TAX BASE CO-OCCUPATION AND PARETO EFFICIENCY

by

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Abstract: It is well known that commodity tax competition leads to inefficiency. Indeed, countries tend to use commodity taxes to affect commodity prices in a way that benefits them and hurts others; the so-called terms-of-trade effects. While the existing literature looks at tax harmonization rules as the way forward, we investigate the efficiency properties of allowing the imposition of a common tax – on the same tax base as the local taxes – by a central government. Within a non-cooperative setting where all governments choose their tax rates simultaneously, we show that the introduction of such a central tax leads to a globally efficient outcome.

Keywords: Tax base co-occupation, commodity tax competition, tax harmonization.

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1 Introduction

This paper aims to explore a key feature of decentralized fiscal architectures (meaning co-occupation, by many levels of governments, of commodity tax bases) and what this implies for efficiency.\(^1\) Using a highly stylized model to formalize this, the central analytical purpose of the paper is to show that co-occupation of commodity tax bases has a strikingly appealing property: it eliminates, in equilibrium, all terms-of-trade externalities and so all tax distortions, thereby generating Pareto efficiency. Seen differently, what this implies is that there is complete commodity tax harmonization across countries suggesting that the purpose of the common tax is to counteract the impact on the flow of trade of inappropriate levels of lower-level government taxes. This is clearly an important perspective capturing the element of the policy concern that relates to cooperative tax policy.\(^2\)

The paper builds on the strand of the literature that has focused predominantly on vertical externalities arising from tax-base co-occupation. This literature emphasizes that these externalities will tend to leave lower-level government taxes too high: each lower-level government ignores the harm it does others by changing its tax rate in so far as the induced contraction in the central government tax base leads to a reduction in central government spending that harms other states too. Early contributions to this literature include Wrede (1996), Keen (1998), Boadway, Marchand and Vigneault (1998), Keen and Kotsogiannis (2002, 2003, 2004) and Dahlby and Wilson (2003).\(^3\) More recently, Haufler and Lülfesmann (2015) — in a sequential move game — show that an optimally chosen central government capital tax reduces the externalities that lower-level government capital taxes create and, thus, improves efficiency. Like Haufler and Lülfesmann (2015), the focus here is on the efficiency properties of the tax setting behaviour of the different levels of government when there is tax-base co-occupation. Unlike Haufler and Lülfesmann (2015), this paper investigates the non-cooperative equilibrium when all players (lower-level and central governments) move simultaneously. As it will be shown shortly

\(^1\)Or, to put it differently, whether there are circumstances in which tax base co-occupation can be part of an efficiency response to existing inefficiencies from taxation.

\(^2\)There is a fairly sizeable literature investigating the appropriate vertical allocation of tax-setting powers and revenues between central and lower-level jurisdictions (an issue that has also generated some vigorous policy debate in a number of countries), not least when it comes to the design and implementation of VAT, Keen and Smith (2000). The main concern here is not with the optimal assignment of tax-setting powers \textit{per se} but with the efficiency implications of allowing the central government to have access to tax levied on a common tax base.

\(^3\)Keen (1998) provides a review of vertical tax externalities, while Wilson (1999) provides a review of the tax competition literature.
below, the efficiency property of the equilibrium being characterized is quite general,\(^4\) and, importantly, does not hinge on the sequential nature of the game.

The paper also shares similarities with the tax harmonization literature and, in particular, Keen (1987, 1989) who analyzed a tax harmonization rule (which takes the form of a move of the countries’ initial tax structures towards a weighted average of those structures) that unambiguously raises global welfare.\(^5\) Interestingly, as the present analysis will show, the optimal tax of the central government is (minus) a weighted average of the lower-level government taxes with the property that (as in Keen (1987, 1989)) world prices are kept unchanged. But while Keen (1987, 1989) preserves the difference between producer and consumer prices, the equilibrium taxes here remove it. The perspective taken here, therefore, points to the fact that imposing an optimal central government tax seems to be a far more powerful instrument than imposing a tax harmonization rule.\(^6\)

The result in the paper reinforces, in some sense, the initially held belief of both academic and policy commentators that decentralization of policy decision-making (in the sense of multilevel governance) is desirable. But the paper shows that this is maybe the case purely for efficiency reasons: co-occupation of tax bases, combined with an appropriate way of allocating revenues, does in general generate Pareto efficiency.

The organization of the paper is the following. Section 2 provides the background against which the analysis is developed and develops and presents the main results. Section 3 concludes.

\section{Description of the model}

The framework is that of Keen (1987, 1989), appropriately modified to incorporate a ‘central’ government that encompasses two low-level governments (conveniently labeled ‘home’ and ‘foreign’ country) trading in \(N+1\) commodities. Variables pertaining to the

\(^4\)Our analysis is conducted within a multi-good competitive setup with countries setting welfare maximizing commodity taxes.

\(^5\)As it will be clear later on the framework in Keen (1987, 1989) allows only for the basic terms-of-trade distortion. Subsequent research has introduced additional distortions investigating the robustness of the main result. This has taken the form: imperfectly competitive markets (Keen and Lahiri 1993, 1998), tax-financed local public goods (Delipalla 1997; Lockwood 1997; Lahiri and Raimondos-Møller 1998), origin-based consumption taxes (Lopez-Garcia 1996; Lucas 2001). Combinations of the above have also been examined (for example, Keen et al. 2002; Kotsogiannis and Lopez-Garcia 2007; Karakosta et al. 2014).

\(^6\)Securing convergence of tax structures without the imposition of tax harmonization is also the main theme in Raimondos-Møller and Schmitt (2010). However, the emphasis there is on the role that market integration (as that is expressed by parallel imports) plays in securing this; indeed, a very different mechanism to the one explored and emphasized in the present paper.
home and foreign country are denoted, respectively, by lower- and upper-case letters. The available tax instruments (one on each good) are destination-based commodity taxes — in the sense that goods are taxed (and revenues accrue to the country) where consumption takes place. The $N+1$-vector of producer prices (common to both countries) is denoted by $p \gg 0$.

Commodities are taxed by both levels of government. The home (foreign) country levies a destination-based tax $t_j$ on each unit of commodity $j$ in its jurisdiction while the central government levies a unit tax on this commodity — common to both countries — at the rate $\tau$. The consolidated tax rate in the home (foreign) country on good $j$ is then $t_j + \tau_j (T_j + \tau_j)$. The $N+1$-vector of consumer prices in the home country and foreign country are denoted, respectively, by $q = p + t + \tau, Q = p + T + \tau$.

In the home (foreign) country there is a single representative consumer with preferences described by an expenditure function

$$e(u, q) \equiv \min_x \{q'x| u(x) \geq \bar{u}\} \quad ; \quad (E(U, Q) \equiv \min_X \{Q'X| U(X) \geq U\}) ,$$

where $u (U)$ is the utility of the consumer and $x (X)$ is the $N+1$-vector of uncompensated demands.

The production sector is competitive and characterized by a revenue function (satisfying the standard properties of homogeneity, convexity and differentiability)

$$r(p, v) \equiv \max_{y, v} \{p'y| f (y, v) \leq 0\} \quad ; \quad (R(P, V) \equiv \min_{Y, V} \{p'Y| F (Y, V) \geq 0\}) ,$$

where $y (Y), v (V), f (F)$ are the $N+1$-vector of output, factors of production and the implicit production possibility frontier, respectively, in the home (foreign) country. The dependence of $r(p)$ and $R(p)$ on the factors of production — $v$ and $V$, respectively — (being fixed) will suppressed from the analysis that follows. The homogeneity properties of the functions in the variables $q, Q$, and $p$, imply that, without loss of generality, we can take the first tradeable good, good 0, to be the numeraire, thereby bearing no tax in both countries, and so $p_0 = q_0 = Q_0$.

There are no inter-governmental transfers, either vertically between the levels of government or horizontally across the countries, but each country retains all the revenue which

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7 $p \gg 0$ means that $p_n > 0$ for all $n = 1, \ldots, N$.

8 The choice of the tax instrument (specific or ad valorem) is immaterial here, given the existence of a perfectly competitive market. But it will not be if countries were allowed (in an additional stage) to choose their tax instrument; see Lockwood and Wong (2000).

9 For the properties of the revenue function see Woodland (1982).
raises and receives all central government tax revenues raised on its tax base. To focus only on the distortions arising from the terms-of-trade (ToT) externality, it is assumed that any tax revenues collected are returned back to consumers in a lump-sum fashion.\textsuperscript{10}

An equilibrium is a set of values for the $N + 2$ endogenous variables \{\(p, U, u\)\} that satisfy world market clearing conditions and meet the budget constraints of the two representative consumers given tax rates \{\(t, T, \tau\)\} and is characterized by (a prime (\(\prime\)) denotes the transpose of a vector)\textsuperscript{11} that is,

\begin{align*}
e(q, u) &= r(p) + (t + \tau)'e_q, \quad (3) \\
E(Q, U) &= R(p) + (T + \tau)'E_Q, \quad (4) \\
e_q(q, u) + E_Q(Q, U) &= r_p(p) + R_p(p), \quad (5)
\end{align*}

where \(e_q (E_Q)\) is the \(N\)-vector of compensated demands in the home (foreign) country.

Equations (3) and (4) give, respectively, the home and foreign country consumer’s budget constraint. Equation (3) simply states that, in equilibrium, the minimum expenditure of the home consumer to achieve utility \(u\) is equal to the sum of the revenues generated by the production of the tradeable goods, \(r(p)\), plus any revenues distributed equal to \((t + \tau)'e_q \left((T + \tau)'E_Q\right)\). Equation (5) is the market clearing conditions for the \(N\) non-numeraire tradeable goods and requires that for each commodity world demand \(e_q + E_Q\) equals world supply \(r_p + R_p\).

The issues addressed will be analyzed by considering perturbations of the system (3)-(5).\textsuperscript{12} Notice, first, that perturbation of (5) gives

\begin{equation}
Zdp = -e_{qq}dt - E_{QQ}dT - (e_{qq} + E_{QQ})d\tau,
\end{equation}

where \(Z \equiv e_{qq} + E_{QQ} - r_{pp} - R_{pp}\) is the world substitution matrix, with diagonal elements \(Z_{ii}\) representing the slope of the world compensated excess demand for good \(i\), and with off-diagonal elements \(Z_{ij}\) representing cross-price effects, and \(m \equiv e_q - r_p\) (\(M \equiv E_Q - R_p\)) denote the \(N\)-vector of imports of the home (foreign) country.\textsuperscript{13} Equation (6) thus

\begin{itemize}
  \item[\textsuperscript{10}] There are thus no ‘vertical’ tax externalities between the levels of government present in the sense of the central government allocating its total receipts equally across countries.
  \item[\textsuperscript{11}] The assumptions made imply that an equilibrium exists. See Woodland (1982).
  \item[\textsuperscript{12}] It will be assumed, for simplicity, that \(e_{qu} = E_{qU} = 0_{N \times 1}\) meaning that in each country income effects attach only to the numeraire good, good 0.
  \item[\textsuperscript{13}] Since \(e_{qq}, E_{QQ}\) are \(N \times N\) negative definite matrices, and \(r_{pp}, R_{pp}\) are \(N \times N\) positive definite matrices, \(Z\) is a negative definite, and thus an invertible matrix exists and is also negative definite. This implies that equation (5) can be solved for the world price vector \(p\).  
\end{itemize}
gives the changes in the international prices of the non-numeraire tradeable goods that arise when consumer demands for those goods alter as a consequence of the change in destination-based consumption taxes.

Perturbing now (3), and upon making use of (6), one arrives at

\[ e_u du = A_1 dt + A_2 dT + A_3 d\tau, \tag{7} \]

where \( e_u > 0 \) is the reciprocal of the marginal utility of income of the consumer residing in the home country and

\[ A_1 = [m' - (t + \tau)' e_{qq}] Z^{-1} e_{qq} + (t + \tau)' e_{qq}, \tag{7a} \]
\[ A_2 = [m' - (t + \tau)' e_{qq}] Z^{-1} E_{QQ}, \tag{7b} \]
\[ A_3 = [m' - (t + \tau)' e_{qq}] Z^{-1}(e_{qq} + E_{QQ}) + (t + \tau)' e_{qq}. \tag{7c} \]

Similarly for the foreign country, we get

\[ E_U dU = B_1 dT + B_2 dt + B_3 d\tau, \tag{8} \]

where

\[ B_1 = [M' - (T + \tau)' E_{QQ}] Z^{-1} E_{QQ} + (T + \tau)' E_{QQ}, \tag{8a} \]
\[ B_2 = [M' - (T + \tau)' E_{QQ}] Z^{-1} e_{qq}, \tag{8b} \]
\[ B_3 = [M' - (T + \tau)' E_{QQ}] Z^{-1}(e_{qq} + E_{QQ}) + (T + \tau)' E_{QQ}. \tag{8c} \]

Close inspection of (7) \((8)\) reveals that home (foreign) utility is affected by three effects:

- An own-tax effect given by \( A_1 \) in \((7a)\), \((B_1 \text{ in (8a)})\), which in turn reflects three effects:
  - a ToT effect since, for given imports \( m' \), a change in the international prices of the non-numeraire goods — caused by a change in the home country destination-based commodity tax vector \( t \) — implies a change to the value of imports given by \( m' dp/dt \);
  - a price-tax revenue effect since tax revenues change by \( (t + \tau)' e_{qq} dp/dt \); and
  - a tax revenue effect which reflects (for given international price vector \( p \)) the change in tax revenues are a consequence of a change in the destination-based commodity tax vector \( t \), given by \( (t + \tau)' e_{qq} dt \).

- A tax-externality effect given by \( A_2 \) in \((7b)\) \((B_2 \text{ in (8b)})\), which in turn reflects two effects:
— a ToT effect since, for given imports $m'$, a change in the international prices of the non-numeraire goods caused by a change in the foreign country destination-based commodity tax vector $T$ implies a change to the value of imports given by $m'dp/dT$;

— and a price-tax revenue effect since tax revenues, given by $(t + \tau)' e_q$, change by $(t + \tau)' e_q dp/dT$.

• A tax base co-occupation effect given by $A_3$ in (7c) ($B_3$ in (8c)). This, too, reflects three effects:

— a ToT effect since, for given imports $m'$, a change in the international prices of the non-numeraire goods — caused by a change in the common destination-based commodity tax vector $\tau$ — implies a change to the value of imports given by $m'dp/d\tau$;

— a price-tax revenue effect since home country tax revenues, given by $(t + \tau)' e_q$, change by $(t + \tau)' e_q dp/d\tau$; and

— a tax revenue effect which reflects (for given international price vector $p$) the change in tax revenues as a consequence of a change in the destination-based commodity tax vector $t$, given by $(t + \tau)' e_{qq} d\tau$.

There is another striking feature of this routine perturbation: the tax base co-occupation effect ($A_3$ ($B_3$)) is exactly equal to the sum of the other two effects (the own-tax, $A_1$ ($B_1$), and the tax externality, $A_2$ ($B_2$), effects) that is, $A_3 = A_1 + A_2$ ($B_3 = B_1 + B_2$). This, as will be shown shortly below, is at the heart of the paper and implies that at the Nash equilibrium the central government tax $\tau$ is a weighted average of the other two commodity tax structures.

All policy makers are assumed to be benevolent, in the sense that they look only to the welfare of their own constituents. The home country then chooses its destination-based tax vector, taking all other taxes (foreign country and central) as given, to maximize (7). The necessary condition for this is given by (7a) that is,

$$A_1 \equiv [m' - (t + \tau)' e_q] Z^{-1} e_q + (t + \tau)' e_q = 0', \tag{9}$$

where for the foreign country the necessary condition is given by (8a) that is,

$$B_1 \equiv [M' - (T + \tau)' E_{QQ}] Z^{-1} E_{QQ} + (T + \tau)' E_{QQ} = 0', \tag{10}$$

It is intuitive that from a global welfare perspective (and in the absence of $\tau$) the setting of
low-level government taxes is inefficient since each country acting independently ignores the damage it causes on other countries by exploiting its ToT.

To illustrate the point, consider the incentives of a country that imports some of the non-numeraire commodities. A high commodity tax will reduce domestic consumption, which in turn will reduce import volumes and thus (assuming large countries) import prices. The latter is of course good for the importing country and bad for the exporting country — while the importing country’s ToT will improve, the terms-of-trade of the exporting country will worsen. As all countries face similar incentives, these externalities will be widespread and welfare reducing.\footnote{Depending on preferences (and the distribution of endowments across countries) not only the pattern of trade will be inefficient but also its volume.}

What global welfare dictates, in this case, is mitigation of the ToT externality achieved by, in this example, a reduction in the tax on those goods the country imports.\footnote{This has been precisely the concern in the European Union, the OECD and elsewhere (a concern, it has to be noted, not shared of course by those who view tax competition as a disciplinary device on spendthrift governments) and it has become still more prominent since the crisis, as countries struggle to restore growth and raise sufficient tax revenues: that international commodity tax competition will result in significant erosion of the tax bases and, therefore, revenues and welfare. This concern is reflected in, for instance, tax legislation in the EU and elsewhere of provision for tax coordination and tax harmonization. In the EU, Directive 2006/112/EC — a recast of the Sixth VAT Directive of 1977 — has achieved some degree of tax harmonisation with the common bands of VAT, which require a minimum VAT rate of 15% on all products (apart from exemptions and special authorisations). Unsurprisingly, the appropriate form of tax harmonization has received considerable attention in the theoretical literature, which has focused on the benefits of imposing tax harmonization rules and, in generally, of rules that may lead to tax convergence (for example, minimum rates). Early contributions are Keen (1987, 1989) and Turunen-Red and Woodland (1990).}

In choosing the vector of destination-based taxes $\tau$, the central government, playing also Nash relative to the two countries, maximizes $dW = e_u du + E_U dU$.\footnote{It is straightforward to show that the same results hold if the central government maximizes the simple sum of utilities. If the central government, however, had redistributional considerations then the allocation of its tax revenue becomes important. It can be shown that, in that case, that the optimal distribution of tax revenues will be solely targeted to that objective, while the optimal central tax level will be solely targeted to the efficiency issue (removing horizontal tax externalities).}

The necessary condition is then given by

$$A_3 + B_3 \equiv [(t + \tau)' e_{qq} - (T + \tau)' E_{QQ}] Z^{-1}(e_{qq} + E_{QQ}) + (t + \tau)' e_{qq} + (T + \tau)' E_{QQ} = 0', \tag{11}$$

where use has been made of the fact that, following from (5), $m' + M' = 0'$.

Equilibrium is given by the simultaneous solution of (9)-(11). Post multiplying (9) by the matrix $e_{qq}^{-1} Z$ and (10) by $E_{QQ}^{-1} Z$ and substituting the resulting expressions into (11) one obtains

$$\tau' = - (t'E_{QQ} + T'e_{qq}) (e_{qq} + E_{QQ})^{-1}. \tag{12}$$
(12) implicitly defines the optimal central government tax $\tau$ and simply says that the central government will choose a commodity tax vector that is (minus) the weighted average of the two countries' commodity tax vectors, with the weight being given to a given country the demand responses of the other.\(^\text{17}\)

Adding now $t$ to (12) and then post-multiplying by $e_{qq} + E_{QQ}$, one obtains

$$
(t + \tau)' = (t - T)'e_{qq}(e_{qq} + E_{QQ})^{-1}.
$$

A similar condition holds for the foreign government, that is

$$
(T + \tau)' = (T - t)'E_{QQ}(e_{qq} + E_{QQ})^{-1}.
$$

Substituting next (13) and (14) into (9) and (10) implies that

$$
(t - T)'\Delta = 0',
$$

where

$$
\Delta \equiv (e_{qq} + E_{QQ})^{-1}[(e_{qq}Z^{-1} - I)e_{qq} - (E_{QQ}Z^{-1} - I)E_{QQ}],
$$

with $I$ being the $N \times N$ identity matrix.

Notice that, in general, $v'Y = 0$ implies $v = 0$ if and only if the matrix $Y$ is of full rank, which in turn implies that the rows of this matrix are linearly independent (Hadley 1965, p.174). Since $I - e_{qq}Z^{-1}$ and $I - E_{QQ}Z^{-1}$ (in (16)) represent the general equilibrium effect of own commodity taxes on consumer prices (that is, $dq/dt$ and $dQ/dT$),\(^\text{18}\) $\Delta$ in equation (15) represents the weighted difference of these effects, with the weights being the demand responses of the corresponding countries. As such, they are in general different from zero and different for each of the $N$ non-numeraire goods. With different demand and production structures in each of the countries, the difference of these effects will in general be non-zero. Thus, each row of $\Delta$ is linearly independent and the matrix has full rank.

The implication of the linear independence of $\Delta$ (taken to be the case)\(^\text{19}\) is that (15) implies that the tax vectors in the two countries are collinear in the sense that $t = T$.

\(^{17}\)Interestingly, leaving aside the negative sign, (12) shares some similarity with the tax harmonization rule of Keen (1987, 1989). Like in Keen (1987, 1989) the vector in (12) is a weighted average of the initial tax structures of the two countries, but the weights here are the demand responses of the other countries and not the own.

\(^{18}\)In the two-good case, absence of the so-called Metzler paradox requires these effects to be positive.

\(^{19}\)Sufficient asymmetry in either preferences and/or endowments will suffice for this to hold.
and so (in equilibrium) there is complete harmonization of the tax vectors. Setting now $t = T$ into (12) a sharp result quickly emerges: the central tax is collinear to those in the two countries and so $t = T = -\tau$. Summarizing the preceding discussion.

**Proposition 1**  The Nash tax equilibrium is characterized by $t = T = -\tau$.

Taxation of a co-occupied tax base from both levels of government thus implies complete harmonization of the tax rates across countries. There is a simple intuition behind this striking result. In the absence of the common tax vector $\tau$, as already noted, ToT externalities linger. With the central government maximizing the common good, externalities are eliminated by the choice of a commodity tax vector that exactly offsets them. This is done, interestingly, by weighting the lower-level government consumption taxes with the externalities these taxes impose. But this implies that all externalities are internalized. Strikingly, although the two lower-level governments are asymmetric, consolidated taxes, $t + \tau$ and $T + \tau$, are the same and equal to zero. What drives the result is the commonality, across the two levels of government, of the tax base and the additivity of the tax instruments. It is these two properties that induces, in equilibrium, countries to choose the same tax. They would, of course, like to exploit their ToT, but there is no room for them to do so, since the common $\tau$ rebalances revenues in such a way that it pushes them towards a zero collective tax $t + \tau = 0$.

To prove Pareto efficiency notice that starting from the equilibrium characterized by Proposition 1, $t = T = -\tau$, it is the case that $dt = dT = -d\tau$. This together with the fact that $A_3 = A_1 + A_2$ and $B_3 = B_1 + B_2$ (see (7) and (8)) implies that

$$e_u du = 0 ; \quad E_U dU = 0.$$  \hspace{1cm} (17)

What this suggests is that no further improvement can be made moving away from the Nash equilibrium level of taxes. This, clearly, can only happen if the equilibrium is Pareto efficient. To emphasize:

**Corollary 1** Under the conditions of Proposition 1, the non-cooperative tax equilibrium is Pareto efficient.

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20 Similar, but not identical, to Keen’s (1987, 1989) harmonisation rule.

21 Another way to see this is the following. Equation (12) reveals is that the central government tax is a weighted average between the two taxes with the weights being the demand responses of the other country. What this means is that the central government tax, for given $t$ and $T$, internalizes the externalities in each of the two countries (which are given by the terms in (7b) and (8b)). Given this, the best response of the two countries (as they are insulated by the externalities) is to choose the ‘efficiently-collective’ tax $t = T$ and so $t + \tau = 0, T + \tau = 0$. There are no externalities and the economy is on the utility possibility frontier.
The intuition behind Corollary 1 follows from the fact that since \( t = T = -\tau \), \( dt = dT = -d\tau \) and so \( dp = 0 \) implying that the producer (world) prices are kept fixed and thus there are no ToT effects (see (6)). In addition, consumer prices equal producer prices in both countries, and thus there is no consumer price diversion between countries — the equilibrium is on the contract curve.

The purpose of the common tax is, therefore, to counteract the impact on the flow of trade of inappropriate levels of country-level taxes (or, equivalently, to undo the trade distortions such taxes create). This entails complete harmonization of the tax vectors which keep producer (and world) prices unchanged and thus no ToT effects will exist, in equilibrium. Interestingly, there is no requirement for the equilibrium to be sequential — all players move simultaneously.

Here is, therefore, a case where co-occupation of the tax base together with the tax revenues being returned in the proportion raised generates Pareto efficiency. Naturally, then, the question is whether this strong result survives outside the particular allocation of revenues chosen across countries. Interestingly, but perhaps not surprisingly, the answer to this is in the affirmative as long as there is no misallocation of tax revenues across countries (and so no additional, to the ToT, distortions) to be corrected by the central government. If there are (as in the case of local public goods), then, the central government would require an additional instrument to target the allocation of tax revenues, leaving again the role of the central government tax in mitigating the ToT externality.\(^{22}\)

### 3 Summary and concluding remarks

This short paper has addressed the following problem. Suppose there are country wide taxes with the well-known terms of trade inefficiencies. Is there any instrument in the hands of a supranational government that can generate (read, *induce*) harmonisation? The answer to this, starkly, is yes. This is an additive tax levied on the common tax base, with the revenues from that tax being allocated in proportion to the individual tax bases. Thus, instead of imposing a tax harmonisation rule (as in, among others, Keen (1987, 1989)) which converges the tax schedules towards a weighted average, the common tax is an instrument that induces it. Thus, co-occupation of tax bases and the existence of central government taxes that can be optimally chosen induces low-level governments to neutralize the tax base externalities, achieving complete harmonization. The purpose of

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\(^{22}\) Possibly, but not only, in the form of an equalization grant system. Elements of this appear in Kotsogiannis (2010).
the common tax is to counteract the impact on the flow of trade of inappropriate levels of low-level governments (country-level) taxes.

Of course, our treatment has been partial in the sense that it has focused only on the tax externality when, clearly, as noted earlier, there are other margins/distortions. The result derived here relies on having only terms of trade distortions. The only reason for commodity taxes in our simple model is the manipulation of the terms-of-trade; taxes are not raised to finance public goods that the country’s residents have preference for. Intuition suggests that if there are public goods, the introduction of central taxes would still be welfare improving as it will be designed to reduce the tax externalities that local government taxes create. It will not deliver Pareto efficiency (as tax revenues have to remain positive to finance the public good), but it will most certainly move the economy towards it. By how much, it depends on the specificities of the framework.  

23 This is exactly the point that Haufler and Lülfesmann (2015) make in a sequential setup.
References


