

Genser, Bernd

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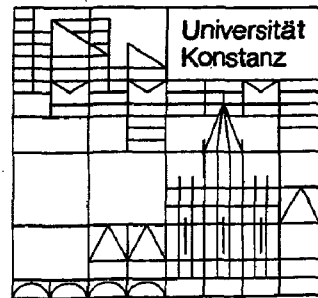
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Bernd Genser

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of Mixed International VAT Regimes**

# **A Generalized Equivalence Property of Mixed International VAT Regimes**

**Bernd Genser**

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## **A GENERALIZED EQUIVALENCE PROPERTY OF MIXED INTERNATIONAL VAT REGIMES**

### **ZUSAMMENFASSUNG**

In dem Papier wird gezeigt, daß eine allgemeine Güterbesteuerung nach dem Bestimmungslandprinzip mit länderweise verschiedenen, aber einheitlichen Steuersätzen in einer Mehrländerwelt äquivalent ist einem gemischten Steuersystem, bei dem die Länder einer Steuerunion untereinander nach dem Ursprungslandprinzip verfahren, aber bei ihrem Handel mit Drittländern einen Grenzausgleich mit einem fixen Unionssteuersatz durchführen. Dieses gemischte Steuerregime mit einem gemischten Außensteuersatz umfaßt auch den Sonderfall des "non-reciprocal restricted origin principle", für das Lockwood, de Mesa und Myles (1994b) jüngst die Äquivalenzeigenschaft nachgewiesen haben. Diese Äquivalenzeigenschaft bedeutet, daß ein Übergang vom weltweiten Bestimmungslandprinzip mit Grenzausgleich, das im GATT empfohlen wird, zu einem Ursprungslandprinzip allein in der EU keine Produktions-, Handels- und Konsumanpassungen nach sich zieht, wenn reine monetäre Faktorpreis- oder Wechselkursänderungen die Preisschocks beim Steuersystemwechsel völlig zu akkomodieren vermögen. Da das Ausmaß der erforderlichen Preisanpassungen durch eine geeignete Wahl des gemeinsamen Unionssteuersatzes für den Grenzausgleich mit Drittländern gegenüber dem Sonderfall des "nichtreziproken beschränkten Ursprungslandprinzips" verringert werden kann, bietet sich das gemischte Mehrwertsteuersystem mit einem gemeinsamen Grenzausgleich als attraktives Szenario für das endgültige EU-Regime an.

# A GENERALIZED EQUIVALENCE PROPERTY OF MIXED INTERNATIONAL VAT REGIMES

Bernd Genser, University of Konstanz

(December 1994)

## ABSTRACT

The note shows that the equivalence property of VAT regimes can be extended to mixed origin / destination regimes with a common border tax, which contain the non-reciprocal restricted origin principle of Lockwood/de Meza/Myles (1994a) as a special case. The common border tax rate reduces the price adjustment required for a switch to an origin-based VAT regime for the EU and should increase the attractiveness of such a scheme.

## I. Introduction

In a recent contribution to this journal Lockwood, de Meza and Myles (1994a) showed that the basic equivalence between VAT systems based either on a worldwide destination principle or on a worldwide origin principle carries over to the "non-reciprocal restricted origin principle". Under this mixed regime, each country  $i \in U \subset W$  (the tax union countries  $U$  are a strict subset of the trading countries  $W$ ) applies an origin based VAT in its trade with all trading partners  $j \in W$ , whereas each country outside  $U$ ,  $k \in W \setminus U$ , applies a destination-based VAT including border tax adjustment with all its trading partners  $j \in W$ . Lockwood et al. separate their "non-reciprocal restricted origin principle" from the "restricted origin principle" which Hirofumi Shibata (1967) suggested in the sixties. Shibata's restricted origin principle follows a rule of international reciprocity and requires that bilateral trade between any two countries should be taxed under the same VAT principle, viz. the origin principle for intra-union trade and the destination principle for trade with countries outside the tax union. This VAT scheme suffers from two shortcomings. It gives rise to trade deflection through strategic tax arbitrage and it has been shown non-equivalent to any of the two pure global tax principles, even if trade deflection can be ruled out by suitable measures (Whalley 1979, 1981; Berglas 1981; Haufler 1993). This non-neutrality property must of course be regarded as one major argument against a switch towards the origin principle within the EU<sup>1</sup>.

Lockwood et al. (1994a) have shown that the equivalence property holds under rather general conditions, as long as all countries apply a uniform VAT rate within their borders and either exchange rates (Proposition 4) or prices of the immobile factors of production (Proposition 1)

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<sup>1</sup> A second major objection against the origin principle has been the widespread conjecture that operating the origin principle requires a switch from the credit method applied within EU member states to the subtraction method (Andel 1986).

are flexible. Basically, equivalence is attained because producer prices in each union country fall by the full amount of the domestic tax rate and ensure competitiveness in export markets, where the origin VAT enters as an additional cost element as well as in the domestic market where imports remain untaxed. The authors show that the equivalence property of the non-reciprocal restricted origin principle holds for trade environments with an arbitrary number of goods and immobile factors (Theorem A1), with and without cross-border shopping affected by transport costs (Proposition 3) and with imperfectly competitive markets (Theorem A2).

Based on this equivalence property Lockwood et al. consider their non-reciprocal restricted origin principle as an attractive VAT regime for the EU, since it would allow to dispense with border controls at internal borders<sup>2</sup> without creating allocative distortions, trade deflection or fiscal imbalances through a displacement of VAT revenues, when national VAT rates differ.

The present note extends the scope of equivalent VAT regimes by showing that the equivalence properties also hold for a mixed international VAT regime with a common border tax adjustment at the tax union's external border (Section II). The non-reciprocal restricted origin principle is a special case of such a regime with a common border tax of zero. In addition, we shortly comment on the implementation of the mixed origin/destination regime in the EU and the desirability of the common border tax rate as a new policy instrument at the EU level (Section III).

## II. The equivalence of the destination principle and a mixed origin/destination principle with a common border tax

Following Lockwood et al. (1994a) we show the equivalence results within a three country world, where countries a and b establish a tax union towards the rest of the world represented by country c. Each country  $i = a, b, c$  produces an output vector  $X^i = (X_1^i, \dots, X_n^i)$  of tradeable consumer goods according to its country specific production technology  $F^i$  utilizing a vector of immobile factors  $Y^i = (Y_1^i, \dots, Y_m^i)$ . The corresponding commodity price vectors are  $q^i$  for consumers and  $p^i$  for producers,  $w^i$  is the vector of factor prices. A price wedge is due to a VAT levied at a uniform ad valorem rate  $t^i$ , viz.  $q^i = p^i (1+t^i)$ . Domestic production is undertaken by profit maximizing enterprises under perfect competition. A representative, utility maximizing consumer demands commodities and supplies factors according to the (national) budget constraint

$$q^i C^i - w^i Y^i - T^i = 0. \quad (1)$$

Tax revenue from VAT collection is returned to the representative consumer in a lump sum fashion<sup>3</sup>. Since there is free trade in commodities, in the equilibrium global excess demand for all commodities is zero, whereas excess demand for immobile factors has to be zero in each of the three countries. Equilibrium prices are related due to price arbitrage induced by trade.

<sup>2</sup> Since commodities leave and enter the tax union without border tax adjustment and since there is no incentive for EU citizens to buy double-taxed commodities across the external border, no EU border controls are necessary at the external borders. But non-member countries have to maintain controls to administer their destination regime and to avoid tax evasion by cross-border shopping of their citizens.

<sup>3</sup> Alternatively, tax revenue from VAT can be used to provide a public good without changing any of the results.

Consumer price arbitrage requires one equilibrium consumer price for any good  $j$  in the relevant market, irrespective of whether this good is domestically produced or imported. Equilibrium producer prices differ from consumer prices by the VAT wedge caused by the tax regime in operation and determine domestic factor demands and equilibrium factor prices.

We use the global destination-based VAT with border controls as the benchmark case, where equilibrium producer prices must be equal for all traded goods. Homogeneity of degree zero of excess demand functions allows for a normalization of the national price levels by a suitable proportionality factor  $e^i$ . Following Lockwood et al. (1994a) we choose the price of factor  $m$  in the rest of the world  $w_m^c$  as the numeraire and we select as national proportionality factors under the destination regime  $e_D^i$  in countries  $a$  and  $b$  the national factor prices  $e_D^a = w_m^a$  and  $e_D^b = w_m^b$ .

**Table 1:** Consumer prices under a mixed origin/destination regime with common border tax adjustment of the tax union's external border

country of production	country of destination / purchase		
	a	b	c
a	$p_M^a(1+t^a)$	$p_M^a(1+t^a)$	$p_M^a(1+t^a) \frac{1+t^c}{1+t^u}$
b	$p_M^b(1+t^b)$	$p_M^b(1+t^b)$	$p_M^b(1+t^b) \frac{1+t^c}{1+t^u}$
c	$p_M^c(1+t^c) \frac{1+t^u}{1+t^c}$	$p_M^c(1+t^c) \frac{1+t^u}{1+t^c}$	$p_M^c(1+t^c)$

Switching to the mixed origin/destination regime<sup>4</sup> with a common border tax adjustment  $t^u$  leads to consumer prices presented in Table 1. Since the tax factors differ, producer prices are no longer equalized across countries by consumer price arbitrage. The equilibrium price structure which generates excess demands of zero on the global commodity markets and the domestic factor markets is summarized in Table 2. Again we choose the factor price  $w_m^c$  as the numeraire and select suitable proportionality factors  $e_M^i$  to compare the equilibrium price structures under the two VAT regimes.

Concentrating on the rest of the world  $c$  first, we conclude that commodity and factor prices under the new mixed system equal those under the global destination principle only if

<sup>4</sup> Variables under the mixed regime are labeled by the subscript  $M$  whereas the global destination regime is labeled by  $D$ .

$$p_D = \frac{q_M}{1+t^u} \text{ and } w_D^c = w_M^c. \quad (2)$$

If these relations hold, it can be checked immediately that choosing

$$e_M^a = w_D^a \frac{1+t^u}{1+t^a} \quad (3)$$

and correspondingly

$$e_M^b = w_D^b \frac{1+t^u}{1+t^b} \quad (4)$$

generates a price vector under the mixed VAT regime, which perfectly replicates the equilibrium price structure under the global destination principle for the tax union as well.

**Table 2:** Equilibrium consumer and factor prices under the mixed regime

Prices for	country a	country b	country c
consumers	$\frac{q_M}{e_M^a}, \frac{w_M^a}{e_M^a}$	$\frac{q_M}{e_M^b}, \frac{w_M^b}{e_M^b}$	$q_M \frac{1+t^c}{1+t^u}, w_M^c$
producers	$\frac{q_M \frac{1}{1+t^a}}{e_M^a}, \frac{w_M^a}{e_M^a}$	$\frac{q_M \frac{1}{1+t^b}}{e_M^b}, \frac{w_M^b}{e_M^b}$	$q_M \frac{1}{1+t^u}, w_M^c$

To ensure that the equivalent price structures under both tax regimes do not change consumers' and producers' decisions in the three countries involved, we must also look at the government sector and check if real effects are triggered by the changing pattern of national tax collection.

VAT revenue for country a under the destination regime is

$$T_D^a = t^a p_D^a C^a(q_D^a, w_D^a, T_D^a). \quad (5)$$

Under the mixed system with common border adjustment tax revenues levied on transactions performed in country a consist of two components. Revenues from levying VAT on domestic production accrue to country a's fisc and are given by

$$T_M^a = t^a p_M^a X^a(p_M^a, w_M^a). \quad (6)$$

Revenues from operating the border tax adjustment for country a's exports to and its imports from the rest of the world go to a supranational border tax authority. Import VAT is calcu-



lated at net export prices from the rest of the world  $t^u p_M^c$ , export VAT rebate is granted at gross domestic prices scaled down by the border tax factor  $t^u p_M^a (1 + t^a) / (1 + t^u) = t^u p_M^c$ . Net revenue (valued at equilibrium producer prices after the adjustment) therefore amounts to

$$T_M^{au} = t^u p_M^c \beta^a (C^c - X^c), \quad (7)$$

where  $C^c - X^c$  is the vector of country c's excess demand and  $\beta^a$  is the diagonal matrix containing the shares of excess demand covered by trade with country a. An analogous revenue term holds for country b, which covers the complementary shares of the excess demand for country c. The share matrices therefore add up to the identity matrix,  $\beta^a + \beta^b = I$ . Net fiscal revenue from border tax adjustment for the union as a whole is zero

$$T_M^{au} + T_M^{bu} = t^u [p_M^c \beta^a (C^c - X^c) + t^u p_M^c \beta^b (C^c - X^c)] = t^u [p_M^c (C^c - X^c)] \quad (8)$$

since due to the overall trade balance of country c tax rebates on exports are equal to import taxes levied. As VAT revenue  $T_M^a$  is returned to country a's representative consumer and the budget constraint requires that the value of domestic production equals the value of domestic consumption, we have

$$T_M^a = t^a p_M^a C^a \quad (9)$$

and tax revenues under the two regimes coincide if prices are equal. The equivalence property between a global destination-based VAT and a mixed origin/destination based VAT with a common border tax adjustment thus holds for any border tax rate  $t^u$ , given the revenue neutral border tax administration is operated by a separate fiscal authority<sup>5</sup>.

Choosing a border tax rate of  $t^u = 0$ , we get the non-reciprocal restricted origin principle suggested by Lockwood et al. as a special case of the mixed regime. Further generalisations of the equivalence results, viz. the introduction of transaction costs and imperfect competition can be proved in the same way.

### III. Does the common border tax regime qualify for a general VAT system in the EU ?

Since the common border tax regime is a generalization of the non-reciprocal restricted origin principle all equivalence and efficiency arguments in favour of the latter hold as well. In addition, equivalence can be shown to hold if capital is introduced as a mobile factor (Genser/Haufler/Sørensen 1995). Equivalence means that any destination-based VAT system with independently chosen VAT rates can be replaced by a common border tax system with the same national VAT rates and an arbitrarily chosen border tax  $t^u$  without inducing any change in equilibrium quantities, however dispersed uniform national VAT rates are. Since no harmonization of tax rates is required to support the switch from the old VAT system to the new one, fiscal autonomy is preserved at the national level. Given the importance of VAT for

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<sup>5</sup> Note that equivalence will not be attained if the administration of border tax administration is assigned to national fiscal authorities who will only face zero net revenues if their bilateral trade with the rest of the world is balanced. This is Berglas' condition for a neutral switch from the global destination principle to the restricted origin principle (Berglas 1981).

feeding the national budgets, the subsidiarity principle of the EU Treaty must be regarded as the most powerful argument in favour of the common border tax system.

A widely accepted argument against a switch to an origin-based VAT within the EU is the conjecture that such a change would require a major change in VAT administration by introducing the subtraction method instead of the credit method. While it is true that a general switch to the subtraction method will impose a high administrative burden on tax authorities and firms and that a partial switch to the subtraction method only at the stage of intercommunity trade flows will create major problems in keeping track of the tax burden (Andel 1986), it is not sufficiently appreciated that the notional credit method (Krause-Junk 1992 is an exception) allows for an administration of the origin principle as well. Switching to the notional credit system would be fully in line with the Commission's objective to extend the VAT credit method to all intra-community transactions, with the only decisive qualification that transborder purchases of registered traders allow for a "notional credit" calculated according to the tax rate of the destination country instead of the credit for VAT actually paid in the country of purchase. A similar administrative procedure is, however, required for border tax adjustment at the external borders, where VAT rebates to exporters are calculated according to the common border tax  $t^u$  instead of rebating VAT according to the rate of the exporting country  $t^i$ .

It is important to note that the equivalence property ceases to hold if countries levy multiple instead of uniform VAT rates (Lockwood et al. 1994b, Genser/Haufler/Sørensen 1995). Non-equivalence occurs since price level adjustments are not able to equate two different price changes at the same time. With respect to the common border tax regime in the EU equivalence can be regained under two restrictive conditions. Firstly, if the reduced tax rate applies only to non-tradeables, neither commodity trade nor tax revenue would be distorted and equivalence prevails. While this assumption might hold for certain agricultural products and print media of local importance, it is not true for the bulk of low taxed commodities traded within the EU. Secondly, a harmonization measure can be applied which secures equivalence for two-tier VAT systems (Fratianni/Christie 1981). If the relation between the regular and a reduced rate  $t_r^i$  is characterized by a uniform tax factor

$$1 + t_r^i = \mu(1 + t^i) \quad i = a, b \quad (10)$$

for all EU members, then a simultaneous adjustment of all prices is possible after the switch to an origin-based VAT. Thus equivalence could be reached if the EU members agreed to a harmonization of their VAT rate structures instead of their VAT rate levels prior to the introduction of the common border tax system.

Finally, one must ask what might be gained by introducing the common border tax  $t^u > 0$  instead of switching directly to the non-reciprocal restricted origin principle and abandoning border tax adjustments at all. While it is true that the administration of a system which creates zero revenue by definition is not very appealing, it must be recognized that an experienced authority to run the external EU border tax adjustment already exists and will not be abolished as long as the EU collects external tariffs. Thus the fixed costs of administering external border taxes are close to zero. In addition, one has to concede that the price adjustment process required to ensure equivalence is risky. The risk of inadequate and thus non-equivalent adjustment is the higher, the larger is the required fall in factor prices or exchange rates. The political acceptability of introducing a new VAT regime for the EU will certainly be much

higher if the necessary price adjustment towards the rest of the world can be reduced<sup>6</sup>. Basically, the introduction of a common border tax reduces the monetary shock when the switch occurs. On the other hand, an optimal selection of  $t^u$  to minimize adjustment costs for the EU as a whole does not prevent a piecemeal reduction of the common border tax in subsequent periods.

The equivalence property of the common border tax system should increase the interest in a blueprint for the future VAT system in the EU that was proposed nearly 30 years ago by Hirofumi Shibata, as a variant of his restricted origin principle that has not gained broad recognition in the theoretical and political discussion yet. Nevertheless the applicability of the common border tax system is not restricted to the EU. It might as well trigger a process of scrutinizing the widely found assignment of commodity tax competences to the central fisc and influence future decisions on VAT in federal states like the US, Canada or Switzerland.

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<sup>6</sup> The introduction of a common border tax regime requires an adjustment of price levels of  $(1+t^u)/(1+t^a)$ . Ignoring the reduced tax rates in the EU for the moment the non-reciprocal restricted origin principle ( $t^u = 0$ ) requires a fall in price levels between 13% in Germany and Spain ( $t^i = 15\%$ ) and 20% in Denmark ( $t^i = 25\%$ ). This is of course a dramatic change compared to an adjustment of zero in Germany and Spain and -8% in Denmark, when the common border tax is 15%.

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