreciated more sharply than the nominal exchange rate, widening the wedge between the two during 2009-13. The wedge between the CPI measure of the REER and the nominal effective exchange rate for New Zealand relative to advanced countries was wider than the wedge relative to all countries during 2009-13. This indicated a sharper deterioration in New Zealand's consumer price competitiveness *vis-a-vis* the advanced economies. New Zealand's IMF consumer price REER (relative to all IMF members) appreciated 2.2 per cent more than the nominal exchange rate appreciation while the BIS's advanced economy consumer price-based REER appreciated by around 5.6 per cent more than nominal exchange rate appreciation by 2014-Q1 over the corresponding average levels since introduction of floating exchange rate system. The ULC measures of REER appreciated more strongly than the CPI measures of the REER reflecting sharper deterioration in New Zealand's labour cost competitiveness.

Panel A: New Zealand's Effective Exchange Rates relative to wide group of countries

Figure 8

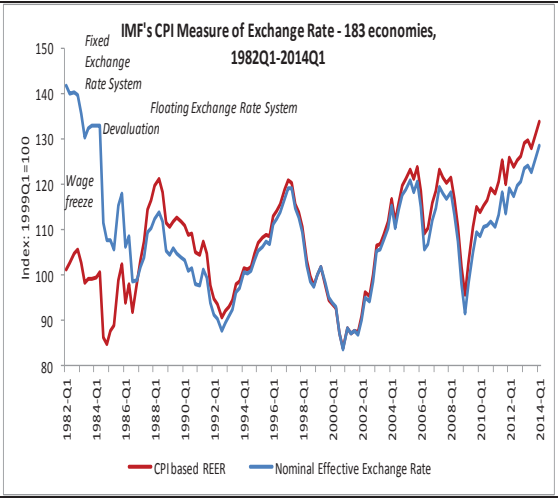


Figure 9

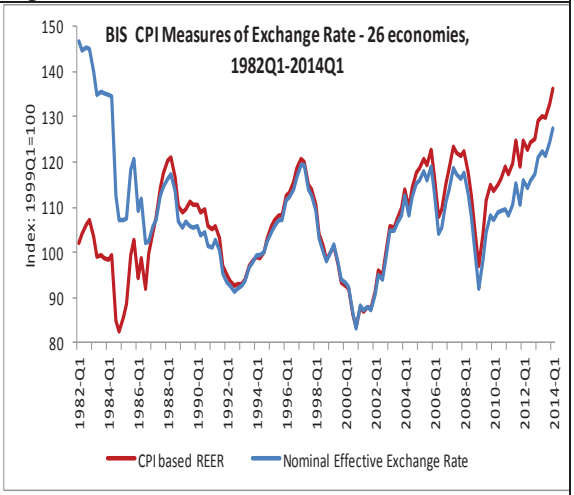


Figure 10

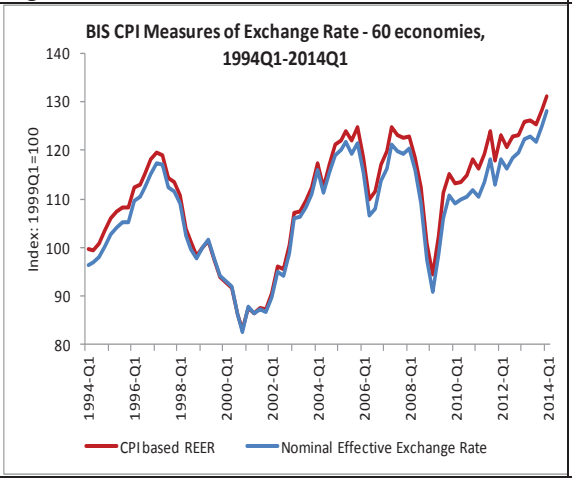


Figure 11

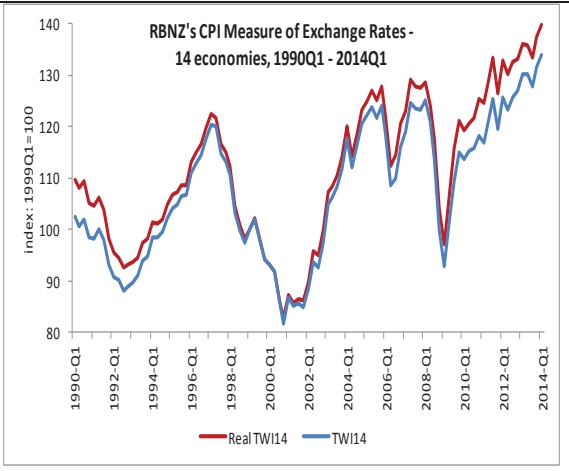


Figure 12

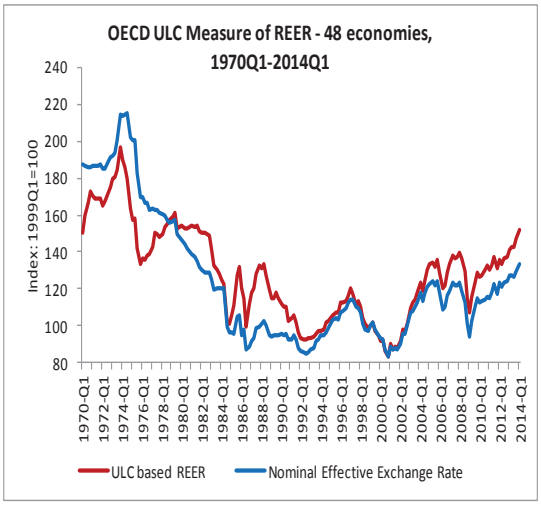
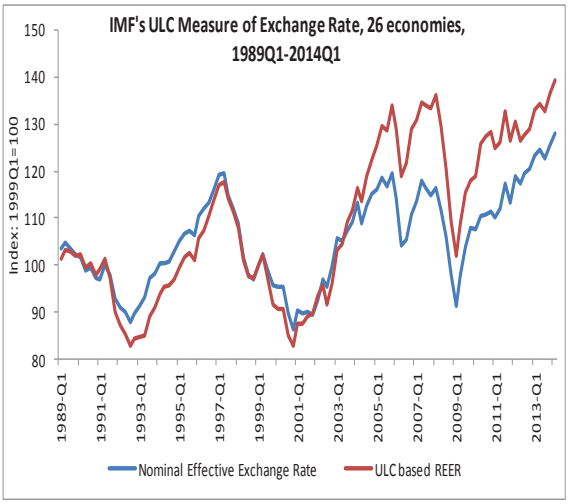


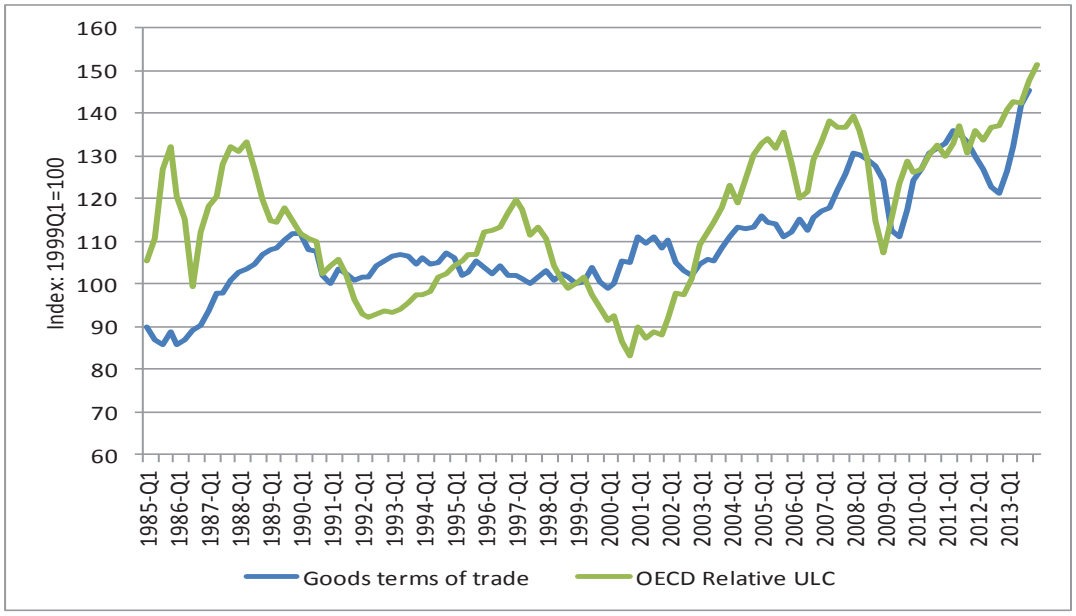
Figure 13



Sources: IMF, BIS, OECD and RBNZ

New Zealand's relative deterioration in labour productivity was reflected in terms of a wider and more persistent wedge evident in respect of a unit labour cost (ULC)-based measure of the real exchange rate since 2004 as compared with the consumer price based real exchange rate measure during recent years. The increase in New Zealand's merchandise terms of trade by 2013-Q4 over the average for the period 1985-Q2 to 2013-Q4 was 25 percent, close to the corresponding increase of 22 percent in the OECD relative ULC REER (Figure 14). To sum up, the appreciation of both the nominal exchange rate and prices/costs of New Zealand relative to advanced economies mutually reinforced real exchange rate appreciation, thereby lowering its international competitiveness particularly over 2009-13.

Figure 14 – Terms of Trade and Relative ULCs



Source: Haver, The Treasury

4.2 Real effective exchange rate measures relative to five advanced economies

New Zealand's multilateral REER measures relative to five trading partners, namely the US, the UK, Australia, the Euro area and Japan, using the RBNZ's trade-*cum*-GDP weightings were compiled for alternative price indices. These economies have been among New Zealand's top trading partners. China has been excluded as it follows a fixed exchange rate system.[10] New Zealand's trends in terms of these measures are shown in panel B. The index equals 100 in 1999-Q1.

PANEL B: *NZ's REER measures relative to Australia, US, UK, Euro and Japan*

Figure 15

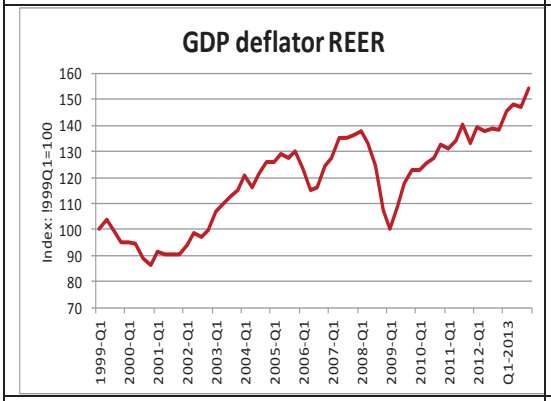


Figure 16

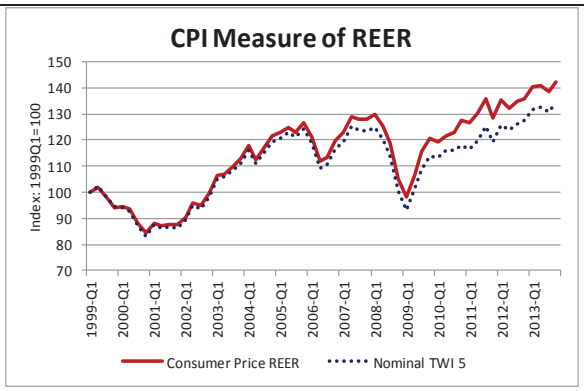


Figure 17

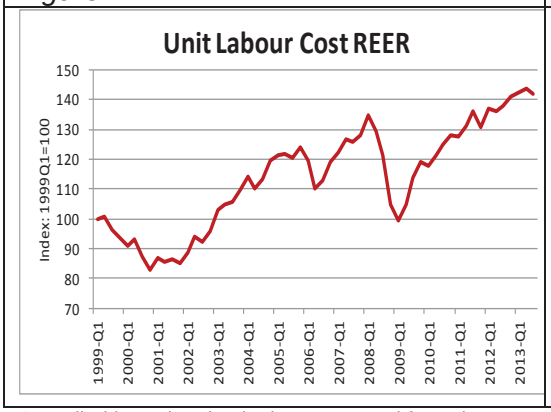
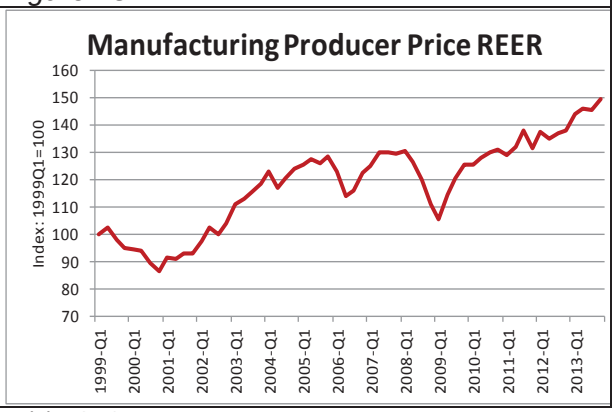


Figure 18



Compiled based on basic data accessed from the Haver and the OECD

Figures 15-18 show that New Zealand's REERs relative to these five economies rose more steeply than the increase recorded for the corresponding measures with wider coverage for trading partners over 1999-2013 in Panel A. The graphs show that New Zealand's competitiveness relative to the five trading partners declined more sharply than relative to the wider trading partner groups, and this has resulted from both stronger appreciations in the nominal exchange rates and higher growth rates in New Zealand's domestic costs relative to these trading partners. In terms of the five economies, the appreciations of average real exchange rate indices during 2009-2013

[10]China revalued reminibi by 2.1 per cent on July 21, 2005 and announced its willingness to allow its exchange rate to vary more flexibly relative to an undisclosed basket of currencies. It took steps to establish over-the-counter spot foreign exchange markets and markets for currency swaps and futures. Nonetheless, the variability of renminbi-US dollar has been found to be less than 2 per cent over three-month period prompting the IMF to classify Chinese system as *de facto* fixed exchange rate system.

over the average levels during 1999-2013 were higher than the corresponding appreciations in the nominal exchange rate indices. The increase was greater in terms of producer price measure (manufacturing) and GDP deflator as compared with the increase in consumer price real exchange rate measure.

Panel C figures disentangle New Zealand's REER across alternative measures of bilateral RER with respect to each of its five trading partners using four price/cost measures. The patterns show an increase in the RER measures in respect of the US, the UK, the European Union and Japan. New Zealand's RER measures relative to Australia reached a plateau by the second half of 2000s before appreciating from 2013 due to appreciations in the nominal exchange rate. Loss in competitiveness of New Zealand relative to the US, the UK and the Euro area was reflected in terms of stagnant exports to these destinations. On the other hand, New Zealand's gains in competitiveness *vis-a-vis* Australia were reflected in terms of increasing exports to Australia by end of 2000s. The rise in RER measures relative to Japan reflected deflationary conditions in that country. Loss in New Zealand's international competitiveness was sharper in respect of cost-based measures such as producer prices (manufacturing). Even in respect of Australia, the producer price (manufacturing) RER measure showed an increasing trend. The movements of New Zealand's RERs indicate that the higher production costs have been a major factor contributing to the decline in New Zealand's international competitiveness relative to its major trading partners except Australia.

PANEL C *NZ's bilateral real exchange rate measures relative to Australia, US, UK, Euro and Japan*

Figure 19

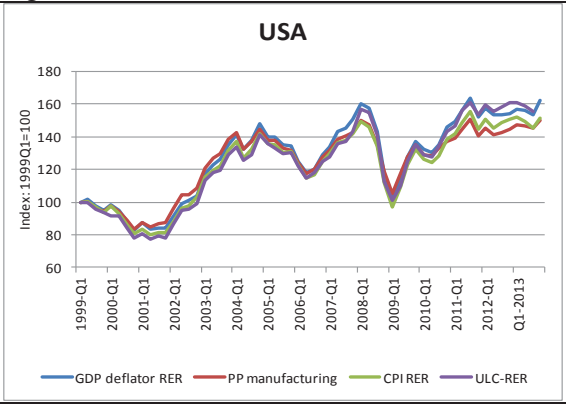


Figure 20

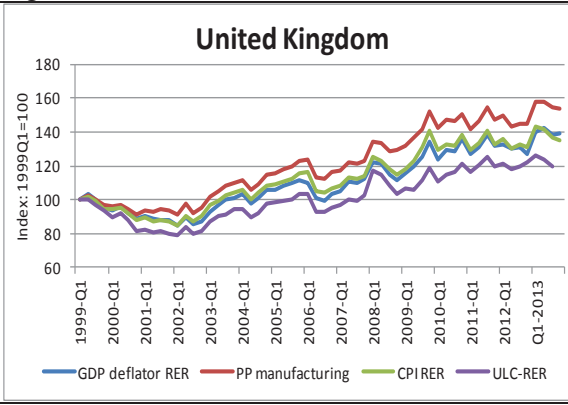


Figure 21

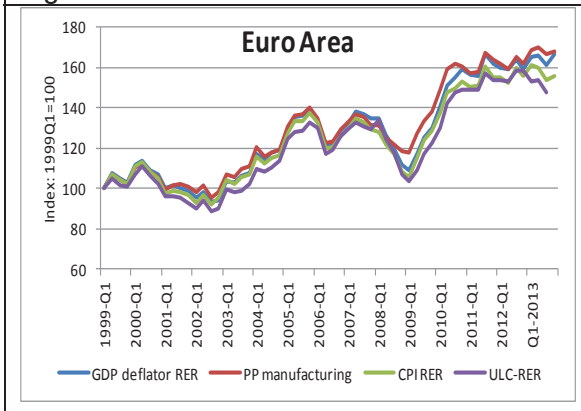


Figure 22

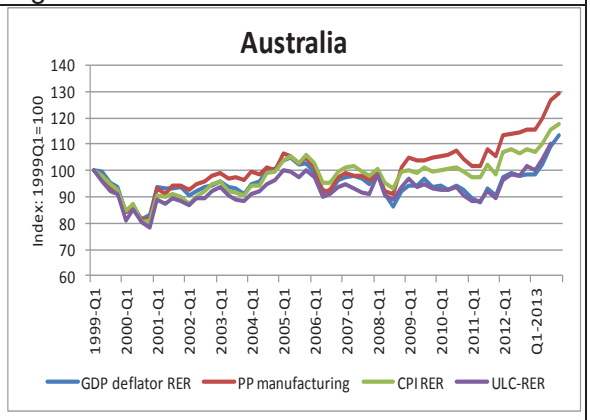


Figure 23

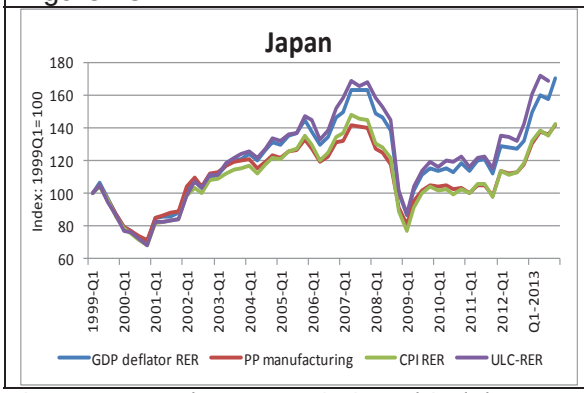
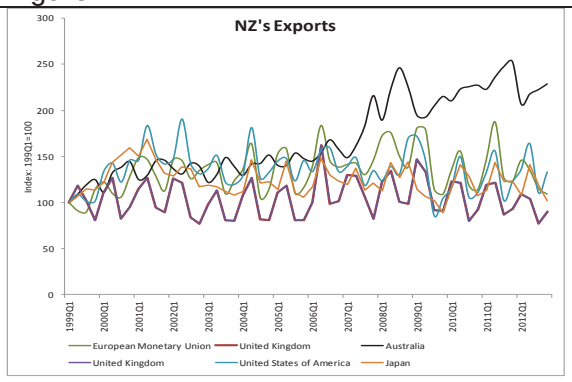


Figure 24



Sources: Haver, The Treasury, OECD and Statistics, New Zealand

IV. CONCLUSIONS

This paper is a primer on conceptual links between the real exchange rate (RER) and international competitiveness. It discusses the alternative measures of RER that can be used to track various facets of competitiveness. It also discusses the trends in New Zealand's international price competitiveness in terms of various measures of the RER. The key messages from the primer are as follows.

First, a reduction in the RER improves international price competitiveness, which is supported by the growth experience of the emerging markets. However, the impact on overall growth depends upon the economy-wide spillovers from the sectors benefitting from the depreciation in the RER and the other enabling factors present. Also, the manufacturing export-led growth strategies of the emerging markets may not be replicable in resource-rich developed economies.

Second, the RER appreciations in resource-rich economies could be due to fundamental shocks in their terms of trade which may not warrant policy action unless positive impetus on primary sectors is more than offset by the negative impact on other tradables like manufacturing.

Third, since changes in the RER relative to its equilibrium indicate changes in competitiveness, it is helpful to identify different equilibrium levels across different time

periods. This is because equilibrium of the RER could itself change over time based on changes in the terms of trade, productivity or other fundamental shocks. Empirical models could be used for estimating equilibrium levels of the RER at short, medium and long-term which can be relevant for assessing New Zealand's macroeconomic outlook for different time periods.

Fourth, a wide menu of RERs can be compiled based on alternative price indices depending upon the aspect of international competitiveness being examined. On the narrow side, export price RERs provide direct measurement of price competiveness in traded goods. Value-added deflator-based RERs provide broad proxies of competitiveness in terms of profitability, which could be more relevant for small economies like New Zealand facing given world prices in tradeables. Producer price RERs enable assessment of competitiveness in terms of actual production prices excluding retail distortions. Consumer price and unit labour cost-based RERs, published by international and national agencies, are best headline proxies of RERs as they are more universally available and compiled on internationally comparable methodologies. Conceptually, consumer price RERs and unit labour cost RERs are proxies of competitiveness in retail purchasing power and labour cost, respectively.

Fifth, New Zealand's RER has generally displayed cyclical behaviour over time. However, since 2006, the various RER measures have persistently been rising. In particular, manufacturing sector's RER has been above the overall RER reflecting New Zealand's high production costs relative to other trading partners, particularly the advanced economies. However, New Zealand has retained competitiveness *vis-a-vis* Australia mainly on account of sharper wage increases in Australia relative to increases elsewhere.

Improving New Zealand's international competitiveness has figured amongst key strategic priorities of the policy makers. This increasing interest and the exchange rate workshop hosted by the Treasury and the RBNZ in 2013 have renewed interest within the Treasury to review various measures of competitiveness with a view to using them in our assessment of the macro economy. In Europe, the necessity of monitoring multiple macroeconomic indicators for the member countries has also been recognised by the European Commission (EC) under its macroeconomic surveillance procedure introduced in December 2011. The EC uses a scoreboard of indicators to detect early any emergence of macroeconomic imbalances. The scoreboard includes indicators across three dimensions, namely, external imbalances, competitiveness positions and internal imbalances (EC, 2012).

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