

RESEARCH SEMINAR IN INTERNATIONAL ECONOMICS

Gerald R. Ford School of Public Policy
The University of Michigan
Ann Arbor, Michigan 48109-3091

Discussion Paper No. 651

**What Do We (and Others) Mean by
“The Terms of Trade”?**

Alan V. Deardorff
University of Michigan

May 23, 2016

Recent RSIE Discussion Papers are available on the World Wide Web at:
<http://www.fordschool.umich.edu/rsie/workingpapers/wp.html>

What Do We (and Others) Mean by “The Terms of Trade”?

Alan V. Deardorff

The University of Michigan

May 23, 2016

ABSTRACT

What Do We (and Others) Mean by “The Terms of Trade”?

Alan V. Deardorff

The University of Michigan

I explore how the concept of “the terms of trade” has been used since it was coined by Marshall. Early writers (Taussig, Viner, Dorrance) constructed variations on the relative price of traded goods that Marshall was concerned with, but most of these variations have been left behind in modern uses of the term, which today almost always refer to a relative price of exports and imports. However, when authors have wanted to identify the terms of trade with a particular country and to represent it either symbolically in an economic model or empirically, they have had to choose between defining the terms of trade as the relative price of exports or the relative price of imports. The first to do this was Taussig, who chose the second option, but he was followed by Viner who chose the first, and was followed in this choice by almost all writers for the next several decades. Then, around 1980, Taussig’s choice came back into fashion among scholars of international finance. I document this contrast in definitions between international trade and international finance, then add slightly to Viner’s argument for preferring that the terms of trade of a country be defined as the relative price of its exports.

Keywords: Terms of trade

JEL Subject Code: F1 Trade

Correspondence:

Alan V. Deardorff
Ford School of Public Policy
University of Michigan
Ann Arbor, MI 48109-3091

Tel. 734-764-6817

Fax. 734-763-9181

E-mail: alandear@umich.edu

<http://www-personal.umich.edu/~alandear/>

What Do We (and Others) Mean by “The Terms of Trade”?*

Alan V. Deardorff
The University of Michigan

The expression “the terms of trade” has been in use by international economists for most of a century, and its fundamental meaning is clear to all: the prices at which countries exchange their products in international trade. Early discussions made that definition more precise in several different ways: the commodity terms of trade, the net and gross barter terms of trade, the single and double factorial terms of trade, and the income terms of trade. But in all cases it has been understood that if a country (or group of countries, or group of industries) gets more for what it sells, relative to what it pays for what it buys, then its terms of trade have (has?¹) improved.

Does that mean it is necessarily better off? No, because prices may be endogenous, and the country’s welfare depends on what has caused prices to change. But the change is nonetheless in the direction of improving welfare, other things equal.

So, aside from having to choose among the many variants of “the terms of trade” listed above, where is the ambiguity that I seek to clarify here? It is in the definition of

* This paper is a byproduct of work I have been doing to update and extend my online *Glossary of International Economics*, Deardorff (2014, 2016), which includes my notes on the origins of many of the terms that are defined there. My interest in one of these terms – the Terms of Trade – expanded beyond what was reasonable to include in the *Glossary*, and this paper is the result. I was prompted to think that this might be of interest to others by the response to this topic when I presented some of my origins research to a group at Yale in April, 2016. My thanks to Sam Kortum and Oleg Itskhoki who have continued to express interest and provided their insights. My thanks also to Ken Rogoff and Maury Obstfeld, for their reflections on how they have used the term.

¹ Most authors treat “terms of trade” as plural when speaking of improvement or deterioration. But when identifying it with a single number or ratio, most (but not all) treat “terms of trade” as singular.

the number that we assign to the concept of the terms of trade, when such a number is necessary. Is it the relative price of exports, p_X/p_M , or the relative price of imports, p_M/p_X ? Like so many such things in international economics, either must be acceptable, but confusion arises if some assume one definition and others another, especially if neither side makes clear what it has done.

A similar ambiguity exists for the exchange rate, but because that is well understood, most of us are very careful to define the term when we use it, as either the domestic-currency price of foreign currency, or the foreign-currency price of domestic currency. Indeed, there is so little presumption of one or the other – or even in many cases which currency is domestic and which is foreign – that exchange rates are sometimes reported both ways, as in the *Wall Street Journal*, where “In US\$” and “Per US\$” appear side by side.

But the terms of trade has taken a different path. Because the terms of trade is so closely associated with economic welfare, unlike the exchange rate, it has been natural to define the terms of trade of a country such that its rise is associated with welfare improvement. Therefore, with exceptions that I will note below, most trade economists have defined a country’s terms of trade as the price of its exports divided by the price of its imports, p_X/p_M .

Such specificity has not been necessary for all who have used the concept of the terms of trade. For many it has been sufficient to say that a country’s terms of trade have “improved” or “deteriorated,” or other equivalent language that is equally unambiguous. But when it has been necessary to formalize the terms of trade as a variable within an

economic model, or to report a measure of it empirically, then authors have had to choose its definition as either the relative price of exports or the relative price of imports.

In what follows, I will first review the early history of the terms-of-trade terminology, which mostly attended to other issues than this choice. I will then report what I have learned about the choices that international economists have made over the years, and then conclude with my own thoughts about how the term should be used going forward.

Theme and Variations from Marshall through Viner

It was Marshall (1923, p. 161) who introduced² the term. In an example involving countries *E* and *G*, he spoke of

the amounts to which *E* and *G* would be severally willing to trade at various “terms of trade”; or, to use a phrase which is more appropriate in some connections, at various “rates of exchange.”

He then explained his preference for the new term on the grounds that “rates of exchange” may be understood to connote monetary exchange rates, while he meant the rate at which goods are traded for other goods. Marshall’s desire to separate exchange of goods from exchange of currencies may have foreshadowed the confusion over its definition that still exists.

Having introduced the expression in his book, Marshall then used it in subsequent discussions, but he did not use it exclusively. He seemed to alternate between “terms of

²Here and elsewhere, when I say that an author was the first to say something, I obviously cannot be sure of that. The most I can do is explore the available literature for what has been written and, mostly, published. I cannot know what people were saying orally to their colleagues or their students. And while the search tool of Google Scholar is wonderful for exploring the written record, neither I nor probably it can do that perfectly.

trade" and "rate of interchange," two expressions that seemed to be synonyms as he used them.

There is slight uncertainty as to whether this was Marshall's first use of the expression. This is because it also appears in Appendix J of the same book, which a footnote explains was largely written much earlier, between 1869 and 1873, and which was "privately printed and circulated among economists at home and abroad in 1879." (p. 330). However, Appendix J with only very few exceptions does *not* use "terms of trade," but rather alternates between "rate of interchange" and "exchange index." It seems likely that the few occurrences (I have found only two) of "terms of trade" in that appendix were added when it was presumably revised for its 1923 publication. This is supported by the fact that "terms of trade" does not appear at all in the 1920 8th edition of Marshall's (1890) *Principles*.

Was Marshall the first to use the term? Taussig (1927) says he was, citing Marshall (1923). And I have confirmed that Mill (1848) did not use the term. That of course leaves open a great many others who might have done so. But from the way Marshall introduced the term, it appears that he at least thought it was new.

Marshall treated the terms of trade as the relative price associated with the exchange of goods between two countries, without ever identifying it as the terms of trade *of* either one of them. His table on p. 162 (repeated on p. 330), of terms on which the two countries were willing to trade, recorded the relative prices as G -bales per E -bales, and thus the relative price of country E 's exports. Identifying the countries as England and Germany, and assuming that Marshall took the English perspective, one might infer that he viewed the proper definition of the terms of trade as p_X/p_M . But

when he later needed to examine the elasticity of E 's import demand (footnote 1, p. 337), he identified the terms of trade in his Fig. 7 as OM/PM , which was the quantity of exports divided by the quantity of imports, and thus p_M/p_X . It seems that he used whichever definition fit best with his purpose at the moment, and probably did not expect either formulation of the relative price to take precedence over the other.

It was Taussig (1927) who first spoke of the terms of trade of a country, rather than only the exchange between two countries. This was not his main concern, which was rather to clarify the term as the “barter terms of trade” and to distinguish the “net” and “gross” versions of that, as I will explain further below. He did not however initially present the terms of trade as a number, but rather as a pair of numbers: “The net barter terms of trade are then 9.8 wheat = 11 ½ linen” (p. 116).

Further in his discussion, however, Taussig presented graphs of data for the terms of trade for Great Britain, Canada, and the United States. To do that he needed a single number, and he chose p_M/p_X . He was not as clear about this as one might have wished, but his discussion accompanying his graphs made clear that a fall in what he was reporting was beneficial and a rise was harmful. Thus, as the first to speak of the terms of trade *of a country*,³ Taussig made a choice contrary to the more common use today.

The reason for this reversal was a decision of Viner (1937). He defined the terms of trade not as the relative price of two goods, but rather as the relative price of exports and imports, and he explicitly chose the price of exports for his numerator on page 558.

That this was deliberate is clear from the associated footnote:

This reverses Taussig's procedure, where a rise in the index indicates an *unfavorable* movement of the terms of trade. No question of principle is

³Taussig actually said the terms of trade *for* each of these countries in his text. But the index to his book included “Barter terms of trade ... of Great Britain,” “of Canada,” and “of United States.”

involved, but it seems to me to be more convenient to represent favorable movements of the indices by rising indices. The formulae which follow are so constructed that a movement of any element in the formula favorable to the country in question operates to raise the index, and vice versa. [Italics in original.]

Again, this choice of numerator was not the main, or even an important, point of Viner.

Like Taussig, he wanted to suggest alternative definitions for the terms of trade that would have more substantive meaning. This seems a good place to review the various forms of the terms of trade that these and other authors have proposed.

Taussig noted that if trade is unbalanced, then the relative prices do not fully indicate the amounts of goods that a country is exchanging for its imports. Letting X and M be the quantities of exports and imports, balanced trade implies $p_X X = p_M M$ and therefore $p_X/p_M = M/X$. Taussig called the price ratio the “net barter terms of trade” and the ratio of quantities the “gross barter terms of trade,” though in both cases he used the reciprocal of what I have stated here. His point was that if trade is unbalanced, then a country will pay either more of its export (if it runs a surplus) or less of its export (if a deficit) than would be indicated by the prices.

Viner, too, argued that the prices of exports and imports were not necessarily what were most important, especially as the classical economists would have understood trade. They, he said, were more concerned with factors than with goods, and specifically with how the services of factors were exchanged for one another. For that he included the productivity of domestic factors in producing exports, A_X , and of foreign factors in producing imports, A_M , in order to define the “single factoral terms of trade,” $A_X p_X/p_M$, and the “double factoral terms of trade,” $A_X p_X/A_M p_M$.

A final variation on these themes was provided by Dorrance (1948) who introduced the “income terms of trade.” He argued that what mattered for a country’s welfare was the amount that it could buy with the total income generated by its exports, and he therefore defined the “income terms of trade” as $p_X X/p_M$. This and the other definitions are presented in Table 1, for ease of reference.

Choices of Orientation

The choice between p_X/p_M and p_M/p_X has not been the same for all writers. Many, as mentioned above, did not need to make a choice, as they needed only to refer to the terms of trade improving or worsening. But those who did choose sometimes chose one and sometimes the other. My question is whether there has been a pattern to these choices. I have looked at a fair number of published papers dealing with the terms of trade, especially those that included the phrase in their titles, and found the results in Table 2.

The table includes all of the sources that I was able to find where a choice between p_X/p_M and p_M/p_X was clear, either from an explicit statement or by inference from the discussion surrounding data that were presented. If I found the same author using the same choice more than once, I include only their first appearance, but if they made a different choice in one paper than another, including with coauthors, then I include each appearance.

One pattern in Table 2 stands out: From the time that Viner (1937) expressed his preference for p_X/p_M , the literature largely conformed to his preference for forty years. Writers in this period included many great names of economics and international trade:

Baldwin, Corden, Johnson, Kaldor, Kemp, Kindleberger, Krueger, Pigou, and Samuelson, all of whom followed Viner's example of p_X/p_M .

Only in 1980 did the alternative definition p_M/p_X begin to reappear frequently in the literature. This may have been prompted by Dornbusch (1976a,b) who spoke of "fluctuations in the exchange rate and the terms of trade" as though they were the same. Since he defined the exchange rate "as the domestic currency price of foreign exchange," one might infer that he viewed the terms of trade similarly, as the domestic-goods price of foreign goods, or p_M/p_X . It is on that basis that I have included his two papers in the right-hand column of Table 2.

Whatever Dornbusch may have intended, however, no such ambiguity was present in two papers by Obstfeld a few years later. Obstfeld (1980, p. 463) included "... where τ denotes the terms of trade, defined as the price of foreign consumption goods in terms of home goods." Likewise, in Obstfeld (1981) he defined p as the terms of trade and on p. 15 considered "a rise from p to p' in the relative price of the foreign good."

I would not have bothered to mention both of these citations were it not for the fact that, years later in what has become the definitive textbook for international macroeconomics, Obstfeld and Rogoff (1996) reversed this practice on p. 25: "In general a country's terms of trade are defined as the price of its exports in terms of its imports." That they saw the same convenience of this formulation noted by Viner is clear later when, on p. 236 they explained the effect of the terms of trade on the well being of the country: "The reason is basic: a country whose terms of trade fall receives less in return for each unit of the good it exports."

One might suppose that this change was due to Obstfeld's co-author, but then the two together went back to the formulation of Obstfeld alone in Obstfeld and Rogoff (2000) when they spoke of "the relative price of home imports in terms of home exports – the home terms of trade."

These contributions by the scholars who have been the foremost figures in international finance and international macroeconomics may account for another pattern that one can see in Table 2: with some exceptions, those who have used the p_M/p_X definition have been scholars of international finance, while those using p_X/p_M have been scholars of international trade.⁴

I've done my best to mark with asterisks in Table 2 those papers the authors or topics of which seem to belong within international monetary/macroeconomics/finance. From Dornbusch (1976) on, all of the papers using the p_M/p_X definition fell into that category, although there have also been an increasing number of such papers using p_X/p_M .

What I did not know and wanted to find out was why so many of our counterparts in the monetary side of international economics have this preference. Communications with Obstfeld and Rogoff suggest that it has to do with aligning the terms of trade with the real exchange rate, which was in turn defined to parallel the use by Dornbusch (1976) of the nominal exchange rate as the domestic currency price of foreign exchange. But why that choice instead of the opposite? Obstfeld says⁵

⁴ The terms of trade have also been a perennial concern of development economists. They have tended to focus on the terms of trade between primary products, exported by developing countries, and manufactures. To the extent that they spoke of the terms of trade of developing countries, it was the relative price of the primary products, in line with the usage of trade economists.

⁵ Personal communication, May 8, 2016.

I suspect this comes from the monetary approach to the exchange rate/bop. Monetary neutrality means that when the money stock rises, all prices rise, including that of foreign exchange. Easy to remember.

Does it Matter?

No, not really. As Viner said, “No question of principle is involved.” He viewed it as a matter of convenience. Since the terms of trade is associated with welfare (as evidenced by the regular use of the terms of trade “improving” or “deteriorating”), it is most intuitive if a rise is associated with a welfare improvement. I can testify to that from my own struggle to understand the graphs in Taussig, though I admit that my difficulty may have been due to years of thinking of the terms of trade by the opposite definition.

There is another reason that I think of, however, for preferring p_X/p_M over p_M/p_X . Countries typically export far fewer products than they import, and some countries such as oil exporters essentially export only one. To think of a terms of trade improvement as a fall in the prices of the many things that they import rather than a rise in the price of the few that they export is counterintuitive. It is true of course that when that happens, they do pay less of their own output for what they import. But that surely is not the most natural way to think of such a change.

Admittedly, in the realm of international finance, where changes in the terms of trade often arise from changes in nominal exchange rates, that connection with the prices of real goods is less direct. Perhaps this is why our colleagues from the monetary/macro/finance side of international economics (the “unreal side”?) see it differently.

Not that anything I say will change what they do. The most that I can hope for is that authors on both sides of the real/monetary divide make a point of stating how they

define the terms of trade whenever they use it in a way where the definition matters.

Table 1
Definitions of the Terms of Trade*

Commodity Terms of Trade	
= Net Barter Terms of Trade	p_X/p_M
Gross Barter Terms of Trade	M/X
Single Factoral Terms of Trade	$A_X p_X/p_M$
Double Factoral Terms of Trade	$A_X p_X/A_M p_M$
Income Terms of Trade	$p_X X/p_M$

where

p_X , X , and A_X are the price, quantity, and productivity of factors producing exports

p_M , M , and A_M are the price, quantity, and productivity of factors producing imports

*All are defined such that an increase is an improvement for the exporting country.

Table 2
Sources using p_X/p_M and p_M/p_X

p_X/p_M

Leontief (1933)
 Viner (1937)
 Belshaw (1939)
 Benham (1940), Kaldor (1940)
 Schiff (1942)
 Boulding (1947)
 Dorrance (1948)
 Imlah (1950), Pigou (1950)
 Johnson, (1951)
 Meier (1952), Samuelson (1952)
 Baldwin (1955), Kemp (1955), Kindleberger (1955)
 Corden (1957)
 Mundell (1964)
 Krueger & Sonnenschein (1967)

*Branson & Katseli-Papaefstratiou (1980), *Díaz Alejandro (1980), Findlay (1980), Spraos (1980)

*Svensson & Razin (1983)
 Diewert & Morrison (1985), *Persson & Svensson (1985), Sapsford (1985)
 *Ahmed (1987)
 Grilli & Yang (1988)
 Cuddington & Urzua (1989)
 Powell (1991), Sarkar & Singer (1991)

Bleaney & Greenaway (1993), Shiells & Reinert (1993)
 *De Gregorio & Wolf (1994), *Gruen & Wilkinson (1994)
 *Amano & van Norden (1995), *Mendoza (1995)
 *Obstfeld & Rogoff (1996)
 Bagwell & Staiger (1999)

*Broda (2001), Hadass & Williamson (2001)
 Kohli (2004)
 Kaplinsky (2006)
 Blattman et al. (2007)

*Aghion et al. (2009), Epifani & Gancia (2009), Spatafora & Tytell (2009)
 *Choudhri & Schembri (2010)
 *Crucini et al. (2011)
 *Aizenman et al. (2012), Hanson (2012)
 Feenstra et al. (2013)
 Caliendo & Parro (2015)

(*International monetary/macro/finance)

p_M/p_X

Taussig (1927)

Mauldon & Anderson (1939)

Harberger (1952)

*Dornbusch (1976a,b)

*Obstfeld (1980)

*Obstfeld (1981)

*Svensson (1985)

*Frenkel & Razin (1987)

*Ostry (1988)

*Sen & Turnovsky (1989)

*Ostry & Reinhart (1992)

*Backus et al. (1994)

*Backus & Crucini (2000), *Obstfeld & Rogoff (2000)

*Corsetti et al. (2007)

*Kehoe & Ruhl (2008)

*Berka et al. (2012)

*Jacob & Peersman (2013)

References

- Aghion, Philippe, Philippe Bacchetta, Romain Rancière, and Kenneth Rogoff. 2009. "Exchange rate volatility and productivity growth: The role of financial development," *Journal of Monetary Economics* 56(4), May, pp. 494–513.
- Aizenman, Joshua, Sebastian Edwards, and Daniel Riera-Crichton. 2012. "Adjustment patterns to commodity terms of trade shocks: The role of exchange rate and international reserves policies," *Journal of International Money and Finance* 31(8), December, pp. 1990–2016.
- Ahmed, Shaghil. 1987. "Government Spending, the Balance of Trade, and the Terms of Trade in British History," *Journal of Monetary Economics* 20(2), September, pp. 195-220.
- Amano, Robert A. and Simoon van Norden. 1995. "Terms of Trade and Real Exchange Rates: Canadian Evidence," *Journal of International Money and Finance* 14(1), February, pp. 83-104.
- Backus, David K., Patrick J. Kehoe, and Finn E. Kydland. 1994. "Dynamics of the Trade Balance and the Terms of Trade: The J-Curve?" *American Economic Review* 84(1), (March), pp. 84-103.
- Backus, David K. and Mario J. Crucini. 2000. "Oil prices and the terms of trade," *Journal of International Economics* 50(1), February, pp. 185-213.
- Bagwell, Kyle and Robert W. Staiger. 1999. "An Economic Theory of GATT," *American Economic Review* 89(1), March, pp. 215-248.
- Baldwin, Robert E. 1955. "Secular Movements in the Terms of Trade," *American Economic Review* 45(2), May, pp. 259- 269.
- Belshaw, H. 1939. "Stabilization in a Dependent Economy," *Economic Record* 15(3), April, pp. 40-60.
- Benham, Frederic. 1940. "The Terms of Trade," *Economica* NS 7(28), November, pp. 360-376.
- Berka, Martin, Michael B. Devereux, and Charles Engel. 2012. "Real Exchange Rate Adjustment in and out of the Eurozone," *American Economic Review* 102(3), May, pp. 179–185.
- Blattman, Christopher, Jason Hwang, and Jeffrey G. Williamson. 2007. "Winners and losers in the commodity lottery: The impact of terms of trade growth and volatility in the Periphery 1870–1939," *Journal of Development Economics* 82(1), January, pp. 156-179.
- Bleaney, Michael and David Greenaway. 1993. "Long-Run Trends in the Relative Price of Primary Commodities and in the Terms of Trade of Developing Countries," *Oxford Economic Papers* NS 45(3), July, pp. 349-363.
- Boulding, Kenneth E. 1947. "Economic Analysis and Agricultural Policy," *Canadian Journal of Economics and Political Science* 13(3), August, pp. 436-446.
- Branson, William H. and Louka T. Katseli-Papaefstratiou. 1980. "Income instability, terms of trade, and the choice of exchange rate regime," *Journal of Development Economics* 7(1), pp. 49-69.
- Broda, Christian. 2001. "Coping with Terms-of-Trade Shocks: Pegs versus Floats," *American Economic Review* 91(2), May, pp. 376-380.
- Caliendo, Lorenzo and Fernando Parro. 2015. "Estimates of the Trade and Welfare Effects of NAFTA," *Review of Economic Studies* 82(1), January, pp. 1-44.
- Choudhri, Ehsan U. and Lawrence L. Schembri. 2010. "Productivity, the Terms of Trade, and the Real Exchange Rate: Balassa–Samuelson Hypothesis Revisited," *Review of International Economics* 18(5), November, pp. 924-936.
- Corden, W. M. 1957. "Tariffs, Subsidies and the Terms of Trade," *Economica* NS 24 (95), August, pp. 235-242.
- Corsetti, Giancarlo, Philippe Martin, and Paolo Pesenti. 2007. "Productivity, terms of trade and the 'home market effect'," *Journal of International Economics* 73(1), September, pp. 99–127.

- Crucini, Mario J., M. Ayhan Kose, and Christopher Otrok. 2011. "What are the driving forces of international business cycles?" *Review of Economic Dynamics* 14(1), January, pp. 156-175.
- Cuddington, John T. and Carlos M. Urzua. 1989. "Trends and Cycles in the Net Barter Terms of Trade: A New Approach," *Economic Journal* 99(396), June, pp. 426-442.
- Deardorff, Alan V. 2014. *Terms of Trade: Glossary of International Economics*, 2nd edition, Singapore: World Scientific Publishers.
- Deardorff, Alan V. 2016. *The Terms of Trade and Other Wonders: Deardorffs' Glossary of International Economics*, online, <http://www-personal.umich.edu/~alandear/glossary/intro.html>.
- De Gregorio, José and Holger Wolf. 1994. "Terms of Trade, Productivity, and the Real Exchange Rate," NBER working paper No. 4807, July.
- Díaz Alejandro, Carlos F. 1980. "Exchange Rates and Terms of Trade in the Argentine Republic, 1913-1976," in Moshé Syrquin and Simón Teitel, eds., *Trade, Stability, Technology, and Equity in Latin America*, New York: Academic Press, pp. 27-43.
- Diewert, W. Irwin and Catherine J. Morrison. 1985. "Adjusting Output and Productivity Indexes for Changes in the Terms of Trade," NBER working paper No. 1564, February.
- Dornbusch, Rudiger. 1976a. "Exchange Rate Expectations and Monetary Policy," *Journal of International Economics* 6(3), August, pp. 231-244.
- Dornbusch, Rudiger. 1976b. "Expectations and Exchange Rate Dynamics," *Journal of Political Economy* 84(6), December, pp. 1161-1176.
- Dorrance, G. S. 1948. "The Income Terms of Trade," *Review of Economic Studies* 16(1), pp. 50-56.
- Epifani, Paolo and Gino Gancia. 2009. "Openness, Government Size and the Terms of Trade," *Review of Economic Studies* 76(2), April, pp. 629-668.
- Feenstra, Robert C., Benjamin R. Mandel, Marshall B. Reinsdorf, and Matthew J. Slaughter. 2013. "Effects of Terms of Trade Gains and Tariff Changes on the Measurement of US Productivity Growth," *American Economic Journal: Economic Policy* 5(1), February, pp. 59-93.
- Findlay, Ronald. 1980. "The Terms of Trade and Equilibrium Growth in the World Economy," *American Economic Review* 70(3), June, pp. 291-299.
- Frenkel, Jacob A. and Assaf Razin. 1987. *Fiscal Policies and the World Economy: An Intertemporal Approach*, Cambridge, MA: MIT Press.
- Grilli, Enzo R. and Maw Cheng Yang. 1988. "Primary Commodity Prices, Manufactured Goods Prices, and the Terms of Trade of Developing Countries: What the Long Run Shows," *World Bank Economic Review* 2(1), pp. 1-47.
- Gruen, David W. R. and Jenny Wilkinson. 1994. "Australia's Real Exchange Rate-Is it Explained by the Terms of Trade or by Real Interest Differentials?" *Economic Record* 70(209), June, pp. 204-219.
- Hadass, Yael S. and Jeffrey G. Williamson. 2001. "Terms of Trade Shocks and Economic Performance 1870-1940: Prebisch and Singer Revisited," NBER working paper No. 8188, March.
- Hanson, Gordon H. 2012. "The Rise of Middle Kingdoms: Emerging Economies in Global Trade," NBER Working Paper #17961, March.
- Harberger, Arnold C. 1952. "Pitfalls in Mathematical Model-Building," *American Economic Review* 42(5), December, pp. 55-865.
- Imlah, Albert H. 1950. "The Terms of Trade of the United Kingdom, 1798-1913," *Journal of Economic History* 10(2), November, pp. 170-194.
- Jacob, Punnoose and Gert Peersman. 2013. "Dissecting the dynamics of the US trade balance in an estimated equilibrium model," *Journal of International Economics* 90(2), July, pp. 302-315.

- Johnson, Harry. 1951. "Optimum Welfare and Maximum Revenue Tariffs," *Review of Economic Studies* 19(1), pp. 28-35.
- Kaldor, Nicholar. 1940. "A Note on Tariffs and the Terms of Trade," *Economica* NS 7(28), November, pp. 377-380.
- Kaplinsky, Raphael. 2006. "Revisiting the Revisited Terms of Trade: Will China Make a Difference?" *World Development* 34(6), June, pp. 981-995.
- Kehoe, Timothy J. and Kim J. Ruhl. 2008. "Are shocks to the terms of trade shocks to productivity?" *Review of Economic Dynamics* 11(4), October, pp. 804-819.
- Kemp, Murray C. 1955. "Technological Change, the Terms of Trade and Welfare," *Economic Journal* 65(259), pp. 457-473.
- Kindleberger, Charles P. 1955. "Industrial Europe's Terms of Trade on Current Account, 1870-1953," *Economic Journal* 65(257), May, pp. 19-35.
- Kohli, Ulrich. 2004. "Real GDP, real domestic income, and terms-of-trade changes," *Journal of International Economics* 62(1), January, pp. 83-106.
- Krueger, Anne O. and Hugo Sonnenschein. 1967. "The Terms of Trade, the Gains from Trade and Price Divergence," *International Economic Review* 8(1), February, pp. 121-127.
- Leontief, Wassily W. 1933. "The Use of Indifference Curves in the Analysis of Foreign Trade," *Quarterly Journal of Economics* 47(3), May, pp. 493-503.
- Marshall, Alfred. 1923. *Money, Credit and Commerce*, London: Macmillan and Co.
- Mauldon, F. R. E. and D. L. Anderson. 1939. "Terms of Exchange of Industry Groups," *Economic Record* 15(2), December, pp. 197-210.
- Meier, G. M. 1952. "Long Period Determinants of Britain's Terms of Trade, 1880-1913," *Review of Economic Studies* 20(2), pp. 115-130.
- Mendoza, Enrique G. 1995. "The Terms of Trade, the Real Exchange Rate, and Economic Fluctuations," *International Economic Review* 36(1), February, pp. 101-137.
- Mundell, Robert A. 1964. "Tariff Preferences and the Terms of Trade," *Manchester School of Economic and Social Studies*, January, pp. 1-13.
- Obstfeld, Maurice. 1980. "Intermediate Imports, the Terms of Trade, and the Dynamics of the Exchange Rate and Current Account," *Journal of International Economics* 10, pp. 461-480.
- Obstfeld, Maurice. 1981. "Aggregate Spending and the Terms of Trade: Is There a Laursen-Metzler Effect?" NBER Working Paper No. 686. (Published in QJE 1982, pp. 251-270.)
- Obstfeld, Maurice and Kenneth Rogoff, 1996. *Foundations of International Macroeconomics*, Cambridge, MA: MIT Press.
- Obstfeld, Maurice and Kenneth Rogoff, 2000. "New directions for stochastic open economy models," *Journal of International Economics* 50(1), February, pp. 117-153.
- Ostry, Jonathan. 1988. "The Balance of Trade, the Terms of Trade, and the Real Exchange Rate: An Intertemporal Optimizing Framework," IMF working paper, WP / 88 / 2, January 12.
- Ostry, Jonathan D. and Carmen M. Reinhart. 1992. "Private Saving and Terms of Trade Shocks: Evidence from Developing Countries," *IMF Staff Papers* 39(3), September, pp. 495-517.
- Persson, Torsten and Lars E. O. Svensson. 1985. "Current Account Dynamics and the Terms of Trade: Harberger-Laursen-Metzler Two Generations Later," *Journal of Political Economy* 93(1), February, pp. 43-65.
- Pigou, A. C. 1950. "Unrequited Imports," *Economic Journal* 60(238), June, pp. 241-254.

- Powell, Andrew. 1991. "Commodity and Developing Country Terms of Trade: What Does the Long Run Show?" *Economic Journal* 101(409), November, pp. 1485-1496.
- Samuelson, Paul A. 1952. "The Transfer Problem and Transport Costs: The Terms of Trade When Impediments are Absent," *Economic Journal* 62(246), June, pp. 278-304.
- Sapsford, D. 1985. "The Statistical Debate on the Net Barter Terms of Trade Between Primary Commodities and Manufactures: A Comment and Some Additional Evidence," *Economic Journal* 95(379), September, pp. 781-788.
- Sarkar, Prabarjit and H. W. Singer. 1991. "Manufactured Exports of Developing Countries and Their Terms of Trade since 1965," *World Development* 19(4), pp. 333-340.
- Schiff, Erich. 1942. "Direct Investments, Terms of Trade, and Balance of Payments," *Quarterly Journal of Economics* 56(2), February, pp. 307-320.
- Sen, Partha and Steven J. Turnovsky. 1989. "Deterioration of the Terms of Trade and Capital Accumulation: A Re-Examination of the Laursen-Metzler Effect," *Journal of International Economics* 26(3-4), May, pp. 227-250.
- Shiells, Clinton R. and Kenneth A. Reinert. 1993. "Armington Models and Terms-of-Trade Effects: Some Econometric Evidence for North America," *Canadian Journal of Economics* 26(2), May, pp. 299-316.
- Spatafora, Nikola and Irina Tytell. 2009. "Commodity Terms of Trade: The History of Booms and Busts," IMF Working Paper WP/09/205, September.
- Spraos, John. 1980. "The Statistical Debate on the Net Barter Terms of Trade Between Primary Commodities and Manufactures," *Economic Journal* 90(357), March, pp. 107-128.
- Svensson, Lars E. O. 1985. "Currency Prices, Terms of Trade, and Interest Rates," *Journal of International Economics* 18(1-2), February, pp. 17-41.
- Svensson, Lars E. O. and Assaf Razin. 1983. "The Terms of Trade and the Current Account: The Harberger-Laursen-Metzler Effect," *Journal of Political Economy* 91(1), February, pp. 97-125.
- Taussig, Frank William. 1927. *International Trade*, New York: Macmillan Co.
- Viner, Jacob. 1937. *Studies in the Theory of International Trade*, New York: Harper and Brothers Publishers.