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The Strategic Effects of Parallel Trade
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Abstract: Why do producers often accept parallel trade in some markets such as automobiles, clothing, toys and consumer electronics? This paper identifies two new factors, viz., market stealing and union-wage cutting, which may make parallel trading beneficial to a manufacturer. Specifically, (i) under perfectly competitive labour markets in both the home and foreign countries, parallel trade may help a manufacturer to steal market shares from competitors, if it is more cost efficient or sells in more markets than competitors; and (ii) in a unionized labour market, parallel trade may help by lowering the unionized wage. These benefits of parallel trade disappear when such factors are removed.

Key Words: Firm-asymmetry; Labour Union; Parallel import

JEL Classifications: F21; F23

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1. Introduction

A common concern of policy makers is to protect the property rights of innovators from unauthorized *production*. While there exist strict measures (e.g., patent protection) to guard the interest of the innovators, a closely related issue, namely, parallel trade (or grey markets), which allows unauthorized *sale* of a product, is often allowed.[1] Many countries such as Australia, New Zealand and Singapore have liberalized restrictions on parallel trade and the European Union is also very active in reducing restrictions on internal parallel trade.[2] As noted in Scherer (1994), the first major competition policy enforcement in the EC is related to an attempted dealership territoriality within the EC. Malueg and Schwartz (1994) confirm that policies worldwide generally support parallel trade.[3]

While the conventional belief is that parallel trade hurts manufacturers by creating competition, anecdotal evidence suggests that parallel trade may benefit them at least in some markets. For example, " … some manufacturers, while publicly opposed to gray market sales of their products, privately do little to inhibit their flow and in some instances even go so far as to encourage these transactions" (Lipner, 1990, p. 4). A report prepared for the EU commission (NERA, 1999, p. 11) states that "[s]ome parallel trade, however, seems to be beneficial to the trademark owner." In the North American automobile market, retailers selling new automobiles must sign a contract with manufacturers forbidding them to re-sell these cars in other countries. However, over 200,000 vehicles intended for the Canadian market were resold south of the border in 2001 (increased from 16,000 in 1996 (Automotive News, 2002)), yet the no-parallel-trade clause was not enforced, thus imposing no penalties on the retailers.

[1] As mentioned in Maskus (2000), parallel trade occurs when a good protected by a patent, copyright, or trademark, having been legally purchased in one country, is exported to another country without the authorization of the local owner of the intellectual property rights in the importing country.

[2] Richardson (2002) documents that restrictions on parallel trade originating outside the EU are quite permissible.

[3] In the US, parallel trade was US$7-10 billions in the mid-1980s (Cespedes et al., 1988), and rose up to US$20 billion more recently (Computer Reseller News, 2001). In Europe, the volume of parallel trade varies from 5% of sales (on appliances, motorcars and consumer electronics) to almost 15% (on musical recordings, cosmetics and perfumes) (NERA, 1999). The House of Commons (1999) report shows that the volume of parallel trade in the UK motorcycle market is around 25% of sales.

In the present paper, we provide two strategic reasons for profitable parallel trading: parallel trade may benefit a manufacturer either by stealing markets from the competitors or by reducing the unionized wage faced by the manufacturer. The model explains why some manufacturers often accept parallel trade in markets where product market competition is visible, such as in automobile, cloths, toys and consumer electronics, and when the factor market is imperfect, such as in some European and U.S. markets, and also justifies policy markers' relaxed approach towards parallel trade.

First, section 2 examines the effect of market stealing, leaving the factor (labour) market perfectly competitive. We use a framework of two manufacturers one of whom serves both domestic and foreign markets and the other serves only the domestic market. We find that the former firm's profit is higher under parallel trading of its product. Moreover, if *both* firms serve *both* markets, parallel trading can benefit the firm that is more cost efficient.

Second, in Section 3 we consider labour market imperfection by assuming a unionized home-country labour market. We demonstrate that parallel trade from a foreign country to the home country reduces the unionized wage. Even though parallel trade increases competition in the home market, this wage-reducing effect can dominate the competition effect, making parallel trading beneficial to the manufacturer.

Previous literature has generally argued that parallel trade reduces profits of the manufacturers (Malueg and Schwartz, 1994, Richardson, 2002, Maskus and Chen, 2004 and Hur and Riyanto, 2006, etc.). There are also works which show that manufacturers can gain from parallel trade under certain conditions, such as if a country chooses both the tariff level and whether or not to allow parallel trade (Knox and Richardson, 2002), or if the product of the parallel trader and that of the manufacturer are differentiated (Ahmadi and Yang, 2000). More recently, Raff and Schmitt (2007) explain that, in the presence of demand uncertainty, parallel trade may benefit the manufacturers if the following four

conditions are met: the retailers must order the product before the realization of demand, it is costly to maintain inventories, the states of demand are different across markets, and different states of demand need to affect the quantity demanded rather than the consumers' willingness to pay for the products.

In contrast, the present paper provides a new rationale for profitable parallel trading, even if the government is not an active agent, the products of the manufacturer and the parallel trader are homogeneous and there is no uncertainty that creates the motives for risk diversification through parallel trade. Certainly these are important factors that can cause parallel trading to arise. However, our focus is on the importance of market stealing and union-wage cutting, which has been ignored in the literature.

The remainder of the paper is organized as follows. Section 2 examines the effects of product market competition with a perfectly competitive labour market. Section 3 looks into the case of a labour union. Finally, section 4 concludes.

2. The effects of product market competition

Consider a manufacturer, firm 1, which sells its product in two countries, *A* and *B*. In country *A*, firm 1 sells directly to the consumers. In country *B*, firm 1 sells through an independent exclusive distributor, *I*. We assume that firm 1 offers *I* a contract in the form of *(w, T)*, where *w* is the wholesale price and *T* is a transfer payment (franchise fee) paid up-front from *I* to firm 1. So far, the model is in line with the vertical pricing model of Maskus and Chen (2004).

Now we introduce market competition, by assuming that in country *A*, the product market is a duopoly with firms 1 and 2 competing with homogeneous products. Both firms have constant marginal costs, which is normalized to zero for simplicity. To demonstrate our result in the simplest way, we start our analysis with the assumption that firm 1 sells in

both countries *A* and *B*, while firm 2 sells only in country *A*, which might be caused by resource constraints. This assumption will be relaxed in Subsection 2.3 to see how the analysis is affected if both firms serve both countries. We assume that the inverse market demand function in each country is $P = 1 - q$.

We consider the following sequence of moves. At stage 1, firm 1 gives a take-it-or-leave-it contract *(w, T)* to firm *I*, which either accepts or rejects it. We assume that *I* accepts the offer if it earns at least its reservation payoff, which is normalized to zero. If *I* accepts the contract, at stage 2, firms 1, 2 and *I* choose their outputs simultaneously, and the respective profits are realized. If *I* does not accept the contract, at stage 2, there is no sale in country *B*, and firms 1 and 2 choose their outputs simultaneously and their profits are realized. We solve the game by backward induction.

2.1. No parallel trade

First, consider the case of no parallel trade. If *I* accepts firm 1's contract, given *w* and *T*, firms 1, 2 and *I* maximize the following expressions simultaneously to determine their respective outputs:

$$\underset{q_{A1}}{Max}(1-q_{A1}-q_{A2})q_{A1}+wq_{BI}+T\,, \tag{1a}$$

$$\underset{q_{A2}}{Max}(1-q_{A1}-q_{A2})q_{A2}\,, \tag{1b}$$

$$\underset{q_{BI}}{Max}(1-q_{BI}-w)q_{BI}-T\,, \tag{1c}$$

where the first subscript denotes the country and the second one the firm.

Standard calculations show that the equilibrium outputs are

$$q_{A1}=q_{A2}=1/3 \quad \text{and} \quad q_{BI}=(1-w)/2\,. \tag{2}$$

The profits of firms 1, 2 and *I* are then

$\pi_1^{np} = \pi_{A1} + \pi_{B1} = 1/9 + w(1-w)/2 + T$,

$\pi_2^{np} = 1/9$,

$\pi_I^{np} = (1-w)^2/4 - T$.

Since firm 1 gives a take-it-or-leave-it offer to *I*, the equilibrium transfer payment is $T^{np} = (1-w)^2/4$. Firm 1 then determines the wholesale price *w* by maximizing

$$\underset{w}{Max}\ 1/9+w(1-w)/2+(1-w)^2/4, \tag{3}$$

which gives the equilibrium wholesale price as $w^{np} = 0$. The reason for this result is easy to understand. Since *I* sells the product in country *B* as a monopolist, firm 1 finds no reason to distort *I*'s output choice. Hence, firm 1 charges the wholesale price that creates the maximum profit in *I*, and it also extracts this profit through the transfer payment. Therefore, under no parallel trade, the equilibrium offer made by firm 1 to *I* is $(w,T) = (0,\ 1/4)$, and this offer will be accepted by *I*.

The net equilibrium profits of firms 1, 2 and *I* are respectively

$$\pi_1^{np} = 13/36,\ \ \pi_2^{np} = 1/9,\ \text{and}\ \ \pi_I^{np} = 0. \tag{4}$$

2.2. Parallel trade

Next consider the game under parallel trade. As in Maskus and Chen (2004), Li and Maskus (2006) and many others, in this situation, *I* not only sells the product in country *A*, but also in country *B* if it is profitable. Hence, while offering the contract to *I*, firm 1 needs to internalize this possibility.

If *I* accepts firm 1's contract, given *w* and *T*, firms 1, 2 and *I* maximize the following expressions simultaneously to determine their outputs:

$$\underset{q_{A1}}{Max}(1-q_{A1}-q_{A2}-q_{AI})q_{A1} + w(q_{BI}+q_{AI}) + T, \tag{5a}$$

$$\underset{q_{A2}}{Max}(1-q_{A1}-q_{A2}-q_{AI})q_{A2}, \tag{5b}$$

$$\underset{q_{BI},q_{AI}}{Max}(1-q_{BI}-w)q_{BI}+(1-q_{A1}-q_{A2}-q_{AI}-w)-T\,. \tag{5c}$$

Standard calculations give the equilibrium outputs as

$$q_{A1}=q_{A2}=(1+w)/4\,,\quad q_{BI}=(1-w)/2\quad\text{and}\quad q_{AI}=(1-3w)/4\,. \tag{6}$$

The profits of firms 1, 2 and *I* are

$$\pi_1^p=\pi_{A1}+\pi_{B1}=(1+w)^2/16+w(3-5w)/4+T\,,$$

$$\pi_2^p=(1+w)^2/16\,,$$

$$\pi_I^p=(1-w)^2/4+(1-3w)^2/16-T\,.$$

The equilibrium transfer payment is obtained as $T^p=(1-w)^2/4+(1-3w)^2/16$. Firm 1 then determines the wholesale price *w* by maximizing

$$\underset{w}{Max}\,(1+\mathrm{w})^2/16+w(3-5w)/4+(1-w)^2/4+(1-3w)^2/16\,. \tag{7}$$

The equilibrium wholesale price is obtained as $w^p=0$.

It is interesting to note that even if firm 1 faces competition from *I* in country *A*, it does not charge a positive wholesale price to *I*. The intuition can be understood as follows. On one hand, *I* is a monopolist seller in country *B*. On the other hand, under parallel trade, not only firm 1 but also firm 2 face competition from *I*. These combined effects induce firm 1 to keep *I*'s marginal cost (which is the wholesale price) low.

The equilibrium offer made by firm 1 to *I* is then $(w,T)=(0,\ 5/16)$, which will be accepted. The net equilibrium profits of firms 1, 2 and *I* are respectively

$$\pi_1^p=3/8\,,\ \ \pi_2^p=1/16\,,\ \text{and}\ \ \pi_I^p=0\,. \tag{8}$$

Now we are in position to state two propositions:

Proposition 1: *The equilibrium outputs of firms 1 and 2 are lower with parallel trade than without.*

Proof: The outputs of firms 1 and 2 are $q_{A1}^{np} = q_{A2}^{np} = 1/3$ under no parallel trade, which are greater than the counterparts under parallel trade, $q_{A1}^{p} = q_{A2}^{p} = 1/4$. ■

Proposition 1 shows that parallel trade reduces the outputs of both firms 1 and 2.

Proposition 2: *Parallel trade increases the profit of firm 1 and reduces that of firm 2.*

Proof: The result follows immediately from (4) and (8). ■

The reason for Proposition 2 is as follows. Parallel trade enables *I* to steal business from both firms 1 and 2 in country *A*. However, since firm 1 can use the transfer payment to extract profit from firm *I* while firm 2 cannot, parallel trade in effect helps firm 1 to gain from firm 2's business loss to firm *I*, making firm 1 better off and firm 2 worse off.

The above analysis is based on homogenous products. However, the implications of product differentiation are straightforward as follows. If firms 1 and 2 produce imperfect substitutes, it will reduce the intensity of competition between them. As a result, the business stealing effects under parallel trade will be weakened. At the extreme situation, if the products of firms 1 and 2 are isolated, parallel trade will not affect the market share and the profit of firm 2, since the product of the parallel trader (which is actually the product of firm 1) is also isolated from firm 2's product. Then parallel trade increases competition only for firm 1. Hence, Proposition 2 holds if the products of firms 1 and 2 are not too much differentiated.

2.3. Competition in both markets

In this subsection we extend the model to cover competition in both markets. We find that profit raising parallel trade can still occur if the firms differ in marginal costs.

Consider that both firms 1 and 2 serve both markets *A* and *B*. Each firm sells directly to the consumers in country *A*, but firms 1 and 2 sell their products through independent exclusive distributors I_1 and I_2 respectively in country *B*.[4] However, we assume that the marginal cost of production is *c* for firm 2, while it has been normalized to zero for firm 1. Also, $c < 12/53$, which is sufficient to ensure that all equilibrium outputs are positive. We consider the same timeline as in the previous section.

2.3.1. No parallel trade

If firms 1 and 2 give the offers (w_1, T_1) and (w_2, T_2) to I_1 and I_2 and the offers are accepted, these firms maximize the following expressions simultaneously to determine their outputs:

$$\underset{q_{A1}}{Max}(1-q_{A1}-q_{A2})q_{A1}+w_1 q_{BI1}+T_1, \tag{9a}$$

$$\underset{q_{A2}}{Max}(1-q_{A1}-q_{A2}-c)q_{A2}+(w_2-c)q_{BI2}+T_2, \tag{9b}$$

$$\underset{q_{BI1}}{Max}(1-q_{BI1}-q_{BI2}-w_1)q_{BI1}-T_1, \tag{9c}$$

$$\underset{q_{BI2}}{Max}(1-q_{BI1}-q_{BI2}-w_2)q_{BI2}-T_2. \tag{9d}$$

Standard calculations show that the equilibrium outputs are $q_{A1}=(1+c)/3$, $q_{A2}=(1-2c)/3$, $q_{BI1}=(1-2w_1+w_2)/3$ and $q_{BI2}=(1-2w_2+w_1)/3$.

The profits of firms 1, 2, I_1 and I_2 are then

$$\pi_1^{np}=\pi_{A1}+\pi_{B1}=(1+c)^2/9+w_1(1-2w_1+w_2)/3+T_1,$$

$$\pi_2^{np}=\pi_{A2}+\pi_{B2}=(1-2c)^2/9+(w_2-c)(1-2w_2+w_1)/3+T_2,$$

$$\pi_{I1}^{np}=(1-2w_1+w_2)^2/9-T_1,$$

$$\pi_{I2}^{np}=(1-2w_2+w_1)^2/9-T_2.$$

[4] In a different context, Ziss (1997) considers the effects of exporting by the manufacturers through distributors on strategic trade policies.

Since firms 1 and 2 give take-it-or-leave-it offers to respectively I_1 and I_2, the equilibrium transfer payments are $T_1^{np} = (1-2w_1+w_2)^2/9$ and $T_2^{np} = (1-2w_2+w_1)^2/9$. Firms 1 and 2 determine the wholesale prices w_1 and w_2 respectively by maximizing

$$\underset{w_1}{Max}\ (1+c)^2/9+w_1(1-2w_1+w_2)/3+(1-2w_1+w_2)^2/9, \tag{10a}$$

$$\underset{w_2}{Max}\ (1-2c)^2/9+(w_2-c)(1-2w_2+w_1)/3+(1-2w_2+w_1)^2/9, \tag{10b}$$

which gives the equilibrium wholesale prices as $w_1^{np} = -\frac{1+2c}{5}$ and $w_2^{np} = -\frac{1-8c}{5}$. Hence, both firms 1 and 2 charge wholesale prices which are lower than their marginal costs of production. It is clear that the business stealing motive in a Cournot oligopoly is the reason for this type of pricing strategies. Firms 1 and 2 want to reduce the marginal costs of I_1 and I_2 respectively to make them more competitive in country *B*, and then use the transfer payment to extract the gain from higher competitiveness. This logic is in line with the incentives for strategic separation as in Vickers (1985) and Ziss (1997).

Since $c < 12/53$, we obtain positive equilibrium outputs, evaluated at the equilibrium wholesale prices. Under no parallel trade, the equilibrium offers made by firms 1 and 2 to I_1 and I_2 are respectively $(w_1^{np}, T_1^{np}) = (-(1+2c)/5, 4(1+2c)^2/25)$ and $(w_2^{np}, T_2^{np}) = (-(1-8c)/5, 4(1-3c)^2/25)$, and these offers will be accepted by I_1 and I_2.

The net equilibrium profits of firms 1, 2 I_1 and I_2 are respectively

$$\pi_1^{np} = (43+122c+97c^2)/225,\ \pi_2^{np} = (43-208c+262c^2)/225 \text{ and } \pi_{I1}^{np} = \pi_{I2}^{np} = 0. \tag{11}$$

2.3.2. Parallel trade

Next consider the game under parallel trade. Then I_1 and I_2 not only sell in country *A*, but also in country *B* if that is profitable. Hence, when offering the contracts to I_1 and I_2, firms 1 and 2 need to internalize this possibility.

If I_1 and I_2 accept the contracts of firms 1 and 2, the equilibrium outputs are determined by maximizing the following expressions:

$$\underset{q_{A1}}{Max}(1-q_{A1}-q_{A2}-q_{AI2})q_{A1}+w_1(q_{BI1}+q_{AI1})+T_1, \tag{12a}$$

$$\underset{q_{A2}}{Max}(1-q_{A1}-q_{A2}-q_{AI1}-q_{AI2}-c)q_{A2}+(w_2-c)(q_{BI2}+q_{AI2})+T_2, \tag{12b}$$

$$\underset{q_{BI1},q_{AI1}}{Max}(1-q_{BI1}-q_{BI2}-w_1)q_{BI1}+(1-q_{A1}-q_{A2}-q_{AI1}-q_{AI2}-w_1)q_{AI1}-T_1, \tag{12c}$$

$$\underset{q_{BI2},q_{AI2}}{Max}(1-q_{BI1}-q_{BI2}-w_2)q_{BI2}+(1-q_{A1}-q_{A2}-q_{AI1}-q_{AI2}-w_2)q_{AI2}-T_2. \tag{12d}$$

Standard calculations yield the equilibrium outputs as $q_{A1}=(1+c+w_1+w_2)/5$, $q_{A2}=(1-4c+w_1+w_2)/5$, $q_{BI1}=(1-2w_1+w_2)/3$, $q_{BI2}=(1-2w_2+w_1)/3$, $q_{AI1}=(1+c-4w_1+w_2)/5$ and $q_{AI2}=(1+c-4w_2+w_1)/5$.

The profits of firms 1, 2, I_1 and I_2 are then

$$\pi_1^p=\pi_{A1}+\pi_{B1}=(1+c+w_1+w_2)^2/25+w_1[(1-2w_1+w_2)/3+(1+c-4w_1+w_2)/5]+T_1,$$

$$\pi_2^p=\pi_{A2}+\pi_{B2}=(1-4c+w_1+w_2)^2/25+(w_2-c)[(1-2w_2+w_1)/3+(1+c-4w_2+w_1)/5]+T_2,$$

$$\pi_{I1}^p=\pi_{BI1}+\pi_{AI1}=(1-2w_1+w_2)^2/9+(1+c-4w_1+w_2)^2/25-T_1,$$

$$\pi_{I2}^p=\pi_{BI2}+\pi_{AI2}=(1-2w_2+w_1)^2/9+(1+c-4w_2+w_1)^2/25-T_2.$$

The equilibrium transfer payments are $T_1^p=(1-2w_1+w_2)^2/9+(1+c-4w_1+w_2)^2/25$ and $T_2^p=(1-2w_2+w_1)^2/9+(1+c-4w_2+w_1)^2/25$. The equilibrium wholesale prices can be found as $w_1^p=-(34+77c)/188$ and $w_2^p=-(34-299c)/188$. It is clear that the wholesale

prices are higher under parallel trade than under no parallel trade. The total equilibrium profits of firms 1, 2 I_1 and I_2 are respectively

$$\pi_1^p = (616 + 3003c + 3867c^2)/4418,\ \pi_2^p = (616 - 10439c + 28260c^2)/4418,\ \pi_{I1}^p = \pi_{I2}^p = 0. \quad (13)$$

Proposition 3: *Parallel trade reduces the profit of firm 2 but increases that of firm 1 if* $c > c^* = 11/50$ (*approx.*).

Proof: We compare the profits of firm 2 under parallel trade and under no parallel trade. Specifically, using the expressions in (11) and (13), we have that $\partial(\pi_1^p - \pi_1^{np})/\partial c > 0$ for $c \in [0, 12/53]$. Further, $\pi_1^p > \pi_1^{np}$ at $c = 12/53$, but $\pi_1^p < \pi_1^{np}$ at $c = 0$. Hence, there exists $c^* = 11/50$ (*approx.*) such that the profit of firm 1 is higher under parallel trade than under no parallel trade if $c > c^*$, which proves the result. ■

Some explanations are in order. Under parallel trade, wholesale prices affect the intensity of competition in both countries *A* and *B*. A lower wholesale price charged by a firm, say firm 1, not only reduces the profits of firm 2 in both countries, it also tends to reduce the profit of firm 1 in country *A*. This negative impact induces the firm to charge a relatively higher wholesale price under parallel trade compared with no parallel trade.

Even if the products of both firms 1 and 2 are being traded in a parallel way, the rent extracting effect is stronger for the more cost efficient firm. If firm 1 is very much cost efficient than firm 2, parallel trade makes the former firm better off by extracting a significant amount of rent from the latter firm. In contrast, if we remove the marginal cost difference between the two firms, their rent shifting effects offset each other, and as a consequence, the intensity of product market competition will be increased, reducing the profits of both firms.

3. Unionized labour market in the home country

In this section we examine the role of unionized labour markets. To isolate its impacts, we make some changes to the above analysis by assuming that firm 1 is a monopolist producer of the product. This firm has a plant in both country *A* (the home country) and country *B* (the foreign country), and serves both countries from the respective plants. We assume that the labour market in country *A* is unionized, while that in country *B* is perfectly competitive, and the reservation wage rates in both countries are *c*, which are assume to be zero for simplicity. There is a transportation cost *t* for trade between the countries. We assume that the inverse demand from the consumers' in country *A* is $P_A = 1 - q_A$ while it is in country *B* is $P_B = a - q_B$, with $a < 1$. This structure is similar to the "partial FDI" case of Lommerud et al. (2003), who exclude parallel trade.

We adopt the right-to-manage[6] model of labour unions,[7] where the labour union chooses the wage rate and firm 1, which requires one unit of labour to produce one unit of output, determines the employment/output level. We consider full bargaining power of the labour union to demonstrate our results in the simplest way.

3.1. No parallel trade

We analyze the following moves of the game. At stage 1, the labour union sets the wage in country *A*. At stage 2, firm 1 hires labour and produces in countries *A* and *B*. Then profits are realized. The game is solved by backward induction.

Given the wage rates in both countries, firm 1 maximizes:

[6] We refer to Vannini and Bughin (2000), Lommerud et al. (2003), López and Naylor (2004), Skaksen (2004) and Mukherjee (2007), to name a few, for works on the right-to-manage model of labour unions.
[7] The 'efficient bargaining' model, which stipulates that the firms and unions bargain over wages and employment, is an alternative to the right-to-manage model. See, Layard et al. (1991) for arguments in favour of right-to-manage models.

$$\underset{q_{A1},q_{B1}}{Max}(1-q_{A1}-w)q_{A1}+(1-q_{B1})q_{B1}\,. \tag{14}$$

The equilibrium outputs in countries *A* and *B* are respectively

$$q_{A1}=(1-w)/2 \qquad \text{and} \qquad q_{B1}=a/2\,. \tag{15}$$

Therefore, the labour demand in country *A* is $L=(1-w)/2$. The labour union maximizes the following expression to determine the wage rate:

$$\underset{w}{Max}\frac{w(1-w)}{2}, \tag{16}$$

which gives

$$w^{*,np}=1/2\,. \tag{17}$$

We assume that $t>w^{*,np}$, i.e.,

$$t>1/2\,, \tag{18}$$

which ensures that firm 1 has no incentive to export its product between the countries, given that we have assumed away the cost of setting up a business in country *B*. Even if the setup cost is positive but small enough, firm 1 prefers to produce in country *B*.

The total profit of firm 1 is

$$\pi_1^{np}=\pi_{A1}+\pi_{B1}=\frac{(1-w)^2+a^2}{4}=\frac{1+4a^2}{16}\,. \tag{19}$$

3.2. Parallel trade

Assume that there is a firm in country 2, called *K*, who buys the product of firm 1 in country *B* and sells it back to country *A*. It is assumed that firm 1 does not know the identity of the parallel trader as in Hur and Riyanto (2006),[8] and as in the previous section the parallel trader derives utility only from profit but not from consumption.

[8] If the parallel trader can be identified, firm 1 will not sell the product to the parallel trader if parallel trade makes it worse off. Here we show that parallel trade benefits firm 1, and thus it has less incentive to restrict parallel trading even if it knows the identity of the parallel trader.

Hence, the demand in country *B* now comes from both consumers and the parallel trader. While producing its output in country *B*, firm 1 needs to internalize this effect.

We consider the following game under parallel trade. At stage 1, the labour union charges wage in country *A*. Then at stage 2, firm 1 makes its production decisions in countries *A* and *B*, and *K* buys the product of firm 1 in country *B* and sells it in country *A*. Then the profits are realized. The game is still solved by backward induction.

Since *K* buys the product in country *B*, it creates demand in that country along with the demand from the consumers. However, the demand by *K* depends on its sales in country *A*. Hence, while determining the output in country *B*, firm 1 should correctly anticipate the demand from *K* and adjust the demand function in country *B* accordingly.

Given the wage rate in country *A*, the transportation cost *t* and the price P_B at which *K* buys the product in country *B*, *K* determines its output to maximize:

$$\underset{q_{AK}}{Max}(1-q_{A1}-q_{AK}-P_B-t)q_{AK} \tag{20}$$

and firm 1 maximizes the following expression to determine output in country *A*:

$$\underset{q_{A1}}{Max}(1-q_{A1}-q_{AK}-w)q_{A1}. \tag{21}$$

The equilibrium outputs of *K* and firm 1 in country *A* are respectively $q_{AK}=\frac{1-2(P_B+t)+w}{3}$ and $q_{A1}=\frac{1-2w+P_B+t}{3}$. Firm 1 anticipates this demand from *K*. Hence, the total inverse demand in country *B* can be expressed as $P_B=\frac{1+3a-2t+w-3q_B}{5}$, which firm 1 should correctly anticipate and use in determining the output in country *B*.[9]

Therefore, the outputs q_{AK}, q_{A1} and q_{B1} are determined by maximizing the expressions (20), (21) and the following expression:

[9] In contrast to the last section, where the demand from the distributors affects the derived demand for firm 1's product, here the demand from the parallel trader affects the market demand.

$$\underset{q_{B1}}{Max}(\frac{1+3a-2t+w-3q_{B1}}{5})q_{B1}. \tag{22}$$

The equilibrium outputs and the price in country B at a given w are respectively $q_{AK}=\frac{1-2(P_B+t)+w}{3}$, $q_{A1}=\frac{1-2w+P_B+t}{3}$, $q_{B1}=\frac{1+3a-2t+w}{6}$ and $P_B=\frac{1+3a-2t+w}{10}$.

The wage in country A is then determined by maximizing the following expression:

$$\underset{w}{Max}\frac{w(1-2w+P_B+t)}{3}. \tag{23}$$

The equilibrium wage is $w=\frac{1+P_B+t}{4}$. Given $P_B=\frac{1+3a-2t+w}{10}$, we obtain the equilibrium wage in country B to be $w^{*,p}=\frac{11+3a+8t}{39}$.

Given the equilibrium wage, the equilibrium outputs and the price in country B are respectively $q_{AK}=\frac{40-21a-56t}{117}$, $q_{A1}=\frac{22+6a+16t}{117}>0$, $q_{B1}=\frac{25+60a-35t}{117}$ and $P_B=\frac{25+60a-35t}{195}$. It can also be found that the demand by the consumers in country B at P_B is $q_{BC}=a-P_B=\frac{135a-25+35t}{195}$. Note that $q_{BC}+q_{AK}=q_{B1}$.

We assume that $t<\frac{40-21a}{56}$, which ensures that $q_{AK}>0$ and $q_{B1}>0$. Further, if $a>\frac{3}{54}(=.06,\ approx.)$, then our assumption (18) implies that $q_{BC}>0$. Hence, we assume in the following analysis that $\frac{1}{2}<t<\frac{40-21a}{56}$, where the first inequality comes from (18). However, the range of t over $[\frac{1}{2},\frac{40-21a}{56}]$ is non-empty if $a<\frac{4}{7}=.57(approx.)$. We restrict our attention to $.06<a<.57$. Also $t>w^{*,p}$ for $.06<a<.57$, i.e., firm 1 has no incentive to export its product between the countries.

Proposition 4: *The equilibrium wage in country A is lower and firm 1's equilibrium output is higher in country A under parallel trade than under no parallel trade.*

Proof: We find that $w^{*,np} > w^{*,p}$ if $t < \frac{17-6a}{16}$, which holds for $\frac{1}{2} < t < \frac{40-21a}{56}$.

Firm 1's output in country *A* is higher under parallel trade than under no parallel trade, i.e., $\frac{22+6a+16t}{117} > \frac{1}{4}$ if $t > \frac{29-24a}{64}$, which holds for $\frac{1}{2} < t < \frac{40-21a}{56}$. ■

The intuition for the wage reducing effect of parallel trade is as follows. Parallel trade increases competition in country *A*. Hence, ceteris paribus, it reduces the labour demand faced by the labour union in the country, which in turn forces the union to reduce its wage hike. On the one hand, the increased competition due to parallel trade tends to reduce the output of firm 1 in country *A*; on the other hand, the lowered wage tends to increase firm 1's output. Our result shows that the wage-reducing effect dominates the competition effect, and thus increases firm 1's output in country *A*.

The total profit of firm 1 under parallel trade is

$$\pi_1^p = \pi_{A1} + \pi_{B1} = \frac{(22+6a+16t)^2}{13689} + \frac{(25+60a-35t)^2}{22815}. \tag{24}$$

Proposition 5: *The profit of firm 1 is higher under parallel trade than under no parallel trade for* $\frac{1}{2} < t < \frac{40-21a}{56}$ *and* $.06 < a < .57$.

Proof: We have $\frac{\partial \pi_1^p}{\partial t} > 0$ for $\frac{1}{2} < t < \frac{40-21a}{56}$. The comparison of (19) and (24) at $t = 1/2$ shows that $\pi_1^p > \pi_1^{np}$ for $.06 < a < .57$. ■

The reason for the above result is as follows. Parallel trade intensifies competition in country *A*, though it creates higher demand in country *B*. For a given wage, the competition effect dominates the demand-raising effect, and thus parallel trade tends to reduce firm 1's profit. This is clearly true if the labour markets in both countries are perfectly competitive (see Appendix for detailed proof). However, one must take into account another effect. As shown in Proposition 4, parallel trade reduces the union wage in country 1, and therefore, helps to reduce firm 1's marginal cost of production in country *A*. The beneficial *wage-reducing effect* (along with the demand-raising effect) outweighs the negative *competition effect* and hence increases firm 1's profit under parallel trade. That is, in the presence of a labour union, parallel trade may benefit a manufacturer by reducing the unionized wage.

To show the role of unions in the simplest way, we have given the labour union full bargaining power. The other extreme case is full bargaining power of the manufacturer. In this situation, the equilibrium wage is equal to the reservation wage of the worker. The analysis under this situation is similar to that shown in the Appendix. Hence, it is clear that the presence of a labour union may make a manufacturer better off under parallel trade if the bargaining power of the labour union is not very low.

The market demand function in country *A*, from which the labour demand is derived, plays an important role in determining the beneficial effects of parallel trade. We may conjecture the case of a different demand situation. For example, as the elasticity of the market demand function in country *A* increases, it will have a lower adverse impact on firm 1's production and labour demand in that country following parallel trade, since a relatively smaller reduction in the price of the final goods is required to accommodate the output of the parallel trader. Hence, as the elasticity of the market demand function increases, firm 1 needs to reduce its output by a lower amount following parallel trade. In other words, both the adverse competition effect and the favourable wage-reducing effect

fall with a more elastic market demand function. However, the demand-raising effect in country *B* remains, thus increasing the possibility of a beneficial parallel trade.

4. Conclusion

It is generally believed that parallel trade reduces profits of the manufacturers. However, empirical evidences do not always support this view. In this paper, we identify two new factors under parallel trade, viz., market stealing and union-wage cutting, which may be responsible for generating higher profits to some manufacturers. Market stealing arises in situations when the manufacturer is even slightly more efficient or sells in more markets than its competitors. In these situations, the manufacturer can strategically take advantage of parallel trading in its competition with rivals. Similarly, it can also use this advantage in an imperfect factor market, such as when labour is unionized. As long as the union has some bargaining power for wage hikes, parallel trading can help the manufacturer to weaken the wage demand. For these reasons, many manufacturers often accept parallel trade in some markets.

Appendix

Parallel trade makes the manufacturer worse off without a union

Consider the set up of Section 3 with the exception that the labour markets are perfectly competitive in both countries. For simplicity, assume that the reservation wage is zero in both countries. If there is no parallel trade, standard calculations show that the total profit of firm 1 is $\pi_1^{np} = \frac{1+a^2}{4}$.

The equilibrium values under parallel trade follows immediately from Section 3 with $w = 0$. We have $q_{A1} = \frac{11+3a+8t}{30} > 0$, $q_{B1} = \frac{1+3a-2t}{6}$, $q_{AK} = \frac{4-3a-8t}{15}$, $q_{BC} = \frac{7a-1+2t}{10}$ and $P_B = \frac{1+3a-2t}{10}$. The boundary conditions are as follows: q_{AK} and q_{B1} are positive for $t < \frac{4-3a}{8}$, and $q_{BC} > 0$ for $t > 0$ if $a \le \frac{1}{7}$, but $q_{BC} > 0$ for $t > \frac{1-7a}{2}$ if $a > \frac{1}{7}$.

The total profit of firm 1 under parallel trade is $\pi_1^p = \frac{(11+3a+8t)^2 + 15(1+3a-2t)^2}{900}$. The profit of firm 1 is convex in *t*, and $\frac{\partial \pi_1^p}{\partial t} > 0$ for $t > \frac{33a-29}{62}$ if $a > \frac{29}{33}$, but $\frac{\partial \pi_1^p}{\partial t} > 0$ for $t > 0$ if $a \le \frac{29}{33}$.

The relevant values of *t* and *a* are $t \in (\frac{1-7a}{2}, \frac{4-3a}{8})$ and $a < \frac{1}{7}$, $t \in [0, \frac{4-3a}{8})$ and $\frac{1}{7} \le a \le \frac{29}{33}$, and $t \in (\frac{33a-29}{62}, \frac{4-3a}{8})$ and $\frac{29}{33} < a < 1$.

Standard calculation shows that $\pi_1^{np} > \pi_1^p$.

References

Ahmadi, R. and R. Yang, 2000, 'Parallel imports: challenge from unauthorized distribution channels', *Marketing Science*, 19: 279 – 94.

Automotive News, 2002, *Gray market yields gold*, 76, Issue 5972, February 25.

Cespedes, F., E.R. Corey and V.K. Rangan, 1988, 'Gray markets: causes and cures', *Harvard Business Review*, 75-82 (July-August).

Computer Reseller News, 2001, *Vendors aim to squash gray market* 963, September 17.

House of Commons, 1999, *Trademarks, fakes and consumers*, 8th Report, Trade and Industry Committee (http://www.parliament.the-stationery-office.co.uk/pa/cm199899/cmselect/cmtrdind/380/38007.htm).

Hur, J. and Y. E. Riyanto, 2006, 'Tariff policy and exhaustion of intellectual property rights in the presence of parallel trade', *Oxford Economic Papers*, 58: 549 – 68.

Knox, D. and M. Richardson, 2002, 'Trade policy and parallel trade', *European Journal of Political Economy*, 19: 133 – 51.

Layard, R., S. Nickell and R. Jackman, 1991, *Unemployment, macroeconomic performance and the labour market*, Oxford University Press, Oxford.

Li, C. and K. Maskus, 2006, 'The impact of parallel trade on investments in cost-reducing research and development', *Journal of International Economics*, 68: 443-55.

Lipner, S., 1990, *The legal and economic aspects of gray market goods*, Quoram Books, London.

Lommerud, K.E., F. Meland and L. Sørgard, 2003, 'Unionised oligopoly, trade liberalisation and location choice', *The Economic Journal*, 113: 782-800.

López, M.C. and Naylor, R.A., 2004, 'The Cournot-Bertrand profit differential: a reversal result in a differentiated duopoly with wage bargaining', *European Economic Review*, 48: 681 – 96.

Malueg, D. A. and M. Schwartz, 1994, 'Parallel trade, demand dispersion, and international price discrimination', *Journal of International Economics*, 37: 167 – 95.

Maskus, K., 2000, 'Parallel trade', *The World Economy*, 23: 1269-84.

Maskus, K. E. and Y. Chen, 2004, 'Vertical price control and parallel trade: theory and evidence', *Review of International Economics*, 12: 551 – 70.

Mukherjee, A., 2008, 'Unionised labour market and strategic production decision of a multinational', *The Economic Journal*, 118: 1621-39.

NERA, 1999, *The economic consequences of the choice of a regime of exhaustion in the area of trademarks*, Final report for DGXV of the European Commission, February.

Raff, H. and N, Schmitt, 2007, 'Why parallel trade may raise producers' profits', *Journal of International Economics*, 71: 434 – 47.

Richardson, M., 2002, 'An elementary proposition concerning parallel trade', *Journal of International Economics*, 56: 233 – 45.

Scherer, F. M., 1994, 'Competition policies for an integrated world economy', *Brookings Institution*, Washington DC.

Skaksen, J.R., 2004, 'International outsourcing when labour markets are unionised', *Canadian Journal of Economics*, 37: 78 – 94.

Vannini, S. and Bughin, J., 2000, 'To be (unionised) or not to be? A case for cost-raising strategies under Cournot oligopoly', *European Economic Review*, 44: 1763 – 81.

Vickers, J., 1985, 'Delegation and the theory of the firm', *Economic Journal (Supplement)*, 95: 138-47.

Ziss, S., 1997, 'Strategic trade policy and vertical structure', *Review of International Economics*, 5: 142-52.