

Terms of trade and real income changes

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TERMS OF TRADE

The relative prices of goods measure what you give up when you purchase something. Therefore, prices are important in making international comparisons of standards of living and in understanding business and trade. An important measure of international prices is known as the *terms of trade*, defined as the average price of a country's exports divided by the average price of its imports.

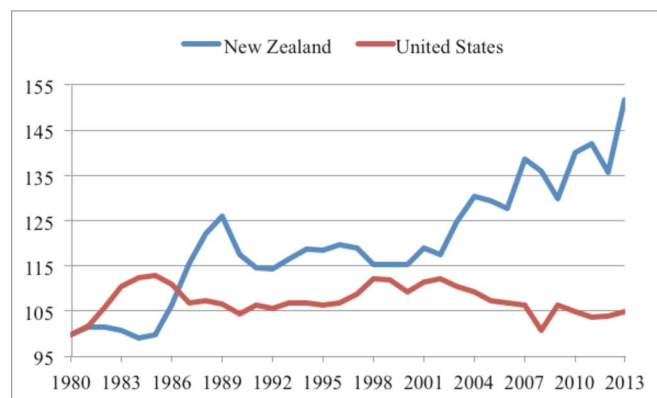
The terms of trade measure the purchasing power of a country's exports abroad. Changes in a country's terms of trade are closely related to the gains from international trade for that country. These issues are especially important for countries that are heavily reliant on export income.¹

The terms of trade (ToT) are calculated by dividing a nation's export price index by its import price index; this can be multiplied by 100 to express the ToT as a percentage:

$$ToT = \frac{\text{Export Price Index}}{\text{Import Price Index}} \times 100 \quad (1)$$

Figure 1 shows the evolution of ToT in New Zealand and the United States between 1980 and 2013, where the ToT are an index set equal to 100 in 1980. In the US, the ToT index rose between 1980 and 1985, and then remained fairly stable between 1986 and 2002. It then declined until 2008, and is now close to its level in the early 1980s. The decline in the index coincided with a period in which the price of petroleum and other primary commodities that the US imports rose sharply. Oil prices started their climb from a low of US\$30 per barrel in 2002 to a high of around US\$150 by mid-2008 (see Bhar and Malliaris, 2011).²

Figure 1: Terms of trade: NZ and the US, 1980-2013 (1980=100)



Source: OECD (2016).

NZ's ToT since the mid-1980s have grown steadily relative to the US's ToT. In contrast to the US, NZ's ToT increased markedly between 2000 and 2007. NZ is a primary commodity exporter, and the increase in NZ's ToT during the 2000s reflected rising export prices. In addition, as argued by Steenkamp (2014), NZ has benefited from reductions in non-oil import prices due to increased levels of low-cost manufacturing production in emerging Asian economies. Nevertheless, declines in the ToT of both the US and NZ were seen during the global financial crisis of 2007-2009.

1 Several different studies focus on the evolution of NZ's terms of trade over time (Steenkamp, 2014; Mellor, 2015). There are also studies that concern terms of trade volatility and its impact on long-run growth in NZ (see Grimes, 2006).
2 From a price of US\$150 per barrel in mid-2008, the price crashed back to around US\$30 by the end of 2008.

REAL INCOME AND TERMS OF TRADE

A nation's total output can be greatly affected by its ToT. When imports become more expensive for a nation relative to exports – i.e. the ToT deteriorates – the purchasing power of the nation declines and hence consumption and welfare decline. On the other hand, an improvement in the ToT makes it possible for an increased volume of goods and services to be purchased by residents out of the income generated by a given level of domestic production (United Nations, 1993).

Diewert and Morrison (1986) point out that an improvement in the ToT is similar to technological progress, as it raises the amount of goods that a country obtains for a given level of effort (see also Kehoe and Ruhl, 2008, 2010). Therefore, when changes in the ToT are large, Gross Domestic Product (GDP) may be a seriously misleading measure of a country's income. GDP may not reflect the real purchasing power of an open economy if there are significant changes in the ToT.

REAL GDP AND REAL GDI

GDP is the market value of final goods and services produced in a country in a given period of time. 'Real' GDP adjusts this value for changes in prices, so that we can make comparisons over time. At the national level, the following accounting relationship shows how real GDP at any point in time t is comprised of its major components:

$$GDP_t = \frac{C_t}{P_t^C} + \frac{G_t}{P_t^G} + \frac{I_t}{P_t^I} + \frac{X_t}{P_t^X} - \frac{M_t}{P_t^M} \quad (2)$$

C is consumption, G is government purchases, I is investment, X is exports, and M is imports. Real GDP is computed by deflating the current value of the components of GDP by their respective prices.

An alternative measure of income is Gross Domestic Income (GDI).³ GDI measures the purchasing power of the total income generated by domestic production, so that when the ToT change there may be a significant divergence between real GDP and real GDI.

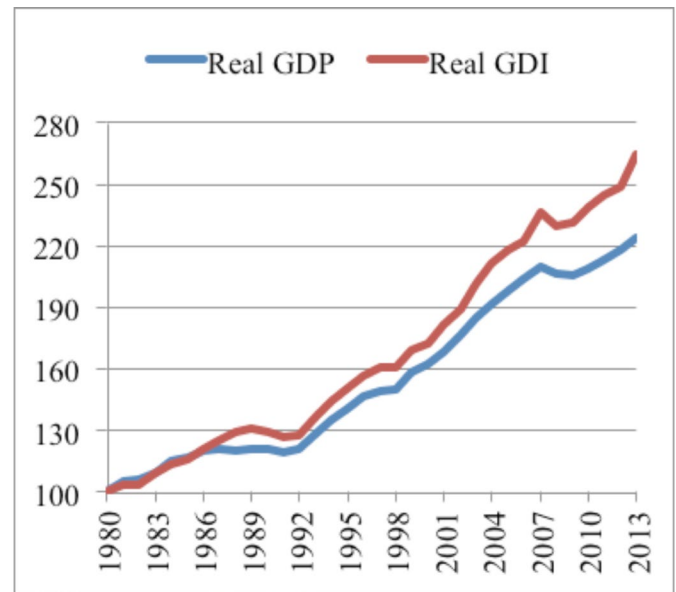
The real GDI measure treats the domestic components of expenditure in the same way that real GDP does – i.e., the components are deflated by their respective price indices. However, it differs in the way that the trade balance is deflated: when calculating GDI, the trade balance is deflated by the import price. The idea here is to think about the quantity of imports that are made possible by the exports (Kohli, 2004; Kehoe and Ruhl, 2008). Real GDI at any time t can be calculated as:

$$GDI_t = \frac{C_t}{P_t^C} + \frac{G_t}{P_t^G} + \frac{I_t}{P_t^I} + \frac{X_t - M_t}{P_t^M} \quad (3)$$

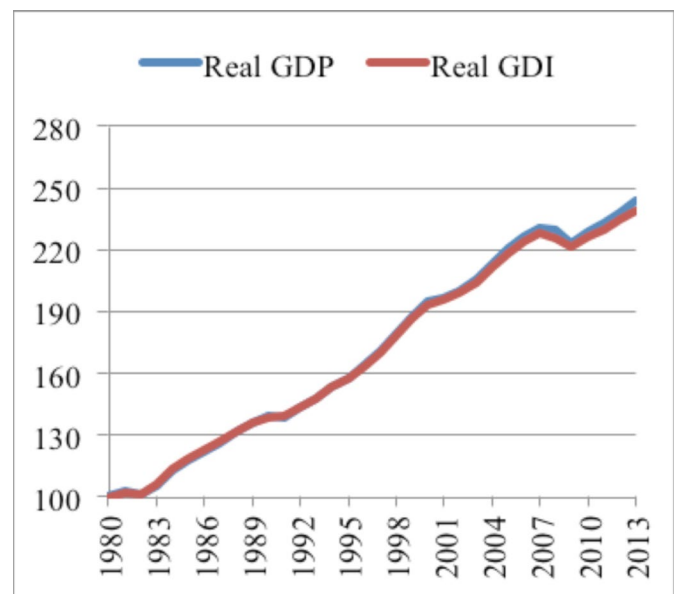
Panel (a) in Figure 2 shows that real GDI has grown faster than real GDP in NZ,⁴ because NZ has enjoyed a steady improvement in its ToT. Real GDI grew by an average annual rate of 3% over 1980-2013, compared to 2.5% growth in real GDP. On the other hand, we can see from panel (b) that real GDP and real GDI are almost indistinguishable in the US, where both real GDP and real GDI grew by 2.7% per year.

Figure 2: Real GDP versus Real GDI: NZ and the US, 1980-2013 (1980=100)

(a): New Zealand



(b): United States



Source: World Bank (2016).

THE FINANCIAL CRISIS OF 2007-09

The global financial crisis of 2007-09 profoundly affected the world. The basic difference between this crisis and previous ones is that the 2007-09 crisis was experienced broadly and intensely throughout the whole world. Many argue (e.g. see Ohanian, 2011) that the recent crisis resembled the Great Depression of 1929 far more closely than it did of any of the post-war recessions.

Romer and Romer (2014) state: "The recession that lasted from December 2007 until June 2009 was the longest since World War II, and the collapse of GDP and employment at the end of 2008 and the start of 2009 dwarfed any declines since the demobilization at the end of that war." However, measures of the magnitude of the effect of the crisis depend on whether we look at GDP or GDI.

³ This measure is also known as command-basis GDP; see Kohli (2004), Bureau of Economic Analysis (2006) and Hall (2011)

⁴ We can also calculate real GDI in each country using different trade balance deflators: the export price deflator, the GDP deflator, and the final consumption expenditure deflator. Results indicate that the choice of deflator does not make a substantial difference to the calculation of real GDI between 1980 and 2013 in either NZ or the US.

Table 1 shows that in both NZ and the US, real GDI declined by a larger proportion than real GDP between 2007 and 2008. In NZ, real GDP fell by 1.6% but real GDI fell by almost 3%; in the US, real GDP fell by 0.3% but GDI fell by 0.9%. On the other hand, between 2008 and 2009 real US GDP fell faster than real GDI (by 2.8% versus 2.2%), while in NZ real GDP fell while real GDI recovered.

Table 1. Comparison of real GDP and real GDI during the global crisis of 2007-09

(percentage change)			
NZ	Real GDP	Real GDI	ToT
2007-2008	-1.62	-2.96	-1.96
2008-2009	-0.25	0.88	-4.47
2007-2009	-0.94	-1.06	-3.22
US	Real GDP	Real GDI	ToT
2007-2008	-0.29	-0.91	-5.26
2008-2009	-2.78	-2.18	5.46
2007-2009	-1.54	-1.54	-0.04

Source: World Bank (2016).

The above example shows that the impact of ToT fluctuations on real incomes varies across countries. How do real income gains from the ToT relate to other changes in income?

There are some studies that quantify the long-run impact of changes in the ToT on income growth, using different accounting frameworks. These studies disaggregate the growth rate of real GDI into different factors, including real GDP growth, changes in the trade balance, and changes in the ToT (see Kohli, 2003, 2004; Macdonald, 2010; Reinsdorf, 2010; İşcan, 2012). These studies carefully distinguish between changes in real output and changes in relative prices, because comparing real GDP with real GDI involves accounting for relative price changes related to traded products.

QUESTIONS TO CONSIDER

1. What is meant by the terms of trade (ToT)? What can account for fluctuations in the ToT?
2. How volatile are NZ's ToT? What is behind the recent evolution of NZ's ToT?
3. How do relative prices affect real income growth? Might an improvement in the ToT enable a country to exploit its comparative advantage even more?
4. Does real GDP accurately reflect the real purchasing power of an open economy? If not, what are the alternative measures that do?

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