



Energy prices and the expansion of world trade[☆]

Benjamin Bridgman^{*}

Bureau of Economic Analysis, U.S. Department of Commerce, Washington, DC 20230, USA

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ABSTRACT

The share of merchandise output that is internationally traded has significantly increased while tariffs have fallen. However, standard trade models have surprising difficulty linking these two facts. Trade growth slowed in the 1970s as tariffs fell relatively sharply while after the late 1980s trade grew quickly as tariffs fell slowly. This pattern implies that the price-import elasticity has changed over time. Also, tariffs have not fallen enough to generate such a large increase in trade given estimates of this elasticity. Changes in transport costs can resolve both puzzles. I present a vertical specialization trade model with an energy-using transportation sector. In the simulated model, trade growth slows from 1974 to 1985. The oil shocks raised transport costs, offsetting falling tariffs, so the price-import elasticity no longer needs to change. It also generates the observed volume of trade growth since transport costs have fallen over the long run.

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1. Introduction

The share of merchandise output that is internationally traded has significantly increased since World War Two. At the same time, successive rounds of General Agreement on Tariffs and Trade (GATT) negotiations have reduced tariffs. It is intuitive that the two phenomena are related.

Fig. 1 shows U.S. merchandise export share of GDP and industrial world merchandise tariffs.¹ Superficially, the two appear related. However, standard trade models have not been able to deliver the result that lower tariffs were responsible for postwar trade growth. They fail to deliver both the magnitude and pattern of trade expansion.

Tariffs have not fallen enough to generate such a large increase in trade. An aggregate elasticity of substitution between domestic and foreign goods or Armington elasticity (Armington, 1969) of around 11 is required to generate actual trade expansion in standard models. Estimates of this elasticity fall in a wide range of values depending on the data and methodology, but most fall well below 11. (Erkel-Rousse and Mirza (2002) provide a summary of this literature.) High frequency estimates, such as Blonigen and Wilson (1999) and Broda and Weinstein (2006), typically estimate low price-import elasticities of 1 or 2. Lower frequency estimates, such as those found in Head and Ries (2001) and Feenstra (1994), tend to find higher elasticities although they are still only about half of the level required.

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^{*} Address for correspondence: Bureau of Economic Analysis, U.S. Department of Commerce, 1441 L Street NW, Washington, DC, USA. Fax: +1 (202) 606 5366.

E-mail address: Benjamin.Bridgman@bea.gov.

¹ Detailed information about data sources is available in Appendix A.

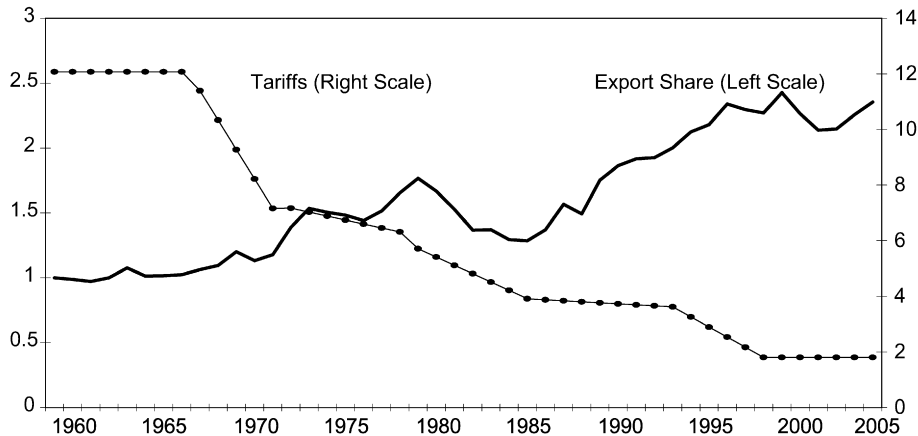


Fig. 1. Tariffs and U.S. export share.

In addition, tariffs have fallen steadily since the late 1960s while trade does not show steady growth. Trade growth shows no sustained growth from 1974 to 1986. The response of trade of falling tariffs is much stronger beginning in the late 1980s, which requires either a strong non-linear response to trade costs (a feature absent from standard models) or a large shift in import-price elasticity in the mid-1980s, perhaps by as much as sevenfold (Yi, 2003).

A number of explanations for these puzzles have been proposed, but have failed to fully account for trade growth. Yi (2003) suggests trade in intermediate goods, or vertical specialization (VS), as a solution. However, the model simulations in Yi (2003) capture only about half of trade growth from 1962 to 1999, leaving a great deal of trade to be explained. Bergoeing and Kehoe (2003) show that “New Trade Models” emphasizing increasing returns and monopolistic competition, such as Krugman (1979) and Helpman (1981), or non-homothetic preferences (Markusen, 1986) are also quantitatively unable to deliver the observed trade increase.

Changes in transport costs can resolve both of these puzzles. Transport costs have fallen since the 1960s, which explains increasing trade volumes. The slowdown coincides with a period of elevated oil prices. Higher energy prices raised the costs of transportation firms, which led to higher trade costs and slower trade growth. While the transport cost explanation may be intuitive, the crucial test it must pass is whether the changes are quantitatively important to trade growth.

Oil shocks must be large enough to significantly increase transport costs. Oil shocks have often been suggested as a source of a number of economic disturbances, including the productivity slowdown and stagflation.² However, it has been difficult to develop models where the effects of energy price changes are quantitatively important, since energy expenses represent a small portion of production costs. Without a significant magnifying mechanism, energy is usually too narrow a channel to have large effects on macroeconomic variables. (See Barsky and Kilian (2004) for a recent discussion.) This is not true for transportation since energy expenses represent a much larger portion of inputs than for the overall economy.

Changes in trade costs also have to be sufficiently large to account for the observed increase in trade. As discussed above, standard models with tariffs fail to predict the amount of trade growth. Incorporating changes in transportation into a VS model passes both tests and can resolve both puzzles in trade growth.

This paper presents a tractable general equilibrium model with Ricardian trade in intermediate goods, similar to Dornbusch et al. (1977) and Eaton and Kortum (2002). There is a continuum of intermediate goods that can be assembled into consumption goods. There are two countries that each produce a distinct consumption good. Trading both types of goods requires a shipping technology that uses energy as an input. I calibrate the model and run simulations using data on energy prices and tariffs.

In the simulated model, trade growth slows from 1974 to 1985. The increase in oil prices led to higher transport costs that offset the decline in tariffs. Total trade costs (tariffs plus transport costs) were constant beginning in the mid-1970s. When energy prices began to fall in 1982, total trade costs also fell. The pattern of trade growth generated by the model is much closer to the observed pattern of trade expansion. Once transport costs are accounted for, the price-import elasticity no longer needs to change.

Accounting for falling transport costs significantly increases the predicted amount of trade growth. The model predicts trade expansion equal to observed trade growth. Transportation industries have developed a number of new technologies that have increased their productivity faster than goods producing industries and reduced the cost of shipping goods. The model also matches the composition of trade growth, generating an increasing role for VS trade.

² The literature on the effect of the oil shocks on the economy is very large. Earlier work includes Hamilton (1983). More recent work includes Rotemberg and Woodford (1996), Barsky and Kilian (2002), and Nordhaus (2004).

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