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**Will corporate tax consolidation improve efficiency in the EU?**

**Albert van der Horst, Leon Bettendorf and Hugo Rojas-Romagosa**

CPB Netherlands Bureau for Economic Policy Analysis

Van Stolkweg 14

P.O. Box 80510

2508 GM The Hague, the Netherlands

Telephone        +31 70 338 33 80

Telefax         +31 70 338 33 50

Internet         [www.cpb.nl](http://www.cpb.nl)

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## Abstract in English

Consolidation of the tax base in the European Union is expected to reduce compliance costs and reduce profit shifting. A number of proposals for consolidation from the European Commission are simulated with the applied general equilibrium model *CORTAX*. We show that the benefits from consolidation are offset by two weaknesses in the proposals for a common consolidated tax base. Formula apportionment, which is needed to allocate the consolidated taxable profits across jurisdictions, creates new tax planning possibilities for MNEs and allows them to benefit from existing tax rate differentials in the European Union. In addition, it triggers tax competition as member states may attract foreign investment by reducing their tax rates. The second distortion is an unlevel playing field, which is introduced if only part of the firms participate in the consolidation. The gains from consolidation can be fully grasped if it is obliged for all firms and if it is accompanied by a harmonisation of the tax rate.

*Key words: corporate tax, consolidation, formula apportionment, European Union, general equilibrium model*

*JEL codes: H87,H21,H25,F21*

## Abstract in Dutch

Consolidatie van de belastinggrondslag in de Europese Unie zal leiden tot een verlaging van de administratieve lasten van bedrijven en een vermindering van winstverschuiving. Een aantal voorstellen voor consolidatie van de Europese Commissie worden gesimuleerd met het toegepaste algemeen evenwichtsmodel *CORTAX*. We laten zien dat de voordelen van consolidatie teniet gedaan worden door twee tekortkomingen in de voorstellen voor een gemeenschappelijke geconsolideerde belastinggrondslag. De verdeelsleutel, die nodig is om de samengevoegde grondslag te verdelen over de lidstaten, introduceert de mogelijkheden voor multinationals om hun Vpb-belastingen te minimaliseren via verplaatsing van productie of verkopen naar lidstaten met lage belastingtarieven. Lidstaten kunnen hierop inspelen door tariefsverlagingen, zodat de trend tot belastingconcurrentie versterkt wordt door consolidatie van de grondslag. De tweede verstoring is ongelijke concurrentie tussen multinationals en binnenlandse bedrijven, die mogelijk uitgesloten worden van de grondslaghervorming. De voordelen van consolidatie kunnen volledig worden benut als alle bedrijven overgaan op de gemeenschappelijke grondslag en als de belastingtarieven geharmoniseerd worden.



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## Preface

Member States are free to choose the tax systems that they consider most appropriate and according to their preferences. Yet, differences in corporate tax systems involve large costs, as it prohibits cross-border tax relief and involve large compliance costs for multinational enterprises. In its 2002 Tax Communication, the European Commission proposes consolidation of the corporate tax base as a solution to these problems and a step forward in the functioning of the Internal Market. Commissioner Kovács (in a speech on April 5, 2006) expects that the Common Consolidated Corporate Tax Base, the most likely means of consolidation, would enhance competitiveness, boost growth and promote the creation of jobs in the EU. With the aim of an applied general equilibrium model of corporate taxation in the European Union, the current paper investigates whether consolidation indeed may deliver these economic benefits. Does it justify EU involvement in corporate taxation?

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Coen Teulings  
Director





## Summary

Companies operating across the internal market are hampered by tax obstacles such as high compliance costs for cross-border operations, transfer pricing and the lack of cross-border loss compensation. These obstacles are inherent in the current system of separate accounting (SA), where the corporate income of foreign subsidiaries of multinational enterprises is treated separately for tax purposes. In its 2002 Tax Communication, the European Commission proposed consolidation of the tax base as an answer to the inherent difficulties of separate accounting and the large compliance costs. The consolidated base has to be apportioned to the member states to guarantee their ability to tax corporate income.

The aim of consolidation is to improve competitiveness in the European Union. Yet, the economic effects of consolidation with formula apportionment are hardly known. This study performs a numerical assessment of the economic effects using the computable general equilibrium model *CORTAX*. This model is designed to investigate corporate tax base consolidation in the European Union. The model captures the main features of corporate income taxation in 17 EU member states and the United States. It includes the investment and labour-demand decisions of both multinational enterprises (MNEs) and domestic firms. Moreover, the model allows for a welfare analysis by considering the optimal response of households to changes in taxes and factor rewards. This welfare analysis answers questions on the efficiency of the corporate income tax system in the European Union and on the distribution of the gains and losses of consolidation.

In a recent communication, the European Commission (2006) reemphasises the need for consolidation and proposes to proceed along the lines of the Common Consolidated Base Taxation (CCBT). This proposal reduces the compliance costs for internationally operating enterprises. In addition, shifting paper profits across jurisdictions becomes meaningless if the tax base is consolidated. Unfortunately, the CCBT not only delivers these gains, but also contains two distortive elements. First, formula apportionment, which is needed to allocate the consolidated taxable profits across jurisdictions, creates new tax planning possibilities for MNEs. Second, an unlevel playing field is introduced if only part of the firms participate in the consolidation.

Formula apportionment creates new tax planning possibilities for MNEs. Tax planning is the ability of firms to minimise their tax obligations by shifting profits or economic activity across jurisdictions. Transfer pricing, the most common means of tax planning in the current system of separate accounting, will become meaningless with the consolidation of the tax base. However, with formula apportionment, the share of the tax base apportioned to each jurisdiction can be influenced by shifting economic activity from one jurisdiction to another. Even though real

economic activity, like production or FDI, can be shifted less easily than paper profits to other member states, its economic impact is larger. The change in the tax planning strategy of MNEs, by reallocation instead of transfer pricing, therefore reduces welfare in the EU.

The second distortion is introduced if the common tax base is optional or if not all firms are allowed to participate. It results in a different treatment of MNEs and domestic firms, if the latter are excluded from the common base and still have to apply to the base of their home country. This creates an unlevel playing field between firms and leads to a reduction of GDP, employment and welfare.

Europe hardly benefits on average from the common consolidated base taxation. The gains from a reduction in compliance costs and the elimination of transfer pricing are offset by the efficiency losses from reallocation. Corporate tax revenues decline on average by about 2% due to the expansion of firms in member states with low tax rates and/or narrow tax bases. Alternative means of financing have to be found in order to balance the government budget. The resulting gains in GDP and welfare are small, respectively 0.05% and 0.01% of GDP, which shows that the distortions introduced by the CCBT offset the gains from consolidation.

Some member states gain, where others lose, from the consolidation and apportionment of the tax base. First, multinationals in most member states gain from consolidation and from the alternative route for tax planning. This gives them a competitive advantage over domestic firms, which do not benefit from tax base consolidation. Second, governments in countries with a broad tax base lose from consolidation if the common tax base is defined at the current EU average. A broader definition of the tax base generates more corporate tax revenues, but distorts investments. Third, welfare improves in member states with large shares of multinational enterprises, below-average tax rates and/or broader-than-average tax bases. A low tax rate matters, because it makes member states relatively attractive for multinationals. A broad tax base matters, because the common base is less distortive. And the openness of countries matter, because these countries are most sensitive to corporate tax reforms.

Consolidation intensifies competition in tax rates, which reflects the benefits from having a low tax rate. The switch by multinationals from favourable profit shifting (under separate accounting) to attracting production (with formula apportionment) implies that the gains from unilateral reductions in the tax rate increase. Simulations show that consolidation implies an optimal reduction in tax rates by individual member states of 10 to 20 percentage points.

One of the disadvantages of CCBT, namely the uneven treatment of multinational and domestic enterprises is obviated in the alternative EC-proposal of Home State Taxation (HST). In this proposal, domestic firms and multinational headquarters are treated equally, as they all have to apply to the tax rules of the member state in which they operate. However, unevenness is now created between subsidiaries from different home countries, which again offsets the initial gains from consolidation. The EU on average hardly gains nor loses from HST: welfare is unchanged and GDP declines slightly.

The second disadvantage of CCBT depends on the design of the apportionment formula, but cannot be fully overcome by a proper design. The largest distortions are introduced if apportionment is based on a single production factor, e.g. on employment or on capital. The incentives for reallocation are minimised if the apportionment formula resembles the distribution of corporate income of MNEs and is based on activities which cannot easily be affected by firms. However, even in this best case, formula apportionment generates an efficiency loss for the European Union.

The reason why formula apportionment and its design matters a lot, is the large differences in tax rates in the European Union. These tax differentials trigger tax planning, by reallocation of production or sales to low-tax countries. This tax planning can be tempered, but not eliminated by a proper choice of the apportionment formula. Only the harmonisation of tax rates can undo the incentives for reallocation.

The gains from consolidation can only be fully grasped if it is obliged for all firms and if it is accompanied by a harmonisation of the tax rate. In this far-reaching scenario, known as the European Union Corporate Income Tax, a welfare gain between 0.1% and 0.2% of GDP can be obtained.



# 1 Introduction

Companies operating across the internal market are hampered by tax obstacles such as high compliance costs for cross-border operations, transfer pricing and the lack of cross-border loss compensation. These obstacles are inherent in the current system of separate accounting (SA), where the corporate income of foreign subsidiaries of multinational enterprises is treated separately for tax purposes. Although SA has been applied in the European Union since decades, changing circumstances have questioned its desirability and practical viability. Indeed, SA was appropriate when most European businesses operated at a national level and when cross-border multinational transactions involved primarily tangible goods. However, increased EU economic integration through the Single Market stimulated many European companies to operate at the EU level. Moreover, the nature of cross-border multinational transactions has changed dramatically. It is ever more frequent that intra-firm transfers involve intangible goods (e.g. copyrights, patents) which are very difficult to price (Martens-Weiner, 2006).

On the one hand, this context has left tax authorities with significant difficulties to apply the separate-entity taxation and the arm's length principle. On the other hand, multinational enterprises (MNEs) have more ease to apply transfer pricing and other profit shifting techniques in order to reduce their tax payments. As a response to these developments, tax authorities have increased the documentation requirements and penalties to curb MNE profit shifting, which results in high compliance costs for EU companies (European Commission, 2004a).

The European Commission (2002) proposed consolidation of the tax base as an answer to the inherent difficulties of separate accounting and the large compliance costs. Indeed, profit shifting will be meaningless and compliance costs will be reduced substantially if tax bases are consolidated. In addition, consolidation will facilitate loss-compensation across jurisdictions (Nicodème, 2006).

Harmonisation of the tax rate is considered to be a bridge too far, as it would overrule the primacy of member states in corporate tax policy. As a solution, member states are allowed to tax a fraction of the consolidated base at their own rate. This requires the apportioning of the consolidated base to the member states, presumably with some kind of apportionment formula.

Formula apportionment (FA) is a way to distribute the tax base between the member states. Some measure of economic activity is used to determine which fraction of the consolidated base is generated in each jurisdiction and may therefore be taxed by each tax authority. Among the potential advantages of formula apportionment is that it reduces the ability of MNEs to apply tax planning strategies, i.e. the ability of firms to minimise their tax obligations by shifting profits or economic activity across jurisdictions (Martens-Weiner, 2006; Sørensen, 2004). Transfer pricing is the tax planning strategy most commonly applied in the current system of separate accounting, but will become meaningless with the consolidation of the tax base. However, formula

apportionment opens up new tax planning possibilities for MNEs, as the apportioned share of the tax base to each jurisdiction can be influenced by shifting economic activity from one jurisdiction to another. By increasing the share of profits in low-tax member states, firms may minimise their tax payments.

The aim of consolidation is to improve competitiveness in the European Union. Yet, the economic effects of consolidation with formula apportionment are hardly known. We can learn from the existing systems in the United States and Canada (Martens-Weiner, 2006). However, economic effects likely depend on both the kind of consolidation and of the economic structure in the EU. For example, tax rate differentials are much larger in the EU, which might have important implications for the economic and welfare effects of formula apportionment. Additional insights into consolidation and formula apportionment can be gained by theorising on the responses of firms and the implications for government revenues (Mintz and Weiner, 2003; Nielsen et al., 2006). Still, an integrated framework is needed, allowing for numerical assessments of the economic outcomes of consolidation with formula apportionment in comparison with the current SA system (Devereux, 2004; Gérard, 2002).

This paper applies such an integrated framework, namely the computable general equilibrium model *CORTAX*, to consolidation in the European Union. The model is designed to investigate these issues, by including consolidation and formula apportionment in a model which is otherwise extensively based on the model by Sørensen (2004). *CORTAX* is therefore the first CGE model applied to consolidation and formula apportionment in Europe (see Edmiston (2002) for an application to the United States). With this model, we investigate the economic and welfare effects of reforming the corporate income tax base in the European Union.

Does consolidation improve the economic efficiency in the European Union by reducing corporate tax distortions? This central question will be supplemented with several others. Does it contribute to employment and GDP? How are the gains and losses distributed within member states, between say domestic firms and multinationals, and between firms and households? Finally, consolidation opens up the opportunity for governments to attract foreign investments by cutting tax rates; does consolidation trigger tax competition?

The answers to these questions depend on the type of consolidation and the details of the apportionment formula. We investigate the following alternatives.

The first choice is about the scope and design of consolidation (see section 3 for a detailed discussion of these proposals). Four alternative types of consolidation have been put forward by the European Commission in its 2002 Tax Communication (European Commission, 2002). Currently, the European Commission (2006) seems to favour the option with a common consolidated tax base, to which multinational enterprises may choose to switch. A practical alternative, which does not require the introduction of a common tax base, is home state

taxation, where each enterprise may consolidate its taxable profits according to the rules of its home state. In more far-reaching proposals, consolidation is made compulsory and the common base is applied to domestic firms too.

The second crucial choice is about the apportionment formula, which is needed to allocate profits across jurisdictions. However, formula apportionment opens up new tax planning possibilities for MNEs. Moreover, it might induce strategic behaviour by governments to attract FDI by cutting tax rates (and thus intensifying tax competition) or by affecting the weights in the apportionment formula. Whether or not the European Union should allow for competition in factor weights is an unresolved issue. However, the economic literature has shown that the ability of each jurisdiction to change and strategically determine its factor weights, has in general, negative welfare implications (see section 2.2). For this reason, we investigate the more transparent uniform system, but allow for competition in tax rates.

The relevance of apportionment is acknowledged by the European Commission (2006), but its implementation is left open. In the paper we therefore investigate several alternatives, without pretending to be exhaustive.

The structure of the paper is as follows. Section 2 contains a survey from the theoretical and empirical literature on the pros and cons of formula apportionment. Section 3 summarises the proposals for consolidation by the European Commission, and surveys the commentaries on the 2002 Tax Communication. Section 4 introduces the *CORTAX*-model and describes in particular how we implement consolidation, formula apportionment and compliance costs in this model.

We then turn to the numerical assessment of consolidation and formula apportionment. Section 5 investigates the switch from the current system of separate accounting to consolidation according to the rules of common consolidated base taxation (CCBT). Section 6 discusses the consequences of the choice of the apportionment formula, within this CCBT-framework. Section 7 turns to the question whether consolidation will intensify competition in tax rates. Section 8 investigates two alternative EC-proposals, namely home state taxation (HST) and European Union Company Taxation (EUCT). Section 9 summarises our main findings.





## 2 Literature survey on formula apportionment

The current system of corporate taxation in the European Union is known as separate accounting, where multinational enterprises (MNE) have to file the tax return in every member state separately. Two elements of this system are seen to be detrimental for the well functioning of the internal market. First, the cross-border activities of MNEs have to be valued in order to determine the taxable profits of each MNE in all member states. This valuation allows for tax planning strategies, as MNEs may set high (low) transfer prices for cross-border deliveries towards high-tax (low-tax) countries. Second, the multiple filing involves high compliance costs.

Consolidation of the tax base solves both problems as it adds up all the taxable profits of the MNE (within the EU) into a single base. In the existing consolidated systems of the United States and Canada, and in the proposed system of the European Commission (see section 3, in particular the CCTB-proposal), the consolidated base is apportioned, via some well-defined formula, towards each jurisdiction. In the EU, this would allow the member states to tax their part of the corporate tax base at their own tax rate.<sup>1</sup>

In the literature that deals with formula apportionment (FA), two topics have received most of the theoretical and empirical analysis: the tax planning strategies employed by MNEs and the strategic decisions to define the apportionment formula by governments. We discuss both issues in turn, and present the available empirical evidence related to the implementation of FA in the US and Canada.

### 2.1 Tax planning strategies by MNEs

When the corporate income tax (CIT) is not fully harmonised between different jurisdictions (i.e. the tax rates are not equal and/or the tax base is not fully consolidated), MNEs have incentives to apply tax planning strategies. The objective of these strategies is to reduce the total CIT payment of the MNE.

A central concern for tax authorities is the increased difficulty to measure transfer pricing using the arm's length principle.<sup>2</sup> These difficulties have increased the scope for tax planning activities by MNEs which is an important distortion under SA. It is expected that tax base consolidation will eliminate the possibility of MNEs to shift profits using transfer pricing mechanisms.

<sup>1</sup> Consolidation and formula apportionment are more precisely defined in the box on page 18, which also includes the applications in the US and Canada.

<sup>2</sup> Arm's length pricing means that taxable income of a corporation's activity in each jurisdiction is based on computing the value of transactions between related affiliates as if they had occurred by independent parties in the market place (Kind et al., 2005).

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## Consolidation and formula apportionment

Consolidation is the central theme in the EC proposals. It means that similar rules and criteria are implemented to estimate corporate profits between jurisdictions and to obtain the consolidated profits of the MNE.

These consolidated profits might be apportioned to the member states according to well-defined rules. Formally, if these consolidated profits are given by  $\pi$ , then the tax revenue of each jurisdiction  $j$  can be expressed by:

$$TR_j = \tau_j \phi_j \pi \quad (2.1)$$

where  $\tau_j$  is the statutory corporate tax rate applied in  $j$  and  $\phi_j$  is the apportionment share of jurisdiction  $j$ ; i.e. the share of the total corporate tax base assigned to  $j$ . The central idea of FA is that  $\phi_j$  reflects the share of corporate income generated by the MNE in each jurisdiction.

The next step is to estimate the share  $\phi$  of corporate income by relating it to measurable factors related to the input (labour, capital) or output (sales) of corporate activity. In principle, several formulae can be designed using different combinations of apportionment factors and their respective weights. In practice, there are four countries (i.e. USA, Canada, Switzerland and Germany) that currently apply some kind of FA in their tax system.<sup>a</sup>

Each province in Canada uses a formula which includes the ratio of the provincial levels of sales ( $S_j$ ) and payroll ( $P_j$ ) to the national total values (i.e.  $S$ , and  $P$ ). The shares of sales and payroll are equally weighted in all provinces. The fraction of the total tax base accruing to each province can then be expressed as:

$$\phi_j^{CA} = 0.5 \left( \frac{S_j}{S} \right) + 0.5 \left( \frac{P_j}{P} \right) \quad (2.2)$$

The apportionment formula in the US is extended in two ways. First, it includes a third factor capital ( $K$ ). In addition, each state ( $j$ ) can independently choose the weights ( $f_j^S, f_j^L, f_j^K$ ) they use for each factor. Thus, the apportionment formula is given by:

$$\phi_j^{US} = f_j^S \left( \frac{S_j}{S} \right) + f_j^P \left( \frac{P_j}{P} \right) + f_j^K \left( \frac{K_j}{K} \right) \quad \text{where } f_j^S + f_j^P + f_j^K = 1 \quad (2.3)$$

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<sup>a</sup> Mintz and Weiner (2003) present a short summary of the FA systems used for each of these countries. However, by far the US and Canadian system have been the most researched. Weiner (1999) presents an in-depth description of the US system, while Mintz and Smart (2004) describe the Canadian system.

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Transfer pricing, however, is not the only instrument used by MNEs to reduce tax payments.

Gérard (2002, 2006) moves beyond the issue of transfer pricing and incorporates in his analysis these other tax planning strategies. Gérard (2006) classifies all the tax planning strategies into three main groups:

1. Allocation and investment decisions.
2. Transfer pricing.
3. Financial detour strategies.

All these strategies could be used by MNEs if either tax rates or tax bases are not fully harmonised between participating jurisdictions. Moreover, they create distortions of their own on the type of finance, the legal organization, and the location of parents and subsidiaries. Thus, Gérard (2006) argues that only a perfectly integrated tax system can eliminate these distortions. For both the SA and FA system, this is fully achieved only with both tax rate and tax base

harmonization. In this scenario, however, FA is a superior system since it implies a reduction in compliance costs and the possibility of loss compensations between subsidiaries of the same MNE.

We proceed to review the literature that deals with each of these tax planning strategies.

### **2.1.1 Allocation and investment decisions**

When the apportionment formula is not homogenous and/or CIT rates differ among jurisdictions, the CIT can be traduced as excise taxes on the specific factors included in the formula, see box on excise taxes. This implies, for example, that if apportionment is (partly) based on payroll, then the labour demand by MNEs is distorted by differences in the corporate income tax between jurisdictions.

Econometric studies for the United States and Canada, surveyed by Edmiston (2002), reveal that changes in the factor weights significantly influence the demand or supply of that factor. Moreover, he shows that the magnitude and sign of the effect depends on the size, industrial make-up, and levels of statutory tax rates in each jurisdiction. In particular, differences in tax rates between jurisdictions will determine the impact of the factor weights in the apportionment formula on allocation and investment. In the following, we repeatedly return to this factor reallocation as a tax planning device.

Already in the current system of separate accounting, the corporate income tax influences the allocation and investment decisions of MNEs. In a review of the literature, De Mooij and Ederveen (2003) find substantial differences in the empirical methods and data employed by different studies. Thus, they perform a meta analysis to estimate the semi-elasticity of FDI to the CIT rate, and report a value of  $-2.4$  when the average corporate tax rate is used. If the statutory rate is used instead, the value is reduced to  $-1.2$ . When FDI data is adjusted to exclude mergers and acquisitions, the elasticities remain high, and increase to  $-5.7$  when only new plants and plant expansions are used instead of total FDI. Therefore, it is clear that CIT policies matter greatly for investment and allocation decisions.

Since differences in CIT rates play such an important role in MNE investment, it is useful to look at tax rate differentials between jurisdictions. Based on the methodology presented by Devereux and Griffith (1999), the European Commission (2002) finds high CIT rate differentials within the EU15. These results are reinforced by Devereux et al. (2004) and Jacobs et al. (2005) who find a large dispersion on the effective tax burdens in the expanded EU25. These significant tax differentials suggest an important potential for production reallocation between member states. Thus, the use of different tax planning strategies by MNEs within the EU can be significant and must be considered while modelling the behaviour of MNEs. In an analytical framework, this is specially true when long-term scenarios are considered, and production factors can reallocate easier.

CIT rate differentials within the US are much smaller than in the EU. The tax differential between the highest and lowest statutory CIT rate in US states is about 8 percentage points,

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### Excise tax with formula apportionment

The early literature (McLure, 1980; Gordon and Wilson, 1986) already identified the main tax distortions created by FA. Indeed, when the apportionment factors, their weights and/or the CIT rates differ over the different jurisdictions, then the FA can be traduced as excise taxes on the factors weighted in the formula. For example, the excise tax on labour  $\tau_\pi^L$  can be written as (see Bettendorf and Van der Horst (2007) for the derivation):

$$MPL = w \left[ 1 + \frac{\tau_\pi^L(i)}{1 - \tau_\pi^{fa}(i)} \right] \quad (2.4)$$
$$\tau_\pi^L(i) = f^P \frac{\pi(i)}{w(i)L(i)} \left[ \tau_\pi(i) - \sum_s \tau_\pi(s) \frac{L^f(i,s)}{L(i)} \right]$$

The first equation shows that the excise tax raises the wage costs by firms (a subsidy will reduce it) by affecting the equality between the marginal productivity of labour,  $MPL$ , and the wage rate,  $w$ . The second equation relates the excise tax to the deviation of the statutory CIT-rate in the home country or state  $\tau_\pi(i)$  to the weighted average of the statutory rate in all countries or states where the MNE is active. This tax gap is weighted with the relative size of consolidated profits  $\pi$  to payroll  $P$  and the weight on payroll  $f^P$ . Similar excise taxes can be derived for other apportionment factors.

From these equations, it is clear that the excise taxes (subsidies) in a country or state arise from deviations from the statutory rate from the factor-weighted national average. Only in the case of uniform tax rates *and* equal apportionment weights (as in Canada) will the factor-specific excise taxes disappear. When this tax rate harmonization is reached, then the FA system will resemble a corporate tax levied at the national level.

In general, these factor-specific distortions create complicated incentive effects for both the MNEs and governments alike. MNEs have incentives to change location and their factor allocation (see section 2.1), while a government has incentives to adjust the weights of the apportionment factors and this in turn, creates strategic interactions with other tax authorities (see section 2.2). However, even when the factor weights are fixed, Mintz (1999) also points out that fiscal externalities will persist when member states can levy different tax rates, credits or surtaxes.

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while it is about 30 percentage points in the EU25. These figures indicate that the tax rate differential and levels are significantly different between both regions and tax rate competition is expected to be a more critical issue for the CIT tax reforms of the EU.

#### 2.1.2 Transfer pricing

If there is tax base consolidation and it is compulsory for all MNEs, it is commonly assumed that switching to FA will eliminate the possibility of MNEs to use transfer pricing as a tax planning device. However, to reach this conclusion one has to assume as well, that there is perfect competition in the industries where MNEs operate. Otherwise, Nielsen et al. (2003) and Kind et al. (2005) argue that under conditions of imperfect (oligopolistic) competition, a transition from separate accounting (SA) to formula apportionment (FA) does not eliminate the problem of transfer pricing. In their models it is assumed that transfer pricing is also a strategic device in a Cournot competition setting. In this context, MNEs have incentives to use transfer pricing strategies to improve their competitiveness against rival firms. Therefore, while FA eliminates the profit shifting incentives of transfer pricing, it does not eliminate the strategic competition ones, and the transfer pricing distortions are kept in place.

Both papers do not consider production reallocation or other tax planning strategies. Thus, their models miss much of the interactions between CIT and MNE decisions. Therefore, although they present interesting modelling features for transfer pricing, their analytical framework can only partially evaluate the welfare implications of moving from a SA system to a FA system.

Nielsen et al. (2006) construct a model where, besides the transfer pricing mechanism, MNE headquarters also share a common input with their subsidiaries. Thus, the interaction between transfer pricing costs and CIT rates affects both the input levels of the MNEs and the fiscal spillovers between countries. Under these assumptions, their model shows that a move from SA to FA will not clearly decrease tax distortions nor the fiscal spillovers associated with transfer pricing under SA. In some cases, moreover, the switch to an apportionment formula may even increase the CIT distortions.

Under SA, the interaction between profit shifting and the MNE location is explored in two papers. Mintz and Smart (2004) point out that if the government values both the tax revenues and the real investment of MNEs, then profit shifting may have ambiguous effects on welfare. If there are more possibilities to shift profits between jurisdictions, then MNEs have less incentives to reallocate production. The other paper is by Peralta et al. (2006). They use a fiscal competition model where the government has two instruments: the CIT rate and the tightness in the control of profit shifting. In this case, tougher transfer pricing rules can be costly for governments, since MNE can respond by delocalising. Thus, some governments find it attractive to have high CIT rates but lose profit shifting controls.

These papers illustrate that the evaluation of how transfer pricing changes with FA or SA is not enough to provide a complete welfare analysis. The inclusion of production or factor reallocation decisions by MNEs is also needed.

### **2.1.3 Financial detour strategies**

If consolidating profits between different jurisdictions is not compulsory for MNEs, then they can also use financial detour strategies to reduce tax payments. This third tax planning strategy by MNEs consists of establishing an “administrative subsidiary” as a financial centre in a third-party country where profits are not consolidated. This subsidiary, which is usually not directly related to production or sales activities, can be used by the MNE to manipulate and devise complex financial operations involving dividends and interest payments, capital gains and the transfer of business income between different subsidiaries.

When this third strategy is incorporated into the analysis, a better picture of the strategic interactions between CIT and MNE can be obtained. Gérard (2006) uses a multi-stage model to include the three tax planning strategies mentioned before, plus the strategic decisions of governments that maximise welfare. To illustrate his model, he uses a numerical case study, which is later complemented with an analytical model. An important feature of this paper, is that it distinguishes between “paper profits” and “real profits”. In this way he decomposes the MNEs

decisions in two steps. In a first step MNEs make decisions to maximise profits by choosing production and distribution locations. In a second step, other tax planning strategies are employed to minimise their tax payments.

In this more complex, but realistic setting, the welfare implications of moving from FA to SA are conditional on several elements:

- the ease on which the firm can manipulate the chosen formula factors.<sup>3</sup>
- the integration of the consolidated FA system with the rest of the world.
- if the consolidation is made compulsory or not.

Since the EC proposals will most probably not be compulsory, this means that third country detour strategies within the EU will remain a significant source of CIT distortions.

## **2.2 The design of the apportionment formula by governments**

The decision to apply a specific apportionment formula is non-trivial. As a result of the implicit excise taxes on the apportionment factors, tax authorities have incentives to strategically choose these factors and their respective weights. As shown below, the ability of each jurisdiction to change and strategically determine its factor weights, has in general, negative welfare implications.

Based on most of the theoretical models and the empirical results presented above, it is clear that jurisdictions have incentives to unilaterally change their factor weights in order to increase production, investment and/or employment levels. This result has been confirmed by Omer and Shelley (2004) who find that in the US there is substantial interstate competition to attract firms that operate on a national level.

In the US these strategic interactions have developed into a tendency, beginning in about 1980, to place higher weights on the sales factor. Following the insights of Gordon and Wilson (1986), reducing the weights on payroll and property will reduce production costs in that jurisdiction and induce MNEs to reallocate production there.<sup>4</sup> This mechanism is referred to as the “economic development” incentive of CIT, since reallocation implies increased employment and capital inflows. This effect is confirmed by the empirical review of Edmiston (2002), who reports evidence of a moderate positive production increase associated with changes in the factor weights. Goolsbee and Maydew (2000) present strong empirical results that confirm the externalities associated with strategic FA. They also point that changes in the factor weights by single States have significant externalities on other States.

This empirical evidence confirms the results of some game theoretical papers. For example,

<sup>3</sup> This includes the mobility of MNE activities between jurisdictions.

<sup>4</sup> Implicit to this reasoning, is the fact that administratively, sales are taken at their destination, and not at their origin as will be preferred.

Anand and Sansing (2000) deal with the incentives of governments to change weights and the related game theoretical issues. They show that a harmonised apportionment rule will be the cooperative solution, but jurisdictions have strong incentives to deviate from this solution. This creates a typical prisoner's dilemma situation. Thus, social welfare will be higher when a common formula is employed.

A second issue is whether apportionment should be based on mobile or immobile factors. Two papers shed some light on this issue. Wellisch (2004) demonstrates that when using two apportionment factors, one immobile (labour) and the other mobile (capital), it will be optimal for the government to allocate all the weight to the immobile factor. In this case, the CIT tax is transformed into a labour tax that reduces wages and there will be no incentives for tax competition between jurisdictions. However, usually the mobility of the apportionment factors is not so clear cut, and he does not consider the case where MNEs can reallocate production to take advantage of factor price differentials.

A related but analytically more complex model is presented by Pethig and Wagener (2003). They analyse how the use of different apportionment formulae affects tax rate competition. In their model different formulae interact with the degree of factor mobility and the properties of the production function. They also find that allocating higher weights to immobile factors is optimal for tax authorities.

## **2.3 Empirical evidence**

We group the main empirical papers into two broad questions:

1. Do variations in the apportionment formula affect investment and employment decisions by MNEs?
2. Do firms use tax planning strategies and shift factors to take advantage of tax differentials under FA?

The first question implicitly assumes a combination of different factor weights and CIT rates between jurisdictions. This set of studies analyses the US experience. On the other hand, the second question analyses tax differentials only when the factor weights are fixed, which is the Canadian FA system. In any case, the empirical evidence points to a positive answer to both questions.

### **2.3.1 FA and factor reallocation in the US**

Weiner (1994) finds no statistical influence on production decisions from the cross-state variation in the formulae used by the States in 1977. However, when she analyses the changes in the States' CIT rates and property factor weights between 1982 and 1990, she finds a statistically significant effect on investment spending by State, but the effects are not very large.

Klassen and Shackelford (1998) report a significant negative relation between the sales excise rate (i.e. CIT statutory rate times the sales factor weight) and the location of MNE activities. Gupta and Hofmann (2003) find an elasticity in the range of  $-0.18$  to  $-0.35$ , for new capital expenditures with respect to the capital excise rate.

Moreover, Goolsbee and Maydew (2000) present strong empirical evidence supporting that the apportionment formula affects MNEs decisions. In particular, they find a significant reaction of state employment to changes in the payroll weights. A reduction in the payroll weight from  $1/3$  to  $1/4$  increases employment by around 1.1%.

### **2.3.2 FA and factor reallocation in Canada**

The Canadian experience, where all Provinces use a formula with common and fixed factor weights,<sup>5</sup> shows that MNEs still use tax planning strategies to exploit differences in the CIT rates between Provinces. The empirical results by Mintz and Smart (2004), using administrative tax data for Canada, find that the elasticity of taxable income to tax rates is significantly higher for firms able to engage in profit-shifting strategies (4.9) than for other comparable firms (2.3).

Likewise, Weiner (1994) concludes that tax rate competition is highly effective in Canada. Using panel data from 1962 to 1989 she finds that reductions in CIT rates are strongly associated with increases in provincial investment. Moreover, Klassen and Shackelford (1998) find evidence for both the US and Canada consistent with corporations shifting their tax bases to tax-favourable jurisdictions.

Tax rate competition affects investment in both SA and FA. However, the incentive to re-adjust property shares under FA creates a second effect that is not present with SA. Thus, the standard point of view is that FA increases tax competition between jurisdictions. This view is supported by the models of Gordon and Wilson (1986) and Nielsen et al. (2006). On the other hand, Sørensen (2004) argues that this “secondary” effect under FA is not assured and under some circumstances is not present. For example, Wellisch (2004) points that it does not exist at all in the Canadian formula where there is no property factor.

If all countries applied the same formula, Pethig and Wagener (2003) argue that tax rate competition will generally be stronger if there is a higher weight on the payroll factor, since labour is assumed to be the least mobile factor, compared to property and sales. Finally, Kolmar and Wagener (2004) point that tax rate competition is independent of the tax base under SA, but both the tax base and the formula simultaneously affect tax rate competition under FA.

An important result found by Mintz and Smart (2004) is that since it is not compulsory for Canadian firms to consolidate their accounts, many firms use this loophole to engage in tax planning strategies also employed under a SA system.

<sup>5</sup> See box on consolidation and formula apportionment.



### 2.3.3 Corporate tax analysis in CGE models

Edmiston (2002) builds a computable general equilibrium (CGE) model to evaluate the strategic formula apportionment policies in the US. The model was aggregated to eight regions and eight industrial sectors and was calibrated to data from the 1992 US economy. To obtain a short run and a long run scenario, he models the production aggregation function using a CES formulation that includes an elasticity of substitution in the location of production. Since there is a limit to production reallocation, Edmiston chooses a higher elasticity for the long run specification (5.0) and assumes that labour is mobile. For the short-run version of the model, labour is geographically immobile and the location elasticity is close to zero (0.3).

Edmiston (2002) applies this CGE model to compare the long-run economic equilibrium when only the sales factor is used ( $f_j^S = 1$ ) to a scenario where all factors have equal weight ( $f_j^S = f_j^P = f_j^R = 1/3$ ). Moreover, to assess the strategic gains for each state, he first simulates the case where each region independently moves to  $f_h^S = 1$ , and then, when all regions simultaneously move in this direction.

He finds support for the economic development effects of strategic weight determination by US regions. In his simulations, when regions act independently and switch from an equal-weight three-factor formula to a single-factor sales formula, net capital inflows, employment and production all increase. In the long run, the percentage change in capital, labour and output is positive for each region, with the average increase being around 1%.

These impacts, however, are conditional on differences in industrial structure, the CIT statutory rates and the size of the US region. Hence, the output increases in a range from 1.4% to 0.2%. In general, small regions with a relatively capital-mobile industrial base and high statutory tax rates gain the most from the move to a single-factor sales formula.

In the case of a simultaneous move of all regions to a single-factor sales formula, there are both winners and losers. However, once a region moves towards a single-factor sales formula, all other regions have an incentive to move in the same direction. This results confirms the prisoner's dilemma situation mentioned before.

The magnitude of the economic development gains is much lower in the short run, when labour is immobile. Finally, his simulations show that the revenue impacts are significantly bigger than the economic development gains, especially in the short run.

Although not designed to explicitly deal with FA, Sørensen (2001, 2004) constructs a CGE model of tax competition and coordination: *OECDTAX*. This model includes profit shifting via transfer pricing assuming SA. Sørensen (2004) estimates the welfare gains from a complete CIT rate and base harmonization in the EU.<sup>6</sup> He does not consider the consolidation of the tax base,

<sup>6</sup> In a recent paper, Sørensen and co-authors (Brøchner et al., 2006) extend the analysis by simulating enhanced cooperation, where only the tax base and rate are harmonised in the euro-area, which sizes down the gains from tax harmonisation.

and therefore does not have to introduce formula apportionment in the model. The welfare gains of harmonisation are just between 0.1 and 0.2%,<sup>7</sup> where the majority of member states benefits, but some will lose. Since Sørensen does not consider welfare gains from lower compliance costs, he concludes that only if these costs are significantly reduced, it will be attractive for Member States to seek tax harmonization and give up sovereignty on corporate taxation.

Devereux (2004) also highlights the crucial role that reducing compliance costs can play when assessing the welfare implications of switching to FA. In addition, he discusses the intrinsic problems of analysing equity and efficiency issues in CGE models. He argues that the equity issues are too complicated to analyse and estimate, and thus, should not be taking into account when designing international taxes.

We summarise this section with two concluding remarks. First, the literature emphasises that within a FA system, there still exist tax planning strategies that can be employed by the multinationals. Thus, the distortions associated with these tax planning strategies are still present; unless the shift to FA also includes a compulsory harmonisation of the tax rate and the tax base. As a consequence, there is the possibility that the overall distortions associated with the CIT are greater under FA, than with SA.

Secondly, the design of the specific apportionment formula is crucial for the economic performance of the system. This is a direct consequence of the strategic incentives that governments have to change the formula, combined with the potential distortions induced by profit shifting strategies under FA. Although there is no ideal FA system, the evidence suggests that the option where jurisdictions can independently determine their factor weights should be avoided. Another recommendation is that the factors should be chosen to limit the profit shifting allocation decisions of MNEs. However, there are no clear candidates that can fully achieve this goal.

<sup>7</sup> Similar welfare gains are simulated in Copenhagen Economics (2004) with *CETAX*, which is a slightly adjusted version of *OECDTAX*. A somewhat larger welfare gain of 0.4%GDP is obtained in a simulation with harmonisation at the equal-weighted rate and base. This unweighted average, however, implies a significant reduction in the CIT-revenues, which reduces the average distortiveness of the CIT.

### 3 The 2002 Tax Communication

In the 2002 Tax Communication,<sup>8</sup> the European Commission presents an overview of the current state of the corporate income tax (CIT) system in the EU and proposes several changes to the current system. We describe the main issues included in this report and the reactions it generated in the economic literature.

The European Commission (2002) points to three main reasons for consolidating the tax base for MNEs within the EU.

- Increase economic efficiency, by improving the allocation of capital within the Internal Market. This also entails the ease of cross-border mergers and multinational activities. However, the aim is to balance the trade-off between tax neutrality and other welfare considerations (i.e. equity preferences and the provision of public goods).
- Reduce the compliance costs associated with the existence of 25 separate tax systems in the EU.
- Eliminate the transfer price problem. The difficulties to apply the arm's length principle have increased the compliance costs for tax authorities and businesses alike; while it facilitates the use of tax planning strategies by MNEs.

The European Commission considers that a comprehensive approach, which provides a single common consolidated tax base for MNEs, is the best way to deal with these problems. Within this comprehensive approach, four alternative schemes are proposed:

1. Home State Taxation (HST): the tax base would be computed in accordance with the tax code of the company's home state (i.e. where the headquarter is based). This system will be optional for MNEs and the CIT rates will still be determined by each Member State.
2. Common Consolidated Base Taxation (CCBT): this will create new harmonised EU rules for the determination of a single tax base on an European level. It will also be optional and country-specific CIT rates are applied.<sup>9</sup>
3. Compulsory Harmonised Corporate Tax Base (CHCTB): a single compulsory EU company tax base and system, as a replacement for existing national systems. This system will be mandatory for all companies, domestic as well as international. However, Member States will still determine the CIT rates.<sup>10</sup>
4. European Union Corporate Income Tax (EUCIT): the CIT will be levied at the European level using a new EU tax base and single tax rate. Part or all of the revenue could go directly to the EU. The system will be compulsory, but only for MNEs.

<sup>8</sup> European Commission (2002). This document is also referred to as the Bolkestein Report.

<sup>9</sup> In a later communication, the European Commission (2006) refers to this proposal as the Common Consolidated Corporate Tax Base (CCCTB).

<sup>10</sup> This option is also known as the compulsory CCCTB.

The first three approaches will implement formula apportionment (FA), while it could also be used in the last one. These proposals, in any case, are not strictly defined and some adjustments can (and have to) be made. However, the last two proposals will need the consensus of all Member States, and it is commonly acknowledged that this is very unlikely to happen (Cnossen, 2003). However, it is arguably a less momentous step than the creation of a single European currency (Devereux, 2004).

To clarify the different issues implicit in each proposal, Table 3.1 classifies each proposal by where the tax base and the tax rate will be determined and whether the consolidation is compulsory or not.

**Table 3.1 EC proposals, classification based on where the tax base and tax rate are determined**

		Tax base		
		National (optional)	EU (optional)	EU (compulsory)
Tax rate	National	HST	CCBT	CHCTB
	EU			EUCIT

### 3.1 Commentaries on the 2002 Tax Communication

Devereux (2004) presents a detailed analysis of the report. He argues that the report does not consider the interaction between corporate and personal taxes, which can also create significant distortions.<sup>11</sup> In general he favours the move towards FA, but concludes that only the CHCTB with a single tax rate will remove all distortions created by the CIT.<sup>12</sup> In a related paper, Weiner (2002) also overviews the 2002 Tax Communication and comments on the possible distortions that can be introduced by FA, which we mentioned in the previous section. Thus, she also concludes that most of the distortions can only be eliminated by implementing the harmonised CHCTB proposal. When moving from the current system to an intermediate one with FA, it is not clear what the final efficiency changes will be.

Cnossen (2003) points that the report focuses only on capital allocation distortions between member states, but not within the states. He argues that these within-country distortions are significant and their elimination should be a prerequisite for between-members tax neutrality. He also points to the potential distortions that can be introduced by switching from SA to FA.

Since CCBT and HST are the proposals most likely to be implemented, they have attracted additional attention. Cnossen (2003) first argues that both proposals will reduce cross-border obstacles faced by MNEs, but in turn, this will probably increase tax competition. Secondly,

<sup>11</sup> Regarding the interaction of CIT with other taxes, Eggert and Schjelderup (2003) find that a FA system is inferior to a property tax.

<sup>12</sup> Note that the CHCTB proposal with a single tax rate will be almost equivalent to the EUCIT. The only difference is that under EUCIT the CIT revenue will go directly to the EU, and will not be apportioned to the Member States.

since both systems will operate alongside national tax systems, they could also hamper the functioning of these systems. Finally, since both systems fall short of full tax rate and base harmonization, they also face the prospect of not reducing the CIT distortions currently found under the SA system. When comparing both proposals, Cnossen (2003) points that HST will intensify tax-related competition for headquarters locations. Thus, HST will create additional fiscal externalities not present under CCBT.

Another paper that compares CCBT and HST is Mintz and Weiner (2003). They employ a simple model with two countries and a formula that uses only the share of capital to apportion MNE profits. They find that the capital allocation distortion created by this specific formula can be positive or negative, but will be greater under HST than under CCBT. This result is driven by HST increasing the differentiation in effective tax rates faced by businesses operating in the same country. To sum up, both papers find that HST is inferior to CCBT.

Sørensen (2004) points that moving to a FA system will involve the resolution of important technical issues: how to define a multinational group<sup>13</sup>, how to choose a specific apportionment formula and how to measure the factors in this formula. He also includes among the disadvantages of HST, that it will probably imply a loss of tax revenue from an EU perspective, since MNEs will switch to HST if it implies a lower tax payment. However, HST has the advantage that it could be immediately adopted by the EU governments.

Another potential problem is that switching to a FA system may not be compulsory for all firms and/or Member States. Hence, this situation will not reduce compliance costs as much as in a compulsory system. In addition, it will leave open the possibility for MNEs to apply tax planning strategies between participating and non-participating countries (Martens-Weiner, 2006).<sup>14</sup> For tax authorities it will also imply the administration of two corporate tax systems, one for the MNEs and one for domestic firms. In turn, this may create distortions between large and small firms within Member States (Sørensen, 2004).

There is consensus, however, to the need for numerical assessments of the economic outcomes under different FA proposals in comparison with the current SA system (Devereux, 2004; Gérard, 2002). The welfare implications of the different efficiency and compliance costs will be very valuable to guide policy makers. Moreover, Gérard (2002) advocates for models that include at least one jurisdiction outside the consolidation region, to assess the flow of funds between the EU and partner countries (e.g. USA). However, a problem with the construction of such numerical assessments stems from the vague nature of the four proposals. In particular, the apportionment formula that will be used is not defined in the 2002 Tax Communication nor in the 2006 Communication on CCCTB (European Commission, 2006). There is no discussion about which factors will be included, which weights are applied; and the possibility or not of member countries to change these weights. All these issues are crucial for the welfare results, and analytically as important as changing from SA to FA itself.

<sup>13</sup> This point is also stressed by Mintz (1999) and Mintz and Weiner (2003).

<sup>14</sup> See also section 2.1.3.

In general, there is consensus that the current system should be changed, but the technical and political mechanisms to do so are unclear. Thus, the 2002 Tax Communication is seen as only a first step forward towards CIT consolidation.

### **3.2 Summary and lessons for the EU**

Although the 2002 Tax Communication clearly favours a move from the current SA system to one that uses FA, it does not propose a specific apportionment formula to be applied. Without a clearly defined FA system, the economic and welfare implications of the EC proposals are at best unclear. However, some general conclusions can be drawn.

First, although the EC proposal aims to reduce the efficiency distortions and profit shifting possibilities under SA, it is not clear that moving to FA can actually eliminate these problems. In fact, these distortions might increase under some circumstances. It all depends on the specific FA system implemented. In any case, only when a full tax base and rate harmonization is applied will all the efficiency distortions associated with the CIT disappear.

Second, disregarding the efficiency changes expected to occur when moving from SA to FA, possibly the major advantage of FA is that it creates the possibilities to significantly reduce compliance and administrative costs for businesses and tax authorities (Mintz, 1999). Thus, one important issue insufficiently analysed in the empirical literature, is the relative importance of these compliance and administrative costs with respect to efficiency gains and changes in government revenue.

Third, the main lesson is that the more uniform the apportionment formula the better. It is clear that allowing the member states to choose their own factor weights will be suboptimal for the EU as a whole as it may induce strategic interactions of member states.

The uniform factor weights should be chosen as to be as independent as possible from MNE decisions. However, which specific factors can achieve this is unclear. Classic factors are payroll, property and sales. Alternative suggestions are to use the VAT base or to allow for sector specific factors (Mintz, 1999; Mintz and Weiner, 2003; Hellerstein and McLure, 2004; Sørensen, 2004). In addition, the harmonization of the tax base will be a superior option than allowing member states and MNEs to choose between FA and the current system. Nevertheless, a tax base harmonization will probably be very difficult to implement politically.

To sum up, defining the specific apportionment formula that will be applied is a critical issue that has to be dealt with. In more specific terms, a positive lesson from the US is the need to consolidate the income of affiliated groups of countries (Hellerstein and McLure, 2004). While the Canadian experience shows that even with a harmonised tax base, jurisdictions can still use CIT rates to attract MNE. Thus, in this case the EU as a whole could gain from reduced compliance costs, while Member States will maintain the advantages of setting their own CIT rates (Martens-Weiner, 2006). However, there is also the danger that tax differentials under FA will create their own distortions.

## 4 The CORTAX model

The proposed reforms of corporate income taxation in the EU are simulated with the general equilibrium model *CORTAX*. The development of this model is heavily inspired by the *OECDTAX*-model of Sørensen (2001). The same model was used in Bettendorf et al. (2006), but extended in three ways for the current study. First, the current model includes the US. In contrast to the European countries, the US applies the worldwide residence-principle for corporate income taxation. The incorporation of the US also allows us to analyse the consequences of a country that does not participate in the shift towards tax base consolidation. Second, a system of tax base consolidation with formula apportionment is specified for the EU-countries. Thirdly, we consider compliance costs arising from company taxation. When separate accounting is no longer obliged for multinationals operational in several jurisdictions, compliance costs are reduced and efficiency gains can be achieved. Simulations with the extended model can give an indication about the contribution of lower compliance costs to overall welfare effects.

We first describe the main features of the model. Thereafter, the modelling is briefly discussed per sector. Attention is in particular given to the specification of corporate taxation in subsection 4.4 (including a detailed discussion of the main extensions).<sup>15</sup>

### 4.1 Main features of the model

- The model includes 17 EU-countries and the US. The EU-countries are the 15 old member states (with BEL and LUX joined) and the three largest new member states (CZE, HUN and POL).
- All markets are characterized by perfect competition. Location-specific rents are, however, introduced so that profits are not zero.
- All countries produce one homogenous good at the exogenous world price (the net supply by the rest of the world (ROW) is assumed perfectly elastic at the given price).
- Two type of assets are traded on the world capital market: bonds and equities. Bonds issued in different countries are considered perfect substitutes, yielding the same given world interest rate. The same holds for equities. An individual country cannot affect world interest rates (the net supply of each asset by ROW is assumed perfectly elastic at the given interest rate).
- We focus on the steady state version of the model. Calculation of the full transition path is beyond the scope of the current project.

<sup>15</sup> A detailed technical description of the basic model can be found in Bettendorf and Van der Horst (2006). The extensions are fully explained in Bettendorf and Van der Horst (2007).

## 4.2 Households

Following the standard overlapping generations model of Diamond, households are assumed to live for two periods.<sup>16</sup> Household decisions on consumption and labor supply are derived from the maximization of lifetime utility, which allows for a proper welfare analysis. An individual only works when young. Young households receive labour income (after taxes) and lump sum transfers. The difference between total income and consumption expenditures (including taxes) gives total savings. These savings are invested in bonds and stocks. Since both asset types are considered imperfect substitutes, an investor prefers to diversify his portfolio over both assets. Since older households do no work, consumption in the second period has to be financed by capital income (net of taxes), together with lump sum transfers.

*Calibration* is in general based on data from 2002.<sup>17</sup> Consumption expenditures are taken from the National Accounts, while labour supply is calculated from data on employment in persons and hours. Values for the main parameters of the household sector are given in Table 4.1.

**Table 4.1 Key parameters and (semi-)elasticities for households**

Population growth	0.5%	
Real return on bonds	2.0%	
Real return on equity	4.0%	
Rate of time preference	1.0%	
<b>Elasticities of substitution</b>		
Intertemporal	0.5	
Intratemporal (consumption-leisure)	1.0	
Bonds-Equity	4.0	
<b>Implied (semi-)elasticities</b>	Min	Max
Labour supply to wage	0.12	0.28
Savings to interest rate	0.35	0.80

## 4.3 Firms

Two types of firms are distinguished: domestic firms and multinationals. A domestic firm only operates in one country. In each country a representative multinational headquarter is located and each multinational is assumed to own one subsidiary in each foreign country.<sup>18</sup> The decisions by each firm are derived from maximizing its value.

<sup>16</sup> Dividing active life in two parts means that a period spans 40 years. We want to express the variables in annual terms while keeping the model tractable. We therefore impose that behavior is the same in each year of the period when young and when old.

<sup>17</sup> The assumptions and choices we have made in the calibration procedure are fully explained in Bettendorf and Van der Horst (2006).

<sup>18</sup> The location decision of a subsidiary is thus not modelled. In the absence of entry costs, multinationals only decide on the size of its subsidiaries.



Production in each firm uses three primary factors: labour, (internationally mobile) capital and location specific capital.

Location-specific capital is supplied perfectly inelastically and is internationally immobile. Since its return, being a rent, is part of the corporate tax base, including this type of capital motivates a lower bound on the corporate income tax rate. Fixed income is assumed to accrue to residents of the home country. In this way a tax export channel is incorporated, as host countries impose the corporate income tax on this income flow.

Labour is also assumed internationally immobile, implying that firms have to compete for labour on the local market.

In contrast, capital is perfectly mobile internationally. Although the gross rate of return is fixed at the world capital market, the user cost of capital depends on country-specific corporate and personal taxation systems. Investments can be financed by issuing bonds or by retaining profits (issuing new shares is not allowed). The equity capital of a subsidiary (defined as FDI) is provided by its parent. The optimal financing mix depends on the difference between the cost of debt financing (after corporate taxation) and the required return on retained profits. The latter is determined by the marginal equity holder, which is assumed to live in the home country. As a consequence, the required return on the firms' equity is determined by the tax rate the domestic household has to pay on equity income. As debt financing is in general tax-favoured, extreme debt positions are avoided by specifying financial distress costs that increase in the debt ratio.

Production in a subsidiary needs in addition an intermediate input that is provided by its parent company. A headquarter can charge a price for these inputs that deviates from the real cost. When tax bases are not consolidated, a multinational has an incentive to shift profits to low-tax countries by setting a low transfer price. Profit shifting remains bounded by specifying that a multinational has to incur extra costs when applying transfer pricing. Corporate taxation issues are further discussed in the next subsection.

**Table 4.2 Key parameters and (semi-)elasticities of production**

Technological growth	1.5%	
Economic rate of depreciation	5.0%	
Income share of location-specific capital	2.5%	
Income share intermediate inputs in subsidiaries	10.0%	
<b>Elasticity of substitution</b>		
Labour-capital	0.7	
<b>Implied semi-elasticities</b>	Min	Max
Capital stock to statutory CIT	– 0.46	0.09
Incoming FDI to statutory CIT	– 1.91	– 0.48
Debt to statutory CIT	0.23	0.38
Incoming transfer price to statutory CIT	0.74	2.14

The *calibration* of the firm sector is summarized in Table 4.2. The capital and labour parameters in the production functions are determined by country-specific labour income shares (corrected for the self-employed). Country-specific TFP-levels are calibrated from figures on GDP per worker. We follow Sørensen (2001) in specifying that domestic firms use location specific capital about twice as much as multinational headquarters (the precise figure is 0.7/0.3). The amount of location specific capital used by each subsidiary is calibrated from data on bilateral FDI-stocks.

## **4.4 Corporate taxation**

We consider two basic principles for taxing corporate income: the source and the residence principle. Next, we explain how we have translated the reform proposals by the EC in terms of the model. In the last subsection, the specification and calibration of compliance costs are described.

### **4.4.1 Source principle**

In the basecase all EU-countries tax corporate income on a source basis. The tax base is defined as the value of output (including the value of intermediate inputs for a multinational headquarter), minus the wage sum, interest payments on debt and depreciation allowances (minus the value of intermediate inputs for a subsidiary). The tax rules in the EU-countries only differ in the value of the depreciation rate for tax purposes. The tax parameters in the EU are discussed after the modelling of the corporate tax system in the US is explained.

### **4.4.2 Residence principle**

In all simulations the US tax authority adopts the world-wide residence principle (alternatively known as the method of world-wide credit, see Sørensen (2001)). The US taxes the total corporate income of its multinationals if the tax bill according to the US-tax rules exceeds the sum of the taxed paid by the parent and all subsidiaries in the source countries.

We calculate the tax payments of a US-multinational in two steps. The tax base and payments of US-owned firms are computed first according to the rules of the source country (i.e. using country-specific fiscal rates of depreciation) and second according to the US-rules. The multinational has to pay to the US tax authority the difference (only if positive) between the world-wide tax obligations under the rules of the home country and the world-wide tax payments summed over all source countries. Notice that transfer pricing is not practiced *if* the residence principle is effective (i.e. the US raises taxes from foreign-source income).

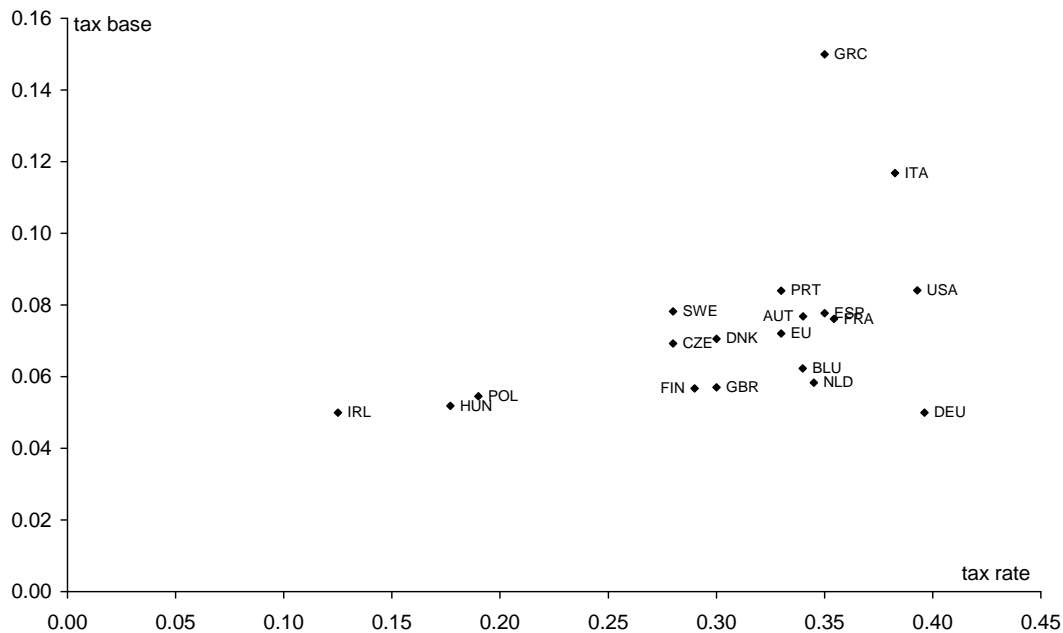
### **4.4.3 Calibration**

The key parameters of the CIT system are the statutory tax rate and the fiscal depreciation rate, or more general the rate of tax allowances. The legal tax rates are taken from the Institute for

Fiscal Studies (IFS), see Devereux et al. (2002), except for the new member states (source: Finkenzeller and Spengel (2004)) and DNK (source: Nexia International (2005)).

The starting point in the calibration of the tax base is the marginal effective tax rate (METR) as calculated by IFS. We take the METR for the case where 25% of new investments are financed with debt and 75% with equity. This is lower than the actual debt-equity mix (40%,60%) in order to ensure reasonable (depreciation) allowances. The rate of tax allowances, which encompass all kinds of tax deductions, is calibrated such that this METR is reproduced, as it is the best measure of how corporate income taxes affect the profit-maximising decision on marginal investments. We restrict the tax allowance rate between 5% and 15%, where the lower bound is given by the economic rate of depreciation and the upper bound is imposed to avoid the undesirable ‘taxation paradox’:<sup>19</sup> when one allows for generous tax allowances (large difference between fiscal and economic rate of depreciation), simulating a reduction in the corporate tax rate might result in an increase in the cost of capital and a reduction of the capital stock (see e.g. Sørensen (2002)).

**Figure 4.1 Tax rate and tax base (rate of tax allowance) in EU member states and the US**



The resulting values for the statutory tax rates and tax allowance rates are shown in Figure 4.1.<sup>20</sup> The observed statutory tax rates ranges from 13% in Ireland to 39% in the US and 40% in Germany. The calibrated depreciation rate identifies the countries with a narrow tax base (PRT, ITA and GRC) and with a broad base (IRL and DEU).<sup>21</sup>

<sup>19</sup> Only in Greece the small tax base still implies the taxation paradox, where a tax increase raises investments.

<sup>20</sup> A drawback of the calibration procedure is that the observed CIT-revenues are not well reproduced (the revenues are on average lower than observed: 2.6% versus 3.0%). In an alternative procedure, we calibrated the tax allowance rate on the observed corporate tax revenues. However, this resulted in implausible high values for this rate, that would give rise to a negative response of the capital stock to a reduction in the corporate tax rate.

<sup>21</sup> The broad tax base of Germany is a result of the calibration choice, where the rate of tax allowances is derived from the

#### 4.4.4 Formula apportionment

First, consolidation of the tax base for a multinational simply amounts to summing the tax bases of all firms that are located in a country that participates in the new system. Under home-state taxation, the rules of the parent country are applied. In the alternative proposals, see Table 3.1, European rules for fiscal depreciation and the like are applied.

Second, this tax base is apportioned to the participating tax authorities according to a prescribed formula. Each country is assigned a share  $\phi_{i,j}$  of the tax base, which it may tax at its own tax rate  $\tau_{\pi,j}$  (except with EUCT). This share is calculated as a weighted average of three factors: employment, capital stock and production:<sup>22</sup>

$$\phi_{ij} = f^L \frac{L_{i,j}}{L_i} + f^K \frac{K_{i,j}}{K_i} + f^Y \frac{Y_{i,j}}{Y_i} \quad (4.1)$$

The weights of the three factors, denoted by  $f^{L,K,Y}$ , sum to one. The variable  $L_{ij}$  denotes employment by a subsidiary in source country  $j$  of a multinational from home country  $i$ . Total employment by multinational  $i$  is thus given by  $L_i = \sum_j L_{ij}$ . When the consolidated tax base is allocated according to the labour shares, jurisdiction  $j$  thus receives a fraction  $L_{ij}/L_i$ . The same notation applies for the capital and production factor. One can easily check that the shares sum to one for each multinational ( $\sum_j \phi_{ij} = 1$ ). Our starting point in the next section is a broad formula with equal weights on employment, capital and production, i.e.  $f^L = f^K = f^Y = 1/3$ . Alternative formulae are investigated in section 6.

The tax rate relevant for decisions by multinationals can be written as a weighted average of the tax rates applied by the participating jurisdictions:

$$\tau_{\pi,i}^{fa} = \sum_j \phi_{ij} \tau_{\pi,j} \quad (4.2)$$

In the determination of optimal input demands, multinationals take into account that they can affect the  $\phi$ -shares to minimise the overall tax rate  $\tau_{\pi}^{fa}$ .

To simplify the analysis, we consider that the FA-system is mandatory for the multinationals. Allowing for the proposed free choice between SA and FA would complicate the analysis considerably.<sup>23</sup>

marginal effective tax rate of the Institute for Fiscal Studies (IFS), see Devereux et al. (2002). Calibration on tax revenues would imply a narrower base for Germany. This calibration choice affects the detailed results for Germany, but does not change the key messages of the paper.

<sup>22</sup> In practice, it is difficult to define capital and to a lesser extent employment and production. This issue is outside the scope of the current document, but interested readers might consult Martens-Weiner (2006). A second remark concerns the choice of production instead of sales as a factor in the apportionment formula. In the current version of our model, we are unable to define the destination of sales, as only the total exports of each country are known. This prohibits the use of sales in the formula, and we include output instead.

<sup>23</sup> The analysis would be easy if the discrete choice between the SA and FA system could be determined before solving

#### 4.4.5 Compliance costs

A motivation for tax base consolidation is to reduce tax compliance costs for multinationals. The European Commission (2004a) reports extensive evidence on perceived compliance costs (these include costs required for company taxation and VAT, next to costs voluntarily incurred to minimize taxes). Compliance costs are estimated at 1.9% and 30.9% of taxes paid by large firms and SMEs, respectively.<sup>24</sup> Costs are larger for firms with subsidiaries. The European Commission (2001) focuses on costs related to transfer pricing. Estimates range from 1 to 2 million euro for medium-sized enterprises and 4 to 5.5 million euro for large multinational groups. Compliance costs of 7.5 million euro would amount to 3% of CIT revenues. Devereux (2004) concludes from this EC-report that compliance costs likely amount to 2.7% to 4% of tax revenues.

As evidence suggests that compliance costs decrease relatively with the size of the firms, these costs could be modelled as a fixed cost. The disadvantage of this specification is that a reduction of compliance costs will not directly affect any of the firm's decisions. This simulation will only result in a direct, positive effect on the output volume when compliance costs are modelled as a variable cost. We therefore prefer to model these costs by introducing a new type of 'unproductive' workers that are needed to keep the tax administration. This overhead labour is specified as a fixed fraction of the productive workers, increasing the wage cost by this fraction.

Since firm-specific, nor country-specific figures are available, the fraction of overhead labour is kept the same for all firms. This fraction is calibrated at 0.43%, such that the simulated compliance costs amount to 10% of the CIT-revenues in the EU. When simulating a switch to the FA-system, compliance costs are abolished for all subsidiaries.

#### 4.5 Rest of the government

Besides taxes on corporate income, tax revenues consist of residence-based taxes on labour income, dividends, capital gains, interest income and consumption. The expenditure side contains government consumption, interest payments on public debt and lump sum transfers. Government consumption as well as public debt are constant fractions of GDP.

Government behaviour is not derived from any optimisation but is exogenously specified. When corporate tax revenues change after a reform, a specified tax rate has to be adjusted to close the government budget. In most of the simulations, the labour tax rate is chosen for this purpose.

the model. However, in this case choosing the tax system with the lowest tax obligations obviously requires the full general equilibrium solution.

<sup>24</sup> Small- and medium-sized enterprises are defined as companies with less than 250 employees.

## 4.6 General equilibrium

Equilibrium must hold on each market:

- The labour market: the country-specific wage adjusts to ensure that domestic supply meets domestic demand.
- The goods market: the surplus of production over domestic demand leads to net exports; the rest of the world is willing to absorb any volume of net exports at the fixed world price. The goods price acts as numeraire.
- The bonds market: all types of bonds (domestic or foreign, issued by firms or government) are perfect substitutes with a fixed return; the net supply of bonds by the rest of world is assumed to be perfectly elastic.
- The equity market: all types of equity (domestic or foreign) are perfect substitutes with a fixed return; the net supply of equity by the rest of the world is assumed to be perfectly elastic.
- The current account equals the change in the net foreign asset position (on the balance of payments) if all previous markets are in equilibrium (due to Walras law).<sup>25</sup>

## 4.7 Main features of the Basecase

Table 4.3 focuses on features of the base path (with SA), that are needed to understand differences in simulation outcomes over the countries.

1. The capital/labour ratio (relative to EU-average) identifies the labour intensive (the three new members and POL) and the capital-intensive countries (FRA and IRL). These different factor intensities will explain how the outcomes depend on the weights of the factors in the formula.
2. Variations in the wage rate are related to variations in the capital/labour ratio. Low-wage countries are attractive for multinationals that want to expand employment.
3. The inward FDI stock (%GDP) indicates the importance of foreign subsidiaries in countries, as IRL, BLU and NLD. More open economies are subject to larger international spillovers. Small countries (NLD, BLU) also seem to be large FDI-exporters (as % of home GDP).
4. The following variables describe the taxation systems. The statutory corporate tax rate is known to vary considerably in the EU (from 13% in IRL to 40% in DEU in 2002).
5. The effective tax rate also depends on the depreciation rate for tax purposes (see also Figure 4.1). GRC and ITA are characterized by a narrow tax base; in contrast, DEU and IRL are examples of countries with a broad base.
6. In the simulations the labour tax rate is adjusted to close the government budget. In cases in which tax revenues fall after a corporate tax reform, welfare losses will be larger for countries with a high initial labour tax rate (like SWE).

<sup>25</sup> This condition is also fulfilled for the rest of the world.

7. Finally, the importance of multinationals is also reflected in the fraction of corporate income taxes paid by domestic firms. Notice that in first instance the consolidation reforms only affect the multinationals. More than half of the CIT revenues originates from multinationals in BLU, IRL and NLD.

**Table 4.3 Characterisation of the base path**

	IRL	HUN	POL	SWE	CZE	FIN	DNK	GBR	PRT
Capital/Labour (EU=1)	1.58	0.63	0.40	0.76	0.57	1.05	0.90	0.70	0.42
Wage (EU=1)	1.12	0.50	0.41	0.95	0.43	0.89	0.98	1.05	0.67
FDI_in (%GDP)	0.93	0.14	0.09	0.36	0.12	0.16	0.36	0.28	0.13
FDI_out (%GDP)	0.22	0.01	0.00	0.37	0.00	0.31	0.22	0.29	0.06
CIT rate	0.13	0.18	0.19	0.28	0.28	0.29	0.30	0.30	0.33
Tax allowance rate	0.05	0.05	0.05	0.08	0.07	0.06	0.07	0.06	0.08
Labour tax rate	0.17	0.33	0.25	0.47	0.35	0.38	0.34	0.22	0.24
CIT domestic firms (%CIT)	0.36	0.65	0.66	0.50	0.66	0.63	0.53	0.52	0.62
	BLU	AUT	NLD	GRC	ESP	FRA	ITA	USA	DEU
Capital/Labour (EU=1)	0.95	0.88	1.02	0.71	0.94	1.29	1.16	1.12	1.03
Wage (EU=1)	1.21	1.02	1.16	0.69	0.78	1.20	0.97	1.10	0.95
FDI_in (%GDP)	0.73	0.15	0.50	0.04	0.11	0.13	0.06	0.08	0.12
FDI_out (%GDP)	0.66	0.09	0.84	0.01	0.03	0.23	0.06	0.06	0.20
CIT rate	0.34	0.34	0.35	0.35	0.35	0.35	0.38	0.39	0.40
Tax allowance rate	0.06	0.08	0.06	0.15	0.08	0.08	0.12	0.08	0.05
Labour tax rate	0.38	0.39	0.31	0.26	0.28	0.38	0.35	0.22	0.34
CIT domestic firms (%CIT)	0.30	0.63	0.47	0.68	0.66	0.65	0.68	0.67	0.66



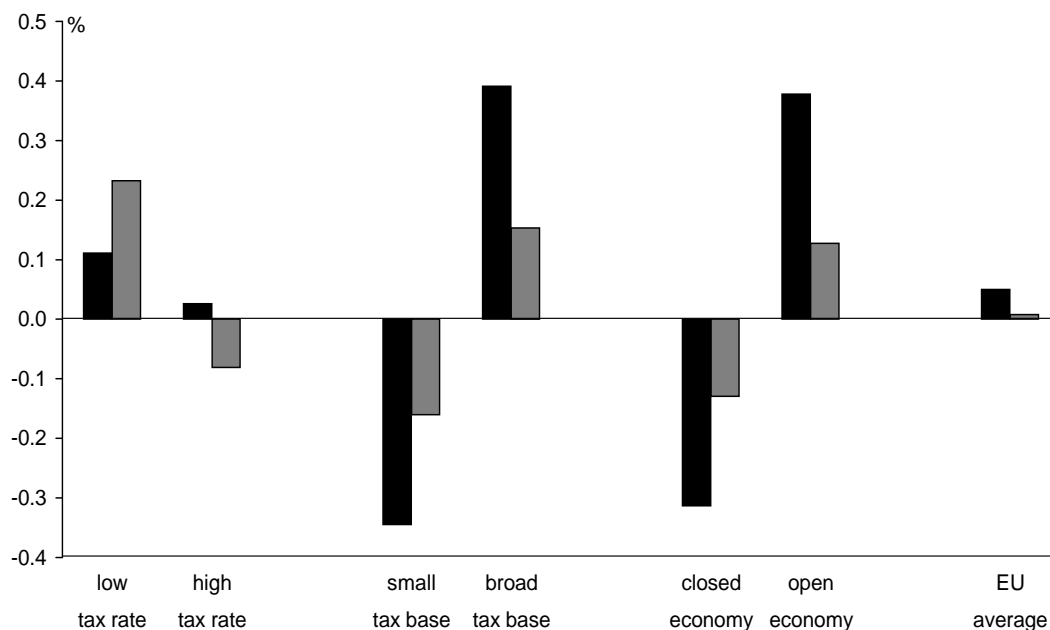


## 5 Common consolidated base taxation

In a recent communication, the European Commission (2006, p.3) emphasises the need for consolidation and proposes to proceed along the lines of the Common Consolidated Base Taxation (CCBT).<sup>26</sup> This section intends to shed light on the economic and welfare implications of this proposal with the use of *CORTAX*. Several choices have to be made, however, whose impact will be investigated in sections 5.5 and 6. First, we assume that the tax base is harmonised at the current EU average, which is the most natural candidate to start with. Second, we assume that the apportionment formula is defined on employment, capital and production, each with equal weight. Third, budget surpluses or deficits are compensated with a change in the labour tax rate. Finally, capital is assumed to be internationally mobile, unlike labour.

The main results of this section are previewed in Figure 5.1. The figure shows which member states will benefit from the introduction of CCBT, in terms of GDP and welfare (see Table 5.1 for more details on the economic effects per member state). The proposal is slightly beneficial for the EU on average, but within the EU the member states with a large share of FDI, a below-average tax rate and a broader-than-average tax base tend to gain.

**Figure 5.1 Impact of CCBT on GDP and welfare<sup>a</sup>**



<sup>a</sup> The black bar shows the average of GDP-growth of each group of countries. The grey bar shows the change in welfare (as %GDP). Countries with a tax rate below average are: IRL, HUN, POL, SWE, CZE, FIN, DNK and GBR. Countries with a relatively small tax base are: GRC, ITA, PRT, SWE, ESP, AUT and FRA. Relatively closed member states are: GRC, ITA, ESP, PRT, CZE, POL, FRA and HUN. For each criterion, the other group consists of the missing member states.

<sup>26</sup> The CCBT has been relabeled in European Commission (2006, p.3) to the 'Common Consolidated Corporate Tax Base'.

This result is further explained in the following subsections, where we first show the direct effect of consolidation and formula apportionment and subsequently investigate its impact on firms, governments and the whole economy. The final subsections show the robustness of the key results for alternative assumptions on the rate of tax allowances, on the financing of deficits and on the international mobility of capital. The implications of alternative apportionment formulae are investigated in section 6.

## 5.1 Direct effects of consolidation and formula apportionment

Consolidation implies that the subsidiaries of a European multinational are treated as a single entity for tax purposes. The main arguments in favour of consolidation, as listed in section 2, are taken into account in our model. First, we assume that multinationals save on compliance costs, as they have to file only one (consolidated) corporate income tax return, where all affiliates are included. Second, consolidation makes profit shifting for tax purposes obsolete, as all profits are added up in a single tax base. In our model, this implies that transfer pricing, i.e. charging different prices for intra-firm exports than for regular exports, becomes redundant.<sup>27</sup>

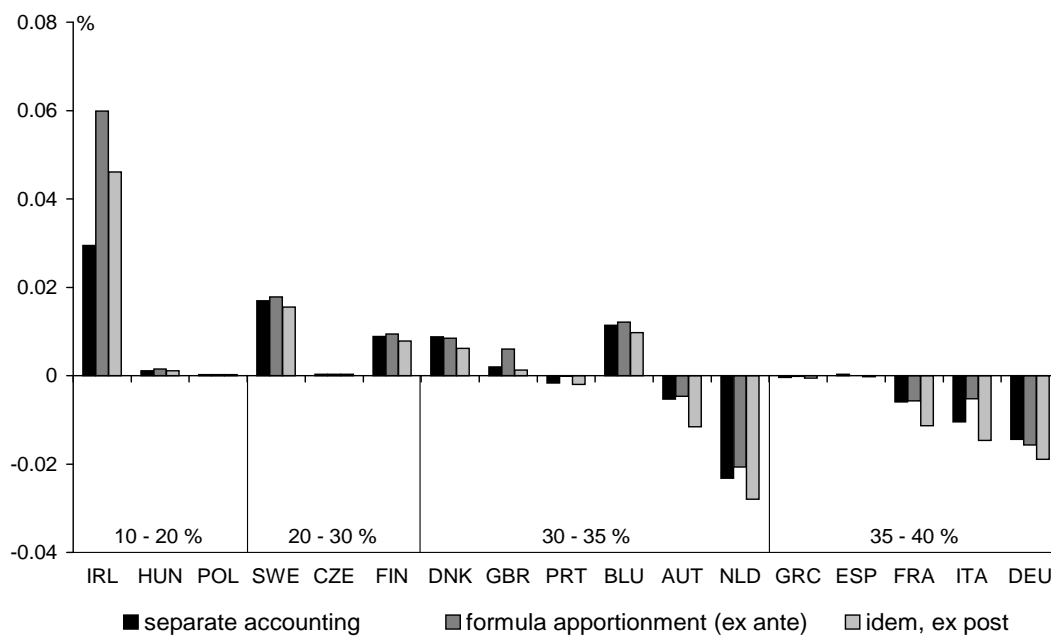
One of the key issues of the introduction of a common consolidated tax base is the broadness of the existing base. As explained in section 4, we have captured this broadness by the rate of tax allowances, see Table 4.3. In this section, we assume that the EU chooses the (population) weighted average of the existing allowances (7.2%). Compared with the existing tax systems, the choice for a common tax base implies a broadening of the tax base in 7 countries (France, Austria, Spain, Sweden, Portugal, Italy and Greece), whereas the tax base is narrowed in the other ten countries, see Table 4.3. Note that the tax base is consolidated and harmonised for multinational enterprises (MNEs) only. Domestic firms still have to apply to the home tax rules.

In addition to the change in the tax base, MNEs are confronted with a change in their average tax rate, which is calculated as a weighted average of the statutory rates of the countries in which the MNEs operate. Under separate accounting, the statutory rates are weighted with the share of each subsidiary in the total tax base of the MNE. For a firm in a low-tax country, like Ireland, this implies that the average tax rate is higher (3 percentage points) than the Irish statutory rate, see Figure 5.2. Key feature of separate accounting is that MNEs are able to affect their tax payments by shifting paper profits to low-tax countries. This reduces the average tax rate, in particular for firms with large production shares in the low-tax countries (which is usually the headquarter).

If formula apportionment is introduced, MNEs have to pay taxes proportional to the factors in the formula (labour, capital and production). However, these factors are less biased than the tax base towards the low-tax countries – at least in the initial situation (as shown in the ex-ante

<sup>27</sup> In addition, cross-border loss offset automatically occurs with tax base consolidation. This aspect is, however, hardly relevant in our model, given its steady state nature, where both parent firms and their subsidiaries generally generate positive profits.

**Figure 5.2 Average tax rate of MNEs, in deviation of the statutory rate in the home country<sup>a</sup>**



<sup>a</sup> Average tax rate of multinationals under separate accounting, formula apportionment – both before and after firms' responses. The initial tax rates are indicated on the x-axis.

bars in Figure 5.2). As a result, the introduction of formula apportionment raises the ex ante average tax rate in nearly all member states, most notably in Ireland.

Multinational enterprises may respond to formula apportionment by restructuring their production. They are able to reduce their tax payments, and thereby their average tax rate, by raising employment, investment and production in low-tax countries and reducing them in high-tax countries. Figure 5.2 shows that this reallocation reduces the average tax rate (ex post) in all member states, in particular in countries (like Ireland and the Netherlands) with strong international investment positions.

## 5.2 Firms

We have seen that formula apportionment induces reallocation, just as separate accounting leads to profit shifting.<sup>28</sup> How does this reallocation take place, and do firms benefit from it?

Reallocation of labour across the border is very difficult (and in our model even impossible) as labour is hardly mobile internationally (immobile in our model). For example, the only way a German multinational can hire extra workers for its Polish subsidiary is by attracting employment from other Polish firms (including domestic firms, the domestic parents of MNEs and subsidiaries from other foreign firms) or from new labour supply. Therefore, the

<sup>28</sup> The incentives for reallocation are shown in the box on page 44.

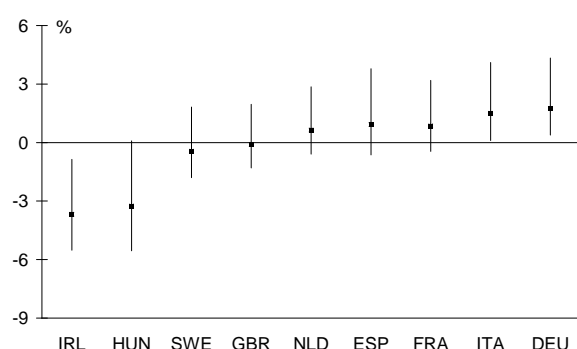
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## The incentive to reallocate

How large is the incentive for firms to reallocate? With the formula based on employment, capital and production shares, MNEs influence the average tax rate by raising the factors in low-tax countries and reducing them in high-tax countries. If we concentrate on employment, the question becomes how large are the gains from boosting or reducing employment? In addition to the regular return on employment (generating production), additional employment may pay off in terms of lowering the average CIT-rate or it may reduce the return by raising the average tax rate on corporate income. This effect distorts labour demand and is therefore known as the excise tax (or subsidy) on labour (the excise tax is explained in a box on page 20).

How large is the excise tax on labour? The figure on the *incentive for reallocation* shows for MNEs in a selection of countries the excise tax as fraction of the initial wage rate. The adjustment ranges between an excise tax of 4% for a Irish subsidiary in Germany and a subsidy of 6% for a German subsidiary in Hungary. Additional employment in the German subsidiary in Poland reduces the average CIT rate for the German multinational, which allows the German firm to pay higher wages or employ more workers. The opposite holds for an Irish subsidiary in Germany. The median excise tax in the EU is about 1%, triggering higher labour demand in about half of the subsidiaries but tempering demand in the other half.

### Incentive for reallocation of employment (excise tax or subsidy)<sup>a</sup>



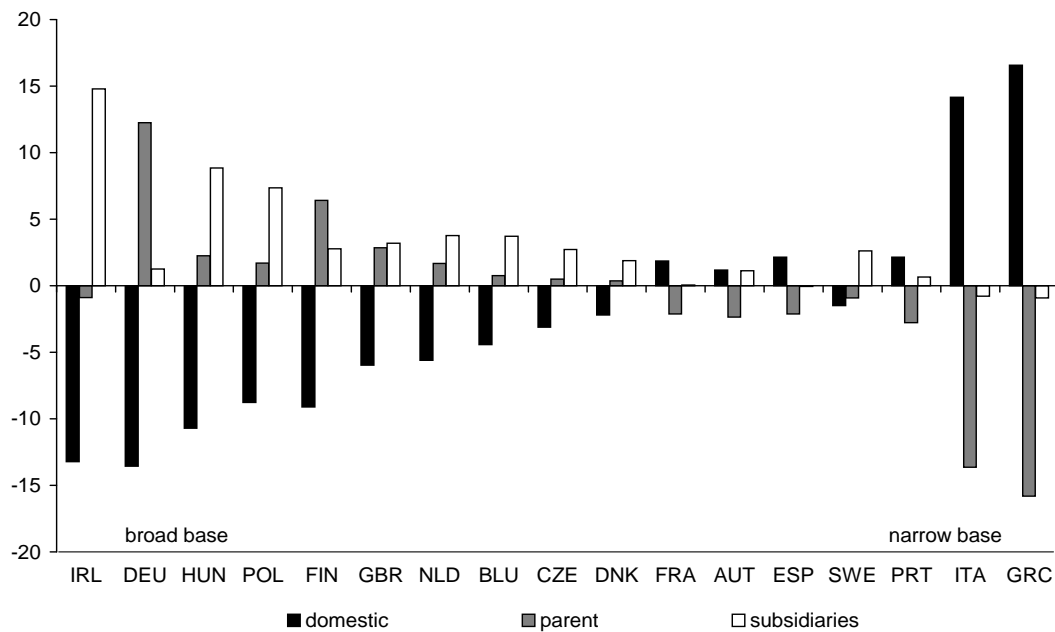
<sup>a</sup> The figure shows the range of excise taxes or subsidies for MNEs hosted in a selection of countries. For example, the excise tax for subsidiaries in Poland ranges between -6% for the German subsidiaries and 0% for the Irish subsidiaries.

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introduction of formula apportionment with a heavy weight on labour induces a reallocation between firms within a country. Reallocation of the second factor in the apportionment formula, namely capital, can occur both within countries and across the border. However, the possibilities for firms to expand capital are limited by the production structure: firms need both capital and labour (with substitution elasticity of 0.7) in the production process. Finally, the reallocation of production requires the reallocation of the production factors, namely labour and capital.

The reallocation of production by MNEs are determined by three effects, which all show up in Figure 5.3. The *base harmonisation effect* implies that firms want to avoid the effect of tax base broadening by reducing production in countries with initially small tax bases. In addition, the uneven treatment of multinationals and domestic firms determines the distribution of employment (and thereby investment) within each member state. In countries with a broad

**Figure 5.3 Reallocation of employment (% labour force)**



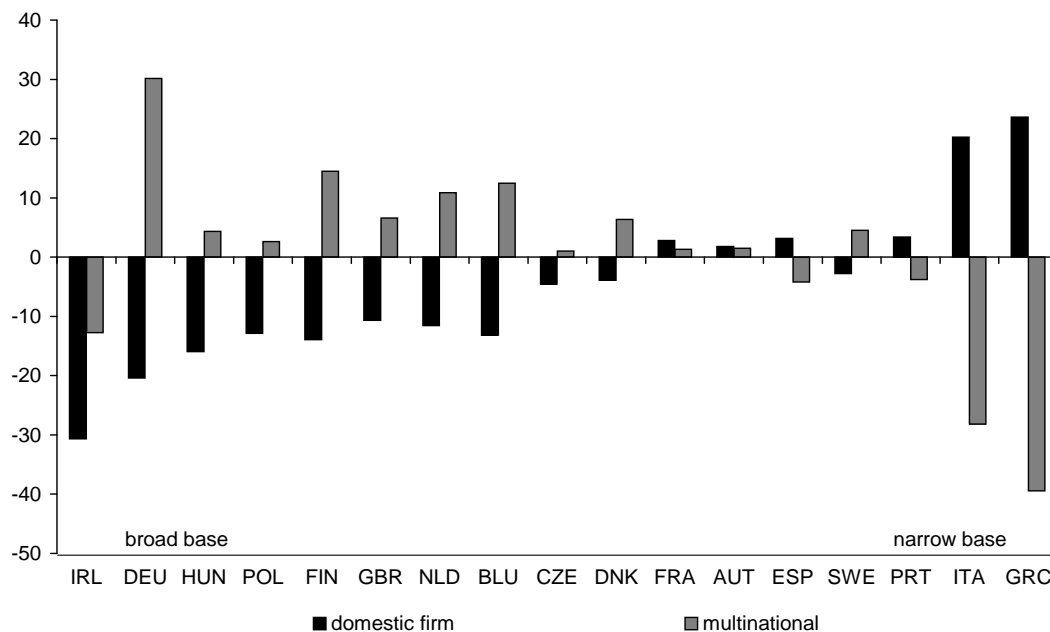
‘own’ base, to which the domestic firms still have to apply, employment will be shifted towards MNEs who benefit from the narrower European tax base. This effect is clearly visible in all countries with a broader-than-average tax base (all countries from Ireland to Denmark). The opposite shift from MNEs towards domestic firms is visible in member states with narrow bases like Greece and Italy.<sup>29</sup>

The *direct tax burden effect* implies that MNEs want to reduce employment and investment in subsidiaries where the average ex ante tax rate increases, which are the countries with low statutory rates, cf Figure 5.2. This implies a reduction of employment and capital by MNEs – both parents and subsidiaries – in low-tax countries (like Ireland, Hungary and Poland) and an increase of both production factors in high-tax countries like Germany and Italy.

The *reallocation effect* implies that firms want to benefit from the opportunity to reduce the tax burden by shifting labour, capital and production to low-tax countries. A larger share of these factors in a low-tax country implies that a large share of the consolidated tax base is apportioned to these low-tax countries. In particular subsidiaries in low-tax countries respond to the opportunities for tax planning which the apportionment formula provides: subsidiaries in Ireland, Hungary and Poland expand at the expense of domestic firms and MNE-headquarters.

<sup>29</sup> The latter effect depends on the assumption that all MNEs are subject to the common tax rules. If they are allowed to choose between consolidation or the current system of separate accounting, they might prefer the latter.

**Figure 5.4 Consolidation and formula apportionment affect value of both multinational and domestic enterprises**



<sup>a</sup> Relative change in the value of the firm (both multinational and domestic firms) by changing from SA to FA.

Does an expansion (or reduction) of employment, capital and production by a MNE also imply that this firm gains (or loses) from the introduction of the Common Consolidated Base Taxation?<sup>30</sup> The answer is affirmative: multinational enterprises which benefit from a narrower tax base and a reduction in the average tax rate do so in terms of both employment and of profitability (as reflected in the value of the firm), see Figure 5.4.

Most remarkable in this figure is, however, the strong impact of CCBT on the value of domestic firms. The reason is that the expansion of employment by MNEs have to be met by additional labour supply or by workers currently working in domestic firms. Wages in these countries are bid up, which raises the labour costs of domestic firms and reduces their profitability.

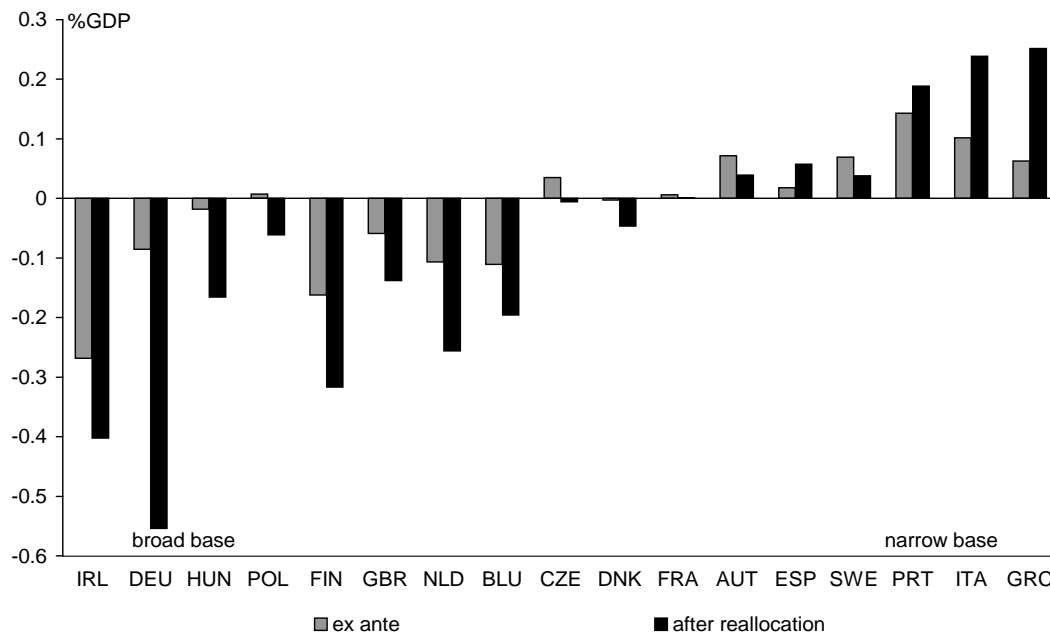
### 5.3 Government

Until now, we have looked at the implications of common consolidated base taxation for firms. We now switch our attention to governments which receive taxes from all firms in their jurisdiction (domestic firms and both domestic and foreign multinationals). Does the change from separate accounting to consolidation with formula apportionment affect the tax revenues of governments?

<sup>30</sup> Observe that this answer cannot be easily induced from Figure 5.3, as the subsidiaries of all foreign MNEs are added up in the host country – what we need for this question is the employment in all member states of each MNE.

First, it should be made very clear that we assume that governments do not raise or cut their statutory tax rates. Figure 5.2, which shows the changes in tax rates for multinationals, tells nothing about the statutory rate, but only shows the average rate (averaged over all statutory rates) which MNEs have to pay over their corporate income. Governments only change the calculation of the tax base. Under separate accounting (with the source principle) they intend to tax the profits generated in their country. With consolidation and formula apportionment, governments tax the apportioned share of the total profits of each MNE. So changes in CIT-revenues, which are shown in Figure 5.5, reflect changes in the tax base, not in the tax rate.

**Figure 5.5 CIT revenues are exaggerated by firms' responses<sup>a</sup>**



<sup>a</sup> Change in the revenues from the corporate income tax in percentage of GDP by changing from SA to FA, before and after reallocation. Countries are ranked according to their tax base.

Figure 5.5 decomposes the change in CIT-revenues in two parts. The ex ante part shows the impact of consolidation with formula apportionment as if firms do not respond. The dominant effect is the *base harmonisation effect*. Countries with an initially narrow base, in which the tax base is broadened to the EU average, will gain revenues, and vice versa. More complex is the impact of consolidation on the tax revenues. Under separate accounting a government taxes all firms located in the home country. In the new system a government may tax part (the apportioned part) of the consolidated base of all MNEs, next to total corporate income of domestic firms. The net impact of this second effect is ambiguous.

Firms respond to the change in the tax system by reallocating production, as we have seen in the previous section. Strong reallocation occurs in countries with extreme tax bases. For example, Italy and Greece are confronted with a strong outflow of MNEs, which implies a

reallocation of labour and capital to domestic firms. This raises the CIT-revenues in both countries as the domestic firms are fully taxed at home, whereas MNEs can be taxed only partly. At the other extreme, countries in which the tax base is narrowed become more attractive for MNEs, at the expense of domestic firms. The higher corporate income in these countries is, however, only partly taxed by the domestic government.

The corporate income tax is, however, not the only source of revenues of the government – taxes on labour income and consumption are quantitatively more important. Reallocation has also important implications for the revenues of these taxes. In fact, in countries where production by MNEs shrinks, the reduced demand for labour cuts down wages and tempers consumption, which narrows the tax base of consumption and labour income. These changes in revenues from the taxes on labour income and consumption tend to counterbalance the change in CIT revenues: in countries where MNEs bid up wages, CIT revenues will decline, but the revenues of both other taxes improve.

The additional tax revenues (and vice versa for a loss of revenues) can be used for additional government expenditures, for a reduction in the CIT-rate or for a reduction in another tax rate. In the analysis, it is a bit arbitrary which of these alternatives are used. We did not choose the CIT-rate, because the change in the CIT-rate would interfere in the analysis with a change in the tax base. Alternatively, we opt for the labour tax to compensate for any change in the government budget.<sup>31</sup> Table 5.1 shows that the labour tax rate has to be increased in countries with high CIT rates, where the opposite holds for low-tax countries.

## **5.4 Economy and welfare**

Growth and jobs are central aims of European as well as national policies. In a recent communication, the European Commission (2006, p.3) expresses the expectation that “(e)liminating tax obstacles such as high compliance costs for cross-border operations and transfer pricing and the lack of cross-border loss compensation in the internal market can contribute to these goals.” How successful is, according to our model, the consolidation of the corporate tax base and the use of formula apportionment in reaching both goals?<sup>32</sup>

Table 5.1 shows that CCBT slightly boosts GDP, but does not improve employment on average in the EU. The main stimulus for growth and employment is the consolidation of the tax base at the common European rate. This efficiency gain would even be larger if the tax base for all firms is harmonised. The change in tax planning strategies is about neutral for growth. On the

<sup>31</sup> See section 5.5 for the alternative simulation where the consumption tax is used to close the budget.

<sup>32</sup> Cross-border loss compensation is hardly beneficial in our model, as almost all firms (and in the base case all firms) have positive profits due to the rents on location specific capital. The model therefore underestimates the gains from consolidation, which might be substantial in the short run, but will be much smaller in the steady state, see Nicodème (2006).



**Table 5.1 Economic and welfare effects of Common Consolidated Base Taxation<sup>a</sup>**

Country <sup>b</sup>	CIT (y)	$\tau_l$ (a)	w (r)	L (r)	K (r)	GDP (r)	CV (y)
Ireland	- 0.32	- 0.45	1.50	0.71	0.21	- 0.60	0.59
Hungary	- 0.05	- 0.33	0.69	0.39	1.09	0.13	0.35
Poland	- 0.02	- 0.29	0.51	0.26	0.86	0.09	0.31
Sweden	0.02	- 0.36	0.10	0.20	- 0.06	0.03	0.31
Czech Republic	0.00	- 0.19	0.19	0.11	0.37	0.05	0.14
Finland	- 0.19	0.15	0.59	0.09	1.21	0.44	0.13
Denmark	- 0.03	- 0.08	0.14	0.04	0.19	0.05	0.15
United Kingdom	- 0.09	- 0.01	0.38	0.07	1.05	0.16	0.19
Portugal	0.08	- 0.29	- 0.11	0.04	- 0.40	- 0.06	0.15
Belgium & Luxembourg	- 0.12	- 0.03	0.48	0.07	1.21	0.49	0.32
Austria	0.02	- 0.01	- 0.06	- 0.03	- 0.17	- 0.11	0.00
Netherlands	- 0.16	0.29	0.44	- 0.13	1.46	0.32	0.14
Greece	0.10	0.03	- 0.77	- 0.14	- 1.51	- 0.72	- 0.41
Spain	0.03	- 0.03	- 0.12	- 0.02	- 0.25	- 0.09	- 0.03
France	0.00	0.26	- 0.10	- 0.21	- 0.31	- 0.22	- 0.15
Italy	0.13	0.15	- 0.70	- 0.26	- 1.34	- 0.73	- 0.37
Germany	- 0.31	0.60	0.87	- 0.07	2.56	0.74	0.04
EU	- 0.07	0.12	0.17	- 0.02	0.50	0.05	0.01
USA	0.00	0.00	0.00	0.01	0.01	0.00	- 0.01

<sup>a</sup> Formula apportionment is assumed to depend on employment, capital and output with equal weights.

<sup>b</sup> CIT: change in revenues from corporate income tax, as share of GDP (y);  $\tau_l$ : absolute (a) change in labour-tax rate; w, L, K and GDP: relative (r) change in respectively the wage rate, employment, capital and gross domestic production; CV: change in welfare, as fraction of GDP.

one hand transfer pricing is eliminated, which reduces growth. The reason is that transfer pricing alleviates the tax burden for MNEs, and is therefore good for growth. On the other hand, new tax planning strategies will be applied by MNEs to alleviate the tax burden in the new system with formula apportionment. With the current formula, with equal weights on employment, capital and production, both effects cancel out in terms of GDP. The reason why employment does not increase is that the loss of tax revenues has to be compensated with an increase in the labour tax rate, which reduces the supply of labour.

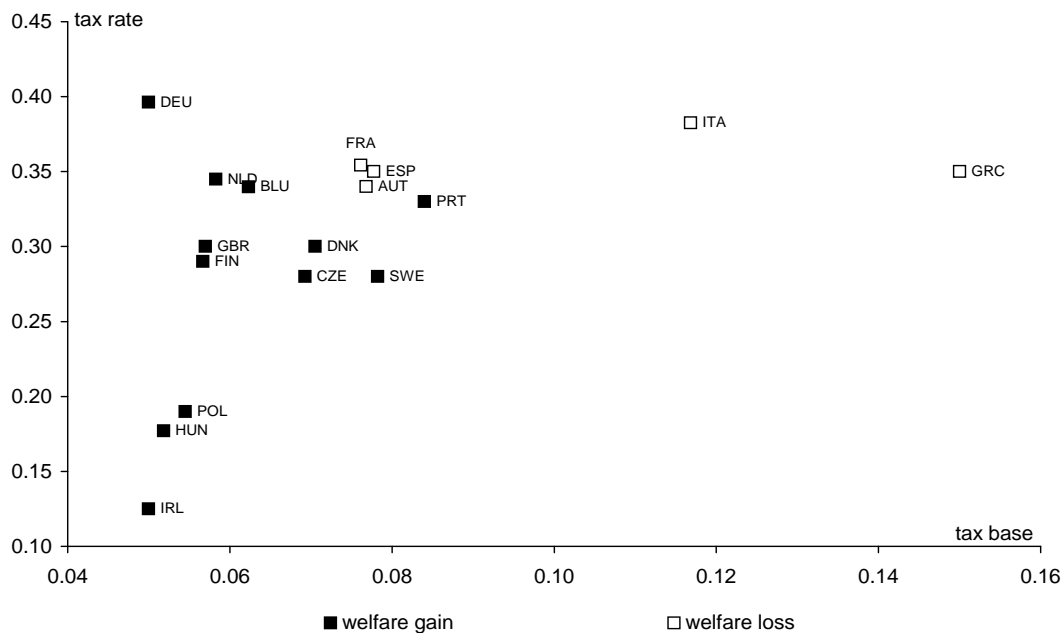
Figure 5.1 shows that GDP increases in relatively open member states with low tax rates and broad tax bases (all measured relative to the EU average). In the countries which fulfill these three requirements, namely Denmark, Finland, Ireland and the UK, employment and production increases.<sup>33</sup> On the other hand, in relatively closed member states with a small tax base and a high tax rate, namely Greece, Italy and France, employment and GDP decline. The single

<sup>33</sup> GDP at 'real' prices, however, declines in Ireland, due to the abolishment of transfer pricing. Under SA, intermediate inputs were imported at 2/3 of the standard (unit) price. These inputs have to be bought at the unit price under FA, which reduces its GDP at 'real' prices by 0.6%. Without this 'price effect', production in Ireland increases by 0.5%. Similar effects, but much smaller in magnitude appear in other low-tax economies. At the other extreme, GDP in high tax countries is overstated, but only slightly.

exception is Portugal where the reduction in the labour tax rate dominates the employment effect. The intuition behind this result is the following. Production by MNEs becomes more profitable in countries where the European base is narrower than the tax base of the member state. In addition, optimal tax planning by MNEs imply that they shift activities to the low-tax countries. Both effects are particularly large in member states with a large share of multinationals.

How does consolidation in the EU affect an outside country, like the United States? According to Table 5.1, this influence is very limited. The main reason is that consolidation does not directly affect US multinationals. Only through reallocation of employment towards (or away from) US subsidiaries might they benefit (or lose) from the consolidation in the European Union. However, this reallocation is significant for particular countries, but hardly affects labour demand on average.

**Figure 5.6 Welfare gain depends on initial tax base and rate<sup>a</sup>**



<sup>a</sup> The change in welfare (%GDP) is the result of the introduction of CCBT, with the one-third apportionment formula on employment, capital and production, and where governments adjust the labour-tax rate to balance the budget. The countries are located at their statutory tax rate and the initial rate of tax deductions.

Figure 5.6 shows the welfare effects of the introduction of a common consolidated tax base with formula apportionment on employment, capital and production. Both axes show the key factors determining the distribution of winners and losers. The winners are concentrated in the lower-left part of the graph, characterised by low tax rates and low tax allowances. The losers are located in the upper-right part, with high tax rates and small tax bases.

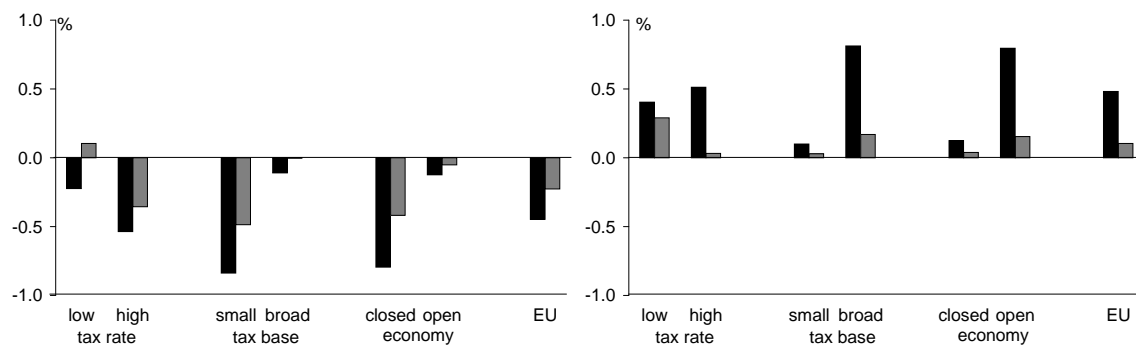
In the EU, there are winners and losers from a common consolidation tax base. On average, Europe hardly benefits (about 0.01% of GDP). The gains from a reduction in compliance costs and the elimination of transfer pricing are in balance with the efficiency losses from reallocation.

## 5.5 Alternative simulations

### 5.5.1 A smaller or broader base

We have assumed in the previous analysis that the common tax base is set at the EU-average (with a tax allowance rate of 7.2%). Though reasonable, this choice is arbitrary – the common tax base can as well be set at a broader or smaller level. How sensitive are the results for the assumption regarding the tax base? We investigate two alternatives, namely a broader base with a tax allowance rate of  $\delta_t^{EU} = 5\%$  and a narrower base with a rate of  $\delta_t^{EU} = 10\%$ .

**Figure 5.7 Impact of CCBT on GDP and welfare – with broader (left panel) or narrower common tax base<sup>a</sup>**



<sup>a</sup> The left (right) panel shows the changes of GDP (black) and welfare (grey) if the tax base is harmonised at the tax allowance rate of 5% (10%). See Figure 5.1 for the criteria.

Figure 5.7 repeats the introductory graph (Figure 5.1) for both a broader (left panel) and a narrower common base. The EU-bars show that a broader tax base creates a welfare loss and reduces GDP. The opposite holds for a narrowing of the base, where the welfare gain amounts to 0.10% of GDP. Broadening the base implies a higher tax burden for MNEs which have to cut down production. The gains from base broadening, as higher tax revenues allow for a reduction of the labour tax rate, cannot offset this production and welfare loss. The opposite holds for a narrowing of the tax base, which benefits all member states except Germany, Italy and Greece.

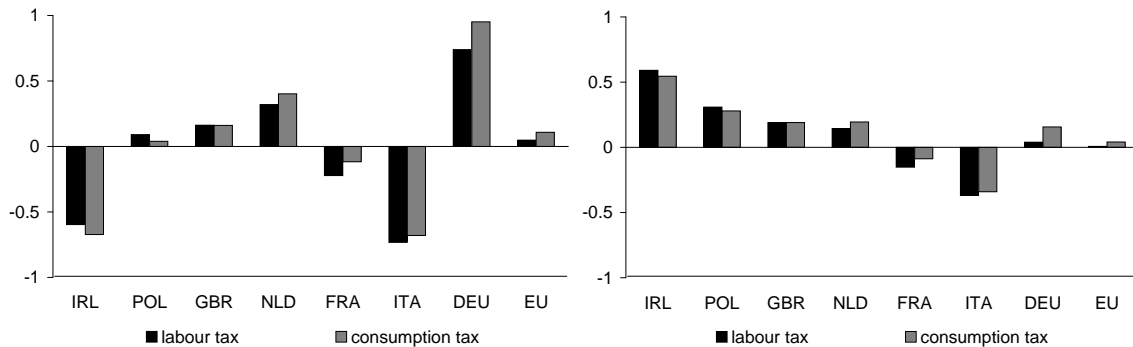
The distribution of the GDP-growth (or reduction) and the welfare gain (or loss) over the member states is similar as before: relatively open member states with low tax rates and broad tax bases tend to gain more (or lose less) than relatively closed member states with high tax rates and narrow tax bases.

### 5.5.2 Alternative means of financing

A realistic way for the government to balance its budget is by adjusting its labour tax rate. Reliance on the indirect tax on consumption is, however, also plausible. How would this affect the economic and welfare effects?

Bettendorf et al. (2006) have shown that the consumption tax is less distortive than the labour tax rate. This implies that if the tax-base reform in a particular country requires an increase in an alternative tax rate, then this country would gain more (or lose less) if the consumption tax may be applied – and vice versa for a country which may reduce the alternative tax rate.

**Figure 5.8 Impact of CCBT on GDP (left panel) and welfare – with alternative budget closing rule<sup>a</sup>**



<sup>a</sup> The grey bars show, for a selection of countries, the changes of GDP and welfare if the budget is closed with the consumption tax rate instead of the labour tax rate (black bars). See Figure 5.1 for the criteria.

Figure 5.8 shows for a selection of countries the implications for GDP and welfare of this alternative means of financing. In countries with an initially low CIT-rate (Ireland and Poland), the tax reform allows for a reduction in the labour income or consumption tax rates (of respectively 0.45 and 0.30 percentage points). It is therefore not surprising that the switch to consumption-tax financing reduces GDP and welfare relative to the labour-tax case. For the United Kingdom, the CIT-reform hardly affects tax revenues. The required change in the alternative tax rates, and its implications for GDP and welfare are therefore negligible. In the remaining four countries, the labour income or consumption tax rates has to be increased, which explains the better performance in terms of GDP and welfare of consumption-tax financing in these countries.

The EU on average is slightly better off with consumption-tax financing than with labour-tax financing: the GDP-effect doubles to 0.11% and the increase in welfare becomes 0.04% of GDP. Again this can be traced back to the required increase in the labour income or consumption tax rate of about 0.1 percentage points, in combination with the smaller distortiveness of the latter. Despite these small differences, the main message from the alternative means of financing is that this choice does not drive the results and does not alter the key message of this section. The consolidation with formula apportionment eliminates one way of tax planning but introduces another: transfer pricing is exchanged for reallocation. This change in tax planning hardly benefits GDP and welfare on average, but strongly affects the distribution of both.

### 5.5.3 Less mobile capital

The final assumption we investigate in this section is the international mobility of capital. Up to now, we have assumed that the rest of the world is willing to supply (or demand) any amount of capital at the given world interest rate. Consider the alternative extreme, that capital is internationally immobile, or domestic capital markets are closed. How would this drastic change in the model affect the results? In other words, how strongly are the results driven by the assumption on capital mobility?

**Figure 5.9 Impact of CCTB on GDP – with perfect mobile or immobile capital**

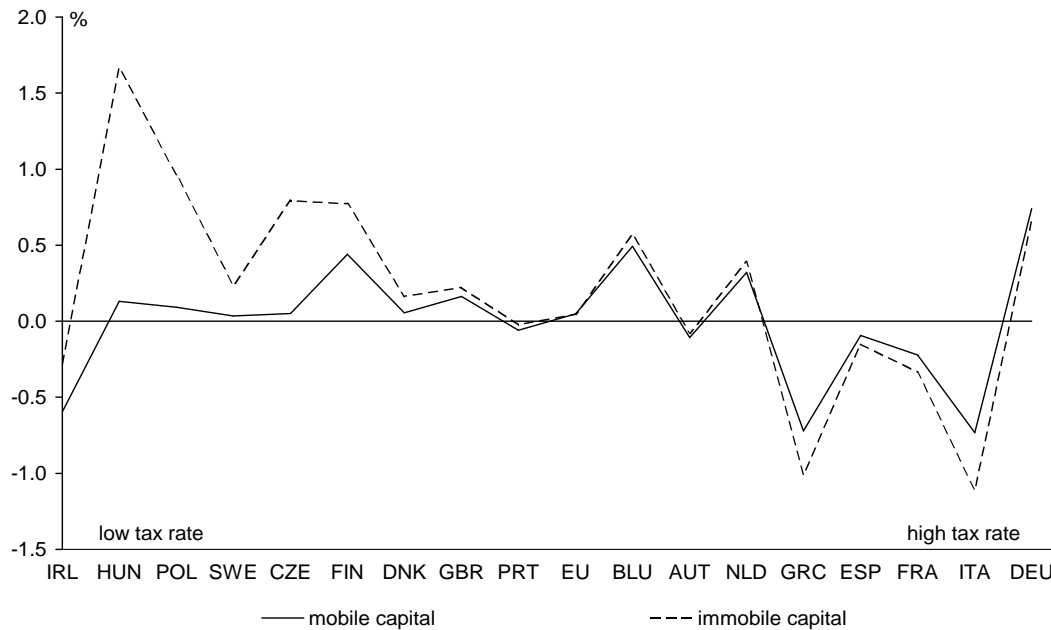


Figure 5.9 shows the impact on GDP of the introduction of CCTB for different assumptions of capital mobility. For the EU on average, the mobility of capital hardly matters. However, for some member states the mobility of capital matters a lot: low-tax countries produce more and high-tax countries produce less if capital is immobile. The main reason for this result is that consolidation with formula apportionment has a positive effect on wages (see Table 5.1), and therefore on savings in low-tax countries. With highly mobile capital the households in these countries can easily invest their additional savings in other countries. If capital is immobile, however, additional savings have to be met by the domestic market which drives the return to debt and equity down and stimulates domestic investment. As a result, employment and GDP in low-tax countries raise more if capital is internationally immobile – and vice versa for high-tax countries. Similarly, both the welfare gain in low-tax countries and the welfare loss in member states with high tax rates are aggravated if capital is immobile.

## **Conclusion**

The key message of this section is that tax planning hardly benefits GDP and welfare on average, but that the gains and losses are unevenly distributed. The gains for the whole Union, in terms of a reduction in compliance costs and the redundancy of transfer pricing, are offset by the distortive effect of reallocation. Within the EU, member states with large shares of inward and outward FDI, with low tax rates and with broad tax bases tend to gain.

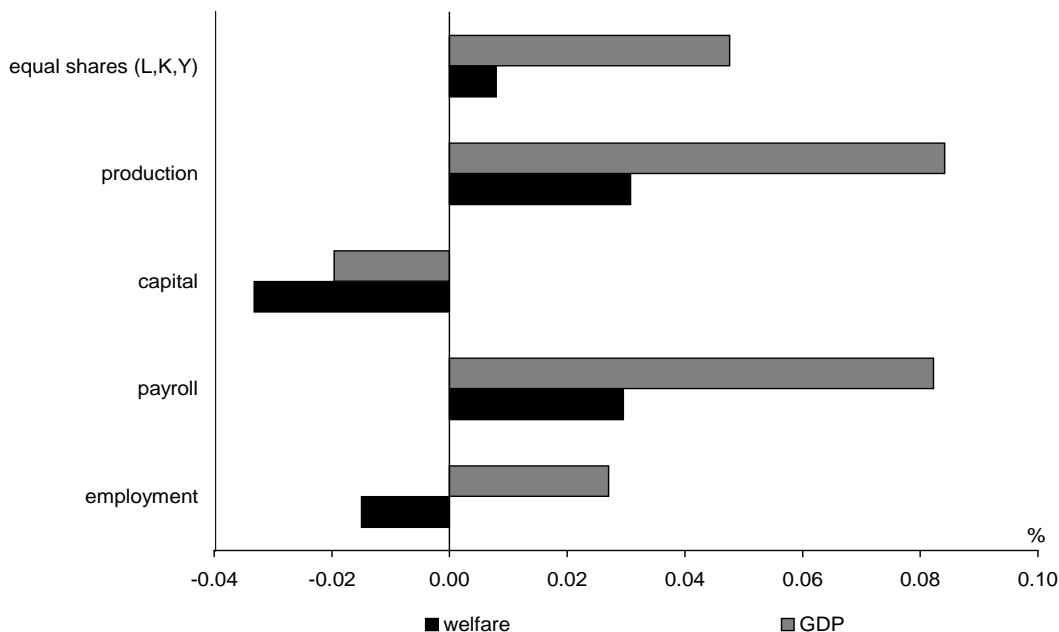
The sensitivity analysis in this chapter reveals that this conclusion holds for alternative assumptions about the mobility of capital and the compensation of budget deficits or surpluses. The broadness of the common base, however, largely influences the gains from consolidation, where a narrower base is beneficial for nearly all countries, whereas almost all member states lose with a very broad common consolidated tax base.

## 6 The choice of the apportionment formula matters

The European Commission (2006) acknowledges that consolidation involves ‘possible mechanisms such as formula apportionment’, but is still silent on which formula should be adopted. In the previous section, we have assumed a particular formula, namely with equal weights on employment, capital and production. The current section explores the economic and welfare effects of alternative formulae, see box. One crucial assumption is adopted throughout, namely that all member states adopt the same formula with same weights. Competition between member states in the choice of formula or the relative weights of each factor is outside the scope of the current paper.<sup>34</sup>

The main results of this section are previewed in Figure 6.1. The largest benefits are obtained for the EU on average if either production or payroll are included with unit weight in the apportionment formula. In contrast, a unit weight on either employment or capital reduces welfare in the EU. The apportionment formula of the previous section takes an intermediate position, with slightly positive effects on both GDP and welfare. In the remaining of this section we explain these results by showing the implications of alternative formulae on reallocation and government revenues.

**Figure 6.1 Impact of alternative apportionment formulae on GDP and welfare in the EU (average)**



<sup>34</sup> Section 2 concludes from the literature that the ability of each jurisdiction to change and strategically determine its factor weights, has in general, negative welfare implications. Competition in tax rates is discussed in section 7.

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### Alternative apportionment formulae

We explore the following alternative formulae (see box on page 18):

- *one-third*: equal weight on employment, capital and production;  $\phi_j = \frac{1}{3} \left( \frac{Y_j}{Y} \right) + \frac{1}{3} \left( \frac{L_j}{L} \right) + \frac{1}{3} \left( \frac{K_j}{K} \right)$
- *production*: unit weight on production;  $\phi_j = \frac{Y_j}{Y}$
- *employment*: unit weight on employment;  $\phi_j = \frac{L_j}{L}$
- *capital*: unit weight on capital;  $\phi_j = \frac{K_j}{K}$
- *payroll*: unit weight on payroll;  $\phi_j = \frac{(WL)_j}{WL}$

The formula with unit weight on payroll has very similar effects as the formula with unit weight on production, and is therefore omitted from the subsequent analysis.

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## 6.1 Ireland and Portugal

Two characteristics of the member states are crucial in the impact of the apportionment formula on the economic and welfare effects, namely the tax rate and the capital intensity. To highlight the working of both effects, we concentrate on two member states with extreme values, namely Ireland and Portugal. Ireland combines a low tax rate with a capital-intensive production structure, whereas Portugal has a much higher tax rate (at the EU-average of 33%) and a labour-intensive production structure. We investigate the impact of the apportionment formula on the tax payments by MNEs and the tax revenues of governments.

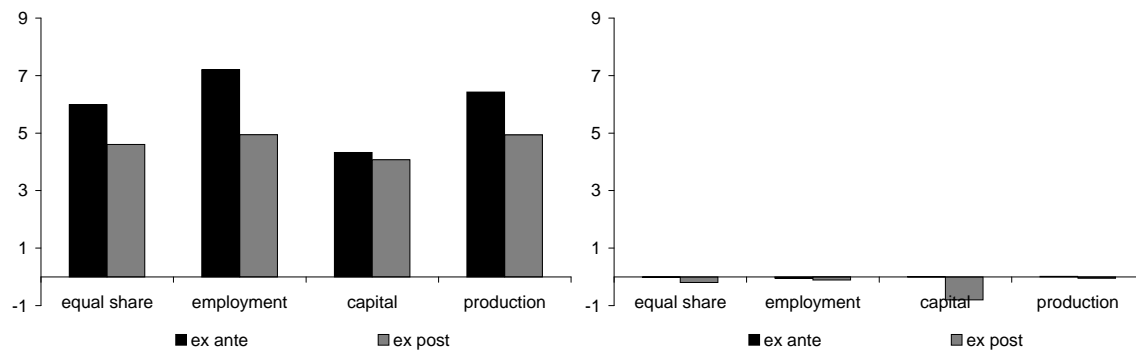
The first side of the picture is the impact of the apportionment formula on the average tax rate levied on multinationals. We expect this change to depend crucially on the following characteristics of MNEs. First, the production structure of subsidiaries are equal to the structure of the country in which they are located. Moreover, MNEs are relatively large in their home country. Thus, the Irish MNE has a relatively capital intensive production structure, whereas the Portuguese MNE is labour intensive. This implies that the Irish MNE will be weakly affected by formula apportionment if capital gets a high weight, as a large share of capital is concentrated in the capital-intensive and large parent firms. However, if labour gets a high weight, then a larger share of the consolidated base will be apportioned to the member states in which its subsidiaries are located, having higher tax rates. Things will be less clear cut for the Portuguese firm as its parent is located in a member state with an average tax rate. The impact of the weighting scheme will depend on the distribution of its subsidiaries in high-tax and low-tax countries.

These expectations are confirmed by Figure 6.2. The Irish MNE is confronted with the largest increase in the average tax rate if labour gets the unit weight in the apportionment formula, while the Portuguese MNE is hardly affected, *ex ante*. However, the latter firm is able to reduce its average tax rate by reallocating to low-tax and capital intensive countries if capital gets a high weight. Similarly, the Irish firm is able to reduce its average tax rate, in particular since reallocation to low-tax and labour intensive countries pays off.

Why are Irish firms able to benefit (relatively) from an apportionment system with a large share on labour, whereas the Portuguese firms benefit from the formula with unit weight on



**Figure 6.2 Average tax rate of a multinational – in Ireland (left panel) and Portugal (right panel)<sup>a</sup>**



<sup>a</sup> The average tax rates of MNEs are expressed in deviation of the statutory rate of their home country. The horizontal axis represent the weighting scheme in the apportionment formula, with respectively one-third weights on employment, capital and production, unit weight on employment, unit weight on capital and unit weight on production.

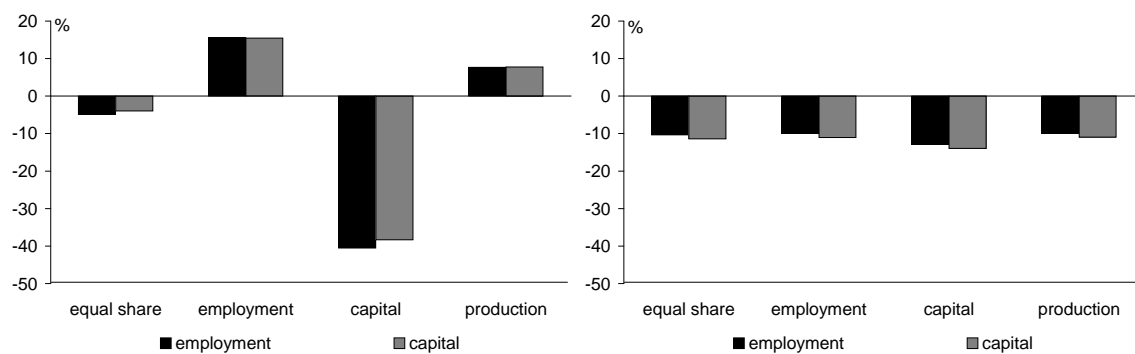
capital? The first possible explanation is that the amount and direction of reallocation depends on the weighting scheme. Figure 6.3 sheds light on this issue, by showing the change in employment and capital by the headquarters in both countries with four alternative apportionment formulae.<sup>35</sup> Observe that the changes in employment and capital go hand in hand, showing that a firm may expand employment only if its complementary input capital is expanded to, and vice versa. The left panel of Figure 6.3 confirms the first explanation: the Irish MNE expands its headquarter if employment gets a large weight in the apportionment formula. However, if apportionment is based on capital shares only, then the Irish multinational shrinks, because foreign MNEs want to expand. The alternative, though not mutually exclusive, reason is that the impact of a ‘similar’ amount of reallocation on the average tax rate depends on the apportionment formula. This effect clearly plays a role for the Portuguese multinational: its reallocation hardly depends on the apportionment formula, but its impact on the average tax rate (as shown in Figure 6.2) is much larger if the expansion in capital-intensive and low-tax countries (like Ireland) or the reduction in Germany (capital intensive & high tax rate) are highly weighted.

The other side of the picture is the tax revenue of governments. Consider first the government in the capital-intensive country Ireland. If capital gets a high weight in the apportionment formula, then a large share of the consolidated tax base of all (including foreign) MNEs is apportioned to Ireland.<sup>36</sup> Moreover, foreign MNEs want to expand their capital stock (which goes hand in hand with employment) in this low-tax country. This reduces the CIT-revenues, but raises the revenues from the labour-income and consumption tax. The CIT-revenues shrink because employment (and production) is shifted from domestic firms (whose CIT-base

<sup>35</sup> The figure shows the impact for the parent of the MNEs in both countries. The reallocation by their subsidiaries tells the same story.

<sup>36</sup> See Figure 6.4 where the increase in tax revenues allows for a reduction of the labour tax rate.

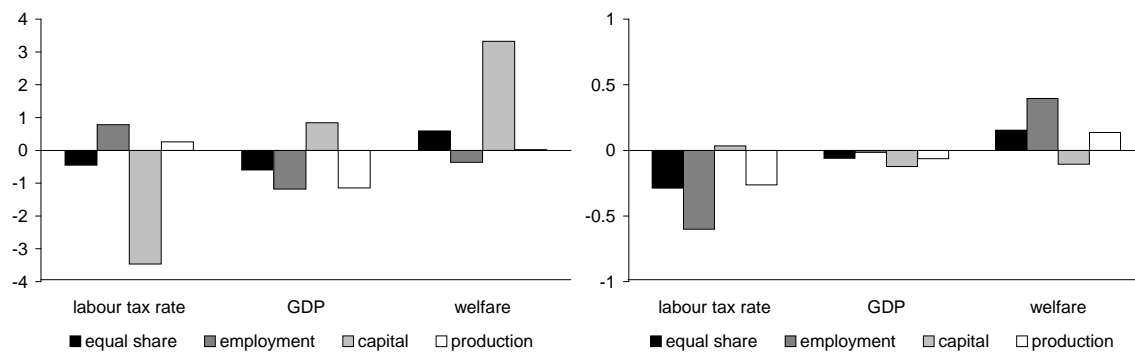
**Figure 6.3 Reallocation by the multinational – in Ireland (left panel) and Portugal (right panel)<sup>a</sup>**



<sup>a</sup> The vertical axis shows the relative change in employment and the capital stock in the head quarters (i.e. the plants in the home country) of the Irish and Portuguese multinationals. The horizontal axis represent the weighting scheme in the apportionment formula, see Figure 6.2.

completely accrues to Ireland) and the Irish parent firms (of which a large part of the CIT-base accrues to Ireland) towards foreign MNEs (of which only a small share of the CIT-base is apportioned to Ireland). The competition for labour, however, drives Irish wages up (by 4%) and allows for higher consumption (an expansion of 6%). The government in a capital-intensive country thus benefits from an apportionment formula with a large weight on capital. Similarly, the government in a labour-intensive country (Portugal) benefits from a large weight on labour, which will be passed through towards the households via a reduction in the labour tax rate.

**Figure 6.4 Key economic and welfare changes – in Ireland (left panel) and Portugal (right panel)<sup>a</sup>**



<sup>a</sup> The figure shows the change in the labour tax rate, the relative change in GDP and the change in welfare for four alternative apportionment formulae.

The change in the tax revenues and the implied change in the labour tax rate<sup>37</sup> are key determinants of the change in GDP and welfare. In all cases, welfare improves if the labour tax rate decreases, and vice versa. The change in GDP reflects at least two other effects. First, the change in GDP in ‘real’ prices Ireland is upward biased by abandoning of transfer prices, see

<sup>37</sup> Qualitatively similar results hold for scenarios where the change in tax revenues are passed through to households in an alternative way, e.g. a reduction in the tax on consumption goods or an increase in income transfers.

footnote 33 on page 49. Second, the reallocation effect, which is of second order in the welfare effects, negatively affects the ‘high-tax’-country (Portugal), as Figure 6.3 already implies.

Production in Ireland, however, becomes more attractive for MNEs as it increases the apportioned share of the consolidated base in a low-tax country.

Summarising, the apportionment formula is important for the tax bill of multinationals. It determines the amount and direction of reallocation, and also the ‘effectiveness’ of reallocation in reducing the average tax rate. Reallocation has important implications for GDP, but less for welfare. The latter depends more heavily on the change in the labour tax rate needed to compensate the reduction or increase in tax revenues. Tax revenues in a capital intensive country, like Ireland, increases if capital gets a large weight in the apportionment formula. This allows for a reduction in the labour tax rate and improves welfare. Similarly, welfare in the labour-intensive country, Portugal, improves if labour gets a high weight.

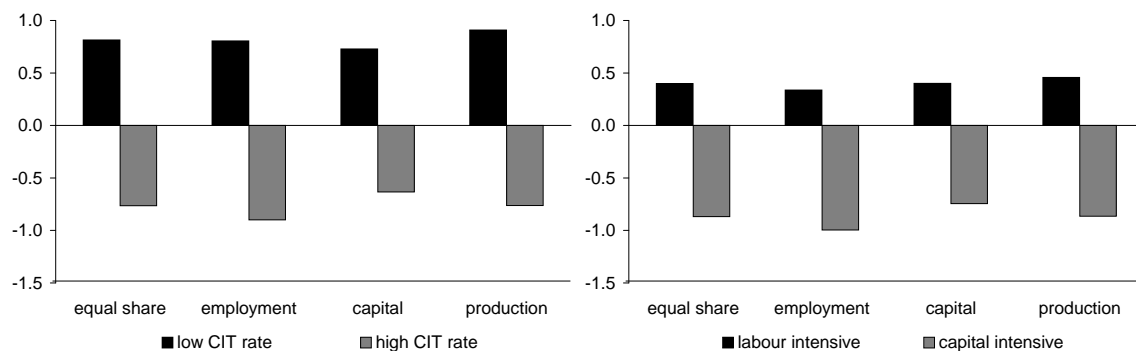
## 6.2 Formula apportionment in the European Union

With the lessons of the preceding section in mind, we extend the analysis to all EU member states. We test the conclusions for both extreme situations (with unit weight on either capital or labour), but also question why the production formula performs best in Figure 6.1.

### 6.2.1 Tax rate

How does the apportionment formula affect the average tax rate of MNEs? To answer this question, we distinguish (like in section 5.1) between the institutional or ex ante part and the endogenous or ex post part.

**Figure 6.5** The average tax rate (ex ante) of MNEs depends on the statutory rate (left panel) and capital intensity (right panel)<sup>a</sup>

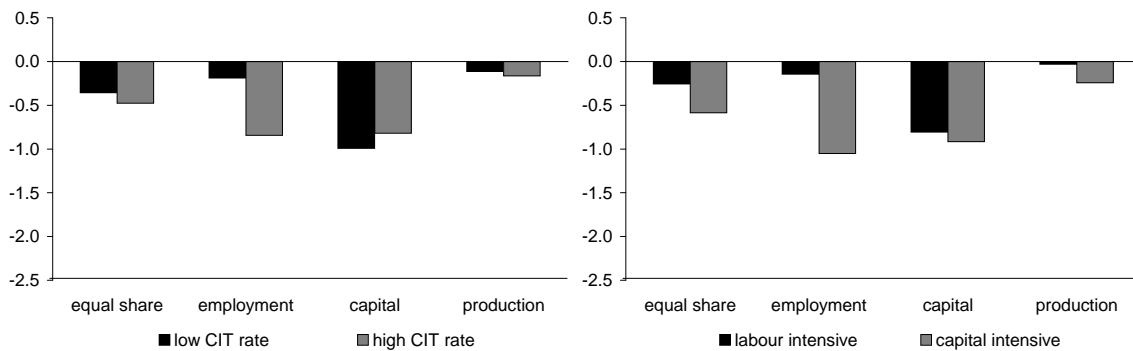


<sup>a</sup> Countries with a tax rate below average are: IRL, HUN, POL, SWE, CZE, FIN, DNK and GBR. Countries with a relatively small tax base are: GRC, ITA, PRT, SWE, ESP, AUT and FRA. Relatively capital extensive member states are: POL, PRT, CZE, HUN, GBR, GRC, SWE, AUT and DNK. For each criterion, the other group consists of the missing member states.

The institutionally determined change in the average tax rate is shown in Figure 6.5. The message from this figure is that the ex ante change in the average tax rate of MNEs hardly depends on the weights in the apportionment formula. Irrespective of the weights, MNEs in low-tax countries face an increase in the tax rate, whereas MNEs in high-tax countries benefit from a reduction in the average tax rate (see left panel). For all four weighting schemes, MNEs in capital-intensive countries pay lower taxes than the statutory rate in their home country. The impact of alternative weights in the apportionment formula is to weaken or enforce the ex ante change in the tax rate, without altering its sign.<sup>38</sup>

Why do MNEs in capital-intensive countries benefit? Theoretically, there is little reason why they benefit more than MNEs in labour-intensive countries. For example, low-tax countries like Ireland and Poland, will be confronted with a higher average tax rate, irrespective of the weights in the apportionment formula. At least insofar the change in the tax rate is institutionally determined (i.e. the ex ante part), the production structure of countries will not have a decisive influence. Therefore, the main reason for the dichotomy in the right panel of Figure 6.5 is not the interaction of the apportionment formula with the production structure of each country, but by the simple fact that a few big capital-intensive countries, namely Germany and France, happen to have high tax rates.

**Figure 6.6 Reallocation reduces the average tax rate of MNEs<sup>a</sup>**



<sup>a</sup> The figure shows the difference between the ex post and ex ante average tax rate for MNEs, depending on the statutory rate (left panel) and capital intensity (right panel) of the home countries.

The production structure might influence, however, the response of MNEs to tax differentials. Moreover, the impact of this reallocation on the average tax rate likely depends on the apportionment formula: MNEs in capital-intensive countries likely benefit from a high weight on labour, and vice versa. The intuition is that MNEs can more easily change the production levels of subsidiaries than of the parent, because changes in the large parent firms might affect the wage rate in the home country which limits the return to reallocation.

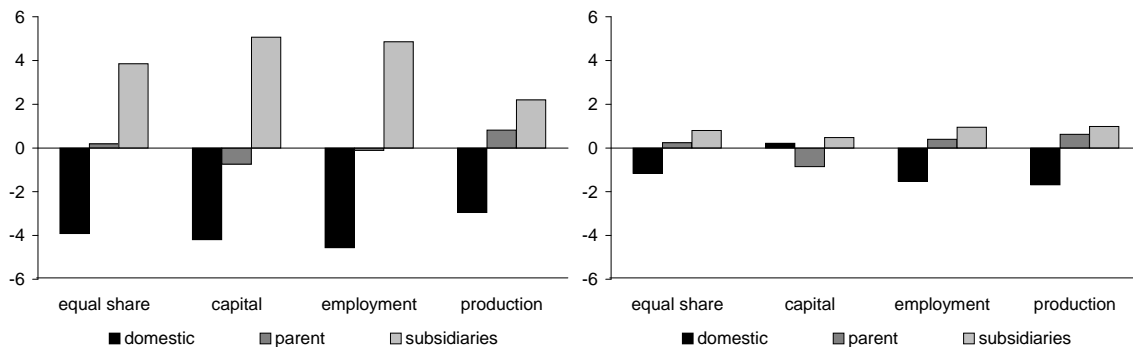
<sup>38</sup> We do not show the dependence of the average tax rate on the initial tax base. As expected, the interaction between the apportionment formula and the initial broadness of the tax base is very weak, because the rules for the consolidated tax base rules are the same for all MNEs.

The right panel in Figure 6.6 confirms both hypotheses: MNEs in capital-intensive countries are more able to reduce their average tax rate via reallocation, in particular if employment gets a high weight. The impact of reallocation does not, in the same uniform way, depend on the initial tax rate. MNEs in low-tax countries benefit most if apportionment depends on capital shares only, but MNEs in high-tax countries benefit most with the other three formulae.

### 6.2.2 Reallocation

Multinational enterprises are able to reduce their average tax rate by expanding production in low tax countries. The change in the tax rate depends, however, on the weights in the apportionment formula. Two reasons might explain this dependence. Either reallocation is stronger if either capital or labour gets a disproportionately large weight or the impact of the same amount of restructuring on the average tax rate differ (or both). In this paragraph, we investigate whether size and direction of reallocation depends on the weights in the apportionment formula.

**Figure 6.7 Change in employment in labour-intensive (left panel) and capital-intensive countries<sup>a</sup>**



<sup>a</sup> Change in employment of domestic firms (black), parents (grey) and subsidiaries (pale grey) as percentage of the labour force. See Figure 6.5 for the classification in labour- and capital intensive countries.

Figure 6.7 shows the reallocation of employment for the four different apportionment formulae. It should be noted, however, that the reallocation of capital provides a similar picture, as labour and capital are both needed in production, with only limited possibilities for substitution between them. This close connection between both production inputs also explains the main result from both figures: the amount and direction of reallocation hardly depends on the factor weights.

Quantitatively much more important is the fact that reallocation is highest in labour-intensive countries, where labour is relatively cheap. This confirms the statement in the previous paragraph that MNEs with capital-intensive parents benefit most from reallocation, because their subsidiaries in labour-intensive countries are expanded or shrunk. This general rule holds for all weighting schemes, which only induces a bit more or a bit less reshuffling of employment. A bit more, if either capital or employment gets a height weight. A bit less, if apportionment is based on production shares.<sup>39</sup>

<sup>39</sup> A split in countries between high-tax and low-tax countries (not shown) confirm these conclusions. The change in

**Table 6.1 Decomposition of the change in tax revenues (%GDP)**

	Equal share	Employment	Capital	Production
Corporate income	– 0.12	– 0.13	– 0.11	– 0.11
Labour income	0.02	0.02	0.00	0.03
Consumption	0.00	– 0.01	0.00	0.01
Personal capital income	– 0.01	– 0.02	– 0.02	0.00
Total tax revenues	– 0.10	– 0.14	– 0.13	– 0.08

The implication of the uniformity in reallocation patterns for the four weighting schemes implies that the differentiated impact on GDP, as shown in Figure 6.1, cannot be explained from the reallocation of MNEs only. The likely alternative explanation is that the weighting in the apportionment formula has a strong impact on the tax revenues by government (the second side of the coin), which will be passed through to households by a change in the labour tax rate. This will be investigated in the next paragraph.

### 6.2.3 Government

Table 6.1 provides a decomposition of the change in tax revenues resulting from changes in the tax bases. The consolidation of the corporate income tax, with the deduction allowances at the current EU average, implies a reduction in CIT revenues. This is mainly the result of the tax planning behaviour by MNEs, which are more able to plan taxes via the restructuring of production than through transfer pricing. Part of the revenue loss is compensated by an increase in the revenues of the labour income and consumption taxes, as the reallocation drives wages up (by 0.15-0.20% on average). Finally, personal capital income reduces slightly.

The implied reduction in total tax revenues varies between the alternative apportionment formulae. Apportionment on production shares implies the smallest reduction in tax revenues, whereas apportionment on either employment or capital generates the largest loss of tax revenues.

### 6.2.4 Economy and welfare

Section 5 has shown that the economic and welfare effects of common consolidated base taxation (CCBT) depend on the initial tax rate and base if apportionment is introduced with equal weights on labour, capital and production. Two questions are central in this section: does the same hold for alternative weighting schemes and why?

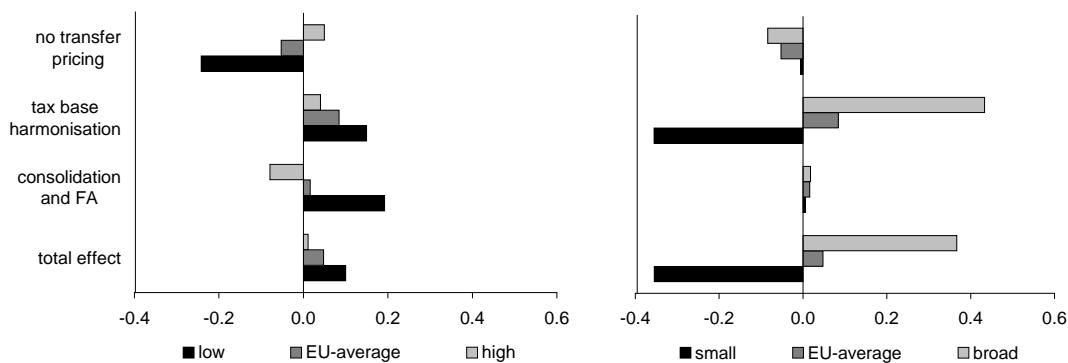
employment and capital between domestic firms and multinationals is, for all four formulae, strongest in low-tax countries. It is a bit more pronounced if capital or labour gets a high weight, and a bit tempered if apportionment is based on production shares.

Before we go to alternative weighting schemes, we first present a decomposition of the GDP-changes of formula apportionment with equal shares. We distinguish the following steps:

1. Elimination of existing distortions by the abolishment of transfer pricing and the reduction of compliance costs
2. Harmonisation of the tax base for multinational enterprises at the EU-average
3. Consolidation of the tax base and the introduction of formula apportionment

Figure 6.8 shows how each step depends on the statutory tax rate and the tax base of each member state.

**Figure 6.8 Decomposition of GDP as function of the tax rate (left panel) and the tax base (right panel)<sup>a</sup>**



<sup>a</sup> The decomposition is given for CCBT with equal weight on employment, capital and production. The three steps are defined in the main text.

The elimination of transfer pricing harms GDP in countries with a net inflow of paper profits, which are the low-tax countries. For the EU on average, transfer pricing reduces the tax burden for MNEs and thereby boosts production. Consequently, elimination of transfer pricing raises the tax burden for MNEs and reduces GDP. This effect is counteracted, but only partly, by the reduction in compliance costs.

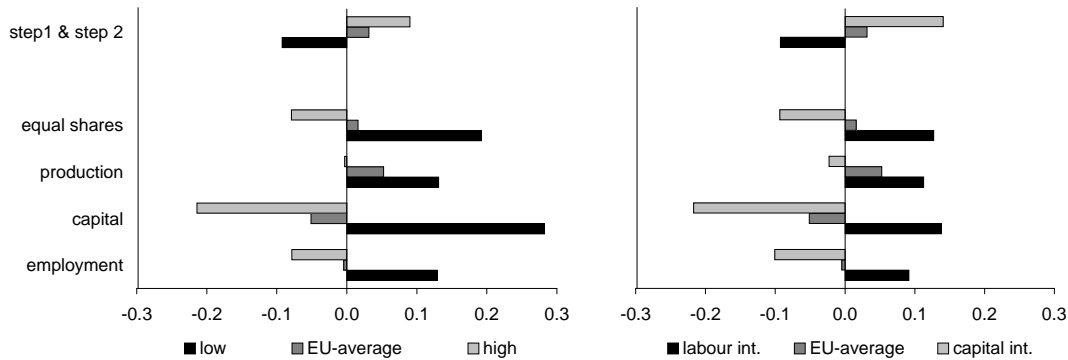
The second step of tax base harmonisation clearly depends on the initial broadness of the tax base: MNEs in member states with narrow bases cut down production because they are confronted with an higher CIT burden.

The introduction of formula apportionment (the third step) again depends on the statutory tax rates of member states: low tax countries benefit from production expansion by MNEs. The initial tax base plays a dominant role in the second step, such that member states with a broad base will benefit from harmonisation or consolidation. The statutory tax rates has conflicting impacts in the three steps, resulting in a slightly positive GDP effect for low-tax countries.

Next, we return to the alternative weighting schemes. Only the third step, consolidation with formula apportionment, depends on the factor weights. Figure 6.9 shows the impact for GDP for two groupings of countries, with low/high tax rates and with labour/capital intensive countries.

The grouping on tax bases is omitted, because the tax base only plays a role in the second step of tax base harmonisation. The capital or labour intensity of countries is added, because section 6.1 has already pointed at its importance, in particular if an extreme weighting scheme (on either employment or capital) is applied.<sup>40</sup>

**Figure 6.9 Decomposition of GDP as function of the tax rate (left panel) and the labour- or capital intensity<sup>a</sup>**



<sup>a</sup> The three steps in decomposition of the change in GDP are given for CCBT with four alternative apportionment formulae. The first and second steps in the decomposition, cf Figure 6.8, do not depend on FA and are therefore given only once.

The left panel of Figure 6.9 reveals that a low initial tax leads to a GDP-gain under all four formulae, but the effect is strongest if the most mobile production factor gets the highest weight. Similarly, MNEs cut down their activity, leading to a reduction in GDP, in the high tax countries, but this effect is hardly present if production is the only element in the apportionment formula. The opportunities for MNEs to affect the formula with full weight on production are limited, because they are not able to utilise the differences in capital intensity across countries, see Figure 6.7. The reason is that these differences in capital intensity are reflected both in the production structure of member states and in the apportionment formula with unit weight on production. This point is confirmed in the right panel, where the variation in GDP-effects are smallest with the 'production' formula.

To close the circle, we return to Figure 6.1 for the welfare effects of alternative apportionment formulae.<sup>41</sup> The most favourable formula is where production shares determine which fraction of the consolidated base is apportioned to each member state. We have shown that the reason for this welfare gain is the limited possibilities for MNEs to use (or abuse) the tax rate differentials between member states, which reduces the amount of tax-induced reallocation. This is confirmed in Figure 6.10, where the gap in welfare effects between low-tax and high-tax member states is minimised with apportionment on production shares. In addition, because tax

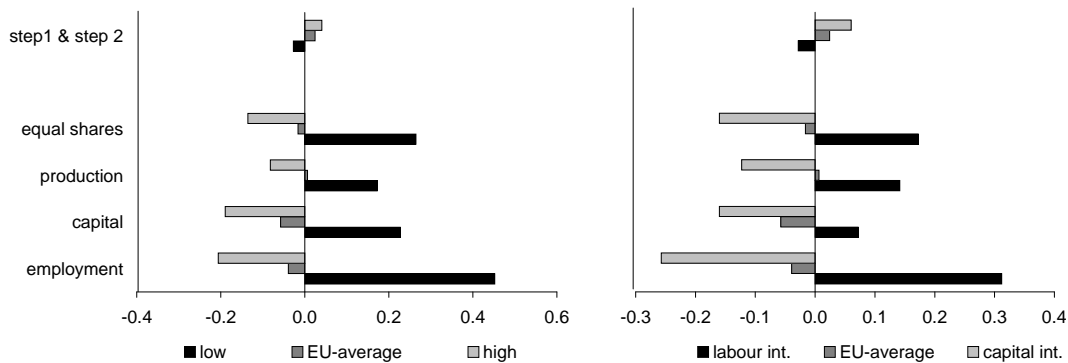
<sup>40</sup> The right panel of Figure 6.9 seems to suggest that the capital intensity also matters in the first and second step. This is merely a coincident, however. For example, Germany dominates the positive effect of capital intensive countries, not because of its capital intensity, but because it benefits a lot from narrowing its tax base.

<sup>41</sup> See Table 6.2 for the effects on employment, GDP and welfare per member state.



planning by MNEs is limited, the tax revenues on corporate income are larger than with the other weighting schemes, such that a smaller increase in alternative tax revenues is needed.

**Figure 6.10 Decomposition of welfare as function of the tax rate (left panel) and the labour- or capital intensity<sup>a</sup>**



<sup>a</sup> The three steps in decomposition of the change in welfare (%GDP) are given for CCBT with four alternative apportionment formulae. The first (the abolishment of transfer pricing and the reduction of compliance costs) and second step (harmonisation of the tax base) in the decomposition do not depend on FA and are therefore given only once.

Welfare declines if either employment or capital gets unit weight in the apportionment formula, as this gives firms the opportunity to intensively exploit the tax differentials between member states. Tax planning is limited, however, if apportionment is based on payroll shares instead of employment shares. The reason is that payroll shares closely reflect the economic structure of MNEs: subsidiaries in capital-intensive countries tend to have a relatively low labour share, which is compensated by a large compensation per employee.

## Conclusion

This section has shown that the design of the apportionment formula matters, because the differences in tax rates are still quite large in Europe. The better the formula resembles the distribution of corporate income of MNEs, the more Europe gains from consolidation. The uneven distribution of gains and losses can, however, not be resolved by a proper choice of the apportionment formula. Low tax countries tend to gain from the introduction of a common consolidated tax base, whereas high-tax countries lose, irrespective of the details of the apportionment formula.

**Table 6.2 Changes in employment (L), production (Y) and welfare (W) under alternative factor weighting<sup>a</sup>**

	Equal share			Employment			Capital			Production		
	<i>L</i>	<i>Y</i>	<i>W</i>	<i>L</i>	<i>Y</i>	<i>W</i>	<i>L</i>	<i>Y</i>	<i>W</i>	<i>L</i>	<i>Y</i>	<i>W</i>
IRL <sup>b</sup>	0.71	-0.60	0.59	0.04	-1.18	-0.36	2.06	0.84	3.35	0.28	-1.14	0.02
HUN	0.39	0.13	0.35	0.47	0.04	0.53	0.70	0.40	0.58	0.12	0.00	0.08
POL	0.26	0.09	0.31	0.54	-0.04	0.87	0.27	0.21	0.22	0.08	0.03	0.08
SWE	0.20	0.03	0.31	0.18	-0.01	0.38	0.19	0.08	0.20	0.14	-0.06	0.27
CZE	0.11	0.05	0.14	0.18	0.08	0.32	0.14	0.10	0.13	0.02	-0.02	-0.01
FIN	0.09	0.44	0.13	-0.06	0.28	-0.03	0.29	0.66	0.39	-0.02	0.30	-0.02
DNK	0.04	0.05	0.15	-0.07	-0.06	0.04	0.11	0.14	0.23	0.00	0.00	0.09
GBR	0.07	0.16	0.19	0.07	0.15	0.28	0.05	0.15	-0.02	0.08	0.14	0.24
PRT	0.04	-0.06	0.15	0.09	-0.02	0.40	-0.02	-0.12	-0.11	0.03	-0.06	0.14
BLU	0.07	0.49	0.32	-0.07	0.40	0.12	-0.18	0.18	-0.06	0.34	0.76	0.74
AUT	-0.03	-0.11	0.00	-0.09	-0.14	-0.05	-0.11	-0.20	-0.11	0.04	-0.05	0.10
NLD	-0.13	0.32	0.14	-0.23	0.29	-0.03	-0.17	0.16	0.00	-0.04	0.44	0.31
GRC	-0.14	-0.72	-0.40	-0.13	-0.71	-0.38	-0.15	-0.73	-0.42	-0.14	-0.72	-0.41
ESP	-0.02	-0.09	-0.03	-0.03	-0.09	-0.03	-0.03	-0.11	-0.02	-0.03	-0.10	-0.05
FRA	-0.21	-0.22	-0.15	-0.36	-0.33	-0.34	-0.21	-0.26	-0.10	-0.14	-0.14	-0.08
ITA	-0.26	-0.73	-0.37	-0.26	-0.71	-0.37	-0.31	-0.83	-0.43	-0.24	-0.70	-0.35
DEU	-0.07	0.74	0.04	-0.08	0.82	0.00	-0.22	0.46	-0.05	0.01	0.86	0.08
EU	-0.02	0.05	0.01	-0.03	0.03	-0.01	-0.05	-0.02	-0.03	-0.01	0.08	0.03

<sup>a</sup> *L* and *Y* denote the relative change (%) in respectively total employment and GDP, *W* represents the change in welfare as percentage of GDP.

<sup>b</sup> The countries are ranked at increasing tax rates.

## 7 Does consolidation trigger tax competition?

One might welcome tax competition as it may discipline governments, or one might fear it for eroding the tax raising capacity of governments. With either of these opinions, one would like to know whether tax competition is more likely with a consolidated tax base. The current section tackles this issue by investigating the incentives for each member state to unilaterally reduce its tax rate.

With the current system of separate accounting, Bettendorf et al. (2006) have concluded that a tax-race to the bottom is unlikely: no country benefits from abandoning the CIT-rate and not even all countries benefit from a tax-rate reduction. The main reason for this result is that the loss of revenues from a reduction in the corporate tax rate has to be compensated by more distortive taxes, like those on labour income or consumption.

The standard point of view in the economic literature is that formula apportionment increases tax competition between jurisdictions, see section 2. On the one hand, consolidation of the tax base eliminates the incentives for countries to underbid each others tax rates for profit shifting reasons. With formula apportionment, however, governments may attract multinational activity – weighted in the formula – by underbidding each others tax rates. The standard view is correct if the latter effect on location decisions dominates the incentives to attract paper profits. In the current section, we investigate whether consolidation triggers tax competition.

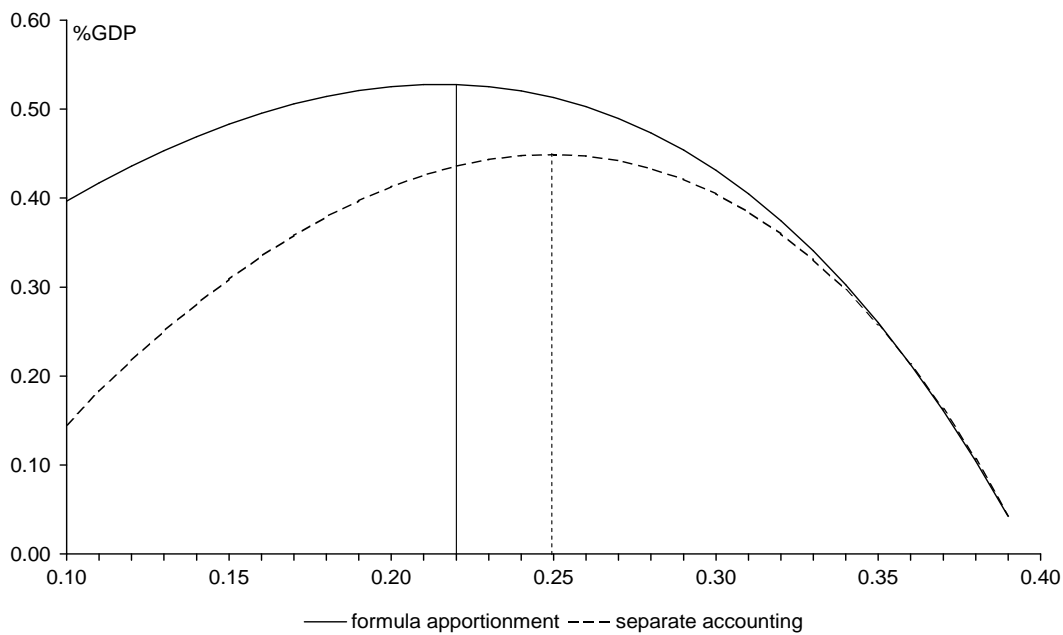
Pethig and Wagener (2003) conclude that tax competition is sharper the more elastically the apportionment formula reacts upon tax changes. An indication of this came forward in the previous section, where low-tax and low-wage countries benefit from a employment-only formula, whereas low-tax but capital-intensive countries benefit from a one-third formula on employment, capital and production. The second question of this section is therefore, whether tax competition depends on the apportionment formula.

Both questions are investigated for the common consolidated base taxation (cf section 5). To avoid overly strong incentives for tax rate reductions, we again assume that governments have to balance their budgets with taxes on labour income. We discuss the simulation results in two steps. We first focus on a single country, Germany, and then extend the analysis to the other member states.

### 7.1 An example: Germany

Consider first a single country, Germany, with a high tax rate of 40% (in 2002). For separate accounting, Bettendorf et al. (2006) have shown that Germany would benefit from an unilateral tax-rate reduction, in order to reduce outward profit shifting by MNEs. This result is reproduced in Figure 7.1, which shows the welfare gain for Germany of introducing a lower tax rate (in the range of 10 to 40%), while keeping the tax rates of the other countries at the observed levels. In this simulation, the optimal tax rate for Germany is 25%, much lower than the current rate.

**Figure 7.1 Lower optimal tax rate under CCBT in Germany<sup>a</sup>**



<sup>a</sup> The figure shows the welfare gain in Germany for setting unilaterally a lower tax rate (between 10 and 40%) in two scenarios: with separate accounting and with CCBT with formula apportionment (1/3 weight on labour, capital and production).

Consolidation with formula apportionment increases the incentives for Germany to reduce the CIT rate. First, the same reduction of 15 percentage points would pay off more (a welfare gain of 0.51% GDP instead of 0.44% GDP). In addition, a further reduction to a rate of 22% would generate an additional gain of 0.02% GDP. This shows for Germany that the incentives to attract paper profits (or to avoid negative paper profit shifting) under separate accounting are weaker than the incentives to attract production by foreign MNEs under formula apportionment.

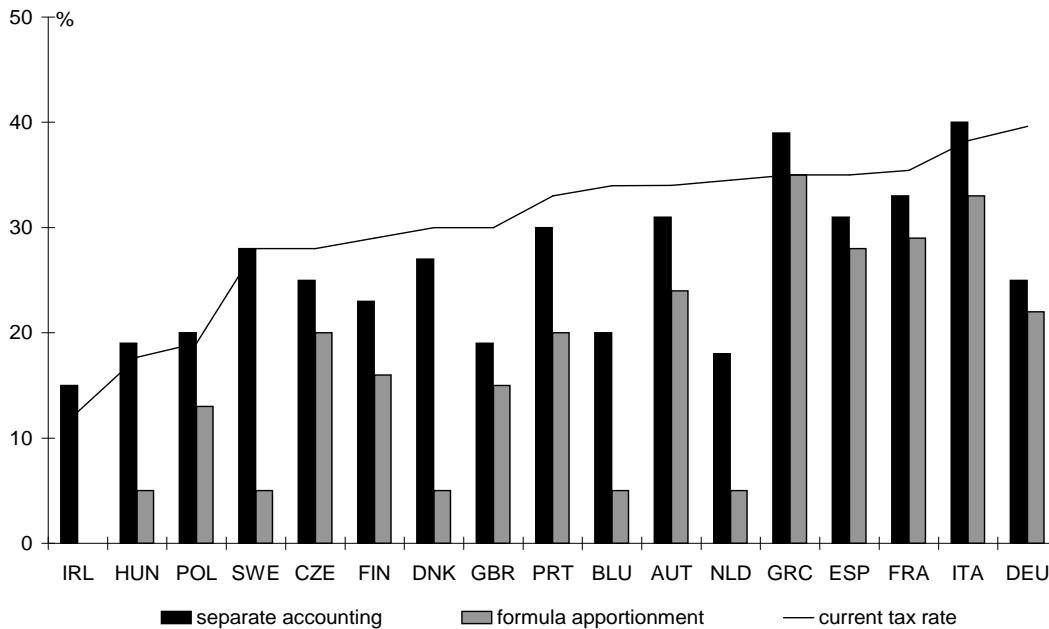
The welfare measure comprises the economic effects of tax competition for Germany. Not in every respect, however, is tax rate reduction more favourable under formula apportionment than with separate accounting. In terms of employment it is: the employment reduction (due to the higher tax on labour) is limited to 0.4% instead of 0.5%. In terms of investment and GDP, however, tax rate reduction under formula apportionment is less favourable: investment increases less (5.3% instead of 6.0%) and the expansion of GDP is slightly limited (1.6% instead of 1.7%).

## 7.2 CCBT & tax competition

The final bar in Figure 7.2 repeats the result for Germany: the optimal tax rates for Germany lie well below the actual rate of 40%. This shows that Germany would gain from an unilateral reduction in its CIT rate, both with separate accounting, but even more with formula apportionment. Similar analysis for the other member states shows that tax competition is intensified by consolidation with formula apportionment (with equal weights on employment,

capital and production). The optimal ‘unilateral’ tax rate under formula apportionment (FA) is lower than the corresponding rate under separate accounting (SA) for every country. The finding that the optimal tax rate under SA is close to the current rate for many countries no longer holds under the FA-system.

**Figure 7.2 More tax competition with formula apportionment<sup>a</sup>**



<sup>a</sup> The figure shows the optimal tax rates for each member state, assuming that other countries do not adjust their rates, in two scenarios: with separate accounting and with CCBT with formula apportionment (1/3 weight on labour, capital and production).

The differences between member states are large, however. At one extreme, Ireland would benefit from subsidising corporate income, in an attempt to attract foreign capital and to induce reallocation of employment towards MNEs. The extreme position of Ireland is mainly due to its openness. For other countries with a large share of multinationals (Belgium and the Netherlands), the incentives to reduce the CIT rate under formula apportionment are strong, but weaker than in Ireland.

Greece is at the other extreme: even with formula apportionment it has no incentive to unilaterally reduce its tax rate. Moreover, the difference between the optimal tax rates in the current system of separate accounting and in the proposed consolidation is small. Similar small effects are observed in relatively closed economies like Germany, France and Spain, but not in closed economies with low wage rates (Hungary and Poland) where reallocation is relatively cheap.

Table 7.1 presents a slightly broader picture of the gains for individual countries to initiate tax competition if other countries do not respond. Of course, all countries benefit from the unilateral change in the CIT rate, otherwise they would not change it in the first place (like

Greece). In addition, investment and GDP expand in all member states, which reflects the increased attractiveness of each country for MNE activity. The picture for employment is mixed, however. On the one hand, employment expands in response to the large labour demand by MNEs. On the other hand, the necessary increase in the labour tax rate reduces employment.

**Table 7.1 Economic effects of optimal unilateral reductions in CIT rates<sup>a</sup>**

	CIT rate	Labour tax rate	Wage	Employment	Investment	GDP
Ireland	– 12.5	1.1	2.6	0.3	2.5	1.3
Hungary	– 12.7	1.5	2.3	– 0.1	3.1	0.6
Poland	– 6.0	0.7	0.9	– 0.1	1.4	0.2
Sweden	– 23.0	0.9	2.7	0.3	4.1	1.3
Czech Republic	– 8.0	1.0	1.4	– 0.2	2.1	0.5
Finland	– 13.0	1.3	2.3	– 0.1	3.5	1.1
Denmark	– 25.0	2.1	3.2	– 0.2	5.0	1.5
United Kingdom	– 15.0	1.4	1.7	– 0.2	3.7	0.9
Portugal	– 13.0	0.9	0.9	– 0.2	2.0	0.3
Belgium	– 29.0	0.2	4.3	1.1	6.3	2.7
Austria	– 10.0	0.8	1.0	– 0.3	1.9	0.3
Netherlands	– 29.5	2.1	4.4	0.0	7.4	2.4
Greece	0.0	0.0	0.0	0.0	0.0	0.0
Spain	– 7.0	0.8	0.9	– 0.2	1.4	0.3
France	– 6.4	0.6	0.8	– 0.2	1.2	0.2
Italy	– 5.3	0.3	0.3	– 0.2	0.1	0.0
Germany	– 17.6	1.8	3.2	– 0.4	5.3	1.6

<sup>a</sup> The optimal CIT-rates are given in Figure 7.2. The change in both tax rate are expressed in percentage points; the others in percentages.

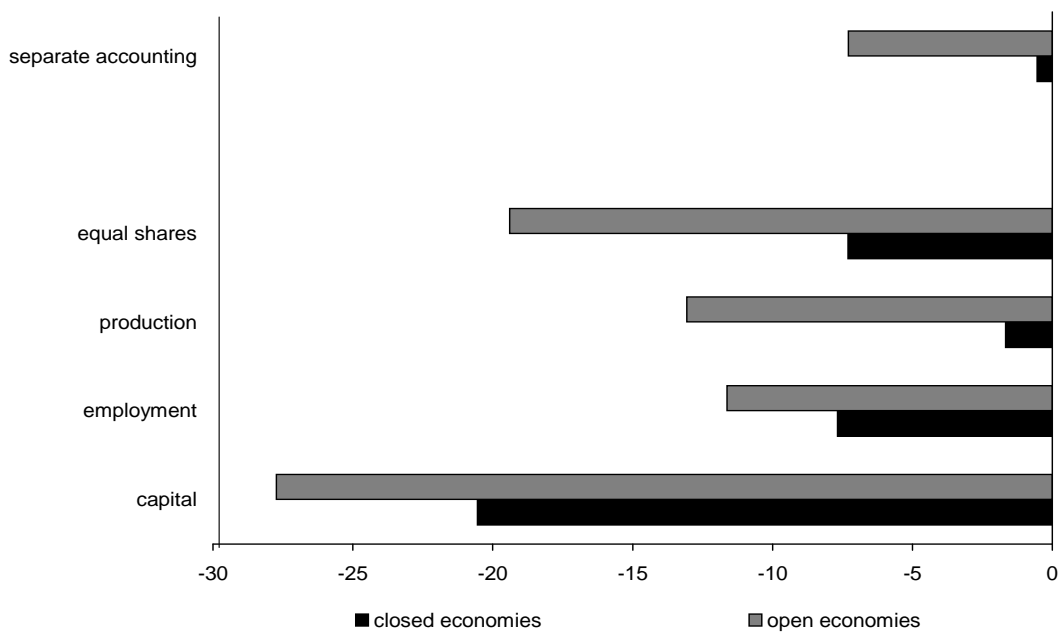
### 7.3 Formula apportionment and tax competition

Does the result that tax base consolidation with formula apportionment triggers competition in tax rates also hold for other apportionment formulae? Does tax competition depend on the mobility of production factors?

Figure 7.3 answers both questions affirmatively. Tax competition is intensified by consolidation with apportionment formula irrespective of the weighting scheme. The weighting scheme does matter, however, resulting in fiercest competition if the internationally mobile production factor, capital, gets a high weight. By reducing tax rates in this scenario, countries are benefitting from the largest response of multinationals and from the largest inflow of foreign direct investment.<sup>42</sup> This confirms the theoretical prediction by Pethig and Wagener (2003)

<sup>42</sup> One might wonder whether this contrasts the earlier findings, in section 6, where the unit weight on capital induces the largest response by MNEs, but at the same time generates an average welfare loss. The crucial difference is that tax competition is about unilateral tax rate reductions, which are valued at the welfare gain of individual member states only, thereby ignoring the beggar-thy-neighbour nature of tax competition. In contrast, the introduction of formula apportionment is an EU-wide policy valued in terms of the welfare in all member states.

**Figure 7.3 Tax competition with alternative formulae<sup>a</sup>**



<sup>a</sup> The figure shows the optimal unilateral (percentage points) reduction of the tax rates with CCBT, assuming that other countries do not adjust their rates, with separate accounting and with formula apportionment with four alternative weighting schemes.

stating that ‘if labour input is fixed, tax competition is sharpest if apportionment is based on property shares’. The final message from Figure 7.3 is that tax competition, measured as the optimal unilateral reduction of the tax rate, is larger in open economies. Obviously, these countries are able to benefit most from the tax planning strategies of multinationals.

### Conclusion

Consolidation enlarges the incentives for member states to reduce their tax rate. Member states benefit more from the real tax planning strategies of MNEs affecting the apportionment of the tax base than from the existing profit shifting via transfer pricing. This intensification of tax competition holds for all apportionment formulae, but is strongest if the internationally mobile production factor, i.e. capital, gets full weight in the formula.





## 8 Alternative proposals for consolidation

Various alternative types of consolidation have been put forward by the European Commission in its 2002 Tax Communication.<sup>43</sup> It is worthwhile to investigate some of these alternative proposals for a couple of reasons. First, although the common base consolidation is put forward in recent communications, like European Commission (2006), the alternatives have not been dismissed altogether and might receive renewed attention in the near future. Second, investigation of the alternatives might shed new light on the particularities of the common consolidated base taxation (CCBT). Third, the most far-reaching proposals, with consolidation of the tax base and harmonisation of the tax rate, offers insight in the potential gains from consolidation as it eliminates most tax distortions between member states.

This section discusses the economic and welfare effects of Home State Taxation (HST), of compulsory consolidation for all firms and the far reaching proposal of the European Union Corporate Income Tax (EUCIT), where even tax rates are harmonised.

### 8.1 Home state taxation

The consolidated tax base is calculated according to the rules of the home state. We assume that all European multinationals change to the new system, but domestic firms stick to the tax rules of their home country. Separate accounting still applies, however, for American firms and for the European subsidiaries in the United States. Like in section 5, we assume that formula apportionment is defined with equal weights on employment, capital and production.

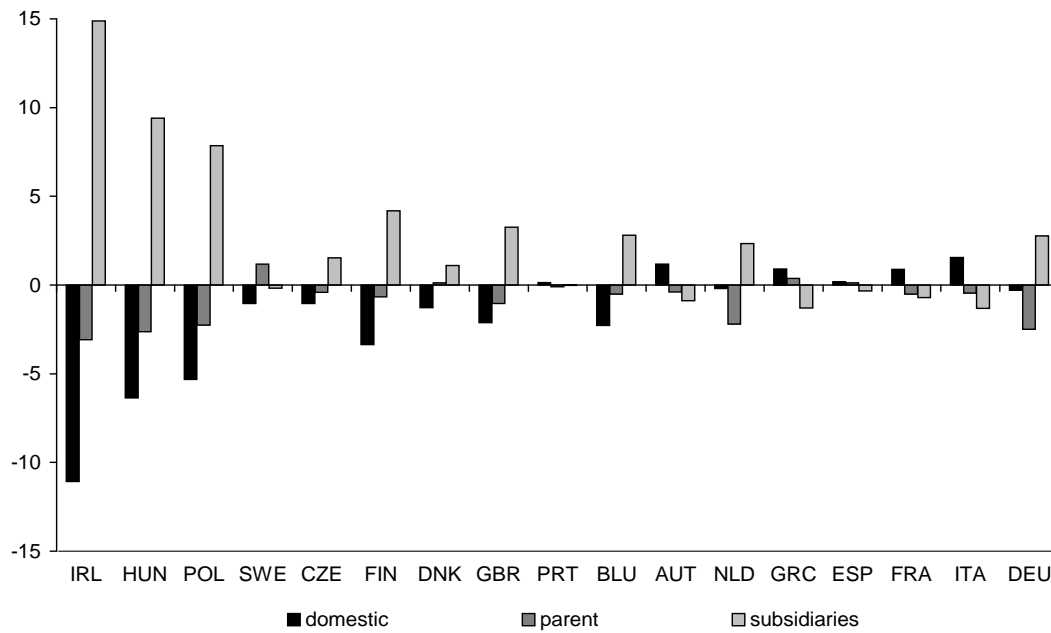
#### 8.1.1 Firms

Home state taxation implies that the tax base of domestic firms and domestic MNEs are defined similarly, but MNEs from different home states are subject to different tax rules. This change in the tax base likely has implications for the reallocation between firms. In comparison with CCBT, the incentives to reallocate between domestic MNEs and domestic firms are reduced, but the differences between domestic firms and foreign MNEs are increased. In comparison with the current system of separate accounting (and this is what the subsequent analysis shows), the tax base rules for firms are hardly changed: no single firm is confronted with a change in the broadness of the tax base. The only change is the consolidation of the tax base, and the subsequent introduction of formula apportionment. It is unlikely therefore that reallocation and other economic effects depend on the initial tax base (like it did with CCBT, see Figure 5.3).

This is confirmed by Figure 8.1 showing that reallocation depends on the initial tax rate, but not on the initial tax base (reallocation is very limited in narrow-base countries like Greece and

<sup>43</sup> See section 3 and more recently in communications on Home State Taxation, see European Commission (2004c, 2005).

Figure 8.1 Reallocation of employment (% labour force)<sup>a</sup>



<sup>a</sup> Reallocation of employment (% labour force) with home state taxation and formula apportionment with one-third weights on employment, capital and production. Countries are ranked with increasing tax rates.

Italy). In the terminology of section 5: the *base harmonisation effect* is absent with home state taxation. The two other effects are still present, though, and mimic reallocation under CCBT. The *direct tax burden effect* implies that MNEs want to reduce employment and investment in subsidiaries for which the average tax rate increases, which are the countries with low statutory rates (cf Figure 5.2). This implies a reduction of employment and capital by MNEs – both parents and subsidiaries – in low-tax countries (like Ireland, Hungary and Poland) and an increase of both production factors in high-tax countries like Germany and Italy.

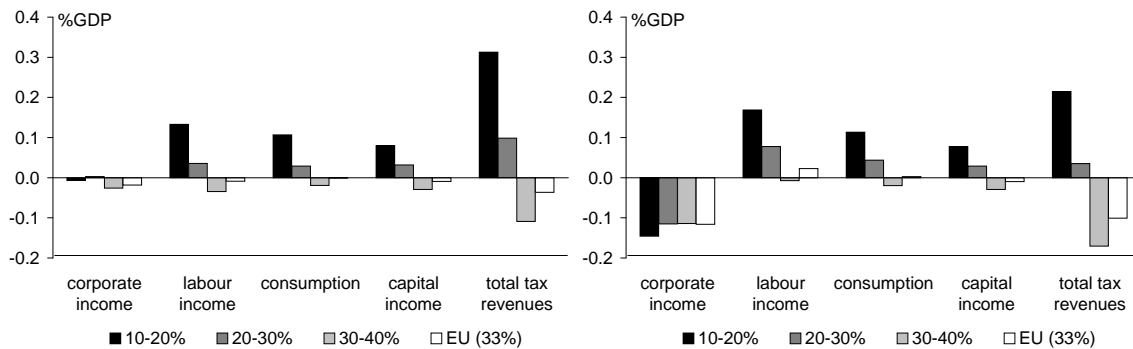
The *reallocation effect* implies that firms want to benefit from the opportunity to reduce the tax burden by shifting labour, capital and production to low-tax countries. A larger share of these factors in a low-tax country implies that a large share of the consolidated tax base is apportioned to these low-tax countries. In particular subsidiaries in low-tax countries respond to the opportunities for tax planning which the apportionment formula provides: subsidiaries in Ireland, Hungary and Poland expand at the expense of domestic firms and MNE-headquarters. However, in high-tax countries, MNEs respond by reducing investment and employment, which offsets the expansionary direct tax burden effect.

The absence of the base harmonisation effect implies that the changes in the value of the firm are tempered (cf Figure 5.4), though the variation between countries still exists. On average, MNEs still gain from consolidation, but this gain reduces from 2.8% with CCBT to 1.6% with HST. Similarly, domestic firms lose on average from consolidation, as they are confronted with fiercer competition for domestic labour, but the average loss reduces from 4.0% with CCBT to 1.4% with HST.

### 8.1.2 Government

How does the change in the type of consolidation and the reduced incentive for reallocation affect government revenues? Figure 8.2 shows a decomposition of tax revenues with either home state taxation or common consolidated base taxation.

**Figure 8.2 Tax revenues with home state taxation (left panel) and common consolidated base taxation (right panel)<sup>a</sup>**



<sup>a</sup> The figure decomposes the total tax revenues before compensation with the labour tax rate. The countries are split in three groups: IRL, POL and HUN have tax rates below 20%, the tax rates of SWE, CZE, FIN, DNK and GBR fall between 20% and 30%, and the remaining countries have tax rates above 30%.

The figure shows a clear difference of both proposals for the change in tax revenues on corporate income. Without the harmonisation of the tax base for MNEs, which is inherent in CCBT, CIT-revenues hardly change. This shows that the pure effect of consolidation on CIT revenues is quite small.

This limited effect of home state taxation on CIT revenues also explains the smaller reduction in total tax revenues in the EU. The labour-tax revenues partly counteract this effect, however, as they slightly increases with the CCBT proposal, but decline with HST. This is due to the smaller amount of reallocation with HST, which tempers the upward pressure on wages.

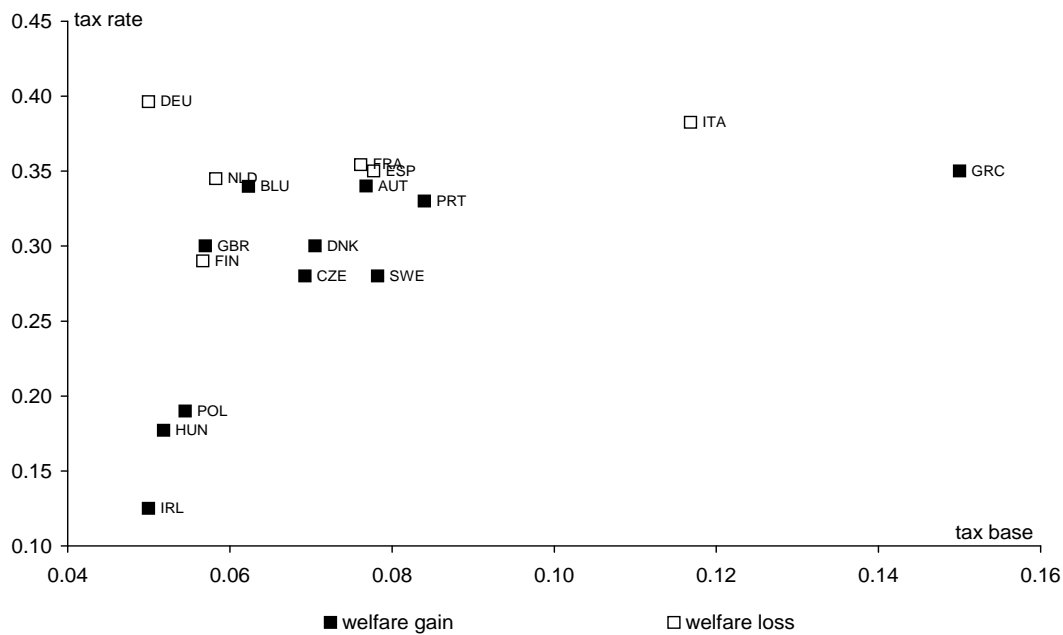
In both scenarios MNEs in low-tax countries want to expand their production, which results in higher wage income, consumption and profit income. This is reflected in higher tax revenues. The opposite holds for high-tax countries, which face a reduction in the revenues of all four kinds of taxes.

### 8.1.3 Economy and welfare

We have emphasised in this section that the initial tax base plays a minor role in the change from separate accounting to home state taxation. Figure 8.3 confirms this, by showing that the distinction between gaining or losing member states depends only on the initial tax rate, but not on the tax base. For example, one of the countries with the narrowest base, namely Greece, benefits from HST, whereas Italy loses.

The welfare gain in low-tax countries reflects the rise in net income of households, due to a higher wage rate and a reduction in the labour tax rate, see Table 8.1. However, the welfare gain

**Figure 8.3 Welfare gain depends on initial tax rate only<sup>a</sup>**



<sup>a</sup> The change in welfare (%GDP) is the result of the introduction of HST, with the one-third apportionment formula on employment, capital and production, and where governments adjust the labour-tax rate to balance the budget. The countries are located at their statutory tax rate and the rate of tax deductions.

does not need to go hand in hand with an expansion of production: the expansion of production by MNEs goes at the expense of domestic firms, as has been shown in Figure 8.1. For many low-tax member states, the net effect is a reduction in GDP and a smaller capital stock.

The EU on average hardly gains nor loses from home state taxation: welfare is unchanged and GDP declines slightly. Consolidation and the induced reduction in compliance costs generate a welfare gain, which is offset by the distortive effect of formula apportionment and the unlevel playing field for MNEs from different member states.

## 8.2 Compulsory consolidation

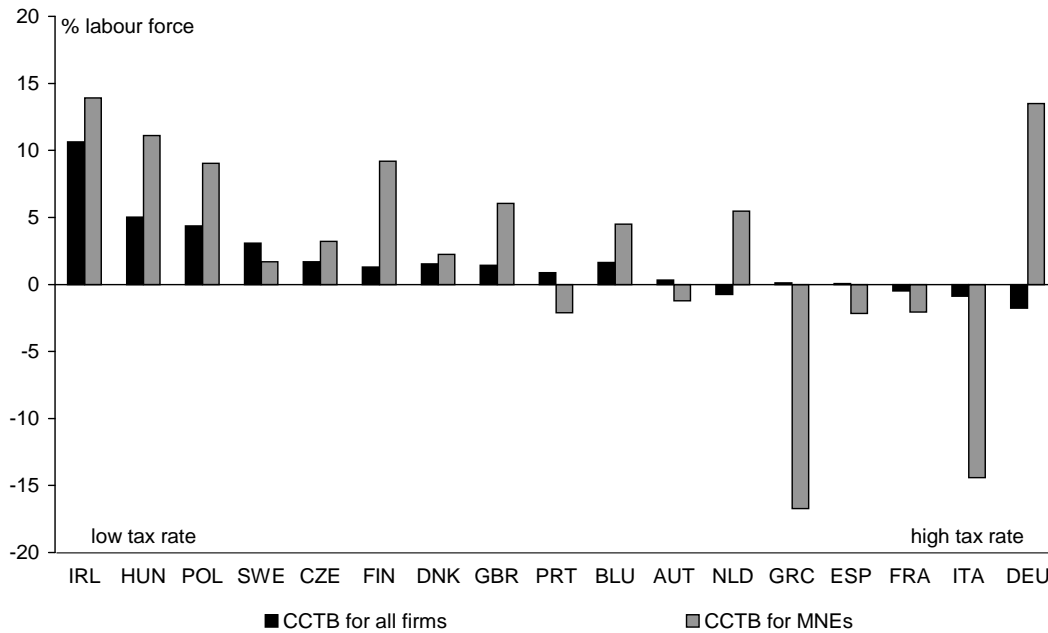
Neither CCTB nor HST will deliver the welfare which might be expected from consolidation. In both cases, unevenness between firms and formula apportionment in combination with the large tax-rate differentials are identified as the culprits. Both culprits will be removed in turn, where we first make the common system compulsory and in the next section we add the harmonisation of the tax rates.

We harmonise the base of the tax on corporate income at the EU average of  $\delta_t^{EU} = 7.2\%$ . Both domestic and multinational enterprises have to switch to this common tax base.<sup>44</sup> Of course, consolidation benefits multinationals, but is meaningless for domestic firms. As before,

<sup>44</sup> This harmonisation of the tax base leaving the tax rate country-specific is known as the compulsory harmonised corporate tax base (CHCTB), see section 3.

the consolidated tax base is apportioned to the member states with one-third shares on employment, capital and production.

**Figure 8.4 Compulsory consolidation reduces reallocation**



<sup>a</sup> Change in employment (% labour force) by MNEs in each member state of both parents and subsidiaries, if CCTB is compulsory for all firms or if only MNEs participate.

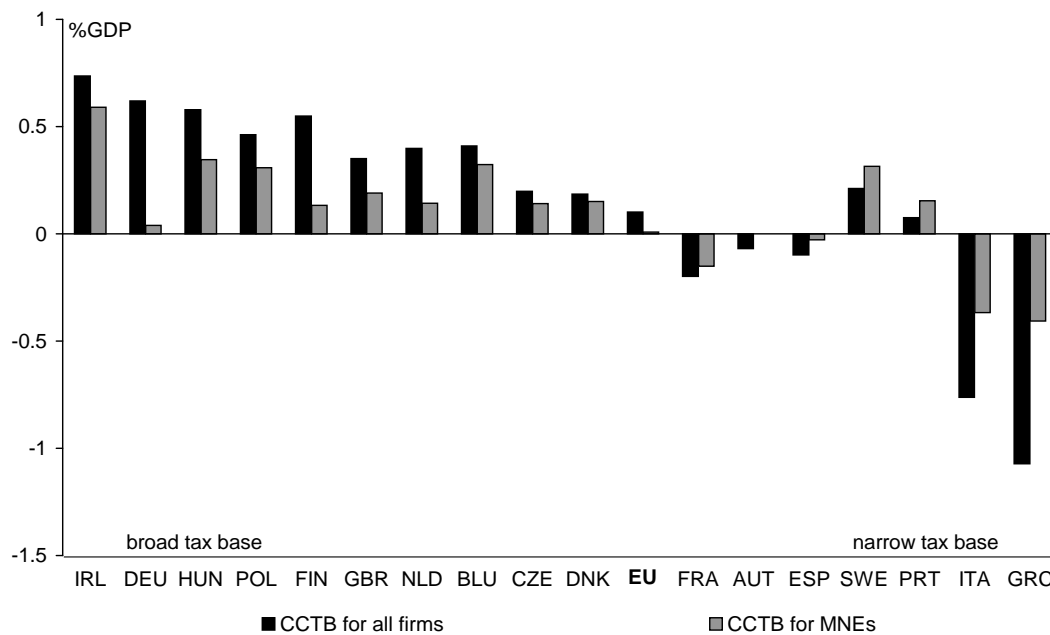
How important is the inclusion of domestic firms in the tax base harmonisation? Figure 8.4 shows that it is very important for the reallocation of production by firms. The figure compares the amount of reallocation, measured as the change in employment of MNEs in each member state, under CCTB for all firms and CCTB for MNEs only. In particular in countries with extreme broad or narrow tax bases, like Germany and Greece, the incentive to reallocate within a country reduces substantially.<sup>45</sup> The remaining incentive to reallocate is the tax-rate differential, as multinational enterprises reduce their tax obligations by expanding their subsidiaries in low-tax countries.

How large are the efficiency gains if all countries harmonise their corporate income tax base for both MNEs and domestic firms? Figure 8.5 answers this question by showing the welfare change for the EU and the member states. Welfare in the EU improves on average by 0.10% GDP if the common tax base applies to all firms. This shows that the design of consolidation is crucial: consolidation will only be beneficial if it does not introduce new distortions between firms.

Despite the average welfare gain with the CCTB for all firms, the distribution of gains and losses is very uneven. This is mainly due to the existing heterogeneity, in particular in the

<sup>45</sup> Cnossen (2003) points at the domestic distortions being obstacles for European harmonisation or consolidation of the corporate income tax.

**Figure 8.5 A compulsory common base improves welfare in the EU<sup>a</sup>**



<sup>a</sup> The figure shows the change in welfare (as %GDP), if the CIT is harmonised for MNEs only (grey bars) or if the CIT is harmonised for all firms (black bars).

breadth of the tax base. In general, member states benefit from a narrowing of their base, but lose if the common base is broader than their existing base. A noticeable exception is Sweden, where the additional CIT-revenues from a broader base can be used for a reduction in the highly distortive tax on labour income.

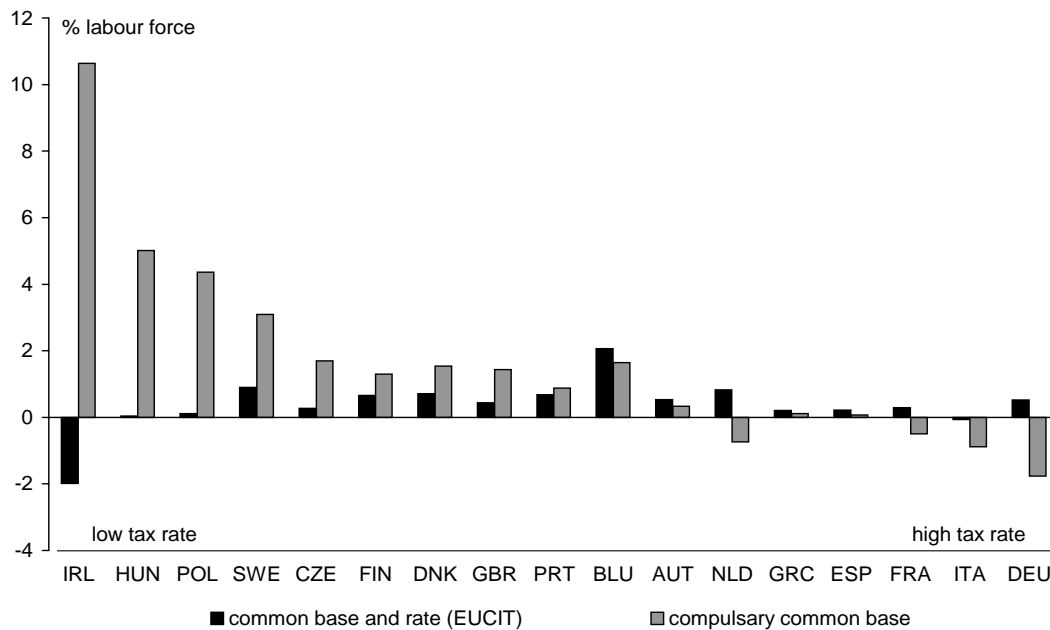
### 8.3 European Union Corporate Income Tax

The most far-reaching proposal for consolidation is the harmonisation of not only the tax base but also the tax rate. A proposal in this direction is the European Union Corporate Income Tax (EUCIT).<sup>46</sup> We investigate this proposal to show the potential welfare gain of consolidation, i.e. if all tax distortions between countries are minimised. This gain is reached if the CIT base and rate are harmonised for both MNEs and domestic firms.<sup>47</sup>

<sup>46</sup> In this proposal, the corporate income tax revenues might become a direct finance source of the EU. As the EU is not included as a separate entity in the model, tax revenues are distributed to the member states. The correlation between the observed shares of the contribution of the considered member states (in 2002, see European Commission (2004b)) and the simulated shares in the CIT revenues equals 0.98. Therefore, under the assumption that the new EU-revenues will partially replace the existing contributions by the member states, our way of modeling these flows does not affect the outcomes.

<sup>47</sup> We harmonise both the rate and the base of the tax on corporate income at the EU average of respectively  $\tau_p^{EU} = 33.3\%$  and  $\delta_t^{EU} = 7.2\%$ , which holds for all European firms, both domestic and MNEs. As before, the consolidated tax base is apportioned to the member states with one-third shares on employment, capital and production.

**Figure 8.6 EUCIT tempers reallocation ...**

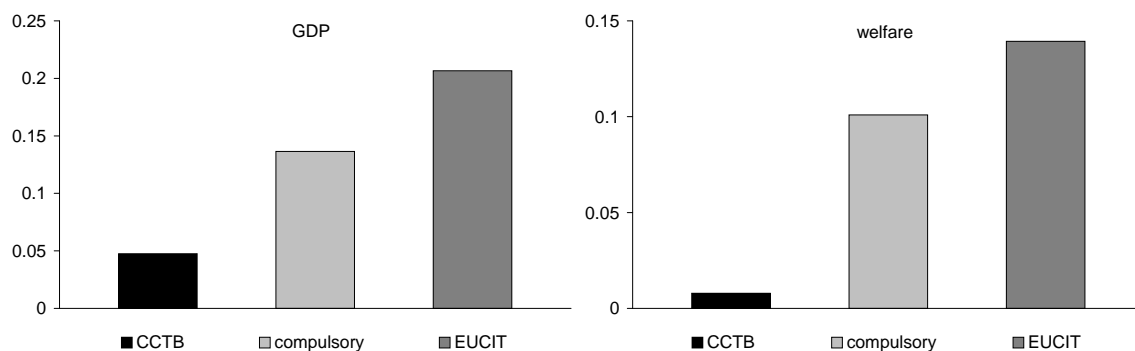


<sup>a</sup> Change in employment (% labour force) by MNEs in each member state of both parents and subsidiaries, if only the CIT for MNEs is harmonised or if CIT for all firms is harmonised.

How important is the harmonisation of the tax rate? Figure 8.6 shows that it is very important for the reallocation of production by firms. Indeed, the common consolidated base and the harmonised tax rate eliminate the tax-incentives for reallocation. Only small amounts of reallocation can still be observed, like in Ireland, where the existing bias for MNEs to locate in this low tax-country rate is eliminated.

Due to the limited incentives for reallocation, harmonisation of the tax rate generates an additional welfare gain of about 0.04% GDP, as is shown in the right panel of Figure 8.7. The left panel, showing the GDP-effects from consolidation and tax-rate harmonisation repeats the

**Figure 8.7 ... and improves GDP and welfare in the EU<sup>a</sup>**



<sup>a</sup> The figure shows the change in GDP (%) and welfare (as %GDP) for three assumptions on the common base: for MNEs only (CCTB), for all firms (compulsory) and if the tax rates are harmonised too (EUCIT).

message of this section: the benefits from the common consolidated base can be fully obtained if the common base applies compulsory for all firms and if in addition the tax rates are harmonised.<sup>48</sup>

## Conclusion

Comparing the alternative types of consolidation with ‘common consolidated base taxation’ points at the importance of the even or uneven treatment of firms within and between countries. The strength of CCBT is that all MNEs are treated equally. Its weakness is, however, that domestic firms might be excluded, and even MNEs might choose to stick to the current system of separate accounting. This creates uneven competition between firms, and leads to a significant reduction of GDP, employment and welfare on average in the EU.

Additional gains can be obtained with the far-reaching EUCIT, where not only tax bases are compulsory consolidated, but where in addition tax rates are harmonised.

**Table 8.1 Economic and welfare effects of Home State Taxation<sup>a</sup>**

Country <sup>b</sup>	CIT (y)	$\tau_l$ (a)	w (r)	L (r)	K (r)	GDP (r)	CV (y)
Ireland	- 0.21	- 0.60	1.21	0.73	- 0.67	- 0.88	0.49
Hungary	0.00	- 0.53	0.39	0.40	0.23	- 0.16	0.33
Poland	0.02	- 0.42	0.30	0.27	0.26	- 0.09	0.28
Sweden	0.04	- 0.17	0.07	- 0.04	- 0.45	- 0.23	0.30
Czech Republic	0.02	- 0.20	0.06	0.08	0.01	- 0.05	0.12
Finland	- 0.08	0.04	0.21	0.15	0.46	0.25	- 0.05
Denmark	- 0.01	0.01	0.08	- 0.04	- 0.05	- 0.07	0.11
United Kingdom	0.00	- 0.15	0.13	0.11	0.34	0.04	0.10
Portugal	0.05	- 0.23	- 0.01	0.02	- 0.08	- 0.01	0.19
Belgium & Luxembourg	- 0.07	0.02	0.24	0.01	0.78	0.25	0.14
Austria	0.02	0.05	- 0.06	- 0.11	- 0.26	- 0.18	0.02
Netherlands	- 0.03	0.10	0.01	- 0.05	0.46	0.13	- 0.04
Greece	0.01	0.00	- 0.05	- 0.04	- 0.15	- 0.07	0.01
Spain	0.00	0.03	- 0.01	- 0.03	- 0.02	- 0.03	0.00
France	- 0.02	0.39	- 0.05	- 0.32	- 0.26	- 0.30	- 0.16
Italy	0.02	0.15	- 0.08	- 0.22	- 0.28	- 0.24	- 0.01
Germany	- 0.04	0.16	0.02	- 0.02	0.64	0.25	- 0.12
EU	- 0.01	0.03	0.04	- 0.02	0.11	- 0.04	0.00
USA	0.00	0.00	0.00	0.00	0.00	- 0.01	0.00

<sup>a</sup> Formula apportionment is assumed to depend on employment, capital and output with equal weights.

<sup>b</sup> CIT: change in revenues from corporate income tax, as share of GDP (y);  $\tau_l$ : absolute (a) change in labour-tax rate; w, L, K and GDP: relative (r) change in respectively the wage rate, employment, capital and gross domestic production; CV: change in welfare, as fraction of GDP.

<sup>48</sup> This does not prove that harmonisation of the tax rate is the best policy. It only shows that harmonisation is better for the EU than the current situation with large tax differentials, but it does not imply that alternative scenario's with – likely – small variation in tax rates might be better.



## 9 Conclusion

The economic effects of consolidating the corporate income tax base and applying formula apportionment depend crucially on its design. The largest gains from consolidation might be expected if all enterprises, both domestic and multinational, are treated equally. Proposals for consolidation which exclude part of the firms may create an unlevel playing field which induces a large restructuring both within and between member states. Formula apportionment distorts the investment and labour-demand behaviour of multinational enterprises, which are minimised if the apportionment formula reflects the distribution of corporate income of MNEs.

The main benefits from the abolishment of separate accounting by consolidating the tax base are the elimination of paper profit shifting, the introduction of automatic loss compensation for cross-border activities and the reduction of compliance costs. However, consolidation has its costs too, as it may create unequal opportunities for different firms. With common consolidated base taxation (CCBT), domestic firms might face a different definition of the tax base than MNEs. Consider the introduction of a common base at the EU average to which only multinationals may apply. In countries with a broad tax base, this consolidation benefits multinationals relative to domestic firms, as the latter still have to apply to the broad domestic rules.

In the alternative proposal of home state taxation, where firms have to make their tax declaration according to the rules of their home country, domestic firms and multinational headquarters are treated equally. Unevenness is now introduced, however, between subsidiaries of foreign MNEs. Home state taxation gives preferential treatment to subsidiaries originating from member states with a narrow tax base.

The full benefits from consolidation can only be reaped if all firms participate and apply to a common tax base. If domestic firms are excluded, the EU-average gains in terms of GDP and welfare from CCBT equal respectively 0.08% and 0.03% GDP in the long run, with the most favourable apportionment formula. The gains would be much larger, with additional gains for both GDP and welfare of about 0.10%, if not only MNEs but all firms participate.

Apportioning the consolidated base to the member states leave them the autonomy to tax corporate income at their own desired rate. However, the way in which the tax base is distributed distorts the investment and production decisions of multinational enterprises. The largest distortions are introduced if apportionment is based on a single production factor, e.g. on employment or on capital. The incentives for reallocating production are minimised if the apportionment formula resembles the distribution of the corporate income of MNEs. In the simulations with *CORTAX* this is achieved if apportionment depends only on production shares.

The economic effects of CCBT with formula apportionment are unevenly distributed, both between and within countries. With separate accounting, low tax countries are attractive for the location of paper profits. With formula apportionment, however, low tax countries are attractive for the location of production (and production factors): higher production in low-tax countries enlarges the apportioned share of the tax base in these jurisdictions and thus reduces the average tax payments of MNEs. This expansion of MNEs implies an increase in GDP, employment and capital in low-tax countries. In contrast, production in high-tax countries declines. This uneven distribution of gains and losses due to formula apportionment adds up to the unbalanced impact of the common consolidated base. In our basic simulation of CCBT, where apportionment is based on employment, capital and production in equal proportions, the change in welfare ranges between a reduction of 0.4% GDP and an increase of 0.6% GDP, whereas the change in GDP ranges between a reduction and an increase of both 0.7%.

Finally, tax competition is intensified with common consolidated base taxation. Relatively open economies and those with low tax rates have stronger incentives to reduce their tax rate with a consolidated tax base than with separate accounting. Would formula apportionment be based on an internationally mobile production factor, like capital, tax competition might even result in a race to the bottom: for several member states it is optimal to leave their proportioned share of the common tax base untaxed. Would apportionment be based on an internationally less mobile factor, like employment, tax rates are likely to be cut, but not to the bottom.

In sum, the advantages of replacing separate accounting by consolidation turn out to be small for the EU as a whole, according to our simulations. The favourable effects of reducing existing distortions are offset by the introduction of new distortions.

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