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Tim Callan (ed.)

Alan Barrett, Frank Barry,
Albert van der Horst, Ide Kearney,
Philip R. Lane, Brian Nolan,
Martin O'Brien, John R. Walsh

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IS EU COORDINATION NEEDED FOR CORPORATE TAXATION?

Albert van der Horst

1. Introduction

Should EU-member states give up their rights to design their own corporate income tax? Currently, member states are free to set their tax rates and are allowed to design their tax base as long as it does not constitute harmful tax competition. This is regulated in the Code of Conduct, which is not a legally binding instrument but does have political force. By adopting this Code, the member states have undertaken to roll back existing tax measures that constitute harmful tax competition and refrain from introducing any such measures in the future.¹

Should the European Union go beyond this minimum and coordinate the taxes on corporate income? In the policy debate, a distinction is made between coordination of tax rates and of tax bases. The stance on tax rates is a clear “hands off”, because tax rates are deemed to be the sole responsibility of the member states. The stance on the tax base is less clear-cut as the European Commission (2002, 2006) aims at consolidation.

This paper questions this current stance on both the rate and the base of the corporate income tax by investigating the economic aspects of both. Is tax rate harmonisation, or alternatively a minimum rate, justified on economic grounds? Would tax base consolidation be a step forward, improving efficiency in the European Union? One of the issues in tax coordination, as in other policies, is the distribution of economic effects over the member states. In this paper, we pay special attention to the implications of corporate tax reforms for Ireland.

¹ Quoted from:
http://ec.europa.eu/taxation_customs/taxation/company_tax/harmful_tax_practices/index_en.htm

In the remaining sections of this paper, we first introduce our tool, a general equilibrium model for corporate tax policy in the European Union. Using this tool, we investigate the economic effects of uncoordinated and coordinated changes in the tax rate and of consolidation of the tax base.

2. Our Line of Reasoning

The key economic mechanisms relating to the behaviour of enterprises, households and the government and the functioning of markets are represented in a general equilibrium model, named *CORTAX*.² This model allows for a numerical assessment of the economic effects of tax reforms in the European Union. We summarise the main features of the model as follows:³

The model distinguishes 17 European countries (the EU15, with Belgium and Luxembourg combined and Poland, Hungary and the Czech Republic) and the United States. The model is calibrated for 2002. It includes the statutory tax rate and a measure of tax deductions. Together, they determine the marginal effective tax rate (METR), which is calibrated in line with Devereux *et al.* (2002). The model investigates the investment response of firms to changes in the tax rate or tax base. The model distinguishes between domestic and multinational firms, which may be affected differently by tax reforms.

There are three channels through which tax policies in one member state affect other member states.

- Foreign direct investment by multinational firms is sensitive to differences in the effective tax rates between member states.
- Profit shifting is a second channel: differences in the statutory rates induce multinational enterprises to shift profits to low-tax countries via transfer pricing.
- The third channel is foreign ownership, as firms are partly owned by households in other member states.

Corporate taxation affects the labour market as investment and labour demand are closely linked (the substitution elasticity between capital and labour is assumed to be 0.7). A higher corporate tax therefore reduces the demand for labour and depresses wages.

Following the standard overlapping generations model of Diamond, households are assumed to live for two periods. In the first period, households split their time between employment and leisure. They spend their after-tax labour and profit income on consumption and savings. Consumption in the second period is financed by capital income (net of taxes) and lump sum transfers.

The main sources of income for the government are the taxes on labour income, consumption and corporate income. The main expenditures are government consumption and income transfers to

² Details set out in Appendix 2.

³ See Bettendorf and Van der Horst (2006) for more details on the model and its calibration.

households. We assume in the simulations that budget deficits (or surpluses) are financed through a change in the tax rate on labour income.⁴

We use the model to investigate the long-run implications of corporate tax reforms, and abstract from the transitional dynamics.

In sum, the model investigates the economy-wide impact of corporate taxation, focusing on the interactions between domestic firms, multinational enterprises, households and the government, both within and between member states. Both the economic effects and the distributional implications of tax reforms across countries may be investigated.

3. Competition in Tax Rates

Capital market integration within the European Union has been successful. It has brought about a superior allocation of capital over member states by linking capital markets. But capital market integration also links national capital-income taxes. In response, member states have reduced their statutory corporate income-tax rates in order to attract foreign direct investment and the paper profits of multinational firms.⁵ Should the European Union respond by coordinating tax rates?

There might be scope for European coordination of corporate income tax (CIT) rates if countries harm each other by unilateral tax policies. We investigate this by looking at the spillovers from unilateral reductions in the CIT-rate. In addition, we show how strong the incentives are for member states to unilaterally reduce their CIT-rate. Finally, we switch the focus from national policies to European coordination, by investigating whether the EU would benefit from a minimum CIT-rate, or from harmonisation.⁶

Does unilateral tax rate policy harm or benefit other member states? A tax rate reduction may benefit the foreign owners of domestically operating firms, whose after-tax profits increase. Moreover, capital-exporting countries may benefit from a tax reform if a tax-cut leads to an increase in the return to capital. This 'if' scenario holds, however, only for countries that are large enough to unilaterally affect the world interest rate, which is quite unlikely, even for large European countries.

On the other hand, countries may attract foreign capital at the expense of others, as investments flow towards locations with the highest net rate of return. Again, how strongly other countries are affected depends on the relative size of both countries: a tax rate reduction in say Finland may boost investment at home, but will

⁴ The results in this paper are qualitatively similar if the budget is closed with a change in the consumption tax rate. Outcomes are different with lump-sum financing which is a nondistortionary source of financing.

⁵ Empirical studies show that a percentage point reduction in the corporate tax rate raises inward FDI by about 2.4 per cent (De Mooij and Ederveen, 2003) and profits by about 1.4 per cent (Huizinga and Laeven, 2007).

⁶ This section is based on Bettendorf *et al.* (2006), to which we also refer for references to the literature.

hardly harm large countries like Germany and France. A second potential harmful spillover is profit shifting, whereby countries reduce their CIT-rate in order to attract highly-mobile paper profits of multinational firms. Important vehicles of profit shifting are transfer pricing, where multinational enterprises (MNEs) manipulate the prices of their intra-firm deliveries, and thin capitalisation, where MNEs have excessive debt in high-tax countries in order to benefit from interest deductions.

In order to see whether spillovers are on average harmful or beneficial, we simulate in *CORTAX* a unilateral reduction in the CIT-rate – financed by an increase in the labour tax.⁷ We run this simulation for each member state separately and each time the question is whether other countries gain or lose.

Figure 1 shows that the harmful spillovers dominate the beneficial spillovers, as the unilateral reduction in one member state reduces welfare (as measured by the “equivalent variation” of the reform as a proportion of GDP) in the others (the rest of the EU). The size of the effect is limited, though, up to 0.02 per cent of European GDP for tax-rate reductions in the United Kingdom and Germany, which are large countries with a highly distortionary corporate tax system (as measured by the METR).⁸

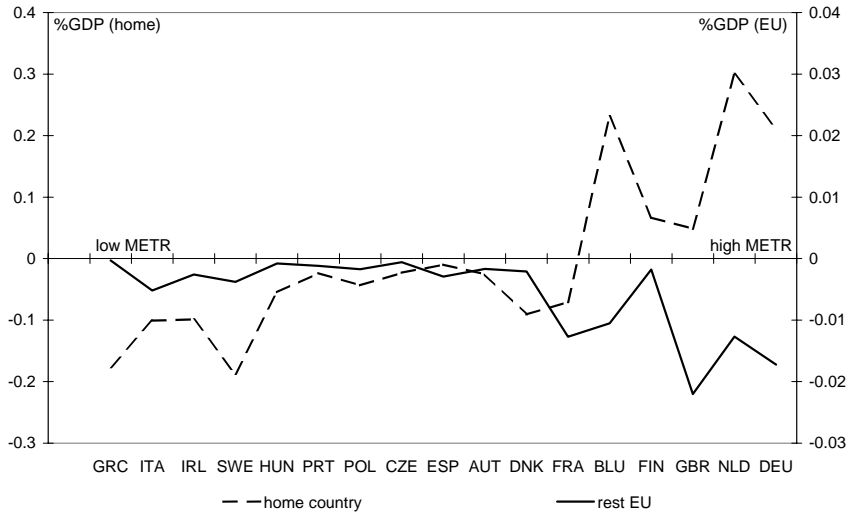
Why do we find that spillovers are so small? It is not because profit shifting is unimportant: it is important, according to the empirical literature on which we have calibrated our model. It is not because FDI does not respond to tax rates: it does.⁹ However, an increase in FDI in one country has a limited impact on each other country because the overall supply of foreign capital, from Europe and the world, is so large. Only if all EU member states jointly reduce their tax rates might a serious repercussion on FDI in non-EU countries obtain. The final reason for the limited spillovers is the relatively small share of foreign direct investment (less than 10 per cent on average) in total investments. The gains from the CIT-reduction primarily accrue to domestic firms that do not have the possibility to transfer profits or expand foreign direct investment.

⁷ The most important reason for including the labour tax as a budget-balancing device is to include the notion that corporate tax revenues cannot be diminished without affecting the economy elsewhere. Alternatively, we have simulated the reforms with consumption-taxes as a budget-balancing device, which yields mainly similar results.

⁸ The change in welfare is measured as the equivalent variation as a percentage of GDP, i.e. the amount of money given to (or taken from) households in each country which would give them the same welfare improvement (or reduction) as in the policy scenario.

⁹ See also De Mooij (2005) for a survey of the literature on the responsiveness of profits and FDI to corporate taxation.

Figure 1: Welfare Effect of Unilateral CIT-Rate Reduction (Equivalent Variation as a Percentage of GDP)



Do member states themselves gain from a tax-rate reduction? Although one might expect the answer to be affirmative, the case is not that clear-cut. On the benefit side, the losses for the other member states reflect a gain for the tax-reducing country: it benefits more from profit shifting than it loses from capital exporting. In addition, the tax distortion on domestic and foreign investment is reduced. On the other hand, if a member state decides to engage in tax competition and reduces its CIT-rate, then it must fill the resulting budgetary hole, either by cutting public expenditure or by increasing the burden of alternative taxes. Alternative means of financing, like raising taxes on labour income or consumption, typically dampen the gains from unilateral CIT-reforms.

Again, we rely on simulations to quantify which effect dominates in the domestic effects of cutting corporate tax rates. As before, we concentrate on the situation where a single member state reduces its tax rate and other member states do not respond. Table 1 reports the “home country” effects for a selection of countries, e.g. the first column shows the implications for Ireland of a unilateral tax reduction in Ireland.

Table 1: Economic Effects of a Unilateral Reduction of the CIT-Rate by 5 Percentage Points¹⁰

	IRL	GBR	NLD	FRA	DEU
Corporate tax revenues (% GDP)	-0.54	-0.26	-0.24	-0.25	-0.35
Labour tax rate (%-point)	1.10	0.53	0.22	0.66	0.61
Consumption (%)	-0.24	-0.02	0.43	-0.31	0.26
Employment (%)	-0.14	-0.12	-0.03	-0.32	-0.12
Wage rate (%)	0.95	0.54	0.73	0.55	1.09
Capital stock (%)	1.53	1.49	1.76	0.89	2.24
GDP (%)	0.78	0.35	0.65	0.11	0.68
Inward FDI (%)	10.10	6.83	5.00	5.33	5.48
Welfare ¹ (% GDP)	-0.10	0.05	0.30	-0.07	0.21

¹The change in welfare is measured as the equivalent variation as per cent GDP, i.e., the amount of money given to (or taken from) households in each country which would give them the same welfare improvement (or reduction) as the policy reform under consideration.

The first row indicates that the tax-rate reduction implies a loss of tax revenues, which are compensated for in this scenario with an increase in the labour tax rate. The required increase in Ireland is relatively strong: a 5 per cent reduction is relatively large when starting from the current rate of 12.5 per cent. Moreover, as Irish corporate taxes are already on the low end of the international spectrum, a further reduction is unlikely to attract more paper profits. For Germany, a country which is harmed by profit shifting, a reduction in the corporate tax rate implies a reduction in profit shifting, which partly refunds the CIT-cut. The cut in the corporate tax rate, even though it is complemented with a labour-tax increase, enhances investment (both domestic and from abroad) and production in nearly every member state (with the exception of Greece and Italy). In the labour market wages go up but employment declines in response to the increase in the labour tax rate. Consumption and welfare decline in a couple of countries, including Ireland. The increase in the wage rate is insufficient to compensate for the reduction in disposable income induced by the higher labour tax rate.

So, the answer to the question of whether member states themselves gain from a tax-rate reduction is mixed. It depends first of all on the alternative measures to close the budget deficit of the government. If the government has the option to reduce *lump sum* income transfers to households, where lump sum means that the transfer is unrelated to households' income or wealth, then each member state benefits from its own reduction of the CIT-rate. In a more realistic scenario, governments have to raise the labour tax rate (or an alternative distortionary tax rate) to compensate for the

¹⁰An extensive table with results for all countries is given in Table A1.1 in Appendix 1.

revenue loss of the corporate income tax. This tax reform benefits only countries with a highly distortionary corporate tax system, i.e., with a high tax rate and/or a broad tax base (see ‘home country’ in Figure 1). Examples are Germany, the Netherlands (before the recent tax reforms) and Belgium, all of which have an incentive to reduce their CIT-rate. Countries like Ireland and several Eastern-European member states with low tax rates have nothing to gain from a CIT reduction. For them it is better to cut the labour tax rate than the tax on corporate income.

Will there be a race to the bottom? The previous discussion shows that, starting at the current tax rates, not all countries benefit from cutting tax rates. Supplementary simulations in Bettendorf *et al.* (2006) reveal that even the member states that do benefit from a tax-rate reduction will not completely abandon the tax on corporate income. At lower CIT-rates, the distortions in the alternative taxes on consumption and labour exceed the distortionary effects of the corporate income tax on investment and profit shifting. So, no member state will unilaterally abandon its tax on corporate income.

Things might change, however, if countries respond to each other. Suppose that all other countries cut their corporate tax rates, should the remaining country respond by cutting its tax rate too? The answer is yes, but only slightly. Yes, because the negative spillovers from tax-reforms in other countries can be undone by cutting one’s own tax rate too. Slightly, because domestic reasons for taxing corporate income (i.e. generating revenues which would otherwise have to be raised in other, distortionary ways) prevent a strong response. The answer is, therefore, that there will be a race, but not to the bottom.

Given that the spillovers are limited and the incentives for unilateral tax-rate reductions are small, is there any room for coordination? Table 2 shows the welfare effects for the EU and a selection of countries of four coordination policies. The first row shows the welfare effects of unilateral tax rate reductions (in each member state separately).

Table 2: Welfare Effects (% GDP) of Tax Rate Coordination (in a Selection of Countries)¹¹

	IRL	GBR	NLD	FRA	DEU	EU
Unilateral tax reform (-5%-point)	-0.10	0.05	0.30	-0.07	0.21	
Multilateral tax reform (-5%-point)	-0.22	-0.02	0.07	-0.15	0.15	-0.04
Minimum tax rate (30%)	-0.28	0.02	0.04	0.01	0.01	0.00
Harmonised tax rate (33%)	-0.46	-0.08	0.14	-0.02	0.25	0.00
Harmonised tax rate (20%)	-0.22	-0.11	0.06	-0.69	0.13	-0.29

The second row shows the welfare effects of a coordinated reduction of the tax rate by 5 percentage points. The potential domestic gains from a cut in the CIT-rate are significantly reduced in

¹¹ The extensive table with results for all countries is given in Table A1.2 in Appendix 1.

a context where this cut is undertaken by all other EU member states. In this case, the inability to attract foreign profit income reduces the benefits from favourable tax planning by multinational enterprises. This implies that for most countries a reduction in the tax rate creates a welfare loss. A multilateral reduction in the tax rate is beneficial only for countries with a highly distortionary CIT-tax, like Germany. Most countries will, therefore, refrain from tax competition if they realise that other countries are likely to respond to their tax cut by making a tax cut of their own.

The next three rows show the welfare effects of three coordination policies: introducing a minimum tax rate, harmonisation of the tax rate at the current average (33 per cent) or harmonisation at a much lower level (20 per cent). The simulations clearly show that the EU will not benefit from tax rate coordination, and may even lose if the harmonised tax rate is set 'too low'.

From an economic point of view, competition in tax rates is hardly worth pursuing by individual member states at current levels of corporate-income taxation, and even less so at a lower level of taxation.¹² Moreover, the spillovers are harmful but limited. Policies to remedy tax competition, like setting a minimum tax rate or even harmonising the CIT-rates, therefore, hardly enhance growth and welfare in the European Union: the winners just gain enough to compensate the losers.

4. Tax Base

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 is treated separately for tax purposes.

In its 2002 Tax Communication, the European Commission (2002) proposed consolidation of the tax base as an answer to the inherent difficulties of separate accounting and large compliance costs. Consolidation implies that all taxable profits of multinational enterprises (MNEs) are added up into a single base. Key choices which have to be made by the member states are on the definition of the single base (either according to the tax rules of the parent country or according to new European rules) and on the question whether the consolidated European base will be introduced instead of, or in addition to, national tax rules. We shed some light on both issues from an economist's point of view.¹³

Consolidation implies that the subsidiaries of an European multinational are treated as a single entity for tax purposes. This

¹² The limited scope for tax competition stemming from the *CORTAX*-simulation stands in contrast to the current reductions in statutory tax rates, but is in line with the limited reduction in effective tax rates and corporate tax revenues, see Nicodème (2006).

¹³ See Van der Horst *et al.* (2007) for an extensive analysis of the economic effects of consolidation.

brings several gains, both for multinational enterprises and for governments. First, multinationals save on compliance costs, as they have to file only one (consolidated) corporate income tax return, where all affiliates are included.¹⁴ Second, cross-border losses are automatically offset with tax base consolidation. Currently this is not the case, as member states may prevent a parent company from deducting from its taxable profits losses incurred by a subsidiary in another member state. This differs from the treatment of resident subsidiaries whose losses may generally be deducted from the companies' profits. Finally, consolidation makes profit shifting for tax purposes obsolete, as all profits are added up into a single tax base. This implies that transfer pricing, i.e., charging different prices for intra-firm exports than for regular exports, becomes redundant. Governments in high-tax countries are the main beneficiaries of the latter effect, as firms are unable to minimise tax payments by shifting profits to low-tax member states.

Consolidation also has several drawbacks, which crucially depends 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 do not treat all firms equally may create distortions, which induce a large restructuring both within and between member states. An example of this is the EU-proposal of home state taxation, where firms have to make their tax declaration according to the rules of their home country. Clearly, domestic firms and multinational headquarters are treated equally, but unevenness is introduced between subsidiaries with different home states. This proposal gives preferential treatment to subsidiaries originating from member states with a narrow tax base.

A second issue is whether consolidation is optional or compulsory for multinationals. Multinationals are likely to prefer the first option, where they may choose the tax system, either national or European, which suits them best. Here the disadvantages are for governments: they have to deal with two tax systems and their tax revenues will decline as firms will exploit the opportunity to minimise their tax payments.

The third issue is the definition of the common base including the amount of tax deductions. If consolidation is compulsory, then a broad tax base benefits governments, whose CIT-revenues increase, but implies a higher tax burden for MNEs which have to cut down production. Simulations with *CORTAX* reveal that the latter effect dominates, such that welfare in the EU declines if the tax base is broadened. The combination of a voluntary system and a broad tax base, however, is likely to imply that very few MNEs will shift towards the common consolidated base, which would make the reform superfluous.

¹⁴ We abstract from the major step of harmonising the tax return and the underlying accounting system, which is of course a major issue in the transition from separate accounting to consolidation.

Maybe the most important issue is that a common consolidated base limits the tax autonomy of member states. 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 through some kind of apportionment formula which distributes 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 jurisdiction.

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, would 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.

A likely response of governments to the tax-planning strategies of MNEs is to cut their tax rates. In the current system of separate accounting, countries may thus attract paper profits and FDI. In the consolidated system with formula apportionment, the possibilities for (paper) profit shifting are limited, but the incentives for FDI are reinforced.

Adopting a system of consolidated base taxation with formula apportionment allows the Commission to achieve its goals in a single stroke (Martens-Weiner, 2006): corporate taxation is simplified for multinationals and autonomy in fiscal policy is guaranteed for governments. Is consolidation a good policy option?

For an answer to this question we again rely on simulations with *CORTAX*. We first investigate a scenario where MNEs adopt a common consolidated base whereas domestic firms stick to the national tax rules. The tax allowances in the common base are fixed at the current EU average. The apportionment formula is defined on three factors, namely employment, capital and production of MNEs in each member state, with equal weight.¹⁵ A summary of the economic effects in a selection of countries is shown in Table 3.

¹⁵ The production factor resembles apportionment on value added or sales by origin. The alternative factor of sales by destination could not be investigated in the current version of *CORTAX*. Van der Horst *et al.* (2007) includes simulations for each apportionment factor (employment, capital and production) separately.

Table 3: Economic Effects of a Common Consolidated Tax Base (Reported for a Selection of Countries)¹⁶

	IRL	GBR	NLD	FRA	DEU	EU
Corporate tax revenue (% GDP)	-0.37	-0.14	-0.26	0.01	-0.56	-0.07
Labour tax rate (%-point)	0.20	0.01	0.23	0.19	0.48	0.11
Wage rate (%)	0.79	0.36	0.51	-0.08	0.95	0.18
Employment (%)	0.28	0.06	-0.09	-0.17	0.03	-0.01
Capital (%)	0.52	1.04	1.45	-0.29	2.62	0.51
GDP (%)	0.44	0.27	0.33	-0.19	0.76	0.10
Welfare (% GDP)	0.06	0.18	0.21	-0.11	0.12	0.02

The first gain, which holds for all multinationals in all countries, is a reduction in compliance costs. It is cheaper for multinationals to fill in one tax return for the EU than many different tax returns for each member state. There is little evidence on the size of this effect. The European Commission (2004) reports evidence on perceived compliance costs (these include costs required for company taxation and VAT, next to costs voluntarily incurred to minimise taxes). Compliance costs are estimated to range between 1.9 per cent and 30.9 per cent of taxes paid by large firms and SMEs, respectively. Costs are larger for firms with subsidiaries. In the simulations with *CORTAX*, we assume that the compliance costs of subsidiaries are eliminated by tax-base consolidation, which incurs a welfare gain of 0.04 per cent of GDP in the EU.

The second potential gain might be a reduction in tax planning, which in the current system operates primarily via transfer pricing. Consolidation eliminates tax planning via transfer pricing, but creates new opportunities via formula apportionment. Firms would expand production or sales in member states with low statutory rates. For example, FDI would increase by 25 per cent in Ireland, but would decline by 5 per cent in Belgium, Luxembourg and the Netherlands. This reallocation aggravates tax competition, which is stronger in a consolidated tax system than in the current system of separate accounting.

The economic effects of consolidation 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

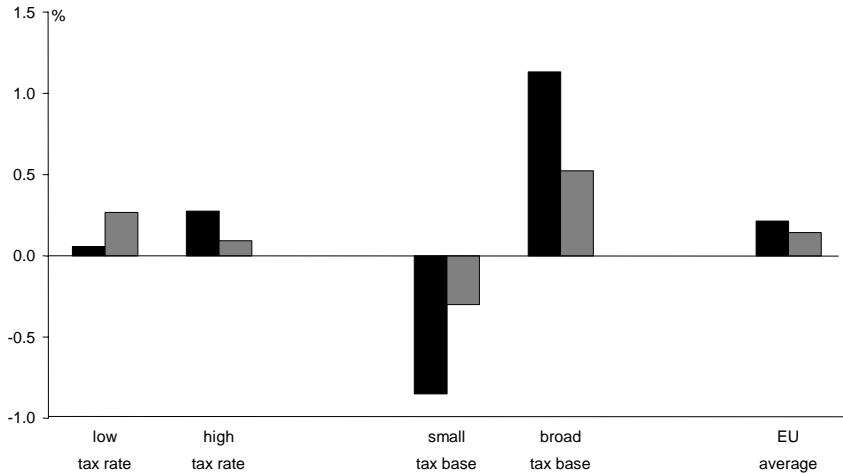
¹⁶ The extensive table with results for all countries is given in Table A1.3 in Appendix 1.

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 commonness of the consolidated base. Currently, the tax deductions differ significantly between member states. For countries with generous tax deductions, like Italy and Greece, a common European base likely implies a broadening of the tax base. This raises their effective tax rate and suppresses investments. The opposite likely holds for member states with limited tax allowances, like Germany and Ireland. Both the change to formula apportionment and the asymmetry in the tax base imply that the change in welfare ranges between a reduction of 0.4 per cent of GDP (in Greece) and an increase of 0.4 per cent of GDP (in Belgium and Luxembourg).

The uneven distribution might possibly be overcome by redistribution if the total gains for the EU are positive. However, 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 per cent 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 per cent and 0.01 per cent of GDP.¹⁷ This shows that the gains from consolidation can be offset by the details of its design.

Figure 2: Impact of EUCIT on GDP (black bar,%) and Welfare (Equivalent Variation as a % of GDP, grey bar)



¹⁷ The impact on GDP (percentage change) and welfare (measured in percentage GDP) of a tax reform generally point in the same direction. A large employment increase, however, improves GDP but declines welfare due to a loss of leisure.

The full benefits from consolidation can only be reaped if all firms participate and apply a common tax base. Moreover, the incentives for reallocating production are minimised if the apportionment formula resembles the distribution of corporate income of MNEs. Further gains can be achieved by a more radical approach, which tackles the tax-planning issue at source, by harmonising the tax rates in addition to consolidating the tax base.¹⁸ In this far-reaching scenario, known as the European Union Corporate Income Tax (EUCIT), a welfare gain of 0.14 per cent GDP can be obtained, as shown in Figure 2. Still, the variation in economic effects is large: countries which switch from a small base to the common base (which is in this scenario defined at the EU-average) will lose, up to 1 per cent GDP in Greece. On the other hand, countries with a broad base tend to gain, up to 0.8 per cent in Germany. The distribution of winners and losers does not depend clearly on the initial tax rate. For example, EUCIT will improve welfare in low-tax countries like Poland (+0.35 per cent GDP) and Hungary (+0.47 per cent GDP), but not in Ireland (-0.14 per cent GDP). In Ireland, the gains from having a more efficient European corporate tax system would not compensate for abandoning the current system.

5. Subsidiarity in Corporate Taxation

Should member states give up their right to design their corporate income tax? We pick up this question, by confronting corporate taxation with the subsidiarity test (Ederveen *et al.*, 2006).

The first question is: are there economies of scale in corporate taxation? Indeed there are, in particular in the consolidation of the tax base. With separate accounting, firms have to file tax returns in each country in which they have subsidiaries. With consolidation, firms save on these fixed costs by filing one return for the European Union.

The second question is: do countries affect each other, or how important are the externalities from corporate taxation? The section on tax-rate reforms extensively discusses this issue, showing that the beggar-thy-neighbour externalities of a tax rate reduction dominate. By cutting taxes, member states are able to attract profits and foreign direct investment (partly) at the expense of other countries. However, the size of these spillovers are limited, and do not justify coordination of CIT-rates.

Quantitatively more important are the spillovers from tax planning with formula apportionment. Countries have a stronger incentive to underbid each other's tax rates, in an attempt to attract investment, production and (possibly) employment from other

¹⁸ The simulation shows that consolidation with tax rate harmonisation is better than without unifying tax rates. We do not show that completely unifying tax rates is the first-best policy. For example, Baldwin and Krugman (2004) show that larger, richer and less peripheral countries are more attractive to market-seeking MNEs and may, therefore, set higher corporate tax rates. We thank the referee for pointing out this qualification.

member states. Both answers weakly support coordination of corporate taxation at the European level.

An important motivation for national policies is the adaptation to local circumstances. Does the heterogeneity of member states support decentralised corporate tax systems? Several elements of this heterogeneity are included in the analysis of this paper. First, the analysis of tax base consolidation clearly shows that its gains depend on the heterogeneity in tax rates: low-tax countries tend to gain more. Second, the gains from an unilateral reduction in the tax rate depends on a country's openness: member states with strong foreign investment linkages have more to gain, but also more to lose, from tax rate reforms. Openness affects the size, rather than the direction, of the economic effects of tax reforms: more open economies gain more or lose more than relatively closed ones. The final heterogeneity that proves to be important is the different starting situation.¹⁹ For example, a common base generally benefits member states which now have a broad base, but harms member states with a narrow tax base. This difference in the initial situation not only determines the distribution of the economic effects, but might also reflect national preferences for corporate tax policy or might depend on local circumstances. Probably, an egalitarian society might prefer a broad tax base and/or a high tax rate, whereas a liberal society might choose the opposite in an attempt to boost economic growth.

Therefore, there are insufficient reasons to coordinate the CIT-rate at the European level, unless tax bases are consolidated in the first place. Whether or not consolidation should be introduced depends: we show that consolidation is beneficial (in particular in combination with tax-rate harmonisation), but overrules the primacy of member states in corporate tax policy. An attempt to run with the hare and hunt with the hounds by consolidating the base but leaving tax-rate policy to be set at the level of the member states, is unlikely to boost welfare in the EU.

6. Conclusions

EU Commission proposals on the reform of corporate taxation have centred on a common, consolidated corporate tax base for EU countries, but with each country free to choose the rate of tax. This proposal has been analysed using *CORTAX*, an economic model which allows for economic responses, including changes in foreign direct investment flows and in the location of paper profits. The findings suggest that gains from this approach are offset by losses of about equal magnitude; some countries would gain, but others would lose. Harmonisation of tax rates or a minimum tax rate would lead to similar results, or even to net losses. When consolidation of the tax base is combined with a harmonised tax rate, there is scope for small aggregate gains at EU level (of the order of 0.14 per cent of

¹⁹ This list of heterogeneity is not complete. The contribution by Pouget *et al.*, in this volume points at differences in public infrastructure, which may be (partly) financed by corporate income taxes.

GDP). However, the effects vary across countries, with some countries gaining, and others, including Ireland, losing from such a reform.

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APPENDIX 1:

ADDITIONAL TABLES

This Appendix supplements the tables in the main text by presenting the economic effects of tax-rate and base reforms for 17 EU-countries: the EU15-countries with Belgium and Luxembourg combined (in BLU), Czech Republic, Hungary and Poland.

Table A1.1: Economic Effects of Unilateral Reduction of the CIT-Rate with 5 Percentage-Points

	CIT	L-tax	C	L	W	K	Y	FDI	Welfare
	% GDP	%-point	%	%	%	%	%	% GDP	% GDP
AUT	-0.22	0.45	-0.13	-0.18	0.43	0.93	0.20	6.42	-0.03
BLU	-0.19	0.14	0.33	0.00	0.56	1.50	0.75	6.52	0.23
DNK	-0.26	0.69	-0.26	-0.26	0.53	1.02	0.22	5.54	-0.09
FIN	-0.34	0.67	0.00	-0.19	0.92	1.68	0.52	5.91	0.07
FRA	-0.25	0.66	-0.31	-0.32	0.55	0.89	0.11	5.33	-0.07
DEU	-0.35	0.61	0.26	-0.12	1.09	2.24	0.68	5.48	0.21
GRC	-0.03	0.32	-0.40	-0.20	-0.14	-0.55	-0.28	5.32	-0.18
IRL	-0.54	1.10	-0.24	-0.14	0.95	1.53	0.78	10.10	-0.10
ITA	-0.08	0.44	-0.34	-0.29	0.13	-0.03	-0.18	3.26	-0.10
NLD	-0.24	0.22	0.43	-0.03	0.73	1.76	0.65	5.00	0.30
PRT	-0.11	0.37	-0.10	-0.11	0.26	0.73	0.15	5.48	-0.02
ESP	-0.21	0.66	-0.15	-0.21	0.58	0.99	0.23	5.79	-0.01
SWE	-0.21	0.62	-0.45	-0.32	0.38	0.68	0.08	5.96	-0.19
GBR	-0.26	0.53	-0.02	-0.12	0.54	1.49	0.35	6.83	0.05
CZE	-0.19	0.75	-0.15	-0.17	0.80	1.31	0.43	6.84	-0.02
HUN	-0.20	0.84	-0.22	-0.19	0.88	1.57	0.48	9.34	-0.05
POL	-0.14	0.73	-0.17	-0.15	0.68	1.41	0.36	9.03	-0.04

CIT: corporate tax revenues; L-tax: labour tax rate; C: consumption; L: employment; W: wage rate; K: capital stock; Y: gross domestic product; FDI: inward foreign direct investment.

Table A.1.2: Welfare Effects (% GDP) of Tax Rate Coordination

	Unilateral Tax Reform (-5%-Point)	Multilateral Tax Reform (-5%-Point)	Minimum Tax Rate (30%)	Harmonised Tax Rate (33%)	Harmonised Tax Rate (20%)
AUT	-0.03	-0.09	0.01	-0.03	-0.41
BLU	0.23	-0.15	0.02	-0.07	-0.59
DNK	-0.09	-0.28	0.03	0.02	-0.71
FIN	0.07	-0.04	0.01	-0.11	-0.18
FRA	-0.07	-0.15	0.01	-0.02	-0.69
DEU	0.21	0.15	0.01	0.25	0.13
GRC	-0.18	-0.19	0.00	-0.06	-0.70
IRL	-0.10	-0.22	-0.28	-0.46	-0.22
ITA	-0.10	-0.13	0.01	-0.10	-0.75
NLD	0.30	0.07	0.04	0.14	0.06
PRT	-0.02	-0.07	0.01	-0.01	-0.25
ESP	-0.01	-0.03	0.00	0.00	-0.26
SWE	-0.19	-0.41	0.06	0.09	-0.84
GBR	0.05	-0.02	0.02	-0.08	-0.11
CZE	-0.02	-0.05	-0.01	-0.07	-0.12
HUN	-0.05	-0.09	-0.14	-0.28	-0.06
POL	-0.04	-0.06	-0.07	-0.15	-0.03
EU		-0.04	0.00	0.00	-0.29

Table A1.3: Economic Effects of a Common Consolidated Tax Base

	CIT %GDP	L-Tax %Point	W %	L %	K %	Y %	Welfare %GDP
IRL	-0.37	0.20	0.79	0.28	0.52	0.44	0.06
HUN	-0.17	-0.14	0.53	0.23	1.04	0.36	0.22
POL	-0.07	-0.18	0.42	0.19	0.86	0.25	0.23
SWE	0.03	-0.21	0.05	0.08	-0.14	0.06	0.21
CZE	-0.01	-0.13	0.16	0.08	0.33	0.12	0.11
FIN	-0.31	0.21	0.57	0.05	1.17	0.41	0.11
DNK	-0.05	-0.02	0.12	0.00	0.16	0.07	0.11
GBR	-0.14	0.01	0.36	0.06	1.04	0.27	0.18
PRT	0.19	-0.29	-0.11	0.04	-0.40	-0.04	0.16
BLU	-0.19	-0.09	0.51	0.11	1.19	0.56	0.37
AUT	0.04	-0.03	-0.05	-0.02	-0.17	-0.05	0.02
NLD	-0.26	0.23	0.51	-0.09	1.45	0.33	0.21
GRC	0.25	0.03	-0.77	-0.14	-1.51	-0.72	-0.40
ESP	0.06	-0.04	-0.12	-0.02	-0.26	-0.09	-0.02
FRA	0.01	0.19	-0.08	-0.17	-0.29	-0.19	-0.11
ITA	0.25	0.10	-0.68	-0.23	-1.34	-0.71	-0.33
DEU	-0.56	0.48	0.95	0.03	2.62	0.76	0.12
EU	-0.07	0.11	0.18	-0.01	0.51	0.10	0.02

APPENDIX 2:

DOCUMENTATION OF *CORTAX*

A2.1 Introduction

CORTAX considers the stationary, long-run equilibrium of a dynamic, general equilibrium framework. The specification of this model is heavily inspired by the *OECDTAX*-model of Sørensen (2001). Consumption and labour supply decisions by households are derived from the maximisation of lifetime utility. Two types of firms are distinguished: domestic firms and multinationals. The latter firms operate in several countries, giving them the opportunity to shift profits to low-tax jurisdictions. Decisions of each firm are derived from the maximisation of its value.

We first describe the main features of the model.¹ Thereafter, the modelling is briefly discussed per sector. Attention is in particular given to the specification and calibration of corporate taxation.

A2.2 Main Features of the Model

The model aims to cover all the EU member states, provided the required data are available. Since data are insufficient for Luxemburg, it is combined with Belgium. As a third country, we model the US.

- All markets are characterised by perfect competition. Location specific rents are 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 types 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

¹ The complete technical documentation of *CORTAX* is given in Bettendorf and Van der Horst (2006).

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. The model is running in GAMS. Output is written in Excel-spreadsheets.

A2.3 Households

Following the standard overlapping generations model of Diamond, households are assumed to live for two periods. Household decisions on consumption and labour supply are derived from the maximisation 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 2005. Consumption expenditures are taken from the National Accounts, while labour supply is calculated from data on employment in persons and hours. Suggested values for the main parameters of the household sector are given in Table A.2.1.

Table A2.1: Key Parameters and (Semi-) Elasticities for Households

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

The implied semi-elasticities are calculated with a 2002 database with EU15, CZE, HUN and POL.

A2.4 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 headquarters is located and each multinational is assumed to own a subsidiary in each foreign country. The decisions by each firm are derived from maximising its value.

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, as also this type of capital motivates a lower bound on the corporate income tax rate. Fixed income is assumed to accrue to the 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 to be 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 headquarters can charge a transfer 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 A2.2: Key Parameters and (Semi-) Elasticities of the Production Function

Technological growth		Per Cent
Economic rate of depreciation		1.5
Income share of location specific capital		5.0
Income share intermediate inputs in subsidiaries		2.5
Elasticities of substitution between labour and capital		10.0
		0.7
<i>Implied (semi-)elasticities</i>	Min	Max
Capital stock to statutory CIT	0.46	0.09
Incoming FDI to statutory CIT	-0.91	-0.48
Debt to statutory CIT	0.23	0.38
Incoming transfer price to statutory CIT	0.74	2.17

The implied semi-elasticities are calculated with a 2002 database with EU15, CZE, HUN and POL.

The calibration of the firm sector is summarised in Table A2.2. 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.

A2.5 Corporate Taxation

We consider two basic principles for taxing corporate income: the source and the residence principle. Next, we explain the modelling of the consolidation systems with formula apportionment. In the last subsection, the specification and calibration of compliance costs are described.

A2.6 Source or Residence Principle

In the base case 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 headquarters), minus the wage sum, interest payments on debt and depreciation allowances (minus the value of intermediate inputs for a subsidiary). Depreciation allowances are assumed to be a fraction of the capital stock. The broadness of the tax base differs over EU-countries by calibrating a country-specific value for this rate of tax allowances. The calibration of the tax parameters in the EU is discussed below.

The US 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 taxes paid by the parent and all subsidiaries in the source countries.

A2.7 Calibration of the CIT Systems

The key parameters of the CIT system are the statutory tax rate and the fiscal depreciation rate (i.e. the tax allowance rate). The legal tax rates are taken from the Institute for Fiscal Studies (IFS, update from Devereux *et al.*, 2002), except for CZE, HUN and POL (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 the IFS. We take the METR for the case where 25 per cent of new investments are financed with debt and 75 per cent with equity. This is lower than the actual debt-equity mix (40 per cent, 60 per cent) 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 marginal investments. We restrict the tax allowance rate between 5 per cent and 15 per cent, where the lower bound is given by the economic rate of

depreciation and the upper bound is imposed to avoid the undesirable ‘taxation paradox’: 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 Sørensen, 2002).

A2.8 Consolidation and Formula Apportionment

Consolidation of the tax base for a multinational simply amounts to summing the tax bases of all firms that are located in a participating country. In all consolidation scenarios, the tax base is defined under one single set of tax rules.

A2.9 Compliance Costs for Companies

A motivation for tax base consolidation is to reduce tax compliance costs for multinationals. The European Commission (2004) reports extensive evidence on perceived compliance costs (these include costs required for company taxation and VAT, together with costs voluntarily incurred to minimise taxes). Compliance costs are estimated at 1.9 per cent and 30.9 per cent of taxes paid by large firms and SMEs, respectively.² Costs are larger for firms with subsidiaries. The European Commission (2001) focuses on costs related to transfer pricing. Estimates of annual compliance costs range from 1 to 2 million euro for the group of medium-sized enterprises and 4 to 5.5 million euro for large multinational enterprises. Compliance costs of 7.5 million euro amount to 3 per cent of CIT revenues. Devereux (2004) concludes from this EU report that compliance costs likely range between 2.7 per cent and 4 per cent of CIT 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’ worker, which 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 neither 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 per cent, such that the simulated compliance costs amount to 10 per cent of the CIT-revenues in the EU.³ When simulating a switch to the FA-system, compliance costs are abolished for all subsidiaries.

² Small- and medium-sized enterprises are defined as companies with less than 250 employees.

³ This value results from an older calibration with 2002-data for EU15, CZE, HUN and POL.

**A2.10
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, tax collection costs and lump sum transfers. Government consumption as well as public debt is a constant fraction of GDP.

Government behaviour is exogenously specified. When tax revenues change after a reform, the specified marginal source of finance is adjusted to close the government budget. Possible compensation mechanisms include the lump sum transfers, the consumption tax rate and the labour income tax rate.

**A2.11
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).

