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ECONOMICS

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January 2018 (updated August 2021) **No: 1148**

This paper has previously appeared with an error in the computation of import quotas, which has been amended

Warwick Economics Research Papers

ISSN 2059-4283 (online)

ISSN 0083-7350 (print)

The Effects of Entry in Oligopolistic Trade with Bargained Input Prices

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24th August 2021

Abstract

Firms which face the threat of import competition from foreign rivals are conventionally seen as favouring import protection. We show that this is not necessarily the case when domestic firms' input prices are determined endogenously. In a framework where the input price is determined through bargaining with an (upstream) input supplier, the relationship between a domestic (downstream) firm's profits and the number of foreign competitors depends on trade costs. If trade costs are sufficiently high, then an increase in the number of foreign entrants can raise the profits of a downstream firm in a home market characterised by Cournot competition. The intuition for this result is that increased product market competition through the entry of foreign firms is mirrored by profit-enhancing moderation of the bargained input price. We examine a number of tariff and non-tariff barriers to international trade and identify conditions under which import-competing firms will favour the removal of barriers to foreign competition.

Keywords: Oligopoly, international trade, profits, entry, vertical markets.
JEL classification: F13, F16, L13.

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1 Introduction

In the standard Cournot model of oligopoly, each firm's profits decrease as the number of firms competing in the product market increases (Seade, 1980). In a model of trade, this implies that a domestic import-competing firm would have an unambiguous incentive to deter foreign competition, for example through aggressive "deep-pocket" entry-deterrence behaviour or through investing in the effort or expense of lobbying government for import protection. In this paper, we show that when a firm's costs are determined endogenously through bargaining with an upstream input supplier in the domestic market, then the relationship between profits-per-firm and the number of foreign entrants depends on trade costs. With sufficiently high trade costs, entry by foreign firms raises the profits of the domestic downstream firm. The intuition for this result is that the adverse effect of increased product market competition through foreign entry is offset by profit-enhancing moderation of input prices in the domestic market through bargaining with the upstream input supplier. In other words, the upstream input supplier bears at least part of the cost of foreign entry, such that the downstream firm may in fact benefit from entry. When trade costs are sufficiently high, the profit-reducing effect of entry via the reduced product price is dominated by the profit-enhancing effect stemming from the impact of entry on the input price.

One implication of our result is that downstream firms in vertical markets do not necessarily have incentives to deter entry from abroad: for example, the profits of a downstream firm can be greater under Cournot competition with a foreign entrant than when import protection gives it a domestic monopoly. The trade literature has identified many channels through which domestic firms can benefit from trade. These channels, however, rely on a firm's ability to experience a more-than proportionate increase in export-generated profits to compensate for the losses incurred in the domestic market. For example, in situations of intra-industry trade (see Brander and Krugman, 1983) oligopolistic firms gain through reciprocal dumping and so are more likely to favour trade liberalisation. We show that in a vertical market setting, the incentive on downstream firms to restrict market access to foreign rivals, such as through lobbying for entry-restricting non-tariff barriers or for tighter import quotas, is weakened or reversed – even in the absence of potential export market considerations. To the best of the authors' knowledge, the finding of the present paper, which implies that increased trade can raise the profits of a domestic firm irrespective of the level of any exports, is novel. Our results are likely to be most relevant in situations where a small number of domestic firms enjoy large market shares and where foreign competition faces some intrinsic competitive disadvantage due to transport costs, a domestic home bias and/or a Stackelberg first-mover advantage on the part of the domestic firm(s).

Our model identifies a mechanism to counter that analysed in the classic model of Protection for Sale (Grossman and Helpman, 1994). In that model, import-competing firms pay campaign contributions to the incumbent government to obtain trade protection, which limits the degree of foreign competition in the domestic market. In contrast, in our framework there is the potential for a domestic downstream firm to

benefit from foreign competition. Thus, a pro-trade position of firms can stem not only from a desire to exploit export markets but also to gain strategic advantages in the domestic market.

We examine a range of politically-induced tariff and non-tariff barriers to trade and explore how import-competing domestic firms might have an incentive to lobby government to reduce such barriers. If the number of firms is fixed, downstream firms will continue to have the Grossman-Helpman incentive to lobby for higher tariffs. This is because, in our model, tariffs have a direct profit-shifting effect in favour of domestic firms. If the number of foreign firms is not fixed, however, it is possible, in our analysis, that the reduction or removal of import tariffs may increase the profits of domestic downstream firms. This result emerges when the reduction in an import tariff induces profit-enhancing entry by foreign firms. Moreover, it follows readily from our analysis that any other non-tariff barrier (bureaucratic 'red tape' or regulatory barriers, for example) which might have an impact on the entry decision of foreign firms may not be in domestic firms' interests. We also examine import quotas in our model, finding that domestic downstream firms unambiguously raise profits with more restrictive import quotas. Downstream firms (and in some situations also upstream firms) might favour the removal of any trade barrier which affects the number of competing foreign firms (i.e., the extensive margin of trade).

Our findings offer new insights into a long-standing puzzle regarding the relationship between market concentration and the extent to which firms lobby government for import protection.[1] Hillman et al. (2001) examine whether firms in highly concentrated industries will be more or less likely to engage in lobbying.[2] They note that a long-held argument based on impediments to collective action (Olson, 1965) suggests that domestic firms in more highly concentrated industries should be better able to coordinate and collude in lobbying for import protection. However, they find that the evidence is not consistent with this hypothesis. Similarly, Winters (2003), citing also Lavergne (1983), reports that concentration ratios do not explain protection. Our results provide an insight into this puzzle. If horizontally concentrated markets are also characterised by vertical market relationships, then the incentive to lobby for protection is mediated by the fact that upstream firms bear at least part of the costs incurred when markets are opened up to increased foreign competition.

We also note that, in our model of vertical markets, the upstream agent (which might take the form of a labour union) continues to have the Grossman-Helpman incentive to lobby for protection, implying potentially conflicting interests between firms (and/or labour unions) at different levels in the vertical hierarchy. Evidence supports the view that businesses tend to favour free trade, whereas labour unions tend to oppose free trade. In the US, for example, labour unions lobbied unsuccessfully against the North American Free Trade Agreement (NAFTA) whereas businesses were largely in favour. While labour unions mostly object

[1] See Maggi and Rodriguez-Clare (2000), for example, whose model generates the prediction that protection can increase with import penetration. See also Greenaway et al. (2008)

[2] See also Bombardini and Trebbi (2012)

to trade agreements with low-wage economies, they were also seen to oppose the Australia-US free trade agreement (AUSFTA) more than two decades ago. Since the 2016 presidential election in the US, many businesses have joined a lobby to preserve NAFTA.

We model a demand function which allows for the possibility that consumer preferences are biased towards the consumption of domestic goods. We find that our apparently counter-intuitive results regarding the impact of import competition on profits, although not dependent on home bias, are nonetheless strengthened the more pronounced is the extent of any home bias. Hence, a greater home bias may be associated with a greater willingness on the part of domestic firms to accommodate foreign competition. We also extend the basic model beyond Cournot competition, and show that if an incumbent firm has a first-mover advantage in the Stackelberg sense, our result is also strengthened: any marginal benefit of entry is greater if the incumbent firm, post entry, is able to act as a Stackelberg leader. Hence, in our framework, Stackelberg leadership is associated with an enhanced willingness to accommodate foreign competition.

The rest of this paper is organised as follows. In Section 2, we briefly outline the relevant literature on profit-raising entry. In Section 3, we set out the basic model and in Section 4 we examine how firms' profits vary with the number of firms. In Section 5, we explore how the nature of barriers to trade affects the ways in which trade protection impacts on the profits of domestic firms. Section 6 extends the model to the case of a Stackelberg leader. Section 7 closes the paper with conclusions and further remarks.

2 Literature review

Our finding that a firm's profits might increase with the overall number of firms can also arise in different environments. There now exists a growing literature exploring different channels through which entry might be associated with profit-raising effects. We identify at least three strands of this literature: 1) Vertical industrial relationships; 2) Stackelberg competition with cost asymmetry; and 3) Product differentiation.

Within the first branch of the literature, an early contribution (Tyagi, 1999) constructs a model of vertical industrial relationships with downstream firms competing in a Cournot setting. Entry into the market leads upstream firms to increase input prices, which in turn leads downstream firms to compete less aggressively post entry. Under certain conditions on the demand function this can lead to an increase in the profits of each firm. Subsequent papers have further explored the possibility of profit-raising entry under vertical relationships (Naylor and Soegaard, 2014; Mukherjee et al., 2009; Matsushima and Mizuno, 2012). Within the second branch, (Mukherjee and Zhao, 2017) use a model of Stackelberg competition where firms differ in marginal costs. They find that if the incumbent Stackelberg leader is efficient, the entry of an inefficient Stackelberg follower increases its profits. A similar result can be found in Pal and Sarkar (2001). These results arise without any vertical relationships in the market. The third branch involves the presence of some product differentiation. Ishibashi and Matsushima (2009), use a model with firms that produce high-end (or

branded) products and firms that produce low-end (or non-branded) products. They show that the entry of low-end firms may increase the profits of high-end producers. This is because in the absence of low-end firms, high-end producers would compete for price-sensitive consumers, and thereby overproduce. Papers which generate profit-raising entry due to some form or product differentiation also include Coughlan and Soberman (2005) and Chen and Riordan (2007).

Our paper fits into all three strands of the literature in that it models a vertical industrial structure, cost asymmetry and allows for product differentiation. But there are important differences. First, while our results are driven by the existence of a vertical structure similar to that modelled in Tyagi (1999), in our model, the entry of competitors leads to moderation of the input price rather than to an increase, and as such our results do not rely on firms competing in a less aggressive way. Second, while we consider both cost asymmetry (in the form of a transport cost for foreign firms, for example) and an extension to Stackelberg competition, our results on profit-raising entry arise without Stackelberg competition. Finally, while our use of product differentiation (modelled as a home bias) increases the parameter range over which profit-raising entry occurs, our results hold also in the absence of product differentiation. In addition, product differentiation in our model can generate profit-raising entry without the presence of price-sensitive consumers which was what drove the result in Ishibashi and Matsushima (2009). Our contribution relative to existing studies of profit-raising entry is the modelling of a novel channel through which profit-raising entry occurs – bargaining of the input price and international trade. Moreover, our explicit modelling of barriers to international trade makes our model applicable not just to the competitive behaviour of firms, but also to the political economy of the international trading system.

In a related literature, Naylor (2002) shows conditions under which industry profits are increasing with the number of firms in the market, but does not address the issue of the individual firm's profit level. It is less surprising that industry profits can increase with the number of firms as such a result is anyway consistent with falling profits-per-firm. In the related literature on vertically integrated oligopoly, Dowrick (1989) develops a framework in which unions act as the upstream agent and shows how the bargained wage varies with market size, but does not focus on the relationship between profits and the number of firms. Horn and Wolinsky (1988) examine a differentiated oligopoly with upstream agents (unions) and downstream firms, but assume a duopolistic market in which the number of firms is fixed.

3 The model

We develop a model in which m downstream firms bargain with an upstream firm (or, alternatively, a labour union) over the price of an input. All are located in country h. If we assumed autarky, the domestic market would be characterised as a situation of vertical oligopoly. However, we assume instead that the downstream firms compete against n entrants from Rest of the World (RoW). We assume for simplicity that foreign firms

are all identical and pay a competitive RoW input price. Foreign firms face an iceberg trade cost associated with exporting to country h. This, together with the assumption of quantity-setting competition among a finite number of downstream firms, generates the possibility that the domestic upstream firm can set an input price greater than the RoW level. This set-up seems particularly relevant for relatively small countries with domestic markets which do not support intense product market competition or for relatively affluent countries with high wages or other input costs. In a first stage (the bargaining game), the downstream home firms bargain over the input price with the upstream firm. In the second stage (modelled initially as a Cournot product market sub-game), the downstream home firms and the n foreign entrants set their output choices – given the pre-determined input price of the home firm from Stage 1 – to maximise profits. We proceed by backward induction.

(i) *Stage 2: the product market game*

In the model, we allow for horizontal product differentiation, which enables us to capture either home or foreign bias among domestic consumers. We will typically examine the case of home bias, though this will not be critical to our main results, as we discuss in Section 4.1. We model inverse demand functions for the home firms and the potential foreign firms as, respectively:

$$p_h = a_h - bQ; \tag{1}$$

$$p_f = a_f - bQ. \tag{2}$$

where $Q = Q_h + Q_f$ is the aggregate output, $Q_h = \sum_{i=1}^{m} q_{hi}$ is the output of the downstream home firms, and $Q_f = \sum_{j=1}^{n} q_{fj}$ is the aggregate output of foreign firms. Thus, in the home market the domestic downstream firms will face a different demand function from any potential foreign firm. Under the assumption that $a_h \geq a_f$ the domestic downstream firm enjoys a home advantage, whereby the preferences of domestic consumers are biased towards the domestic product. We do not model demand in the RoW as the focus is on output decisions in country h. The profits of a home firm i, and those of a foreign firm j, respectively, can be written as:

$$\pi_{hi} = [a_h - b(Q_h + Q_f) - c_{hi}]\, q_{hi}; \tag{3}$$

$$\pi_{fj} = [a_f - b(Q_h + Q_f) - c_{fj} - \tau]\, q_{fj}. \tag{4}$$

c_{hi} is the domestic input price, which results from the bargaining between the upstream firm or labour union and the downstream firms in country h. For simplicity and clarity of analysis, we assume a single monopoly upstream firm, or equivalently a centralised labour union. A unique value of the input price emerges, incurred by all domestic firms, as shown below in the analysis of the Stage 1 sub-game. Hence, we drop the subscript such that $c_{hi} = c_h \; \forall \; i$. c_j is the exogenous input price incurred by foreign firm j, and τ is

an iceberg trade cost faced by foreign firms.[3] Under the assumption that they do not negotiate with an input supplier, foreign firms pay a given input price which we denote as $\overline{c}$.[4] Hence, we have $c_{fj} = \overline{c} \; \forall \; j$. Under the Cournot-Nash assumption, differentiation of (3) and (4), respectively, yields the first-order conditions for profit maximisation for the incumbent firms and the foreign entrants, from which it is straightforward to derive the corresponding best-reply functions:

$$q_{hi} = \frac{a_h - b\left(Q_h + Q_f\right) - c_h}{b}; \tag{5}$$

$$q_{fj} = \frac{a_f - b\left(Q_h + Q_f\right) - \overline{c} - \tau}{b}. \tag{6}$$

Solving across the $m + n$ first-order conditions gives the following expressions for total output in sub-game perfect equilibrium:

$$Q_h = \frac{m\left[(a_h - c_h)(n+1) - n(a_f - \overline{c} - \tau)\right]}{b(m+n+1)}; \tag{7}$$

$$Q_f = \frac{n\left[(a_f - \overline{c} - \tau)(m+1) - m(a_h - c_h)\right]}{b(m+n+1)}. \tag{8}$$

Since all domestic downstream firms are identical, we can drop subscripts such that $q_{hi} = q_h \; \forall \; i$ and likewise for foreign firms $q_{fj} = q_f \; \forall \; j$, we must have $q_h = \frac{Q_h}{m}$ and $q_f = \frac{Q_f}{n}$. It is useful to express the profits of all firms in terms of a vector of their input prices. Substituting (7) and (8), respectively, into (3) and (4) yields, $\forall \; i$ and $\forall \; j$:

$$\pi_{hi} = \pi_h = \frac{\left[(a_h - c_h)(n+1) - n(a_f - \overline{c} - \tau)\right]^2}{b(m+n+1)}; \tag{9}$$

$$\pi_{fj} = \pi_f = \frac{\left[(a_f - \overline{c} - \tau)(m+1) - m(a_h - c_h)\right]^2}{b(m+n+1)}. \tag{10}$$

(ii) *Stage 1: the bargaining game*

We assume there is one upstream firm or labour union in country h. The implication is that input prices or wages are bargained centrally. We could alternatively have assumed a decentralised firm-firm or union-firm bargaining relationship. This modification of the modelling assumptions does not produce results that are qualitatively different.[5] Similarly, we could have assumed an upstream input supplier for foreign firms, though again this does not impact on the qualitative nature of our results regarding the domestic market.

The profits of the domestic input supplier can be written as:

$$\pi_h^I = \left(c_h - \overline{c}\right) Q_h, \tag{11}$$

[3]Trade costs may include such things as transport technology, storage, inventory and preparation technology, communications networks, language barriers, import tariffs and so on.

[4]Naylor (1999) considers a situation in which both domestic and foreign firms bargain over input prices with respective upstream suppliers, but without considering the effects of entry on the downstream firm's profits.

[5]Results of analysis based on decentralised bargaining are available from the authors on request.

where $\overline{c}$ denotes the marginal cost of the input, which is assumed to be a fundamental economic cost common across countries.[6] We assume Nash bargaining of the domestic input price c_h. The maximand for the domestic bargaining problem is:

$$B_h = \left(\pi_h^I\right)^{\beta} \left(m\pi_h\right)^{1-\beta}, \tag{12}$$

where we assume that disagreement pay-offs are zero. β represents the input supplier's Nash bargaining parameter in the asymmetric input price bargain. Substituting (7) into (11), and the resulting expression together with (9) into (12) yields:

$$B_h = \frac{m(c_h - \overline{c})^{\beta}}{b(m+n+1)^{2-\beta}} \left[(a_h - c_h)(n+1) - n(a_f - \overline{c} - \tau)\right]^{2-\beta}. \tag{13}$$

Maximising (13) with respect to c_h and solving yield:

$$c_h = \overline{c} + \frac{(a_h - \overline{c} + n\tau + n(a_h - a_f))\beta}{2(n+1)}. \tag{14}$$

Substituting (14) into each of (7) and (8) yields the following outputs in equilibrium for each of the home and foreign firm, respectively:

$$q_h = \frac{(2-\beta)\left[(a_h - \overline{c} + n\tau) + n(a_h - a_f)\right]}{2b(m+n+1)}; \tag{15}$$

$$q_f = \frac{m\left[(2-\beta)n(a_f - a_h - \tau) + (a_h - \overline{c})\beta + 2(a_f - a_h - \tau)\right] + 2(n+1)(a_f - \overline{c} - \tau)}{2b(n+1)(m+n+1)}. \tag{16}$$

The resulting profits are:

$$\pi_h = \frac{(2-\beta)^2[(a_h - \overline{c} + n\tau) + n(a_h - a_f)]^2}{4b(m+n+1)^2}; \tag{17}$$

$$\pi_f = \frac{\left[m\left[(2-\beta)n(a_f - a_h - \tau) + (a_h - \overline{c})\beta + 2(a_f - a_h - \tau)\right] + 2(n+1)(a_f - \overline{c} - \tau)\right]^2}{4b(n+1)^2(m+n+1)^2}. \tag{18}$$

Clearly, the magnitude of trade costs might prohibit trade. Lemma 1 specifies the critical level $\hat{\tau}$ below which trade occurs in sub-game perfect equilibrium.

Lemma 1. *Trade costs are non-prohibitive if and only if:*

$$\tau < \hat{\tau} \equiv a_f - \frac{a_h m[(2-\beta)(n+1)] + \overline{c}[\beta m + 2(n+1)]}{2(n+1)(m+1) - \beta mn}. \tag{19}$$

Proof. Solving for the non-negativity of q_f in (16) yields the prohibitive value of τ shown in expression (19). □

[6] This marginal cost might reflect workers' reservation wages if the input is labour, or some underlying intrinsic cost of producing the intermediate input.

4 The effects of trade on profits

We now investigate how the profits of the domestic downstream firms in sub-game perfect Nash equilibrium vary with the number of foreign rivals in the home market. Our motivation is to examine whether there are conditions under which the domestic downstream firm might have an incentive to encourage or accommodate foreign entry. We establish Proposition 1.

Proposition 1. *Profits of a domestic downstream firm increase in the number of entrants if and only if trade costs are sufficiently high.*

Proof. Differentiating (17) with respect to n, we obtain:

$$\frac{d\pi_h}{dn} = \frac{(2-\beta)^2\left[m(a_f - a_h - \tau) + a_f - \overline{c} - \tau\right]\left[a_h + n(a_h - a_f) - \overline{c} + n\tau\right]}{2b(m+n+1)^3}, \tag{20}$$

which is non-negative – implying that profits are non-decreasing in the number of entrants – if and only if the following condition is satisfied:

$$\tau \geq \tilde{\tau} \equiv \frac{m(a_f - a_h) + a_f - \overline{c}}{m+1}, \tag{21}$$

where $\tilde{\tau}$ is the threshold level of trade costs above which profits increase in the number of firms. □

For this to be consistent with values of τ for which trade costs are not prohibitively high, we require that $\tilde{\tau} \leq \tau \leq \hat{\tau}$. From comparison of (19) and (21), the condition that $\hat{\tau} \geq \tilde{\tau}$ is given by:

$$\hat{\tau} \geq \tilde{\tau} \Rightarrow (a_h - \overline{c})\beta m\left[m+n+1\right] \geq 0. \tag{22}$$

As the non-negativity condition is satisfied, it follows that there are always ranges of non-prohibitive trade costs for which profits-per-firm are increasing in the number of firms for all $\beta > 0$.

We can illustrate a specific situation of profit-raising entry by comparing the profits obtained by one home firm when it is a monopolist in its own downstream market with that obtained in a duopoly arising from competition with just one foreign firm. Evaluating the downstream home firm's profits in (17) for $m = 1$ at $n = 0$ and $n = 1$, respectively, we obtain:

$$\pi_{h|n=0} = \frac{(2-\beta)^2(a_h - \overline{c})^2}{16b}; \tag{23}$$

$$\pi_{h|n=1} = \frac{(2-\beta)^2[(a_h - \overline{c} + \tau) + (a_h - a_f)]^2}{36b}. \tag{24}$$

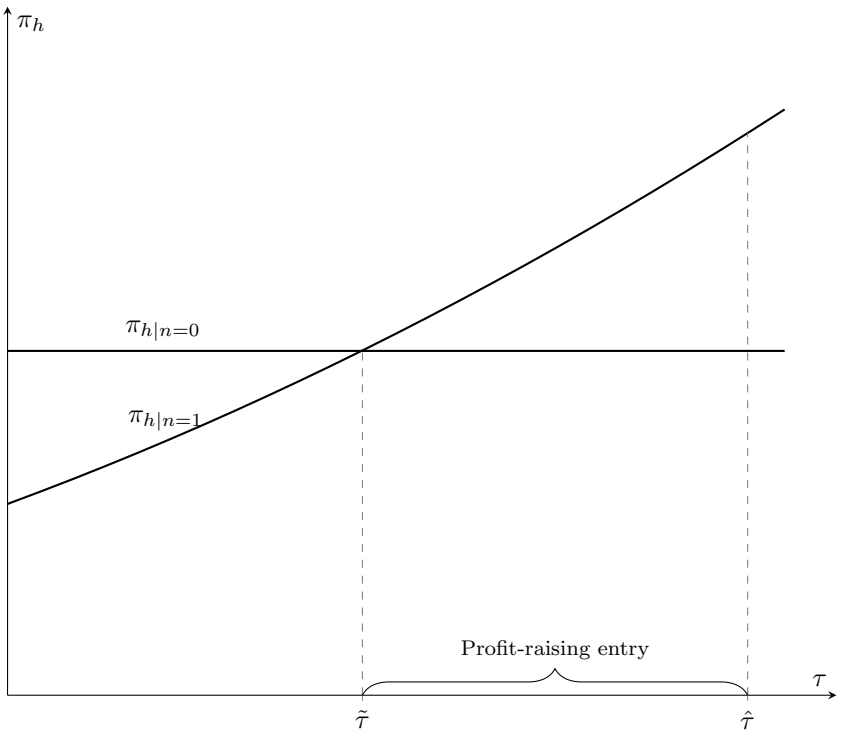
In Figure 1, we plot these functions for specific parameter values. It is clear from the figure that whenever $\tau \in [\tilde{\tau}; \hat{\tau})$, the downstream home firm earns higher profits when it is in competition with a rival foreign entrant than when it has a domestic monopoly. From (20), it follows that the home firm's (or firms') profits continue to rise in the number of foreign rivals, so long as (21) is satisfied. The key result that a domestic

downstream firm's profits can be higher in the presence of a foreign rival holds in the absence of home bias, as discussed further in Section 4.1. Nonetheless, it is clear from (21) that the stronger the home bias (i.e. the greater a_h is relative to a_f), the greater the range of non-prohibitive trade costs for which there is profit-raising entry. It is even possible that for specific parameter values, the duopoly profits exceed monopoly profits for all positive non-prohibitive trade costs. For example, consider $a_h = 4$, $a_f = 2$, $\overline{c} = 1$, $b = 1$, $m = 1$ and $\beta = 1$. Plugging these parameter values into, respectively, (23) and (24), and taking the difference, yields:

$$\pi_{h|n=1} - \pi_{h|n=0} = \frac{(1+2\tau)(2\tau+19)}{144} \geq 0, \tag{25}$$

which is non-negative for all non-negative values of τ. This shows that in the presence of a strong bias towards domestically produced goods, the home firm prefers to accommodate entry regardless of the trade costs. One implication of this finding is that our result may be relevant even in situations without international trade. For example, consider an industry with a small number of producers that enjoy a high level of consumer loyalty. Entry of additional domestic rivals, which do not incur any of the asymmetric costs associated with international trade, may therefore raise the profits of downstream incumbent firms.

Figure 1: Profits of the incumbent firm for $n = 0$ and $n = 1$.



What is the intuition for the result that profits of the incumbent increase in the number of entrants if

trade costs, τ, and/or the home bias are sufficiently high? In the standard model of oligopoly, an increase in the number of entrants unambiguously reduces the profits of incumbents through increased product market competition, which reduces the product price. This mechanism is still at work in the present model, as can be seen by obtaining a specific expression for the product price. Substituting (7) and (8) into (1), we obtain:

$$p = \frac{a_h(n+1) + mc_h - na_f + n(\overline{c}+\tau)}{m+n+1}, \tag{26}$$

where c_h is given by (14). Differentiating (26), it follows that:

$$\frac{dp}{dn} = \underbrace{\frac{m}{m+n+1}\frac{dc_h}{dn}}_{\text{Indirect effect}} - \underbrace{\left[\frac{(a_f - \overline{c} - \tau)(m+1) - m(a_h - c_h)}{(m+n+1)^2}\right]}_{\text{Direct effect}}. \tag{27}$$

(27) decomposes the effect of entry on the product price into an indirect effect through the input price, $\left(\frac{dp}{dc_h}\frac{dc_h}{dn}\right)$, and a direct effect of entry on the final product price, $\left(\frac{dp}{dn}\right)$. Assuming that $\frac{dc_h}{dn} \leq 0$, as we demonstrate below, it follows from (27) that $\frac{dp}{dn}$ must be negative: an increase in n leads to a fall in the product price.

In addition to the standard profit-reducing effect of the fall in the product price, however, the increase in the number of firms in the market also leads the upstream input supplier to moderate the input price. We can see this result by simply differentiating (14) with respect to n, which yields:

$$\frac{dc_h}{dn} = -\frac{(a_f - \overline{c} - \tau)\beta}{2(n+1)^2} \leq 0. \tag{28}$$

Put differently, the upstream input supplier is bearing at least a part of the cost associated with entry, for all values of τ when $\beta > 0$. The domestic downstream firm benefits from the entry of a foreign rival if the profit-enhancing effect of entry on the moderation of input prices dominates the profit-reducing effect of entry on the product price. Using the definition of c_h in (14) and $\hat{\tau}$ in (19), we can rewrite (27) as:

$$\frac{dp}{dn} = \underbrace{-\frac{(a_f - \overline{c} - \tau)\beta m}{2(m+n+1)(n+1)^2}}_{\text{Indirect effect}} \underbrace{-\frac{(\hat{\tau} - \tau)\left[2(n+1)(m+1) - \beta mn\right]}{2(n+1)(m+n+1)^2}}_{\text{Direct effect}}. \tag{29}$$

It is clear that the direct effect of entry on the product price becomes smaller as τ approaches the prohibitive level of trade costs $\hat{\tau}$. If we further differentiate (29) with respect to τ, we obtain:

$$\frac{d^2p}{dnd\tau} = \frac{2(m+1)(n+1)^2 + \beta(m+1-n^2)}{2(n+1)^2(m+n+1)^2} > 0. \tag{30}$$

This implies that as τ increases, the profit-reducing effect of entry through increased product market competition becomes smaller, thus making entry more profitable. The intuition for this last effect is that an increase in the trade cost will increase the domestic downstream firm's market share in the home market, and hence the direct impact of foreign competition on the product price will be smaller. Hence, in a situation where the domestic firm has a large market share in the home market, either through trade costs which

restrict the volume of trade or through a bias on the part of domestic consumers, the impact of trade on the final product price is substantially reduced. Downstream firms are therefore most likely to experience increased profits from entry in industries with high levels of (domestic) market share.

4.1 The impact of home bias

It follows from equation (21) that the greater the home-bias (the lower a_f relative to a_h), the lower the cut-off level of trade costs for which there is profit-raising entry. It is interesting to note that in the absence of any home bias, that is $a_h = a_f = a$, the cut-off level of trade costs, $\tilde{\tau}$, becomes:

$$\tilde{\tau}|_{a_h=a_f=a} = \frac{a - \overline{c}}{m+1}.$$

This measure has the economic interpretation of being the "competitive oligopoly" output. That is, the output which would result if the downstream firms were competing under oligopoly without foreign competition and faced the competitive input cost. This value of $\tilde{\tau}$ is still compatible with the condition that $\hat{\tau} \geq \tilde{\tau}$, and so there is scope for profit-enhancing foreign entry even in the absence of home bias. However, in the absence of a home bias, the cut-off level of trade costs above which profit-raising entry occurs is higher.

4.2 The impact of the number of firms in the domestic industry

Taking the derivative of $\tilde{\tau}$ in equation (21) with respect to m, it follows that an increase in the number of downstream domestic firms lowers the cut-off level of trade costs for which there is profit-raising entry:

$$\frac{d\tilde{\tau}}{m} = -\frac{(a_h - \overline{c})}{(m+1)^2} < 0.$$

The implication of this is that our finding is not limited to industries with a small number of firms.[7] While this is true, the value of m must be small enough to ensure strategic interaction since our result would not hold in an environment of price-taking behaviour where price is equal to marginal cost. In a similar vein, our result would not hold under price competition à la Bertrand where price is equal to marginal cost. As such, we believe our story of profit-raising entry is suitable to a setting in which production is concentrated with a small group of firms, which interact strategically in a quantity-setting fashion.[8]

[7] Notice from (19) that the prohibitive level of trade costs is also decreasing in m. As such, the *range* of non-prohibitive trade costs for which profits may increase in foreign entry may not be larger when there is a greater number of domestic firms. Simple algebra, however, shows that for smaller values of both m and n, this range increases in m.

[8] Our results can be extended to the Bertrand case by introducing product differentiation. It is possible to show that profit-raising entry may also occur in such a setting.

5 Political economy of trade policy

The classic model of Protection for Sale (Grossman and Helpman, 1994) shows how import-competing firms pay campaign contributions to their government in exchange for a more protectionist trade policy. Our finding that domestic downstream firms may have incentives to accommodate foreign entry is likely to have implications for their preferences regarding trade policy. So far, we have considered only entry by foreign competitors and its effects on domestic profits, showing that domestic downstream firms might have incentives to lobby for the relaxation of restrictive trade policies which focus on limiting entry. In this section of the paper, we explore alternative forms of import protection and how these impact on the profits of domestic firms, focussing on both tariff barriers and on non-tariff barriers, such as import quotas.

5.1 Tariff barriers

In this subsection, we investigate whether domestic firms have incentives to lobby the government for less restrictive tariff barriers to trade. Previously, we noted that τ can be interpreted as representing any element of the costs associated with trade, including any import tariff. Accordingly, in this section of the paper, we model changes in tariffs as operating through τ. We first show that for a given number of foreign firms, domestic firms continue to have the Grossman-Helpman incentive to lobby for tariffs to shield them from foreign competition. To see this, we differentiate the profits of a domestic firm in (17) with respect to the trade cost τ:

$$\frac{d\pi_h}{d\tau} = \frac{n(2-\beta)^2[(a_h - \overline{c} + n\tau) + n(a_h - a_f)]}{2b(m+n+1)^2} > 0, \tag{31}$$

which is monotonically increasing in τ. Hence, with a fixed number of firms, any increase in the import tariff will benefit domestic firms. An increase in the import tariff, however, has a similar moderating effect on input prices/wages as does entry. To see this, we differentiate the input price in (14) with respect to τ. We obtain:

$$\frac{dc_h}{d\tau} = \frac{n\beta}{2(n+1)} > 0. \tag{32}$$

This implies that as τ decreases, the downstream firms' input prices are moderated which by itself is a profit-enhancing effect. With import tariffs, however, the downward pressure on the final import price from the lowering of the tariff outweighs any benefits from a lower import price.

However, we next show that allowing the reduction in import tariffs to have an effect on the extensive margin of trade leads to a business incentive to favour free trade or a reduction in the import tariff. This is because if the lowering of tariffs induces entry, the benefits described in the previous section regarding the potential for entry to raise domestic firms' profits can be realised. To be precise, consider the case where there are three potential foreign entrants. The three entrants have marginal costs c_1, c_2 and c_3, respectively,

where $c_1 < c_2 < c_3$ and consider also just one incumbent downstream firm. We add the assumption that there is a fixed entry cost to enter the market in country h. There will now be three relevant cut-off levels for the trade cost. There is the trade cost above which all three firms enter the market; one where only two firms enter; one where the domestic incumbent competes in a duopoly with one entrant; and finally a situation of domestic monopoly in the downstream market. The profits of all firms are:

$$\pi_h = [a_h - b(Q_h + Q_f) - c_h] q_h, \tag{33}$$

$$\pi_{fj} = [a_h - b(Q_h + Q_f) - c_j - \tau] q_{fj} - F^2, \quad j = 1, 2, 3. \tag{34}$$

where F is a fixed entry cost. Following steps similar to (5)-(18), we obtain the following profits:

$$\pi_h = \frac{(2-\beta)^2 \left[4(a_h - \overline{c}) - 3(a_f - \tau) + \sum_{j=1}^{3} c_j\right]}{100b}; \tag{35}$$

$$\pi_{fj} = \frac{(a_f - \tau)(16 - 3\beta) - 4(a_h - \overline{c})(2-\beta) + (8+\beta)\sum_{j=1}^{3} c_j}{1600b} - F^2, \tag{36}$$

We can now define the three cut-off levels of τ. We assume that a foreign firm enters if it makes non-negative profits. As such, the threshold level of τ above which a firm enters the market in h is given by solving:

$$\pi_{fj} \geq 0, \tag{37}$$

for τ. Hence, firm j enters if and only if:

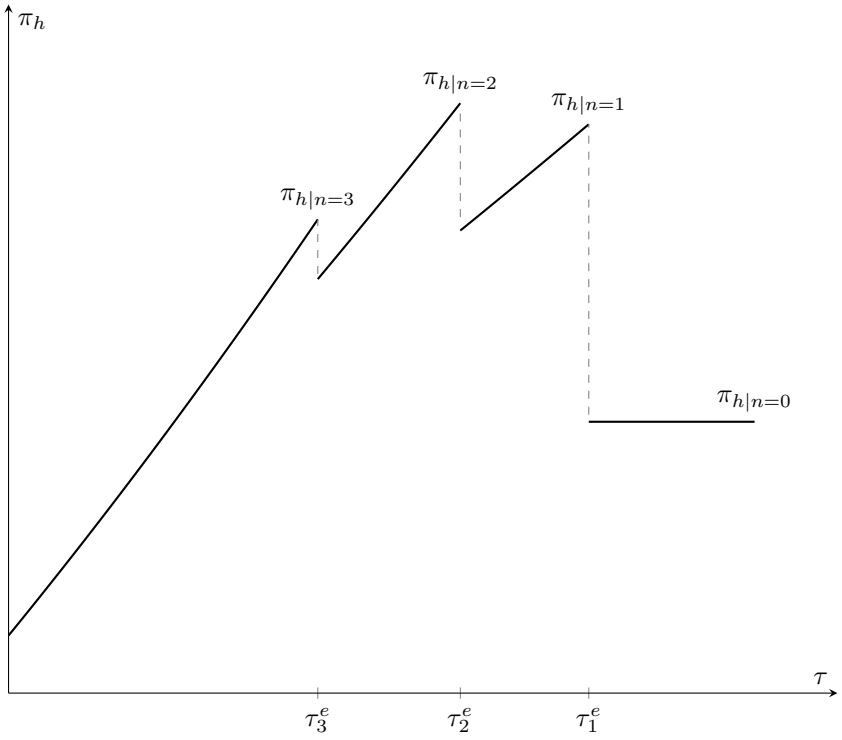
$$\tau \leq \tau_j^e \equiv a_f - \left[\frac{4(a_h - \overline{c})(2-\beta) - 40(c_j + F\sqrt{b}) + (8+\beta)\sum_{j=1}^{3} c_j}{16 - 3\beta}\right], \tag{38}$$

where the superscript 'e' is for entry. We can illustrate the profits of the incumbent downstream firm for different values of τ. We show this in Figure 2. Foreign firm 1 enters if the value of τ does not exceed τ_1^e where it is able to make non-negative profits. Any value of τ exceeding this value results in a situation of domestic monopoly. It is clear from the figure that for the specific parameters we have chosen, the incumbent domestic firm prefers a value of τ below τ_1^e. It is also clear from this figure that there are values of τ allowing for the entry of three foreign firms, yet still compatible with a larger profit for the domestic firm compared to monopoly. The incumbent also prefers a value of τ equal to τ_2^e than a value just above τ_2^e since it would deter entry, and we can make a similar argument for values of τ in the vicinity of τ_1^e. In Figure 2, the incumbent firm's profits are maximised for a value of τ equal to τ_2^e. Hence, if lowering an import tariff increases trade at the extensive margin, it is possible that the Grossman-Helpman result that import-competing firms resist trade liberalisation is reversed.

5.2 Non-tariff barriers

It follows from our analysis that the reduction or removal of several types of non-tariff barriers, such as bureaucratic 'red tape', regulatory barriers or import licenses, may similarly raise the profits of domestic

Figure 2: Profits of the incumbent firm for a range of trade costs.



firms provided they affect trade primarily at the extensive margin. That is, if the removal of non-tariff barriers facilitates entry into the home market, then depending on the parameters of the model, it is possible that home firms would see it in their own self-interest to lobby for their removal. This is not so if the protectionist instrument is an import quota, however, to which we turn next. Assume that each foreign firm is restricted to produce only a fraction α of the equilibrium free-trade volume given in (8). Denoting this volume Q_f^{FT}, where FT stands for "Free Trade", the profits of home firm i is:

$$\pi_{hi} = (a - Q - c_h)q_{hi} = (a - Q_h - \alpha Q_f^{FT} - c_h)q_{hi}. \tag{39}$$

Maximising with respect to each of the home firms gives us an expression of the Cournot output of each domestic firm:

$$q_h^C = \frac{a - c_h - \alpha Q_f^{FT}}{m+1}. \tag{40}$$

The profits of the upstream firm is $(c_h - \overline{c})Q_h$, and its maximisation problem yields the following input price:

$$c_h^* = \frac{a + \overline{c} - \alpha Q_f^{FT}}{2} \tag{41}$$

Substituting (41) into (40) and the resulting expression into (39), we can write the equilibrium level of profits as:

$$\pi_h^* = \frac{(a - \overline{c} - \alpha Q_f^{FT})^2}{4(m+1)^2}. \tag{42}$$

It is clear from (42) that profits of downstream firm is monotonically decreasing in α, and as such home firms would unambiguously prefer a more restrictive import quota. The reason for this result is that the exogenously imposed import quota will not produce an endogenous change in the number of foreign rivals.

6 Stackelberg leadership

So far, we have studied the effects of entry when the domestic firms face Cournot competition from foreign rivals in the downstream market. In reality, one might expect domestic firms to acquire structural and distributional advantages in their own market relative to foreign firms due to incumbency or for geo-political reasons. In this section we extend the basic model by assuming that the home firms have a first-mover advantage in the Stackelberg sense. We assume for simplicity that there is only domestic firm. The game now has the following stages: in the first, the upstream and downstream home firms bargain over the input price; in the second, the incumbent domestic downstream firm makes its output choice; in the final stage, each foreign entrant chooses their output levels. We proceed by backward induction. A foreign entrant i is assumed to maximise profits, given by (4), from which we obtain the best-reply function in (6), as solved out in the previous section. In the second stage, the incumbent firm maximises profits, but with the knowledge of how the entrants will respond. Multiplying the output of entrant i in (6) by the total number of entrants n and substituting the resulting expression into (3) we obtain the maximand of firm h as:

$$\pi_h = \frac{\left[(a_h - c_h)(n+1) - bq_h - na_f + n(\overline{c} + \tau)\right] q_h}{(n+1)}. \tag{43}$$

Maximising the profits of home firm h and solving for q_h yields:

$$q_h = \frac{(a_h - c_h)(n+1) - n(a_f - \overline{c} - \tau)}{2b}. \tag{44}$$

Substituting this expression back into the output of entrant i in (6), and using symmetry across each foreign entrant, we obtain an expression for the output of each entrant:

$$q_i = \overline{q} = \frac{(2+n)(a_f - \overline{c} - \tau) - (a_h - c_h)(n+1)}{2b(n+1)}. \tag{45}$$

Substituting (44) into (43), we obtain an expression for the profits of the incumbent firm:

$$\pi_h = \frac{\left[(a_h - c_h)(n+1) - n(a_f - \overline{c} - \tau)\right]^2}{4b(n+1)}. \tag{46}$$

We can now solve for the input price c_h in the first stage of the game. The profits of the upstream input supplier can be obtained by substituting (44) into (11). The maximand of the home firms is still as in (12). Substituting the profits of the input supplier and those of the domestic downstream firm into (12) yields:

$$B_h = \left[\frac{(c_h - \overline{c})((a_h - c_h)(n+1) - n(a_f - \overline{c} - \tau))}{2b}\right]^{\beta} \left[\frac{[(a_h - c_h)(n+1) - n(a_f - \overline{c} - \tau)]^2}{4b(n+1)}\right]^{1-\beta}. \quad (47)$$

Maximising (47) with respect to c_h gives:

$$c_h = \frac{[a_h - \overline{c} + n\tau + n(a_h - a_f)]\beta + 2\overline{c}(n+1)}{2(n+1)}. \quad (48)$$

Substituting this expression for the input price back into (44) and (45), respectively, yields:

$$q_h = \frac{(2-\beta)[a_h - \overline{c} + n\tau + n(a_h - a_f)]}{4b}; \quad (49)$$

$$\overline{q} = \frac{4a_f - (2-\beta)a_h - (2-\beta)(a_h - a_f) - (2+\beta)\overline{c} - (n(2-\beta)+4)\tau}{4b(n+1)}. \quad (50)$$

We can now obtain an expression for the profits of the downstream home firm by substituting the input price in (48) into (46):

$$\pi_h = \frac{(2-\beta)^2(a_h(n+1) - na_f - \overline{c} + n\tau)^2}{16b(n+1)}. \quad (51)$$

As in the Cournot case, it is possible that trade costs prohibit trade. We establish Lemma 2:

Lemma 2. *Trade costs are non-prohibitive if and only if:*

$$\tau < \hat{\tau}^S \equiv \frac{4a_f - (2-\beta)a_h - (2-\beta)(a_h - a_f) - (2+\beta)\overline{c}}{4 + n(2-\beta)}. \quad (52)$$

We are now able to investigate how profits change with entry in the Stackelberg case and how this compares with the situation under Cournot competition. We establish Proposition 2:

Proposition 2. *Profits of the domestic downstream firm increase in the number of entrants if and only if trade costs are sufficiently high.*

Proof. Differentiating (51) with respect to n yields:

$$\frac{\pi_h}{dn} = -\frac{(2-\beta)^2[(2+n)a_f - (n+1)a_h - \overline{c} - (n+2)\tau][a_h(n+1) - na_f - \overline{c} + n\tau]}{16b(n+1)^2}, \quad (53)$$

which is non-negative if and only if the following condition is satisfied:

$$\tau \geq \tilde{\tau}^S \equiv \frac{(2+n)a_f - (n+1)a_h - \overline{c}}{2+n}, \quad (54)$$

where $\tilde{\tau}^S$ is the threshold level of trade costs above which profits increase in the number of firms in the Stackelberg case. □

Hence, as in the case of Cournot competition, the domestic downstream firm enjoys a potential benefit from foreign competition. The mechanism is as before: the profit-enhancing effect of a lower bargained input price offsets the profit-reducing effect of a lower final product price. From comparison of $\tilde{\tau}^S$ and the equivalent threshold derived under Cournot competition in Section 4, it is clear that if the downstream home firm has a first-mover advantage, it enjoys beneficial effects of entry for lower levels of trade costs, that is $\tilde{\tau}^S \leq \tilde{\tau}$. Thus, the main result of our analysis, that domestic downstream firms have a potential incentive to accommodate entry by foreign rivals, is stronger under Stackelberg than under Cournot competition. This result arises because, relative to the Cournot case, the profit-reducing effect of greater competition in the product market is weaker in the case of Stackelberg than is the profit-enhancing effect via the input price.

7 Conclusions

In this paper, we consider the potential impacts on profits of domestic downstream firms in vertical markets when confronted by foreign entry into the home market. We assume that foreign firms incur low and exogenous production costs but face additional – and exogenous – import costs, in the form of transportation or tariff costs, for example.

We have established that when trade costs are above a threshold level, the profits of a domestic downstream firm can be increasing with the entry of foreign rivals. This result is strengthened if there is a bias on the part of the domestic consumer towards domestically produced goods: the stronger any such home bias, the lower the threshold of trade costs required for the incumbent domestic firm to realise enhanced profits following entry. We have also identified specific parameter values for which there is profit-raising entry for all non-negative trade costs, arising when home bias is sufficiently pronounced. We have also extended the basic model to allow for a first-mover advantage on the part of the domestic firm: we find that Stackelberg competition generates an enhanced incentive on the part of the domestic downstream firm to accommodate entry from abroad.

Overall, our results counter the standard notion in the literature on Protection for Sale (Grossman and Helpman, 1994), in which domestic import-competing firms have an unambiguous incentive to deter rather than accommodate entry. The key intuition behind our apparently counter-intuitive result is that, although increased product market competition drives down the final product price and hence reduces the profits of the downstream home firm, there is a countervailing profit-enhancing effect arising from the fact that entry generates moderation of the input price bargained between the domestic upstream and downstream firms. The profit-enhancing effect we have identified in the input market is stronger in industries where domestic incumbents have more market power in the final goods market.

We have examined several types of trade policy instrument. We find that, for a given number of foreign firms, downstream domestic firms have a potential incentive to lobby government for the removal or reduction

of import quotas, just as they have a potential incentive to lobby for trade policies which, up to a point, accommodate entry. If the trade policy instrument is an import tariff, however, there is no such incentive for domestic firms to favour a less restrictive trade policy as the removal or reduction of an import tariff will unambiguously shift profits towards the foreign firms. Hence, our paper contributes to the literature on the non-equivalence of tariffs and quotas under imperfect competition. When the number of foreign firms is not fixed, there can be a profit-enhancing effect from a reduction in tariffs - but only if the reduction leads to extensive-margin trade effects, such as through increased entry. In a similar vein, there may be profit-enhancing effects of a reduction in any type of non-tariff barrier to trade if there are trade-creating effects at the extensive margin.

The existence of the profit-enhancing effect can help to explain why downstream firms in highly concentrated (oligopolistic) markets might be less likely to lobby for import protection (for tariff and non-tariff barriers) than might otherwise be expected. This suggests that empirical attempts to identify a relationship between market concentration and lobbying for protection should take account of the nature of the vertical relationships in oligopolistic markets.

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