

TRADE INTERMEDIARIES AND THE TARIFF PASS-THROUGH

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ABSTRACT

We show how the pro-competitive effects of trade liberalization can be weakened by the market power of intermediaries producing distribution services.

In a Cournot oligopoly model, where an homogeneous good is imported by trade intermediaries, who sell it to final consumers, the pass-through elasticity of the price with respect to the tariff is lower than one, but tends to increase with the degree of competition in the distribution-service sector. A tariff reduction increases the optimal mark-up of intermediaries, but allows a rise of their number. As a result, the long-run equilibrium mark-up, determined jointly by the maximum-profit and break-even conditions, remains unchanged. The pro-competitive effect of trade liberalization is entirely absorbed by the market power of intermediaries.

On the other hand, a reduction in regulatory barriers limiting market access in the distribution-service sector translates into a fall of the fixed costs faced by intermediaries. The resulting new equilibrium entails a higher number of intermediaries and a lower mark-up.

In short, the pro-competitive effect of trade liberalization can be achieved only if tariff reductions are complemented by open trade and competition policies in the distribution-service sector.

Keywords: trade liberalization, tariff pass-through, distribution services.

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1. Introduction

The static and dynamic benefits generated by trade liberalization policies arise mainly from their price effects. A tariff reduction is expected to lower the domestic price of imported goods, inducing a welfare improvement through a better allocation of existing resources and a stimulus to their accumulation.

In a standard partial equilibrium model of a small country under perfect competition, any tariff reduction translates into an equal fall of the domestic price of the imported good. In other words, the so-called tariff ‘pass-through elasticity’, defined as the ratio between the percentage changes of the price and the tariff rate, is equal to one (complete pass-through). In the case of a large country the tariff reduction affects not only the domestic but also the foreign price of the imported good. So, even if the wedge created between these two prices is equal to the tariff, the pass-through elasticity of the domestic price is lower than one.

Under imperfect competition firms enjoy a certain degree of market power, but trade liberalization brings about a pro-competitive effect, squeezing the mark-up between price and marginal cost (Markusen, 1981). However, at the same time, trade liberalization generates terms-of-trade changes even in small countries, because foreign suppliers find it profitable to use their market power in order to counteract the domestic price effect of the tariff cut. As a result, the tariff pass-through is normally lower than one, in analogy with what observed for the exchange rate pass-through (Feenstra, 1995)¹.

A common assumption in traditional and new models of international trade is that domestic and foreign producers sell their goods directly to final consumers. On the other hand, in the real world, trade is normally made possible through intermediaries, that perform all the activities required to match demand and supply, including transport, wholesale and retail distribution. More generally, with asymmetric information, intermediaries reduce transaction costs with respect to direct exchange between producers and consumers (Spulber, 1999). At the same time, independently of the country where they are located, intermediaries tend to absorb part of the rents suppressed by trade liberalization.²

¹ Feenstra (1989) shows the equivalence between the domestic price effects of tariff and exchange rate changes. Empirical research has focussed mainly on exchange rates, also because tariff changes are relatively less frequent and their specific impact is more difficult to detect in the data (Ianchovichina, Binkley and Hertel, 2000).

² Morisset (1998) argues that the role of international trade intermediaries can explain why changes in the international price of many commodities have been transmitted weakly and asymmetrically to consumer prices. Feenstra and Hanson (2004) analyze the strategies of intermediaries in the re-exports of Chinese manufactures.

This paper aims at improving our understanding of the role of intermediaries in the process of trade liberalization. More precisely, we wish to study the relationship between the degree of competition in the distribution-service market and the transmission of tariff changes to domestic prices. This issue is of great relevance for assessing the effectiveness of trade policies, and highlights the crucial interdependence between trade and competition policies in goods and services.

Our analysis is based on a simple model of a small open economy, where consumers purchase an homogeneous good from trade intermediaries, who import it from the rest of the world and produce the distribution services needed to reach consumers. We use this model to see how tariff liberalization and the reduction of market access barriers in distribution services affect the intermediaries' mark-up and the tariff pass-through elasticity of domestic prices.

The only study of which we are aware that uses a similar approach is that of Francois and Wooton (2005). Our model differs in three main aspects. On one hand, for the sake of simplicity, we concentrate on the domestic market of the importing country, without trying to model the interaction between intermediaries and foreign producers. On the other hand, we extend Francois and Wooton's model by making the number of intermediaries endogenous, through the long-run zero-profit condition³. In addition, by introducing fixed costs in the intermediation sector, our model allows to distinguish between the effects of a tariff reduction on the imported good and those of market access liberalization in distribution services.

In the following two sections we describe our model and its graphical representation. Section 4 shows the effects of a tariff reduction on consumer price, the number of intermediaries and their equilibrium mark-up. Section 5 extends the analysis to the effects of trade liberalization in the distribution services sector. Section 6 concludes.

2. The model

In our model, following Francois and Wooton (2005), a set of symmetric trade intermediaries, competing *à la Cournot*, supplies an homogeneous good to consumers of a small country (H), by importing it from the rest of the world and producing all the necessary distribution services (wholesale, retail, and any other activity required to sell the good, excluding any further manufacturing, processing and differentiation).

Each intermediary uses the same technology and faces equal costs. Marginal costs c include the price of the imported good and a constant component, denoted by k . For the sake of simplicity,

³ Here our approach has been partly inspired by Baldwin and Wyplosz (2005).

since we are interested only in what happens in country H , we assume that the price of the imported good (p_w) is given at its world level. The government of country H imposes an *ad valorem* tariff (t) on the imports of the good, so that

$$c = (1+t)p_w + k \quad (1)$$

In addition, we assume that the technology used by trade intermediaries to produce their distribution services is characterised by increasing returns to scale, due to the existence of fixed costs, denoted by F .

An inverse linear demand function relates the market price to the total quantity purchased by consumers:

$$p = \lambda - \delta Q \quad (\lambda, \delta > 0)$$

Since intermediaries are assumed to be symmetric, the inverse demand function can be written as:

$$p = \lambda - \delta nq \quad (2)$$

where q (firm size) is the quantity supplied by each of the n intermediaries⁴.

Profits are given by

$$\pi = (\lambda - \delta nq)q - [(1+t)p_w + k]q - F \quad (3)$$

To analyze the oligopoly behaviour, we use an approach developed by Helpman and Krugman (1989), based on the concept of *perceived marginal revenue* ($\tilde{r}$). The underlying assumption is that each firm calculates its marginal revenue taking as given not only the price, but also the output level of its rivals. Perceived marginal revenue is a weighted average of the true marginal revenue (r) and the price (p):

$$\tilde{r} = \left(\frac{1}{n}\right)r + \left(1 - \frac{1}{n}\right)p$$

⁴ We assume that $\lambda > c$, which is a necessary condition for production to be profitable.

$$\tilde{r} = \left(\frac{1}{n}\right)(\lambda - 2\delta nq) + \left(\frac{n-1}{n}\right)(\lambda - \delta nq)$$

$$\tilde{r} = \frac{1}{n}(n\lambda - \delta nq - \delta n^2 q) = \lambda - \delta q(1+n). \quad (4)$$

We determine the short-run optimal (maximum-profit) firm size and price by equating perceived marginal revenue and marginal cost:

$$q^* = \frac{\lambda - c}{\delta(1+n)} = \frac{\lambda - (1+t)p_w - k}{\delta(1+n)} \quad (5)$$

$$p^* = \frac{\lambda + nc}{1+n} = \frac{\lambda + n[(1+t)p_w + k]}{1+n} \quad (6)$$

Intermediaries' optimal mark-up μ^* is given by:

$$\mu^* = p^* - c = \delta q^* = \frac{\lambda - c}{1+n} \quad (7)$$

The number of intermediaries operating in our market can be determined through the zero profit (break-even) condition, stating that in the long run firms will enter (exit) the market if the price is higher (lower) than the average cost. In other words, and taking into account our assumption of increasing returns to scale, the number of intermediaries will be determined at the level for which the mark-up allows to cover fixed average cost.

$$\pi = \mu q - F = 0 \quad (8)$$

We denote this break-even mark-up as μ_0 :

$$\mu_0 = \frac{F}{q} \quad (9)$$

The relationship between μ_0 and the number of intermediaries can be determined by deriving q from the inverse demand function (2) and reminding that the price is just the marginal cost plus the mark-up:

$$\mu_0 = \frac{\delta F n}{\lambda - c - \mu_0} \quad (10)$$

$$n = \frac{(\lambda - c)\mu_0 - \mu_0^2}{\delta F} \quad (11)$$

Solving the equation system given by (7) and (11), we can determine the equilibrium levels for the mark-up ($\bar{\mu}$) and the number of intermediaries ($\bar{n}$), satisfying jointly the maximum-profit and the break-even conditions:

$$\bar{\mu} = \sqrt{\delta F} \quad (12)$$

$$\bar{n} = \frac{\lambda - c}{\sqrt{\delta F}} - 1. \quad (13)$$

The corresponding levels of the price and firm size are as follows:

$$\bar{p} = c + \sqrt{\delta F} \quad (14)$$

$$\bar{q} = \frac{F}{\bar{\mu}} = \frac{F}{\sqrt{\delta F}} = \sqrt{\frac{F}{\delta}} \quad (15)$$

3. The PP-ZZ diagram with trade intermediaries

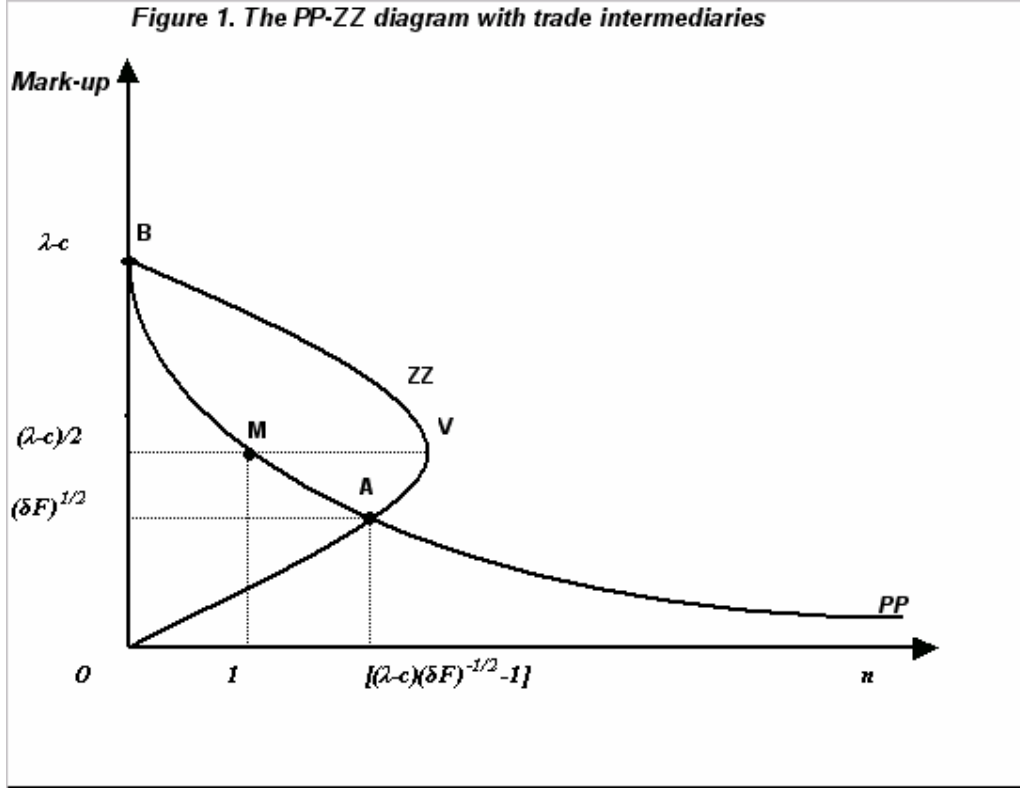
In this section we present a graphical representation of our model, based on a modified version of the *PP-ZZ* diagram (Helpman and Krugman, 1989), taking into account the role of trade intermediaries.

The PP (maximum profit) curve. This hyperbola, corresponding to equation (7), depicts the negative relationship between the maximum-profit mark-up (μ^*) and the number of active firms (n). In the case of a monopoly, μ^* is equal to $(\lambda - c)/2$. As the number of rivals rises, increased competition will force down the margins. Asymptotically, the PP curve tends to a zero mark-up, corresponding to perfect competition ($n = \infty$).

The ZZ (zero profit) curve. This curve, corresponding to equation (11), represents the quadratic relationship between the break-even mark-up and the number of intermediaries. It can be shown that the vertical upper intercept of the ZZ curve (point B) is equal to the intercept of the PP curve $(\lambda - c)$. Moreover, the ZZ axis of symmetry intersects the vertical axis at $(\lambda - c)/2$, that is the monopoly optimal mark-up.

Along the upward sloping tract of the parabola, given the level of fixed costs, an increase in the number of active firms is made possible only by an increase in the mark-up, offsetting the fall in firm size. The downward sloping tract of the ZZ curve can be ignored, because the corresponding mark-up levels on the PP curve are higher than the monopoly mark-up.

The intersection between the *PP* curve and the upward-sloping tract of the *ZZ* curve determines the equilibrium levels of the mark-up and number of firms (point A), whose coordinates are given by (12) and (13). Given the demand function, the position of the A point is determined by the cost structure of the intermediaries, which will allow us to study the effects of trade policies in the following sections.



4. The effects of tariff liberalization

Equation (6) shows that, for any given world price of the imported good, the price paid by consumers is positively related to the tariff rate imposed by the H government, and inversely related to the competition degree of the intermediaries' market, as proxied by the number of firms.

$$\frac{\partial p^*}{\partial t} = \frac{np_w}{1+n} > 0 \quad (16)$$

$$\frac{\partial p^*}{\partial n} = \frac{c-\lambda}{(1+n)^2} < 0 \quad (17)$$

It can also be shown that, other things being equal, the effect of a tariff change on the domestic consumer price will be greater, the more competitive the distribution service market is, which confirms the complementarity between trade and competition policies in goods and services (see section 5).

$$\frac{\partial^2 p^*}{\partial t \partial n} = \frac{p_w}{(1+n)^2} > 0 \quad (18)$$

The effect of tariff changes on the consumer price can also be measured in relative terms through the so-called tariff ‘pass-through elasticity’ (*TPT*), i.e. the ratio between the relative changes of p^* and T , where $T = (1 + t)$:

$$TPT = \frac{\partial p^*}{\partial T} \frac{T}{p^*} = \frac{np_w}{(1+n)} \frac{T(1+n)}{\lambda + n(Tp_w + k)} = \frac{nTp_w}{\lambda + n(Tp_w + k)} < 1 \quad (19)$$

According to this formula, any change in T will translate into a less than proportional change in consumer prices (incomplete pass-through). This is essentially due to the imperfectly competitive structure of the intermediaries’ market, as is shown by the fact that the *TPT* elasticity tends to rise with the number of intermediaries:⁵

$$\frac{\partial TPT}{\partial n} = \frac{\lambda Tp_w}{(\lambda + nc)^2} > 0 \quad (20)$$

However the *TPT* would be less than complete even if intermediaries were perfectly competitive firms. It can be shown that the limit for the *TPT* as the number of intermediaries approaches infinity is given by:

$$\lim_{n \rightarrow \infty} TPT = \frac{Tp_w}{Tp_w + k} \quad (21)$$

In other words, the very existence of intermediation costs (k) makes it so that the *TPT* is less than complete, even under perfect competition.

In the context of our oligopoly model, an incomplete pass-through means that any import tariff cut will reduce the marginal cost faced by intermediaries more than the price paid by consumers. In

⁵ These theoretical conclusions reveal a close analogy with Frankel et al. (2005) empirical results on the exchange rate pass-through, measured at different steps of the value processing chain. They find that the pass-through coefficient is higher for the prices at the dock than for the same imports at retail, higher for retail import prices than for local competitor prices, and higher for local competitor prices than for the aggregate price index.

other words, for any given number of intermediaries, import tariff cuts will translate into an increase of the intermediaries' mark-up:

$$\frac{\partial \mu^*}{\partial t} = -\frac{p_w}{1+n} < 0. \quad (22)$$

Equation (22) shows also that the size of the mark-up increase caused by the tariff reduction is inversely related to the number of intermediaries.

Equation (11) can be used to determine the effect of a tariff change on the number of intermediaries: other things being equal, lower tariffs will raise the number of firms that are able to cover fixed costs:

$$\frac{\partial n}{\partial t} = -\frac{\mu_0 p_w}{\delta F} \quad (23)$$

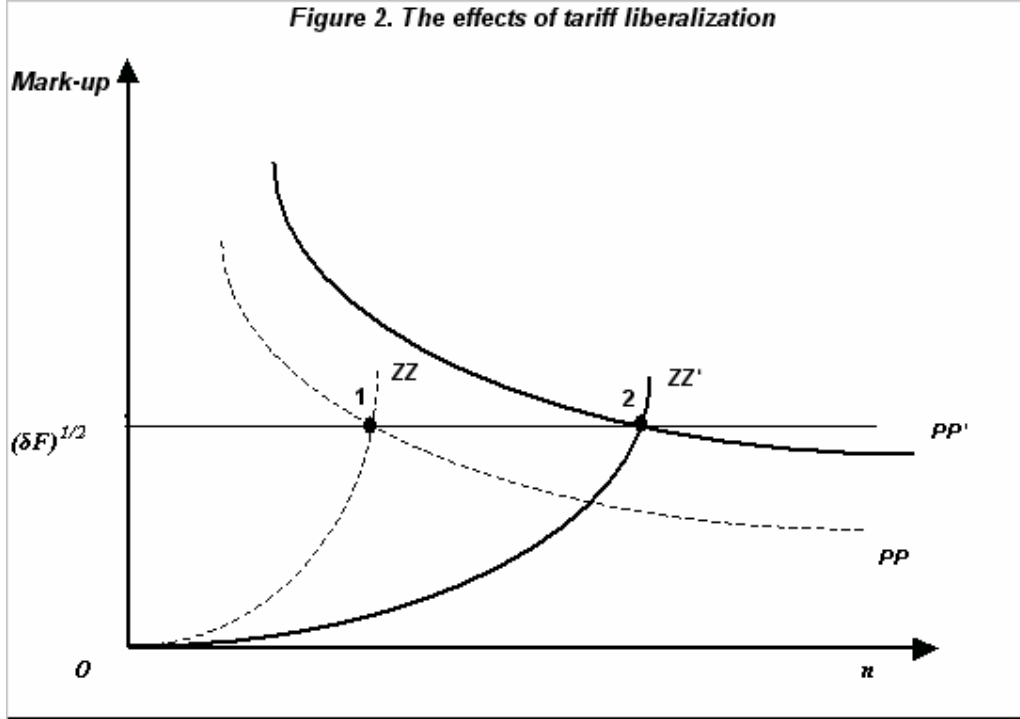
These conclusions hold independently of the country in which the intermediaries are located.

We can examine the effects of tariff liberalization on the equilibrium mark-up and number of firms, using the *PP-ZZ* diagram.

As the import tariff goes down, each intermediary's mark-up rises for any given number of firms (see equation 7), so the *PP* curve shifts upwards.

At the same time, equation (11) shows that, for any given level of mark-up, a tariff cut will increase the number of intermediaries that are able to cover fixed costs. In other words, the *ZZ* curve shifts rightwards.

It is interesting to note that the equilibrium mark-up is not affected by these shifts. Equation 12 shows that its level depends only on the slope of the demand function (δ) and on the level of fixed costs (F). In other words, tariff liberalization increases the number of active intermediaries without reducing their mark-up. The tariff cut is translated into a price reduction of equal absolute value, which implies an incomplete pass-through, as shown also by equation (19). The pro-competitive effect of trade liberalization is entirely absorbed by the market power of intermediaries.



5. Market access liberalization in the intermediation-service sector

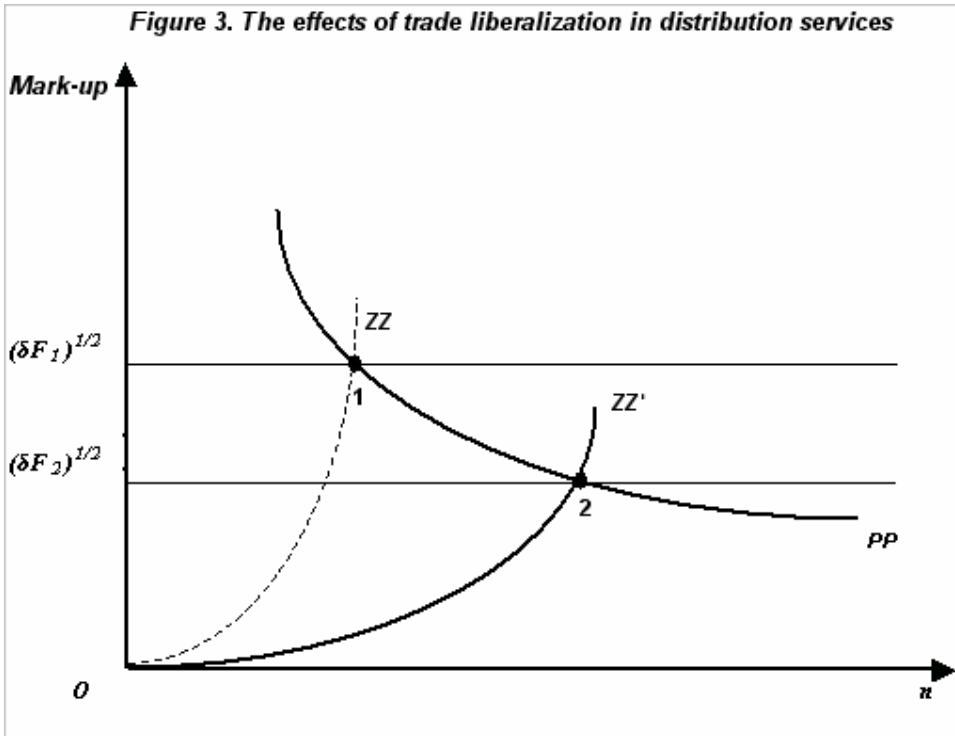
In our model, the intermediaries are firms that produce all the distribution services necessary to deliver the good to final consumers. Distribution services are subject to a series of non-tariff restrictions, that hinder firms from entering and/or operating in the market, and are normally imposed through government regulations (Kalirajan, 2000). In principle, these restrictions can be non-discriminatory and affect domestic and foreign producers in the same way. In practice, intentionally or not, they tend to protect local intermediaries against foreign competition. In our model this distinction can be neglected, since we do not differentiate between domestic and foreign intermediaries.

We concentrate on market access restrictions, assuming that they translate into a higher level of the fixed costs faced by the intermediaries:

$$F = F_0 + \alpha R \quad (24)$$

where F_0 is the true fixed industrial cost of distribution services and αR measures the fixed cost increase due to market access restrictions (R) in the intermediation sector.

Fixed costs do not enter into the optimal pricing rule of intermediaries, as shown by the PP curve (see equation (7)). On the other hand, they influence the shape of the zero-profit condition, represented by equation (11). As a result, a fall in fixed costs due to trade liberalization in the distribution-service sector translates into a rightward shift of the ZZ curve: for any given mark-up, a higher number of intermediaries is now able to break even, thanks to the fall of fixed costs. The effects of this process are represented in figure 3, where the equilibrium mark-up is now lower than in figure 2, where trade liberalization involved only the tariff on the imported good.



6. Conclusions

We have tried to show how the pro-competitive effects of trade liberalization can be weakened by the market power of intermediaries producing distribution services.

In a Cournot oligopoly model, where an homogeneous good is imported by trade intermediaries, who sell it to final consumers, the pass-through elasticity of the price with respect to the tariff is lower than one, but tends to increase with the degree of competition in the distribution-service sector. A tariff reduction increases the optimal mark-up of intermediaries, but allows a rise of their number. As a result, the long-run equilibrium mark-up, determined jointly by the maximum-profit and break-even conditions, remains unchanged. The pro-competitive effect of trade liberalization is

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In short, the pro-competitive effect of trade liberalization can be achieved only if tariff reductions are complemented by open trade and competition policies in the distribution-service sector.

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