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Tax Principles and Tariff-Tax Reforms

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Abstract

This paper develops a two-country general equilibrium model to examine the welfare effect of tariff-tax reforms that fix the world price. We show that this reform improves welfare if an origin tax is adjusted, but that it reduces welfare if a destination tax is used. Moreover, this result is reversed in the export tax case. In short, whether the proposed policy reform improves welfare depends on which between imports and exports are taxed as well as tax principles.

Keywords: destination principle, origin principle, tariff-tax reform

JEL classification: F11, F13, H2

1 Introduction

World trade has considerably grown since the end of World War II. As standard international economics tells, trade liberalization benefits the world as well as an individual country. However, there is still resistance to trade liberalization for a variety of reasons. One reason is that trade liberalization alone does not necessarily ensure a welfare improvement in the presence of other market distortions, e.g. domestic taxes.[1] Then, a natural question arises; what sort of tariff-tax reform is welfare-improving?

To this question, Hatzipanayotou et al. (1994) and Keen and Ligthart (2002) provide a clear answer. Assuming a competitive small open economy, they show that a tariff reduction accompanied by a point-by-point increase in destination tax improves welfare. Although this result is useful in the sense that the proposed policy is practically easy to implement, it can not apply to a large country that influences the world price.

In order to complement the above literature, this paper seeks a tariff-tax reform that necessarily leads to a welfare improvement in a two-country general equilibrium model. Concretely, we consider tariff reductions combined with an adjustment of a domestic tax that fix the world price by allowing for two tax principles: a destination-based tax and an origin-based tax. There are two reasons for focusing on the world-price-fixing tariff-tax reform. For one thing, this reform is shown to freeze foreign welfare, which avoids foreign retaliation. Besides, this property allows us to easily determine whether the proposed reform improves world welfare just by looking at the effect on domestic welfare. For another thing, this reform has a practical advantage that it targets an observable variable. While one can theoretically consider a welfare-fixing policy, such a policy is impossible to implement since it is based on an unobservable variable, welfare. The policy prescription we pro-

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[1]Another reason is that trade liberalization decreases the government revenue. This is serious particularly for low-income countries since the government of these countries largely depends on trade tax revenue as IMF (2005) reports.

pose overcomes this difficulty.[2] As we will establish, whether this reform improves welfare depends on (i) tax principles and (ii) which between imports and exports are taxed. For example, in the case of import tariffs, the above reform raises (resp. lowers) domestic welfare if the origin (resp. destination) tax is used.

There is a large literature on tariff-tax reforms.[3] As mentioned earlier, Hatzipanayotou et al. (1994) and Keen and Ligthart (2002) show that one unit of tariff reduction and one unit of destination-based tax increase improve welfare of a small open country. Kreickemeier and Raimondos-Møller (2008) find that the same reform can worsen market access defined by a value of imports evaluated at the world prices. While these papers assume an import tariff, Emran (2005) shows that a point-by-point reduction in export tax and increase in origin tax is welfare-improving. Taking into account an informal sector, Emran and Stiglitz (2005) demonstrate that a revenue-neutral tariff reduction combined with an increase in destination tax may worsen welfare.[4] Although we assume away an informal sector, we show that an appropriately-designed tariff-tax reform is still useful.

This paper proceeds as follows. Sections 2 and 3 examine the welfare effects of the world-price-fixing tariff-tax reforms under the destination and origin taxes, respectively. Section 4 concludes.

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[2]For these reasons, the world-price-fixing policy has been studied in the literature on multilateral and regional trade agreements. Vanek (1965), Ohyama (1972) and Kemp and Wan (1976) apply this idea to Pareto-improving customs unions. Bagwell and Staiger (1999, 2002) are a pioneering work in the literature on multilateral trade agreements.

[3]Neither the literature on the reform of trade policy only nor the literature on the multilateral tax reform is reviewed since both issues are beyond the scope of this paper. See Woodland (1982), Dixit (1985), Neary (1998), and Falvey and Kreickemeier (2011) for these fields.

[4]As to the negative evaluation of the tariff-tax reform of Emran and Stiglitz (2005), Keen (2008, p. 1894) claims that 'the results of Emran and Stiglitz (2005) are much less damaging to conventional advice than they may appear.

2 Destination Tax

2.1 Model

Suppose a perfectly competitive two-country (Home and Foreign), two-good (Goods 1 and 2) general equilibrium model with an asterisk representing a Foreign variable. The Home government levies a trade tax t and a destination-based tax τ on Good 1. All taxes are assumed to take a specific (per-unit) form.[5] Thus, the consumer price and the producer price are $p + t + \tau$ and $p + t$, respectively, where p is the world price of Good 1 in terms of Good 2. Good 2 (numeraire) is untaxed, following the existing literature, e.g. Keen and Ligthart (2002). If Foreign observes laissez-faire, the trading equilibrium is characterized by:

$$e(p + t + \tau, u) = r(p + t) + \tau e_p(p + t + \tau, u) + t[e_p(p + t + \tau, u) - r_p(p + t)] \tag{1}$$

$$e^*(p, u^*) = r^*(p) \tag{2}$$

$$e_p(p + t + \tau, u) + e_p^*(p, u^*) = r_p(p + t) + r_p^*(p), \tag{3}$$

where u and u^* are utility of Home and Foreign, $e(\cdot)$ and $e^*(\cdot)$ are an expenditure function, $r(\cdot)$ and $r^*(\cdot)$ are a GDP function, and subscript p stands for a partial derivative with respect to the price. All the functions are assumed to satisfy the standard properties.[6] Eq. (1) is an expenditure-income equality of Home, where $\tau e_p(\cdot)$ and $t[e_p(\cdot) - r_p(\cdot)]$ represent revenue from the destination tax and the trade tax, respectively. Eq. (2) is a counterpart of Foreign, and (3) is a world market-clearing condition of Good 1. This system determines u, u^* and p, given t and τ.

To see the effects of a change in two taxes, let us totally differentiate the

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[5]If t is positive and Home imports (resp. exports) Good 1, it represents an import tariff (resp. export subsidy).

[6]See Dixit and Norman (1980), Woodland (1982), Wong (1995), and Feenstra (2003).

above system:

$$\begin{bmatrix} e_u - (\tau + t)e_{pu} & 0 & e_p - r_p - \tau e_{pp} - t(e_{pp} - r_{pp}) \\ 0 & e^*_{u^*} & e^*_p - r^*_p \\ e_{pu} & e^*_{pu^*} & e_{pp} + e^*_{pp} - r_{pp} - r^*_{pp} \end{bmatrix} \begin{bmatrix} du \\ du^* \\ dp \end{bmatrix}$$

$$= \begin{bmatrix} (\tau + t)e_{pp} \\ 0 \\ -e_{pp} \end{bmatrix} d\tau + \begin{bmatrix} \tau e_{pp} + t(e_{pp} - r_{pp}) \\ 0 \\ -(e_{pp} - r_{pp}) \end{bmatrix} dt, \qquad (4)$$

where subscripts u and u^* refer to a partial derivative with respect to u and u^*, respectively.

2.2 Welfare Effect

We now address the welfare effect of a tariff-tax reform. As stressed in Introduction, we assume an integrated policy reform consisting of a tariff reduction and an adjustment of τ that fixes the world price. Since a change in p is given by $dp = (\partial p/\partial t)dt + (\partial p/\partial \tau)d\tau$, the proposed reform requires that

$$d\tau = -\frac{\partial p/\partial t}{\partial p/\partial \tau}dt = -\frac{e_u e_{pp} - (e_u - \tau e_{pu})r_{pp}}{e_u e_{pp}}dt, \qquad (5)$$

by setting $dp = 0$. At this stage, we make an assumption, which dates back to Hatta (1977a, b):[7]

Assumption (Hatta Normality Condition) $e_u - \tau e_{pu} > 0$.

Eq. (5) has three notable properties. First, as is evident from Eq. (2), this reform fixes Foreign welfare, and hence we can easily determine the effect on world welfare just by looking at the effect on Home welfare. Second, the destination tax must be raised in response to the tariff reduction, i.e., $d\tau > 0$.

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[7]By linear homogeneity of the expenditure function, this condition is alternatively expressed as $e_u - \tau e_{pu} = (p + t)e_{pu} + e_{2u} > 0$, where $e_{2u} \equiv \partial^2 e(\cdot)/\partial u \partial p_2$. Thus, this condition requires that the producer-price-evaluated expenditure increases in utility.

Third, noting that (5) is rewritten as

$$d\tau = \left[-1 + \underbrace{\frac{(e_u - \tau e_{pu})r_{pp}}{e_u e_{pp}}}_{(-)} \right] dt,$$

we have $|d\tau| > |dt|$. That is, when a tariff is reduced, domestic consumption must be over-taxed so as to keep the world price constant.

In order to interpret the last two properties of the reform, recall that tariff reductions have a 'dual' effect; tariff reductions are equivalent to simultaneous reductions in destination tax and origin subsidy. However, by assumption, the destination tax is the only domestic policy available to the Home government. Therefore, the Home government has to over-tax domestic consumption so as to offset the 'dual' effect of tariff reductions.

Substituting (5) into the right-hand side of (4) yields

$$-\frac{e_u e_{pp} - (e_u - \tau e_{pu})r_{pp}}{e_u e_{pp}} \begin{bmatrix} (\tau + t)e_{pp} \\ 0 \\ -e_{pp} \end{bmatrix} dt + \begin{bmatrix} \tau e_{pp} + t(e_{pp} - r_{pp}) \\ 0 \\ r_{pp} - e_{pp} \end{bmatrix} dt$$

$$= \frac{\tau r_{pp}}{e_u} \begin{bmatrix} e_u - (\tau + t)e_{pu} \\ 0 \\ e_{pu} \end{bmatrix} dt.$$

The rest of our task is to replace the right-hand side of (4) with the above vector, and compute the comparative statics outcomes. Through some manipulations, we can establish:

Proposition 1 A coordinated reduction in import tariffs and an increase in destination-based taxes reduce welfare of Home and the world.

Proof. By applying Cramer's rule, the effect of the proposed reform on Home welfare becomes

$$du|_{dp=0} = \frac{\tau r_{pp}}{e_u} dt, \tag{6}$$

which leads to $sign\{du\} = sign\{\tau \cdot dt\}$. In other words, if the initial destination tax is positive ($\tau > 0$) and a tariff is reduced ($dt < 0$), Home welfare falls ($du < 0$). $\|$

Assuming the simplest case where t, τ and $e_p - r_p$ are positive, we now explain the intuition behind Proposition 1. As Proposition 1 of Ederington (2001, p. 1585) suggests, the world efficiency requires both τ and t to be zero. Relating this result to our context, world welfare rises when the policy reform involves a simultaneous reduction in trade and domestic taxes. Then, the world gains from the reform by approaching the first-best equilibrium. However, this does not hold in the present case because the world-price-fixing requirement results in an increase in the destination tax. This is the reason for welfare losses in (6).

While Proposition 1 concerns the import tariff case, it readily applies to the export tax case in which both t and $e_p - r_p$ are negative. Given the fact that 'over 100 countries apply export taxes,' (Solleder, 2012, p. 1) it is worthwhile to address the export tax case. Then, an export tax reduction is represented by $dt > 0$, thereby arriving at $d\tau < 0$ (consumption tax decrease) and $du|_{dp=0} > 0$ from (5) and (6). This result is stated as:

Corollary 1 A coordinated reduction in export taxes and a decrease in destination-based taxes raise welfare of Home and the world.

That is, the world-price-fixing reform is a good policy prescription if initially exports and domestic consumption are taxed. More broadly, Proposition 1 and Corollary 1 suggest that replacing an import tariff and/or export subsidy (resp. import subsidy and/or export tax) with a destination subsidy (resp. destination tax) ensures welfare gains of the world.

3　Origin Tax

3.1　Model

This section turns to the case of destination-based taxes. Since the derivation of the main results is substantially the same as that of the previous section, we briefly outline the core argument. The trading equilibrium is described by

$$e(p+t,u) = r(p+t-s) + sr_p(p+t-s) + t[e_p(p+t,u) - r_p(p+t-s)] \tag{7}$$

$$e^*(p,u^*) = r^*(p) \tag{8}$$

$$e_p(p+t,u) + e_p^*(p) = r_p(p+t-s) + r_p^*(p), \tag{9}$$

by replacing the destination tax τ with an origin tax s.

The totally-differentiated system of the above equations is

$$
\begin{bmatrix}
e_u - te_{pu} & 0 & e_p - r_p - sr_{pp} - t(e_{pp} - r_{pp}) \\
0 & e_{u^*}^* & e_p^* - r_p^* \\
e_{pu} & e_{pu^*}^* & e_{pp} + e_{pp}^* - r_{pp} - r_{pp}^*
\end{bmatrix}
\begin{bmatrix}
du \\
du^* \\
dp
\end{bmatrix}
$$
$$
=
\begin{bmatrix}
(-s+t)r_{pp} \\
0 \\
-r_{pp}
\end{bmatrix}
ds +
\begin{bmatrix}
sr_{pp} + t(e_{pp} - r_{pp}) \\
0 \\
-(e_{pp} - r_{pp})
\end{bmatrix}
dt, \tag{10}
$$

which serves as a basis for our analysis.

The world-price-fixing reform is now defined. Noting $dp = (\partial p/\partial s)ds + (\partial p/\partial t)dt$ and using (10), our requirement becomes

$$
\begin{aligned}
ds &= -\frac{\partial p/\partial t}{\partial p/\partial s}dt = \frac{(e_u - se_{pu})r_{pp} - e_u e_{pp}}{(e_u - se_{pu})r_{pp}}dt \\
&= \left[1 - \underbrace{\frac{e_u e_{pp}}{(e_u - se_{pu})r_{pp}}}_{(+)} \right] dt, \tag{11}
\end{aligned}
$$

by setting $dp = 0$. As in the destination tax case, we assume a Hatta Normality Condition:

Assumption (Hatta Normality Condition). $e_u - se_{pu} > 0$.

Eq. (11) has three key properties that are mentioned in the last section. First, this reform fixes Foreign welfare. Second, the origin tax must fall $(ds < 0)$ as a result of a tariff reduction $(dt < 0)$. Third, when a tariff is cut, the origin tax must be over-reduced to freeze the world price. The reason is as follows. Tariff reductions have the 'dual' effect in the sense that a tariff reduction is equivalent to a simultaneous reduction in a destination tax and an origin subsidy. However, the origin tax alone is available by assumption, and so the Home government ends up over-cutting the origin tax in order to offset the effect of initial tariff reduction.

3.2   Welfare Effect

We now identify the tariff-tax reform in (11) on Home welfare. When ds in the right-hand side of (10) is replaced by (11), the right-hand side of (10) becomes

$$
\frac{r_{pp}(e_u - se_{pu}) - e_u e_{pp}}{r_{pp}(e_u - se_{pu})} \begin{bmatrix} (-s+t)r_{pp} \\ 0 \\ -r_{pp} \end{bmatrix} dt + \begin{bmatrix} sr_{pp} + t(e_{pp} - r_{pp}) \\ 0 \\ -(e_{pp} - r_{pp}) \end{bmatrix} dt
$$

$$
= \frac{se_{pp}}{e_u - se_{pu}} \begin{bmatrix} e_u - te_{pu} \\ 0 \\ e_{pu} \end{bmatrix} dt.
$$

Straightforward manipulations yield

Proposition 2 A coordinated reduction in import tariffs and a decrease in origin-based production taxes raise welfare of Home and the world.

Proof. Making a comparative statics exercise, we have

$$
du|_{dp=0} = \frac{se_{pp}}{e_u - se_{pu}} dt. \tag{12}
$$

Since the coefficient of $dt < 0$ is negative, we have $sign\{du\} = -sign\{s \cdot dt\}$. Thus, if domestic production is initially taxed $(s > 0)$, a reduction in the Home tariff $(dt < 0)$ raises Home welfare $(du > 0)$. ||

It suffices to provide the intuition of Proposition 2 briefly because it is almost the same as that of Proposition 1. As mentioned earlier, whether the proposed reform improves welfare depends on whether both the trade and domestic taxes approach zero. If the origin tax is employed, this requirement is satisfied, i.e., both the import tariff and the origin tax fall. As a result, the proposed reform benefits the world as well as Home.

Once we get Proposition 2, it easily applies to the export tax case in which t is negative and its reduction is expressed by $dt > 0$. Then, we obtain:

Corollary 2 A coordinated reduction in export taxes and an increase in origin-based production taxes reduce welfare of Home and the world.

It follows from our findings that the welfare effects of the world-price-fixing tariff-tax reform depend on (i) which between imports and exports are taxed and (ii) tax principles. This is shown in Table 1.[8]

(Table 1 around here)

Remark. As stated in Footnote 1, tariff-tax reforms are an attractive policy guidance particularly for low-income countries that heavily depend on trade tax revenue. However, we have discussed no fiscal implication of the reform. This is not because the fiscal aspect is unimportant but just because the effect on government revenue is ambiguous. This is made clear by defining government revenue G as follows.

destination tax case : $G \equiv \tau e_p(p + t + \tau, u) + t\left[e_p(p + t + \tau, u) - r_p(p + t)\right]$

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[8]One can extend our results to the case of subsidies by properly changing the sign of t, τ and s.

origin tax case   : $G \equiv s r_p(p + t - s) + t \left[e_p(p + t, u) - r_p(p + t - s) \right].$

Totally differentiating these definitions, the change in G is decomposed as

destination tax case   : $dG = \underbrace{e_p d\tau}_{(+)} + \underbrace{\tau de_p}_{(-)} + \underbrace{(e_p - r_p)dt}_{(-)} + \underbrace{td(e_p - r_p)}_{0}$

origin tax case   : $dG = \underbrace{r_p ds}_{(-)} + \underbrace{s dr_p}_{(+)} + \underbrace{(e_p - r_p)dt}_{(-)} + \underbrace{td(e_p - r_p)}_{0}.$

Accordingly, the revenue effects can be both positive and negative.

4 Conclusion

We have studied world-price-fixing tariff-tax reforms in a two-country general equilibrium model. It is shown that tariff reductions are welfare-improving (resp. reducing) if an origin (resp. destination) tax is adjusted to keep the world price unchanged. This superiority of origin tax over destination tax is reversed in the case of export taxes. In the existing literature, 'in the competitive case, the principle by which taxes are levied is thus irrelevant to the efficiency case for their harmonization' (Keen et al., 2002, p. 1560) However, our results clearly suggest that this statement is no longer true of the context of tariff-tax reforms.[9]

Despite the above novelty, a number of open questions are left. First, we have assumed that Foreign observes laissez-faire by following the existing literature on tariff-tax reforms. It is of great importance to explore multilateral reforms within our context and framework. Second, we have employed a two-country, two-good model for convenience, but it is interesting to check the validity of our results in higher dimensions. Third, we have used a static model of perfect competition, which calls for more elaborations. For example, Keen and Lahiri (1998), Keen et al. (2002), Haufler and Pflüger (2004), Keen and Ligthart (2005), Haufler et al. (2005) and Naito and Abe

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[9]This difference in evaluation comes from that they consider tax harmonization while we examine tariff-tax reforms.

(2008) consider imperfect competition, and public goods are allowed in Abe (1992, 1995) and Lahiri and Raimondos-Møller (1998).[10] Furthermore, Naito (2006a, 2006b) takes into account a dynamic effect of reforms in a model of endogenous growth. Our study is just a reference point, and extensions and generalizations to these richer frameworks are important research agenda.

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	Destination Tax	Origin Tax
Import Tariff	$-$	$+$
Export Tax	$+$	$-$

Table 1: Welfare effects of the reform: the row represents the domestic tax base, and the column represents which between imports and exports is taxed. In the table, '$+$' (resp. '$-$') means a welfare improvement (resp. deterioration) as a result of the world-price-fixing policy reform.