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Exploring Formula Allocation for the European Union

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Abstract

This paper explores the efficiency impacts of two methods of consolidated base taxation with formula allocation under consideration in the European Union. The first method, common (consolidated) base taxation (CCBT), would allow companies to choose a single tax base for their EU-wide operations. This tax base would be common throughout the participating member states. The second method, Home State taxation (HST), would also allow companies to choose a single tax base for their EU-wide operations. But, unlike with CCBT, the tax base would be defined according to the rules in the company's residence, or "home," state. Thus, several different tax bases would exist within the EU. Both methods would use a common formula to distribute profits across countries. This paper finds that since countries continue to set corporate income tax rates, economic inefficiencies continue to exist under both methods. However, under HST, since the tax base differs according to residence, additional inefficiencies may arise depending on whether countries reduced their tax rates to combat the incentive for companies to relocate to locations with narrow tax bases.

Keywords: corporate tax reform in the EU, formula apportionment, tax harmonization, tax competition

JEL Code: H2, H3, H7, H87

1. Introduction

The European Commission (2002) study "Company Taxation in the Internal Market," puts the idea of comprehensive EU company tax reform on the top of EU policymakers' agendas.[1] The Commission presents a strategy that would allow companies to create a consolidated corporate tax base for their EU-wide activities that would then be distributed across the member states (formula allocation) for taxation at national rates. This comprehensive approach of consolidated base taxation with formula allocation essentially replaces the current separate accounting and arm's length pricing system.

This paper compares the economic impacts of two of the comprehensive approaches under consideration: Common (Consolidated) Base Taxation (CCBT) and Home State Taxation (HST). We first describe these two approaches and then discuss various aspects of formula allocation (or, formula apportionment, as it is also known).[2] We then compare the efficiency

impacts of CCBT and HST. A discussion of some other relevant economic issues follows this analysis: the treatment of corporate groups, the use of incentives and potential revenue impacts.

2. Background: Some Specifics About CCBT and HST

2.1. Conceptual Features

The CCBT approach would essentially allow a company to consolidate its accounts across the EU with the taxable base calculated under a set of common rules. As described in the Commission study (2002, p. 463), the CCBT approach "involves all Member States, or possibly initially only a group, agreeing on a set of common rules for establishing the taxable base of certain enterprises with operations in a number of Member States (or even in a single member state)." Companies would have the option of using this common tax base for their activities in participating member states.

The common consolidated tax base has not yet been defined. Thus, by starting from the point that two or more member states will be able to reach agreement on a common tax base, this method in many ways ignores the political difficulties that have prevented the EU from reaching such agreement in the past. However, a European industry group (UNICE, 2000) that supports creating a common tax base for EU operations has suggested that the tax base could be derived from International Accounting Standards, a synthesis of taxation rules of the member states, or a combination of both approaches.[3]

As noted in the Commission study (2002, p. 461), HST "involves all or a group of Member States agreeing to accept that certain enterprises with operations in a number of Member States should compute their taxable base according to the tax code of a single Member State—the 'home State'. . ."[4] The HST approach differs from the CCBT approach in that it extends the application of existing national tax codes throughout the EU rather than developing a common new tax code for application throughout the EU.

Under the rules proposed for HST, to be allowed to participate in the system, member states must agree to "mutual recognition" of each other's systems for calculating and consolidating the profits of groups of companies with activities in the other participating member states. This recognition is necessary as the tax base in the member state where the subsidiaries are located would be defined according to the rules in the parent company's home state. Gorter and deMooij (2001) note that since foreign tax authorities determine the tax base of hosted subsidiaries, HST reduces member state sovereignty.

An example will help illustrate how HST might operate. For example, a company with headquarters in France with operations in France and Sweden would use the French tax rules to determine its consolidated group income. Likewise, a company with headquarters in Sweden and operations in Sweden and France, would use the Swedish tax rules to determine its consolidated group income. In both cases, that consolidated income would be distributed between the countries according to an agreed formula. A consequence of allowing the company to use a single tax system for all of its EU operations is that it has a strong incentive to locate in the member state with the narrowest tax base.

2.2. A Comparison of CCBT and HST

The two approaches share several features. First, both HST and CCBT are presented as optional for member states and for companies. Member states may remain out of the new approach if they desire. In the case of CCBT, this means that the system would operate in parallel with existing national tax systems. Thus, CCBT introduces a tax distinction between purely domestic firms and multinational firms. By making a discrete foreign investment, a purely domestic firm could dramatically alter its tax base if the definition of the CCBT differed substantially from the domestic tax base.[5]

Second, both approaches would be limited to EU operations.[6] Thus, the company would still need to maintain the current separate accounting system for transactions with non-participating member states and, since the system would be limited to the EU, for transactions with non-EU countries. Tax authorities would also continue to require expertise in implementing and auditing the transfer pricing rules with non-EU activities.

Third, both approaches allow member states to continue to set the tax rate at the national level. In the case of CCBT, the national rate would be applied to a tax base that would be identical for the participating member states, while in the case of HST, tax bases and tax rates would continue to vary across member states.

Fourth, although the need to distribute the consolidated tax base to the individual member states arises under both methods, how that distribution would occur has not yet been defined (this issue is discussed below). The Commission has indicated that any formula used under the new approach would be agreed by all member states so that only one formula would apply within the member states. Technically, this statement applies to industry groups. It is contemplated that a different formula might be appropriate for financial industries as compared with manufacturing and merchandising industries. Even in such a case, however, the same industry formula would apply throughout the EU.

However, there are differences between the two methods.

Under CCBT, a single tax base would be apportioned throughout the EU. CCBT does not lead to tax base proliferation because, by definition, a single, common tax base would apply throughout the EU for companies operating in the member states that chose to adopt CCBT. Under HST, by contrast, although companies would be subject to just a single tax base, that of their 'home' state, if all member states participate in the system, the EU as a whole would continue to have 15 different tax bases subject to apportionment (one for each member state)[7]. Thus, the end result of the HST process could be the further entrenchment of the various company tax bases in the internal market. The Commission study (2002, p. 471) expressed a concern about this issue, noting that HST might impose a "brake" on further progress toward creating a common tax base in the EU as the proposal may lock into place the existing tax codes of participating member states.

Differences also arise regarding the number of tax bases that apply within a single member state. Under HST, income could be defined under 15 (or more after enlargement) different ways within a single member state, whereas under CCBT, income could be defined under at most two different ways within a single member state (the common base and the domestic base).[8]

2.3. *Formula Apportionment*

A tax system with cross-border income consolidation and formula apportionment would eliminate many of the problems inherent in the separate accounting with arm's length pricing system now used by the EU member states. To begin, by distributing income according to a formula, rather than according to separate accounts, formula apportionment recognizes that it may not make economic sense to attempt to use the separate accounting system when significant economic interdependence exists within a multinational corporate group.

It can be difficult to apply the arm's length method if arm's length prices do not exist.[9] As group income is consolidated within an economic area, the need to find transfer prices is eliminated for many transactions within that area. In addition, it becomes more difficult for multinational enterprises to shift income to related entities doing business in low tax jurisdictions.

Further, within a consolidated group doing business within an integrated market, such as the European Union, there is no economic need to draw distinctions between different types of income, such as interest and dividends, or to draw distinctions between the sale of goods, the use of intangible assets, and the provision of services income. Moreover, within an internal market, there is no need to impose withholding taxes on internal cross-border payments of royalties, fees, or dividends.

However, cross-border income consolidation with formula allocation introduces many complications.[10] A few are listed below:

- In terms of its economic impact, using a formula, which implicitly assumes that all factors earn the same rate of return across jurisdictions, can distort the geographic attribution of income, particularly when location-specific rents exist.
- Since the factor shares in the formula may be endogenous to the firm's choices, changes in investment or employment (if the formula uses these factors) can have unintended effects on a firm's total tax burden (see below for further elaboration).
- Agreement would be needed on how the formula should be defined and to what extent deviations could occur to the definitions of the formula components. Canadian provinces use the same two allocation factors, but the US states have the freedom to choose their own factors and the weights that apply to those factors.
- It would need to be determined whether the same formula would apply to all industries or whether specialized industry formulae would be appropriate. If the same formula is applied to all industries, it can create distortions and perceptions of unfairness if that formula does not accurately represent the factors that generate income. For example, tangible property may be relatively unimportant while intangible property may be quite important to the financial services sector.
- To the degree that formula allocation applies only to companies in a corporate group, the system needs legal or economic rules to define a group. However, some members effectively related to a group may not be classified as part of the legal group, thus creating potential tax avoidance possibilities with transfer pricing and financial transactions. In this case, it may be necessary to apply an approach that looks beyond the legal group and examines the economic relationship among affiliated entities for purposes of determining the group.

- Formula apportionment can affect the personal tax system, particularly with respect to the personal taxation of dividends and capital gains and attempts to avoid double taxation at the corporate and personal level. European states integrate corporate and personal income taxes to some extent (even with the recent demise of imputation systems). Generally, such relief systems are only provided to domestic shareholders.

Guidance for developing the formula can be obtained by examining the experience in countries that use formula apportionment. For example, the North American experience suggests using a form of property, payroll, sales, or manufacturing costs formula. These firm-specific factors are used primarily because they reflect the location where income is earned.

Alternatively, the value-added tax base might be used as an allocation formula. McLure (2002) notes that the value-added base would be similar to the use of payroll and economic rents as an allocation formula (but with weights varying according to the relative capital-labor intensity of the firm.). However, as Westberg (2002) notes, transactions that are taxable for VAT purposes may not necessarily be taxable for income tax purposes. In addition, the VAT base would need to be adjusted for exports and imports to place the base on an origin-basis. Certain elements of depreciation would also need to be adjusted to reflect the fact that the VAT is designed to be a tax on flows and not on stocks. Moreover, non-taxable supplies would have to be added to the tax base. Schön (2002) notes that although using the VAT base will eliminate incentives to shift profits through altering the financial structure, it does not eliminate the need for a company to justify its intra-group pricing regarding the consideration for sales and services rendered. A value-added based formula would also need to be modified for certain industries. For example, different criteria would be necessary for financial firms, which are exempt from VAT.

It is worth emphasising that countries presently using formula apportionment operate under the umbrella of a federal corporate tax system. This federal system leads to considerable conformity among the tax practices in the sub-national jurisdictions in these countries, generally in relation to the federal tax law. As the EU does not presently bear much resemblance to a federation of countries, the efficacy of a formula apportionment system within a non-federal structure must be evaluated on its own merits.

3. Economic Effects of CCBT and HST

There is a large body of literature analyzing formula apportionment, typically used in the United States or Canada, and comparing this approach with separate accounting methods (see McLure, 1980, 1981, 2002; Gordon and Wilson, 1986; Weiner, 1994, 1999; Mintz, 1999; McLure and Weiner, 2000; Musgrave, 2000; McDaniel, 1994; Nielsen, Raimondos-Moller and Schjelderup, 2001). Our purpose is to compare and analyze the current EU-specific CCBT and HST formula allocation methods.

3.1. Old and New Investment Distortions

Efficiency in the European Union results from investment being allocated such that pre-tax rates of return on capital would be the same across all business activities and jurisdictions (see the Annex for derivation of the results reviewed here).[11]

Under existing systems, investment is misallocated since governments levy their own distinctive taxes on the income earned by a corporation. Domestic taxes are paid by resident companies on their domestic and world-wide income (including income earned in other states). Non-resident companies pay domestic taxes on income sourced in the jurisdiction. Differences in tax levels can influence the allocation of investment across EU jurisdictions, as well as lead to industry and asset distortions. Capital is also misallocated among businesses to the extent that some businesses are subject to higher taxes than others based on their form of organization (separate entities, partnerships, subsidiaries and branches). In some situations, non-tax reasons may prevent corporations from choosing tax-minimizing strategies, thereby resulting in inefficiencies as some enterprises are taxed more heavily than others.

The Commission study (2002) shows that significant differences in effective tax rates exist among business activities, jurisdictions and financing methods. These differences stem from the differences in corporate income tax rates, tax deductions for depreciation and inventories and tax credits incorporated in the calculations of effective tax rates. The allocation of investment would be further affected by existing tax regimes if the effective tax rate calculations included the use of losses for tax purposes, income shifting through financial transactions, transfer pricing regimes, thin-capitalization rules, reserve accounting and other provisions that affect cross-border transactions.

Both CCBT and HST expect to improve the efficiency of corporate tax systems by reducing differences in effective tax rates on investments by different entities. This convergence would likely occur through convergence of tax bases and, possibly, of tax rates. Since a corporation must aggregate income from all European sources to calculate tax, both CCBT and HST remove distortions arising from differences in tax bases across jurisdictions, provide for consolidation of profits and losses, and remove incentives for the use of financial structures and transfer pricing (that in turn can affect investment decisions).

However, since corporate income tax rates would continue to differ across member states, some misallocation of capital would result under both approaches. Specifically, not only would pre-tax rates of return differ due to statutory tax rate differentials but also, depending on the weights used for allocation, would affect the incentives for corporations to shift factors towards low-tax rate jurisdictions. For example, if capital is used to apportion income, a company would invest more capital in the jurisdiction with the lower tax rate in order to shift income towards that jurisdiction (for proof, see the Annex). The cost of capital in the low tax rate jurisdiction will therefore be lower than under the conventional calculation that ignores the effect of changing the weight.

3.1.1. Inefficiencies Under CCBT and HST Since the system is optional, companies would be able to choose whether they would adopt the CCBT or maintain the existing system. Effective tax rates on businesses will vary according to whether the option is chosen or not. It is not clear whether the inefficiencies introduced by CCBT compared to the existing system are empirically important compared to those that are removed (like differences in tax bases). However, the existence of Canada's relatively non-controversial allocation system suggests that the common tax base and factor formula provides some support for a CCBT system, although this conclusion would require analysis that has not been done.

Unlike CCBT, HST introduces differences in taxes among entities operating within the same country but with difference residence. Thus, for example, competing identical French and German companies operating in Germany (or France) face different effective tax rates, while, under CCBT, differences would be mitigated, since the same tax base applies across locations.

As remarked earlier, HST creates an incentive for companies to shift headquarters to the countries with the smallest tax base. The narrow tax base might lower effective tax rates on capital (thereby improving efficiency by reducing the tax on investment in general) although differences in effective tax rates according to nationality might increase inefficiencies.

Under HST, there will be less investment in any given member state from members with more generous tax base rules. CCBT does not face these difficulties concerning tax base competition, except to the extent that the tax base becomes more obvious and cannot be used to mask differences in effective tax rates.

Whether HST would result in greater inefficiency in the allocation of capital compared to CCBT is very much an empirical issue. Further, the efficiency gains of moving from existing systems to optional CCBT and HST are also unknown. As noted by Mintz (2002), the gains may not be sufficient to warrant a change at all.

4. Some Other Issues

The discussion of efficiency suggests that CCBT can be superior to HST in terms of reducing potential distortions within a consolidated tax base with a formula allocation system. However, other important questions should be considered when evaluating the two approaches. Below, we provide a brief description of issues related to the tax treatment of corporate groups, the use of incentives, and revenue impacts.

One important point to note is that CCBT, unlike what has been characterised so far, could provide mechanisms for countries to choose different bases as in the US and, to a certain degree, in Canada. Thus, rather than having a single common tax base in the EU, a "modified CCBT" could allow countries to start with the initial common base and provide country-specific deviations after total income had been allocated. However, if this flexibility is allowed, then additional distortions are introduced, although CCBT would still avoid the taxation of businesses according to their residence.

4.1. Corporate Groups

The tax treatment of corporate groups is a key issue with formula allocation methods. In the United States, consolidation methods at the federal level result in a natural definition of a corporate group at the state level so that all income in the corporate group is allocated according to a formula. In Canada, federal consolidation is not allowed so a company would not allocate a subsidiary's taxable income across provinces if the subsidiary operates in only one jurisdiction. Thus, Canadian companies can arrange a corporate group to allocate income or to operate separate subsidiaries, depending on the most tax-efficient method. The difficulty with the Canadian approach is that some of the important gains from using

allocation—avoiding the need to determine income of related companies—is lost to a certain degree.

Presumably the EU would desire to define a corporate group for allocation purposes as EU businesses have indicated their support for a common set of tax rules for their EU-wide activities (UNICE, 2000). Both CCBT and HST would require rules, such as a minimum level of ownership and residency, among others, for determining when a company becomes part of or leaves the corporate group.

Assuming that countries can reach agreement on how to define a corporate group, CCBT and HST have some different impacts on the incentives for companies to be part of a group and potentially on tax competition among the member states. Under CCBT, taxable income would be the same no matter where companies locate or reside, whereas under HST, taxable income depends on how the tax base is defined in the resident home state. Thus, under HST, if a member is sold from one group to another operating in the same country but with different country ownership, taxation could dramatically switch from the one home jurisdiction to another, resulting in a "cross-border" transaction even though the two groups operate at the same location.

Under both systems, the total tax paid will depend on the apportionment factors involved. If a company joins or leaves a corporate group in a specific jurisdiction, its tax liability will change depending on whether the tax owing under formula allocation is more or less than the liability owed if operating as a separate entity. States with narrow tax bases could attract companies that divest themselves from corporate groups that are subject to allocation.

Under HST, the incentives for companies to join or leave groups are even stronger than under CCBT. If one country offers a more favourable tax regime, it could attract companies from other jurisdictions to establish residency there, even those that allocate income across jurisdictions. Thus, for example, a country that offers a more liberal treatment of depreciation costs could attract companies based on effective management and control. Subsidiaries operating in all EU countries would then operate under the tax rules of the more competitive jurisdictions. Effectively, countries can compete for residency on this basis.

The tax treatment of cross-border reorganizations (mergers and acquisitions), especially under HST, further complicates this analysis. Under CCBT, assets could be transferred according to their fair market value or taxable value and losses could be transferred to the new entity according to a commonly agreed set of rules. With HST, governments may not provide relieving rules for acquisitions and mergers if a company effectively changes residence. Similar to the existing systems, assets would likely be transferred at their market value and losses may not be transferable to a new parent operating in a different jurisdiction since the determination of losses would depend on rules used by the previous country of residence. Under both CCBT and HST, capital gains taxes may apply at the shareholder level upon a sale of shares to a non-resident company, although countries could consider common rules that would allow for deferral of capital gains taxes as currently available under domestic tax systems.

4.2. Incentives

Although the primary aim of formula allocation is to facilitate taxation of companies with cross-border operations, countries often wish to provide special incentives for capital

investments, a practice which formula allocation could make more difficult. In the US, the states have substantial flexibility in that they are able to choose both the definitions of the tax base and the factors used to allocate income. Empirical evidence suggests that states may choose factors more heavily weighted on sales and less on capital and employment in order to attract more business investment, while other states may pursue the opposite strategy, depending on the composition of their industrial base. The result is that the formula is unstable, both across jurisdictions and over time.[12]

These differences in formulas and tax bases that exist in the US states create significant complexities for tax administration and compliance. By contrast, for more than 50 years, the Canadian provinces have largely adhered to a common formula and a common tax base differentiating in rates and tax credits. Thus, the Canadian provincial system has not suffered from the same degree of criticism as has the US state system.

However, jurisdictions often wish to provide special incentives to stimulate investment. CCBT can accommodate this differentiation as it can allow countries to provide tax credits that do not affect the tax base since the credits are calculated after income is allocated. Under HST, countries can choose a different tax base than other countries although the base must apply to both home and foreign investments made by resident multinationals. The simplification under HST is that the same tax base must be used across countries. However, states could still use location-specific incentives, like tax credits, to attract investments.

4.3. Revenues

A move from a current tax system to formula allocation would be fraught with difficulties, but one of the most problematic issues is the distribution of revenues.[13] Knowing neither the tax base nor the formula, it is impossible to predict in advance how any particular member state's revenue would be affected under formula allocation. However, as both systems will allow for cross-border loss offsetting, the revenue impact in each member state depends on the overall loss position of the company group, although these losses are likely to be quite large initially.[14] The revenue impacts vary depending on whether HST or CCBT is considered. For example, under HST, by offering loss offsetting across participating member states, the tax base of not only the home state multinationals but also the tax base in the host country could fall. Moreover, depending on the overall tax base definition, countries might see companies migrate to other countries that offer relatively generous loss offsetting and favorable tax base definitions.

Under CCBT, the incentive to shift corporate residence would not occur, as the tax base does not vary with the company's residence. Governments will be more willing to adopt one of the allocation methods if they believe there are revenue gains from improved administration or reductions in revenue losses caused by the inability of multinationals to engage in profit shifting within an apportionment tax system.

Within the political constraints in the EU, one issue to consider is that neither HST nor CCBT has been suggested as being mandatory for EU companies or member states. Thus, the proposals overcome some of the political obstacles facing member states in undertaking comprehensive company tax reform at the EU level. Making the system optional, however,

introduces its own complications and would put the receipts of member state treasuries at significant risk.

5. Conclusion

Both of the proposals discussed in this paper face the same difficulties in reaching agreement on a common allocation formula (including the definition of the weights and the individual factors), the definition of the taxable group, and the administrative issues involved in moving away from the internationally used separate accounting method. Neither proposal discusses how non-EU companies would be treated, how this system would interact with the current international arm's length practice, nor provides extensive details on the treatment of transactions outside the EU. Allocation introduces new distortions to factor choices and creates an unstable situation regarding the definition of the formula (unless some means can be found to bind member states to the initial formula).

Although both proposals face many of the same obstacles concerning the formula and the definition of the taxable group, there is a key difference between the two proposals. If all member states participate under CCBT, a single tax base would apply throughout the EU regardless of where the parent company is resident. However, under HST, as the tax base depends on where the parent company is resident, if all member states participate, 15 different tax bases would continue to exist within the EU. Moreover, if all member states participate under HST, there could potentially be 15 different tax bases within a single EU country, compared with the maximum of two tax bases under CCBT.

Therefore, even though HST has the advantage of allowing it to be adopted relatively easily—there is no need for the member states to agree on the tax base definition before they adopt an apportionment system—the price of this flexibility is that even though a company may be subject to just one tax base, within the EU, 15 HST bases continue to exist, resulting in less economic efficiency relative to the CCBT approach. Whether the political benefits of moving on a piecemeal basis to an allocation method for taxing EU company income outweigh its drawbacks is for the individual member states to decide once the European Commission decides which, if any, specific proposal to pursue.

Annex

To explore the impact of both CCBT and HST on economic efficiency, consider a simple model of two countries, Britannia and Frankland, with identical multinational firms operating as residents of each country. Let $f[k]$ be the strictly concave production function of a Britannia-resident multinational operating in Britannia with capital stock, k. Let $F[K]$ be the Britannia-resident production function operating in Frankland with capital stock, K. Similarly, a Frankland-resident multinational operates with a home production function $f[k^*]$ in Frankland and $F[K^*]$ in Britannia with capital stocks k^* and K^* respectively.

Define r as the fixed international cost of capital, assuming that the firms are equity-financed. Define $Y(= f[k] + F[K])$ and $Y^*(= f[k^*] + F[K^*])$ as the profits, gross of

capital costs, earned at home and abroad. The pre-tax profits, Π and Π^*, respectively, earned by multinationals are therefore

$$\text{Resident in Britannia:} \quad \Pi = Y - r(k + K) \tag{1a}$$

$$\text{Resident in Frankland:} \quad \Pi^* = Y^* - r(k^* + K^*) \tag{1b}$$

Governments in Britannia and Frankland raise revenue by taxing corporate profits (with no deduction for the imputed cost of equity finance).

Under both CCBT and HST, a multijurisdictional company will calculate its total profits using a commonly-measured tax base, allocate income to each jurisdiction according to a common formula, and pay tax to the jurisdictional governments according to the (effective) tax rate prevailing in the country.

The allocation of multinational profits, as shown above in (1a) and (1b), depends on the share of capital located in each country.[15] Let the share of profits allocated by the Britannia-resident company to Britannia equal $\forall = k/(k + K)$ and that to Frankland be $1 - \forall$. Similarly, the shares of Frankland multinational profits allocated to Frankland and Britannia are $\forall^* = k^*/(k + K^*)$ and $1 - \forall^*$, respectively. Let t and T be the tax rates in Britannia and Frankland, respectively, on profits earned in each jurisdiction. Let $\vartheta = \forall t + (1 - \forall)T$ be the "average" tax rate paid on total profits by the Britannia multinational. Similarly, let $\vartheta^* = \forall^* T + (1 - \forall^*)t$ be the "average" tax rate paid by the Frankland multinational.

Common Consolidated Base Taxation

Under CCBT, the same tax base applies in each country. Thus, after-tax profits earned by multinationals are the following:

$$\text{Britannia-resident:} \quad B = (1 - \vartheta)Y - r(k + K) \tag{2a}$$

$$\text{Frankland-resident:} \quad B^* = (1 - \vartheta^*)Y^* - r(k^* + K^*) \tag{2b}$$

Letting $E = (f[k] + F[K])/(k + K)$, which is the average productivity of Britannia multinationals and, correspondingly $E^* = (f[k^*] + F[K^*])/(k^* + K^*)$, the first-order conditions for profit maximisation for the multinationals are the following:

Britannia-resident Multinational

$$k: \quad (1 - \vartheta)f' = r + (t - T)KY/(k + K)^2 = r + (t - T)(1 - \forall)E \tag{3a}$$

$$K: \quad (1 - \vartheta)F' = r + (t - T)kY/(k + K)^2 = r + (t - T)\forall E \tag{3b}$$

Frankland-resident Multinational

$$k^*: \quad (1 - \vartheta^*)f' = r + (T - t)K^*Y^*/(k^* + K^*)^2 = r + (T - t)(1 - \forall^*)E^* \tag{3c}$$

$$K^*: \quad (1 - \vartheta^*)F' = r + (T - t)k^*Y^*/(k^* + K^*)^2 = r + (T - t)\forall^* E^* \tag{3d}$$

Each multinational invests in capital stock at home until the after-tax marginal product of capital equals the cost of capital *plus* the marginal impact of allocating additional profits to the home country.[16] We will label this expression the overall cost of capital. These first-order conditions show that taxing under an apportionment system introduces an additional

distortion to the capital allocation decision beyond the distortion that exists under separate accounting.[17] This distortion arises because the allocation formula includes capital, a firm-specific element. As this distortion can be positive or negative for any jurisdiction, formulary apportionment of profits on the basis of the location of capital might discourage or encourage additional investment.

To see this distortion for the Britannia-resident multinational, note that if the home tax rate exceeds the foreign tax rate ($t > T$) the overall cost of capital is higher than the financial cost, r, in the home state (the cost of capital is lower than the financial cost if $t < T$). The additional term associated with differences in tax rates reflects the cost of allocating more capital to the high tax region. This distortion does not exist under a system of separate accounting. It also would not arise if the formula did not include-firm specific elements, such as member state population. An equivalent interpretation applies for additional capital stock investment in the foreign jurisdiction.

Home State Taxation

With HST, a multinational enterprise is taxed on its income according to its home country tax rules. These rules are not necessarily identical in each country. Profits are allocated to each jurisdiction according to a common formula with the tax paid according to the tax rate of the local country. Using the same formula as above, we obtain nearly the same conditions for profit maximisation as described above when tax rates differ between the two countries. The differences between the two systems become apparent with respect to defining the tax base, which will be discussed further below.

In this model, the tax bases can be represented as being different by indicating that Britannia taxes income according to bY (b is a fraction greater than zero but less than 1. Thus, the tax base in Britannia will be narrower than in Frankland). The term 'b' stands for the different tax base definition in Britannia compared with the tax base definition in Frankland. The relevant tax rate for the Britannia firm is equal to tb and Tb. Frankland continues to define its tax base as Y^*.

Profits for the Britannia-resident multinational are shown below. As Frankland can be assumed to use the same base as earlier, the Frankland-based multinational's profits are the same as defined by the expression in 2b, which is repeated below.

$$\text{Britannia-resident:} \quad B = (1 - \vartheta)bY - r(k + K) \tag{4a}$$

$$\text{Frankland-resident:} \quad B^* = (1 - \vartheta^*)Y^* - r(k^* + K^*) \tag{4b}$$

Multiplying the tax rates in (4a) by the term 'b' derives the first-order conditions, which correspond to the expressions in (3a) and (3b) for the Britannia-resident multinational, as shown below:

Britannia-resident Multinational

$$k: \quad (1 - \vartheta)f' = r + b(t - T)KY/(k + K)^2 = r + b(t - T)(1 - \forall)E \tag{5a}$$

$$K: \quad (1 - \vartheta)F' = r + b(t - T)kY/(k + K)^2 = r + b(t - T)\forall E \tag{5b}$$

with the first-order conditions remaining the same for the Frankland multinational as shown in expressions (3c) and (3d). Comparing equations (5a) and (5b) with equations (3a) and (3b) shows that the difference in incentives depends on the size of b—in any case, however, this distortion to capital allocation decisions will be greater under HST than under CCBT. These expressions also show that a country can offset the impact of having a relatively high tax rate by narrowing the tax base.

Efficiency

We consider "global" efficiency to be maximized where capital is allocated across both countries to maximise total output. Global efficiency seems particularly relevant in cases where both countries come to an agreement to tax profits. To reach this agreement, they would each need to achieve a better allocation of resources compared to that possible if each sought to maximise national welfare instead. We do not explore this issue further.

Welfare is defined as the sum of output across the two countries, which is the following:

$$W = f[k] + F[K] + f[k^*] + F[K^*] \tag{6}$$

Assuming the total capital stock available in the two countries is equal to a fixed amount of saved capital, the resource constraint for the global problem equals:

$$A = k + K + k^* + K^* \tag{7}$$

Totally differentiating equation (6) using equation (7) to solve for K yields the following condition for welfare optimisation:

$$dW = \{f'[k] - F'[K]\}\,dk + \{f'[k^*] - F'[K]\}\,dk^* + \{F'[K^*] - F'[K]\}\,dK^* \tag{8}$$

Common Consolidated Base Taxation

Under CCBT, the tax bases in both countries are identical. Note that under the assumption of identical production functions for multinationals of both countries, $\forall = 1 - \forall^*$ (the capital allocated by the Britannia firm to home is equal to the amount allocated by the Frankland firm to Britannia). Similarly, $1 - \forall = \forall^*$ (the capital allocated by the Frankland firm to home is equal to the amount allocated by the Britannia firm to Frankland). Therefore, at the optimum, $\vartheta = \vartheta^*$ (average tax rates are equal across countries) and $E = E^*$ (average productivity, or the return to capital, is equal across countries).

Condition (8) simplifies, using the first-order conditions in expressions (3), as follows:

$$dW = (t - T)E(1 - \vartheta)^{-1}dk - (t - T)E(1 - \vartheta)^{-1}\{\forall^* - \forall\}\,dK^* \tag{9}$$

The expression in (9) shows two distortions associated with CCBT that impact the cross-border allocation decisions of multinationals.

The first expression measures the non-neutrality from misallocating capital between Britannia and Frankland by the Britannia company, reflecting capital export non-neutrality. For instance, when $t > T$, the first expression in (9) is positive if the Britannia firm allocated additional capital to the Britannia production facilities from elsewhere since the cost of capital for investment located in Britannia is higher than that in Frankland. Therefore, global

efficiency would be improved if capital were allocated to Britannia. If $t < T$, Britannia has too much capital under CCBT and welfare would increase if the Britannia firm relocated capital to Frankland.

The second part of the expression denotes the misallocation of capital when the foreign income of the Frankland company is taxed differently than the domestic income of the Britannia company. This condition is a form of capital import non-neutrality. Note, if $t > T$ then $\forall^* > \forall$. Therefore, as the second expression is unambiguously negative for $dK^* > 0$, a reallocation of capital by the Frankland multinational to Frankland reduces total welfare.

Both of the distortions shown in (9) equal zero if tax rates are identical. Thus, as under separate accounting, setting tax rates equal across jurisdictions eliminates many distortions to the capital allocation decision.

Home State Taxation

Under HST, the relevant first-order conditions are in expressions (5) for the Britannia-resident multinational and (3) for the Frankland multinational. Using these first-order conditions for equation (8) yields the following:

$$dW = b(t-T)E(1-\vartheta)^{-1}\,dk - (t-T)\{(1-\forall^*)E^*(1-\vartheta^*)^{-1} - b\forall E(1-\vartheta)^{-1}\}\,dk^* - (t-T)\{\forall^* E^*(1-\vartheta)^{-1} - b\forall E(1-\vartheta)^{-1}\}\,dK^* \quad (10)$$

The terms in equation (10) reflect three distortions.

- The first term is similar to the first term in expression (9) reflecting the lack of capital export neutrality between host and home production for the Britannia firm, except that the welfare gain or loss is based on the amount of income subject to tax in Britannia under HST (i.e., the size of b).
- The second term is related to the distortion arising from taxing differently companies of different nationality in Frankland—we can think of this as reflecting a lack of capital import neutrality since the marginal product of capital for the Frankland multinational is not the same as that for the Britannia multinational investing in Frankland. Since under HST the taxation of income in each country depends on the residence of the parent company, this condition arises under HST but not under CCBT. This expression is ambiguous in sign without further evaluation.
- The third term in expression (10) parallels the second expression in (9) under CCBT. Capital import neutrality does not hold in this case, since the operations of Frankland multinationals in Britannia are differently taxed than operations by Britannia multinationals in Britannia. If $t < T$ and $0 < b < 1$, so the effective tax rate in Britannia for Britannia firms is below that of Frankland firms operating in Britannia, the second expression is unambiguously negative in that too little capital is allocated to Frankland investments in Britannia. If this effect outweighs the first two effects, then non-resident (Frankland) companies would be treated less favorably than resident (Britannia) companies, leading to a potential situation of discriminatory tax treatment.

Further work would provide information on the size of the distortions under HST and in comparison to CCBT. However, as suggested above, HST could result in greater

non-neutrality simply by providing greater differentiation in effective tax rates on businesses operating in the same territory.

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Notes

1. The report was released in October 2001 and published in revised form in April 2002. All references to the report are to the 2002 version. For a discussion of the Commission's strategy, see Commission (2001) and Weiner (2001b).
2. We use the terms "formula allocation" and "formula apportionment" interchangeably in this paper. Some authors use the term 'allocation' to refer to the process of allocating specific items of income to a particular location and use 'apportionment' to refer to the use of a formula to apportion business income across locations. Generally, the term 'formula apportionment' is used in the United States and the term 'formula allocation' in Canada.
3. The Commission (2003) has launched open consultations on the possibility of using International Accounting Standards as a starting point for developing an EU-wide common consolidated tax base.
4. See Lodin and Gammie (2001). The Commission (2003) has launched consultations on developing the HST idea as a pilot project for small and medium enterprises.
5. We are grateful to an anonymous referee for pointing out this issue.
6. By limiting its application to the EU, the EU would avoid the controversies that arose in the US concerning the application of formula apportionment on a worldwide basis. For details of this controversy, see Weiner (2001a).
7. This number would soon expand to 25 with the projected enlargement of the EU in 2004.
8. For further views, see Gorter and Mooij (2001) and the papers in *European Taxation* (August 2002).
9. Mintz (1999) shows that the use of profit split and comparable profit methods for non-arm's length transactions resembles a complicated form of formula allocation when considering transfer pricing (see the discussion below with regard to integration within the EU).
10. See also Weiner (2001a) for additional discussion of some of these complications.
11. Inefficiency is also related to tax competition and tax spillovers such as tax base flight and tax exportation—see Mintz (1999). As noted in the literature, inefficiencies resulting from governments choosing independent tax rates could be larger under allocation rules compared to separate accounting. We do not comment on the relative size of such spillovers under HST compared to CCBT.
12. For recent evidence on these effects, see Gupta and Hofmann (2002) and Anand and Sansing (2000).
13. For some evidence, see Klassen and Shackelford (1998) and Shackelford and Slemrod (1998).
14. The Commission Study (2002) cites evidence that many EU companies would have had substantial 'cost savings' if cross-border loss offset were available (p. 327).
15. In practice, the definition of the "property" factor is much broader than capital, as it includes land, buildings, machinery, stock of goods, equipment, and other real and tangible personal property. Mobile and in-transit property are subject to special rules.
16. For a slightly different presentation of this relationship, see Weiner (1994, 1999).
17. Second order conditions for profit-maximisation are not readily apparent. To see this, consider the principal minor for a Hessian matrix for k (or correspondingly K) is $((1-\vartheta)f'' - \{f' - E\}2(t-T)K/(k+K)^2$. The first term is negative due to strict concavity. The second term is negative if the marginal product of investment is less than the average productivity of the multinational's whole operation and $t < T$ (or the converse if

$t > T$). While one might expect that the marginal productivity of capital in the home country is less than average productivity when the tax rate at home is less than that abroad, the second term could be positive if $t > T$ but $f' < (f + F)/(k + K)$. A similar evaluation could be made of the other principal minor (K).

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