

[The effect of changes in the terms of trade on GDP and welfare: a Divisia approach to the SNA](#)

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In popular discussion GDP is often treated as a measure of welfare but national income accountants never tire of pointing out that it is designed to be a measure of output or income. As a welfare measure GDP has a number of obvious failings. For example GDP is gross of capital consumption and the position of the production boundary is somewhat arbitrary: the imputed rent of owner-occupiers is included while unpaid house work and child care are excluded. Moreover the treatment of environmental assets is unsatisfactory. Should GDP then be reformed to make it closer to a welfare measure or should we stick with GDP as an output measure and develop different measures of welfare? In this paper I am concerned with one particular aspect of this debate: how should changes in the terms of trade be treated in the national accounts?

In fact, the various manuals setting out the System of National Accounts (SNA) and the European System of Accounts (ESA) are very clear on this point. Real GDP is a measure of output and what the manuals call real Gross Domestic Income is a welfare measure, or rather a step on the road towards a more comprehensive welfare measure. The difference between real GDP and real GDI is the so-called “trading gain” which measures the effect of changes in the terms of trade. The distinction between real GDI and real GDP is empirically important at least for some countries, e.g. Australia, Canada and Switzerland. The allegedly declining terms of trade of primary producers in the 1950s and 1960s (the Prebisch thesis), the oil price shocks of the 1970s, 1980s and later, the recently ended commodity price boom, and the gains to countries which can import ICT products at rapidly falling prices, all these make changes in the terms of trade a subject of perennial interest.

The approach of this paper is to consider two very simple models of trading economies and calculate from first principles the effect on output and welfare following an exogenous change in the terms of trade. I then ask, would a national income accountant actually living in one of these model economies with access to all the necessary data and applying the principles of the SNA reach qualitatively similar conclusions to those predicted by economic theory? Both models are versions of the Heckscher-Ohlin-Samuelson (HOS) framework of a small open economy facing given terms of trade and with given factor endowments and technology. Potentially at least the economy can produce two goods under competitive conditions with constant returns to scale. In the first such model, to be found in any textbook of international trade, the economy produces both goods which are for final consumption. Theory then predicts that (under certain assumptions) an improvement in the terms of trade, i.e. an increase in the price of exports relative to that of imports, raises economic welfare but leaves aggregate output (GDP) unchanged.

The second simple model again has two goods but now one of them, the imported good, is an intermediate input into the other. This is the type of model used to analyse an oil price shock. Theory predicts that a fall in the relative price of the imported input (an improvement in the terms of trade) raises welfare (consumption) while leaving GDP (real value added) unchanged.

These models are oversimplified and ignore many real world features. But considering them serves to illustrate the principals involved. And if we can't understand the relationship between GDP and welfare in these simple cases we will certainly fail to do so in more complicated ones.

In both models I show that the national income accountant would reach the same conclusions as the theorist. In fact the accountant can do better than the theorist by actually quantifying the size of the welfare gains and output changes in these cases. The accountant does not have to have any interest in or liking for economic theory but just needs to apply the principles of the SNA. In summary, in both models an improvement in the terms of trade raises welfare but leaves GDP unchanged. This demonstrates that GDP should be regarded as a measure of output, not of welfare.

I reach this conclusion on the basis that the national income accountant can make use of Divisia index numbers which have a number of desirable properties but are defined in continuous time. I argue that Divisia index numbers provide the appropriate conceptual basis for national income accounting. Of course in practice Divisia index numbers cannot be calculated exactly since the national income accountant does not have access to data in continuous time but only at discrete intervals. The real world counterparts to Divisia index numbers are chained price and quantity indices which can be regarded as approximations to Divisia index numbers.

Economists (though not necessarily national income accountants) usually take the view that the conceptual foundation for the national accounts should be so-called "superlative" index numbers which are discrete, for example Fisher or Törnqvist indices. The trouble with these is that they do not possess all the desirable properties of Divisia indices. This suggests that superlative indices should be regarded for the time being as approximations to Divisia indices which will hopefully in future be replaced by better approximations.