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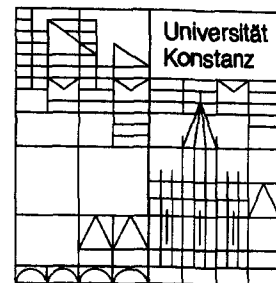
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Diskussionsbeiträge



Juristische
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The Case of the
Restricted Origin Principle**

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Trade Deflection with Transaction Costs: The Case of the Restricted Origin Principle

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Abstract

The paper analyzes the implications of allowing for trade deflection under the restricted origin principle. It is shown that (a) producer trade deflection leads to circular trade and must be ruled out to obtain a trade equilibrium, (b) consumer trade deflection will not occur in a Nash equilibrium when transaction costs are linear (zero) and tax rates are endogenized, (c) with strictly convex transaction costs model results do not differ qualitatively from those obtained in the absence of trade deflection. Together, these results give some theoretical support for the no cross-hauling assumption typically used in multi-country trade modelling.

Keywords: tax differentials, cross-hauling

JEL classification: F15, H73

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Introduction

A long-standing issue in three-country trade modelling has been the possible occurrence of trade deflection, i.e., the transshipment of goods from one country to another. This phenomenon is well known from free trade areas when integrating countries impose different tariffs vis-a-vis the rest of the world. Similar problems arise under the restricted origin principle of commodity taxation, which has gained renewed relevance due to the abolition of border controls in the European Union. Under this scheme members of a tax union tax their internal trade under the origin principle but apply the destination principle for trade with non-member states, leading to the possible exploitation of intra-union tax differentials through trade deflection. The standard approach in international trade theory is to rule out trade deflection – and, more generally, the simultaneous importing and exporting of a homogeneous good (cross-hauling) – as “non-permissible” [Lloyd (1982, p. 50)]. It is assumed that there are “appropriate natural (...) and legal obstacles” [Corden (1984, p. 116)] which prevent this form of tax arbitrage.

Recent years, however, have seen a number of contributions involving these ‘non-permissible’ trade patterns, in particular in the context of the restricted origin principle¹. Georgakopoulos/Hitiris (1992) and Georgakopoulos (1989, 1992) have extended Shibata’s (1967) original analysis of trade deflection, arguing that the underlying arbitrage activities cannot be prevented in practice. This has led to a virtual split in the literature on the restricted origin principle since other authors have ruled out trade deflection by assumption [Whalley (1979), Berglas (1981), Haufler (1994)].

At least two questions arise from these conflicting approaches: in view of the strong reservations in much of trade theory a first question is whether a well-defined trade equilibrium exists at all if simultaneous importing and exporting of the same good is allowed. To the best of our knowledge this issue has not been explicitly analyzed in the relevant literature. If trade deflection is found not to violate basic equilibrium conditions a second question is whether, and how, its incorporation affects the results obtained. Previous work has shown that intra-union tax differentials distort relative producer prices under the restricted origin principle when trade deflection is excluded. These distortions disappear when trade deflection in all goods is allowed and no other taxes or tariffs are imposed. On the other hand, the high-tax country collects zero revenue under costless trade deflection.

¹A recent paper on free trade areas by Richardson (1992) rules out trade deflection as traditionally defined but allows for the deflection of domestic production as a result of producer arbitrage. This setting raises some of the same issues as are discussed here for the restricted origin principle.

Thus it has been concluded that " (...) trade deflection becomes the adjustment mechanism which prevents Pareto-type distortions but at the expense of inter-country income transfers" [Georgakopoulos/Hitiris (1992, p. 129)]. If upheld this would be a rather disturbing result for conventional trade modelling, indicating that both redistributive and overall efficiency effects depend crucially on the a priori assumption to exclude trade deflection.

The present paper attempts to shed some light on these questions, focusing on the case of the restricted origin principle. It is argued here that while the no cross-hauling assumption of standard trade models may not allow a realistic representation of actual trade flows there is *no* fundamental conflict between the model results derived in the absence and in the presence of trade deflection. This offers some theoretical support for the standard model which is independent of the practical feasibility of preventing triangular tax arbitrage². The argument proceeds in three steps. In section 1 we show that producer trade deflection leads to circular trade and must be ruled out to obtain a trade equilibrium. Without this assumption firms could earn infinite profits at the expense of the high-tax country's treasury. Section 2 shows that consumer trade deflection will not occur in equilibrium when governments select taxes endogenously and deflection costs are linear (including zero as a special case). Section 3 argues that when transaction costs are strictly convex trade deflection does not change the qualitative results of standard trade models with respect to either redistributive effects or global efficiency losses. Section 4 summarizes the results of the analysis.

1. Existence of an Equilibrium Price Vector

The analysis of trade deflection under the restricted origin principle is based on a three-country model where countries A and B form a tax union while country C represents the rest of the world. The number of goods is arbitrary but all goods are assumed to be tradeable. In each of the union countries a general commodity tax is levied at a uniform ad valorem rate while the tax rate in country C is irrelevant and can be set equal to zero with no loss of generality. Commodity tax rates within the tax union differ and the analysis assumes that country A's tax rate exceeds that of country B ($t^A > t^B$). Additional taxes or external tariffs are omitted because they are not central to the argument. Finally, it is assumed in this section that transaction (transportation) costs are zero for both direct

²The empirical validity of the no-deflection assumption is by no means undisputed, at least under the restricted origin principle. Cf., e.g., the argument between Whalley (1979, p. 219) and Georgakopoulos (1992, pp. 386-387).

and deflected trade.

In the analysis of Shibata (1967, p. 212) two routes of trade deflection exist under the restricted origin principle when tax rates differ within the union: first, consumers in the high-tax country A can obtain all goods from country C through country B thus paying only the lower tax rate t^B on their imports from the rest of the world. Second, producers in country B can sell to country C via country A to benefit from the higher tax rebates. Therefore, trade flows are exclusively determined by tax considerations (i.e., the no-tax trade pattern based on comparative advantage in production is irrelevant) and a triangular trade pattern emerges where all goods flow from country C via B to A, and back to C. This is illustrated in Figure 1.

***** Figure 1 about here *****

Since all goods receive the same tax treatment the analysis can be based on a single (representative) good. It is thus obvious that relative producer prices cannot be distorted in this framework. The producer price in the rest of the world is normalized to unity and producer and consumer prices in the union countries are denoted by p^k and q^k , $k \in [A, B]$, respectively. In the absence of transportation costs, the first route of trade deflection described above leads to consumers in both union countries paying the world price increased by the tax rate of the low-tax country:

$$q^B = 1 + t^B, \quad (1)$$

$$q^A = 1 + t^B. \quad (2)$$

Second, by diverting their exports to the rest of the world through country A, producers in the low-tax country receive the world price increased by the intra-union tax differential while producers in the high-tax country realize the world price on their exports:

$$p^B = \frac{(1 + t^A)}{(1 + t^B)}, \quad (3)$$

$$p^A = 1. \quad (4)$$

Finally, if imported and domestically produced products are to have the same price in each of the union countries, consumer prices in countries B and A must equal producer prices, increased by the *domestic* tax rates:

$$q^B = (1 + t^B)p^B, \quad (5)$$

$$q^A = (1 + t^A)p^A. \quad (6)$$

It is immediately seen that the equation system (1)–(6) is overdetermined and two of the equations in (1)–(6) must be omitted, implying that arbitrage opportunities are restricted in some way. The standard approach in international trade theory is to rule out trade deflection and thus eliminate equations (2) and (3) [e.g. Lloyd (1982, p. 50)]. If trade deflection is permitted we get

Proposition 1: *Producer trade deflection is incompatible with the existence of an equilibrium price vector whereas consumer trade deflection is not.*

Proof: If both routes of trade deflection described by Shibata are open to traders then relative prices are determined by (1)–(4) and equations (5) and (6) must be excluded. Equation (3) implies, however, that traders in country B can purchase the representative good in the world market at the tax-inclusive price $1 + t^B$ but receive the world price plus a rebate of $t^A > t^B$. Thus a positive profit margin can be earned by shipping goods 'clockwise' from country A through countries C and B, and back to country A. With circular trade, these arbitrage opportunities are never exhausted and no equilibrium set of relative prices exists³. As a consequence, producer deflection has to be ruled out, and equation (3) has to be deleted if a trade equilibrium is to be obtained.

In contrast, consumer trade deflection is compatible with a trade equilibrium. Producer and consumer prices in the union are then given by (1), (2), (4), and (5). Since equation (6) does not hold producer prices in country A exceed consumer prices, discounted by the domestic tax rate. However, equation (4) rules out that producers in country A can take advantage of this wedge by exporting to the rest of the world and re-importing through country B. Therefore, while there is *triangular* trade in the presence of consumer trade deflection, trade flows are not *circular* and an equilibrium price vector exists. \square

This setting with consumer but no producer trade deflection corresponds to conditions in existing tax unions, in particular the European Union (EU). Under the current administration of the European value-added tax the destination principle is maintained for imports by registered traders and export tax rebates are based upon proof that the domestic tax has been paid. Even if the EU switches to the international tax credit method for its intra-union trade, as is envisaged for 1997, this scheme would still ensure that tax rebates for exports to third countries do not exceed the amount of tax actually paid. Thus producer trade deflection can actually be ruled out through cooperation between national

³This is already implicit in Shibata's (1967, p. 223) statement that "(...) a sort of revolving trade equilibrium will be established" in the presence of both consumer and producer deflection.

tax administrations. On the other hand, consumer cross-border shopping cannot be prevented in the absence of border controls. These direct consumer purchases will generally include goods produced in all union countries and in the rest of the world so that both cross-hauling and trade deflection occur in the EU's internal market.

2. Linear Consumer Deflection Costs

While consumer trade deflection is 'permissible' in the above framework it does not yield sensible results in the absence of deflection costs: if equation (6) does not hold there are no domestic purchases in the high-tax union country, and the tax base in country A is accordingly zero. This cannot be a *tax equilibrium* since country A would clearly wish to lower its tax rate to the level set by its union partner. In this section we discuss linear deflection costs, as introduced by Georgakopoulos and Hitiris (1992, pp. 121–122). The authors distinguish two different cases, depending on whether deflection costs are higher or lower than the intra-union tax differential. They do not, however, endogenize the tax rates set by the union countries. The simplest way to do this is to assume that both governments maximize private consumption c^k subject to a revenue requirement g^k . Denoting the common per unit deflection costs by τ and national tax bases by b^k each government thus solves the problem

$$\begin{aligned} \max \quad & c^k \quad \text{s.t.} \quad t^k b^k \geq g^k & (7) \\ b^k = \begin{cases} c^k + c^l & \text{if } t^l - t^k > \tau & (RI) \\ c^k & \text{if } |t^k - t^l| \leq \tau & (RII) \\ 0 & \text{if } t^k - t^l > \tau & (RIII) \end{cases} & \forall k, l \in [A, B], k \neq l, \end{aligned}$$

where the composition of national tax bases follows immediately from the linearity of the transaction cost function and it is assumed that consumers shop at home when the price of domestic and foreign goods (gross of transportation costs) is just equal. It is then straightforward to show⁴

⁴The fixed revenue assumption implies a zero elasticity of substitution between public and private consumption in each country. Under this assumption a Nash equilibrium will exist only if the differences in the required ratios of government over private consumption are 'not too high' relative to deflection costs. For reasons of brevity and simplicity we assume this to be the case throughout the following analysis. Alternatively, one could assume positive elasticities of substitution in both countries. While this will generally ensure the existence of a Nash equilibrium it also complicates the analysis without providing additional insights into the issues discussed here.

Proposition 2: *With linear deflection costs, consumer trade deflection does not occur in a Nash equilibrium.*

Proof: The maximization problem (7) yields the following reaction functions for the optimal tax problems in the two countries:

$$t_{*k}^A = \begin{cases} g^A/(c^A + c^B) & \text{if } t_{*}^B - g^A/c^A > \tau \quad (RI) \\ g^A/c^A & \text{if } |t_{*}^B - g^A/c^A| \leq \tau \quad (RII) \end{cases} \quad (8)$$

$$t_{*k}^B = \begin{cases} g^B/(c^A + c^B) & \text{if } t_{*}^A - g^B/c^B > \tau \quad (RI) \\ g^B/c^B & \text{if } |t_{*}^A - g^B/c^B| \leq \tau \quad (RII) \end{cases} \quad (9)$$

Optimal tax rates exist only in regimes I and II. The maximization problem (7) is infeasible for a country which is in regime III since the revenue constraint cannot be met. Substituting from (9) into (8) and vice versa yields a contradiction whenever at least one country is in regime I. Thus optimal tax rates for the two countries are compatible - and a Nash equilibrium exists - only when both countries are in regime II where trade deflection does not occur. \square

Intuitively, optimal tax rates must be such that the tax base is strictly positive in both countries. With linear deflection costs the intra-union tax differential will thus always be less than per unit transaction costs, effectively prohibiting all consumer trade deflection. In the special case of zero deflection costs this implies, of course, that optimal tax rates within the union are identical even if governments have different preferences for public goods (cf. footnote 4).

3. Convex Consumer Deflection Costs

It follows from Proposition 2 that for trade deflection to occur at all in a tax equilibrium deflection costs must be strictly convex. A straightforward interpretation of this case is that there are a large number of commodities which can be ordered by increasing consumer transaction costs. Producers in the high-tax country can still export all goods to the rest of the world at no transportation costs. Thus equation (4) continues to hold for all goods and aggregation to a single good is possible. Under this specification the government's problem becomes

$$\max c^k \quad \text{s.t.} \quad t^k(c^k - m^k) \geq g^k \quad (10)$$

where m^k denotes the amount of deflected imports by residents of country k

$$m^k \begin{cases} > 0 & \text{if } t^k - t^l > 0 & (RI) \\ < 0 & \text{if } t^k - t^l < 0 & (RII) \\ = 0 & \text{if } t^k - t^l = 0 & (RIII) \end{cases} \quad \forall k, l \in [A, B], k \neq l.$$

Two further assumptions are made to simplify the exposition: first, residents in both countries face identical deflection cost functions $\tau(m^k)$. Second, transaction costs are zero for the first unit of deflected trade so that trade deflection will always occur when tax rates differ within the union. Thus

$$\tau'(m^k) > 0, \quad \tau''(m^k) > 0, \quad \tau'(0) = 0, \quad \tau''(0) > 0 \quad \forall k \in [A, B].$$

Residents of country k will then find it profitable to shop abroad until

$$t^k - t^l = \tau'(m^k) \quad \text{if } t^k > t^l. \quad (11)$$

The arbitrage condition (11) links equations (2) and (6) above, implying that consumer trade deflection and domestic purchases in the high-tax country can now occur simultaneously. The level of trade deflection is obtained by inverting (11)

$$m^k = (\tau')^{-1}(t^k - t^l) \quad \text{if } t^k > t^l. \quad (12)$$

Using (12) the optimal tax rates derived from the maximization problem (10) are given by

$$t_*^A = \frac{g^A}{c^A - (\tau')^{-1}(t^A - t^B)}, \quad (13)$$

$$t_*^B = \frac{g^B}{c^B + (\tau')^{-1}(t^A - t^B)}, \quad (14)$$

where $\text{sign}(\tau')^{-1} = \text{sign}(t^A - t^B)$. Mutual substitution of (13) and (14) shows that optimal tax rates are compatible, provided that relative revenue requirements are not too different across countries in relation to deflection costs (footnote 4). Furthermore, $g^A/c^A > g^B/c^B \implies t^A > t^B$ unambiguously follows from (13)–(14). Thus the country with the higher relative revenue requirement will have the higher tax rate in a Nash equilibrium, and consumer trade deflection occurs.

To study the welfare effects of international tax differentials we set up the budget constraints for both countries and assume as before that country A is the high-tax region. Private expenses by A residents equal the amount that had to be paid if all goods were purchased at home, less the tax savings through cross-border purchases. In addition,

residents of country A incur real resource costs by shopping directly in the low-tax neighbouring state. Residents of the low-tax country B make all purchases at home and incur no transportation costs. Origin-based purchases of A residents in country B increase the latter country's tax base at the expense of country A. Denoting overall consumption and (exogenous) production levels by c^k and x^k , respectively, and assuming that tax revenues in each country are redistributed to the representative consumer the budget constraints are given by

$$\begin{aligned}(1 + t^A) c^A - (t^A - t^B) m^A + \tau (m^A) &= x^A + t^A (c^A - m^A) \\ (1 + t^B) c^B &= x^B + t^B (c^B + m^A)\end{aligned}\tag{15}$$

To analyze the effects of intra-union tax differentials t^A is increased exogenously, reflecting an increase in country A's revenue requirement. Simplifying and differentiating (15) and using (11)–(12) yields

$$\begin{aligned}\frac{dc^A}{dt^A} &= \frac{-(\tau_I + t^B)}{\tau_{II}} = \frac{-t^A}{\tau_{II}} < 0, & \frac{dc^B}{dt^A} &= \frac{t^B}{\tau_{II}} > 0, \\ \frac{dc^A + dc^B}{dt^A} &= \frac{-\tau_I}{\tau_{II}} = \frac{-(t^A - t^B)}{\tau_{II}} < 0,\end{aligned}\tag{16}$$

where the differentiation rule for an inverse function has been used. Under convex deflection costs a tax rise in country A thus induces a *finite* redistribution from country A to country B, due to the limited increase in consumer trade deflection. Furthermore, the tax rise increases the total amount of deflection costs incurred by country A's residents in pursuit of tax advantages. These costs clearly represent a direct efficiency loss since undeflected producer trade has zero costs by assumption⁵. This is overlooked in the analysis of Georgakopoulos/Hitiris (1992) who equate Pareto efficiency with the absence of relative price distortions.

These results are contrasted with the case where consumer trade deflection is ruled out by assumption. The underlying trade pattern must then be specified exogenously, reflecting comparative advantage in production. The simplest possible setting that excludes the transshipment of goods within the union but incorporates bilateral trade between all countries is the three-country, two-good model shown in Figure 2. The exogenous transfers T^k from both union countries to the rest of the world balance country C's trade account, thus avoiding the need to introduce a third commodity.

⁵Similar welfare costs arise from selective tariffs, which cause a substitution of high transportation cost suppliers for low cost suppliers [e.g. Melvin (1985)].

***** Figure 2 about here *****

Arbitrage ensures that producer prices are equalized when trade is taxed under the destination principle while consumer prices are equalized when the origin principle is employed. From the trade flows given in Figure 2 this implies that producer prices for good 2 are equalized across all countries so that good 2 is chosen as the numeraire. Assuming that the rest of the world is large relative to the union countries arbitrage for good 1 must ensure

$$\frac{(1+t^A)}{(1+t^B)} p_1^A = p_1^B = \bar{p}_1^C. \quad (17)$$

It is thus obvious from (17) that intra-union tax differentials distort relative producer prices in the absence of trade deflection [cf. Berglas (1981)]. While this framework differs substantially from the trade deflection model analyzed above we find

Proposition 3: *With convex transaction costs the effects of intra-union tax differentials on national and global welfare do not differ qualitatively in the presence and in the absence of trade deflection.*

Proof: We denote consumption of good i by c_i^k , production by x_i^k and import demand by $m_i^k = c_i^k - x_i^k$. Since the commodity tax is levied on both goods the tax base in country A is given by the domestic consumption of good 1, less origin-based imports from country B, plus the domestic consumption of good 2 (since exports to country C are taxed in the destination country). Country B's tax base is derived analogously. Redistributing tax revenues in each country lump sum the national budget constraints are

$$(1+t^A)p_1^A c_1^A + (1+t^A)c_2^A = p_1^A x_1^A + x_2^A + t^A [p_1^A(c_1^A - m_1^A) + c_2^A] - T^A, \quad (18)$$

$$(1+t^B)p_1^B c_1^B + (1+t^B)c_2^B = p_1^B x_1^B + x_2^B + t^B [p_1^B(c_1^B + m_1^A) + c_2^B] - T^B. \quad (19)$$

Cancelling terms, using (17) and neglecting income effects – which are of lesser interest in the present context – an exogenous variation in t^A has the following effects on national and global welfare⁶:

$$\begin{aligned} \frac{dy^A}{dt^A} &= t^A p_1^A \frac{p_1^A}{(1+t^A)} \frac{\partial m_1^A}{\partial p_1^A} < 0, & \frac{dy^B}{dt^A} &= -t^B p_1^B \frac{p_1^A}{(1+t^A)} \frac{\partial m_1^A}{\partial p_1^A} > 0, \\ \frac{dy^A + dy^B}{dt^A} &= (t^A - t^B) \frac{p_1^B p_1^A}{(1+t^A)^2} \frac{\partial m_1^A}{\partial p_1^A} < 0, \end{aligned} \quad (20)$$

⁶Cf. Haufler (1994) for a more general analysis which includes income effects and shows that the tax base changes given in (20) carry over to alternative specifications of trade flows.

where $dy^k = p_1^k dc_1^k + dc_2^k$ gives the change in national income, valued at producer prices. Comparing eqs. (16) and (20) demonstrates the proposition. \square

In the two-good trade model a tax increase in country A lowers p_1^A [by eq. (17)], thus increasing both country A's imports of good 1 and its exports of good 2. Since imports of good 1 are taxed in the origin country while exports of good 2 are taxed under the destination principle country A's tax base shrinks as a result of this change in trade flows. Symmetrically, country B's tax base increases as origin-based exports to country A expand while destination-based exports to country C are reduced. Thus redistributive effects harming the high-tax country occur in both scenarios but are bounded by the convexity of the production possibility set in the case where trade deflection is ruled out, and by the convexity of the deflection cost function itself in the case where it is not. Similarly, global efficiency losses are monotonously rising in the tax differential in both of the competing models. In the absence of trade deflection an increase in t^A widens the tax-induced wedge between relative producer prices in the union countries and reduces their joint welfare. This is paralleled in the trade deflection model by an increase in consumer transaction costs, which represent a source of pure waste.

4. Concluding Remark

This paper has attempted to reconcile the apparently conflicting results which emerge from the existence of tax differentials under the restricted origin principle, depending on whether trade deflection is permitted or excluded by assumption. Our results can be summarized as follows: (1) producer trade deflection is neither a realistic possibility in actual tax unions nor is it compatible with the existence of an equilibrium price vector. In contrast, consumer trade deflection is 'permissible' in a trade equilibrium. (2) with linear (zero) transaction costs consumer trade deflection will not occur in a Nash equilibrium when tax rates are endogenized. Optimizing governments will always set taxes such that the tax differential is less than per unit deflection costs. (3) if deflection costs are strictly convex consumer trade deflection will occur in equilibrium but neither the redistributive effects nor the overall efficiency losses derived from this model differ qualitatively from those of the standard framework without trade deflection.

It should be emphasized that, despite the similarity in results, the workings of the two models are quite different and this has potentially important implications for empirical work: in the standard trade model the size of welfare effects depends primarily on the

countries' import demand elasticities for individual goods whereas the precise specification of the transaction cost function is crucial in the trade deflection model. Since the latter allows to focus more closely on the consumer's decision to cross-border shop it is quite possibly the preferred framework for assessing the quantitative effects of tax differentials in existing tax unions. From a theoretical perspective, however, our analysis suggests that the results derived from standard trade models may be more robust with respect to the no-deflection assumption than has previously been thought.

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Figure 1: Trade Flows with Deflection

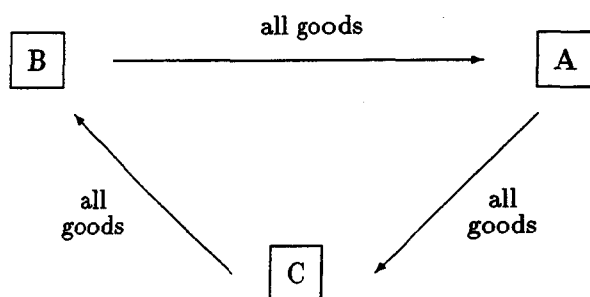


Figure 2: Trade Flows without Deflection

