INTERNATIONAL TAX COMPETITION :
A NEW FRAMEWORK FOR ANALYSIS

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Tax competition versus tax coordination: where do we stand?

Spurred by the liberalization of capital flows and the launching of the EU single market and monetary union, the last two decades have witnessed an intense European and international debate on the need for supranational tax coordination. In recent years there has been a clear shift in the dominant opinion in this long-standing debate. Only a few years ago the European Commission expressed concern that international tax competition seems to shift the tax burden from mobile capital onto unemployment-ridden labour. The Commission therefore argued for improved coordination of capital taxation within the EU to prevent further shifts in the tax burden to the disadvantage of labour. However, more recently the Commission has expressed the view that "..a reasonable degree of tax competition within the EU is healthy and should be allowed to operate. Tax competition may strengthen fiscal discipline to the extent that it encourages Member States to streamline their public expenditure, thus allowing a reduction in the overall tax burden." (European Commission, 2001, p. 4).

In other words, international tax competition is now seen as an instrument for enforcing a necessary reduction in public spending in Europe. Although dissenters remain, the view that tax competition is in general beneficial is becoming increasingly popular. As an indication of this, the much publicized OECD initiative against socalled harmful tax competition was recently marketed under the headline "Promoting Tax Competition" (Hammer and Owens, 2001). The basic message in this statement co-authored by the Head of the OECD Fiscal Affairs Department was that the

OECD initiative is only intended to fight international tax evasion so as to allow international tax competition to take place on a level playing field for all multinational companies and investors.

Parallel to the shifting mood among policy makers we have seen a shift in the dominant academic view of international tax competition. In the 1980s when the literature on tax competition started to flourish, most academics agreed that interjurisdictional competition for mobile capital will drive source-based capital income taxes to suboptimally low levels unless the international community engages in some form of tax coordination. But recent refinements of the basic model of tax competition show that the theoretical case for tax coordination in the form of a minimum source tax on capital is not clear-cut. For example, the increasing importance of foreign direct investment increases the incentive for policy makers to use the source-based corporation tax as an instrument for exporting some of the domestic tax burden to foreign capital owners. If the degree of foreign ownership of the domestic capital stock increases due to economic integration, this may offset the incentive to lower the corporation tax to attract more foreign investment. Moreover, if the political process is imperfect, tax competition may enforce fiscal discipline which reduces the scope for rent-seeking by politicians and bureaucrats, as suggested by the previous quote from the European Commission.

You might think that although tax competition in general may not be bad, economic theory at least suggests that selective preferential tax regimes for particularly mobile activities must be harmful by distorting competition between different sectors of the economy. Indeed, this view underlies the recent OECD and EU initiatives against 'harmful' tax competition. However, even competition in preferential tax regimes for mobile activities may not be unambiguously bad. The point is that if governments cannot compete by offering selective cuts in effective tax rates on the most mobile activties, they will only be able to attract such activities by lowering the *general level* of business taxation. A ban on preferential tax regimes may therefore have the unintended side effect of lowering the overall level of capital taxation, as Michael Keen (2001) has pointed out in a recent article. The example of Ireland shows that this is not just an esoteric theoretical possibility. When Ireland recently gave in to pressure from the EU to abandon its preferential 10 percent corporate tax rate for manufacturing and various other activities, it decided instead to lower its general rate of corporation tax from 28 percent to 12.5 percent!

If the theoretical case for tax coordination is uncertain, it is natural to look at the empirical evidence to see if there are any indications that competition is forcing undesirable changes in the

level or structure of taxation? In particular, we may ask if tax competition has caused an erosion of corporate tax revenues, and whether it has caused a significant change in the relative tax burdens of capital and labour?

As to the first question, the general picture in the OECD area is that falling statutory corporate tax rates have been roughly offset by a broadening of the corporate tax base so that corporate tax revenues have been fairly stable as a fraction of GDP in most countries. However, in several countries there has been a tendency for the profit share of GDP to increase in the 1990s, and a tendency for the corporate sector to expand at the expense of the non-corporate business sector. Seen in isolation, these trends ought to have *raised* corporate tax revenues relative to GDP. The fact that this has not happened may reflect the influence of tax competition. Still, there is so far no empirical basis for Doomsday predictions that corporate tax revenues are about to collapse due to fiscal competition.

Considering the evolution of the relative tax burdens on capital and labour, calculations based on the popular methodology developed by Mendoza, Razin and Tesar (1994) show that - between the mid-1980s and the mid-1990s where international capital flows increased considerably - the average effective tax rate on capital income stayed roughly constant in the typical EU and OECD country, whereas the total average effective tax rate on labour income (which includes indirect taxes) increased between 3 and 4 percentage points (see Sørensen, 2000 and 2002). In other words, the *increase* in the overall tax burden experienced in most countries during this period was concentrated on labour, suggesting that increasing capital mobility induced governments to raise the *relative* tax burden on the more immobile labour factor. In the most recent years there is some indication that the trend towards a rising relative tax burden on labour in the EU has been reversed (see Martinez-Mongay (2000) and Huizinga and Martinez-Mongay (2001)), although it is too early to say whether this reversal is a lasting phenomenon. Moreover, the estimated effective tax rates on capital referred to above include taxes on immobile as well as internationally mobile activities. When an attempt is made to isolate corporate taxes on *mobile* capital, there is some indication of a tendency for the average effective tax rate to fall over time, as Michael P. Devereux and Rachel Griffith (2001) have recently shown.

Thus, although the evidence is not clearcut, my reading of it is that taxes on mobile capital have tended to fall relative to taxes on labour in recent decades. This is consistent with the traditional theory of tax competition.

Where do we go from here?

But even if you grant that tax competition has shifted part of the tax burden from mobile capital to less mobile labour, this does not necessarily mean that such competition is harmful. Perhaps capital was overtaxed relative to labour before the recent increase in capital mobility made its fiscal impact? And looking towards the future, perhaps it is economically beneficial if tax competition forces a further reduction in the relative tax burden in the years to come?

In the rest of this lecture I will sketch a new framework for tax policy analysis which may be used to answer questions such as these. The framework takes the form of an applied general equilibrium model of the OECD economy. Assuming that capital will remain much more mobile than labour for many years to come, I will use the model to illustrate the effects on output, factor markets and consumer welfare of a fall in corporate tax rates financed by an increase in tax rates on labour income. If the effects of such a tax shift appear to be positive, we should probably welcome a process of tax competition which shifts the tax burden from the mobile onto the immobile factors. But if the effects are negative and quantitatively significant, there may be good reasons to neutralize international tax competition through tax coordination.

Before describing the model, let me anticipate my main findings so you have an idea of where we are heading. As you might expect, when you set up a complex model of a complex world economy, you do not get simple and clear-cut answers to your policy questions. Nevertheless, our analysis will yield several useful insights which are worth stressing up front. First of all, when evaluating the effects of changes in corporate tax policy in a region like the European Union, it is important to allow for capital flows between the EU and the rest of the world. Analysing the EU as if it were a closed economy can give quite misleading results. Second, if tax competition drives down corporate taxes in Europe, the effects depend crucially on whether countries in the rest of the world react by cutting *their* corporate taxes. Third, when analysing the effects of a tax shift from capital to labour, the labour market response to higher tax rates is very important. In particular, the labour supply elasticity is a crucial parameter. Fourth, and perhaps most important, because of differences in initial positions and tax structures, tax competition has a very different impact on different countries, ranging from rather positive to very negative effects. Hence it is impossible to generalize about the effects of tax competition for all EU countries.

Let me now sketch the model underlying these conclusions.

A new framework for tax policy analysis: the OECDTAX model

A weakness of most existing models of tax competition is that they only include a single type of capital subject to a single capital income tax rate. In practice the tax code distinguishes between foreign direct investment and foreign portfolio investment, between household investors and institutional investors, between different asset types like stocks, bonds, and real estate, between current income and capital gains, between debt and equity, and so on. Moreover, while some types of foreign investment are taxed in the country of source, other income types are taxed in the investor's country of residence.

My simulation model of the OECD economy accounts for all of these complexities of the tax system by distinguishing between different types of investors and assets. The model - called the OECDTAX model - also includes international profit shifting via transfer-pricing by multinational corporations, and it allows for domestic and international tax evasion by assuming that only a fraction of the capital income of portfolio investors can be monitored and taxed. Moreover, the model assumes that wages and working hours are set by trade unions whose market power generates involuntary unemployment. By incorporating labour market imperfections, the model thus addresses the concern of policy makers that a shift of the tax burden towards labour may cause more unemployment.

The OECDTAX model is static, describing a long-run equilibrium. In its present version the model includes 25 countries which are grouped into two main regions representing the European Union and the Rest of the World. One country in the Rest of the World is a tax haven representing those small jurisdictions which have specialized in offering banking services and bank secrecy facilitating international tax evasion.

Labour is immobile across countries whereas capital is imperfectly mobile. The supply of capital to any country is thus an increasing function of the rate of return offered in that country. By parametrically varying the elasticity of substitution between assets invested in different countries, one can vary the degree of capital mobility and approximate a situation of perfect mobility. In particular, the model is designed to allow for a higher degree of capital mobility within the EU than between the EU and the rest of the world.

Households in each country must choose between immediate and postponed consumption, and the utility-maximizing consumer increases his total saving as the after-tax real rate of return increases. In other words, the total supply of capital is endogenous in the model. Having

optimized his total saving, the consumer divides his funds between investment in housing equity and financial saving, as shown in Figure 1.

(Figure 1 here)

In the next step, he allocates financial saving between institutional saving and so-called household saving. Household saving includes direct household purchases of stocks and debt instruments, including bank deposits. Institutional saving includes financial saving channeled through pension funds and life insurance companies, plus pension savings via the banking and corporate sectors.

(Figure 2 here)

Figure 2 shows the subsequent stages of the consumer's decision process. Household financial saving must be allocated between stocks and interest-bearing assets, denoted 'bonds' for convenience. Each of these two aggregates must then be allocated between domestic and foreign assets which in turn must be allocated between assets issued in the EU region and assets issued in the rest of the world. In the final stage, the portfolio is split into assets issued in the individual countries. The institutional savings are allocated across similar asset types in a similar manner.

Figure 3 illustrates the structure of the business sector in the OECDTAX model. Each country is endowed with a fixed stock of intangible assets representing the level of human capital, technological and management know-how, etc. An exogenous fraction of these assets is allocated to a sector of multinational corporations which are headquartered in the country and which own foreign subsidiaries in all the other countries in the world economy. The remaining fraction of the country's intangible assets is allocated to domestic corporations with no foreign operations. Domestic corporations issue debt to domestic and foreign household and institutional investors and purchase labour services from domestic households. The equity shares in these firms are not traded internationally, but are held only by domestic households.

(Figure 3 here)

By contrast, multinational corporations issue shares as well as debt instruments to foreign as well as domestic household and institutional investors. The multinational parent companies inject equity into foreign subsidiaries, representing foreign direct investment. Subsidiaries also borrow in the host country capital market, and they hire labour in the foreign host country. In addition to equity, parent companies provide their foreign subsidiaries with intermediate inputs.

Factor demands and financial policies are determined by profit maximization. A firm's

optimal level of debt is found by trading off the tax advantage of debt finance against the costs of financial distress which are assumed to increase with the debt-asset ratio. Moreover, multinational parent companies choose their transfer prices of intermediate inputs by trading off the organizational costs of distorted input prices against the tax advantage of shifting profits to foreign subsidiaries operating in low-tax countries.

Each national government levies indirect taxes on consumption and imposes direct taxes on labour income, interest income, corporate profits, and the return on shares. The model also includes various withholding taxes and a number of policy variables indicating the extent to which governments engage in international exchange of information to enforce residence-based income taxation. Public revenues are spent on public consumption, on unemployment benefits and on other transfers. Finally, the model accounts for the various methods used to alleviate the domestic and international double taxation of corporate-source income.

A general equilibrium is established when households and trade unions maximize their utilities, firms maximize profits, and all national markets for bonds and stocks are clearing. Because of high substitutability between securities issued in different countries, the national asset markets are of course highly interdependent.

The calibration of the model relies mainly on OECD national income accounts plus the OECD tax data base for the year 2000, supplemented by data from various other OECD publications. Parameter values are chosen so as to generate realistic levels of endogenous variables such as foreign direct investment, foreign portfolio investment, the ratio of household to institutional saving, the ratio of housing capital relative to business capital, unemployment rates, relative national income per capita, net foreign asset positions, and last, but not least, effective average tax rates on labour income and corporate income. Time and space does not allow me to elaborate on the calibration, but I have given more details on the model and its calibration elsewhere (Sørensen, 2001b and 2001c).

I have spent some time presenting the OECDTAX model in order to make the methodological point that, given the power of modern computers, it is possible to construct operational simulation models capturing a fair amount of the institutional complexity of real world tax systems and capital markets. I believe that tax economists should devote more effort to the construction of such models to be able to offer more relevant answers to the policy issues with which tax policy makers are concerned.

Let me now illustrate an application of the OECDTAX model.

European tax competition: a shift from corporate taxes to labour taxes in the EU

With the advent of the euro capital market integration in the EU is expected to deepen even further. As a consequence, Member State competition to attract mobile capital is likely to intensify, putting further downward pressure on corporate tax rates in Europe. I mentioned earlier that previous cuts in statutory corporate tax rates have to a large extent been financed through a broadening of the corporate income tax base. However, as depreciation schedules are being tightened and special investment incentives are being phased out, the scope for further broadening of the European corporate tax base is diminishing. In the future it will therefore be difficult to finance further cuts in statutory corporate tax rates without losing corporate tax revenues. This means that lost revenues will have to be recouped either via cuts in public spending or via higher direct or indirect taxes on labour. Over the last decades, there has been a steady growth of the relative size of the public sector in continental Europe, and population ageing is putting further upward pressure on public budgets in the years to come. Hence it does not seem very realistic that a possible fall in corporate tax revenues can be made up by lower public expenditure. This raises the prospect of further increases in average effective tax rates on labour income.

Against this background, I have used the OECDTAX model to simulate the effects of a 10 percentage point cut in the statutory corporate tax rate in all EU countries, financed by higher tax rates on labour income to keep the stock of public debt constant. The simulation includes the effects on 25 different countries, but to avoid getting lost in too many figures, Table 1 only shows the simulated effects for Denmark, Germany, and the United States plus the effects for the EU and OECD areas as a whole. Denmark and Germany have been selected because they are examples of a small and a large European economy, respectively, and because their initial tax structures are rather different. Note that the calibration of the initial equilibrium is based on the tax rules prevailing in the year 2000, before the recent German tax reform was starting to take effect.

Table 1. Effects of a 10 percentage point cut in corporate tax rates across the EU, financed by higher taxes on labour income.

	Denmark	Germany	EU[1]	USA	OECD[1]
			----- Percent. -----		
GDP	-1.5	0.9	0.6	-0.1	0.1
Stock of business capital	-0.2	3.1	2.3	-0.3	0.7
Inward FDI	11.6	57.6	51.2[2]	2.9	15.4
Outward FDI	9.4	-5.1	-2.4[2]	40.2	22.6
Financial saving	0.6	0.3	0.2	0.3	0.3
Working hours	-1.2	-0.0	-0.2	-0.0	-0.1
			----- Percentage.points -----		
Unemployment	1.5	0.2	0.1	+0.0	0.1
Tax rate on labour income	3.7	0.7	1.0	+0.0	0.5
			----- Percent.of initial GDP -----		
Inward profit shifting	0.1	0.2	0.1	-0.0	-0.0
Welfare	-0.9	0.4	0.1	-0.0	+0.0

Source: Simulations of the OECDTAX model.

1) Population-weighted average for the EU and the OECD, respectively.

2) FDI flows between the EU and the rest of the OECD.

Consider first the effects of the tax shift on the EU area as a whole, shown in the third column of Table 1. As the level of corporate taxes in Europe falls, the EU becomes a more attractive location for international investment, so the level of inward foreign direct investment goes up whereas outward direct investment decreases, as multinationals prefer to invest more of their capital in Europe rather than elsewhere. As a consequence, the European capital stock inceases. This in turn raises European GDP. In addition, the lower statutory corporate tax rates in the EU induce European multinationals to change their transfer prices so as to shift taxable profits from the rest of the world to the EU area. Financial saving in Europe goes up, partly because the corporate tax cut increases the after-tax return to saving, and partly because increasing demand for capital drives up the level of pre-tax rates of return in the EU.

The downside of this scenario shows up in the labour market which must absorb an increase in labour taxes. Because the labour income tax base is much broader than the corporate

tax base, and because the rise in investment and output automatically generates some additional revenue, the average effective tax rate on labour income only has to increase by 1 percentage point in the average EU country. Still, this has a negative labour market impact for two reasons. First, there is a tax-push effect on union wage setting, as trade unions try to compensate for the higher tax burden by driving up pre-tax wage rates. As a consequence, the rate of unemployment goes up. The existence of such a tax-push effect on wages and the resulting negative impact on employment has been documented by Francesco Daveri and Guido Tabellini (2000), among others. Second, the higher marginal tax rates on labour income also induce unions to bargain for shorter working hours, as shown in Table 1. Nevertheless, despite the negative labour market response, the net effect of the tax shift is a modest increase in average consumer welfare in Europe, due to the inflow of capital from the rest of the world.

However, as indicated by the first two columns in Table 1, this welfare gain for Europe as a whole will be quite unevenly distributed across EU countries. For a country like Germany which starts out with a very high corporate tax rate in 2000, we observe a strongly positive effect on domestic investment. The large percentage increase in inward direct investment in Germany may seem dramatic, but note that according to the OECD statistics the level of inward foreign direct investment in Germany was relatively low in the 1990s, perhaps partly due to the high corporate tax rate. Because of the low initial investment level, even a modest *absolute* increase in inward FDI in Germany implies a substantial *percentage* increase, and given the heavy weight of Germany in the EU economy, this translates into a large percentage increase in inward FDI for the EU as well. Anyway, the figures in the second column of Table 1 suggest that Germany will benefit considerably from the recently enacted cuts in the corporate tax rate, as I have argued elsewhere (Sørensen, 2001b).

Turning to the first column in the table, we see that Denmark would actually *lose* from an increase in the relative tax burden on labour. The reason is that the initial corporate tax rate in Denmark is much lower than in Germany, whereas the initial level of labour taxes is significantly higher, due to very high indirect tax rates. Because Danish workers are already overburdened with taxes, the Danish labour income tax base shrinks considerably in reaction to further tax increases, so the average effective tax rate on labour income has to increase by 3.7 percentage points to finance the 10 percentage point cut in the corporate tax rate. The result is a marked increase in Danish unemployment and a fall in GDP and welfare. The strikingly different effects for Denmark

and Germany illustrate my earlier point that the effects of international tax competition depend very much on a country's initial level and structure of taxation.

World tax competition

The third column of Table 1 shows that the European tax shift is a beggar-thy-neighbour policy: the effects on the U.S. economy will be negative, because the fall in European corporate tax rates will generate an outflow of capital from America to Europe. It seems quite likely that the U.S. government and other governments in the rest of the world will react to intensified tax competition from Europe by lowering their own corporate tax rates.

Table 2. Effects of a 10 percentage point cut in corporate tax rates in all OECD countries, financed by higher taxes on labour income.

	Denmark	Germany	*EU[1]*	USA	*OECD[1]*
	----- *Percent.* -----				
GDP	-2.6	0.4	0.1	0.4	0.2
Stock of business capital	-1.7	2.5	1.5	2.1	1.7
	----- *Pct.point* ----				
Unemployment	2.2	0.4	0.3	+0.0	0.1
Tax rate on labour income	5.1	1.2	1.5	1.2	1.3
	----- *Pct. af initial BNP* -----				
Welfare	-1.3	0.2	-0.0	0.1	+0.0

Source: Simulations of the OECDTAX model.

1) Population.weighted average for the EU and for the OECD, respectively.

Table 2 therefore shows the effects of a 10 percentage point cut in corporate tax rates in *all* OECD countries, financed by higher taxes on labour income. In this scenario the EU area as a whole no longer gains from a capital inflow from the rest of the world. Compared to the case with a unilateral European corporate tax cut, the increase in European economic activity is therefore much smaller, so the necessary increase in labour tax rates is larger, generating a larger increase in unemployment. As a result, the net effect is a slight drop in welfare for the EU as a whole. In other words, the effects of intensified tax competition in Europe depend very much on whether tax policy in the rest of the world remains passive, or whether it imitates European policy.

In the former case stronger tax competition may be beneficial for Europe, but in the latter case it seems to be harmful, in particular for the European labour market.

The importance of labour market responses

The simulations above assume that the net wage elasticity of effective labour supply is 0.2. In practice, changes in effective labour supply do not only reflect changes in hours worked, but also changes in the supply of skills, changes in on-the-job effort, and shifts in labour supply between the formal and the informal labour market.

Table 3. Sensitivity of welfare gain from a 10 percentage point cut in corporate tax rates across the EU, financed by higher taxes on labour income.

	EU average	OECD average
	--- Welfare gain in percent of initial GDP ---	
Medium labour supply elasticity (0.2)	0.1	0.0
High labour supply elasticity (0.3)	-0.3	-0.2

Source: Simulations of the OECDTAX model.

Once the effects of after-tax wage rates on all these margins of decision-making are accounted for, it is quite conceivable that the elasticity of effective labour supply is larger than 0.2. As one might expect, the effects of a shift from corporate taxes to labour taxes are quite sensitive to the magnitude of the labour supply elasticity. This is illustrated in Table 3 which compares the welfare effect of a tax shift in Europe in the benchmark case with a labour supply elasticity of 0.2 to the effect in an alternative scenario with an elasticity of 0.3. In the latter case where effective labour supply reacts more negatively to higher labour taxes, we see that a shift in the tax burden from mobile capital to immobile labour has a substantial *negative* effect for the EU as a whole. To evaluate such a policy scenario it is therefore very important to have reliable estimates of the labour market response to higher labour taxes.

Implications for corporate tax harmonization in the EU

Before I close, let me relate my analysis to the debate on corporate tax harmonization in the EU. The fact that a change in the corporate income tax rate has a very different impact on

different Member States suggests that a harmonization of the corporation tax across the EU would create losers as well as winners, even if the EU as a whole would gain from a more efficient intra-European allocation of the capital stock. A simulation of the OECDTAX model has confirmed this hypothesis. A presentation of this simulation is beyond the scope of this lecture, but the main result is that the current low-tax countries would tend to lose from a harmonization of effective corporate tax rates around the EU average. Unless those countries which benefit from harmonization are willing and able to compensate the losers, say, via the common EU budget or via a political package deal, it is unlikely that harmonization will ever become politically feasible, at least as long as the unanimity principle is maintained for matters of tax policy. We should also keep in mind that small peripheral economies may have a legitimate need for a lower corporate tax rate to compensate for their locational disadvantage, as Richard Baldwin and Paul Krugman (2000) have recently argued on the basis of a model of economic geography.

Nevertheless, at least for the European core countries, I believe that corporate tax harmonization remains a legitimate long term goal. My point is that the corporation tax is basically just a withholding tax, serving as a prepayment of the personal tax on corporate source income. The OECD and the EU are currently making efforts to secure a more effective international exchange of information between tax authorities. If information exchange could be made to work - and I admit that this is a big 'if' indeed - residence countries would be able to choose their own preferred level of *total* tax on corporate source income via their control of the residence-based personal taxes on dividends and capital gains. If a Member State finds that the harmonized corporation tax implies an inappropriately low level of tax on corporate-source equity income, it can rectify the situation by adding personal taxes on dividends and capital gains at the shareholder level. If it finds that the harmonized corporation tax is too high, it can use part of its corporate tax revenue to finance tax credits to shareholders. In this way the subsidiarity principle could be respected even if the corporation tax were harmonized across the European core countries, as I have argued in more detail elsewhere (Sørensen, 2002). The advantage of a fully harmonized corporation tax is that, apart from securing an efficient allocation of corporate investment across Europe, it would also eliminate the need for European multinationals to deal with 15 different national systems, thereby greatly reducing the costs of tax compliance.

But for the time being, this scenario is undoubtedly too ambitious. It seems quite likely that tax competition has to become more intense and to show more adverse effects before EU

Member States are willing to even consider coordination measures such as the imposition of a minimum corporate tax rate and measures to prevent erosion of the corporate tax base through exemptions and investment incentives etc. In the meantime, the analysis in this lecture suggests that we could see a shift of the tax burden towards labour which would aggravate the European unemployment problem.

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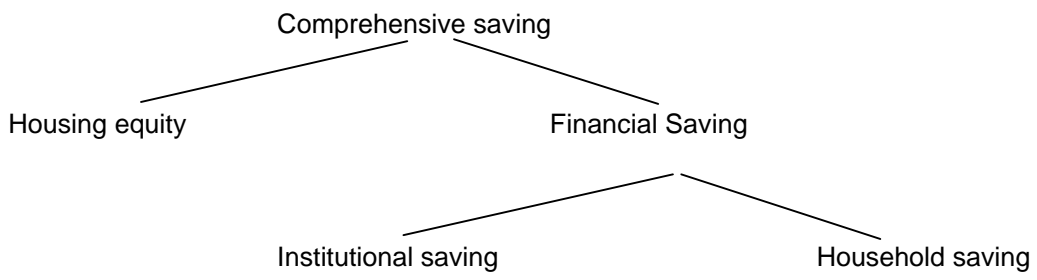Figure 1: Allocation of savings in the OECDTAX model: the initial stages

Comprehensive saving

Housing equity   Financial Saving

Institutional saving   Household saving

Household saving

Stocks

Bonds

Domestic stocks

Foreign stocks

Domestic bonds

Foreign bonds

EU stocks

ROW stocks

EU bonds

ROW bonds

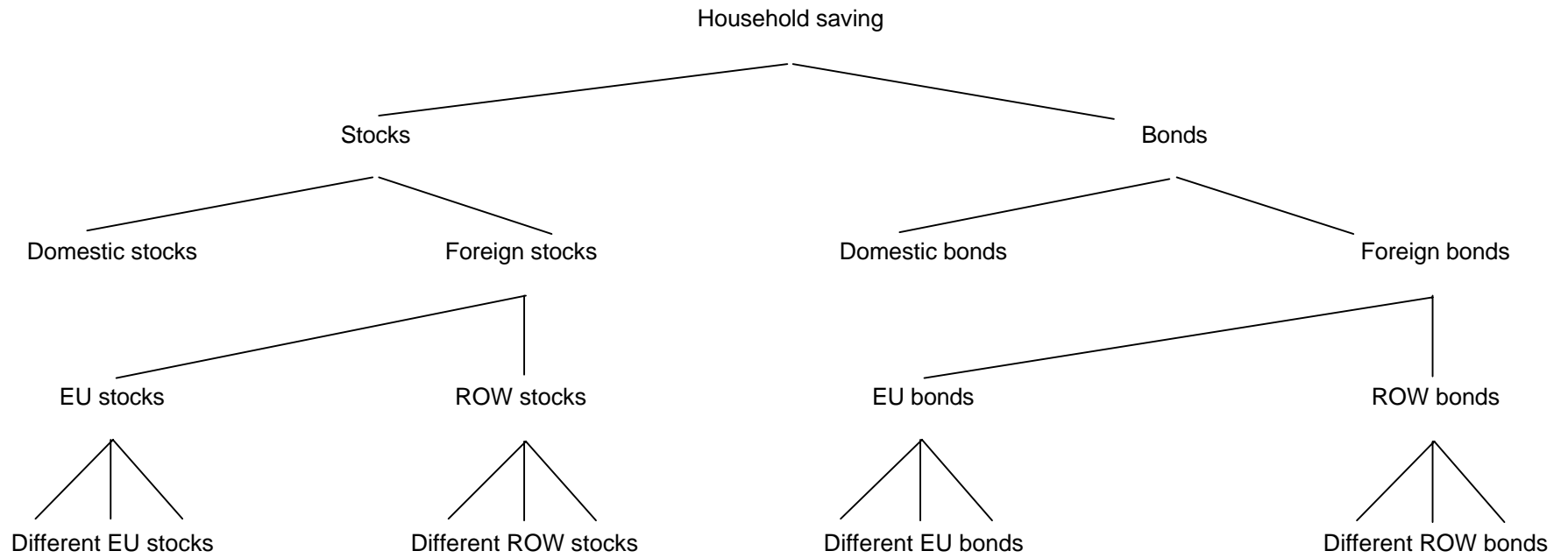Different EU stocks

Different ROW stocks

Different EU bonds

Different ROW bonds

Figure 3: The business sector in the OECDTAX model